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9 Joyce Way Whitchurch Shropshire SY13 1TZ			Plas Fron Barns 1 in 100 + 30% Attenuation			
Date 065.08.16 File 1 in 100 + 30% Attenuat...			Designed by ag Checked by			
Micro Drainage			Source Control 2016.1			
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		15.262	0.264	5.0	9.0	O K
30 min Summer		15.286	0.288	5.0	10.4	O K
60 min Summer		15.284	0.286	5.0	10.3	O K
120 min Summer		15.253	0.255	5.0	8.6	O K
180 min Summer		15.217	0.219	5.0	6.7	O K
240 min Summer		15.184	0.186	5.0	5.1	O K
360 min Summer		15.136	0.138	4.9	2.9	O K
480 min Summer		15.112	0.114	4.5	2.0	O K
600 min Summer		15.099	0.101	3.9	1.5	O K
720 min Summer		15.090	0.092	3.5	1.2	O K
960 min Summer		15.077	0.079	2.8	0.9	O K
1440 min Summer		15.063	0.065	2.1	0.6	O K
2160 min Summer		15.052	0.054	1.5	0.4	O K
2880 min Summer		15.046	0.048	1.2	0.3	O K
4320 min Summer		15.038	0.040	0.9	0.3	O K
5760 min Summer		15.033	0.035	0.7	0.2	O K
7200 min Summer		15.030	0.032	0.6	0.2	O K
8640 min Summer		15.028	0.030	0.5	0.2	O K
10080 min Summer		15.026	0.028	0.4	0.1	O K
15 min Winter		15.287	0.289	5.0	10.4	O K
30 min Winter		15.317	0.319	5.0	12.1	O K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		113.475	0.0	13.0	17	
30 min Summer		74.884	0.0	17.1	27	
60 min Summer		47.182	0.0	21.6	44	
120 min Summer		28.794	0.0	26.3	78	
180 min Summer		21.311	0.0	29.2	108	
240 min Summer		17.124	0.0	31.3	138	
360 min Summer		12.482	0.0	34.3	194	
480 min Summer		9.952	0.0	36.4	252	
600 min Summer		8.353	0.0	38.2	310	
720 min Summer		7.236	0.0	39.7	370	
960 min Summer		5.764	0.0	42.2	490	
1440 min Summer		4.178	0.0	45.9	734	
2160 min Summer		3.023	0.0	49.8	1084	
2880 min Summer		2.400	0.0	52.7	1456	
4320 min Summer		1.732	0.0	57.0	2200	
5760 min Summer		1.372	0.0	60.3	2928	
7200 min Summer		1.145	0.0	62.9	3552	
8640 min Summer		0.987	0.0	65.0	4376	
10080 min Summer		0.871	0.0	66.9	4992	
15 min Winter		113.475	0.0	14.5	17	
30 min Winter		74.884	0.0	19.2	29	
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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	15.310	0.312	5.0	11.7	O K
120 min Winter	15.258	0.260	5.0	8.8	O K
180 min Winter	15.202	0.204	5.0	5.9	O K
240 min Winter	15.154	0.156	5.0	3.7	O K
360 min Winter	15.108	0.110	4.3	1.9	O K
480 min Winter	15.091	0.093	3.5	1.3	O K
600 min Winter	15.080	0.082	3.0	1.0	O K
720 min Winter	15.073	0.075	2.6	0.8	O K
960 min Winter	15.063	0.065	2.1	0.6	O K
1440 min Winter	15.052	0.054	1.5	0.4	O K
2160 min Winter	15.043	0.045	1.1	0.3	O K
2880 min Winter	15.038	0.040	0.9	0.3	O K
4320 min Winter	15.032	0.034	0.6	0.2	O K
5760 min Winter	15.028	0.030	0.5	0.2	O K
7200 min Winter	15.025	0.027	0.4	0.1	O K
8640 min Winter	15.023	0.025	0.4	0.1	O K
10080 min Winter	15.022	0.024	0.3	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	47.182	0.0	24.2	48	
120 min Winter	28.794	0.0	29.5	82	
180 min Winter	21.311	0.0	32.8	114	
240 min Winter	17.124	0.0	35.1	142	
360 min Winter	12.482	0.0	38.4	194	
480 min Winter	9.952	0.0	40.8	250	
600 min Winter	8.353	0.0	42.8	308	
720 min Winter	7.236	0.0	44.5	370	
960 min Winter	5.764	0.0	47.3	490	
1440 min Winter	4.178	0.0	51.4	732	
2160 min Winter	3.023	0.0	55.8	1100	
2880 min Winter	2.400	0.0	59.0	1468	
4320 min Winter	1.732	0.0	63.9	2180	
5760 min Winter	1.372	0.0	67.5	2880	
7200 min Winter	1.145	0.0	70.4	3648	
8640 min Winter	0.987	0.0	72.8	4256	
10080 min Winter	0.871	0.0	74.9	5032	
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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)	18.000	Shortest Storm (mins)	15
Ratio R	0.392	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.061

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.047	4 8	0.014

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Model Details

Storage is Online Cover Level (m) 16.936

Double Pipe Structure

Diameter (m)	Conduit Section	Length (m)	26.000
Slope (1:X)	400.000	Invert Level (m)	14.998

Section Number	44	Minor Dimn (mm)	525	4 * Hyd Radius (mm)	0.525
Conduit Type	oo	Side Slope (Deg)		XSect Area (m ²)	0.433
Major Dimn (mm)	1050	Corner Splay (mm)			

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0112-5000-0585-5000
Design Head (m)	0.585
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	112
Invert Level (m)	14.998
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.585	5.0
Flush-Flo™	0.192	5.0
Kick-Flo®	0.423	4.3
Mean Flow over Head Range	-	4.2

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	3.9	1.200	7.0	3.000	10.8	7.000	16.1
0.200	5.0	1.400	7.5	3.500	11.6	7.500	16.7
0.300	4.9	1.600	8.0	4.000	12.3	8.000	17.2
0.400	4.5	1.800	8.4	4.500	13.0	8.500	17.8
0.500	4.6	2.000	8.9	5.000	13.7	9.000	18.3
0.600	5.1	2.200	9.3	5.500	14.4	9.500	18.8
0.800	5.8	2.400	9.7	6.000	14.9		
1.000	6.4	2.600	10.0	6.500	15.5		

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