BARRETT **MAHONY**
CIVIL & STRUCTURAL
CONSULTING ENGINEERS

Surface Water Design Report

Project:

Citywest Apartments

Project Citywest Apartments

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1. INTRODUCTION

The report provides an overview the surface water design for the residential development at Citywest.

2. OVERVIEW OF SURFACE WATER DESIGN

- The principles of the surface water network design are outlined in DBFL Consulting Engineers' Infrastructure Report, prepared at planning stage which was submitted with the parent permission application documentation (ABP Ref. ABP-305556-19).
- The SW network has been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the Department of the Environment's Recommendations for Site Development Works for Housing Areas, the Department of the Environments' Building Regulations "Technical Guidance Documents Part H Drainage and Wastewater Disposal" and BS EN 752:2008 Drain and Sewer systems Outside Buildings.
- The site has been divided into four catchments, each discharging into the existing SW network at a different manhole.
- Surface water is collected via conventional road gullies, tree pits and green roofs prior to discharging via below ground pipework.
- Each catchment is attenuated for a 1 in 100 year storm (+10% climate change) using below ground 'Stormtech' systems.
- As the catchments are relatively small, the outflows have been limited to 2 l/s using a vortex flow control device (e.g. 'Hydrobrake' or similar).
- SuDS measures such as tree pits, green roofs and infiltration trenches have been incorporated.

2.1 SW Drainage Considerations due to Compliance Submissions and the Proposed Development

- In order to comply with conditions 2, 3, 4 and 6 attached to the parent permission for the development, a revised layout was submitted and agreed with the Planning Authority. This revised layout included the provision of a though connection with Carrigmore Green, together with alterations to the car parking and road layout to the south and west of Block D. This has resulted in a nominal increase in hardstanding.
- There is a slight reduction in green roofing to make room for the proposed roof top plantrooms.
- The catchments have been altered slightly to reflect the most recent drainage arrangement.
- See figure 1 below.

2.2 Design Criteria

- Return Period for Pipe Design — 5 years
- Return Period for Attenuation Design — 100 years
- Soil Type — 2
- Allowable Outflow — 2.0 l/s
- Time of Entry — 4 minutes
- M5-60 — 18.5 mm
- Ratio "R" — 0.20
- Pipe Friction (Ks) — 0.6 mm
- Minimum Velocity — 1.0 m/s
- Volumetric Run-off Coefficient (CV) — 1.00
- Climate Change — 10%

2.3 Breakdown of Hardstanding, Landscaping and Green Roofing Areas

Table 2.1 – Drainage areas

		Catchment A		Catchment B		Catchment C		Catchment D		Totals m²	
	Factors	Gross Areas (m²)	Factored Areas (m²)	Gross Areas (m²)	Factored Areas (m²)	Gross Areas (m²)	Factored Areas (m²)	Gross Areas (m²)	Factored Areas (m²)	Gross Areas (m²)	Factored Areas (m²)
Green roofs	0.75	3536	2652	1897	1422	652	489	444	333	6530	4898
Paved areas	0.80	3050	2441	3242	2593	1204	963	1305	1044	8802	7043
Permeable Paving	0.50	986	492	779	389	67	34	0	0	1832	916
Soft landscaping	0.15	2018	302	466	70	641	96	699	104	3825	574
		9590	**5890**	**6385**	**4476**	**2565**	**1582**	**2449**	**1482**	**20990**	**13430**

