




APPENDIX F
PRELIMINARY SURFACE WATER DRAINAGE & ATTENUATION CALCULATIONS

MJA Consulting		Page 1
Monarch House Barton Lane OX14 3NB	Oakcroft Lane Stubbington Persimmon Homes SC	
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Innovyze	Source Control 2019.1	


Cascade Summary of Results for Stubbington Tank May 20.srcx

Upstream Structures Outflow To Overflow To

(None) Stubbington South Pond May 20.srcx (None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.126	0.126	22.8	51.6	O K
30 min Summer	9.159	0.159	23.4	65.2	O K
60 min Summer	9.177	0.177	23.7	72.5	O K
120 min Summer	9.178	0.178	23.7	72.9	O K
180 min Summer	9.168	0.168	23.6	69.1	O K
240 min Summer	9.157	0.157	23.4	64.5	O K
360 min Summer	9.134	0.134	23.0	55.0	O K
480 min Summer	9.116	0.116	22.0	47.5	O K
600 min Summer	9.102	0.102	20.6	41.8	O K
720 min Summer	9.091	0.091	19.4	37.1	O K
960 min Summer	9.073	0.073	17.2	29.9	O K
1440 min Summer	9.051	0.051	14.1	20.7	O K
2160 min Summer	9.030	0.030	11.2	12.5	O K
2880 min Summer	9.018	0.018	9.5	7.3	O K
15 min Winter	9.144	0.144	23.2	59.1	O K
30 min Winter	9.183	0.183	23.8	75.1	O K
60 min Winter	9.204	0.204	24.1	83.6	O K
120 min Winter	9.199	0.199	24.0	81.5	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	28.264	0.0	73.8	24
30 min Summer	18.753	0.0	98.3	33
60 min Summer	12.155	0.0	127.1	52
120 min Summer	7.737	0.0	162.0	84
180 min Summer	5.916	0.0	186.5	118
240 min Summer	4.887	0.0	205.3	150
360 min Summer	3.706	0.0	233.4	214
480 min Summer	3.038	0.0	254.8	274
600 min Summer	2.604	0.0	273.2	334
720 min Summer	2.296	0.0	289.1	396
960 min Summer	1.883	0.0	316.3	516
1440 min Summer	1.425	0.0	358.7	756
2160 min Summer	1.077	0.0	406.9	1120
2880 min Summer	0.883	0.0	444.9	1476
15 min Winter	28.264	0.0	82.8	24
30 min Winter	18.753	0.0	110.0	34
60 min Winter	12.155	0.0	142.8	54
120 min Winter	7.737	0.0	181.5	90

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Cascade Summary of Results for Stubbington Tank May 20.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	9.180	0.180	23.8	73.8	O K
240 min Winter	9.160	0.160	23.5	65.4	O K
360 min Winter	9.124	0.124	22.7	50.8	O K
480 min Winter	9.101	0.101	20.5	41.4	O K
600 min Winter	9.084	0.084	18.6	34.5	O K
720 min Winter	9.071	0.071	17.0	29.2	O K
960 min Winter	9.053	0.053	14.4	21.7	O K
1440 min Winter	9.031	0.031	11.3	12.5	O K
2160 min Winter	9.012	0.012	8.7	4.8	O K
2880 min Winter	9.001	0.001	7.3	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
180 min Winter	5.916	0.0	208.5	126
240 min Winter	4.887	0.0	229.5	160
360 min Winter	3.706	0.0	261.4	220
480 min Winter	3.038	0.0	285.7	282
600 min Winter	2.604	0.0	305.9	344
720 min Winter	2.296	0.0	323.7	404
960 min Winter	1.883	0.0	354.2	526
1440 min Winter	1.425	0.0	401.9	766
2160 min Winter	1.077	0.0	455.6	1128
2880 min Winter	0.883	0.0	498.3	1472

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Cascade Rainfall Details for Stubbington Tank May 20.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.400

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:
0	4	0.450	4	8	0.450	8	12
						0.300	12
							16
							0.200

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Cascade Model Details for Stubbington Tank May 20.srcx

Storage is Online Cover Level (m) 11.500

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	410.0	0.700	410.0	1.400	410.0	2.100	410.0
0.100	410.0	0.800	410.0	1.500	410.0	2.200	410.0
0.200	410.0	0.900	410.0	1.600	410.0	2.300	410.0
0.300	410.0	1.000	410.0	1.700	410.0	2.400	410.0
0.400	410.0	1.100	410.0	1.800	410.0	2.500	410.0
0.500	410.0	1.200	410.0	1.900	410.0		
0.600	410.0	1.300	410.0	2.000	410.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0211-2500-1600-2500
Design Head (m)	1.600
Design Flow (l/s)	25.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	211
Invert Level (m)	8.900
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	25.0
Flush-Flo™	0.484	25.0
Kick-Flo®	1.055	20.5
Mean Flow over Head Range	-	21.6

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	7.2	1.200	21.8	3.000	33.8	7.000	50.9
0.200	20.4	1.400	23.5	3.500	36.4	7.500	52.6
0.300	24.1	1.600	25.0	4.000	38.8	8.000	54.3
0.400	24.8	1.800	26.4	4.500	41.1	8.500	55.9
0.500	25.0	2.000	27.8	5.000	43.2	9.000	57.5
0.600	24.8	2.200	29.1	5.500	45.3	9.500	59.0
0.800	24.0	2.400	30.4	6.000	47.2		
1.000	21.7	2.600	31.5	6.500	49.1		

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Cascade Summary of Results for Stubbington South Pond May 20.srcx

