Assessment of Allowable Runoff Rates:

GREEN FIELD RUNOFF RATES	
Project:	**RATHMOLYON**
Job No:	**5514**
Date:	**04/10/2021**

Q_{bar} = 0.00108 x Area$^{0.89}$ x SAAR$^{1.17}$ x Soil$^{2.17}$

Area = 6591.12 m^2 0.006591 km^2

SAAR(1) = 874 mm

Soil(1) = 4 Soil Index 0.47

Calculate Q_{bar} for 50 ha site and interpolate for 4095m^2 site

50 ha = 0.5 km^2

For 50 ha Site: Q_{bar} = 0.312988 m^3/s = **312.99** l/s

For Above Site: Q_{bar} = 0.004126 m^3/s = **4.10** l/s

Allowable Discharge			
	Factor	**Discharge**	
1 year	0.85	**3.50**	l/s
30 year	2.13	**8.70**	l/s
100 year	2.61	**10.70**	l/s

Notes:

1) Obtained from UKSUDs website

Notes:

1) Total area of site = 6591.12 m^2

2) Area depositing into Attenuation Tanks = 3759.112m^2 (Refer Page 2 for Calculation)

3) 4 = Clayey Poorly Drained

Greater Dublin Strategic Drainage Study Regional Drainage Policies - Volume 2

6.7.2 Assessment of Greenfield Runoff Volumes

The estimation of runoff volume from pervious areas using FSSR 16 is detailed in Appendix D. However this closely approximates to an assumption that runoff volume is equal to the SPR value for the soil type. Table 6.7 summarises the SPR value for the 5 soil types used in the FSR procedure.

SOIL	SPR value (% runoff)
1	0.1
2	0.3
3	0.37
4	0.47
5	0.53

Table 6.7 SPR Values for SOIL (pervious surface runoff factor)

Calculation of Total Area Contributing Run-off to the Attenuation Tank:

Total Site Area:	6591.1	m^2
Site Area Depositing into attenuation Tank:	3759.116	m^2
Standard Average Annual Rainfall (SAAR):	874	mm
Standard Percentage Run Value (SPR):	0.47	4 = Clayey Poorly Draine

Table 1: Break Down of Surface Types, Surface Areas, and Surface Coefficients for Site Area Depositing into attenuation Tank:

	Area for Entire Site		
Structure Type	Area (m^2)	Runoff Coefficient	Area Contributing to Run-off (m^2)
Building Roofs	1286.68	1	1286.68
New Road & Footpath (Impermeable surface)	1915.44	0.9	1723.896
Permeable Paving - General (Permeable Membrane)	404.1	0.5	202.05
Permeable Paving - Parking (Impermeable Membrane)	310	0.9	279
Grass	2674.9	0.1	267.49
Total Area (m^2):	6591.12		**3759.116**