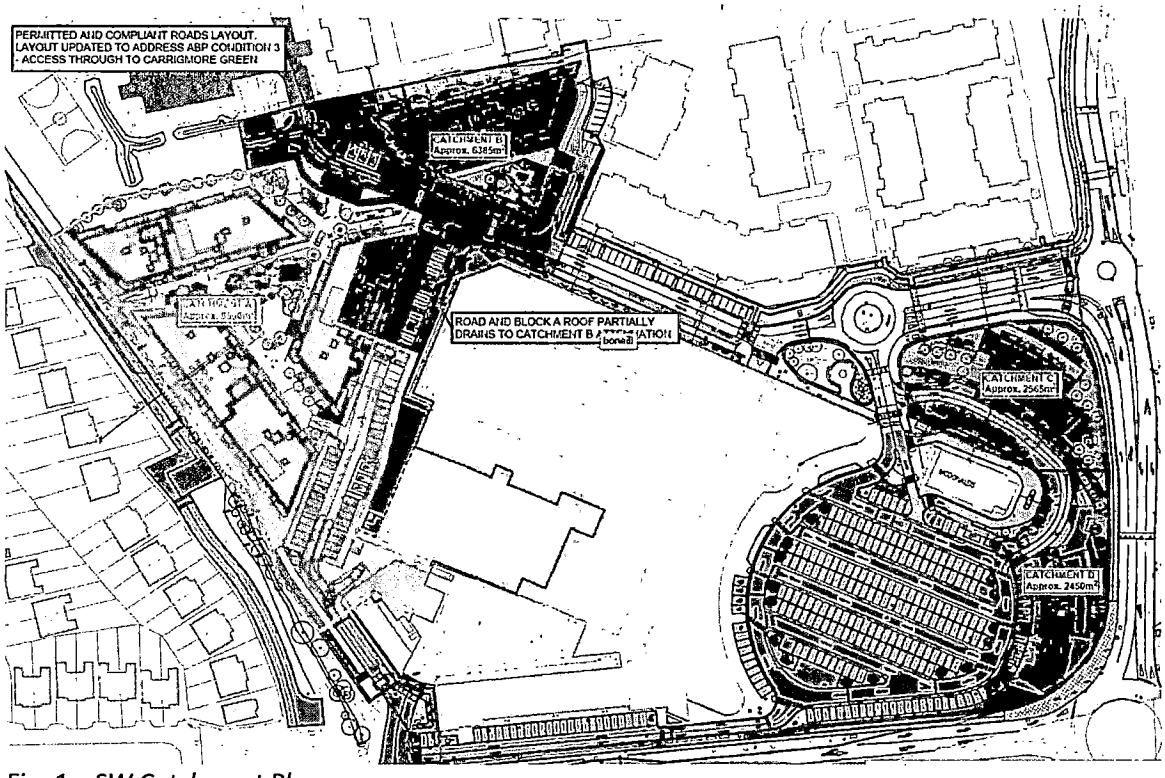


Fig. 1 – SW Catchment Plan

2.4 Attenuation Tank Sizes

Table 2.2 – Attenuation Tank Sizes

Catchment	**Storage System Type**	**Total Catchment Area (Ha)**	**Allowable Outflow (Max.)**	**Storage Volume Provided (m^3) for 1-in-100 year event**
A	Stormtech Type	0.959	2.00 l/s	455
B	Stormtech Type	0.6385	2.00 l/s	122
C	Stormtech Type	0.2565	2.00 l/s	69
D	Stormtech Type	0.2449	2.00 l/s	60
Total		**2.099**		**706**

APPENDIX A

CAUSEWAY FLOW SURFACE WATER CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S1.1.1	0.059	4.00	118.231	1200	1.455
SA-1.0	0.051	4.00	118.131	1200	1.709
S6.0	0.034	4.00	118.154	1200	1.520
S6.2	0.047	4.00	118.200	1200	1.211
S6.1	0.049	4.00	118.177	1200	1.490
S7.0	0.000	4.00	115.950	1200	1.162
S7.1	0.045		116.437	1200	2.109
S1.1	0.012	4.00	118.108	1200	1.767
S1.2	0.014	4.00	118.085	1200	1.912
S1.3	0.014	4.00	118.062	1200	2.019
S1.4	0.045	4.00	118.020	1200	2.041
S1.4.2	0.043	4.00	118.200	1200	1.384
S1.4.1	0.022	4.00	118.110	1200	1.588
S1.5.2	0.008	4.00	118.650	1200	1.925
S1.5.1	0.048	4.00	118.300	1200	2.278
S1.6	0.024	4.00	117.600	1200	2.180
S1.5	0.035	4.00	117.950	1200	2.530
S2.0	0.016	4.00	118.032	1200	1.332
S2.1	0.008	4.00	118.150	1200	2.560
S2.2	0.003	4.00	118.100	1200	2.680
S1.7	0.013	4.00	117.250	1200	2.000
TANK A	0.000		118.100	1200	2.680
EX.S	0.000		116.919	1200	1.869