Storm Event	Upstream Structures		Outflow To Overflow To				Status
	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	
	Stubbington Tank May 20.srcx		(None)	(None)	(None)	(None)	
15 min Summer	7.777	0.277	23.8	0.0	23.8	104.0	O K
30 min Summer	7.858	0.358	24.0	0.0	24.0	138.4	O K
60 min Summer	7.934	0.434	24.0	0.0	24.0	176.9	O K
120 min Summer	7.975	0.475	24.0	0.0	24.0	214.5	O K
180 min Summer	7.986	0.486	24.0	0.0	24.0	227.5	O K
240 min Summer	7.988	0.488	24.0	0.0	24.0	229.5	O K
360 min Summer	7.985	0.485	24.0	0.0	24.0	225.6	O K
480 min Summer	7.977	0.477	24.0	0.0	24.0	216.8	O K
600 min Summer	7.967	0.467	24.0	0.0	24.0	205.7	O K
720 min Summer	7.955	0.455	24.0	0.0	24.0	193.5	O K
960 min Summer	7.920	0.420	24.0	0.0	24.0	167.8	O K
1440 min Summer	7.816	0.316	23.9	0.0	23.9	120.5	O K
2160 min Summer	7.696	0.196	23.2	0.0	23.2	71.6	O K
2880 min Summer	7.627	0.127	22.1	0.0	22.1	45.4	O K
15 min Winter	7.810	0.310	23.9	0.0	23.9	117.7	O K
30 min Winter	7.898	0.398	24.0	0.0	24.0	156.5	O K
60 min Winter	7.962	0.462	24.0	0.0	24.0	200.7	O K
120 min Winter	8.001	0.501	24.0	0.0	24.0	247.1	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	28.264	0.0	182.4	0.0	29
30 min Summer	18.753	0.0	242.1	0.0	45
60 min Summer	12.155	0.0	313.9	0.0	74
120 min Summer	7.737	0.0	399.9	0.0	128
180 min Summer	5.916	0.0	459.3	0.0	180
240 min Summer	4.887	0.0	505.5	0.0	212
360 min Summer	3.706	0.0	575.2	0.0	274
480 min Summer	3.038	0.0	628.4	0.0	336
600 min Summer	2.604	0.0	673.6	0.0	400
720 min Summer	2.296	0.0	712.6	0.0	466
960 min Summer	1.883	0.0	779.2	0.0	592
1440 min Summer	1.425	0.0	884.2	0.0	834
2160 min Summer	1.077	0.0	1002.7	0.0	1176
2880 min Summer	0.883	0.0	1096.2	0.0	1504
15 min Winter	28.264	0.0	204.5	0.0	30
30 min Winter	18.753	0.0	271.2	0.0	45
60 min Winter	12.155	0.0	352.0	0.0	74
120 min Winter	7.737	0.0	448.0	0.0	132

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Cascade Summary of Results for Stubbington South Pond May 20.srcx

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
180 min Winter	8.017	0.517	24.0	0.0	24.0	269.0	O K
240 min Winter	8.020	0.520	24.0	0.0	24.0	273.7	O K
360 min Winter	8.013	0.513	24.0	0.0	24.0	263.5	O K
480 min Winter	8.000	0.500	24.0	0.0	24.0	245.3	O K
600 min Winter	7.983	0.483	24.0	0.0	24.0	223.6	O K
720 min Winter	7.962	0.462	24.0	0.0	24.0	200.4	O K
960 min Winter	7.895	0.395	24.0	0.0	24.0	155.1	O K
1440 min Winter	7.731	0.231	23.5	0.0	23.5	85.3	O K
2160 min Winter	7.611	0.111	21.1	0.0	21.1	39.5	O K
2880 min Winter	7.580	0.080	17.7	0.0	17.7	28.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
180 min Winter	5.916	0.0	513.6	0.0	182
240 min Winter	4.887	0.0	565.7	0.0	230
360 min Winter	3.706	0.0	643.7	0.0	290
480 min Winter	3.038	0.0	704.0	0.0	360
600 min Winter	2.604	0.0	753.8	0.0	428
720 min Winter	2.296	0.0	797.6	0.0	496
960 min Winter	1.883	0.0	872.8	0.0	624
1440 min Winter	1.425	0.0	990.5	0.0	852
2160 min Winter	1.077	0.0	1123.0	0.0	1152
2880 min Winter	0.883	0.0	1227.9	0.0	1488

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Cascade Rainfall Details for Stubbington South Pond May 20.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.050

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area				
From:	To:	From:	To:	From:	To:	From:	To:				
0	4	0.750	4	8	0.600	8	12	0.450	12	16	0.250

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Cascade Model Details for Stubbington South Pond May 20.srcx

Storage is Online Cover Level (m) 9.000

Tank or Pond Structure

Invert Level (m) 7.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	341.3	0.700	1606.5	1.400	2357.3	2.100	5250.0
0.100	367.5	0.800	1711.5	1.500	2467.5	2.200	5250.0
0.200	388.5	0.900	1821.8	1.600	5250.0	2.300	5250.0
0.300	420.0	1.000	1926.8	1.700	5250.0	2.400	5250.0
0.400	451.5	1.100	2021.3	1.800	5250.0	2.500	5250.0
0.500	1396.5	1.200	2126.3	1.900	5250.0		
0.600	1501.5	1.300	2252.3	2.000	5250.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0208-2400-1525-2400
Design Head (m)	1.525
Design Flow (l/s)	24.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	208
Invert Level (m)	7.400
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.525	24.0
Flush-Flo™	0.462	24.0
Kick-Flo®	1.011	19.7
Mean Flow over Head Range	-	20.7


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	7.1	1.200	21.4	3.000	33.2	7.000	49.9
0.200	20.0	1.400	23.0	3.500	35.7	7.500	51.6
0.300	23.2	1.600	24.5	4.000	38.1	8.000	53.3
0.400	23.9	1.800	26.0	4.500	40.3	8.500	54.9
0.500	24.0	2.000	27.3	5.000	42.4	9.000	56.4
0.600	23.7	2.200	28.6	5.500	44.4	9.500	57.9
0.800	22.8	2.400	29.8	6.000	46.4		
1.000	20.0	2.600	31.0	6.500	48.2		

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Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 8.950

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Cascade Summary of Results for Stubbington Tank May 20.srcx

