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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 3 1 in 10	
Date 16/05/2023 File C798-V1.0 Pond 3 - 1 in ...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 10 year Return Period


Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	80.572	0.098	3.6	40.0	O K
30 min Summer	80.597	0.123	4.4	50.7	O K
60 min Summer	80.620	0.146	4.5	60.6	O K
120 min Summer	80.641	0.167	4.5	69.9	O K
180 min Summer	80.649	0.175	4.5	73.4	O K
240 min Summer	80.652	0.178	4.5	74.9	O K
360 min Summer	80.652	0.178	4.5	74.6	O K
480 min Summer	80.647	0.173	4.5	72.4	O K
600 min Summer	80.640	0.166	4.5	69.4	O K
720 min Summer	80.633	0.159	4.5	66.2	O K
960 min Summer	80.618	0.144	4.5	59.9	O K
1440 min Summer	80.595	0.121	4.4	50.0	O K
2160 min Summer	80.577	0.103	3.8	42.2	O K
2880 min Summer	80.566	0.092	3.3	37.4	O K
4320 min Summer	80.553	0.079	2.7	31.9	O K
5760 min Summer	80.545	0.071	2.3	28.8	O K
7200 min Summer	80.540	0.066	2.1	26.7	O K
8640 min Summer	80.537	0.063	1.9	25.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	61.725	0.0	39.1	21
30 min Summer	40.464	0.0	52.0	35
60 min Summer	25.532	0.0	68.1	62
120 min Summer	16.169	0.0	86.6	112
180 min Summer	12.182	0.0	98.1	144
240 min Summer	9.886	0.0	106.2	176
360 min Summer	7.272	0.0	117.3	244
480 min Summer	5.806	0.0	125.0	312
600 min Summer	4.861	0.0	130.8	380
720 min Summer	4.198	0.0	135.6	444
960 min Summer	3.323	0.0	143.0	572
1440 min Summer	2.392	0.0	154.1	810
2160 min Summer	1.733	0.0	169.2	1168
2880 min Summer	1.389	0.0	180.7	1532
4320 min Summer	1.036	0.0	201.3	2252
5760 min Summer	0.853	0.0	222.7	2992
7200 min Summer	0.740	0.0	241.5	3680
8640 min Summer	0.664	0.0	259.6	4408

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	80.534	0.060	1.7	24.1	O K
15 min Winter	80.583	0.109	4.0	44.8	O K
30 min Winter	80.612	0.138	4.5	57.1	O K
60 min Winter	80.638	0.164	4.5	68.7	O K
120 min Winter	80.664	0.190	4.5	79.9	O K
180 min Winter	80.671	0.197	4.5	83.2	O K
240 min Winter	80.673	0.199	4.5	84.2	O K
360 min Winter	80.669	0.195	4.5	82.4	O K
480 min Winter	80.660	0.186	4.5	78.3	O K
600 min Winter	80.649	0.175	4.5	73.3	O K
720 min Winter	80.637	0.163	4.5	68.2	O K
960 min Winter	80.616	0.142	4.5	58.7	O K
1440 min Winter	80.587	0.113	4.1	46.4	O K
2160 min Winter	80.566	0.092	3.3	37.6	O K
2880 min Winter	80.555	0.081	2.8	32.7	O K
4320 min Winter	80.542	0.068	2.1	27.5	O K
5760 min Winter	80.535	0.061	1.8	24.6	O K
7200 min Winter	80.530	0.056	1.6	22.6	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	276.9	5144
15 min Winter	61.725	0.0	44.1	21
30 min Winter	40.464	0.0	58.6	35
60 min Winter	25.532	0.0	76.5	62
120 min Winter	16.169	0.0	97.2	118
180 min Winter	12.182	0.0	110.0	168
240 min Winter	9.886	0.0	119.2	190
360 min Winter	7.272	0.0	131.6	266
480 min Winter	5.806	0.0	140.1	340
600 min Winter	4.861	0.0	146.7	410
720 min Winter	4.198	0.0	152.0	478
960 min Winter	3.323	0.0	160.4	604
1440 min Winter	2.392	0.0	172.9	838
2160 min Winter	1.733	0.0	189.7	1192
2880 min Winter	1.389	0.0	202.6	1556
4320 min Winter	1.036	0.0	225.8	2292
5760 min Winter	0.853	0.0	249.6	3000
7200 min Winter	0.740	0.0	270.6	3744

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Causeway	Source Control 2020.1.3	

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	80.527	0.053	1.4	21.3	O K
10080 min Winter	80.525	0.051	1.3	20.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	0.664	0.0	290.9	4496
10080 min Winter	0.608	0.0	310.5	5152

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Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.364

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 0.182	4	8 0.182

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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 81.274

Tank or Pond Structure

Invert Level (m) 80.474

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	395.3	0.300	479.6	0.600	569.1
0.100	422.8	0.400	508.9	0.700	600.0
0.200	451.0	0.500	538.7	0.800	631.5


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0107-4500-0500-4500
Design Head (m)	0.500
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	80.474
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	4.5	Kick-Flo®	0.368	3.9
Flush-Flo™	0.173	4.5	Mean Flow over Head Range	-	3.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	6.8	3.000	10.4	7.000	15.7
0.200	4.5	1.400	7.3	3.500	11.2	7.500	16.2
0.300	4.3	1.600	7.7	4.000	11.9	8.000	16.8
0.400	4.1	1.800	8.2	4.500	12.6	8.500	17.3
0.500	4.5	2.000	8.6	5.000	13.3	9.000	17.8
0.600	4.9	2.200	9.0	5.500	13.9	9.500	18.3
0.800	5.6	2.400	9.4	6.000	14.5		
1.000	6.2	2.600	9.7	6.500	15.1		

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Causeway		Source Control 2020.1.3

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	80.600	0.126	4.4	51.9	O K
30 min Summer	80.635	0.161	4.5	67.3	O K
60 min Summer	80.668	0.194	4.5	81.9	O K
120 min Summer	80.693	0.219	4.5	93.0	O K
180 min Summer	80.700	0.226	4.5	96.4	O K
240 min Summer	80.703	0.229	4.5	97.6	O K
360 min Summer	80.701	0.227	4.5	96.8	O K
480 min Summer	80.695	0.221	4.5	94.1	O K
600 min Summer	80.687	0.213	4.5	90.5	O K
720 min Summer	80.678	0.204	4.5	86.5	O K
960 min Summer	80.660	0.186	4.5	78.4	O K
1440 min Summer	80.629	0.155	4.5	64.4	O K
2160 min Summer	80.596	0.122	4.4	50.4	O K
2880 min Summer	80.580	0.106	3.9	43.6	O K
4320 min Summer	80.563	0.089	3.2	36.2	O K
5760 min Summer	80.553	0.079	2.7	32.0	O K
7200 min Summer	80.547	0.073	2.4	29.4	O K
8640 min Summer	80.542	0.068	2.2	27.6	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	80.127	0.0	51.5	21
30 min Summer	53.145	0.0	69.2	35
60 min Summer	33.681	0.0	90.3	64
120 min Summer	20.661	0.0	111.1	122
180 min Summer	15.374	0.0	124.2	162
240 min Summer	12.395	0.0	133.6	194
360 min Summer	9.057	0.0	146.5	258
480 min Summer	7.207	0.0	155.5	326
600 min Summer	6.021	0.0	162.4	392
720 min Summer	5.191	0.0	168.0	460
960 min Summer	4.097	0.0	176.8	590
1440 min Summer	2.933	0.0	189.5	838
2160 min Summer	2.107	0.0	206.0	1176
2880 min Summer	1.676	0.0	218.2	1532
4320 min Summer	1.230	0.0	239.4	2252
5760 min Summer	0.999	0.0	261.1	2992
7200 min Summer	0.858	0.0	280.2	3680
8640 min Summer	0.763	0.0	298.6	4408

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Causeway		Source Control 2020.1.3

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	80.539	0.065	2.0	26.2	O K
15 min Winter	80.615	0.141	4.5	58.3	O K
30 min Winter	80.655	0.181	4.5	75.9	O K
60 min Winter	80.692	0.218	4.5	92.7	O K
120 min Winter	80.721	0.247	4.5	106.0	O K
180 min Winter	80.731	0.257	4.5	110.5	O K
240 min Winter	80.732	0.258	4.5	111.0	O K
360 min Winter	80.727	0.253	4.5	108.7	O K
480 min Winter	80.717	0.243	4.5	104.2	O K
600 min Winter	80.704	0.230	4.5	98.4	O K
720 min Winter	80.691	0.217	4.5	92.2	O K
960 min Winter	80.663	0.189	4.5	79.8	O K
1440 min Winter	80.617	0.143	4.5	59.5	O K
2160 min Winter	80.582	0.108	4.0	44.4	O K
2880 min Winter	80.566	0.092	3.3	37.6	O K
4320 min Winter	80.550	0.076	2.5	30.8	O K
5760 min Winter	80.541	0.067	2.1	27.1	O K
7200 min Winter	80.535	0.061	1.8	24.8	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.694	0.0	316.3	5144
15 min Winter	80.127	0.0	58.0	21
30 min Winter	53.145	0.0	77.8	35
60 min Winter	33.681	0.0	101.3	64
120 min Winter	20.661	0.0	124.6	120
180 min Winter	15.374	0.0	139.2	174
240 min Winter	12.395	0.0	149.8	226
360 min Winter	9.057	0.0	164.2	280
480 min Winter	7.207	0.0	174.3	354
600 min Winter	6.021	0.0	182.1	428
720 min Winter	5.191	0.0	188.4	498
960 min Winter	4.097	0.0	198.2	634
1440 min Winter	2.933	0.0	212.6	870
2160 min Winter	2.107	0.0	230.8	1212
2880 min Winter	1.676	0.0	244.6	1560
4320 min Winter	1.230	0.0	268.4	2292
5760 min Winter	0.999	0.0	292.5	2992
7200 min Winter	0.858	0.0	314.0	3744

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Causeway	Source Control 2020.1.3	

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	80.531	0.057	1.6	23.2	O K
10080 min Winter	80.529	0.055	1.5	21.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	0.763	0.0	334.7	4488
10080 min Winter	0.694	0.0	354.6	5192

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Causeway	Source Control 2020.1.3	


Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.364

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.182	4	8	0.182

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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 81.274

Tank or Pond Structure

Invert Level (m) 80.474

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	395.3	0.300	479.6	0.600	569.1
0.100	422.8	0.400	508.9	0.700	600.0
0.200	451.0	0.500	538.7	0.800	631.5


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0107-4500-0500-4500
Design Head (m)	0.500
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	80.474
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	4.5	Kick-Flo®	0.368	3.9
Flush-Flo™	0.173	4.5	Mean Flow over Head Range	-	3.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	6.8	3.000	10.4	7.000	15.7
0.200	4.5	1.400	7.3	3.500	11.2	7.500	16.2
0.300	4.3	1.600	7.7	4.000	11.9	8.000	16.8
0.400	4.1	1.800	8.2	4.500	12.6	8.500	17.3
0.500	4.5	2.000	8.6	5.000	13.3	9.000	17.8
0.600	4.9	2.200	9.0	5.500	13.9	9.500	18.3
0.800	5.6	2.400	9.4	6.000	14.5		
1.000	6.2	2.600	9.7	6.500	15.1		

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Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	80.701	0.227	4.5	97.0	O K
30 min Summer	80.768	0.294	4.5	128.3	O K
60 min Summer	80.834	0.360	4.5	160.3	O K
120 min Summer	80.883	0.409	4.5	185.3	O K
180 min Summer	80.906	0.432	4.5	197.2	O K
240 min Summer	80.917	0.443	4.5	202.9	O K
360 min Summer	80.920	0.446	4.5	204.5	O K
480 min Summer	80.917	0.443	4.5	202.5	O K
600 min Summer	80.911	0.437	4.5	199.4	O K
720 min Summer	80.903	0.429	4.5	195.5	O K
960 min Summer	80.885	0.411	4.5	186.2	O K
1440 min Summer	80.845	0.371	4.5	165.7	O K
2160 min Summer	80.777	0.303	4.5	132.6	O K
2880 min Summer	80.721	0.247	4.5	106.0	O K
4320 min Summer	80.641	0.167	4.5	69.7	O K
5760 min Summer	80.599	0.125	4.4	51.4	O K
7200 min Summer	80.582	0.108	4.0	44.3	O K
8640 min Summer	80.572	0.098	3.6	40.1	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	147.323	0.0	97.0	22
30 min Summer	98.447	0.0	130.3	37
60 min Summer	62.800	0.0	169.6	66
120 min Summer	37.929	0.0	205.1	124
180 min Summer	28.125	0.0	228.2	184
240 min Summer	22.670	0.0	245.4	242
360 min Summer	16.609	0.0	269.7	350
480 min Summer	13.291	0.0	287.8	404
600 min Summer	11.157	0.0	302.0	466
720 min Summer	9.655	0.0	313.6	528
960 min Summer	7.657	0.0	331.5	664
1440 min Summer	5.502	0.0	356.9	942
2160 min Summer	3.916	0.0	383.7	1320
2880 min Summer	3.075	0.0	401.5	1680
4320 min Summer	2.195	0.0	428.9	2376
5760 min Summer	1.740	0.0	455.3	3000
7200 min Summer	1.468	0.0	479.9	3744
8640 min Summer	1.286	0.0	504.1	4416

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Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	80.565	0.091	3.3	37.2	O K
15 min Winter	80.727	0.253	4.5	109.0	O K
30 min Winter	80.801	0.327	4.5	144.3	O K
60 min Winter	80.874	0.400	4.5	180.6	O K
120 min Winter	80.929	0.455	4.5	209.2	O K
180 min Winter	80.956	0.482	4.5	223.4	O K
240 min Winter	80.970	0.496	4.5	230.7	O K
360 min Winter	80.977	0.503	4.5	234.5	Flood Risk
480 min Winter	80.972	0.498	4.5	231.9	O K
600 min Winter	80.963	0.489	4.5	227.0	O K
720 min Winter	80.954	0.480	4.5	222.0	O K
960 min Winter	80.930	0.456	4.5	209.4	O K
1440 min Winter	80.875	0.401	4.5	180.8	O K
2160 min Winter	80.775	0.301	4.5	131.5	O K
2880 min Winter	80.691	0.217	4.5	92.4	O K
4320 min Winter	80.596	0.122	4.4	50.2	O K
5760 min Winter	80.573	0.099	3.6	40.5	O K
7200 min Winter	80.561	0.087	3.1	35.4	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	1.156	0.0	527.8	5144
15 min Winter	147.323	0.0	108.9	22
30 min Winter	98.447	0.0	146.2	36
60 min Winter	62.800	0.0	190.1	66
120 min Winter	37.929	0.0	229.9	122
180 min Winter	28.125	0.0	255.8	180
240 min Winter	22.670	0.0	275.0	236
360 min Winter	16.609	0.0	302.2	348
480 min Winter	13.291	0.0	322.5	452
600 min Winter	11.157	0.0	338.4	488
720 min Winter	9.655	0.0	351.4	562
960 min Winter	7.657	0.0	371.4	716
1440 min Winter	5.502	0.0	399.8	1024
2160 min Winter	3.916	0.0	429.9	1424
2880 min Winter	3.075	0.0	449.9	1764
4320 min Winter	2.195	0.0	480.8	2336
5760 min Winter	1.740	0.0	510.0	3000
7200 min Winter	1.468	0.0	537.7	3744

PFA Consulting		Page 3
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 3 1 in 100 yr + CC	
Date 16/06/2023 File C798-V1.0 Pond 3 - 1 in ...	Designed by IS Checked by	
Causeway	Source Control 2020.1.3	

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	80.554	0.080	2.7	32.3	O K
10080 min Winter	80.548	0.074	2.5	30.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	1.286	0.0	564.8	4416
10080 min Winter	1.156	0.0	591.6	5144

PFA Consulting		Page 4
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 3 1 in 100 yr + CC	
Date 16/06/2023	Designed by IS	
File C798-V1.0 Pond 3 - 1 in ...	Checked by	
Causeway	Source Control 2020.1.3	


Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.364

Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:
	(ha)		(ha)
0	4 0.182	4	8 0.182

PFA Consulting		Page 5
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 3 1 in 100 yr + CC	
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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 81.274

Tank or Pond Structure

Invert Level (m) 80.474

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	395.3	0.300	479.6	0.600	569.1
0.100	422.8	0.400	508.9	0.700	600.0
0.200	451.0	0.500	538.7	0.800	631.5


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0107-4500-0500-4500
Design Head (m)	0.500
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	80.474
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	4.5	Kick-Flo®	0.368	3.9
Flush-Flo™	0.173	4.5	Mean Flow over Head Range	-	3.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	6.8	3.000	10.4	7.000	15.7
0.200	4.5	1.400	7.3	3.500	11.2	7.500	16.2
0.300	4.3	1.600	7.7	4.000	11.9	8.000	16.8
0.400	4.1	1.800	8.2	4.500	12.6	8.500	17.3
0.500	4.5	2.000	8.6	5.000	13.3	9.000	17.8
0.600	4.9	2.200	9.0	5.500	13.9	9.500	18.3
0.800	5.6	2.400	9.4	6.000	14.5		
1.000	6.2	2.600	9.7	6.500	15.1		

PFA Consulting		Page 1
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butt Close, Marnhull Attenuation Pond 4 1 in 10 yr	
Date 16/05/2023	Designed by IS	
File C798-V2.0 Pond 4 - 1 in ...	Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 10 year Return Period


Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	82.910	0.082	2.8	13.8	O K
30 min Summer	82.926	0.098	3.6	16.7	O K
60 min Summer	82.936	0.108	4.0	18.6	O K
120 min Summer	82.945	0.117	4.3	20.3	O K
180 min Summer	82.946	0.118	4.3	20.4	O K
240 min Summer	82.943	0.115	4.2	19.9	O K
360 min Summer	82.935	0.107	3.9	18.4	O K
480 min Summer	82.927	0.099	3.6	17.0	O K
600 min Summer	82.921	0.093	3.4	15.8	O K
720 min Summer	82.915	0.087	3.1	14.8	O K
960 min Summer	82.907	0.079	2.7	13.2	O K
1440 min Summer	82.896	0.068	2.1	11.3	O K
2160 min Summer	82.886	0.058	1.6	9.6	O K
2880 min Summer	82.880	0.052	1.4	8.6	O K
4320 min Summer	82.873	0.045	1.0	7.4	O K
5760 min Summer	82.869	0.041	0.9	6.7	O K
7200 min Summer	82.866	0.038	0.8	6.2	O K
8640 min Summer	82.864	0.036	0.7	5.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	61.725	0.0	14.7	17
30 min Summer	40.464	0.0	19.4	30
60 min Summer	25.532	0.0	24.8	46
120 min Summer	16.169	0.0	31.5	80
180 min Summer	12.182	0.0	35.6	114
240 min Summer	9.886	0.0	38.6	146
360 min Summer	7.272	0.0	42.6	210
480 min Summer	5.806	0.0	45.4	272
600 min Summer	4.861	0.0	47.5	334
720 min Summer	4.198	0.0	49.2	396
960 min Summer	3.323	0.0	51.9	518
1440 min Summer	2.392	0.0	56.0	762
2160 min Summer	1.733	0.0	61.1	1124
2880 min Summer	1.389	0.0	65.3	1496
4320 min Summer	1.036	0.0	72.9	2208
5760 min Summer	0.853	0.0	80.3	2944
7200 min Summer	0.740	0.0	87.1	3672
8640 min Summer	0.664	0.0	93.7	4408

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	82.862	0.034	0.6	5.6	O K
15 min Winter	82.919	0.091	3.3	15.5	O K
30 min Winter	82.937	0.109	4.0	18.7	O K
60 min Winter	82.948	0.120	4.4	20.7	O K
120 min Winter	82.955	0.127	4.4	22.1	O K
180 min Winter	82.952	0.124	4.4	21.5	O K
240 min Winter	82.946	0.118	4.3	20.4	O K
360 min Winter	82.934	0.106	3.9	18.1	O K
480 min Winter	82.923	0.095	3.5	16.2	O K
600 min Winter	82.915	0.087	3.1	14.7	O K
720 min Winter	82.909	0.081	2.8	13.6	O K
960 min Winter	82.900	0.072	2.3	12.0	O K
1440 min Winter	82.888	0.060	1.8	9.9	O K
2160 min Winter	82.879	0.051	1.3	8.3	O K
2880 min Winter	82.873	0.045	1.0	7.4	O K
4320 min Winter	82.867	0.039	0.8	6.3	O K
5760 min Winter	82.863	0.035	0.7	5.6	O K
7200 min Winter	82.860	0.032	0.6	5.2	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	100.0	5144
15 min Winter	61.725	0.0	16.5	17
30 min Winter	40.464	0.0	21.8	30
60 min Winter	25.532	0.0	27.8	48
120 min Winter	16.169	0.0	35.3	86
180 min Winter	12.182	0.0	40.0	122
240 min Winter	9.886	0.0	43.2	156
360 min Winter	7.272	0.0	47.7	220
480 min Winter	5.806	0.0	50.8	284
600 min Winter	4.861	0.0	53.2	344
720 min Winter	4.198	0.0	55.1	406
960 min Winter	3.323	0.0	58.2	528
1440 min Winter	2.392	0.0	62.7	776
2160 min Winter	1.733	0.0	68.5	1136
2880 min Winter	1.389	0.0	73.2	1504
4320 min Winter	1.036	0.0	81.7	2232
5760 min Winter	0.853	0.0	89.9	2944
7200 min Winter	0.740	0.0	97.6	3672

PFA Consulting		Page 3
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butt Close, Marnhull Attenuation Pond 4 1 in 10 yr	
Date 16/06/2023 File C798-V2.0 Pond 4 - 1 in ...	Designed by IS Checked by	
Causeway	Source Control 2020.1.3	

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	82.859	0.031	0.5	4.9	O K
10080 min Winter	82.857	0.029	0.5	4.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	0.664	0.0	104.9	4440
10080 min Winter	0.608	0.0	112.1	5040

PFA Consulting		Page 4
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butt Close, Marnhull Attenuation Pond 4 1 in 10 yr	
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File C798-V2.0 Pond 4 - 1 in ...	Checked by	
Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.131

Time (mins)	Area
From:	To: (ha)
0	4 0.131

PFA Consulting		Page 5
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butt Close, Marnhull Attenuation Pond 4 1 in 10 yr	
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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 83.628

Tank or Pond Structure

Invert Level (m) 82.828

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	158.6	0.300	234.5	0.600	315.4
0.100	183.3	0.400	260.9	0.700	343.5
0.200	208.6	0.500	287.9	0.800	372.2


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0107-4500-0500-4500
Design Head (m)	0.500
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	82.828
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	4.5	Kick-Flo®	0.368	3.9
Flush-Flo™	0.173	4.5	Mean Flow over Head Range	-	3.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	6.8	3.000	10.4	7.000	15.7
0.200	4.5	1.400	7.3	3.500	11.2	7.500	16.2
0.300	4.3	1.600	7.7	4.000	11.9	8.000	16.8
0.400	4.1	1.800	8.2	4.500	12.6	8.500	17.3
0.500	4.5	2.000	8.6	5.000	13.3	9.000	17.8
0.600	4.9	2.200	9.0	5.500	13.9	9.500	18.3
0.800	5.6	2.400	9.4	6.000	14.5		
1.000	6.2	2.600	9.7	6.500	15.1		

PFA Consulting		Page 1
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butt Close, Marnhull Attenuation Pond 4 1 in 30 yr	
Date 16/05/2023 File C798-V2.0 Pond 4 - 1 in ...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	82.932	0.104	3.8	17.8	O K
30 min Summer	82.954	0.126	4.4	21.9	O K
60 min Summer	82.969	0.141	4.5	24.8	O K
120 min Summer	82.977	0.149	4.5	26.4	O K
180 min Summer	82.976	0.148	4.5	26.2	O K
240 min Summer	82.972	0.144	4.5	25.3	O K
360 min Summer	82.959	0.131	4.4	22.9	O K
480 min Summer	82.947	0.119	4.4	20.6	O K
600 min Summer	82.938	0.110	4.1	19.0	O K
720 min Summer	82.931	0.103	3.8	17.6	O K
960 min Summer	82.920	0.092	3.3	15.5	O K
1440 min Summer	82.905	0.077	2.6	13.0	O K
2160 min Summer	82.893	0.065	2.0	10.9	O K
2880 min Summer	82.886	0.058	1.7	9.6	O K
4320 min Summer	82.878	0.050	1.3	8.2	O K
5760 min Summer	82.873	0.045	1.0	7.3	O K
7200 min Summer	82.869	0.041	0.9	6.7	O K
8640 min Summer	82.867	0.039	0.8	6.3	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	80.127	0.0	19.2	17
30 min Summer	53.145	0.0	25.6	31
60 min Summer	33.681	0.0	32.8	48
120 min Summer	20.661	0.0	40.3	82
180 min Summer	15.374	0.0	45.1	116
240 min Summer	12.395	0.0	48.4	150
360 min Summer	9.057	0.0	53.1	214
480 min Summer	7.207	0.0	56.4	274
600 min Summer	6.021	0.0	58.9	336
720 min Summer	5.191	0.0	60.9	398
960 min Summer	4.097	0.0	64.1	518
1440 min Summer	2.933	0.0	68.7	762
2160 min Summer	2.107	0.0	74.4	1124
2880 min Summer	1.676	0.0	78.8	1472
4320 min Summer	1.230	0.0	86.6	2204
5760 min Summer	0.999	0.0	94.1	2936
7200 min Summer	0.858	0.0	101.0	3672
8640 min Summer	0.763	0.0	107.7	4408

PFA Consulting		Page 2
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butt Close, Marnhull Attenuation Pond 4 1 in 30 yr	
Date 16/06/2023 File C798-V2.0 Pond 4 - 1 in ...	Designed by IS Checked by	
Causeway		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	82.865	0.037	0.7	6.0	O K
15 min Winter	82.944	0.116	4.3	20.0	O K
30 min Winter	82.969	0.141	4.5	24.8	O K
60 min Winter	82.986	0.158	4.5	28.1	O K
120 min Winter	82.991	0.163	4.5	29.2	O K
180 min Winter	82.986	0.158	4.5	28.2	O K
240 min Winter	82.978	0.150	4.5	26.5	O K
360 min Winter	82.957	0.129	4.4	22.6	O K
480 min Winter	82.942	0.114	4.2	19.7	O K
600 min Winter	82.931	0.103	3.8	17.6	O K
720 min Winter	82.922	0.094	3.4	16.1	O K
960 min Winter	82.910	0.082	2.9	13.9	O K
1440 min Winter	82.896	0.068	2.2	11.3	O K
2160 min Winter	82.885	0.057	1.6	9.4	O K
2880 min Winter	82.878	0.050	1.3	8.2	O K
4320 min Winter	82.870	0.042	0.9	6.9	O K
5760 min Winter	82.866	0.038	0.8	6.2	O K
7200 min Winter	82.863	0.035	0.7	5.7	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.694	0.0	114.2	5136
15 min Winter	80.127	0.0	21.5	17
30 min Winter	53.145	0.0	28.7	31
60 min Winter	33.681	0.0	36.8	56
120 min Winter	20.661	0.0	45.2	90
180 min Winter	15.374	0.0	50.5	128
240 min Winter	12.395	0.0	54.3	162
360 min Winter	9.057	0.0	59.5	226
480 min Winter	7.207	0.0	63.2	286
600 min Winter	6.021	0.0	66.0	348
720 min Winter	5.191	0.0	68.2	408
960 min Winter	4.097	0.0	71.8	530
1440 min Winter	2.933	0.0	77.0	766
2160 min Winter	2.107	0.0	83.3	1128
2880 min Winter	1.676	0.0	88.3	1500
4320 min Winter	1.230	0.0	97.0	2208
5760 min Winter	0.999	0.0	105.4	2944
7200 min Winter	0.858	0.0	113.2	3680

PFA Consulting		Page 3
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butt Close, Marnhull Attenuation Pond 4 1 in 30 yr	
Date 16/06/2023 File C798-V2.0 Pond 4 - 1 in ...	Designed by IS Checked by	
Causeway	Source Control 2020.1.3	

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	82.861	0.033	0.6	5.3	O K
10080 min Winter	82.859	0.031	0.5	5.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	0.763	0.0	120.7	4408
10080 min Winter	0.694	0.0	128.0	4984

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butt Close, Marnhull Attenuation Pond 4 1 in 30 yr	
Date 16/06/2023	Designed by IS	
File C798-V2.0 Pond 4 - 1 in ...	Checked by	
Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.131

Time (mins)	Area (ha)
From:	To:
0	4 0.131

PFA Consulting		Page 5
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butt Close, Marnhull Attenuation Pond 4 1 in 30 yr	
Date 16/06/2023 File C798-V2.0 Pond 4 - 1 in ...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 83.628

Tank or Pond Structure

Invert Level (m) 82.828

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	158.6	0.300	234.5	0.600	315.4
0.100	183.3	0.400	260.9	0.700	343.5
0.200	208.6	0.500	287.9	0.800	372.2


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0107-4500-0500-4500
Design Head (m)	0.500
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	82.828
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	4.5	Kick-Flo®	0.368	3.9
Flush-Flo™	0.173	4.5	Mean Flow over Head Range	-	3.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	6.8	3.000	10.4	7.000	15.7
0.200	4.5	1.400	7.3	3.500	11.2	7.500	16.2
0.300	4.3	1.600	7.7	4.000	11.9	8.000	16.8
0.400	4.1	1.800	8.2	4.500	12.6	8.500	17.3
0.500	4.5	2.000	8.6	5.000	13.3	9.000	17.8
0.600	4.9	2.200	9.0	5.500	13.9	9.500	18.3
0.800	5.6	2.400	9.4	6.000	14.5		
1.000	6.2	2.600	9.7	6.500	15.1		

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Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	83.012	0.184	4.5	33.4	O K
30 min Summer	83.058	0.230	4.5	43.1	O K
60 min Summer	83.095	0.267	4.5	51.2	O K
120 min Summer	83.107	0.279	4.5	54.0	O K
180 min Summer	83.109	0.281	4.5	54.3	O K
240 min Summer	83.105	0.277	4.5	53.5	O K
360 min Summer	83.090	0.262	4.5	50.1	O K
480 min Summer	83.073	0.245	4.5	46.2	O K
600 min Summer	83.054	0.226	4.5	42.2	O K
720 min Summer	83.036	0.208	4.5	38.4	O K
960 min Summer	83.003	0.175	4.5	31.6	O K
1440 min Summer	82.957	0.129	4.4	22.5	O K
2160 min Summer	82.929	0.101	3.7	17.2	O K
2880 min Summer	82.914	0.086	3.0	14.5	O K
4320 min Summer	82.898	0.070	2.3	11.8	O K
5760 min Summer	82.890	0.062	1.8	10.2	O K
7200 min Summer	82.884	0.056	1.6	9.3	O K
8640 min Summer	82.880	0.052	1.4	8.6	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	147.323	0.0	35.7	18
30 min Summer	98.447	0.0	47.8	32
60 min Summer	62.800	0.0	61.4	60
120 min Summer	37.929	0.0	74.3	102
180 min Summer	28.125	0.0	82.6	134
240 min Summer	22.670	0.0	88.8	168
360 min Summer	16.609	0.0	97.6	236
480 min Summer	13.291	0.0	104.2	302
600 min Summer	11.157	0.0	109.3	368
720 min Summer	9.655	0.0	113.5	432
960 min Summer	7.657	0.0	120.0	550
1440 min Summer	5.502	0.0	129.3	778
2160 min Summer	3.916	0.0	138.3	1124
2880 min Summer	3.075	0.0	144.8	1472
4320 min Summer	2.195	0.0	154.9	2204
5760 min Summer	1.740	0.0	164.0	2936
7200 min Summer	1.468	0.0	172.9	3672
8640 min Summer	1.286	0.0	181.7	4400

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Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	82.877	0.049	1.2	8.1	O K
15 min Winter	83.033	0.205	4.5	37.7	O K
30 min Winter	83.084	0.256	4.5	48.8	O K
60 min Winter	83.126	0.298	4.5	58.4	O K
120 min Winter	83.142	0.314	4.5	62.1	O K
180 min Winter	83.140	0.312	4.5	61.6	O K
240 min Winter	83.134	0.306	4.5	60.1	O K
360 min Winter	83.111	0.283	4.5	54.8	O K
480 min Winter	83.084	0.256	4.5	48.6	O K
600 min Winter	83.055	0.227	4.5	42.4	O K
720 min Winter	83.028	0.200	4.5	36.6	O K
960 min Winter	82.981	0.153	4.5	27.1	O K
1440 min Winter	82.936	0.108	4.0	18.5	O K
2160 min Winter	82.912	0.084	2.9	14.1	O K
2880 min Winter	82.900	0.072	2.3	12.0	O K
4320 min Winter	82.887	0.059	1.7	9.7	O K
5760 min Winter	82.880	0.052	1.4	8.5	O K
7200 min Winter	82.875	0.047	1.1	7.7	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	1.156	0.0	190.4	5112
15 min Winter	147.323	0.0	40.0	18
30 min Winter	98.447	0.0	53.6	32
60 min Winter	62.800	0.0	68.8	60
120 min Winter	37.929	0.0	83.2	114
180 min Winter	28.125	0.0	92.6	144
240 min Winter	22.670	0.0	99.5	182
360 min Winter	16.609	0.0	109.4	258
480 min Winter	13.291	0.0	116.7	328
600 min Winter	11.157	0.0	122.5	394
720 min Winter	9.655	0.0	127.2	456
960 min Winter	7.657	0.0	134.5	568
1440 min Winter	5.502	0.0	144.8	780
2160 min Winter	3.916	0.0	155.0	1128
2880 min Winter	3.075	0.0	162.2	1496
4320 min Winter	2.195	0.0	173.5	2204
5760 min Winter	1.740	0.0	183.7	2936
7200 min Winter	1.468	0.0	193.7	3672

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Causeway	Source Control 2020.1.3	

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	82.872	0.044	1.0	7.1	O K
10080 min Winter	82.869	0.041	0.9	6.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	1.286	0.0	203.5	4408
10080 min Winter	1.156	0.0	213.3	5040

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Causeway	Source Control 2020.1.3	


Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.131

Time (mins)	Area
From: To:	(ha)
0	4 0.131

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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 83.628

Tank or Pond Structure

Invert Level (m) 82.828

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	158.6	0.300	234.5	0.600	315.4
0.100	183.3	0.400	260.9	0.700	343.5
0.200	208.6	0.500	287.9	0.800	372.2