Summary of Results for 1 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	79.740	0.240	3.5	0.0	3.5	17.5	O K
30 min Summer	79.784	0.284	3.5	0.0	3.5	22.7	O K
60 min Summer	79.811	0.311	3.5	0.0	3.5	26.8	O K
120 min Summer	79.825	0.325	3.5	0.0	3.5	29.0	O K
180 min Summer	79.827	0.327	3.5	0.0	3.5	29.3	O K
240 min Summer	79.824	0.324	3.5	0.0	3.5	28.8	O K
360 min Summer	79.814	0.314	3.5	0.0	3.5	27.2	O K
480 min Summer	79.800	0.300	3.5	0.0	3.5	25.1	O K
600 min Summer	79.786	0.286	3.5	0.0	3.5	23.0	O K
720 min Summer	79.771	0.271	3.5	0.0	3.5	21.0	O K
960 min Summer	79.737	0.237	3.5	0.0	3.5	17.2	O K
1440 min Summer	79.667	0.167	3.5	0.0	3.5	11.7	O K
2160 min Summer	79.611	0.111	3.3	0.0	3.3	7.8	O K
2880 min Summer	79.593	0.093	2.8	0.0	2.8	6.6	O K
4320 min Summer	79.575	0.075	2.2	0.0	2.2	5.3	O K
5760 min Summer	79.566	0.066	1.8	0.0	1.8	4.6	O K
7200 min Summer	79.560	0.060	1.5	0.0	1.5	4.2	O K
8640 min Summer	79.555	0.055	1.3	0.0	1.3	3.9	O K
10080 min Summer	79.552	0.052	1.2	0.0	1.2	3.7	O K
15 min Winter	79.762	0.262	3.5	0.0	3.5	19.9	O K
30 min Winter	79.805	0.305	3.5	0.0	3.5	25.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	29.317	0.0	20.5	0.0	23
30 min Summer	19.616	0.0	27.5	0.0	35
60 min Summer	12.679	0.0	35.6	0.0	60
120 min Summer	8.042	0.0	45.2	0.0	96
180 min Summer	6.133	0.0	51.7	0.0	130
240 min Summer	5.055	0.0	56.8	0.0	166
360 min Summer	3.846	0.0	64.8	0.0	234
480 min Summer	3.167	0.0	71.2	0.0	300
600 min Summer	2.725	0.0	76.6	0.0	366
720 min Summer	2.409	0.0	81.3	0.0	428
960 min Summer	1.985	0.0	89.3	0.0	550
1440 min Summer	1.510	0.0	101.8	0.0	780
2160 min Summer	1.143	0.0	115.7	0.0	1112
2880 min Summer	0.939	0.0	126.7	0.0	1472
4320 min Summer	0.710	0.0	143.7	0.0	2204
5760 min Summer	0.583	0.0	157.4	0.0	2936
7200 min Summer	0.500	0.0	168.8	0.0	3616
8640 min Summer	0.442	0.0	178.8	0.0	4400
10080 min Summer	0.397	0.0	187.7	0.0	5088
15 min Winter	29.317	0.0	23.0	0.0	23
30 min Winter	19.616	0.0	30.8	0.0	36

Summary of Results for 1 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	79.837	0.337	3.5	0.0	3.5	30.8	O K
120 min Winter	79.852	0.352	3.5	0.0	3.5	33.2	O K
180 min Winter	79.852	0.352	3.5	0.0	3.5	33.2	O K
240 min Winter	79.846	0.346	3.5	0.0	3.5	32.2	O K
360 min Winter	79.826	0.326	3.5	0.0	3.5	29.1	O K
480 min Winter	79.803	0.303	3.5	0.0	3.5	25.5	O K
600 min Winter	79.778	0.278	3.5	0.0	3.5	21.9	O K
720 min Winter	79.750	0.250	3.5	0.0	3.5	18.6	O K
960 min Winter	79.686	0.186	3.5	0.0	3.5	13.1	O K
1440 min Winter	79.610	0.110	3.2	0.0	3.2	7.7	O K
2160 min Winter	79.585	0.085	2.5	0.0	2.5	6.0	O K
2880 min Winter	79.573	0.073	2.1	0.0	2.1	5.1	O K
4320 min Winter	79.561	0.061	1.6	0.0	1.6	4.3	O K
5760 min Winter	79.554	0.054	1.3	0.0	1.3	3.8	O K
7200 min Winter	79.549	0.049	1.1	0.0	1.1	3.5	O K
8640 min Winter	79.546	0.046	1.0	0.0	1.0	3.2	O K
10080 min Winter	79.543	0.043	0.9	0.0	0.9	3.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	12.679	0.0	39.9	0.0	62
120 min Winter	8.042	0.0	50.6	0.0	104
180 min Winter	6.133	0.0	57.9	0.0	142
240 min Winter	5.055	0.0	63.6	0.0	180
360 min Winter	3.846	0.0	72.6	0.0	254
480 min Winter	3.167	0.0	79.8	0.0	324
600 min Winter	2.725	0.0	85.8	0.0	390
720 min Winter	2.409	0.0	91.0	0.0	450
960 min Winter	1.985	0.0	100.0	0.0	564
1440 min Winter	1.510	0.0	114.1	0.0	762
2160 min Winter	1.143	0.0	129.6	0.0	1112
2880 min Winter	0.939	0.0	141.9	0.0	1472
4320 min Winter	0.710	0.0	161.0	0.0	2184
5760 min Winter	0.583	0.0	176.2	0.0	2936
7200 min Winter	0.500	0.0	189.1	0.0	3608
8640 min Winter	0.442	0.0	200.3	0.0	4360
10080 min Winter	0.397	0.0	210.2	0.0	5128