Upstream Structures


Outflow To

Overflow To

(None) Stubbington South Pond May 20.srcx Stubbington South Pond May 20.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	9.280	0.280	24.7	114.7	O K
30 min Summer	9.359	0.359	25.0	147.2	O K
60 min Summer	9.411	0.411	25.0	168.5	O K
120 min Summer	9.423	0.423	25.0	173.3	O K
180 min Summer	9.411	0.411	25.0	168.4	O K
240 min Summer	9.391	0.391	25.0	160.4	O K
360 min Summer	9.349	0.349	25.0	142.9	O K
480 min Summer	9.308	0.308	24.9	126.2	O K
600 min Summer	9.270	0.270	24.7	110.8	O K
720 min Summer	9.237	0.237	24.4	97.2	O K
960 min Summer	9.183	0.183	23.8	75.1	O K
1440 min Summer	9.119	0.119	22.3	48.6	O K
2160 min Summer	9.079	0.079	17.9	32.3	O K
2880 min Summer	9.057	0.057	15.1	23.4	O K
15 min Winter	9.319	0.319	24.9	130.8	O K
30 min Winter	9.411	0.411	25.0	168.6	O K
60 min Winter	9.477	0.477	25.0	195.5	O K
120 min Winter	9.488	0.488	25.0	200.3	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	54.732	0.0	143.2	25
30 min Summer	36.115	0.0	189.5	36
60 min Summer	22.913	0.0	240.1	60
120 min Summer	14.184	0.0	297.7	94
180 min Summer	10.629	0.0	334.9	128
240 min Summer	8.634	0.0	362.2	162
360 min Summer	6.430	0.0	404.9	230
480 min Summer	5.213	0.0	437.9	294
600 min Summer	4.428	0.0	464.9	356
720 min Summer	3.874	0.0	488.0	418
960 min Summer	3.136	0.0	526.6	536
1440 min Summer	2.326	0.0	586.0	762
2160 min Summer	1.724	0.0	651.7	1124
2880 min Summer	1.394	0.0	702.2	1476
15 min Winter	54.732	0.0	160.8	25
30 min Winter	36.115	0.0	211.9	37
60 min Winter	22.913	0.0	268.9	62
120 min Winter	14.184	0.0	333.8	102

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Cascade Summary of Results for Stubbington Tank May 20.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	9.468	0.468	25.0	191.9	O K
240 min Winter	9.437	0.437	25.0	179.0	O K
360 min Winter	9.367	0.367	25.0	150.4	O K
480 min Winter	9.301	0.301	24.8	123.6	O K
600 min Winter	9.245	0.245	24.5	100.4	O K
720 min Winter	9.198	0.198	24.0	81.1	O K
960 min Winter	9.132	0.132	22.9	54.0	O K
1440 min Winter	9.082	0.082	18.4	33.7	O K
2160 min Winter	9.049	0.049	13.9	20.2	O K
2880 min Winter	9.031	0.031	11.4	12.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
180 min Winter	10.629	0.0	375.1	138
240 min Winter	8.634	0.0	405.9	176
360 min Winter	6.430	0.0	453.3	246
480 min Winter	5.213	0.0	490.3	312
600 min Winter	4.428	0.0	520.6	374
720 min Winter	3.874	0.0	546.4	434
960 min Winter	3.136	0.0	589.9	540
1440 min Winter	2.326	0.0	656.3	770
2160 min Winter	1.724	0.0	729.9	1128
2880 min Winter	1.394	0.0	786.6	1480

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Cascade Rainfall Details for Stubbington Tank May 20.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	10	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.400

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:
0	4	0.450	4	8	0.450	8	12
						0.300	12
							16
							0.200

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Monarch House Barton Lane OX14 3NB	Oakcroft Lane Stubbington Persimmon Homes SC	
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Innovyze	Source Control 2019.1	

Cascade Model Details for Stubbington Tank May 20.srcx

Storage is Online Cover Level (m) 11.500

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	410.0	0.700	410.0	1.400	410.0	2.100	410.0
0.100	410.0	0.800	410.0	1.500	410.0	2.200	410.0
0.200	410.0	0.900	410.0	1.600	410.0	2.300	410.0
0.300	410.0	1.000	410.0	1.700	410.0	2.400	410.0
0.400	410.0	1.100	410.0	1.800	410.0	2.500	410.0
0.500	410.0	1.200	410.0	1.900	410.0		
0.600	410.0	1.300	410.0	2.000	410.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0211-2500-1600-2500
Design Head (m)	1.600
Design Flow (l/s)	25.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	211
Invert Level (m)	8.900
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	25.0
Flush-Flo™	0.484	25.0
Kick-Flo®	1.055	20.5
Mean Flow over Head Range	-	21.6

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	7.2	1.200	21.8	3.000	33.8	7.000	50.9
0.200	20.4	1.400	23.5	3.500	36.4	7.500	52.6
0.300	24.1	1.600	25.0	4.000	38.8	8.000	54.3
0.400	24.8	1.800	26.4	4.500	41.1	8.500	55.9
0.500	25.0	2.000	27.8	5.000	43.2	9.000	57.5
0.600	24.8	2.200	29.1	5.500	45.3	9.500	59.0
0.800	24.0	2.400	30.4	6.000	47.2		
1.000	21.7	2.600	31.5	6.500	49.1		

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Monarch House Barton Lane OX14 3NB	Oakcroft Lane Stubbington Persimmon Homes SC	
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Cascade Summary of Results for Stubbington South Pond May 20.srcx