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
6.000	S7.0	S7.1	28.273	0.600	114.788	114.328	0.460	61.5	300	4.23	50.0
1.000	S6.2	S6.1	46.150	0.600	116.989	116.687	0.302	152.8	300	4.61	50.0
1.001	S6.1	S6.0	9.453	0.600	116.687	116.634	0.053	178.4	300	4.74	50.0
1.002	S6.0	SA-1.0	32.410	0.600	116.634	116.422	0.212	152.9	300	5.17	50.0
2.000	S1.1.1	SA-1.0	25.416	0.600	116.776	116.422	0.354	71.8	300	4.23	50.0
1.003	SA-1.0	S1.1	13.485	0.600	116.422	116.341	0.081	166.5	300	5.35	50.0
1.004	S1.1	S1.2	26.520	0.600	116.341	116.173	0.168	157.9	300	5.70	50.0
1.005	S1.2	S1.3	21.026	0.600	116.173	116.043	0.130	161.7	300	5.99	50.0
1.006	S1.3	S1.4	11.277	0.600	116.043	115.979	0.064	176.2	300	6.15	50.0
3.000	S1.4.2	S1.4.1	22.280	0.600	116.816	116.522	0.294	75.8	300	4.21	50.0
3.001	S1.4.1	S1.4	38.029	0.600	116.522	115.979	0.543	70.0	300	4.54	50.0
1.007	S1.4	S1.5	26.194	0.600	115.979	115.613	0.366	71.6	300	6.38	50.0
4.000	S1.5.2	S1.5.1	49.426	0.600	116.725	116.022	0.703	70.3	300	4.44	50.0
4.001	S1.5.1	S1.5	29.866	0.600	116.022	115.420	0.602	49.6	300	4.66	50.0
5.000	S1.2	S2.0	4.130	0.600	116.173	116.700	-0.527	-7.8	300	4.07	50.0
5.001	S2.0	S2.1	24.589	0.600	116.700	115.590	1.110	22.2	300	4.19	50.0
5.002	S2.1	TANK A	1.000	0.600	115.590	115.420	0.170	5.9	300	4.19	50.0
5.003	TANK A	S2.2	2.625	0.600	115.420	115.420	0.000	0.0	300	4.24	50.0
5.004	S2.2	S1.5	5.956	0.600	115.420	115.420	0.000	0.0	300	4.34	50.0
1.008	S1.5	S1.6	4.277	0.600	115.420	115.420	0.000	0.0	300	6.45	50.0
1.009	S1.6	S1.7	29.846	0.600	115.420	115.250	0.170	175.6	300	6.87	50.0
1.010	S1.7	EX.S	32.897	0.600	115.250	115.050	0.200	164.5	300	7.32	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
6.000	2.009	142.0	0.0	0.862	1.809	0.000	0.0	0	0.000
1.000	1.269	89.7	8.5	0.911	1.190	0.047	0.0	62	0.805
1.001	1.174	83.0	17.3	1.190	1.220	0.096	0.0	93	0.934
1.002	1.269	89.7	23.5	1.220	1.409	0.130	0.0	105	1.074
2.000	1.857	131.3	10.7	1.155	1.409	0.059	0.0	57	1.127
1.003	1.215	85.9	43.4	1.409	1.467	0.240	0.0	151	1.218
1.004	1.249	88.3	45.5	1.467	1.612	0.252	0.0	153	1.257
1.005	1.233	87.2	48.1	1.612	1.719	0.266	0.0	159	1.262
1.006	1.181	83.5	50.6	1.719	1.741	0.280	0.0	168	1.235
3.000	1.808	127.8	7.8	1.084	1.288	0.043	0.0	50	1.007
3.001	1.881	132.9	11.7	1.288	1.741	0.065	0.0	60	1.176
1.007	1.860	131.5	70.5	1.741	2.037	0.390	0.0	156	1.890
4.000	1.877	132.7	1.4	1.625	1.978	0.008	0.0	22	0.626
4.001	2.237	158.1	10.1	1.978	2.230	0.056	0.0	51	1.274
5.000	1.000	70.7	0.0	1.612	1.032	0.000	0.0	0	0.000
5.001	3.354	237.1	2.9	1.032	2.260	0.016	0.0	23	1.164
5.002	6.522	461.0	4.3	2.260	2.380	0.024	0.0	20	2.079
5.003	1.000	70.7	4.3	2.380	2.380	0.024	0.0	0	∞
5.004	1.000	70.7	4.9	2.380	2.230	0.027	0.0	0	∞
1.008	1.000	70.7	91.8	2.230	1.880	0.508	0.0	0	∞
1.009	1.183	83.6	96.1	1.880	1.700	0.532	0.0	300	1.199
1.010	1.223	86.4	98.5	1.700	1.569	0.545	0.0	300	1.239

