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44 Canal Street Bootle Liverpool L20 8QU	1 St James' Road 100yr 40CC 0.2ls Attenuation	
Date 13/04/2020 File attenuation 100yr 40cc ...	Designed by CC Checked by PK	
Micro Drainage	Source Control 2019.1	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	0.406	0.406	0.1	8.9	O K
30 min Summer	0.531	0.531	0.2	11.7	O K
60 min Summer	0.656	0.656	0.2	14.4	O K
120 min Summer	0.774	0.774	0.2	17.0	O K
180 min Summer	0.835	0.835	0.2	18.4	O K
240 min Summer	0.870	0.870	0.2	19.1	O K
360 min Summer	0.909	0.909	0.2	20.0	O K
480 min Summer	0.927	0.927	0.2	20.4	O K
600 min Summer	0.933	0.933	0.2	20.5	O K
720 min Summer	0.931	0.931	0.2	20.5	O K
960 min Summer	0.917	0.917	0.2	20.2	O K
1440 min Summer	0.886	0.886	0.2	19.5	O K
2160 min Summer	0.834	0.834	0.2	18.3	O K
2880 min Summer	0.785	0.785	0.2	17.3	O K
4320 min Summer	0.700	0.700	0.2	15.4	O K
5760 min Summer	0.626	0.626	0.2	13.8	O K
7200 min Summer	0.561	0.561	0.2	12.3	O K
8640 min Summer	0.503	0.503	0.2	11.1	O K
10080 min Summer	0.452	0.452	0.1	9.9	O K
15 min Winter	0.456	0.456	0.1	10.0	O K
30 min Winter	0.595	0.595	0.2	13.1	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	138.153	0.0	8.9	23
30 min Summer	90.705	0.0	10.5	37
60 min Summer	56.713	0.0	14.9	66
120 min Summer	34.246	0.0	18.0	126
180 min Summer	25.149	0.0	19.8	186
240 min Summer	20.078	0.0	21.0	244
360 min Summer	14.585	0.0	22.8	364
480 min Summer	11.622	0.0	23.9	482
600 min Summer	9.738	0.0	24.3	602
720 min Summer	8.424	0.0	24.5	720
960 min Summer	6.697	0.0	24.8	832
1440 min Summer	4.839	0.0	25.0	1082
2160 min Summer	3.490	0.0	33.0	1476
2880 min Summer	2.766	0.0	34.9	1904
4320 min Summer	1.989	0.0	37.6	2724
5760 min Summer	1.573	0.0	39.7	3520
7200 min Summer	1.311	0.0	41.4	4320
8640 min Summer	1.129	0.0	42.7	5096
10080 min Summer	0.994	0.0	43.9	5848
15 min Winter	138.153	0.0	9.8	23
30 min Winter	90.705	0.0	10.9	37

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
60 min Winter	0.737	0.737	0.2	16.2	O K
120 min Winter	0.872	0.872	0.2	19.2	O K
180 min Winter	0.942	0.942	0.2	20.7	O K
240 min Winter	0.984	0.984	0.2	21.6	O K
360 min Winter	1.032	1.032	0.2	22.7	O K
480 min Winter	1.058	1.058	0.2	23.3	O K
600 min Winter	1.069	1.069	0.2	23.5	O K
720 min Winter	1.072	1.072	0.2	23.6	O K
960 min Winter	1.062	1.062	0.2	23.4	O K
1440 min Winter	1.022	1.022	0.2	22.5	O K
2160 min Winter	0.957	0.957	0.2	21.1	O K
2880 min Winter	0.889	0.889	0.2	19.6	O K
4320 min Winter	0.765	0.765	0.2	16.8	O K
5760 min Winter	0.659	0.659	0.2	14.5	O K
7200 min Winter	0.567	0.567	0.2	12.5	O K
8640 min Winter	0.489	0.489	0.1	10.8	O K
10080 min Winter	0.421	0.421	0.1	9.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
60 min Winter	56.713	0.0	16.7	66
120 min Winter	34.246	0.0	20.1	124
180 min Winter	25.149	0.0	22.1	182
240 min Winter	20.078	0.0	23.4	240
360 min Winter	14.585	0.0	24.8	356
480 min Winter	11.622	0.0	25.4	472
600 min Winter	9.738	0.0	25.8	584
720 min Winter	8.424	0.0	26.2	694
960 min Winter	6.697	0.0	26.6	908
1440 min Winter	4.839	0.0	26.7	1138
2160 min Winter	3.490	0.0	37.0	1600
2880 min Winter	2.766	0.0	39.1	2048
4320 min Winter	1.989	0.0	41.9	2940
5760 min Winter	1.573	0.0	44.5	3752
7200 min Winter	1.311	0.0	46.3	4608
8640 min Winter	1.129	0.0	47.9	5368
10080 min Winter	0.994	0.0	49.2	6152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.035

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:	From:	To:
0	4 0.020	32	36 0.000	64	68 0.000	96	100 0.000
4	8 0.015	36	40 0.000	68	72 0.000	100	104 0.000
8	12 0.000	40	44 0.000	72	76 0.000	104	108 0.000
12	16 0.000	44	48 0.000	76	80 0.000	108	112 0.000
16	20 0.000	48	52 0.000	80	84 0.000	112	116 0.000
20	24 0.000	52	56 0.000	84	88 0.000	116	120 0.000
24	28 0.000	56	60 0.000	88	92 0.000		
28	32 0.000	60	64 0.000	92	96 0.000		

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Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	22.0	0.700	22.0	1.400	22.0	2.100	22.0
0.100	22.0	0.800	22.0	1.500	22.0	2.200	22.0
0.200	22.0	0.900	22.0	1.600	22.0	2.300	22.0
0.300	22.0	1.000	22.0	1.700	22.0	2.400	22.0
0.400	22.0	1.100	22.0	1.800	22.0	2.500	22.0
0.500	22.0	1.200	22.0	1.900	22.0		
0.600	22.0	1.300	22.0	2.000	22.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SCL-0019-2000-1000-2000
Design Head (m) 1.000
Design Flow (l/s) 0.2
Flush-Flo™ Calculated
Objective Minimise blockage risk
Application Surface
Sump Available Yes
Diameter (mm) 19
Invert Level (m) 0.000
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	0.2
Flush-Flo™	0.082	0.1
Kick-Flo®	0.167	0.1
Mean Flow over Head Range	-	0.1

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	0.1	1.200	0.2	3.000	0.3	7.000	0.5
0.200	0.1	1.400	0.2	3.500	0.3	7.500	0.5
0.300	0.1	1.600	0.2	4.000	0.4	8.000	0.5
0.400	0.1	1.800	0.3	4.500	0.4	8.500	0.5
0.500	0.1	2.000	0.3	5.000	0.4	9.000	0.5
0.600	0.2	2.200	0.3	5.500	0.4	9.500	0.5
0.800	0.2	2.400	0.3	6.000	0.4		
1.000	0.2	2.600	0.3	6.500	0.4		