Storm Event	Upstream Structures		Outflow To Overflow To				Status
	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow (l/s)	Max Volume (m ³)	
	Stubbington Tank May 20.srcx		(None)	(None)	(None)	(None)	
15 min Summer	7.971	0.471	24.0	0.0	24.0	209.3	O K
30 min Summer	8.023	0.523	24.0	0.0	24.0	277.9	O K
60 min Summer	8.074	0.574	24.0	0.0	24.0	351.5	O K
120 min Summer	8.125	0.625	24.0	0.0	24.0	428.4	O K
180 min Summer	8.153	0.653	24.0	0.0	24.0	471.6	O K
240 min Summer	8.171	0.671	24.0	0.0	24.0	499.3	O K
360 min Summer	8.189	0.689	24.0	0.0	24.0	527.9	O K
480 min Summer	8.184	0.684	24.0	0.0	24.0	519.2	O K
600 min Summer	8.176	0.676	24.0	0.0	24.0	507.9	O K
720 min Summer	8.169	0.669	24.0	0.0	24.0	495.8	O K
960 min Summer	8.151	0.651	24.0	0.0	24.0	468.3	O K
1440 min Summer	8.106	0.606	24.0	0.0	24.0	399.3	O K
2160 min Summer	8.034	0.534	24.0	0.0	24.0	293.2	O K
2880 min Summer	7.966	0.466	24.0	0.0	24.0	203.9	O K
15 min Winter	7.993	0.493	24.0	0.0	24.0	235.7	O K
30 min Winter	8.048	0.548	24.0	0.0	24.0	313.1	O K
60 min Winter	8.105	0.605	24.0	0.0	24.0	397.4	O K
120 min Winter	8.163	0.663	24.0	0.0	24.0	487.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Overflow Volume (m ³)	Time-Peak (mins)
15 min Summer	54.732	0.0	353.2	0.0	54
30 min Summer	36.115	0.0	466.7	0.0	92
60 min Summer	22.913	0.0	592.4	0.0	136
120 min Summer	14.184	0.0	733.6	0.0	194
180 min Summer	10.629	0.0	825.2	0.0	236
240 min Summer	8.634	0.0	892.9	0.0	276
360 min Summer	6.430	0.0	998.1	0.0	364
480 min Summer	5.213	0.0	1078.5	0.0	434
600 min Summer	4.428	0.0	1145.5	0.0	488
720 min Summer	3.874	0.0	1202.9	0.0	544
960 min Summer	3.136	0.0	1297.8	0.0	662
1440 min Summer	2.326	0.0	1444.1	0.0	914
2160 min Summer	1.724	0.0	1606.1	0.0	1288
2880 min Summer	1.394	0.0	1730.7	0.0	1644
15 min Winter	54.732	0.0	396.0	0.0	67
30 min Winter	36.115	0.0	522.7	0.0	108
60 min Winter	22.913	0.0	663.1	0.0	156
120 min Winter	14.184	0.0	821.9	0.0	218

Cascade Summary of Results for Stubbington South Pond May 20.srcx

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
180 min Winter	8.197	0.697	24.0	0.0	24.0	540.7	O K
240 min Winter	8.219	0.719	24.0	0.0	24.0	576.3	O K
360 min Winter	8.246	0.746	24.0	0.0	24.0	620.1	O K
480 min Winter	8.249	0.749	24.0	0.0	24.0	625.5	O K
600 min Winter	8.236	0.736	24.0	0.0	24.0	603.8	O K
720 min Winter	8.223	0.723	24.0	0.0	24.0	583.4	O K
960 min Winter	8.191	0.691	24.0	0.0	24.0	530.6	O K
1440 min Winter	8.111	0.611	24.0	0.0	24.0	406.2	O K
2160 min Winter	7.994	0.494	24.0	0.0	24.0	237.6	O K
2880 min Winter	7.809	0.309	23.9	0.0	23.9	117.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
180 min Winter	10.629	0.0	924.1	0.0	262
240 min Winter	8.634	0.0	1000.2	0.0	300
360 min Winter	6.430	0.0	1117.6	0.0	372
480 min Winter	5.213	0.0	1208.1	0.0	464
600 min Winter	4.428	0.0	1283.3	0.0	518
720 min Winter	3.874	0.0	1346.5	0.0	572
960 min Winter	3.136	0.0	1453.7	0.0	704
1440 min Winter	2.326	0.0	1617.7	0.0	978
2160 min Winter	1.724	0.0	1799.0	0.0	1348
2880 min Winter	1.394	0.0	1938.5	0.0	1656

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Cascade Rainfall Details for Stubbington South Pond May 20.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	10	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.050

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:
0	4	0.750	4	8	0.600	8	12
						12	16
							0.250

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Cascade Model Details for Stubbington South Pond May 20.srcx

Storage is Online Cover Level (m) 9.000

Tank or Pond Structure

Invert Level (m) 7.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	341.3	0.700	1606.5	1.400	2357.3	2.100	5250.0
0.100	367.5	0.800	1711.5	1.500	2467.5	2.200	5250.0
0.200	388.5	0.900	1821.8	1.600	5250.0	2.300	5250.0
0.300	420.0	1.000	1926.8	1.700	5250.0	2.400	5250.0
0.400	451.5	1.100	2021.3	1.800	5250.0	2.500	5250.0
0.500	1396.5	1.200	2126.3	1.900	5250.0		
0.600	1501.5	1.300	2252.3	2.000	5250.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0208-2400-1525-2400
Design Head (m)	1.525
Design Flow (l/s)	24.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	208
Invert Level (m)	7.400
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.525	24.0
Flush-Flo™	0.462	24.0
Kick-Flo®	1.011	19.7
Mean Flow over Head Range	-	20.7

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	7.1	1.200	21.4	3.000	33.2	7.000	49.9
0.200	20.0	1.400	23.0	3.500	35.7	7.500	51.6
0.300	23.2	1.600	24.5	4.000	38.1	8.000	53.3
0.400	23.9	1.800	26.0	4.500	40.3	8.500	54.9
0.500	24.0	2.000	27.3	5.000	42.4	9.000	56.4
0.600	23.7	2.200	28.6	5.500	44.4	9.500	57.9
0.800	22.8	2.400	29.8	6.000	46.4		
1.000	20.0	2.600	31.0	6.500	48.2		

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Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 8.950