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0107-4500-0500-4500
Design Head (m)	0.500
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	82.828
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	4.5	Kick-Flo®	0.368	3.9
Flush-Flo™	0.173	4.5	Mean Flow over Head Range	-	3.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	6.8	3.000	10.4	7.000	15.7
0.200	4.5	1.400	7.3	3.500	11.2	7.500	16.2
0.300	4.3	1.600	7.7	4.000	11.9	8.000	16.8
0.400	4.1	1.800	8.2	4.500	12.6	8.500	17.3
0.500	4.5	2.000	8.6	5.000	13.3	9.000	17.8
0.600	4.9	2.200	9.0	5.500	13.9	9.500	18.3
0.800	5.6	2.400	9.4	6.000	14.5		
1.000	6.2	2.600	9.7	6.500	15.1		

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Causeway		Source Control 2020.1.3

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	75.518	0.176	7.0	55.7	O K
30 min Summer	75.561	0.219	7.1	70.8	O K
60 min Summer	75.598	0.256	7.2	83.9	O K
120 min Summer	75.627	0.285	7.2	94.8	O K
180 min Summer	75.636	0.294	7.2	98.2	O K
240 min Summer	75.638	0.296	7.2	98.7	O K
360 min Summer	75.629	0.287	7.2	95.3	O K
480 min Summer	75.614	0.272	7.2	89.7	O K
600 min Summer	75.597	0.255	7.2	83.6	O K
720 min Summer	75.580	0.238	7.2	77.6	O K
960 min Summer	75.550	0.208	7.1	66.7	O K
1440 min Summer	75.504	0.162	6.9	51.0	O K
2160 min Summer	75.470	0.128	6.1	39.9	O K
2880 min Summer	75.453	0.111	5.2	34.3	O K
4320 min Summer	75.436	0.094	4.1	28.6	O K
5760 min Summer	75.426	0.084	3.5	25.5	O K
7200 min Summer	75.419	0.077	3.1	23.5	O K
8640 min Summer	75.415	0.073	2.8	22.1	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	61.725	0.0	58.8	20
30 min Summer	40.464	0.0	77.5	33
60 min Summer	25.532	0.0	99.1	62
120 min Summer	16.169	0.0	125.8	104
180 min Summer	12.182	0.0	142.2	138
240 min Summer	9.886	0.0	153.9	172
360 min Summer	7.272	0.0	169.9	240
480 min Summer	5.806	0.0	180.9	306
600 min Summer	4.861	0.0	189.4	372
720 min Summer	4.198	0.0	196.2	436
960 min Summer	3.323	0.0	207.1	560
1440 min Summer	2.392	0.0	223.4	794
2160 min Summer	1.733	0.0	243.7	1144
2880 min Summer	1.389	0.0	260.4	1500
4320 min Summer	1.036	0.0	290.7	2208
5760 min Summer	0.853	0.0	320.1	2944
7200 min Summer	0.740	0.0	347.2	3672
8640 min Summer	0.664	0.0	373.4	4408

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Causeway		Source Control 2020.1.3

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	75.411	0.069	2.6	21.0	O K
15 min Winter	75.538	0.196	7.1	62.7	O K
30 min Winter	75.587	0.245	7.2	80.0	O K
60 min Winter	75.629	0.287	7.2	95.3	O K
120 min Winter	75.664	0.322	7.2	108.5	O K
180 min Winter	75.670	0.328	7.2	111.2	O K
240 min Winter	75.670	0.328	7.2	110.9	O K
360 min Winter	75.654	0.312	7.2	104.7	O K
480 min Winter	75.630	0.288	7.2	95.8	O K
600 min Winter	75.604	0.262	7.2	86.3	O K
720 min Winter	75.579	0.237	7.2	77.3	O K
960 min Winter	75.535	0.193	7.0	61.6	O K
1440 min Winter	75.480	0.138	6.5	43.1	O K
2160 min Winter	75.451	0.109	5.1	33.4	O K
2880 min Winter	75.436	0.094	4.1	28.7	O K
4320 min Winter	75.421	0.079	3.2	23.8	O K
5760 min Winter	75.412	0.070	2.6	21.2	O K
7200 min Winter	75.407	0.065	2.3	19.5	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	398.8	5136
15 min Winter	61.725	0.0	66.0	20
30 min Winter	40.464	0.0	87.0	33
60 min Winter	25.532	0.0	111.1	62
120 min Winter	16.169	0.0	140.9	116
180 min Winter	12.182	0.0	159.4	148
240 min Winter	9.886	0.0	172.5	186
360 min Winter	7.272	0.0	190.4	262
480 min Winter	5.806	0.0	202.7	334
600 min Winter	4.861	0.0	212.2	402
720 min Winter	4.198	0.0	219.9	466
960 min Winter	3.323	0.0	232.0	588
1440 min Winter	2.392	0.0	250.4	806
2160 min Winter	1.733	0.0	273.0	1152
2880 min Winter	1.389	0.0	291.7	1508
4320 min Winter	1.036	0.0	325.8	2244
5760 min Winter	0.853	0.0	358.5	2936
7200 min Winter	0.740	0.0	388.9	3672

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Causeway	Source Control 2020.1.3	

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	75.403	0.061	2.0	18.3	O K
10080 min Winter	75.400	0.058	1.9	17.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	0.664	0.0	418.3	4408
10080 min Winter	0.608	0.0	446.9	5144

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Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.522

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 0.340	4	8 0.182

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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 76.542

Tank or Pond Structure

Invert Level (m) 75.342

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	293.1	0.400	405.7	0.800	527.2	1.200	657.7
0.100	320.4	0.500	435.2	0.900	559.0		
0.200	348.2	0.600	465.3	1.000	591.3		
0.300	376.7	0.700	496.0	1.100	624.2		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0127-7200-0900-7200
Design Head (m)	0.900
Design Flow (l/s)	7.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	127
Invert Level (m)	75.342
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	7.2	Kick-Flo®	0.606	6.0
Flush-Flo™	0.273	7.2	Mean Flow over Head Range	-	6.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.5	1.200	8.2	3.000	12.7	7.000	19.0
0.200	7.1	1.400	8.9	3.500	13.7	7.500	19.7
0.300	7.2	1.600	9.4	4.000	14.6	8.000	20.3
0.400	7.0	1.800	10.0	4.500	15.4	8.500	20.9
0.500	6.8	2.000	10.5	5.000	16.2	9.000	21.5
0.600	6.1	2.200	11.0	5.500	17.0	9.500	22.0
0.800	6.8	2.400	11.4	6.000	17.7		
1.000	7.6	2.600	11.9	6.500	18.4		

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Causeway		Source Control 2020.1.3

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	75.568	0.226	7.1	73.1	O K
30 min Summer	75.627	0.285	7.2	94.8	O K
60 min Summer	75.679	0.337	7.2	114.4	O K
120 min Summer	75.712	0.370	7.2	127.3	O K
180 min Summer	75.719	0.377	7.2	130.1	O K
240 min Summer	75.719	0.377	7.2	130.1	O K
360 min Summer	75.708	0.366	7.2	125.9	O K
480 min Summer	75.692	0.350	7.2	119.4	O K
600 min Summer	75.673	0.331	7.2	112.1	O K
720 min Summer	75.654	0.312	7.2	104.8	O K
960 min Summer	75.617	0.275	7.2	91.0	O K
1440 min Summer	75.556	0.214	7.1	69.0	O K
2160 min Summer	75.498	0.156	6.8	49.2	O K
2880 min Summer	75.472	0.130	6.2	40.5	O K
4320 min Summer	75.447	0.105	4.9	32.4	O K
5760 min Summer	75.435	0.093	4.1	28.4	O K
7200 min Summer	75.427	0.085	3.6	25.9	O K
8640 min Summer	75.421	0.079	3.2	24.1	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	80.127	0.0	76.8	20
30 min Summer	53.145	0.0	102.3	34
60 min Summer	33.681	0.0	131.0	62
120 min Summer	20.661	0.0	160.9	120
180 min Summer	15.374	0.0	179.7	152
240 min Summer	12.395	0.0	193.2	184
360 min Summer	9.057	0.0	211.8	250
480 min Summer	7.207	0.0	224.8	318
600 min Summer	6.021	0.0	234.7	386
720 min Summer	5.191	0.0	242.8	450
960 min Summer	4.097	0.0	255.5	578
1440 min Summer	2.933	0.0	274.2	822
2160 min Summer	2.107	0.0	296.5	1164
2880 min Summer	1.676	0.0	314.2	1504
4320 min Summer	1.230	0.0	345.4	2208
5760 min Summer	0.999	0.0	375.1	2944
7200 min Summer	0.858	0.0	402.7	3672
8640 min Summer	0.763	0.0	429.4	4408

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Causeway		Source Control 2020.1.3

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (1/s)	Max Volume (m ³)	Status
10080 min Summer	75.417	0.075	2.9	22.8	O K
15 min Winter	75.593	0.251	7.2	82.3	O K
30 min Winter	75.660	0.318	7.2	107.0	O K
60 min Winter	75.718	0.376	7.2	129.8	O K
120 min Winter	75.758	0.416	7.2	145.9	O K
180 min Winter	75.767	0.425	7.2	149.5	O K
240 min Winter	75.763	0.421	7.2	148.1	O K
360 min Winter	75.747	0.405	7.2	141.6	O K
480 min Winter	75.723	0.381	7.2	131.7	O K
600 min Winter	75.695	0.353	7.2	120.7	O K
720 min Winter	75.666	0.324	7.2	109.6	O K
960 min Winter	75.611	0.269	7.2	88.9	O K
1440 min Winter	75.526	0.184	7.0	58.7	O K
2160 min Winter	75.470	0.128	6.1	39.8	O K
2880 min Winter	75.449	0.107	5.0	33.0	O K
4320 min Winter	75.430	0.088	3.8	26.7	O K
5760 min Winter	75.419	0.077	3.1	23.4	O K
7200 min Winter	75.413	0.071	2.6	21.3	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.694	0.0	455.4	5136
15 min Winter	80.127	0.0	86.1	21
30 min Winter	53.145	0.0	114.7	34
60 min Winter	33.681	0.0	146.8	62
120 min Winter	20.661	0.0	180.3	118
180 min Winter	15.374	0.0	201.3	172
240 min Winter	12.395	0.0	216.5	198
360 min Winter	9.057	0.0	237.3	272
480 min Winter	7.207	0.0	251.8	348
600 min Winter	6.021	0.0	263.0	420
720 min Winter	5.191	0.0	272.1	488
960 min Winter	4.097	0.0	286.3	616
1440 min Winter	2.933	0.0	307.3	850
2160 min Winter	2.107	0.0	332.1	1168
2880 min Winter	1.676	0.0	352.0	1524
4320 min Winter	1.230	0.0	387.0	2244
5760 min Winter	0.999	0.0	420.1	2936
7200 min Winter	0.858	0.0	451.1	3672

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenauation Pond 2 1 in 30 yr	
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Causeway	Source Control 2020.1.3	

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	75.408	0.066	2.3	19.9	O K
10080 min Winter	75.404	0.062	2.1	18.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	0.763	0.0	481.1	4408
10080 min Winter	0.694	0.0	510.3	5144

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Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.522

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 0.340	4	8 0.182

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenaution Pond 2 1 in 30 yr	
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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 76.542

Tank or Pond Structure

Invert Level (m) 75.342

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	293.1	0.400	405.7	0.800	527.2	1.200	657.7
0.100	320.4	0.500	435.2	0.900	559.0		
0.200	348.2	0.600	465.3	1.000	591.3		
0.300	376.7	0.700	496.0	1.100	624.2		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0127-7200-0900-7200
Design Head (m)	0.900
Design Flow (l/s)	7.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	127
Invert Level (m)	75.342
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	7.2	Kick-Flo®	0.606	6.0
Flush-Flo™	0.273	7.2	Mean Flow over Head Range	-	6.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.5	1.200	8.2	3.000	12.7	7.000	19.0
0.200	7.1	1.400	8.9	3.500	13.7	7.500	19.7
0.300	7.2	1.600	9.4	4.000	14.6	8.000	20.3
0.400	7.0	1.800	10.0	4.500	15.4	8.500	20.9
0.500	6.8	2.000	10.5	5.000	16.2	9.000	21.5
0.600	6.1	2.200	11.0	5.500	17.0	9.500	22.0
0.800	6.8	2.400	11.4	6.000	17.7		
1.000	7.6	2.600	11.9	6.500	18.4		

PFA Consulting		Page 1
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 2 1 in 100 yr + CC	
Date 16/05/2023 File C798-V11.0 POND 2 - 1 IN...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	75.738	0.396	7.2	137.9	O K
30 min Summer	75.844	0.502	7.2	182.2	O K
60 min Summer	75.942	0.600	7.2	226.6	O K
120 min Summer	76.012	0.670	7.2	259.7	O K
180 min Summer	76.041	0.699	7.2	274.0	O K
240 min Summer	76.052	0.710	7.2	279.6	O K
360 min Summer	76.048	0.706	7.2	277.6	O K
480 min Summer	76.037	0.695	7.2	271.9	O K
600 min Summer	76.022	0.680	7.2	264.9	O K
720 min Summer	76.007	0.665	7.2	257.2	O K
960 min Summer	75.971	0.629	7.2	240.1	O K
1440 min Summer	75.891	0.549	7.2	203.0	O K
2160 min Summer	75.776	0.434	7.2	153.5	O K
2880 min Summer	75.680	0.338	7.2	114.7	O K
4320 min Summer	75.550	0.208	7.1	67.0	O K
5760 min Summer	75.489	0.147	6.8	46.0	O K
7200 min Summer	75.469	0.127	6.0	39.3	O K
8640 min Summer	75.456	0.114	5.3	35.2	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	147.323	0.0	142.3	22
30 min Summer	98.447	0.0	190.6	36
60 min Summer	62.800	0.0	244.9	64
120 min Summer	37.929	0.0	296.0	124
180 min Summer	28.125	0.0	329.3	182
240 min Summer	22.670	0.0	353.9	242
360 min Summer	16.609	0.0	389.0	338
480 min Summer	13.291	0.0	415.1	394
600 min Summer	11.157	0.0	435.5	456
720 min Summer	9.655	0.0	452.3	522
960 min Summer	7.657	0.0	478.2	658
1440 min Summer	5.502	0.0	515.3	922
2160 min Summer	3.916	0.0	551.4	1300
2880 min Summer	3.075	0.0	577.1	1648
4320 min Summer	2.195	0.0	617.4	2332
5760 min Summer	1.740	0.0	653.6	2992
7200 min Summer	1.468	0.0	689.1	3672
8640 min Summer	1.286	0.0	724.2	4408

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Date 16/06/2023 File C798-V11.0 POND 2 - 1 IN...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	75.447	0.105	4.9	32.3	O K
15 min Winter	75.780	0.438	7.2	155.1	O K
30 min Winter	75.896	0.554	7.2	205.2	O K
60 min Winter	76.004	0.662	7.2	256.1	O K
120 min Winter	76.081	0.739	7.2	294.4	O K
180 min Winter	76.116	0.774	7.2	312.2	O K
240 min Winter	76.132	0.790	7.2	320.2	O K
360 min Winter	76.133	0.791	7.2	321.2	O K
480 min Winter	76.119	0.777	7.2	313.7	O K
600 min Winter	76.101	0.759	7.2	304.2	O K
720 min Winter	76.082	0.740	7.2	294.4	O K
960 min Winter	76.036	0.694	7.2	271.5	O K
1440 min Winter	75.926	0.584	7.2	219.1	O K
2160 min Winter	75.750	0.408	7.2	142.8	O K
2880 min Winter	75.612	0.270	7.2	89.1	O K
4320 min Winter	75.481	0.139	6.6	43.4	O K
5760 min Winter	75.455	0.113	5.3	34.8	O K
7200 min Winter	75.441	0.099	4.5	30.4	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	1.156	0.0	759.0	5136
15 min Winter	147.323	0.0	159.5	22
30 min Winter	98.447	0.0	213.6	36
60 min Winter	62.800	0.0	274.4	64
120 min Winter	37.929	0.0	331.6	122
180 min Winter	28.125	0.0	368.9	178
240 min Winter	22.670	0.0	396.5	236
360 min Winter	16.609	0.0	435.8	346
480 min Winter	13.291	0.0	464.9	446
600 min Winter	11.157	0.0	487.9	480
720 min Winter	9.655	0.0	506.6	556
960 min Winter	7.657	0.0	535.6	712
1440 min Winter	5.502	0.0	577.2	1010
2160 min Winter	3.916	0.0	617.6	1380
2880 min Winter	3.075	0.0	646.5	1704
4320 min Winter	2.195	0.0	691.7	2252
5760 min Winter	1.740	0.0	732.1	2952
7200 min Winter	1.468	0.0	771.9	3672

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenauation Pond 2 1 in 100 yr + CC	
Date 16/06/2023 File C798-V11.0 POND 2 - 1 IN...	Designed by IS Checked by	
Causeway	Source Control 2020.1.3	

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	75.433	0.091	3.9	27.7	O K
10080 min Winter	75.427	0.085	3.6	25.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	1.286	0.0	811.2	4408
10080 min Winter	1.156	0.0	850.3	5136

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenaution Pond 2 1 in 100 yr + CC	
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Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.522

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.340	4	8	0.182

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenauation Pond 2 1 in 100 yr + CC	
Date 16/06/2023 File C798-V11.0 POND 2 - 1 IN...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 76.542