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
6.000	28.273	61.5	300	Circular	115.950	114.788	0.862	116.437	114.328	1.809
1.000	46.150	152.8	300	Circular	118.200	116.989	0.911	118.177	116.687	1.190
1.001	9.453	178.4	300	Circular	118.177	116.687	1.190	118.154	116.634	1.220
1.002	32.410	152.9	300	Circular	118.154	116.634	1.220	118.131	116.422	1.409
2.000	25.416	71.8	300	Circular	118.231	116.776	1.155	118.131	116.422	1.409
1.003	13.485	166.5	300	Circular	118.131	116.422	1.409	118.108	116.341	1.467
1.004	26.520	157.9	300	Circular	118.108	116.341	1.467	118.085	116.173	1.612
1.005	21.026	161.7	300	Circular	118.085	116.173	1.612	118.062	116.043	1.719
1.006	11.277	176.2	300	Circular	118.062	116.043	1.719	118.020	115.979	1.741
3.000	22.280	75.8	300	Circular	118.200	116.816	1.084	118.110	116.522	1.288
3.001	38.029	70.0	300	Circular	118.110	116.522	1.288	118.020	115.979	1.741
1.007	26.194	71.6	300	Circular	118.020	115.979	1.741	117.950	115.613	2.037
4.000	49.426	70.3	300	Circular	118.650	116.725	1.625	118.300	116.022	1.978
4.001	29.866	49.6	300	Circular	118.300	116.022	1.978	117.950	115.420	2.230
5.000	4.130	-7.8	300	Circular	118.085	116.173	1.612	118.032	116.700	1.032
5.001	24.589	22.2	300	Circular	118.032	116.700	1.032	118.150	115.590	2.260
5.002	1.000	5.9	300	Circular	118.150	115.590	2.260	118.100	115.420	2.380
5.003	2.625	0.0	300	Circular	118.100	115.420	2.380	118.100	115.420	2.380
5.004	5.956	0.0	300	Circular	118.100	115.420	2.380	117.950	115.420	2.230
1.008	4.277	0.0	300	Circular	117.950	115.420	2.230	117.600	115.420	1.880
1.009	29.846	175.6	300	Circular	117.600	115.420	1.880	117.250	115.250	1.700
1.010	32.897	164.5	300	Circular	117.250	115.250	1.700	116.919	115.050	1.569