Cascade Summary of Results for Stubbington Tank May 20.srcx

Upstream Structures Outflow To Overflow To

(None) Stubbington South Pond May 20.srcx (None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.368	0.368	25.0	150.9	O K
30 min Summer	9.480	0.480	25.0	196.7	O K
60 min Summer	9.565	0.565	25.0	231.8	O K
120 min Summer	9.595	0.595	25.0	244.0	O K
180 min Summer	9.586	0.586	25.0	240.3	O K
240 min Summer	9.565	0.565	25.0	231.8	O K
360 min Summer	9.516	0.516	25.0	211.7	O K
480 min Summer	9.467	0.467	25.0	191.4	O K
600 min Summer	9.419	0.419	25.0	171.9	O K
720 min Summer	9.375	0.375	25.0	153.7	O K
960 min Summer	9.298	0.298	24.8	122.1	O K
1440 min Summer	9.189	0.189	23.9	77.6	O K
2160 min Summer	9.112	0.112	21.7	46.0	O K
2880 min Summer	9.081	0.081	18.2	33.3	O K
15 min Winter	9.419	0.419	25.0	171.8	O K
30 min Winter	9.548	0.548	25.0	224.8	O K
60 min Winter	9.653	0.653	25.0	267.8	O K
120 min Winter	9.696	0.696	25.0	285.4	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	69.220	0.0	181.4	25
30 min Summer	46.082	0.0	241.8	37
60 min Summer	29.395	0.0	308.1	62
120 min Summer	18.205	0.0	382.3	102
180 min Summer	13.601	0.0	427.9	136
240 min Summer	11.003	0.0	462.2	170
360 min Summer	8.144	0.0	513.0	238
480 min Summer	6.575	0.0	552.2	304
600 min Summer	5.565	0.0	583.9	370
720 min Summer	4.855	0.0	611.5	432
960 min Summer	3.911	0.0	656.8	554
1440 min Summer	2.880	0.0	725.5	784
2160 min Summer	2.117	0.0	800.2	1128
2880 min Summer	1.701	0.0	857.0	1480
15 min Winter	69.220	0.0	203.1	26
30 min Winter	46.082	0.0	270.8	38
60 min Winter	29.395	0.0	345.9	64
120 min Winter	18.205	0.0	427.6	116

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Cascade Summary of Results for Stubbington Tank May 20.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
180 min Winter	9.680	0.680	25.0	278.6	O K
240 min Winter	9.648	0.648	25.0	265.9	O K
360 min Winter	9.571	0.571	25.0	234.1	O K
480 min Winter	9.491	0.491	25.0	201.3	O K
600 min Winter	9.416	0.416	25.0	170.4	O K
720 min Winter	9.348	0.348	25.0	142.7	O K
960 min Winter	9.239	0.239	24.5	98.0	O K
1440 min Winter	9.120	0.120	22.5	49.2	O K
2160 min Winter	9.072	0.072	17.1	29.6	O K
2880 min Winter	9.049	0.049	13.9	20.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
180 min Winter	13.601	0.0	479.6	146
240 min Winter	11.003	0.0	517.0	184
360 min Winter	8.144	0.0	574.8	258
480 min Winter	6.575	0.0	618.6	328
600 min Winter	5.565	0.0	654.0	394
720 min Winter	4.855	0.0	684.8	458
960 min Winter	3.911	0.0	735.5	574
1440 min Winter	2.880	0.0	812.4	778
2160 min Winter	2.117	0.0	896.2	1128
2880 min Winter	1.701	0.0	959.7	1484

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Innovyze	Source Control 2019.1	


Cascade Rainfall Details for Stubbington Tank May 20.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.400

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:	From:	To:
0	4	4	8	8	12	12	16
	0.450		0.450		0.300		0.200

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Monarch House Barton Lane OX14 3NB	Oakcroft Lane Stubbington Persimmon Homes SC	
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Innovyze	Source Control 2019.1	

Cascade Model Details for Stubbington Tank May 20.srcx

Storage is Online Cover Level (m) 11.500

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	410.0	0.700	410.0	1.400	410.0	2.100	410.0
0.100	410.0	0.800	410.0	1.500	410.0	2.200	410.0
0.200	410.0	0.900	410.0	1.600	410.0	2.300	410.0
0.300	410.0	1.000	410.0	1.700	410.0	2.400	410.0
0.400	410.0	1.100	410.0	1.800	410.0	2.500	410.0
0.500	410.0	1.200	410.0	1.900	410.0		
0.600	410.0	1.300	410.0	2.000	410.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0211-2500-1600-2500
Design Head (m)	1.600
Design Flow (l/s)	25.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	211
Invert Level (m)	8.900
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	25.0
Flush-Flo™	0.484	25.0
Kick-Flo®	1.055	20.5
Mean Flow over Head Range	-	21.6

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	7.2	1.200	21.8	3.000	33.8	7.000	50.9
0.200	20.4	1.400	23.5	3.500	36.4	7.500	52.6
0.300	24.1	1.600	25.0	4.000	38.8	8.000	54.3
0.400	24.8	1.800	26.4	4.500	41.1	8.500	55.9
0.500	25.0	2.000	27.8	5.000	43.2	9.000	57.5
0.600	24.8	2.200	29.1	5.500	45.3	9.500	59.0
0.800	24.0	2.400	30.4	6.000	47.2		
1.000	21.7	2.600	31.5	6.500	49.1		

