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7 St James Crescent Swansea Wales SA1 6DP	C1701 Wales and West Utilities Depot Attenuation Tank 100yr +40%	
Date 01/03/2023 File C1701 - Attenuation Tan...	Designed by DH Checked by DF	
XP Solutions	Source Control 2020.1.3	

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

Half Drain Time : 843 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	54.462	0.762	0.0	5.7	5.7	217.2	O K
30 min Summer	54.705	1.005	0.0	5.7	5.7	286.5	O K
60 min Summer	54.951	1.251	0.0	5.7	5.7	356.4	O K
120 min Summer	55.177	1.477	0.0	5.7	5.7	420.8	O K
180 min Summer	55.284	1.584	0.0	5.8	5.8	451.3	O K
240 min Summer	55.340	1.640	0.0	5.9	5.9	467.4	O K
360 min Summer	55.398	1.698	0.0	6.0	6.0	483.9	O K
480 min Summer	55.411	1.711	0.0	6.0	6.0	487.6	O K
600 min Summer	55.399	1.699	0.0	6.0	6.0	484.3	O K
720 min Summer	55.380	1.680	0.0	6.0	6.0	478.8	O K
960 min Summer	55.339	1.639	0.0	5.9	5.9	467.1	O K
1440 min Summer	55.252	1.552	0.0	5.8	5.8	442.2	O K
2160 min Summer	55.126	1.426	0.0	5.7	5.7	406.5	O K
2880 min Summer	55.008	1.308	0.0	5.7	5.7	372.9	O K
4320 min Summer	54.784	1.084	0.0	5.7	5.7	308.8	O K
5760 min Summer	54.522	0.822	0.0	5.7	5.7	234.4	O K
7200 min Summer	54.316	0.616	0.0	5.7	5.7	175.7	O K
8640 min Summer	54.170	0.470	0.0	5.7	5.7	134.1	O K
10080 min Summer	54.066	0.366	0.0	5.7	5.7	104.2	O K
15 min Winter	54.555	0.855	0.0	5.7	5.7	243.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	137.777	0.0	219.0	19
30 min Summer	91.507	0.0	290.7	34
60 min Summer	57.877	0.0	371.2	64
120 min Summer	35.291	0.0	452.7	122
180 min Summer	26.021	0.0	500.7	182
240 min Summer	20.831	0.0	534.4	242
360 min Summer	15.245	0.0	586.5	362
480 min Summer	12.196	0.0	625.5	480
600 min Summer	10.250	0.0	656.9	594
720 min Summer	8.888	0.0	683.4	642
960 min Summer	7.091	0.0	726.3	762
1440 min Summer	5.149	0.0	787.5	1024
2160 min Summer	3.732	0.0	863.7	1448
2880 min Summer	2.966	0.0	915.3	1848
4320 min Summer	2.143	0.0	991.3	2680
5760 min Summer	1.699	0.0	1049.5	3408
7200 min Summer	1.419	0.0	1095.0	4104
8640 min Summer	1.225	0.0	1134.3	4760
10080 min Summer	1.082	0.0	1168.5	5440
15 min Winter	137.777	0.0	245.3	19