Tank or Pond Structure

Invert Level (m) 75.342

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	293.1	0.400	405.7	0.800	527.2	1.200	657.7
0.100	320.4	0.500	435.2	0.900	559.0		
0.200	348.2	0.600	465.3	1.000	591.3		
0.300	376.7	0.700	496.0	1.100	624.2		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0127-7200-0900-7200
Design Head (m)	0.900
Design Flow (l/s)	7.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	127
Invert Level (m)	75.342
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	7.2	Kick-Flo®	0.606	6.0
Flush-Flo™	0.273	7.2	Mean Flow over Head Range	-	6.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.5	1.200	8.2	3.000	12.7	7.000	19.0
0.200	7.1	1.400	8.9	3.500	13.7	7.500	19.7
0.300	7.2	1.600	9.4	4.000	14.6	8.000	20.3
0.400	7.0	1.800	10.0	4.500	15.4	8.500	20.9
0.500	6.8	2.000	10.5	5.000	16.2	9.000	21.5
0.600	6.1	2.200	11.0	5.500	17.0	9.500	22.0
0.800	6.8	2.400	11.4	6.000	17.7		
1.000	7.6	2.600	11.9	6.500	18.4		

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Date 16/05/2023 File C798-V12.0 Pond 1 - 1 in...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	72.613	0.157	15.2	167.2	O K
30 min Summer	72.652	0.196	20.3	211.6	O K
60 min Summer	72.686	0.230	22.5	250.2	O K
120 min Summer	72.716	0.260	22.8	285.4	O K
180 min Summer	72.728	0.272	22.9	299.6	O K
240 min Summer	72.732	0.276	22.9	304.9	O K
360 min Summer	72.730	0.274	22.9	301.7	O K
480 min Summer	72.721	0.265	22.9	291.0	O K
600 min Summer	72.709	0.253	22.8	277.9	O K
720 min Summer	72.698	0.242	22.6	264.3	O K
960 min Summer	72.676	0.220	22.4	239.3	O K
1440 min Summer	72.648	0.192	19.8	206.9	O K
2160 min Summer	72.622	0.166	16.5	177.4	O K
2880 min Summer	72.606	0.150	14.2	159.3	O K
4320 min Summer	72.586	0.130	11.4	137.7	O K
5760 min Summer	72.574	0.118	9.7	124.7	O K
7200 min Summer	72.567	0.111	8.6	116.2	O K
8640 min Summer	72.561	0.105	7.8	110.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	61.725	0.0	163.3	23
30 min Summer	40.464	0.0	217.9	35
60 min Summer	25.532	0.0	286.1	62
120 min Summer	16.169	0.0	364.0	102
180 min Summer	12.182	0.0	412.2	136
240 min Summer	9.886	0.0	446.5	170
360 min Summer	7.272	0.0	493.3	238
480 min Summer	5.806	0.0	525.3	304
600 min Summer	4.861	0.0	549.9	370
720 min Summer	4.198	0.0	569.9	434
960 min Summer	3.323	0.0	601.2	556
1440 min Summer	2.392	0.0	647.7	798
2160 min Summer	1.733	0.0	711.8	1164
2880 min Summer	1.389	0.0	760.1	1528
4320 min Summer	1.036	0.0	846.5	2252
5760 min Summer	0.853	0.0	937.2	2992
7200 min Summer	0.740	0.0	1016.2	3680
8640 min Summer	0.664	0.0	1092.1	4416


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Causeway		Source Control 2020.1.3



Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	72.557	0.101	7.3	105.3	O K
15 min Winter	72.630	0.174	17.6	186.8	O K
30 min Winter	72.674	0.218	22.3	237.1	O K
60 min Winter	72.714	0.258	22.8	283.3	O K
120 min Winter	72.748	0.292	23.0	324.3	O K
180 min Winter	72.759	0.303	23.1	336.7	O K
240 min Winter	72.761	0.305	23.1	339.3	O K
360 min Winter	72.751	0.295	23.0	327.8	O K
480 min Winter	72.735	0.279	23.0	307.7	O K
600 min Winter	72.716	0.260	22.8	285.8	O K
720 min Winter	72.698	0.242	22.7	264.7	O K
960 min Winter	72.669	0.213	22.1	230.6	O K
1440 min Winter	72.635	0.179	18.2	191.7	O K
2160 min Winter	72.606	0.150	14.2	159.6	O K
2880 min Winter	72.589	0.133	11.8	140.8	O K
4320 min Winter	72.570	0.114	9.0	119.3	O K
5760 min Winter	72.558	0.102	7.5	107.1	O K
7200 min Winter	72.551	0.095	6.6	99.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.608	0.0	1164.6	5144
15 min Winter	61.725	0.0	184.4	23
30 min Winter	40.464	0.0	245.6	35
60 min Winter	25.532	0.0	321.2	62
120 min Winter	16.169	0.0	408.6	116
180 min Winter	12.182	0.0	462.5	146
240 min Winter	9.886	0.0	500.9	184
360 min Winter	7.272	0.0	553.3	258
480 min Winter	5.806	0.0	589.3	330
600 min Winter	4.861	0.0	616.9	396
720 min Winter	4.198	0.0	639.3	460
960 min Winter	3.323	0.0	674.4	578
1440 min Winter	2.392	0.0	726.8	824
2160 min Winter	1.733	0.0	797.9	1192
2880 min Winter	1.389	0.0	852.1	1556
4320 min Winter	1.036	0.0	949.4	2288
5760 min Winter	0.853	0.0	1050.1	3000
7200 min Winter	0.740	0.0	1138.7	3744

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Date 16/06/2023 File C798-V12.0 Pond 1 - 1 in...	Designed by IS Checked by	
Causeway	Source Control 2020.1.3	

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	72.545	0.089	5.9	93.3	O K
10080 min Winter	72.541	0.085	5.4	88.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	0.664	0.0	1224.0	4488
10080 min Winter	0.608	0.0	1306.0	5152

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 10 yr	
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Causeway	Source Control 2020.1.3	


Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.532

Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)
0	4	0.696	4	8	0.558	8	12	0.278

PFA Consulting		Page 5
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 10 yr	
Date 16/06/2023 File C798-V12.0 Pond 1 - 1 in...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 73.656

Tank or Pond Structure

Invert Level (m) 72.456

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1014.8	0.400	1275.8	0.800	1545.8	1.200	1824.8
0.100	1079.2	0.500	1342.5	0.900	1614.8		
0.200	1144.2	0.600	1409.7	1.000	1684.2		
0.300	1209.7	0.700	1477.5	1.100	1754.3		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0213-2320-0900-2320
Design Head (m)	0.900
Design Flow (l/s)	23.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	213
Invert Level (m)	72.456
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	23.2	Kick-Flo®	0.672	20.2
Flush-Flo™	0.342	23.1	Mean Flow over Head Range	-	19.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.2	1.200	26.6	3.000	41.3	7.000	62.3
0.200	20.7	1.400	28.6	3.500	44.5	7.500	64.4
0.300	23.1	1.600	30.5	4.000	47.5	8.000	66.5
0.400	23.0	1.800	32.3	4.500	50.3	8.500	68.5
0.500	22.6	2.000	34.0	5.000	52.9	9.000	70.4
0.600	21.6	2.200	35.6	5.500	55.4	9.500	71.9
0.800	21.9	2.400	37.1	6.000	57.8		
1.000	24.4	2.600	38.6	6.500	60.1		

PFA Consulting		Page 1
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 30 yr	
Date 16/05/2023 File C798-V12.0 Pond 1 - 1 in...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	72.656	0.200	20.7	215.9	O K
30 min Summer	72.710	0.254	22.8	278.8	O K
60 min Summer	72.759	0.303	23.1	337.2	O K
120 min Summer	72.792	0.336	23.1	377.1	O K
180 min Summer	72.802	0.346	23.1	390.2	O K
240 min Summer	72.806	0.350	23.1	394.5	O K
360 min Summer	72.801	0.345	23.1	389.1	O K
480 min Summer	72.790	0.334	23.1	375.4	O K
600 min Summer	72.777	0.321	23.1	358.5	O K
720 min Summer	72.762	0.306	23.1	340.5	O K
960 min Summer	72.733	0.277	23.0	305.6	O K
1440 min Summer	72.686	0.230	22.5	250.4	O K
2160 min Summer	72.648	0.192	19.8	207.0	O K
2880 min Summer	72.627	0.171	17.1	182.4	O K
4320 min Summer	72.602	0.146	13.6	154.5	O K
5760 min Summer	72.587	0.131	11.4	137.9	O K
7200 min Summer	72.577	0.121	10.0	127.4	O K
8640 min Summer	72.570	0.114	9.0	119.8	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	80.127	0.0	215.7	23
30 min Summer	53.145	0.0	290.2	36
60 min Summer	33.681	0.0	379.5	64
120 min Summer	20.661	0.0	467.1	118
180 min Summer	15.374	0.0	522.0	148
240 min Summer	12.395	0.0	561.6	180
360 min Summer	9.057	0.0	616.0	246
480 min Summer	7.207	0.0	653.9	314
600 min Summer	6.021	0.0	683.0	382
720 min Summer	5.191	0.0	706.6	446
960 min Summer	4.097	0.0	743.3	574
1440 min Summer	2.933	0.0	796.7	810
2160 min Summer	2.107	0.0	866.6	1168
2880 min Summer	1.676	0.0	918.0	1528
4320 min Summer	1.230	0.0	1006.7	2252
5760 min Summer	0.999	0.0	1098.6	2976
7200 min Summer	0.858	0.0	1179.1	3680
8640 min Summer	0.763	0.0	1256.5	4416

PFA Consulting		Page 2
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 30 yr	
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Causeway		Source Control 2020.1.3

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	72.565	0.109	8.4	114.0	O K
15 min Winter	72.678	0.222	22.4	241.7	O K
30 min Winter	72.740	0.284	23.0	314.1	O K
60 min Winter	72.796	0.340	23.1	381.9	O K
120 min Winter	72.835	0.379	23.1	430.9	O K
180 min Winter	72.844	0.388	23.1	442.8	O K
240 min Winter	72.845	0.389	23.1	444.0	O K
360 min Winter	72.835	0.379	23.1	430.5	O K
480 min Winter	72.815	0.359	23.1	406.5	O K
600 min Winter	72.793	0.337	23.1	378.8	O K
720 min Winter	72.770	0.314	23.1	350.7	O K
960 min Winter	72.727	0.271	22.9	298.7	O K
1440 min Winter	72.667	0.211	21.9	228.2	O K
2160 min Winter	72.628	0.172	17.3	183.8	O K
2880 min Winter	72.606	0.150	14.2	159.7	O K
4320 min Winter	72.582	0.126	10.7	132.9	O K
5760 min Winter	72.568	0.112	8.8	117.8	O K
7200 min Winter	72.559	0.103	7.6	108.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.694	0.0	1330.3	5144
15 min Winter	80.127	0.0	243.2	23
30 min Winter	53.145	0.0	326.6	36
60 min Winter	33.681	0.0	425.9	64
120 min Winter	20.661	0.0	523.9	118
180 min Winter	15.374	0.0	585.5	170
240 min Winter	12.395	0.0	629.8	192
360 min Winter	9.057	0.0	690.8	268
480 min Winter	7.207	0.0	733.2	342
600 min Winter	6.021	0.0	765.8	412
720 min Winter	5.191	0.0	792.3	480
960 min Winter	4.097	0.0	833.6	606
1440 min Winter	2.933	0.0	893.7	828
2160 min Winter	2.107	0.0	971.2	1192
2880 min Winter	1.676	0.0	1028.9	1556
4320 min Winter	1.230	0.0	1129.0	2292
5760 min Winter	0.999	0.0	1230.8	3000
7200 min Winter	0.858	0.0	1321.1	3744

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 30 yr	
Date 16/06/2023 File C798-V12.0 Pond 1 - 1 in...	Designed by IS Checked by	
Causeway	Source Control 2020.1.3	

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	72.553	0.097	6.8	101.0	O K
10080 min Winter	72.548	0.092	6.2	95.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	0.763	0.0	1408.1	4416
10080 min Winter	0.694	0.0	1491.7	5152

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 30 yr	
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Causeway	Source Control 2020.1.3	


Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.532

Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)
0	4	0.696	4	8	0.558	8	12	0.278

PFA Consulting		Page 5
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 30 yr	
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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 73.656

Tank or Pond Structure

Invert Level (m) 72.456

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1014.8	0.400	1275.8	0.800	1545.8	1.200	1824.8
0.100	1079.2	0.500	1342.5	0.900	1614.8		
0.200	1144.2	0.600	1409.7	1.000	1684.2		
0.300	1209.7	0.700	1477.5	1.100	1754.3		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0213-2320-0900-2320
Design Head (m)	0.900
Design Flow (l/s)	23.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	213
Invert Level (m)	72.456
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	23.2	Kick-Flo®	0.672	20.2
Flush-Flo™	0.342	23.1	Mean Flow over Head Range	-	19.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.2	1.200	26.6	3.000	41.3	7.000	62.3
0.200	20.7	1.400	28.6	3.500	44.5	7.500	64.4
0.300	23.1	1.600	30.5	4.000	47.5	8.000	66.5
0.400	23.0	1.800	32.3	4.500	50.3	8.500	68.5
0.500	22.6	2.000	34.0	5.000	52.9	9.000	70.4
0.600	21.6	2.200	35.6	5.500	55.4	9.500	71.9
0.800	21.9	2.400	37.1	6.000	57.8		
1.000	24.4	2.600	38.6	6.500	60.1		

PFA Consulting		Page 1
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 100 yr + CC	
Date 16/05/2023 File C798-V12.0 POND 1 - 1 IN...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	72.812	0.356	23.1	401.9	O K
30 min Summer	72.913	0.457	23.1	532.0	O K
60 min Summer	73.010	0.554	23.1	662.4	O K
120 min Summer	73.080	0.624	23.1	759.7	O K
180 min Summer	73.111	0.655	23.1	804.2	O K
240 min Summer	73.124	0.668	23.1	823.2	O K
360 min Summer	73.123	0.667	23.1	821.8	O K
480 min Summer	73.114	0.658	23.1	809.0	O K
600 min Summer	73.101	0.645	23.1	790.2	O K
720 min Summer	73.085	0.629	23.1	767.8	O K
960 min Summer	73.049	0.593	23.1	716.4	O K
1440 min Summer	72.974	0.518	23.1	613.4	O K
2160 min Summer	72.868	0.412	23.1	473.6	O K
2880 min Summer	72.785	0.329	23.1	368.7	O K
4320 min Summer	72.684	0.228	22.5	248.6	O K
5760 min Summer	72.647	0.191	19.7	205.8	O K
7200 min Summer	72.627	0.171	17.2	183.4	O K
8640 min Summer	72.614	0.158	15.4	168.7	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	147.323	0.0	407.2	24
30 min Summer	98.447	0.0	548.1	38
60 min Summer	62.800	0.0	713.4	66
120 min Summer	37.929	0.0	863.0	124
180 min Summer	28.125	0.0	960.4	182
240 min Summer	22.670	0.0	1032.6	242
360 min Summer	16.609	0.0	1135.2	320
480 min Summer	13.291	0.0	1211.4	380
600 min Summer	11.157	0.0	1271.2	438
720 min Summer	9.655	0.0	1320.1	504
960 min Summer	7.657	0.0	1395.7	636
1440 min Summer	5.502	0.0	1503.2	898
2160 min Summer	3.916	0.0	1614.6	1276
2880 min Summer	3.075	0.0	1689.4	1620
4320 min Summer	2.195	0.0	1804.4	2292
5760 min Summer	1.740	0.0	1916.0	2992
7200 min Summer	1.468	0.0	2019.6	3680
8640 min Summer	1.286	0.0	2121.3	4416

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 100 yr + CC	
Date 16/06/2023 File C798-V12.0 POND 1 - 1 IN...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	72.605	0.149	14.0	157.9	O K
15 min Winter	72.851	0.395	23.1	452.0	O K
30 min Winter	72.964	0.508	23.1	599.2	O K
60 min Winter	73.071	0.615	23.1	748.0	O K
120 min Winter	73.151	0.695	23.1	863.5	O K
180 min Winter	73.188	0.732	23.1	917.6	O K
240 min Winter	73.204	0.748	23.1	942.0	O K
360 min Winter	73.206	0.750	23.1	945.5	O K
480 min Winter	73.192	0.736	23.1	924.0	O K
600 min Winter	73.176	0.720	23.1	900.7	O K
720 min Winter	73.157	0.701	23.1	871.4	O K
960 min Winter	73.105	0.649	23.1	795.8	O K
1440 min Winter	72.991	0.535	23.1	636.4	O K
2160 min Winter	72.834	0.378	23.1	429.9	O K
2880 min Winter	72.722	0.266	22.9	293.1	O K
4320 min Winter	72.642	0.186	19.1	199.9	O K
5760 min Winter	72.615	0.159	15.4	168.9	O K
7200 min Winter	72.598	0.142	13.1	150.9	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	1.156	0.0	2220.7	5144
15 min Winter	147.323	0.0	457.5	24
30 min Winter	98.447	0.0	615.3	38
60 min Winter	62.800	0.0	799.7	66
120 min Winter	37.929	0.0	967.2	122
180 min Winter	28.125	0.0	1076.4	180
240 min Winter	22.670	0.0	1157.2	236
360 min Winter	16.609	0.0	1272.1	346
480 min Winter	13.291	0.0	1357.4	434
600 min Winter	11.157	0.0	1424.4	472
720 min Winter	9.655	0.0	1479.2	550
960 min Winter	7.657	0.0	1563.8	700
1440 min Winter	5.502	0.0	1684.5	972
2160 min Winter	3.916	0.0	1809.0	1340
2880 min Winter	3.075	0.0	1892.9	1652
4320 min Winter	2.195	0.0	2022.6	2292
5760 min Winter	1.740	0.0	2146.4	3000
7200 min Winter	1.468	0.0	2262.6	3744

