

4 Calder Close
Wakefield
WF4 3BA



Date 19/09/2019 08:30
File Attenuation Volume Calc...

Designed by john.mitchell
Checked by

Micro Drainage Source Control 2018.1.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.928	0.928	4.1	0.0	4.1	124.7	O K
30 min Summer	1.138	1.138	4.1	0.0	4.1	166.2	O K
60 min Summer	1.361	1.361	4.2	0.0	4.2	208.8	O K
120 min Summer	1.592	1.592	4.5	0.0	4.5	247.8	O K
180 min Summer	1.721	1.721	4.7	0.0	4.7	265.5	O K
240 min Summer	1.796	1.796	4.7	0.0	4.7	273.4	O K
360 min Summer	1.851	1.851	4.8	0.0	4.8	277.7	O K
480 min Summer	1.811	1.811	4.8	0.0	4.8	274.8	O K
600 min Summer	1.764	1.764	4.7	0.0	4.7	270.3	O K
720 min Summer	1.722	1.722	4.7	0.0	4.7	265.5	O K
960 min Summer	1.653	1.653	4.6	0.0	4.6	256.6	O K
1440 min Summer	1.546	1.546	4.4	0.0	4.4	240.7	O K
2160 min Summer	1.410	1.410	4.2	0.0	4.2	217.6	O K
2880 min Summer	1.288	1.288	4.1	0.0	4.1	195.3	O K
4320 min Summer	1.074	1.074	4.1	0.0	4.1	153.6	O K
5760 min Summer	0.874	0.874	4.1	0.0	4.1	114.0	O K
7200 min Summer	0.634	0.634	4.1	0.0	4.1	68.5	O K
8640 min Summer	0.475	0.475	4.1	0.0	4.1	41.4	O K
10080 min Summer	0.358	0.358	4.1	0.0	4.1	24.1	O K
15 min Winter	0.902	0.902	4.1	0.0	4.1	119.6	O K
30 min Winter	1.104	1.104	4.1	0.0	4.1	159.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	115.731	0.0	130.1	0.0	26
30 min Summer	77.804	0.0	175.0	0.0	41
60 min Summer	49.937	0.0	224.6	0.0	70
120 min Summer	30.956	0.0	278.4	0.0	128
180 min Summer	23.058	0.0	311.1	0.0	186
240 min Summer	18.577	0.0	334.2	0.0	244
360 min Summer	13.656	0.0	368.5	0.0	362
480 min Summer	10.974	0.0	394.8	0.0	458
600 min Summer	9.254	0.0	416.2	0.0	514
720 min Summer	8.046	0.0	434.3	0.0	578
960 min Summer	6.447	0.0	463.9	0.0	708
1440 min Summer	4.709	0.0	508.3	0.0	984
2160 min Summer	3.432	0.0	555.7	0.0	1404
2880 min Summer	2.739	0.0	591.2	0.0	1820
4320 min Summer	1.989	0.0	644.0	0.0	2636
5760 min Summer	1.583	0.0	683.4	0.0	3416
7200 min Summer	1.325	0.0	715.1	0.0	4040
8640 min Summer	1.147	0.0	742.7	0.0	4672
10080 min Summer	1.015	0.0	767.1	0.0	5344
15 min Winter	115.731	0.0	124.9	0.0	26
30 min Winter	77.804	0.0	168.0	0.0	40

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Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	1.315	1.315	4.1	0.0	4.1	200.4	O K
120 min Winter	1.531	1.531	4.4	0.0	4.4	238.2	O K
180 min Winter	1.644	1.644	4.6	0.0	4.6	255.4	O K
240 min Winter	1.704	1.704	4.6	0.0	4.6	263.3	O K
360 min Winter	1.744	1.744	4.7	0.0	4.7	268.1	O K
480 min Winter	1.726	1.726	4.7	0.0	4.7	266.0	O K
600 min Winter	1.681	1.681	4.6	0.0	4.6	260.4	O K
720 min Winter	1.636	1.636	4.5	0.0	4.5	254.2	O K
960 min Winter	1.561	1.561	4.5	0.0	4.5	243.1	O K
1440 min Winter	1.429	1.429	4.3	0.0	4.3	221.0	O K
2160 min Winter	1.244	1.244	4.1	0.0	4.1	186.8	O K
2880 min Winter	1.073	1.073	4.1	0.0	4.1	153.4	O K
4320 min Winter	0.680	0.680	4.1	0.0	4.1	77.0	O K
5760 min Winter	0.380	0.380	4.1	0.0	4.1	27.2	O K
7200 min Winter	0.217	0.217	3.9	0.0	3.9	7.9	O K
8640 min Winter	0.138	0.138	3.5	0.0	3.5	2.6	O K
10080 min Winter	0.108	0.108	3.1	0.0	3.1	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	49.937	0.0	215.6	0.0	68
120 min Winter	30.956	0.0	267.3	0.0	126
180 min Winter	23.058	0.0	298.7	0.0	182
240 min Winter	18.577	0.0	320.8	0.0	240
360 min Winter	13.656	0.0	353.8	0.0	352
480 min Winter	10.974	0.0	379.0	0.0	460
600 min Winter	9.254	0.0	399.5	0.0	560
720 min Winter	8.046	0.0	416.9	0.0	586
960 min Winter	6.447	0.0	445.4	0.0	738
1440 min Winter	4.709	0.0	488.0	0.0	1048
2160 min Winter	3.432	0.0	533.5	0.0	1500
2880 min Winter	2.739	0.0	567.6	0.0	1940
4320 min Winter	1.989	0.0	618.2	0.0	2688
5760 min Winter	1.583	0.0	656.1	0.0	3240
7200 min Winter	1.325	0.0	686.5	0.0	3816
8640 min Winter	1.147	0.0	713.0	0.0	4408
10080 min Winter	1.015	0.0	736.4	0.0	5136

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.875
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.514

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.171		0.171		0.171

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Model Details

Storage is Online Cover Level (m) 3.000

Pipe Structure

Diameter (m) 1.800 Length (m) 110.000
Slope (1:X) 500.000 Invert Level (m) 0.000

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0092-5000-2000-5000
Design Head (m) 2.000
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 92
Invert Level (m) 0.000
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	5.0
Flush-Flo™	0.398	4.1
Kick-Flo®	0.816	3.3
Mean Flow over Head Range	-	3.9

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)						
0.100	2.9	1.200	3.9	3.000	6.0	7.000	9.0
0.200	3.8	1.400	4.2	3.500	6.5	7.500	9.3
0.300	4.1	1.600	4.5	4.000	6.9	8.000	9.6
0.400	4.1	1.800	4.8	4.500	7.3	8.500	9.9
0.500	4.1	2.000	5.0	5.000	7.7	9.000	10.2
0.600	4.0	2.200	5.2	5.500	8.0	9.500	10.4
0.800	3.4	2.400	5.4	6.000	8.4		
1.000	3.6	2.600	5.6	6.500	8.7		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.500 Invert Level (m) 2.000