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9 Joyce Way Whitchurch Shropshire SY13 1TZ		Ellesmere Lane, Penley Attenuation Calcs 1 in 100 + 30%			
Date 24/01/2017 File 1 in 100 + 30% Attenuat...		Designed by ag Checked by			
Micro Drainage		Source Control 2016.1.1			
Summary of Results for 100 year Return Period (+30%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	66.508	0.508	5.0	77.5	O K
30 min Summer	66.642	0.642	5.0	100.2	O K
60 min Summer	66.765	0.765	5.0	121.7	O K
120 min Summer	66.850	0.850	5.0	137.0	O K
180 min Summer	66.876	0.876	5.0	141.7	O K
240 min Summer	66.873	0.873	5.0	141.2	O K
360 min Summer	66.854	0.854	5.0	137.7	O K
480 min Summer	66.833	0.833	5.0	133.9	O K
600 min Summer	66.809	0.809	5.0	129.7	O K
720 min Summer	66.786	0.786	5.0	125.4	O K
960 min Summer	66.738	0.738	5.0	116.9	O K
1440 min Summer	66.648	0.648	5.0	101.2	O K
2160 min Summer	66.527	0.527	5.0	80.6	O K
2880 min Summer	66.412	0.412	5.0	62.0	O K
4320 min Summer	66.188	0.188	4.6	27.2	O K
5760 min Summer	66.146	0.146	3.8	21.0	O K
7200 min Summer	66.121	0.121	3.3	17.3	O K
8640 min Summer	66.105	0.105	2.9	14.9	O K
10080 min Summer	66.093	0.093	2.6	13.3	O K
15 min Winter	66.567	0.567	5.0	87.5	O K
30 min Winter	66.715	0.715	5.0	112.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	121.269	0.0	80.5	22	
30 min Summer	79.695	0.0	105.8	37	
60 min Summer	49.937	0.0	133.7	66	
120 min Summer	30.267	0.0	161.8	124	
180 min Summer	22.297	0.0	179.3	182	
240 min Summer	17.851	0.0	191.2	230	
360 min Summer	12.957	0.0	208.3	286	
480 min Summer	10.330	0.0	221.5	350	
600 min Summer	8.659	0.0	232.1	418	
720 min Summer	7.492	0.0	241.0	490	
960 min Summer	5.959	0.0	255.6	626	
1440 min Summer	4.309	0.0	277.1	900	
2160 min Summer	3.110	0.0	300.5	1304	
2880 min Summer	2.466	0.0	317.6	1704	
4320 min Summer	1.775	0.0	342.7	2248	
5760 min Summer	1.405	0.0	361.9	2944	
7200 min Summer	1.171	0.0	377.0	3680	
8640 min Summer	1.008	0.0	389.7	4408	
10080 min Summer	0.889	0.0	400.4	5136	
15 min Winter	121.269	0.0	90.5	22	
30 min Winter	79.695	0.0	118.7	36	
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<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	66.848	0.848	5.0	136.6	O K
120 min Winter	66.955	0.955	5.0	156.4	O K
180 min Winter	66.987	0.987	5.0	162.5	O K
240 min Winter	66.991	0.991	5.0	163.3	O K
360 min Winter	66.965	0.965	5.0	158.4	O K
480 min Winter	66.940	0.940	5.0	153.7	O K
600 min Winter	66.910	0.910	5.0	148.0	O K
720 min Winter	66.877	0.877	5.0	142.0	O K
960 min Winter	66.809	0.809	5.0	129.6	O K
1440 min Winter	66.677	0.677	5.0	106.3	O K
2160 min Winter	66.486	0.486	5.0	73.9	O K
2880 min Winter	66.205	0.205	4.8	29.8	O K
4320 min Winter	66.137	0.137	3.7	19.7	O K
5760 min Winter	66.106	0.106	2.9	15.2	O K
7200 min Winter	66.090	0.090	2.5	12.8	O K
8640 min Winter	66.080	0.080	2.1	11.3	O K
10080 min Winter	66.073	0.073	1.9	10.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	49.937	0.0	149.0	64	
120 min Winter	30.267	0.0	181.7	122	
180 min Winter	22.297	0.0	200.8	178	
240 min Winter	17.851	0.0	214.3	232	
360 min Winter	12.957	0.0	233.4	302	
480 min Winter	10.330	0.0	248.2	372	
600 min Winter	8.659	0.0	260.0	450	
720 min Winter	7.492	0.0	270.0	526	
960 min Winter	5.959	0.0	286.3	678	
1440 min Winter	4.309	0.0	310.4	970	
2160 min Winter	3.110	0.0	336.5	1408	
2880 min Winter	2.466	0.0	355.7	1560	
4320 min Winter	1.775	0.0	383.9	2248	
5760 min Winter	1.405	0.0	405.4	2960	
7200 min Winter	1.171	0.0	422.3	3664	
8640 min Winter	1.008	0.0	436.5	4384	
10080 min Winter	0.889	0.0	448.6	5128	
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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)	19.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Pipe Network

Volume in Pipe Network (m³)	1	Dia of Outfall Pipe (m)	0.2
Slope of Outfall Pipe (1:X)	150	Roughness of Outfall Pipe (mm)	0.600

Time Area Diagram

Total Area (ha) 0.358

Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:
	(ha)		(ha)
0	4 0.200	4	8 0.158

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Model Details

Storage is Online Cover Level (m) 67.300

Tank or Pond Structure

Invert Level (m) 66.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	140.0	0.700	175.0	1.400	0.0	2.100	0.0
0.100	145.0	0.800	180.0	1.500	0.0	2.200	0.0
0.200	150.0	0.900	185.0	1.600	0.0	2.300	0.0
0.300	155.0	1.000	190.0	1.700	0.0	2.400	0.0
0.400	160.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	165.0	1.200	0.0	1.900	0.0		
0.600	170.0	1.300	0.0	2.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-CHE-0101-5000-1000-5000
Design Head (m) 1.000
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available No
Diameter (mm) 101
Invert Level (m) 66.000
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.229	5.0
Kick-Flo®	0.322	2.9
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	2.8	1.200	5.5	3.000	8.6	7.000	13.0
0.200	4.8	1.400	5.9	3.500	9.2	7.500	13.4
0.300	3.0	1.600	6.3	4.000	9.9	8.000	13.8
0.400	3.2	1.800	6.7	4.500	10.4	8.500	14.3
0.500	3.6	2.000	7.0	5.000	11.0	9.000	14.7
0.600	3.9	2.200	7.4	5.500	11.5	9.500	15.1
0.800	4.5	2.400	7.7	6.000	12.0		
1.000	5.0	2.600	8.0	6.500	12.5		

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