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.300	Shortest Storm (mins)	15
Ratio R	0.324	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.375

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.125	4	8	0.125	8	12	0.125

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Model Details

Storage is Online Cover Level (m) 81.500

Tank or Pond Structure

Invert Level (m) 79.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	70.4	0.300	155.0	0.600	155.0	0.900	155.0
0.100	70.4	0.400	155.0	0.700	155.0		
0.200	70.4	0.500	155.0	0.800	155.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0093-3500-0700-3500
Design Head (m)	0.700
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	93
Invert Level (m)	79.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	3.5
Flush-Flo™	0.209	3.5
Kick-Flo®	0.468	2.9
Mean Flow over Head Range	-	3.0

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	1.200	4.5	3.000	6.9	7.000	10.3
0.200	3.5	1.400	4.8	3.500	7.4	7.500	10.6
0.300	3.4	1.600	5.1	4.000	7.9	8.000	11.0
0.400	3.3	1.800	5.4	4.500	8.3	8.500	11.3
0.500	3.0	2.000	5.7	5.000	8.8	9.000	11.6
0.600	3.3	2.200	6.0	5.500	9.2	9.500	12.0
0.800	3.7	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.4	6.500	9.9		

Pipe Overflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	1.000	Upstream Invert Level (m)	80.400
Roughness k (mm)	0.600		

Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	79.910	0.410	3.5	0.0	3.5	42.1	O K
30 min Summer	79.998	0.498	3.5	0.0	3.5	55.8	O K
60 min Summer	80.076	0.576	3.5	0.0	3.5	67.9	O K
120 min Summer	80.133	0.633	3.5	0.0	3.5	76.7	O K
180 min Summer	80.147	0.647	3.5	0.0	3.5	78.9	O K
240 min Summer	80.148	0.648	3.5	0.0	3.5	79.0	O K
360 min Summer	80.141	0.641	3.5	0.0	3.5	77.9	O K
480 min Summer	80.129	0.629	3.5	0.0	3.5	76.1	O K
600 min Summer	80.116	0.616	3.5	0.0	3.5	74.0	O K
720 min Summer	80.101	0.601	3.5	0.0	3.5	71.7	O K
960 min Summer	80.069	0.569	3.5	0.0	3.5	66.8	O K
1440 min Summer	80.003	0.503	3.5	0.0	3.5	56.5	O K
2160 min Summer	79.890	0.390	3.5	0.0	3.5	39.1	O K
2880 min Summer	79.807	0.307	3.5	0.0	3.5	26.1	O K
4320 min Summer	79.668	0.168	3.5	0.0	3.5	11.8	O K
5760 min Summer	79.608	0.108	3.2	0.0	3.2	7.6	O K
7200 min Summer	79.592	0.092	2.7	0.0	2.7	6.5	O K
8640 min Summer	79.581	0.081	2.4	0.0	2.4	5.7	O K
10080 min Summer	79.575	0.075	2.1	0.0	2.1	5.2	O K
15 min Winter	79.945	0.445	3.5	0.0	3.5	47.6	O K
30 min Winter	80.045	0.545	3.5	0.0	3.5	63.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	65.087	0.0	45.6	0.0	25
30 min Summer	43.648	0.0	61.3	0.0	39
60 min Summer	27.845	0.0	78.3	0.0	66
120 min Summer	17.289	0.0	97.2	0.0	124
180 min Summer	12.993	0.0	109.6	0.0	180
240 min Summer	10.584	0.0	119.0	0.0	210
360 min Summer	7.913	0.0	133.5	0.0	274
480 min Summer	6.430	0.0	144.6	0.0	342
600 min Summer	5.471	0.0	153.8	0.0	412
720 min Summer	4.793	0.0	161.7	0.0	482
960 min Summer	3.889	0.0	174.9	0.0	620
1440 min Summer	2.894	0.0	195.3	0.0	896
2160 min Summer	2.153	0.0	218.0	0.0	1260
2880 min Summer	1.745	0.0	235.6	0.0	1596
4320 min Summer	1.298	0.0	262.7	0.0	2252
5760 min Summer	1.051	0.0	283.9	0.0	2936
7200 min Summer	0.893	0.0	301.3	0.0	3672
8640 min Summer	0.781	0.0	316.2	0.0	4400
10080 min Summer	0.697	0.0	329.4	0.0	5080
15 min Winter	65.087	0.0	51.1	0.0	25
30 min Winter	43.648	0.0	68.6	0.0	39

Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	80.136	0.636	3.5	0.0	3.5	77.1	O K
120 min Winter	80.206	0.706	3.5	0.0	3.5	88.0	O K
180 min Winter	80.229	0.729	3.6	0.0	3.6	91.6	O K
240 min Winter	80.232	0.732	3.6	0.0	3.6	92.0	O K
360 min Winter	80.220	0.720	3.5	0.0	3.5	90.2	O K
480 min Winter	80.203	0.703	3.5	0.0	3.5	87.6	O K
600 min Winter	80.181	0.681	3.5	0.0	3.5	84.2	O K
720 min Winter	80.157	0.657	3.5	0.0	3.5	80.5	O K
960 min Winter	80.106	0.606	3.5	0.0	3.5	72.6	O K
1440 min Winter	79.998	0.498	3.5	0.0	3.5	55.8	O K
2160 min Winter	79.823	0.323	3.5	0.0	3.5	28.6	O K
2880 min Winter	79.685	0.185	3.5	0.0	3.5	13.0	O K
4320 min Winter	79.596	0.096	2.9	0.0	2.9	6.8	O K
5760 min Winter	79.580	0.080	2.3	0.0	2.3	5.6	O K
7200 min Winter	79.571	0.071	2.0	0.0	2.0	5.0	O K
8640 min Winter	79.565	0.065	1.7	0.0	1.7	4.5	O K
10080 min Winter	79.560	0.060	1.6	0.0	1.6	4.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	27.845	0.0	87.7	0.0	66
120 min Winter	17.289	0.0	108.9	0.0	122
180 min Winter	12.993	0.0	122.7	0.0	178
240 min Winter	10.584	0.0	133.3	0.0	230
360 min Winter	7.913	0.0	149.5	0.0	288
480 min Winter	6.430	0.0	162.0	0.0	366
600 min Winter	5.471	0.0	172.3	0.0	444
720 min Winter	4.793	0.0	181.1	0.0	522
960 min Winter	3.889	0.0	195.9	0.0	672
1440 min Winter	2.894	0.0	218.7	0.0	968
2160 min Winter	2.153	0.0	244.1	0.0	1304
2880 min Winter	1.745	0.0	263.8	0.0	1588
4320 min Winter	1.298	0.0	294.3	0.0	2208
5760 min Winter	1.051	0.0	317.9	0.0	2912
7200 min Winter	0.893	0.0	337.4	0.0	3608
8640 min Winter	0.781	0.0	354.2	0.0	4320
10080 min Winter	0.697	0.0	368.9	0.0	5056

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.300	Shortest Storm (mins)	15
Ratio R	0.324	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.375

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.125	4	8	0.125	8	12	0.125

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Model Details

Storage is Online Cover Level (m) 81.500

Tank or Pond Structure

Invert Level (m) 79.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	70.4	0.300	155.0	0.600	155.0	0.900	155.0
0.100	70.4	0.400	155.0	0.700	155.0		
0.200	70.4	0.500	155.0	0.800	155.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0093-3500-0700-3500
Design Head (m)	0.700
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	93
Invert Level (m)	79.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	3.5
Flush-Flo™	0.209	3.5
Kick-Flo®	0.468	2.9
Mean Flow over Head Range	-	3.0

