

Mucklow & Harris Ltd				Page 1	
Studio 313 Scott House The Custard Factory, Gibb St... Birmingham, B9 4AA		Fole Dairy Storm Area D			
Date 09/09/2021 File Area D.SRCX		Designed by RAA Checked by AM			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	109.189	0.289	20.0	17.3	O K
30 min Summer	109.225	0.325	20.0	19.5	O K
60 min Summer	109.208	0.308	20.0	18.5	O K
120 min Summer	109.135	0.235	19.7	14.1	O K
180 min Summer	109.091	0.191	18.2	11.5	O K
240 min Summer	109.068	0.168	15.7	10.1	O K
360 min Summer	109.041	0.141	12.2	8.5	O K
480 min Summer	109.025	0.125	10.1	7.5	O K
600 min Summer	109.014	0.114	8.6	6.8	O K
720 min Summer	109.005	0.105	7.6	6.3	O K
960 min Summer	108.993	0.093	6.1	5.6	O K
1440 min Summer	108.979	0.079	4.5	4.7	O K
2160 min Summer	108.966	0.066	3.3	4.0	O K
2880 min Summer	108.959	0.059	2.6	3.5	O K
4320 min Summer	108.950	0.050	1.9	3.0	O K
5760 min Summer	108.944	0.044	1.5	2.6	O K
7200 min Summer	108.940	0.040	1.3	2.4	O K
8640 min Summer	108.937	0.037	1.1	2.2	O K
10080 min Summer	108.935	0.035	1.0	2.1	O K
15 min Winter	109.225	0.325	20.0	19.5	O K
30 min Winter	109.254	0.354	20.0	21.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	126.113	0.0	26.4	13	
30 min Summer	84.299	0.0	35.4	22	
60 min Summer	53.779	0.0	45.1	38	
120 min Summer	33.149	0.0	55.7	68	
180 min Summer	24.624	0.0	62.0	98	
240 min Summer	19.809	0.0	66.5	128	
360 min Summer	14.513	0.0	73.1	188	
480 min Summer	11.640	0.0	78.2	248	
600 min Summer	9.801	0.0	82.3	308	
720 min Summer	8.511	0.0	85.8	368	
960 min Summer	6.807	0.0	91.5	490	
1440 min Summer	4.960	0.0	99.9	734	
2160 min Summer	3.606	0.0	109.0	1100	
2880 min Summer	2.873	0.0	115.8	1468	
4320 min Summer	2.082	0.0	125.9	2156	
5760 min Summer	1.655	0.0	133.4	2936	
7200 min Summer	1.384	0.0	139.4	3648	
8640 min Summer	1.195	0.0	144.5	4288	
10080 min Summer	1.057	0.0	149.1	5128	
15 min Winter	126.113	0.0	29.6	14	
30 min Winter	84.299	0.0	39.6	23	
©1982-2019 Innovyze					

Mucklow & Harris Ltd				Page 2	
Studio 313 Scott House The Custard Factory, Gibb St... Birmingham, B9 4AA		Fole Dairy Storm Area D			
Date 09/09/2021 File Area D.SRCX		Designed by RAA Checked by AM			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	109.207	0.307	20.0	18.4	O K
120 min Winter	109.102	0.202	19.3	12.1	O K
180 min Winter	109.065	0.165	15.3	9.9	O K
240 min Winter	109.044	0.144	12.6	8.6	O K
360 min Winter	109.020	0.120	9.4	7.2	O K
480 min Winter	109.006	0.106	7.6	6.3	O K
600 min Winter	108.996	0.096	6.4	5.7	O K
720 min Winter	108.989	0.089	5.6	5.3	O K
960 min Winter	108.978	0.078	4.5	4.7	O K
1440 min Winter	108.966	0.066	3.3	4.0	O K
2160 min Winter	108.956	0.056	2.4	3.4	O K
2880 min Winter	108.950	0.050	1.9	3.0	O K
4320 min Winter	108.942	0.042	1.4	2.5	O K
5760 min Winter	108.937	0.037	1.1	2.2	O K
7200 min Winter	108.934	0.034	0.9	2.0	O K
8640 min Winter	108.932	0.032	0.8	1.9	O K
10080 min Winter	108.930	0.030	0.7	1.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	53.779	0.0	50.6	40	
120 min Winter	33.149	0.0	62.3	68	
180 min Winter	24.624	0.0	69.5	98	
240 min Winter	19.809	0.0	74.5	128	
360 min Winter	14.513	0.0	81.9	188	
480 min Winter	11.640	0.0	87.6	248	
600 min Winter	9.801	0.0	92.2	310	
720 min Winter	8.511	0.0	96.1	368	
960 min Winter	6.807	0.0	102.4	492	
1440 min Winter	4.960	0.0	111.9	732	
2160 min Winter	3.606	0.0	122.1	1100	
2880 min Winter	2.873	0.0	129.7	1448	
4320 min Winter	2.082	0.0	141.0	2200	
5760 min Winter	1.655	0.0	149.4	2856	
7200 min Winter	1.384	0.0	156.2	3664	
8640 min Winter	1.195	0.0	161.9	4328	
10080 min Winter	1.057	0.0	167.0	5000	
©1982-2019 Innovyze					

Mucklow & Harris Ltd		Page 3
Studio 313 Scott House The Custard Factory, Gibb St... Birmingham, B9 4AA	Fole Dairy Storm Area D	
Date 09/09/2021 File Area D.SRCX	Designed by RAA Checked by AM	
Innovyze Source Control 2019.1		

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

Time Area Diagram

Total Area (ha) 0.112

Time (mins)	Area
From:	To: (ha)
0	4 0.112

©1982-2019 Innovyze

Mucklow & Harris Ltd		Page 4
Studio 313 Scott House The Custard Factory, Gibb St... Birmingham, B9 4AA	Fole Dairy Storm Area D	
Date 09/09/2021 File Area D.SRCX	Designed by RAA Checked by AM	
Innovyze Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 111.200

Tank or Pond Structure

Invert Level (m) 108.900

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	60.0	0.700	0.0	1.400	0.0	2.100	0.0
0.100	60.0	0.800	0.0	1.500	0.0	2.200	0.0
0.200	60.0	0.900	0.0	1.600	0.0	2.300	0.0
0.300	60.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	60.0	1.100	0.0	1.800	0.0	2.500	0.0
0.401	0.0	1.200	0.0	1.900	0.0		
0.600	0.0	1.300	0.0	2.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0201-2000-0800-2000

Design Head (m) 0.800

Design Flow (l/s) 20.0

Flush-Flo™ Calculated

Objective Minimise upstream storage

Application Surface

Sump Available Yes

Diameter (mm) 201

Invert Level (m) 108.900

Minimum Outlet Pipe Diameter (mm) 225

Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	20.0
Flush-Flo™	0.315	20.0
Kick-Flo®	0.605	17.5
Mean Flow over Head Range	-	16.4

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	6.9	1.200	24.3	3.000	37.7	7.000	56.8
0.200	19.0	1.400	26.1	3.500	40.6	7.500	58.7
0.300	20.0	1.600	27.8	4.000	43.3	8.000	60.6
0.400	19.8	1.800	29.5	4.500	45.8	8.500	62.1
0.500	19.2	2.000	31.0	5.000	48.2	9.000	63.9
0.600	17.7	2.200	32.4	5.500	50.5	9.500	65.7
0.800	20.0	2.400	33.8	6.000	52.7		
1.000	22.2	2.600	35.2	6.500	54.8		

©1982-2019 Innovyze