



# TOPPING ENGINEERS

CONSULTING CIVIL &  
STRUCTURAL ENGINEERS

## DRAINAGE CALCULATIONS

### LOCATION:

Cliffe Lane  
Gomersal

### CLIENT:

Quarters Gomersal

### DOCUMENT REF:

22691-C-Cals-001-P1

### REVISION/DATE:

P1 02-08-23

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Aire House 12 Victoria Avenue Harrogate, HG1 1ED	Cliffe Lane Gomersal	
Date 01/07/2023 File Calcs July 2023.SRCX	Designed by PB Checked by	
Innovyze	Source Control 2019.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 556 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	129.993	0.593	0.0	16.1	16.1	388.5	O K
30 min Summer	130.196	0.796	0.0	16.1	16.1	521.5	O K
60 min Summer	130.408	1.008	0.0	16.1	16.1	661.0	O K
120 min Summer	130.605	1.205	0.0	16.1	16.1	790.0	O K
180 min Summer	130.695	1.295	0.0	16.1	16.1	849.0	O K
240 min Summer	130.738	1.338	0.0	16.1	16.1	877.0	O K
360 min Summer	130.768	1.368	0.0	16.1	16.1	896.6	O K
480 min Summer	130.761	1.361	0.0	16.1	16.1	892.3	O K
600 min Summer	130.745	1.345	0.0	16.1	16.1	881.3	O K
720 min Summer	130.725	1.325	0.0	16.1	16.1	868.7	O K
960 min Summer	130.683	1.283	0.0	16.1	16.1	840.8	O K
1440 min Summer	130.593	1.193	0.0	16.1	16.1	782.1	O K
2160 min Summer	130.452	1.052	0.0	16.1	16.1	689.8	O K
2880 min Summer	130.288	0.888	0.0	16.1	16.1	581.9	O K
4320 min Summer	130.020	0.620	0.0	16.1	16.1	406.1	O K
5760 min Summer	129.828	0.428	0.0	16.1	16.1	280.5	O K
7200 min Summer	129.701	0.301	0.0	15.8	15.8	197.4	O K
8640 min Summer	129.620	0.220	0.0	15.2	15.2	143.9	O K
10080 min Summer	129.568	0.168	0.0	14.5	14.5	110.2	O K
15 min Winter	130.067	0.667	0.0	16.1	16.1	437.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m <sup>3</sup> )	Discharge Volume (m <sup>3</sup> )	Time-Peak (mins)
15 min Summer	123.881	0.0	409.4	29
30 min Summer	83.529	0.0	552.3	44
60 min Summer	53.779	0.0	711.1	72
120 min Summer	33.433	0.0	884.6	130
180 min Summer	24.938	0.0	989.8	188
240 min Summer	20.107	0.0	1063.9	246
360 min Summer	14.806	0.0	1175.2	362
480 min Summer	11.910	0.0	1260.6	468
600 min Summer	10.051	0.0	1329.7	520
720 min Summer	8.745	0.0	1388.3	582
960 min Summer	7.014	0.0	1484.6	712
1440 min Summer	5.129	0.0	1628.7	988
2160 min Summer	3.743	0.0	1782.8	1408
2880 min Summer	2.989	0.0	1898.0	1792
4320 min Summer	2.173	0.0	2069.4	2512
5760 min Summer	1.731	0.0	2197.7	3184
7200 min Summer	1.450	0.0	2301.9	3888
8640 min Summer	1.256	0.0	2392.8	4512
10080 min Summer	1.113	0.0	2472.7	5240
15 min Winter	123.881	0.0	458.6	29

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	130.297	0.897	0.0	16.1	16.1	588.1	O K
60 min Winter	130.539	1.139	0.0	16.1	16.1	746.3	O K
120 min Winter	130.765	1.365	0.0	16.1	16.1	894.7	O K
180 min Winter	130.873	1.473	0.0	16.1	16.1	965.5	O K
240 min Winter	130.928	1.528	0.0	16.1	16.1	1001.7	O K
360 min Winter	130.975	1.575	0.0	16.1	16.1	1032.3	O K
480 min Winter	130.980	1.580	0.0	16.1	16.1	1035.7	O K
600 min Winter	130.962	1.562	0.0	16.1	16.1	1024.2	O K
720 min Winter	130.933	1.533	0.0	16.1	16.1	1004.9	O K
960 min Winter	130.880	1.480	0.0	16.1	16.1	970.0	O K
1440 min Winter	130.754	1.354	0.0	16.1	16.1	887.5	O K
2160 min Winter	130.547	1.147	0.0	16.1	16.1	751.8	O K
2880 min Winter	130.296	0.896	0.0	16.1	16.1	587.1	O K
4320 min Winter	129.897	0.497	0.0	16.1	16.1	325.7	O K
5760 min Winter	129.672	0.272	0.0	15.6	15.6	178.0	O K
7200 min Winter	129.561	0.161	0.0	14.4	14.4	105.6	O K
8640 min Winter	129.523	0.123	0.0	12.9	12.9	80.9	O K
10080 min Winter	129.505	0.105	0.0	11.5	11.5	69.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	83.529	0.0	618.5	44
60 min Winter	53.779	0.0	797.0	72
120 min Winter	33.433	0.0	990.7	128
180 min Winter	24.938	0.0	1108.5	186
240 min Winter	20.107	0.0	1191.7	242
360 min Winter	14.806	0.0	1316.3	356
480 min Winter	11.910	0.0	1411.9	466
600 min Winter	10.051	0.0	1489.3	570
720 min Winter	8.745	0.0	1554.9	658
960 min Winter	7.014	0.0	1662.9	752
1440 min Winter	5.129	0.0	1824.0	1064
2160 min Winter	3.743	0.0	1996.6	1524
2880 min Winter	2.989	0.0	2125.4	1936
4320 min Winter	2.173	0.0	2318.2	2604
5760 min Winter	1.731	0.0	2461.6	3232
7200 min Winter	1.450	0.0	2578.1	3824
8640 min Winter	1.256	0.0	2680.1	4424
10080 min Winter	1.113	0.0	2769.5	5152

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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	0.344	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.764

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:	From:	To:
	(ha)		(ha)		(ha)		(ha)
0	4 0.441	4	8 0.441	8	12 0.441	12	16 0.441

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Model Details

Storage is Online Cover Level (m) 131.800

Cellular Storage Structure

Invert Level (m) 129.400 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 <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	690.0	690.0	1.700	0.0	885.2
1.600	690.0	885.2			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0171-1610-1650-1610  
 Design Head (m) 1.650  
 Design Flow (l/s) 16.1  
 Flush-Flo™ Calculated  
 Objective Minimise upstream storage  
 Application Surface  
 Sump Available Yes  
 Diameter (mm) 171  
 Invert Level (m) 129.350  
 Minimum Outlet Pipe Diameter (mm) 225  
 Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.650	16.1
Flush-Flo™	0.487	16.1
Kick-Flo®	1.041	12.9
Mean Flow over Head Range	-	14.0

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)						
0.100	6.1	1.200	13.8	3.000	21.4	7.000	32.2
0.200	14.2	1.400	14.9	3.500	23.0	7.500	33.2
0.300	15.4	1.600	15.9	4.000	24.6	8.000	34.3
0.400	16.0	1.800	16.8	4.500	26.0	8.500	35.3
0.500	16.1	2.000	17.6	5.000	27.3	9.000	36.3
0.600	16.0	2.200	18.5	5.500	28.6	9.500	37.3
0.800	15.3	2.400	19.2	6.000	29.9		
1.000	13.6	2.600	20.0	6.500	31.0		