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	1.200	4.5	3.000	6.9	7.000	10.3
0.200	3.5	1.400	4.8	3.500	7.4	7.500	10.6
0.300	3.4	1.600	5.1	4.000	7.9	8.000	11.0
0.400	3.3	1.800	5.4	4.500	8.3	8.500	11.3
0.500	3.0	2.000	5.7	5.000	8.8	9.000	11.6
0.600	3.3	2.200	6.0	5.500	9.2	9.500	12.0
0.800	3.7	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.4	6.500	9.9		

Pipe Overflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	1.000	Upstream Invert Level (m)	80.400
Roughness k (mm)	0.600		

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	79.997	0.497	3.5	0.0	3.5	55.6	O K
30 min Summer	80.116	0.616	3.5	0.0	3.5	74.0	O K
60 min Summer	80.222	0.722	3.6	0.0	3.6	90.5	O K
120 min Summer	80.303	0.803	3.7	0.0	3.7	103.1	O K
180 min Summer	80.329	0.829	3.8	0.0	3.8	107.1	O K
240 min Summer	80.332	0.832	3.8	0.0	3.8	107.6	O K
360 min Summer	80.325	0.825	3.8	0.0	3.8	106.4	O K
480 min Summer	80.311	0.811	3.7	0.0	3.7	104.3	O K
600 min Summer	80.296	0.796	3.7	0.0	3.7	102.0	O K
720 min Summer	80.280	0.780	3.7	0.0	3.7	99.5	O K
960 min Summer	80.247	0.747	3.6	0.0	3.6	94.3	O K
1440 min Summer	80.178	0.678	3.5	0.0	3.5	83.7	O K
2160 min Summer	80.079	0.579	3.5	0.0	3.5	68.3	O K
2880 min Summer	79.981	0.481	3.5	0.0	3.5	53.1	O K
4320 min Summer	79.802	0.302	3.5	0.0	3.5	25.4	O K
5760 min Summer	79.677	0.177	3.5	0.0	3.5	12.5	O K
7200 min Summer	79.613	0.113	3.3	0.0	3.3	8.0	O K
8640 min Summer	79.597	0.097	2.9	0.0	2.9	6.8	O K
10080 min Summer	79.587	0.087	2.6	0.0	2.6	6.1	O K
15 min Winter	80.042	0.542	3.5	0.0	3.5	62.6	O K
30 min Winter	80.177	0.677	3.5	0.0	3.5	83.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	84.328	0.0	59.2	0.0	25
30 min Summer	56.942	0.0	79.9	0.0	39
60 min Summer	36.249	0.0	101.9	0.0	68
120 min Summer	22.363	0.0	125.7	0.0	124
180 min Summer	16.728	0.0	141.1	0.0	182
240 min Summer	13.576	0.0	152.7	0.0	228
360 min Summer	10.094	0.0	170.3	0.0	288
480 min Summer	8.168	0.0	183.7	0.0	354
600 min Summer	6.926	0.0	194.7	0.0	422
720 min Summer	6.051	0.0	204.1	0.0	492
960 min Summer	4.887	0.0	219.8	0.0	630
1440 min Summer	3.614	0.0	243.8	0.0	908
2160 min Summer	2.671	0.0	270.4	0.0	1308
2880 min Summer	2.155	0.0	290.8	0.0	1708
4320 min Summer	1.592	0.0	322.2	0.0	2344
5760 min Summer	1.283	0.0	346.4	0.0	3000
7200 min Summer	1.085	0.0	366.2	0.0	3672
8640 min Summer	0.946	0.0	383.0	0.0	4400
10080 min Summer	0.842	0.0	397.8	0.0	5136
15 min Winter	84.328	0.0	66.3	0.0	25
30 min Winter	56.942	0.0	89.5	0.0	39

