



TOPPING ENGINEERS

CONSULTING CIVIL &
STRUCTURAL ENGINEERS

DRAINAGE CALCULATIONS

LOCATION:

2 Redmayne Square, Strensall,
York YO32 5YN

CLIENT:

Mr Sean Leaf

DOCUMENT REF:

- 17059-CAL-001

REVISION/DATE:

- Rev B
- Feb 2024

Aire House
12 Victoria Avenue
Harrogate, HG1 1ED



Date 29/02/2024 09:15
File Attenuation 29.02.24.SRCX

Designed by OliverG
Checked by

Innovyze Source Control 2020.1.3

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 128 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	98.694	0.694	0.0	0.4	0.4	3.5	O K
30 min Summer	98.880	0.880	0.0	0.4	0.4	4.4	O K
60 min Summer	99.016	1.016	0.0	0.5	0.5	5.1	O K
120 min Summer	99.052	1.052	0.0	0.5	0.5	5.2	O K
180 min Summer	99.030	1.030	0.0	0.5	0.5	5.1	O K
240 min Summer	98.994	0.994	0.0	0.5	0.5	5.0	O K
360 min Summer	98.916	0.916	0.0	0.4	0.4	4.6	O K
480 min Summer	98.848	0.848	0.0	0.4	0.4	4.2	O K
600 min Summer	98.784	0.784	0.0	0.4	0.4	3.9	O K
720 min Summer	98.725	0.725	0.0	0.4	0.4	3.6	O K
960 min Summer	98.618	0.618	0.0	0.4	0.4	3.1	O K
1440 min Summer	98.448	0.448	0.0	0.3	0.3	2.2	O K
2160 min Summer	98.219	0.219	0.0	0.3	0.3	1.1	O K
2880 min Summer	98.099	0.099	0.0	0.3	0.3	0.5	O K
4320 min Summer	98.047	0.047	0.0	0.2	0.2	0.2	O K
5760 min Summer	98.036	0.036	0.0	0.2	0.2	0.2	O K
7200 min Summer	98.030	0.030	0.0	0.2	0.2	0.1	O K
8640 min Summer	98.026	0.026	0.0	0.1	0.1	0.1	O K
10080 min Summer	98.024	0.024	0.0	0.1	0.1	0.1	O K
15 min Winter	98.783	0.783	0.0	0.4	0.4	3.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.269	0.0	3.9	24
30 min Summer	79.695	0.0	5.1	37
60 min Summer	49.937	0.0	6.4	64
120 min Summer	30.267	0.0	7.7	104
180 min Summer	22.297	0.0	8.5	136
240 min Summer	17.851	0.0	9.1	170
360 min Summer	12.957	0.0	9.9	240
480 min Summer	10.330	0.0	10.5	308
600 min Summer	8.659	0.0	11.0	376
720 min Summer	7.492	0.0	11.5	442
960 min Summer	5.959	0.0	12.2	574
1440 min Summer	4.309	0.0	13.2	830
2160 min Summer	3.110	0.0	14.3	1188
2880 min Summer	2.466	0.0	15.1	1500
4320 min Summer	1.775	0.0	16.3	2204
5760 min Summer	1.405	0.0	17.2	2936
7200 min Summer	1.171	0.0	17.9	3664
8640 min Summer	1.008	0.0	18.5	4296
10080 min Summer	0.889	0.0	19.0	5136
15 min Winter	121.269	0.0	4.3	24

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
30 min Winter	98.997	0.997	0.0	0.5	0.5	5.0	O K
60 min Winter	99.162	1.162	0.0	0.5	0.5	5.8	O K
120 min Winter	99.222	1.222	0.0	0.5	0.5	6.1	O K
180 min Winter	99.190	1.190	0.0	0.5	0.5	5.9	O K
240 min Winter	99.142	1.142	0.0	0.5	0.5	5.7	O K
360 min Winter	99.030	1.030	0.0	0.5	0.5	5.1	O K
480 min Winter	98.928	0.928	0.0	0.4	0.4	4.6	O K
600 min Winter	98.834	0.834	0.0	0.4	0.4	4.2	O K
720 min Winter	98.749	0.749	0.0	0.4	0.4	3.7	O K
960 min Winter	98.601	0.601	0.0	0.4	0.4	3.0	O K
1440 min Winter	98.367	0.367	0.0	0.3	0.3	1.8	O K
2160 min Winter	98.083	0.083	0.0	0.3	0.3	0.4	O K
2880 min Winter	98.048	0.048	0.0	0.2	0.2	0.2	O K
4320 min Winter	98.033	0.033	0.0	0.2	0.2	0.2	O K
5760 min Winter	98.026	0.026	0.0	0.1	0.1	0.1	O K
7200 min Winter	98.023	0.023	0.0	0.1	0.1	0.1	O K
8640 min Winter	98.021	0.021	0.0	0.1	0.1	0.1	O K
10080 min Winter	98.019	0.019	0.0	0.1	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	79.695	0.0	5.7	37
60 min Winter	49.937	0.0	7.1	64
120 min Winter	30.267	0.0	8.6	114
180 min Winter	22.297	0.0	9.6	144
240 min Winter	17.851	0.0	10.2	184
360 min Winter	12.957	0.0	11.1	258
480 min Winter	10.330	0.0	11.8	332
600 min Winter	8.659	0.0	12.4	402
720 min Winter	7.492	0.0	12.8	472
960 min Winter	5.959	0.0	13.6	608
1440 min Winter	4.309	0.0	14.8	882
2160 min Winter	3.110	0.0	16.0	1148
2880 min Winter	2.466	0.0	16.9	1468
4320 min Winter	1.775	0.0	18.2	2196
5760 min Winter	1.405	0.0	19.3	2920
7200 min Winter	1.171	0.0	20.1	3600
8640 min Winter	1.008	0.0	20.7	4344
10080 min Winter	0.889	0.0	21.3	4968

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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

Time Area Diagram

Total Area (ha) 0.017

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
0	4	0.006	4	8	0.006
				8	12
					0.006

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Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 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	5.3	5.3	1.300	0.0	17.3
1.200	5.3	17.3			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0031-5000-1200-5000
 Design Head (m) 1.200
 Design Flow (l/s) 0.5
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 31
 Invert Level (m) 98.000
 Minimum Outlet Pipe Diameter (mm) 75
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	0.5
Flush-Flo™	0.137	0.3
Kick-Flo®	0.275	0.3
Mean Flow over Head Range	-	0.4

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	0.3	1.200	0.5	3.000	0.7	7.000	1.1
0.200	0.3	1.400	0.5	3.500	0.8	7.500	1.1
0.300	0.3	1.600	0.6	4.000	0.9	8.000	1.2
0.400	0.3	1.800	0.6	4.500	0.9	8.500	1.2
0.500	0.3	2.000	0.6	5.000	0.9	9.000	1.2
0.600	0.4	2.200	0.7	5.500	1.0	9.500	1.3
0.800	0.4	2.400	0.7	6.000	1.0		
1.000	0.5	2.600	0.7	6.500	1.1		