Cascade Summary of Results for Stubbington South Pond May 20.srcx


Storm Event	Upstream Structures			Outflow To	Overflow To	Max Outflow (l/s)	Max Volume (m³)	Status
	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Overflow Σ			
	Stubbington Tank May 20.srcx			(None)	(None)			
15 min Summer	8.016	0.516	24.0	0.0	24.0	267.9	O K	
30 min Summer	8.079	0.579	24.0	0.0	24.0	358.8	O K	
60 min Summer	8.144	0.644	24.0	0.0	24.0	457.7	O K	
120 min Summer	8.211	0.711	24.0	0.0	24.0	562.6	O K	
180 min Summer	8.247	0.747	24.0	0.0	24.0	622.9	O K	
240 min Summer	8.271	0.771	24.0	0.0	24.0	661.9	O K	
360 min Summer	8.300	0.800	24.0	0.0	24.0	710.5	O K	
480 min Summer	8.315	0.815	24.0	0.0	24.0	737.4	O K	
600 min Summer	8.309	0.809	24.0	0.0	24.0	727.5	O K	
720 min Summer	8.300	0.800	24.0	0.0	24.0	711.9	O K	
960 min Summer	8.282	0.782	24.0	0.0	24.0	680.8	O K	
1440 min Summer	8.240	0.740	24.0	0.0	24.0	610.0	O K	
2160 min Summer	8.163	0.663	24.0	0.0	24.0	487.0	O K	
2880 min Summer	8.088	0.588	24.0	0.0	24.0	371.9	O K	
15 min Winter	8.040	0.540	24.0	0.0	24.0	301.3	O K	
30 min Winter	8.109	0.609	24.0	0.0	24.0	404.0	O K	
60 min Winter	8.182	0.682	24.0	0.0	24.0	516.8	O K	
120 min Winter	8.257	0.757	24.0	0.0	24.0	639.5	O K	

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	69.220	0.0	447.1	0.0	82
30 min Summer	46.082	0.0	595.8	0.0	129
60 min Summer	29.395	0.0	759.6	0.0	186
120 min Summer	18.205	0.0	941.9	0.0	254
180 min Summer	13.601	0.0	1055.0	0.0	300
240 min Summer	11.003	0.0	1138.4	0.0	340
360 min Summer	8.144	0.0	1264.1	0.0	412
480 min Summer	6.575	0.0	1360.6	0.0	488
600 min Summer	5.565	0.0	1439.5	0.0	566
720 min Summer	4.855	0.0	1507.0	0.0	616
960 min Summer	3.911	0.0	1618.5	0.0	724
1440 min Summer	2.880	0.0	1787.8	0.0	958
2160 min Summer	2.117	0.0	1971.9	0.0	1340
2880 min Summer	1.701	0.0	2111.8	0.0	1708
15 min Winter	69.220	0.0	500.6	0.0	97
30 min Winter	46.082	0.0	667.5	0.0	151
60 min Winter	29.395	0.0	851.8	0.0	214
120 min Winter	18.205	0.0	1054.0	0.0	286

Cascade Summary of Results for Stubbington South Pond May 20.srcx

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
180 min Winter	8.301	0.801	24.0	0.0	24.0	713.6	O K
240 min Winter	8.330	0.830	24.0	0.0	24.0	764.0	O K
360 min Winter	8.368	0.868	24.0	0.0	24.0	830.3	O K
480 min Winter	8.390	0.890	24.0	0.0	24.0	870.2	O K
600 min Winter	8.398	0.898	24.0	0.0	24.0	885.2	O K
720 min Winter	8.386	0.886	24.0	0.0	24.0	862.3	O K
960 min Winter	8.355	0.855	24.0	0.0	24.0	806.7	O K
1440 min Winter	8.278	0.778	24.0	0.0	24.0	674.6	O K
2160 min Winter	8.151	0.651	24.0	0.0	24.0	467.9	O K
2880 min Winter	8.033	0.533	24.0	0.0	24.0	291.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
180 min Winter	13.601	0.0	1181.6	0.0	334
240 min Winter	11.003	0.0	1275.1	0.0	374
360 min Winter	8.144	0.0	1416.4	0.0	444
480 min Winter	6.575	0.0	1523.9	0.0	510
600 min Winter	5.565	0.0	1612.2	0.0	592
720 min Winter	4.855	0.0	1688.1	0.0	672
960 min Winter	3.911	0.0	1812.4	0.0	762
1440 min Winter	2.880	0.0	2002.5	0.0	1030
2160 min Winter	2.117	0.0	2208.3	0.0	1428
2880 min Winter	1.701	0.0	2365.3	0.0	1788

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Cascade Rainfall Details for Stubbington South Pond May 20.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.050

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 0.750	4	8 0.600	8	12 0.450	12	16 0.250

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Cascade Model Details for Stubbington South Pond May 20.srcx

Storage is Online Cover Level (m) 9.000

Tank or Pond Structure

Invert Level (m) 7.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	341.3	0.700	1606.5	1.400	2357.3	2.100	5250.0
0.100	367.5	0.800	1711.5	1.500	2467.5	2.200	5250.0
0.200	388.5	0.900	1821.8	1.600	5250.0	2.300	5250.0
0.300	420.0	1.000	1926.8	1.700	5250.0	2.400	5250.0
0.400	451.5	1.100	2021.3	1.800	5250.0	2.500	5250.0
0.500	1396.5	1.200	2126.3	1.900	5250.0		
0.600	1501.5	1.300	2252.3	2.000	5250.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0208-2400-1525-2400
Design Head (m) 1.525
Design Flow (l/s) 24.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 208
Invert Level (m) 7.400
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.525	24.0
Flush-Flo™	0.462	24.0
Kick-Flo®	1.011	19.7
Mean Flow over Head Range	-	20.7

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	7.1	1.200	21.4	3.000	33.2	7.000	49.9
0.200	20.0	1.400	23.0	3.500	35.7	7.500	51.6
0.300	23.2	1.600	24.5	4.000	38.1	8.000	53.3
0.400	23.9	1.800	26.0	4.500	40.3	8.500	54.9
0.500	24.0	2.000	27.3	5.000	42.4	9.000	56.4
0.600	23.7	2.200	28.6	5.500	44.4	9.500	57.9
0.800	22.8	2.400	29.8	6.000	46.4		
1.000	20.0	2.600	31.0	6.500	48.2		

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Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 8.950