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 100 yr + CC	
Date 16/06/2023 File C798-V12.0 POND 1 - 1 IN...	Designed by IS Checked by	
Causeway	Source Control 2020.1.3	

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Winter	72.587	0.131	11.5	138.8	O K
10080 min Winter	72.579	0.123	10.4	130.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Winter	1.286	0.0	2376.8	4416
10080 min Winter	1.156	0.0	2489.2	5144

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Attenuation Pond 1 1 in 100 yr + CC	
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Causeway		Source Control 2020.1.3

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 1.532

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
0	4 0.696	4	8 0.558	8	12 0.278

PFA Consulting		Page 5
Stratton Park House Wanborough Road Swindon SN3 4HG		C798: Butts Close, Marnhull Attenuation Pond 1 1 in 100 yr + CC
Date 16/06/2023 File C798-V12.0 POND 1 - 1 IN...		Designed by IS Checked by
Causeway		Source Control 2020.1.3



Model Details

Storage is Online Cover Level (m) 73.656

Tank or Pond Structure

Invert Level (m) 72.456

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1014.8	0.400	1275.8	0.800	1545.8	1.200	1824.8
0.100	1079.2	0.500	1342.5	0.900	1614.8		
0.200	1144.2	0.600	1409.7	1.000	1684.2		
0.300	1209.7	0.700	1477.5	1.100	1754.3		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0213-2320-0900-2320
Design Head (m)	0.900
Design Flow (l/s)	23.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	213
Invert Level (m)	72.456
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	23.2	Kick-Flo®	0.672	20.2
Flush-Flo™	0.342	23.1	Mean Flow over Head Range	-	19.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.2	1.200	26.6	3.000	41.3	7.000	62.3
0.200	20.7	1.400	28.6	3.500	44.5	7.500	64.4
0.300	23.1	1.600	30.5	4.000	47.5	8.000	66.5
0.400	23.0	1.800	32.3	4.500	50.3	8.500	68.5
0.500	22.6	2.000	34.0	5.000	52.9	9.000	70.4
0.600	21.6	2.200	35.6	5.500	55.4	9.500	71.9
0.800	21.9	2.400	37.1	6.000	57.8		
1.000	24.4	2.600	38.6	6.500	60.1		

PFA Consulting		Page 1
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Cellular Storage Area 1 1 in 10 yr	
Date 16/05/2023 File C798-V1.0 Cellular Stora...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

Summary of Results for 10 year Return Period

Half Drain Time : 438 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	78.922	0.042	0.0	0.9	0.9	49.3	O K
30 min Summer	78.934	0.054	0.0	1.4	1.4	64.1	O K
60 min Summer	78.947	0.067	0.0	1.9	1.9	79.1	O K
120 min Summer	78.961	0.081	0.0	2.6	2.6	95.7	O K
180 min Summer	78.967	0.087	0.0	2.8	2.8	103.3	O K
240 min Summer	78.970	0.090	0.0	2.9	2.9	106.8	O K
360 min Summer	78.973	0.093	0.0	3.0	3.0	110.0	O K
480 min Summer	78.974	0.094	0.0	3.1	3.1	111.3	O K
600 min Summer	78.974	0.094	0.0	3.1	3.1	111.8	O K
720 min Summer	78.974	0.094	0.0	3.1	3.1	111.6	O K
960 min Summer	78.973	0.093	0.0	3.1	3.1	110.3	O K
1440 min Summer	78.970	0.090	0.0	2.9	2.9	106.5	O K
2160 min Summer	78.965	0.085	0.0	2.7	2.7	100.6	O K
2880 min Summer	78.961	0.081	0.0	2.6	2.6	95.6	O K
4320 min Summer	78.954	0.074	0.0	2.3	2.3	88.3	O K
5760 min Summer	78.950	0.070	0.0	2.1	2.1	83.0	O K
7200 min Summer	78.947	0.067	0.0	1.9	1.9	79.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	61.725	0.0	30.8	19
30 min Summer	40.464	0.0	44.0	34
60 min Summer	25.532	0.0	69.4	62
120 min Summer	16.169	0.0	90.5	122
180 min Summer	12.182	0.0	103.6	180
240 min Summer	9.886	0.0	112.9	236
360 min Summer	7.272	0.0	125.4	288
480 min Summer	5.806	0.0	133.9	348
600 min Summer	4.861	0.0	140.3	416
720 min Summer	4.198	0.0	145.4	484
960 min Summer	3.323	0.0	153.1	618
1440 min Summer	2.392	0.0	163.7	884
2160 min Summer	1.733	0.0	191.5	1276
2880 min Summer	1.389	0.0	204.0	1668
4320 min Summer	1.036	0.0	224.5	2420
5760 min Summer	0.853	0.0	258.2	3120
7200 min Summer	0.740	0.0	279.3	3888


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Stratton Park House Wanborough Road Swindon SN3 4HG		C798: Butts Close, Marnhull Cellular Storage Area 1 1 in 10 yr
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Causeway		Source Control 2020.1.3



Summary of Results for 10 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
8640 min Summer	78.944	0.064	0.0	1.8	1.8	76.1	O K
10080 min Summer	78.942	0.062	0.0	1.7	1.7	73.7	O K
15 min Winter	78.927	0.047	0.0	1.1	1.1	55.2	O K
30 min Winter	78.940	0.060	0.0	1.6	1.6	71.7	O K
60 min Winter	78.955	0.075	0.0	2.3	2.3	88.5	O K
120 min Winter	78.970	0.090	0.0	2.9	2.9	107.2	O K
180 min Winter	78.978	0.098	0.0	3.2	3.2	116.0	O K
240 min Winter	78.981	0.101	0.0	3.3	3.3	120.3	O K
360 min Winter	78.984	0.104	0.0	3.4	3.4	122.9	O K
480 min Winter	78.984	0.104	0.0	3.4	3.4	123.8	O K
600 min Winter	78.984	0.104	0.0	3.4	3.4	123.4	O K
720 min Winter	78.983	0.103	0.0	3.4	3.4	122.3	O K
960 min Winter	78.980	0.100	0.0	3.3	3.3	118.9	O K
1440 min Winter	78.974	0.094	0.0	3.1	3.1	111.4	O K
2160 min Winter	78.966	0.086	0.0	2.8	2.8	101.7	O K
2880 min Winter	78.960	0.080	0.0	2.5	2.5	94.3	O K
4320 min Winter	78.951	0.071	0.0	2.1	2.1	84.1	O K
5760 min Winter	78.945	0.065	0.0	1.9	1.9	77.3	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.664	0.0	299.0	4584
10080 min Summer	0.608	0.0	316.6	5344
15 min Winter	61.725	0.0	35.9	19
30 min Winter	40.464	0.0	51.0	33
60 min Winter	25.532	0.0	79.0	62
120 min Winter	16.169	0.0	102.7	120
180 min Winter	12.182	0.0	117.4	176
240 min Winter	9.886	0.0	127.8	230
360 min Winter	7.272	0.0	141.9	294
480 min Winter	5.806	0.0	151.5	366
600 min Winter	4.861	0.0	158.7	442
720 min Winter	4.198	0.0	164.4	518
960 min Winter	3.323	0.0	173.2	664
1440 min Winter	2.392	0.0	185.2	950
2160 min Winter	1.733	0.0	215.6	1344
2880 min Winter	1.389	0.0	229.6	1732
4320 min Winter	1.036	0.0	253.0	2504
5760 min Winter	0.853	0.0	289.8	3232

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Causeway		Source Control 2020.1.3

Summary of Results for 10 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
7200 min Winter	78.941	0.061	0.0	1.7	1.7	72.4	O K
8640 min Winter	78.938	0.058	0.0	1.6	1.6	68.8	O K
10080 min Winter	78.936	0.056	0.0	1.4	1.4	65.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.740	0.0	313.6	3968
8640 min Winter	0.664	0.0	336.0	4672
10080 min Winter	0.608	0.0	356.2	5440

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Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.430

Time (mins)	Area
From:	To: (ha)
0	4 0.430

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Cellular Storage Area 1 1 in 10 yr	
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Model Details

Storage is Online Cover Level (m) 79.980

Cellular Storage Structure

Invert Level (m) 78.880 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	1248.0	1248.0	0.801	0.0	1361.6
0.800	1248.0	1361.6			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0100-3800-0500-3800
 Design Head (m) 0.500
 Design Flow (l/s) 3.8
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 100
 Invert Level (m) 78.880
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.8	Kick-Flo®	0.361	3.3
Flush-Flo™	0.165	3.8	Mean Flow over Head Range	-	3.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	5.7	3.000	8.8	7.000	13.2
0.200	3.8	1.400	6.1	3.500	9.4	7.500	13.7
0.300	3.6	1.600	6.5	4.000	10.1	8.000	14.1
0.400	3.4	1.800	6.9	4.500	10.6	8.500	14.5
0.500	3.8	2.000	7.2	5.000	11.2	9.000	15.0
0.600	4.1	2.200	7.6	5.500	11.7	9.500	15.4
0.800	4.7	2.400	7.9	6.000	12.2		
1.000	5.2	2.600	8.2	6.500	12.7		

PFA Consulting		Page 1
Stratton Park House Wanborough Road Swindon SN3 4HG		C798: Butts Close, Marnhull Cellular Storage Area 1 1 in 30 yr
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Causeway		Source Control 2020.1.3



Summary of Results for 30 year Return Period

Half Drain Time : 471 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	78.934	0.054	0.0	1.4	1.4	63.9	O K
30 min Summer	78.951	0.071	0.0	2.1	2.1	83.8	O K
60 min Summer	78.967	0.087	0.0	2.8	2.8	103.7	O K
120 min Summer	78.983	0.103	0.0	3.4	3.4	121.6	O K
180 min Summer	78.989	0.109	0.0	3.6	3.6	129.6	O K
240 min Summer	78.992	0.112	0.0	3.7	3.7	133.2	O K
360 min Summer	78.995	0.115	0.0	3.7	3.7	136.2	O K
480 min Summer	78.996	0.116	0.0	3.7	3.7	137.3	O K
600 min Summer	78.996	0.116	0.0	3.7	3.7	137.4	O K
720 min Summer	78.995	0.115	0.0	3.7	3.7	136.8	O K
960 min Summer	78.993	0.113	0.0	3.7	3.7	134.4	O K
1440 min Summer	78.988	0.108	0.0	3.5	3.5	128.3	O K
2160 min Summer	78.981	0.101	0.0	3.3	3.3	119.3	O K
2880 min Summer	78.974	0.094	0.0	3.1	3.1	111.7	O K
4320 min Summer	78.965	0.085	0.0	2.7	2.7	100.6	O K
5760 min Summer	78.959	0.079	0.0	2.5	2.5	93.1	O K
7200 min Summer	78.954	0.074	0.0	2.3	2.3	87.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	80.127	0.0	43.6	19
30 min Summer	53.145	0.0	62.3	33
60 min Summer	33.681	0.0	94.9	62
120 min Summer	20.661	0.0	118.8	122
180 min Summer	15.374	0.0	133.8	180
240 min Summer	12.395	0.0	144.5	238
360 min Summer	9.057	0.0	159.2	290
480 min Summer	7.207	0.0	169.2	352
600 min Summer	6.021	0.0	176.8	418
720 min Summer	5.191	0.0	182.9	486
960 min Summer	4.097	0.0	192.1	618
1440 min Summer	2.933	0.0	204.3	892
2160 min Summer	2.107	0.0	234.8	1280
2880 min Summer	1.676	0.0	248.0	1668
4320 min Summer	1.230	0.0	268.9	2416
5760 min Summer	0.999	0.0	303.4	3120
7200 min Summer	0.858	0.0	324.9	3888


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Causeway		Source Control 2020.1.3



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
8640 min Summer	78.951	0.071	0.0	2.1	2.1	83.7	O K
10080 min Summer	78.948	0.068	0.0	2.0	2.0	80.5	O K
15 min Winter	78.940	0.060	0.0	1.6	1.6	71.6	O K
30 min Winter	78.959	0.079	0.0	2.5	2.5	93.8	O K
60 min Winter	78.978	0.098	0.0	3.2	3.2	116.2	O K
120 min Winter	78.995	0.115	0.0	3.7	3.7	136.5	O K
180 min Winter	79.003	0.123	0.0	3.7	3.7	146.4	O K
240 min Winter	79.008	0.128	0.0	3.7	3.7	151.5	O K
360 min Winter	79.010	0.130	0.0	3.8	3.8	154.3	O K
480 min Winter	79.010	0.130	0.0	3.8	3.8	154.3	O K
600 min Winter	79.009	0.129	0.0	3.7	3.7	153.4	O K
720 min Winter	79.008	0.128	0.0	3.7	3.7	151.4	O K
960 min Winter	79.003	0.123	0.0	3.7	3.7	146.0	O K
1440 min Winter	78.993	0.113	0.0	3.7	3.7	134.3	O K
2160 min Winter	78.981	0.101	0.0	3.3	3.3	120.3	O K
2880 min Winter	78.972	0.092	0.0	3.0	3.0	109.6	O K
4320 min Winter	78.960	0.080	0.0	2.5	2.5	95.1	O K
5760 min Winter	78.953	0.073	0.0	2.2	2.2	86.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.763	0.0	344.9	4584
10080 min Summer	0.694	0.0	362.7	5344
15 min Winter	80.127	0.0	50.4	19
30 min Winter	53.145	0.0	71.6	33
60 min Winter	33.681	0.0	107.6	62
120 min Winter	20.661	0.0	134.5	120
180 min Winter	15.374	0.0	151.3	176
240 min Winter	12.395	0.0	163.3	232
360 min Winter	9.057	0.0	179.7	336
480 min Winter	7.207	0.0	191.0	376
600 min Winter	6.021	0.0	199.5	452
720 min Winter	5.191	0.0	206.3	528
960 min Winter	4.097	0.0	216.7	674
1440 min Winter	2.933	0.0	230.8	952
2160 min Winter	2.107	0.0	264.0	1360
2880 min Winter	1.676	0.0	279.0	1732
4320 min Winter	1.230	0.0	302.9	2504
5760 min Winter	0.999	0.0	340.4	3224

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Date 16/05/2023 File C798-V1.0 Cellular Stora...	Designed by IS Checked by	
Causeway		Source Control 2020.1.3

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
7200 min Winter	78.947	0.067	0.0	2.0	2.0	79.7	O K
8640 min Winter	78.943	0.063	0.0	1.8	1.8	75.1	O K
10080 min Winter	78.940	0.060	0.0	1.6	1.6	71.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.858	0.0	364.7	3960
8640 min Winter	0.763	0.0	387.5	4672
10080 min Winter	0.694	0.0	408.0	5448

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Cellular Storage Area 1 1 in 30 yr	
Date 16/05/2023	Designed by IS	
File C798-V1.0 Cellular Stora...	Checked by	
Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.430

Time (mins)	Area
From:	To: (ha)
0	4 0.430

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Cellular Storage Area 1 1 in 30 yr	
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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 79.980

Cellular Storage Structure

Invert Level (m) 78.880 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	1248.0	1248.0	0.801	0.0	1361.6
0.800	1248.0	1361.6			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0100-3800-0500-3800
 Design Head (m) 0.500
 Design Flow (l/s) 3.8
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 100
 Invert Level (m) 78.880
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.8	Kick-Flo®	0.361	3.3
Flush-Flo™	0.165	3.8	Mean Flow over Head Range	-	3.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	5.7	3.000	8.8	7.000	13.2
0.200	3.8	1.400	6.1	3.500	9.4	7.500	13.7
0.300	3.6	1.600	6.5	4.000	10.1	8.000	14.1
0.400	3.4	1.800	6.9	4.500	10.6	8.500	14.5
0.500	3.8	2.000	7.2	5.000	11.2	9.000	15.0
0.600	4.1	2.200	7.6	5.500	11.7	9.500	15.4
0.800	4.7	2.400	7.9	6.000	12.2		
1.000	5.2	2.600	8.2	6.500	12.7		

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Stratton Park House Wanborough Road Swindon SN3 4HG		C798: Butts Close, Marnhull Cellular Storage Area 1 1 in 100 yr + CC
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Causeway		Source Control 2020.1.3




Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 711 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	78.979	0.099	0.0	3.2	3.2	117.1	O K
30 min Summer	79.011	0.131	0.0	3.8	3.8	154.9	O K
60 min Summer	79.044	0.164	0.0	3.8	3.8	194.5	O K
120 min Summer	79.073	0.193	0.0	3.8	3.8	228.5	O K
180 min Summer	79.089	0.209	0.0	3.8	3.8	247.7	O K
240 min Summer	79.099	0.219	0.0	3.8	3.8	259.6	O K
360 min Summer	79.109	0.229	0.0	3.8	3.8	271.5	O K
480 min Summer	79.113	0.233	0.0	3.8	3.8	275.8	O K
600 min Summer	79.113	0.233	0.0	3.8	3.8	276.4	O K
720 min Summer	79.113	0.233	0.0	3.8	3.8	276.0	O K
960 min Summer	79.110	0.230	0.0	3.8	3.8	272.6	O K
1440 min Summer	79.101	0.221	0.0	3.8	3.8	261.9	O K
2160 min Summer	79.082	0.202	0.0	3.8	3.8	239.5	O K
2880 min Summer	79.063	0.183	0.0	3.8	3.8	217.4	O K
4320 min Summer	79.032	0.152	0.0	3.8	3.8	180.0	O K
5760 min Summer	79.009	0.129	0.0	3.7	3.7	153.0	O K
7200 min Summer	78.994	0.114	0.0	3.7	3.7	135.7	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	147.323	0.0	92.6	19
30 min Summer	98.447	0.0	129.2	33
60 min Summer	62.800	0.0	186.6	64
120 min Summer	37.929	0.0	227.4	122
180 min Summer	28.125	0.0	253.7	182
240 min Summer	22.670	0.0	273.1	242
360 min Summer	16.609	0.0	300.4	360
480 min Summer	13.291	0.0	320.4	480
600 min Summer	11.157	0.0	335.8	538
720 min Summer	9.655	0.0	348.2	596
960 min Summer	7.657	0.0	366.6	714
1440 min Summer	5.502	0.0	390.3	980
2160 min Summer	3.916	0.0	443.2	1384
2880 min Summer	3.075	0.0	463.0	1764
4320 min Summer	2.195	0.0	490.6	2508
5760 min Summer	1.740	0.0	532.5	3232
7200 min Summer	1.468	0.0	560.4	3896

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Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

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
8640 min Summer	78.986	0.106	0.0	3.5	3.5	125.4	O K
10080 min Summer	78.979	0.099	0.0	3.3	3.3	117.9	O K
15 min Winter	78.991	0.111	0.0	3.6	3.6	131.1	O K
30 min Winter	79.027	0.147	0.0	3.8	3.8	173.8	O K
60 min Winter	79.064	0.184	0.0	3.8	3.8	218.7	O K
120 min Winter	79.097	0.217	0.0	3.8	3.8	257.4	O K
180 min Winter	79.116	0.236	0.0	3.8	3.8	279.6	O K
240 min Winter	79.128	0.248	0.0	3.8	3.8	293.7	O K
360 min Winter	79.140	0.260	0.0	3.8	3.8	308.7	O K
480 min Winter	79.146	0.266	0.0	3.8	3.8	315.4	O K
600 min Winter	79.147	0.267	0.0	3.8	3.8	317.1	O K
720 min Winter	79.146	0.266	0.0	3.8	3.8	315.6	O K
960 min Winter	79.140	0.260	0.0	3.8	3.8	308.2	O K
1440 min Winter	79.126	0.246	0.0	3.8	3.8	291.4	O K
2160 min Winter	79.097	0.217	0.0	3.8	3.8	257.2	O K
2880 min Winter	79.069	0.189	0.0	3.8	3.8	223.6	O K
4320 min Winter	79.023	0.143	0.0	3.8	3.8	169.1	O K
5760 min Winter	78.994	0.114	0.0	3.7	3.7	135.1	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.286	0.0	586.9	4592
10080 min Summer	1.156	0.0	611.0	5344
15 min Winter	147.323	0.0	105.7	19
30 min Winter	98.447	0.0	146.5	33
60 min Winter	62.800	0.0	210.3	62
120 min Winter	37.929	0.0	255.8	120
180 min Winter	28.125	0.0	285.2	180
240 min Winter	22.670	0.0	306.8	238
360 min Winter	16.609	0.0	337.2	352
480 min Winter	13.291	0.0	359.3	464
600 min Winter	11.157	0.0	376.4	574
720 min Winter	9.655	0.0	390.0	678
960 min Winter	7.657	0.0	410.2	770
1440 min Winter	5.502	0.0	435.5	1068
2160 min Winter	3.916	0.0	497.2	1512
2880 min Winter	3.075	0.0	519.7	1904
4320 min Winter	2.195	0.0	551.5	2640
5760 min Winter	1.740	0.0	597.2	3288

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Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

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
7200 min Winter	78.981	0.101	0.0	3.3	3.3	119.4	O K
8640 min Winter	78.972	0.092	0.0	3.0	3.0	108.6	O K
10080 min Winter	78.965	0.085	0.0	2.8	2.8	101.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.468	0.0	628.6	3968
8640 min Winter	1.286	0.0	658.6	4680
10080 min Winter	1.156	0.0	686.4	5440

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Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.430

Time (mins)		Area
From:	To:	(ha)
0	4	0.430

PFA Consulting		Page 5
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Model Details

Storage is Online Cover Level (m) 79.980

Cellular Storage Structure

Invert Level (m) 78.880 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	1248.0	1248.0	0.801	0.0	1361.6
0.800	1248.0	1361.6			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0100-3800-0500-3800
 Design Head (m) 0.500
 Design Flow (l/s) 3.8
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 100
 Invert Level (m) 78.880
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.8	Kick-Flo®	0.361	3.3
Flush-Flo™	0.165	3.8	Mean Flow over Head Range	-	3.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	5.7	3.000	8.8	7.000	13.2
0.200	3.8	1.400	6.1	3.500	9.4	7.500	13.7
0.300	3.6	1.600	6.5	4.000	10.1	8.000	14.1
0.400	3.4	1.800	6.9	4.500	10.6	8.500	14.5
0.500	3.8	2.000	7.2	5.000	11.2	9.000	15.0
0.600	4.1	2.200	7.6	5.500	11.7	9.500	15.4
0.800	4.7	2.400	7.9	6.000	12.2		
1.000	5.2	2.600	8.2	6.500	12.7		

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Causeway		Source Control 2020.1.3

Summary of Results for 10 year Return Period

Half Drain Time : 81 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	81.858	0.118	0.0	3.7	3.7	18.8	O K
30 min Summer	81.886	0.146	0.0	3.8	3.8	23.3	O K
60 min Summer	81.906	0.166	0.0	3.8	3.8	26.6	O K
120 min Summer	81.925	0.185	0.0	3.8	3.8	29.5	O K
180 min Summer	81.928	0.188	0.0	3.8	3.8	30.0	O K
240 min Summer	81.925	0.185	0.0	3.8	3.8	29.5	O K
360 min Summer	81.910	0.170	0.0	3.8	3.8	27.2	O K
480 min Summer	81.894	0.154	0.0	3.8	3.8	24.6	O K
600 min Summer	81.879	0.139	0.0	3.8	3.8	22.1	O K
720 min Summer	81.866	0.126	0.0	3.7	3.7	20.0	O K
960 min Summer	81.848	0.108	0.0	3.5	3.5	17.2	O K
1440 min Summer	81.829	0.089	0.0	2.9	2.9	14.2	O K
2160 min Summer	81.814	0.074	0.0	2.3	2.3	11.8	O K
2880 min Summer	81.805	0.065	0.0	1.9	1.9	10.4	O K
4320 min Summer	81.796	0.056	0.0	1.4	1.4	8.9	O K
5760 min Summer	81.790	0.050	0.0	1.2	1.2	8.0	O K
7200 min Summer	81.787	0.047	0.0	1.1	1.1	7.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	61.725	0.0	20.2	17
30 min Summer	40.464	0.0	26.6	31
60 min Summer	25.532	0.0	34.0	54
120 min Summer	16.169	0.0	43.1	88
180 min Summer	12.182	0.0	48.8	122
240 min Summer	9.886	0.0	52.8	156
360 min Summer	7.272	0.0	58.3	222
480 min Summer	5.806	0.0	62.1	286
600 min Summer	4.861	0.0	65.0	348
720 min Summer	4.198	0.0	67.3	406
960 min Summer	3.323	0.0	71.0	520
1440 min Summer	2.392	0.0	76.6	764
2160 min Summer	1.733	0.0	83.6	1124
2880 min Summer	1.389	0.0	89.3	1472
4320 min Summer	1.036	0.0	99.7	2204
5760 min Summer	0.853	0.0	109.8	2936
7200 min Summer	0.740	0.0	119.1	3672

Summary of Results for 10 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
8640 min Summer	81.784	0.044	0.0	1.0	1.0	7.0	O K
10080 min Summer	81.782	0.042	0.0	0.9	0.9	6.7	O K
15 min Winter	81.873	0.133	0.0	3.8	3.8	21.2	O K
30 min Winter	81.906	0.166	0.0	3.8	3.8	26.4	O K
60 min Winter	81.930	0.190	0.0	3.8	3.8	30.3	O K
120 min Winter	81.947	0.207	0.0	3.8	3.8	33.1	O K
180 min Winter	81.947	0.207	0.0	3.8	3.8	33.1	O K
240 min Winter	81.939	0.199	0.0	3.8	3.8	31.8	O K
360 min Winter	81.915	0.175	0.0	3.8	3.8	27.9	O K
480 min Winter	81.890	0.150	0.0	3.8	3.8	23.9	O K
600 min Winter	81.868	0.128	0.0	3.7	3.7	20.5	O K
720 min Winter	81.853	0.113	0.0	3.7	3.7	18.0	O K
960 min Winter	81.835	0.095	0.0	3.1	3.1	15.2	O K
1440 min Winter	81.817	0.077	0.0	2.4	2.4	12.2	O K
2160 min Winter	81.803	0.063	0.0	1.8	1.8	10.1	O K
2880 min Winter	81.796	0.056	0.0	1.4	1.4	8.9	O K
4320 min Winter	81.787	0.047	0.0	1.1	1.1	7.5	O K
5760 min Winter	81.782	0.042	0.0	0.9	0.9	6.8	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.664	0.0	128.0	4400
10080 min Summer	0.608	0.0	136.8	5120
15 min Winter	61.725	0.0	22.7	17
30 min Winter	40.464	0.0	29.9	31
60 min Winter	25.532	0.0	38.1	58
120 min Winter	16.169	0.0	48.3	94
180 min Winter	12.182	0.0	54.7	134
240 min Winter	9.886	0.0	59.2	170
360 min Winter	7.272	0.0	65.3	240
480 min Winter	5.806	0.0	69.5	304
600 min Winter	4.861	0.0	72.8	362
720 min Winter	4.198	0.0	75.4	412
960 min Winter	3.323	0.0	79.6	532
1440 min Winter	2.392	0.0	85.9	766
2160 min Winter	1.733	0.0	93.6	1128
2880 min Winter	1.389	0.0	100.0	1476
4320 min Winter	1.036	0.0	111.7	2204
5760 min Winter	0.853	0.0	122.9	2944

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Summary of Results for 10 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
7200 min Winter	81.779	0.039	0.0	0.8	0.8	6.2	O K
8640 min Winter	81.777	0.037	0.0	0.7	0.7	5.9	O K
10080 min Winter	81.775	0.035	0.0	0.6	0.6	5.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.740	0.0	133.4	3672
8640 min Winter	0.664	0.0	143.4	4440
10080 min Winter	0.608	0.0	153.3	5144

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Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.179

Time (mins)	Area (ha)
From:	To:
0	4 0.179

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Model Details

Storage is Online Cover Level (m) 82.840

Cellular Storage Structure

Invert Level (m) 81.740 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	168.0	168.0	0.900	0.0	214.4
0.800	168.0	214.4			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0100-3800-0500-3800
 Design Head (m) 0.500
 Design Flow (l/s) 3.8
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 100
 Invert Level (m) 81.740
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.8	Kick-Flo®	0.361	3.3
Flush-Flo™	0.165	3.8	Mean Flow over Head Range	-	3.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	5.7	3.000	8.8	7.000	13.2
0.200	3.8	1.400	6.1	3.500	9.4	7.500	13.7
0.300	3.6	1.600	6.5	4.000	10.1	8.000	14.1
0.400	3.4	1.800	6.9	4.500	10.6	8.500	14.5
0.500	3.8	2.000	7.2	5.000	11.2	9.000	15.0
0.600	4.1	2.200	7.6	5.500	11.7	9.500	15.4
0.800	4.7	2.400	7.9	6.000	12.2		
1.000	5.2	2.600	8.2	6.500	12.7		

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Summary of Results for 30 year Return Period

Half Drain Time : 101 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	81.895	0.155	0.0	3.8	3.8	24.7	O K
30 min Summer	81.937	0.197	0.0	3.8	3.8	31.4	O K
60 min Summer	81.970	0.230	0.0	3.8	3.8	36.8	O K
120 min Summer	81.987	0.247	0.0	3.8	3.8	39.4	O K
180 min Summer	81.989	0.249	0.0	3.8	3.8	39.8	O K
240 min Summer	81.985	0.245	0.0	3.8	3.8	39.1	O K
360 min Summer	81.967	0.227	0.0	3.8	3.8	36.3	O K
480 min Summer	81.947	0.207	0.0	3.8	3.8	33.0	O K
600 min Summer	81.926	0.186	0.0	3.8	3.8	29.7	O K
720 min Summer	81.908	0.168	0.0	3.8	3.8	26.8	O K
960 min Summer	81.878	0.138	0.0	3.8	3.8	22.0	O K
1440 min Summer	81.846	0.106	0.0	3.5	3.5	16.8	O K
2160 min Summer	81.825	0.085	0.0	2.7	2.7	13.5	O K
2880 min Summer	81.814	0.074	0.0	2.3	2.3	11.8	O K
4320 min Summer	81.802	0.062	0.0	1.7	1.7	9.9	O K
5760 min Summer	81.795	0.055	0.0	1.4	1.4	8.8	O K
7200 min Summer	81.791	0.051	0.0	1.2	1.2	8.1	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	80.127	0.0	26.4	18
30 min Summer	53.145	0.0	35.1	32
60 min Summer	33.681	0.0	44.9	60
120 min Summer	20.661	0.0	55.2	96
180 min Summer	15.374	0.0	61.6	128
240 min Summer	12.395	0.0	66.3	164
360 min Summer	9.057	0.0	72.7	230
480 min Summer	7.207	0.0	77.1	296
600 min Summer	6.021	0.0	80.5	360
720 min Summer	5.191	0.0	83.3	420
960 min Summer	4.097	0.0	87.6	538
1440 min Summer	2.933	0.0	94.1	764
2160 min Summer	2.107	0.0	101.7	1124
2880 min Summer	1.676	0.0	107.7	1472
4320 min Summer	1.230	0.0	118.4	2204
5760 min Summer	0.999	0.0	128.6	2936
7200 min Summer	0.858	0.0	138.1	3672

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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
8640 min Summer	81.788	0.048	0.0	1.1	1.1	7.6	O K
10080 min Summer	81.785	0.045	0.0	1.0	1.0	7.2	O K
15 min Winter	81.914	0.174	0.0	3.8	3.8	27.8	O K
30 min Winter	81.963	0.223	0.0	3.8	3.8	35.6	O K
60 min Winter	82.003	0.263	0.0	3.8	3.8	42.0	O K
120 min Winter	82.021	0.281	0.0	3.8	3.8	44.9	O K
180 min Winter	82.020	0.280	0.0	3.8	3.8	44.7	O K
240 min Winter	82.012	0.272	0.0	3.8	3.8	43.4	O K
360 min Winter	81.983	0.243	0.0	3.8	3.8	38.8	O K
480 min Winter	81.951	0.211	0.0	3.8	3.8	33.6	O K
600 min Winter	81.920	0.180	0.0	3.8	3.8	28.8	O K
720 min Winter	81.894	0.154	0.0	3.8	3.8	24.5	O K
960 min Winter	81.857	0.117	0.0	3.7	3.7	18.6	O K
1440 min Winter	81.829	0.089	0.0	2.9	2.9	14.3	O K
2160 min Winter	81.812	0.072	0.0	2.2	2.2	11.4	O K
2880 min Winter	81.802	0.062	0.0	1.7	1.7	9.9	O K
4320 min Winter	81.792	0.052	0.0	1.3	1.3	8.3	O K
5760 min Winter	81.786	0.046	0.0	1.0	1.0	7.4	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.763	0.0	147.3	4400
10080 min Summer	0.694	0.0	156.2	5136
15 min Winter	80.127	0.0	29.6	18
30 min Winter	53.145	0.0	39.4	32
60 min Winter	33.681	0.0	50.4	60
120 min Winter	20.661	0.0	61.8	112
180 min Winter	15.374	0.0	69.1	140
240 min Winter	12.395	0.0	74.3	178
360 min Winter	9.057	0.0	81.4	252
480 min Winter	7.207	0.0	86.4	318
600 min Winter	6.021	0.0	90.2	382
720 min Winter	5.191	0.0	93.3	440
960 min Winter	4.097	0.0	98.2	542
1440 min Winter	2.933	0.0	105.4	778
2160 min Winter	2.107	0.0	113.9	1128
2880 min Winter	1.676	0.0	120.7	1496
4320 min Winter	1.230	0.0	132.7	2236
5760 min Winter	0.999	0.0	144.1	2944

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Causeway		Source Control 2020.1.3

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
7200 min Winter	81.783	0.043	0.0	0.9	0.9	6.8	O K
8640 min Winter	81.780	0.040	0.0	0.8	0.8	6.4	O K
10080 min Winter	81.778	0.038	0.0	0.7	0.7	6.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.858	0.0	154.7	3656
8640 min Winter	0.763	0.0	165.0	4392
10080 min Winter	0.694	0.0	175.0	5152