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow Σ (l/s)	Max Volume (m³)	Status
60 min Winter	80.300	0.800	3.7	0.0	3.7	102.6	O K
120 min Winter	80.400	0.900	3.9	0.0	3.9	118.0	O K
180 min Winter	80.432	0.932	4.0	0.8	4.8	123.0	O K
240 min Winter	80.435	0.935	4.0	0.9	4.9	123.5	O K
360 min Winter	80.429	0.929	4.0	0.7	4.7	122.6	O K
480 min Winter	80.417	0.917	4.0	0.3	4.2	120.8	O K
600 min Winter	80.397	0.897	3.9	0.0	3.9	117.7	O K
720 min Winter	80.372	0.872	3.9	0.0	3.9	113.8	O K
960 min Winter	80.319	0.819	3.8	0.0	3.8	105.6	O K
1440 min Winter	80.211	0.711	3.5	0.0	3.5	88.8	O K
2160 min Winter	80.056	0.556	3.5	0.0	3.5	64.8	O K
2880 min Winter	79.875	0.375	3.5	0.0	3.5	36.7	O K
4320 min Winter	79.637	0.137	3.4	0.0	3.4	9.6	O K
5760 min Winter	79.595	0.095	2.8	0.0	2.8	6.7	O K
7200 min Winter	79.582	0.082	2.4	0.0	2.4	5.7	O K
8640 min Winter	79.574	0.074	2.1	0.0	2.1	5.2	O K
10080 min Winter	79.568	0.068	1.9	0.0	1.9	4.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	36.249	0.0	114.1	0.0	66
120 min Winter	22.363	0.0	140.8	0.0	122
180 min Winter	16.728	0.0	158.0	1.4	176
240 min Winter	13.576	0.0	171.0	2.8	228
360 min Winter	10.094	0.0	190.7	2.7	286
480 min Winter	8.168	0.0	205.7	0.7	370
600 min Winter	6.926	0.0	218.1	0.0	454
720 min Winter	6.051	0.0	228.6	0.0	530
960 min Winter	4.887	0.0	246.2	0.0	682
1440 min Winter	3.614	0.0	273.1	0.0	978
2160 min Winter	2.671	0.0	302.8	0.0	1408
2880 min Winter	2.155	0.0	325.7	0.0	1760
4320 min Winter	1.592	0.0	360.9	0.0	2292
5760 min Winter	1.283	0.0	388.0	0.0	2936
7200 min Winter	1.085	0.0	410.1	0.0	3592
8640 min Winter	0.946	0.0	429.0	0.0	4344
10080 min Winter	0.842	0.0	445.6	0.0	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.300	Shortest Storm (mins)	15
Ratio R	0.324	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.375

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.125	4	8	0.125	8	12	0.125

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Model Details

Storage is Online Cover Level (m) 81.500

Tank or Pond Structure

Invert Level (m) 79.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	70.4	0.300	155.0	0.600	155.0	0.900	155.0
0.100	70.4	0.400	155.0	0.700	155.0		
0.200	70.4	0.500	155.0	0.800	155.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0093-3500-0700-3500
Design Head (m)	0.700
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	93
Invert Level (m)	79.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	3.5
Flush-Flo™	0.209	3.5
Kick-Flo®	0.468	2.9
Mean Flow over Head Range	-	3.0

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	1.200	4.5	3.000	6.9	7.000	10.3
0.200	3.5	1.400	4.8	3.500	7.4	7.500	10.6
0.300	3.4	1.600	5.1	4.000	7.9	8.000	11.0
0.400	3.3	1.800	5.4	4.500	8.3	8.500	11.3
0.500	3.0	2.000	5.7	5.000	8.8	9.000	11.6
0.600	3.3	2.200	6.0	5.500	9.2	9.500	12.0
0.800	3.7	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.4	6.500	9.9		

Pipe Overflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	1.000	Upstream Invert Level (m)	80.400
Roughness k (mm)	0.600		