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Windsor House Cornwall Road Harrogate HG1 2PW			Willow Tree, Hillingdon Storage Check				
Date 03/03/2020 15:49 File STORAGE CHECK 3.3.20.SRCX			Designed by TM Checked by				
Micro Drainage			Source Control 2017.1.2				
Summary of Results for 100 year Return Period (+40%)							
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	8.790	0.790	0.0	9.0	9.0	22.5	0 K
60 min Winter	8.769	0.769	0.0	9.0	9.0	21.9	0 K
120 min Winter	8.595	0.595	0.0	9.0	9.0	17.0	0 K
180 min Winter	8.372	0.372	0.0	9.0	9.0	10.6	0 K
240 min Winter	8.225	0.225	0.0	8.9	8.9	6.4	0 K
360 min Winter	8.135	0.135	0.0	7.6	7.6	3.9	0 K
480 min Winter	8.113	0.113	0.0	6.1	6.1	3.2	0 K
600 min Winter	8.100	0.100	0.0	5.1	5.1	2.8	0 K
720 min Winter	8.091	0.091	0.0	4.4	4.4	2.6	0 K
960 min Winter	8.079	0.079	0.0	3.5	3.5	2.3	0 K
1440 min Winter	8.066	0.066	0.0	2.5	2.5	1.9	0 K
2160 min Winter	8.055	0.055	0.0	1.8	1.8	1.6	0 K
2880 min Winter	8.048	0.048	0.0	1.4	1.4	1.4	0 K
4320 min Winter	8.041	0.041	0.0	1.1	1.1	1.2	0 K
5760 min Winter	8.036	0.036	0.0	0.8	0.8	1.0	0 K
7200 min Winter	8.033	0.033	0.0	0.7	0.7	0.9	0 K
8640 min Winter	8.030	0.030	0.0	0.6	0.6	0.9	0 K
10080 min Winter	8.028	0.028	0.0	0.5	0.5	0.8	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	92.772	0.0	35.1	32			
60 min Winter	57.587	0.0	43.5	50			
120 min Winter	34.523	0.0	52.2	88			
180 min Winter	25.253	0.0	57.3	118			
240 min Winter	20.111	0.0	60.8	142			
360 min Winter	14.561	0.0	66.0	192			
480 min Winter	11.576	0.0	70.0	252			
600 min Winter	9.683	0.0	73.2	312			
720 min Winter	8.364	0.0	75.9	370			
960 min Winter	6.634	0.0	80.2	492			
1440 min Winter	4.779	0.0	86.7	726			
2160 min Winter	3.437	0.0	93.5	1108			
2880 min Winter	2.718	0.0	98.6	1448			
4320 min Winter	1.950	0.0	106.1	2172			
5760 min Winter	1.539	0.0	111.7	2888			
7200 min Winter	1.280	0.0	116.1	3624			
8640 min Winter	1.101	0.0	119.9	4280			
10080 min Winter	0.969	0.0	123.1	5040			
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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)	20.300	Shortest Storm (mins)	15
Ratio R	0.415	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.090

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
0	4	0.030	4	8	0.030
				8	12
					0.030

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Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
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	30.0	30.0	0.900	0.0	47.6
0.800	30.0	47.6			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0142-9000-0800-9000
Design Head (m) 0.800
Design Flow (l/s) 9.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 142
Invert Level (m) 8.000
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	9.0
Flush-Flo™	0.257	9.0
Kick-Flo®	0.562	7.6
Mean Flow over Head Range	-	7.6

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	5.1	1.200	10.9	3.000	16.8	7.000	25.3
0.200	8.9	1.400	11.7	3.500	18.1	7.500	26.1
0.300	8.9	1.600	12.5	4.000	19.3	8.000	26.9
0.400	8.7	1.800	13.2	4.500	20.4	8.500	27.7
0.500	8.3	2.000	13.9	5.000	21.5	9.000	28.5
0.600	7.9	2.200	14.5	5.500	22.5	9.500	29.3
0.800	9.0	2.400	15.1	6.000	23.5		
1.000	10.0	2.600	15.7	6.500	24.4		

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