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.179

Time (mins)	Area
From: To:	(ha)
0	4 0.179

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Model Details

Storage is Online Cover Level (m) 82.840

Cellular Storage Structure

Invert Level (m) 81.740 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	168.0	168.0	0.900	0.0	214.4
0.800	168.0	214.4			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0100-3800-0500-3800
 Design Head (m) 0.500
 Design Flow (l/s) 3.8
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 100
 Invert Level (m) 81.740
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.8	Kick-Flo®	0.361	3.3
Flush-Flo™	0.165	3.8	Mean Flow over Head Range	-	3.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	5.7	3.000	8.8	7.000	13.2
0.200	3.8	1.400	6.1	3.500	9.4	7.500	13.7
0.300	3.6	1.600	6.5	4.000	10.1	8.000	14.1
0.400	3.4	1.800	6.9	4.500	10.6	8.500	14.5
0.500	3.8	2.000	7.2	5.000	11.2	9.000	15.0
0.600	4.1	2.200	7.6	5.500	11.7	9.500	15.4
0.800	4.7	2.400	7.9	6.000	12.2		
1.000	5.2	2.600	8.2	6.500	12.7		

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Causeway		Source Control 2020.1.3




Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 212 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	82.034	0.294	0.0	3.8	3.8	46.9	O K
30 min Summer	82.125	0.385	0.0	3.8	3.8	61.4	O K
60 min Summer	82.208	0.468	0.0	3.8	3.8	74.7	O K
120 min Summer	82.253	0.513	0.0	3.8	3.8	81.9	O K
180 min Summer	82.261	0.521	0.0	3.9	3.9	83.2	O K
240 min Summer	82.260	0.520	0.0	3.9	3.9	83.0	O K
360 min Summer	82.246	0.506	0.0	3.8	3.8	80.7	O K
480 min Summer	82.226	0.486	0.0	3.8	3.8	77.6	O K
600 min Summer	82.204	0.464	0.0	3.8	3.8	74.1	O K
720 min Summer	82.181	0.441	0.0	3.8	3.8	70.4	O K
960 min Summer	82.134	0.394	0.0	3.8	3.8	62.9	O K
1440 min Summer	82.034	0.294	0.0	3.8	3.8	47.0	O K
2160 min Summer	81.926	0.186	0.0	3.8	3.8	29.7	O K
2880 min Summer	81.868	0.128	0.0	3.7	3.7	20.4	O K
4320 min Summer	81.833	0.093	0.0	3.1	3.1	14.9	O K
5760 min Summer	81.819	0.079	0.0	2.5	2.5	12.6	O K
7200 min Summer	81.811	0.071	0.0	2.1	2.1	11.3	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	147.323	0.0	48.9	18
30 min Summer	98.447	0.0	65.5	33
60 min Summer	62.800	0.0	84.0	62
120 min Summer	37.929	0.0	101.5	120
180 min Summer	28.125	0.0	113.0	164
240 min Summer	22.670	0.0	121.4	194
360 min Summer	16.609	0.0	133.5	258
480 min Summer	13.291	0.0	142.4	328
600 min Summer	11.157	0.0	149.4	398
720 min Summer	9.655	0.0	155.2	466
960 min Summer	7.657	0.0	164.1	606
1440 min Summer	5.502	0.0	176.8	852
2160 min Summer	3.916	0.0	189.1	1192
2880 min Summer	3.075	0.0	197.9	1524
4320 min Summer	2.195	0.0	211.7	2204
5760 min Summer	1.740	0.0	224.1	2936
7200 min Summer	1.468	0.0	236.3	3672

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Summary of Results for 100 year Return Period (+45%)

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
8640 min Summer	81.805	0.065	0.0	1.9	1.9	10.4	O K
10080 min Summer	81.801	0.061	0.0	1.7	1.7	9.7	O K
15 min Winter	82.071	0.331	0.0	3.8	3.8	52.8	O K
30 min Winter	82.173	0.433	0.0	3.8	3.8	69.2	O K
60 min Winter	82.268	0.528	0.0	3.9	3.9	84.3	O K
120 min Winter	82.325	0.585	0.0	4.1	4.1	93.3	O K
180 min Winter	82.338	0.598	0.0	4.1	4.1	95.5	O K
240 min Winter	82.334	0.594	0.0	4.1	4.1	94.7	O K
360 min Winter	82.314	0.574	0.0	4.0	4.0	91.7	O K
480 min Winter	82.287	0.547	0.0	4.0	4.0	87.2	O K
600 min Winter	82.254	0.514	0.0	3.8	3.8	82.1	O K
720 min Winter	82.221	0.481	0.0	3.8	3.8	76.7	O K
960 min Winter	82.151	0.411	0.0	3.8	3.8	65.5	O K
1440 min Winter	82.000	0.260	0.0	3.8	3.8	41.5	O K
2160 min Winter	81.867	0.127	0.0	3.7	3.7	20.3	O K
2880 min Winter	81.837	0.097	0.0	3.2	3.2	15.4	O K
4320 min Winter	81.815	0.075	0.0	2.3	2.3	11.9	O K
5760 min Winter	81.804	0.064	0.0	1.8	1.8	10.2	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.286	0.0	248.3	4400
10080 min Summer	1.156	0.0	260.3	5128
15 min Winter	147.323	0.0	54.8	18
30 min Winter	98.447	0.0	73.4	32
60 min Winter	62.800	0.0	94.1	62
120 min Winter	37.929	0.0	113.8	118
180 min Winter	28.125	0.0	126.6	172
240 min Winter	22.670	0.0	136.0	220
360 min Winter	16.609	0.0	149.5	276
480 min Winter	13.291	0.0	159.5	354
600 min Winter	11.157	0.0	167.4	430
720 min Winter	9.655	0.0	173.8	506
960 min Winter	7.657	0.0	183.8	654
1440 min Winter	5.502	0.0	198.1	896
2160 min Winter	3.916	0.0	211.8	1188
2880 min Winter	3.075	0.0	221.7	1500
4320 min Winter	2.195	0.0	237.2	2204
5760 min Winter	1.740	0.0	251.0	2936

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Causeway	Source Control 2020.1.3	

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
7200 min Winter	81.798	0.058	0.0	1.6	1.6	9.3	O K
8640 min Winter	81.794	0.054	0.0	1.4	1.4	8.5	O K
10080 min Winter	81.791	0.051	0.0	1.2	1.2	8.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
7200 min Winter	1.468	0.0	264.7	3656
8640 min Winter	1.286	0.0	278.2	4392
10080 min Winter	1.156	0.0	291.6	5120

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.179

Time (mins)	Area
From: To:	(ha)
0	4 0.179

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Model Details

Storage is Online Cover Level (m) 82.840

Cellular Storage Structure

Invert Level (m) 81.740 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	168.0	168.0	0.900	0.0	214.4
0.800	168.0	214.4			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0100-3800-0500-3800
 Design Head (m) 0.500
 Design Flow (l/s) 3.8
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 100
 Invert Level (m) 81.740
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.8	Kick-Flo®	0.361	3.3
Flush-Flo™	0.165	3.8	Mean Flow over Head Range	-	3.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	5.7	3.000	8.8	7.000	13.2
0.200	3.8	1.400	6.1	3.500	9.4	7.500	13.7
0.300	3.6	1.600	6.5	4.000	10.1	8.000	14.1
0.400	3.4	1.800	6.9	4.500	10.6	8.500	14.5
0.500	3.8	2.000	7.2	5.000	11.2	9.000	15.0
0.600	4.1	2.200	7.6	5.500	11.7	9.500	15.4
0.800	4.7	2.400	7.9	6.000	12.2		
1.000	5.2	2.600	8.2	6.500	12.7		

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Summary of Results for 10 year Return Period

Half Drain Time : 74 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	80.365	0.105	0.0	3.4	3.4	15.9	O K
30 min Summer	80.389	0.129	0.0	3.5	3.5	19.6	O K
60 min Summer	80.406	0.146	0.0	3.5	3.5	22.2	O K
120 min Summer	80.422	0.162	0.0	3.5	3.5	24.6	O K
180 min Summer	80.424	0.164	0.0	3.5	3.5	25.0	O K
240 min Summer	80.421	0.161	0.0	3.5	3.5	24.4	O K
360 min Summer	80.407	0.147	0.0	3.5	3.5	22.4	O K
480 min Summer	80.392	0.132	0.0	3.5	3.5	20.1	O K
600 min Summer	80.379	0.119	0.0	3.5	3.5	18.0	O K
720 min Summer	80.368	0.108	0.0	3.5	3.5	16.4	O K
960 min Summer	80.355	0.095	0.0	3.1	3.1	14.4	O K
1440 min Summer	80.339	0.079	0.0	2.5	2.5	12.0	O K
2160 min Summer	80.327	0.067	0.0	1.9	1.9	10.1	O K
2880 min Summer	80.319	0.059	0.0	1.6	1.6	9.0	O K
4320 min Summer	80.311	0.051	0.0	1.2	1.2	7.7	O K
5760 min Summer	80.306	0.046	0.0	1.0	1.0	7.0	O K
7200 min Summer	80.303	0.043	0.0	0.9	0.9	6.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	61.725	0.0	17.1	17
30 min Summer	40.464	0.0	22.6	31
60 min Summer	25.532	0.0	28.9	52
120 min Summer	16.169	0.0	36.6	86
180 min Summer	12.182	0.0	41.4	120
240 min Summer	9.886	0.0	44.8	154
360 min Summer	7.272	0.0	49.5	220
480 min Summer	5.806	0.0	52.7	282
600 min Summer	4.861	0.0	55.1	342
720 min Summer	4.198	0.0	57.1	398
960 min Summer	3.323	0.0	60.3	518
1440 min Summer	2.392	0.0	65.0	754
2160 min Summer	1.733	0.0	71.0	1124
2880 min Summer	1.389	0.0	75.8	1472
4320 min Summer	1.036	0.0	84.6	2204
5760 min Summer	0.853	0.0	93.2	2936
7200 min Summer	0.740	0.0	101.1	3672


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Summary of Results for 10 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
8640 min Summer	80.300	0.040	0.0	0.8	0.8	6.1	O K
10080 min Summer	80.298	0.038	0.0	0.7	0.7	5.8	O K
15 min Winter	80.378	0.118	0.0	3.5	3.5	17.9	O K
30 min Winter	80.406	0.146	0.0	3.5	3.5	22.2	O K
60 min Winter	80.427	0.167	0.0	3.5	3.5	25.4	O K
120 min Winter	80.442	0.182	0.0	3.5	3.5	27.6	O K
180 min Winter	80.440	0.180	0.0	3.5	3.5	27.4	O K
240 min Winter	80.432	0.172	0.0	3.5	3.5	26.2	O K
360 min Winter	80.409	0.149	0.0	3.5	3.5	22.6	O K
480 min Winter	80.386	0.126	0.0	3.5	3.5	19.1	O K
600 min Winter	80.368	0.108	0.0	3.5	3.5	16.4	O K
720 min Winter	80.358	0.098	0.0	3.2	3.2	14.9	O K
960 min Winter	80.344	0.084	0.0	2.7	2.7	12.8	O K
1440 min Winter	80.329	0.069	0.0	2.0	2.0	10.5	O K
2160 min Winter	80.317	0.057	0.0	1.5	1.5	8.7	O K
2880 min Winter	80.311	0.051	0.0	1.2	1.2	7.7	O K
4320 min Winter	80.303	0.043	0.0	0.9	0.9	6.5	O K
5760 min Winter	80.299	0.039	0.0	0.8	0.8	5.9	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.664	0.0	108.7	4408
10080 min Summer	0.608	0.0	116.1	5136
15 min Winter	61.725	0.0	19.2	17
30 min Winter	40.464	0.0	25.3	31
60 min Winter	25.532	0.0	32.4	58
120 min Winter	16.169	0.0	41.0	94
180 min Winter	12.182	0.0	46.4	132
240 min Winter	9.886	0.0	50.2	168
360 min Winter	7.272	0.0	55.4	236
480 min Winter	5.806	0.0	59.0	296
600 min Winter	4.861	0.0	61.8	350
720 min Winter	4.198	0.0	64.0	410
960 min Winter	3.323	0.0	67.6	530
1440 min Winter	2.392	0.0	72.9	766
2160 min Winter	1.733	0.0	79.5	1128
2880 min Winter	1.389	0.0	84.9	1492
4320 min Winter	1.036	0.0	94.9	2244
5760 min Winter	0.853	0.0	104.4	2936

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Summary of Results for 10 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
7200 min Winter	80.296	0.036	0.0	0.7	0.7	5.5	O K
8640 min Winter	80.294	0.034	0.0	0.6	0.6	5.1	O K
10080 min Winter	80.292	0.032	0.0	0.5	0.5	4.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.740	0.0	113.2	3680
8640 min Winter	0.664	0.0	121.8	4408
10080 min Winter	0.608	0.0	130.1	5144

PFA Consulting		Page 4
Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Cellular Storage Area 3 1 in 10 yr	
Date 16/06/2023	Designed by IS	
File C798-V1.0 Cellular Stora...	Checked by	
Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.152

Time (mins)	Area
From:	To: (ha)
0	4 0.152

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Cellular Storage Area 3 1 in 10 yr	
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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 81.360

Cellular Storage Structure

Invert Level (m) 80.260 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	160.0	160.0	0.900	0.0	219.2
0.800	160.0	219.2			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0100-3500-0200-3500
 Design Head (m) 0.200
 Design Flow (l/s) 3.5
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 100
 Invert Level (m) 80.260
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.200	3.5	Kick-Flo®	0.181	3.3
Flush-Flo™	0.131	3.5	Mean Flow over Head Range	-	2.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	8.1	3.000	12.5	7.000	19.1
0.200	3.5	1.400	8.7	3.500	13.5	7.500	19.8
0.300	4.2	1.600	9.2	4.000	14.4	8.000	20.5
0.400	4.8	1.800	9.8	4.500	15.3	8.500	21.1
0.500	5.3	2.000	10.3	5.000	16.2	9.000	21.7
0.600	5.8	2.200	10.6	5.500	17.0	9.500	22.3
0.800	6.7	2.400	11.1	6.000	17.7		
1.000	7.4	2.600	11.6	6.500	18.4		

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Causeway		Source Control 2020.1.3



Summary of Results for 30 year Return Period

Half Drain Time : 90 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	80.397	0.137	0.0	3.5	3.5	20.9	O K
30 min Summer	80.434	0.174	0.0	3.5	3.5	26.5	O K
60 min Summer	80.462	0.202	0.0	3.5	3.5	30.7	O K
120 min Summer	80.475	0.215	0.0	3.6	3.6	32.7	O K
180 min Summer	80.476	0.216	0.0	3.6	3.6	32.9	O K
240 min Summer	80.472	0.212	0.0	3.6	3.6	32.2	O K
360 min Summer	80.457	0.197	0.0	3.5	3.5	29.9	O K
480 min Summer	80.438	0.178	0.0	3.5	3.5	27.0	O K
600 min Summer	80.419	0.159	0.0	3.5	3.5	24.1	O K
720 min Summer	80.402	0.142	0.0	3.5	3.5	21.6	O K
960 min Summer	80.376	0.116	0.0	3.5	3.5	17.7	O K
1440 min Summer	80.352	0.092	0.0	3.0	3.0	14.0	O K
2160 min Summer	80.336	0.076	0.0	2.4	2.4	11.5	O K
2880 min Summer	80.327	0.067	0.0	1.9	1.9	10.1	O K
4320 min Summer	80.316	0.056	0.0	1.5	1.5	8.6	O K
5760 min Summer	80.310	0.050	0.0	1.2	1.2	7.6	O K
7200 min Summer	80.306	0.046	0.0	1.0	1.0	7.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	80.127	0.0	22.4	17
30 min Summer	53.145	0.0	29.8	32
60 min Summer	33.681	0.0	38.2	60
120 min Summer	20.661	0.0	46.9	90
180 min Summer	15.374	0.0	52.3	124
240 min Summer	12.395	0.0	56.3	158
360 min Summer	9.057	0.0	61.7	228
480 min Summer	7.207	0.0	65.5	294
600 min Summer	6.021	0.0	68.4	356
720 min Summer	5.191	0.0	70.7	414
960 min Summer	4.097	0.0	74.4	528
1440 min Summer	2.933	0.0	79.8	764
2160 min Summer	2.107	0.0	86.3	1124
2880 min Summer	1.676	0.0	91.5	1472
4320 min Summer	1.230	0.0	100.6	2204
5760 min Summer	0.999	0.0	109.2	2936
7200 min Summer	0.858	0.0	117.2	3672


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Causeway		Source Control 2020.1.3