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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	54.829	1.129	0.0	5.7	5.7	321.7	O K
60 min Winter	55.106	1.406	0.0	5.7	5.7	400.6	O K
120 min Winter	55.365	1.665	0.0	6.0	6.0	474.6	O K
180 min Winter	55.491	1.791	0.0	6.2	6.2	510.6	O K
240 min Winter	55.561	1.861	0.0	6.3	6.3	530.4	O K
360 min Winter	55.639	1.939	0.0	6.4	6.4	552.7	O K
480 min Winter	55.667	1.967	0.0	6.4	6.4	560.6	O K
<b>600 min Winter</b>	<b>55.668</b>	<b>1.968</b>	<b>0.0</b>	<b>6.4</b>	<b>6.4</b>	<b>560.8</b>	<b>O K</b>
720 min Winter	55.652	1.952	0.0	6.4	6.4	556.2	O K
960 min Winter	55.594	1.894	0.0	6.3	6.3	539.9	O K
1440 min Winter	55.487	1.787	0.0	6.2	6.2	509.3	O K
2160 min Winter	55.310	1.610	0.0	5.9	5.9	458.8	O K
2880 min Winter	55.135	1.435	0.0	5.7	5.7	409.0	O K
4320 min Winter	54.796	1.096	0.0	5.7	5.7	312.4	O K
5760 min Winter	54.390	0.690	0.0	5.7	5.7	196.6	O K
7200 min Winter	54.136	0.436	0.0	5.7	5.7	124.2	O K
8640 min Winter	53.989	0.289	0.0	5.5	5.5	82.4	O K
10080 min Winter	53.906	0.206	0.0	5.1	5.1	58.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	91.507	0.0	325.1	33
60 min Winter	57.877	0.0	415.7	62
120 min Winter	35.291	0.0	507.0	122
180 min Winter	26.021	0.0	560.7	180
240 min Winter	20.831	0.0	598.5	238
360 min Winter	15.245	0.0	656.8	352
480 min Winter	12.196	0.0	700.3	466
<b>600 min Winter</b>	<b>10.250</b>	<b>0.0</b>	<b>735.4</b>	<b>576</b>
720 min Winter	8.888	0.0	764.7	684
960 min Winter	7.091	0.0	812.0	808
1440 min Winter	5.149	0.0	870.7	1094
2160 min Winter	3.732	0.0	967.4	1556
2880 min Winter	2.966	0.0	1025.1	2016
4320 min Winter	2.143	0.0	1110.2	2896
5760 min Winter	1.699	0.0	1175.4	3576
7200 min Winter	1.419	0.0	1226.5	4184
8640 min Winter	1.225	0.0	1270.5	4760
10080 min Winter	1.082	0.0	1309.0	5440

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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)	20.400	Shortest Storm (mins)	15
Ratio R	0.373	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.858

Time (mins)		Area
From:	To:	(ha)
0	4	0.858

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Model Details

Storage is Online Cover Level (m) 56.700

Cellular Storage Structure

Invert Level (m) 53.700 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	300.0	300.0	1.300	300.0	390.1
0.100	300.0	306.9	1.400	300.0	397.0
0.200	300.0	313.9	1.500	300.0	403.9
0.300	300.0	320.8	1.600	300.0	410.9
0.400	300.0	327.7	1.700	300.0	417.8
0.500	300.0	334.6	1.800	300.0	424.7
0.600	300.0	341.6	1.900	300.0	431.6
0.700	300.0	348.5	2.000	300.0	438.6
0.800	300.0	355.4	2.001	0.0	438.6
0.900	300.0	362.4	2.200	0.0	438.6
1.000	300.0	369.3	2.300	0.0	438.6
1.100	300.0	376.2	2.400	0.0	438.6
1.200	300.0	383.1	2.500	0.0	438.6

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0105-6500-2000-6500  
 Design Head (m) 2.000  
 Design Flow (l/s) 6.5  
 Flush-Flo™ Calculated  
 Objective Minimise upstream storage  
 Application Surface  
 Sump Available Yes  
 Diameter (mm) 105  
 Invert Level (m) 53.700  
 Minimum Outlet Pipe Diameter (mm) 150  
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	6.5
Flush-Flo™	0.459	5.7
Kick-Flo®	0.937	4.6
Mean Flow over Head Range	-	5.3

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

7 St James Crescent  
Swansea  
Wales SA1 6DP

C1701 Wales and West  
Utilities Depot  
Attenuation Tank 100yr +40%



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Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	5.1	3.000	7.9	7.000	11.7
0.200	5.1	1.400	5.5	3.500	8.4	7.500	12.1
0.300	5.5	1.600	5.8	4.000	9.0	8.000	12.5
0.400	5.7	1.800	6.2	4.500	9.5	8.500	12.9
0.500	5.7	2.000	6.5	5.000	10.0	9.000	13.2
0.600	5.6	2.200	6.8	5.500	10.5	9.500	13.6
0.800	5.3	2.400	7.1	6.000	10.9		
1.000	4.7	2.600	7.3	6.500	11.3		