Cascade Summary of Results for Stubbington Tank May 20.srcx

Upstream Structures Outflow To Overflow To

(None) Stubbington South Pond May 20.srcx (None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.719	0.719	25.0	294.9	O K
30 min Summer	9.961	0.961	25.0	394.1	O K
60 min Summer	10.183	1.183	25.0	485.1	O K
120 min Summer	10.336	1.336	25.0	547.8	O K
180 min Summer	10.360	1.360	25.0	557.6	O K
240 min Summer	10.341	1.341	25.0	549.9	O K
360 min Summer	10.292	1.292	25.0	529.8	O K
480 min Summer	10.241	1.241	25.0	508.9	O K
600 min Summer	10.188	1.188	25.0	487.1	O K
720 min Summer	10.134	1.134	25.0	464.8	O K
960 min Summer	10.022	1.022	25.0	419.0	O K
1440 min Summer	9.770	0.770	25.0	315.7	O K
2160 min Summer	9.486	0.486	25.0	199.1	O K
2880 min Summer	9.302	0.302	24.9	123.8	O K
15 min Winter	9.815	0.815	25.0	334.2	O K
30 min Winter	10.090	1.090	25.0	446.8	O K
60 min Winter	10.346	1.346	25.0	551.9	O K
120 min Winter	10.536	1.536	25.3	629.8	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	125.353	0.0	328.8	27
30 min Summer	84.267	0.0	442.3	40
60 min Summer	54.074	0.0	567.9	68
120 min Summer	33.506	0.0	703.5	124
180 min Summer	24.949	0.0	786.2	180
240 min Summer	20.093	0.0	844.0	210
360 min Summer	14.773	0.0	930.4	274
480 min Summer	11.871	0.0	997.2	342
600 min Summer	10.010	0.0	1051.1	412
720 min Summer	8.703	0.0	1096.8	482
960 min Summer	6.973	0.0	1171.0	622
1440 min Summer	5.093	0.0	1283.3	872
2160 min Summer	3.711	0.0	1402.6	1224
2880 min Summer	2.961	0.0	1492.2	1560
15 min Winter	125.353	0.0	368.3	27
30 min Winter	84.267	0.0	495.5	40
60 min Winter	54.074	0.0	636.3	68
120 min Winter	33.506	0.0	787.9	122

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Cascade Summary of Results for Stubbington Tank May 20.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
180 min Winter	10.580	1.580	25.6	647.8	O K
240 min Winter	10.564	1.564	25.5	641.2	O K
360 min Winter	10.498	1.498	25.0	614.2	O K
480 min Winter	10.428	1.428	25.0	585.4	O K
600 min Winter	10.350	1.350	25.0	553.4	O K
720 min Winter	10.269	1.269	25.0	520.2	O K
960 min Winter	10.101	1.101	25.0	451.4	O K
1440 min Winter	9.709	0.709	25.0	290.8	O K
2160 min Winter	9.321	0.321	24.9	131.6	O K
2880 min Winter	9.145	0.145	23.2	59.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
180 min Winter	24.949	0.0	880.6	178
240 min Winter	20.093	0.0	945.3	230
360 min Winter	14.773	0.0	1042.3	288
480 min Winter	11.871	0.0	1117.1	366
600 min Winter	10.010	0.0	1177.3	444
720 min Winter	8.703	0.0	1228.4	522
960 min Winter	6.973	0.0	1312.0	674
1440 min Winter	5.093	0.0	1437.4	928
2160 min Winter	3.711	0.0	1571.2	1256
2880 min Winter	2.961	0.0	1671.4	1540

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Cascade Rainfall Details for Stubbington Tank May 20.srcx

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)	19.100	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.400

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:
0	4	0.450	4	8	0.450	8	12
						12	16
							0.200

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Cascade Model Details for Stubbington Tank May 20.srcx

Storage is Online Cover Level (m) 11.500

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	410.0	0.700	410.0	1.400	410.0	2.100	410.0
0.100	410.0	0.800	410.0	1.500	410.0	2.200	410.0
0.200	410.0	0.900	410.0	1.600	410.0	2.300	410.0
0.300	410.0	1.000	410.0	1.700	410.0	2.400	410.0
0.400	410.0	1.100	410.0	1.800	410.0	2.500	410.0
0.500	410.0	1.200	410.0	1.900	410.0		
0.600	410.0	1.300	410.0	2.000	410.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0211-2500-1600-2500
Design Head (m)	1.600
Design Flow (l/s)	25.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	211
Invert Level (m)	8.900
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	25.0
Flush-Flo™	0.484	25.0
Kick-Flo®	1.055	20.5
Mean Flow over Head Range	-	21.6

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	7.2	1.200	21.8	3.000	33.8	7.000	50.9
0.200	20.4	1.400	23.5	3.500	36.4	7.500	52.6
0.300	24.1	1.600	25.0	4.000	38.8	8.000	54.3
0.400	24.8	1.800	26.4	4.500	41.1	8.500	55.9
0.500	25.0	2.000	27.8	5.000	43.2	9.000	57.5
0.600	24.8	2.200	29.1	5.500	45.3	9.500	59.0
0.800	24.0	2.400	30.4	6.000	47.2		
1.000	21.7	2.600	31.5	6.500	49.1		

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Cascade Summary of Results for Stubbington South Pond May 20.srcx