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
8640 min Summer	80.304	0.044	0.0	0.9	0.9	6.6	O K
10080 min Summer	80.301	0.041	0.0	0.9	0.9	6.3	O K
15 min Winter	80.415	0.155	0.0	3.5	3.5	23.5	O K
30 min Winter	80.457	0.197	0.0	3.5	3.5	30.0	O K
60 min Winter	80.489	0.229	0.0	3.7	3.7	34.8	O K
120 min Winter	80.501	0.241	0.0	3.8	3.8	36.7	O K
180 min Winter	80.500	0.240	0.0	3.8	3.8	36.4	O K
240 min Winter	80.491	0.231	0.0	3.7	3.7	35.1	O K
360 min Winter	80.466	0.206	0.0	3.5	3.5	31.3	O K
480 min Winter	80.438	0.178	0.0	3.5	3.5	27.0	O K
600 min Winter	80.409	0.149	0.0	3.5	3.5	22.6	O K
720 min Winter	80.386	0.126	0.0	3.5	3.5	19.2	O K
960 min Winter	80.360	0.100	0.0	3.3	3.3	15.2	O K
1440 min Winter	80.339	0.079	0.0	2.5	2.5	12.0	O K
2160 min Winter	80.325	0.065	0.0	1.9	1.9	9.8	O K
2880 min Winter	80.316	0.056	0.0	1.5	1.5	8.6	O K
4320 min Winter	80.307	0.047	0.0	1.1	1.1	7.2	O K
5760 min Winter	80.302	0.042	0.0	0.9	0.9	6.4	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.763	0.0	125.0	4400
10080 min Summer	0.694	0.0	132.6	5136
15 min Winter	80.127	0.0	25.1	17
30 min Winter	53.145	0.0	33.4	31
60 min Winter	33.681	0.0	42.8	58
120 min Winter	20.661	0.0	52.5	96
180 min Winter	15.374	0.0	58.6	134
240 min Winter	12.395	0.0	63.0	172
360 min Winter	9.057	0.0	69.1	246
480 min Winter	7.207	0.0	73.3	314
600 min Winter	6.021	0.0	76.6	374
720 min Winter	5.191	0.0	79.2	428
960 min Winter	4.097	0.0	83.4	532
1440 min Winter	2.933	0.0	89.5	766
2160 min Winter	2.107	0.0	96.7	1128
2880 min Winter	1.676	0.0	102.5	1500
4320 min Winter	1.230	0.0	112.7	2208
5760 min Winter	0.999	0.0	122.3	2936

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Causeway		Source Control 2020.1.3

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
7200 min Winter	80.299	0.039	0.0	0.8	0.8	5.9	O K
8640 min Winter	80.297	0.037	0.0	0.7	0.7	5.5	O K
10080 min Winter	80.295	0.035	0.0	0.6	0.6	5.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.858	0.0	131.3	3680
8640 min Winter	0.763	0.0	140.1	4392
10080 min Winter	0.694	0.0	148.6	4992

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Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.152

Time (mins)	Area
From:	To: (ha)
0	4 0.152

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Model Details

Storage is Online Cover Level (m) 81.360

Cellular Storage Structure

Invert Level (m) 80.260 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	160.0	160.0	0.900	0.0	219.2
0.800	160.0	219.2			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0100-3500-0200-3500
 Design Head (m) 0.200
 Design Flow (l/s) 3.5
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 100
 Invert Level (m) 80.260
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.200	3.5	Kick-Flo®	0.181	3.3
Flush-Flo™	0.131	3.5	Mean Flow over Head Range	-	2.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	8.1	3.000	12.5	7.000	19.1
0.200	3.5	1.400	8.7	3.500	13.5	7.500	19.8
0.300	4.2	1.600	9.2	4.000	14.4	8.000	20.5
0.400	4.8	1.800	9.8	4.500	15.3	8.500	21.1
0.500	5.3	2.000	10.3	5.000	16.2	9.000	21.7
0.600	5.8	2.200	10.6	5.500	17.0	9.500	22.3
0.800	6.7	2.400	11.1	6.000	17.7		
1.000	7.4	2.600	11.6	6.500	18.4		


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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Cellular Storage Area 3 1 in 100 yr + CC	
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Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 137 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	80.520	0.260	0.0	3.9	3.9	39.5	O K
30 min Summer	80.595	0.335	0.0	4.4	4.4	50.9	O K
60 min Summer	80.658	0.398	0.0	4.8	4.8	60.5	O K
120 min Summer	80.682	0.422	0.0	4.9	4.9	64.1	O K
180 min Summer	80.687	0.427	0.0	5.0	5.0	64.8	O K
240 min Summer	80.684	0.424	0.0	4.9	4.9	64.4	O K
360 min Summer	80.666	0.406	0.0	4.9	4.9	61.7	O K
480 min Summer	80.645	0.385	0.0	4.7	4.7	58.4	O K
600 min Summer	80.622	0.362	0.0	4.6	4.6	55.0	O K
720 min Summer	80.600	0.340	0.0	4.5	4.5	51.6	O K
960 min Summer	80.558	0.298	0.0	4.2	4.2	45.4	O K
1440 min Summer	80.491	0.231	0.0	3.7	3.7	35.2	O K
2160 min Summer	80.408	0.148	0.0	3.5	3.5	22.5	O K
2880 min Summer	80.365	0.105	0.0	3.4	3.4	16.0	O K
4320 min Summer	80.342	0.082	0.0	2.6	2.6	12.5	O K
5760 min Summer	80.331	0.071	0.0	2.1	2.1	10.7	O K
7200 min Summer	80.324	0.064	0.0	1.8	1.8	9.7	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	147.323	0.0	41.5	18
30 min Summer	98.447	0.0	55.6	32
60 min Summer	62.800	0.0	71.3	62
120 min Summer	37.929	0.0	86.2	104
180 min Summer	28.125	0.0	95.9	134
240 min Summer	22.670	0.0	103.1	168
360 min Summer	16.609	0.0	113.3	238
480 min Summer	13.291	0.0	120.9	306
600 min Summer	11.157	0.0	126.9	374
720 min Summer	9.655	0.0	131.8	440
960 min Summer	7.657	0.0	139.3	570
1440 min Summer	5.502	0.0	150.1	824
2160 min Summer	3.916	0.0	160.5	1172
2880 min Summer	3.075	0.0	168.0	1496
4320 min Summer	2.195	0.0	179.8	2204
5760 min Summer	1.740	0.0	190.3	2936
7200 min Summer	1.468	0.0	200.7	3672

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Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

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
8640 min Summer	80.319	0.059	0.0	1.6	1.6	8.9	O K
10080 min Summer	80.315	0.055	0.0	1.4	1.4	8.4	O K
15 min Winter	80.552	0.292	0.0	4.2	4.2	44.4	O K
30 min Winter	80.638	0.378	0.0	4.7	4.7	57.4	O K
60 min Winter	80.711	0.451	0.0	5.1	5.1	68.6	O K
120 min Winter	80.741	0.481	0.0	5.2	5.2	73.2	O K
180 min Winter	80.743	0.483	0.0	5.3	5.3	73.4	O K
240 min Winter	80.737	0.477	0.0	5.2	5.2	72.5	O K
360 min Winter	80.709	0.449	0.0	5.1	5.1	68.3	O K
480 min Winter	80.676	0.416	0.0	4.9	4.9	63.3	O K
600 min Winter	80.643	0.383	0.0	4.7	4.7	58.2	O K
720 min Winter	80.611	0.351	0.0	4.5	4.5	53.3	O K
960 min Winter	80.553	0.293	0.0	4.2	4.2	44.5	O K
1440 min Winter	80.460	0.200	0.0	3.5	3.5	30.5	O K
2160 min Winter	80.363	0.103	0.0	3.4	3.4	15.6	O K
2880 min Winter	80.344	0.084	0.0	2.7	2.7	12.8	O K
4320 min Winter	80.327	0.067	0.0	1.9	1.9	10.2	O K
5760 min Winter	80.318	0.058	0.0	1.6	1.6	8.8	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.286	0.0	210.9	4408
10080 min Summer	1.156	0.0	221.0	5136
15 min Winter	147.323	0.0	46.5	18
30 min Winter	98.447	0.0	62.3	32
60 min Winter	62.800	0.0	79.9	60
120 min Winter	37.929	0.0	96.6	114
180 min Winter	28.125	0.0	107.5	142
240 min Winter	22.670	0.0	115.5	180
360 min Winter	16.609	0.0	127.0	256
480 min Winter	13.291	0.0	135.5	330
600 min Winter	11.157	0.0	142.1	402
720 min Winter	9.655	0.0	147.6	470
960 min Winter	7.657	0.0	156.1	606
1440 min Winter	5.502	0.0	168.2	868
2160 min Winter	3.916	0.0	179.8	1144
2880 min Winter	3.075	0.0	188.2	1496
4320 min Winter	2.195	0.0	201.4	2208
5760 min Winter	1.740	0.0	213.2	2936

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Cellular Storage Area 3 1 in 100 yr + CC	
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Causeway		Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

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
7200 min Winter	80.313	0.053	0.0	1.3	1.3	8.0	O K
8640 min Winter	80.309	0.049	0.0	1.1	1.1	7.4	O K
10080 min Winter	80.306	0.046	0.0	1.0	1.0	7.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.468	0.0	224.8	3672
8640 min Winter	1.286	0.0	236.2	4408
10080 min Winter	1.156	0.0	247.6	5088

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Causeway		Source Control 2020.1.3


Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 377947 118457 ST 77947 18457
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.152

Time (mins)	Area
From: To:	(ha)
0	4 0.152

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Stratton Park House Wanborough Road Swindon SN3 4HG	C798: Butts Close, Marnhull Cellular Storage Area 3 1 in 100 yr + CC	
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Causeway		Source Control 2020.1.3

Model Details

Storage is Online Cover Level (m) 81.360

Cellular Storage Structure

Invert Level (m) 80.260 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	160.0	160.0	0.900	0.0	219.2
0.800	160.0	219.2			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0100-3500-0200-3500
 Design Head (m) 0.200
 Design Flow (l/s) 3.5
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 100
 Invert Level (m) 80.260
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.200	3.5	Kick-Flo®	0.181	3.3
Flush-Flo™	0.131	3.5	Mean Flow over Head Range	-	2.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	8.1	3.000	12.5	7.000	19.1
0.200	3.5	1.400	8.7	3.500	13.5	7.500	19.8
0.300	4.2	1.600	9.2	4.000	14.4	8.000	20.5
0.400	4.8	1.800	9.8	4.500	15.3	8.500	21.1
0.500	5.3	2.000	10.3	5.000	16.2	9.000	21.7
0.600	5.8	2.200	10.6	5.500	17.0	9.500	22.3
0.800	6.7	2.400	11.1	6.000	17.7		
1.000	7.4	2.600	11.6	6.500	18.4		


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Cascade Summary of Results for C798-V12.0 Pond 1 - 1 in 100yr+45%CC.srcx

Upstream Structures	Outflow To	Overflow To
C798-V1.0 Cellular Storage Area 3 - 1 in 100yr+45%CC.srcx	(None)	(None)
C798-V2.0 Pond 4 - 1 in 100yr+45%CC.srcx		
C798-V1.0 Cellular Storage Area 2 - 1 in 100yr+45%CC.srcx		
C798-V11.0 Pond 2 - 1 in 100yr+45%CC.srcx		
C798-V1.0 Cellular Storage Area 1 - 1 in 100yr+45%CC.srcx		
C798-V1.0 Pond 3 - 1 in 100yr+45%CC.srcx		

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	72.821	0.365	23.1	413.2	O K
30 min Summer	72.927	0.471	23.1	550.0	O K
60 min Summer	73.033	0.577	23.1	694.7	O K
120 min Summer	73.124	0.668	23.1	824.0	O K
180 min Summer	73.176	0.720	23.1	900.5	O K
240 min Summer	73.209	0.753	23.1	949.4	O K
360 min Summer	73.243	0.787	23.1	1002.4	O K
480 min Summer	73.259	0.803	23.1	1027.1	O K
600 min Summer	73.264	0.808	23.1	1034.6	O K
720 min Summer	73.262	0.806	23.1	1031.0	O K
960 min Summer	73.246	0.790	23.1	1006.4	O K
1440 min Summer	73.210	0.754	23.1	951.9	O K
2160 min Summer	73.148	0.692	23.1	858.5	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	147.323	0.0	820.5	25
30 min Summer	98.447	0.0	1103.1	40
60 min Summer	62.800	0.0	1502.8	68
120 min Summer	37.929	0.0	1815.1	128
180 min Summer	28.125	0.0	2014.8	186
240 min Summer	22.670	0.0	2159.3	246
360 min Summer	16.609	0.0	2355.8	364
480 min Summer	13.291	0.0	2489.5	482
600 min Summer	11.157	0.0	2582.1	602
720 min Summer	9.655	0.0	2649.1	720
960 min Summer	7.657	0.0	2751.6	856
1440 min Summer	5.502	0.0	2882.0	1108
2160 min Summer	3.916	0.0	3446.5	1516

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Cascade Summary of Results for C798-V12.0 Pond 1 - 1 in 100yr+45%CC.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
2880 min Summer	73.074	0.618	23.1	752.0	O K
4320 min Summer	72.958	0.502	23.1	591.5	O K
5760 min Summer	72.860	0.404	23.1	462.3	O K
7200 min Summer	72.787	0.331	23.1	371.0	O K
8640 min Summer	72.736	0.280	23.0	309.7	O K
10080 min Summer	72.702	0.246	22.7	268.7	O K
15 min Winter	72.861	0.405	23.1	463.8	O K
30 min Winter	72.978	0.522	23.1	617.8	O K
60 min Winter	73.095	0.639	23.1	781.7	O K
120 min Winter	73.195	0.739	23.1	928.6	O K
180 min Winter	73.251	0.795	23.1	1013.9	O K
240 min Winter	73.287	0.831	23.1	1069.7	O K
360 min Winter	73.327	0.871	23.1	1132.8	O K
480 min Winter	73.347	0.891	23.1	1165.0	O K
600 min Winter	73.355	0.899	23.2	1178.5	O K
720 min Winter	73.356	0.900	23.2	1179.6	O K
960 min Winter	73.343	0.887	23.1	1158.3	O K
1440 min Winter	73.297	0.841	23.1	1086.3	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
2880 min Summer	3.075	0.0	3597.1	1876
4320 min Summer	2.195	0.0	3805.8	2604
5760 min Summer	1.740	0.0	4127.9	3336
7200 min Summer	1.468	0.0	4349.4	3976
8640 min Summer	1.286	0.0	4564.4	4672
10080 min Summer	1.156	0.0	4769.7	5344
15 min Winter	147.323	0.0	923.5	25
30 min Winter	98.447	0.0	1231.4	39
60 min Winter	62.800	0.0	1684.1	68
120 min Winter	37.929	0.0	2029.9	126
180 min Winter	28.125	0.0	2248.0	184
240 min Winter	22.670	0.0	2402.1	242
360 min Winter	16.609	0.0	2599.1	358
480 min Winter	13.291	0.0	2723.2	472
600 min Winter	11.157	0.0	2823.6	586
720 min Winter	9.655	0.0	2906.0	698
960 min Winter	7.657	0.0	3025.9	914
1440 min Winter	5.502	0.0	3144.8	1156

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Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
2160 min Winter	73.221	0.765	23.1	968.4	O K
2880 min Winter	73.133	0.677	23.1	837.2	O K
4320 min Winter	72.929	0.473	23.1	553.1	O K
5760 min Winter	72.783	0.327	23.1	366.6	O K
7200 min Winter	72.698	0.242	22.6	264.1	O K
8640 min Winter	72.667	0.211	21.9	228.0	O K
10080 min Winter	72.653	0.197	20.3	212.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
2160 min Winter	3.916	0.0	3855.5	1624
2880 min Winter	3.075	0.0	4019.6	2104
4320 min Winter	2.195	0.0	4219.7	2768
5760 min Winter	1.740	0.0	4624.7	3408
7200 min Winter	1.468	0.0	4874.0	3968
8640 min Winter	1.286	0.0	5116.5	4504
10080 min Winter	1.156	0.0	5350.1	5248

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Cascade Rainfall Details for C798-V12.0 Pond 1 - 1 in 100yr+45%CC.srcx

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Rainfall Model                FEH
Return Period (years)         100
FEH Rainfall Version          2013
Site Location GB 377947 118457 ST 77947 18457
Data Type                      Point
Summer Storms                  Yes
Winter Storms                  Yes
Cv (Summer)                    0.750
Cv (Winter)                    0.840
Shortest Storm (mins)         15
Longest Storm (mins)          10080
Climate Change %               +45

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Time Area Diagram

Total Area (ha) 1.532

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 0.696	4	8 0.558	8	12 0.278

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Cascade Model Details for C798-V12.0 Pond 1 - 1 in 100yr+45%CC.srcx

Storage is Online Cover Level (m) 73.656

Tank or Pond Structure

Invert Level (m) 72.456

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1014.8	0.400	1275.8	0.800	1545.8	1.200	1824.8
0.100	1079.2	0.500	1342.5	0.900	1614.8		
0.200	1144.2	0.600	1409.7	1.000	1684.2		
0.300	1209.7	0.700	1477.5	1.100	1754.3		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0213-2320-0900-2320
Design Head (m)	0.900
Design Flow (l/s)	23.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	213
Invert Level (m)	72.456
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	23.2	Kick-Flo®	0.672	20.2
Flush-Flo™	0.342	23.1	Mean Flow over Head Range	-	19.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.2	1.200	26.6	3.000	41.3	7.000	62.3
0.200	20.7	1.400	28.6	3.500	44.5	7.500	64.4
0.300	23.1	1.600	30.5	4.000	47.5	8.000	66.5
0.400	23.0	1.800	32.3	4.500	50.3	8.500	68.5
0.500	22.6	2.000	34.0	5.000	52.9	9.000	70.4
0.600	21.6	2.200	35.6	5.500	55.4	9.500	71.9
0.800	21.9	2.400	37.1	6.000	57.8		
1.000	24.4	2.600	38.6	6.500	60.1		