

Adept Consulting Engineers							Page 1
14 Festoon Rooms Sunny Bank Mills Town Street Farsley Leeds LS28 5UJ							
Date 18/07/2018 11:53 File Ferring 18 07 18.SRCX			Designed by Robert.Marshall Checked by				
Micro Drainage			Source Control 2017.1.2				
<u>Summary of Results for 100 year Return Period (+30%)</u>							
Half Drain Time : 658 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	6.296	0.196	0.0	2.0	2.0	58.2	O K
30 min Summer	6.360	0.260	0.0	2.0	2.0	77.4	O K
60 min Summer	6.427	0.327	0.0	2.0	2.0	97.4	O K
120 min Summer	6.490	0.390	0.0	2.0	2.0	116.1	O K
180 min Summer	6.520	0.420	0.0	2.0	2.0	124.8	O K
240 min Summer	6.534	0.434	0.0	2.0	2.0	129.2	O K
360 min Summer	6.545	0.445	0.0	2.0	2.0	132.5	O K
480 min Summer	6.545	0.445	0.0	2.0	2.0	132.5	O K
600 min Summer	6.539	0.439	0.0	2.0	2.0	130.7	O K
720 min Summer	6.533	0.433	0.0	2.0	2.0	128.8	O K
960 min Summer	6.519	0.419	0.0	2.0	2.0	124.6	O K
1440 min Summer	6.491	0.391	0.0	2.0	2.0	116.5	O K
2160 min Summer	6.451	0.351	0.0	2.0	2.0	104.5	O K
2880 min Summer	6.407	0.307	0.0	2.0	2.0	91.4	O K
4320 min Summer	6.327	0.227	0.0	2.0	2.0	67.4	O K
5760 min Summer	6.262	0.162	0.0	2.0	2.0	48.3	O K
7200 min Summer	6.214	0.114	0.0	2.0	2.0	33.9	O K
8640 min Summer	6.180	0.080	0.0	2.0	2.0	23.7	O K
10080 min Summer	6.157	0.057	0.0	1.9	1.9	17.0	O K
15 min Winter	6.320	0.220	0.0	2.0	2.0	65.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	115.731	0.0	60.0	19			
30 min Summer	77.804	0.0	80.7	33			
60 min Summer	49.937	0.0	103.6	64			
120 min Summer	30.956	0.0	128.5	122			
180 min Summer	23.058	0.0	143.6	182			
240 min Summer	18.577	0.0	154.2	242			
360 min Summer	13.656	0.0	170.0	360			
480 min Summer	10.974	0.0	182.2	480			
600 min Summer	9.254	0.0	192.1	560			
720 min Summer	8.046	0.0	200.4	614			
960 min Summer	6.447	0.0	214.1	742			
1440 min Summer	4.709	0.0	234.6	1010			
2160 min Summer	3.432	0.0	256.6	1428			
2880 min Summer	2.739	0.0	273.0	1820			
4320 min Summer	1.989	0.0	297.3	2592			
5760 min Summer	1.583	0.0	315.4	3288			
7200 min Summer	1.325	0.0	330.2	3968			
8640 min Summer	1.147	0.0	342.9	4664			
10080 min Summer	1.015	0.0	354.2	5248			
15 min Winter	115.731	0.0	67.2	19			
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Adept Consulting Engineers							Page 2
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Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	6.393	0.293	0.0	2.0	2.0	87.1	O K
60 min Winter	6.469	0.369	0.0	2.0	2.0	109.9	O K
120 min Winter	6.542	0.442	0.0	2.0	2.0	131.4	O K
180 min Winter	6.577	0.477	0.0	2.0	2.0	141.9	O K
240 min Winter	6.596	0.496	0.0	2.0	2.0	147.5	O K
360 min Winter	6.613	0.513	0.0	2.0	2.0	152.6	O K
480 min Winter	6.617	0.517	0.0	2.0	2.0	153.9	O K
600 min Winter	6.614	0.514	0.0	2.0	2.0	153.0	O K
720 min Winter	6.607	0.507	0.0	2.0	2.0	150.8	O K
960 min Winter	6.588	0.488	0.0	2.0	2.0	145.2	O K
1440 min Winter	6.552	0.452	0.0	2.0	2.0	134.5	O K
2160 min Winter	6.493	0.393	0.0	2.0	2.0	117.0	O K
2880 min Winter	6.432	0.332	0.0	2.0	2.0	98.7	O K
4320 min Winter	6.303	0.203	0.0	2.0	2.0	60.5	O K
5760 min Winter	6.214	0.114	0.0	2.0	2.0	33.8	O K
7200 min Winter	6.160	0.060	0.0	1.9	1.9	18.0	O K
8640 min Winter	6.138	0.038	0.0	1.8	1.8	11.4	O K
10080 min Winter	6.128	0.028	0.0	1.6	1.6	8.4	O K
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
30 min Winter	77.804		0.0	90.4	33		
60 min Winter	49.937		0.0	116.0	62		
120 min Winter	30.956		0.0	143.9	120		
180 min Winter	23.058		0.0	160.8	180		
240 min Winter	18.577		0.0	172.7	238		
360 min Winter	13.656		0.0	190.5	352		
480 min Winter	10.974		0.0	204.1	464		
600 min Winter	9.254		0.0	215.1	572		
720 min Winter	8.046		0.0	224.5	678		
960 min Winter	6.447		0.0	239.8	772		
1440 min Winter	4.709		0.0	262.9	1082		
2160 min Winter	3.432		0.0	287.4	1540		
2880 min Winter	2.739		0.0	305.7	1992		
4320 min Winter	1.989		0.0	333.0	2724		
5760 min Winter	1.583		0.0	353.4	3400		
7200 min Winter	1.325		0.0	369.8	3968		
8640 min Winter	1.147		0.0	384.1	4504		
10080 min Winter	1.015		0.0	396.7	5240		
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Adept Consulting Engineers		Page 3																																										
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<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.277 <table> <thead> <tr> <th colspan="3">Time (mins) Area</th> <th colspan="3">Time (mins) Area</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>(ha)</th> <th>From:</th> <th>To:</th> <th>(ha)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>2</td> <td>0.139</td> <td>2</td> <td>4</td> <td>0.138</td> </tr> </tbody> </table>			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)	19.000	Shortest Storm (mins)	15	Ratio R	0.350	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins) Area			Time (mins) Area			From:	To:	(ha)	From:	To:	(ha)	0	2	0.139	2	4	0.138
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Adept Consulting Engineers		Page 4
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Model Details

Storage is Online Cover Level (m) 7.100

Cellular Storage Structure

Invert Level (m) 6.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.96
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	310.0	0.0	0.551	0.0	0.0
0.550	310.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0074-2000-0550-2000
Design Head (m) 0.550
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 74
Invert Level (m) 6.050
Minimum Outlet Pipe Diameter (mm) 100
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.550	2.0
Flush-Flo™	0.163	2.0
Kick-Flo®	0.371	1.7
Mean Flow over Head Range	-	1.7

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	1.9	1.200	2.9	3.000	4.4	7.000	6.5
0.200	2.0	1.400	3.1	3.500	4.7	7.500	6.8
0.300	1.9	1.600	3.3	4.000	5.0	8.000	7.0
0.400	1.7	1.800	3.4	4.500	5.3	8.500	7.2
0.500	1.9	2.000	3.6	5.000	5.5	9.000	7.4
0.600	2.1	2.200	3.8	5.500	5.8	9.500	7.6
0.800	2.4	2.400	3.9	6.000	6.0		
1.000	2.6	2.600	4.1	6.500	6.3		

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