Storm Event	Upstream Structures			Outflow To	Overflow To	Max Outflow (l/s)	Max Volume (m³)	Status
	Max Level (m)	Max Depth (m)	Max Control (l/s)	(None)	(None)			
15 min Summer	8.169	0.669	24.0	0.0	24.0	495.9	0 K	
30 min Summer	8.274	0.774	24.0	0.0	24.0	668.0	0 K	
60 min Summer	8.396	0.896	24.0	0.0	24.0	880.7	0 K	
120 min Summer	8.508	1.008	24.0	0.0	24.0	1091.2	0 K	
180 min Summer	8.564	1.064	24.0	0.0	24.0	1200.5	0 K	
240 min Summer	8.599	1.099	24.0	0.0	24.0	1271.7	0 K	
360 min Summer	8.645	1.145	24.0	0.0	24.0	1365.7	0 K	
480 min Summer	8.674	1.174	24.0	0.0	24.0	1424.5	0 K	
600 min Summer	8.691	1.191	24.0	0.0	24.0	1462.0	0 K	
720 min Summer	8.705	1.205	24.0	0.0	24.0	1491.7	0 K	
960 min Summer	8.731	1.231	24.0	0.0	24.0	1546.8	0 K	
1440 min Summer	8.732	1.232	24.0	0.0	24.0	1548.3	0 K	
2160 min Summer	8.685	1.185	24.0	0.0	24.0	1448.4	0 K	
2880 min Summer	8.625	1.125	24.0	0.0	24.0	1324.5	0 K	
15 min Winter	8.207	0.707	24.0	0.0	24.0	557.0	0 K	
30 min Winter	8.324	0.824	24.0	0.0	24.0	753.5	0 K	
60 min Winter	8.462	0.962	24.0	0.0	24.0	1003.2	0 K	
120 min Winter	8.573	1.073	24.0	0.0	24.0	1219.2	0 K	

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	125.353	0.0	810.3	0.0	191
30 min Summer	84.267	0.0	1090.0	0.0	285
60 min Summer	54.074	0.0	1399.3	0.0	390
120 min Summer	33.506	0.0	1733.5	0.0	492
180 min Summer	24.949	0.0	1936.8	0.0	554
240 min Summer	20.093	0.0	2079.9	0.0	604
360 min Summer	14.773	0.0	2293.2	0.0	690
480 min Summer	11.871	0.0	2457.2	0.0	768
600 min Summer	10.010	0.0	2590.1	0.0	844
720 min Summer	8.703	0.0	2702.5	0.0	914
960 min Summer	6.973	0.0	2886.5	0.0	1038
1440 min Summer	5.093	0.0	3162.2	0.0	1244
2160 min Summer	3.711	0.0	3456.2	0.0	1536
2880 min Summer	2.961	0.0	3677.9	0.0	1892
15 min Winter	125.353	0.0	907.5	0.0	223
30 min Winter	84.267	0.0	1221.0	0.0	328
60 min Winter	54.074	0.0	1567.3	0.0	438
120 min Winter	33.506	0.0	1941.4	0.0	544

Cascade Summary of Results for Stubbington South Pond May 20.srcx

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
180 min Winter	8.635	1.135	24.0	0.0	24.0	1344.7	O K
240 min Winter	8.676	1.176	24.0	0.0	24.0	1428.7	O K
360 min Winter	8.730	1.230	24.0	0.0	24.0	1544.2	O K
480 min Winter	8.765	1.265	24.0	0.0	24.0	1621.4	O K
600 min Winter	8.789	1.289	24.0	0.0	24.0	1674.2	O K
720 min Winter	8.805	1.305	24.0	0.0	24.0	1711.0	O K
960 min Winter	8.830	1.330	24.0	0.0	24.0	1767.0	O K
1440 min Winter	8.858	1.358	24.0	0.0	24.0	1831.0	O K
2160 min Winter	8.787	1.287	24.0	0.0	24.0	1670.5	O K
2880 min Winter	8.691	1.191	24.0	0.0	24.0	1461.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
180 min Winter	24.949	0.0	2169.0	0.0	610
240 min Winter	20.093	0.0	2328.9	0.0	662
360 min Winter	14.773	0.0	2569.0	0.0	748
480 min Winter	11.871	0.0	2752.1	0.0	826
600 min Winter	10.010	0.0	2901.3	0.0	898
720 min Winter	8.703	0.0	3027.0	0.0	968
960 min Winter	6.973	0.0	3233.2	0.0	1096
1440 min Winter	5.093	0.0	3542.4	0.0	1312
2160 min Winter	3.711	0.0	3872.7	0.0	1604
2880 min Winter	2.961	0.0	4118.8	0.0	2044

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Cascade Rainfall Details for Stubbington South Pond May 20.srcx

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)	19.100	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.050

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area				
From:	To:	From:	To:	From:	To:	From:	To:				
0	4	0.750	4	8	0.600	8	12	0.450	12	16	0.250

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Cascade Model Details for Stubbington South Pond May 20.srcx

Storage is Online Cover Level (m) 9.000

Tank or Pond Structure

Invert Level (m) 7.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	341.3	0.700	1606.5	1.400	2357.3	2.100	5250.0
0.100	367.5	0.800	1711.5	1.500	2467.5	2.200	5250.0
0.200	388.5	0.900	1821.8	1.600	5250.0	2.300	5250.0
0.300	420.0	1.000	1926.8	1.700	5250.0	2.400	5250.0
0.400	451.5	1.100	2021.3	1.800	5250.0	2.500	5250.0
0.500	1396.5	1.200	2126.3	1.900	5250.0		
0.600	1501.5	1.300	2252.3	2.000	5250.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0208-2400-1525-2400
Design Head (m)	1.525
Design Flow (l/s)	24.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	208
Invert Level (m)	7.400
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.525	24.0
Flush-Flo™	0.462	24.0
Kick-Flo®	1.011	19.7
Mean Flow over Head Range	-	20.7

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	7.1	1.200	21.4	3.000	33.2	7.000	49.9
0.200	20.0	1.400	23.0	3.500	35.7	7.500	51.6
0.300	23.2	1.600	24.5	4.000	38.1	8.000	53.3
0.400	23.9	1.800	26.0	4.500	40.3	8.500	54.9
0.500	24.0	2.000	27.3	5.000	42.4	9.000	56.4
0.600	23.7	2.200	28.6	5.500	44.4	9.500	57.9
0.800	22.8	2.400	29.8	6.000	46.4		
1.000	20.0	2.600	31.0	6.500	48.2		

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Innovyze	Source Control 2019.1	

Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 8.950