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
6.000	S7.0	1200	Manhole	Adoptable	S7.1	1200	Manhole	Adoptable
1.000	S6.2	1200	Manhole	Adoptable	S6.1	1200	Manhole	Adoptable
1.001	S6.1	1200	Manhole	Adoptable	S6.0	1200	Manhole	Adoptable
1.002	S6.0	1200	Manhole	Adoptable	SA-1.0	1200	Manhole	Adoptable
2.000	S1.1.1	1200	Manhole	Adoptable	SA-1.0	1200	Manhole	Adoptable
1.003	SA-1.0	1200	Manhole	Adoptable	S1.1	1200	Manhole	Adoptable
1.004	S1.1	1200	Manhole	Adoptable	S1.2	1200	Manhole	Adoptable
1.005	S1.2	1200	Manhole	Adoptable	S1.3	1200	Manhole	Adoptable
1.006	S1.3	1200	Manhole	Adoptable	S1.4	1200	Manhole	Adoptable
3.000	S1.4.2	1200	Manhole	Adoptable	S1.4.1	1200	Manhole	Adoptable
3.001	S1.4.1	1200	Manhole	Adoptable	S1.4	1200	Manhole	Adoptable
1.007	S1.4	1200	Manhole	Adoptable	S1.5	1200	Manhole	Adoptable
4.000	S1.5.2	1200	Manhole	Adoptable	S1.5.1	1200	Manhole	Adoptable
4.001	S1.5.1	1200	Manhole	Adoptable	S1.5	1200	Manhole	Adoptable
5.000	S1.2	1200	Manhole	Adoptable	S2.0	1200	Manhole	Adoptable
5.001	S2.0	1200	Manhole	Adoptable	S2.1	1200	Manhole	Adoptable
5.002	S2.1	1200	Manhole	Adoptable	TANK A	1200	Manhole	Adoptable
5.003	TANK A	1200	Manhole	Adoptable	S2.2	1200	Manhole	Adoptable
5.004	S2.2	1200	Manhole	Adoptable	S1.5	1200	Manhole	Adoptable
1.008	S1.5	1200	Manhole	Adoptable	S1.6	1200	Manhole	Adoptable
1.009	S1.6	1200	Manhole	Adoptable	S1.7	1200	Manhole	Adoptable
1.010	S1.7	1200	Manhole	Adoptable	EX.S	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1.1.1	118.231	1.455	1200	0	2.000	116.776	300
SA-1.0	118.131	1.709	1200	1	2.000	116.422	300
				2	1.002	116.422	300
				0	1.003	116.422	300
S6.0	118.154	1.520	1200	1	1.001	116.634	300
				0	1.002	116.634	300
S6.2	118.200	1.211	1200	0	1.000	116.989	300
S6.1	118.177	1.490	1200	1	1.000	116.687	300
				0	1.001	116.687	300
S7.0	115.950	1.162	1200	0	6.000	114.788	300
S7.1	116.437	2.109	1200	1	6.000	114.328	300
S1.1	118.108	1.767	1200	1	1.003	116.341	300
				0	1.004	116.341	300
S1.2	118.085	1.912	1200	1	1.004	116.173	300
				0-1	1.005	116.173	300
				0-2	5.000	116.173	300
S1.3	118.062	2.019	1200	1	1.005	116.043	300
				0	1.006	116.043	300
S1.4	118.020	2.041	1200	1	3.001	115.979	300
				2	1.006	115.979	300
				0	1.007	115.979	300
S1.4.2	118.200	1.384	1200	0	3.000	116.816	300
S1.4.1	118.110	1.588	1200	1	3.000	116.522	300
				0	3.001	116.522	300

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1.5.2	118.650	1.925	1200	0	4.000	116.725	300
S1.5.1	118.300	2.278	1200	1	4.000	116.022	300
				0	4.001	116.022	300
S1.6	117.600	2.180	1200	1	1.008	115.420	300
				0	1.009	115.420	300
S1.5	117.950	2.530	1200	1	5.004	115.420	300
				2	4.001	115.420	300
				3	1.007	115.613	300
				0	1.008	115.420	300
S2.0	118.032	1.332	1200	1	5.000	116.700	300
				0	5.001	116.700	300
S2.1	118.150	2.560	1200	1	5.001	115.590	300
				0	5.002	115.590	300
S2.2	118.100	2.680	1200	1	5.003	115.420	300
				0	5.004	115.420	300
S1.7	117.250	2.000	1200	1	1.009	115.250	300
				0	1.010	115.250	300
TANK A	118.100	2.680	1200	1	5.002	115.420	300
				0	5.003	115.420	300
EX.S	116.919	1.869	1200	1	1.010	115.050	300

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	Scotland and Ireland	Drain Down Time (mins)	360
M5-60 (mm)	18.500	Additional Storage (m³/ha)	20.0
Ratio-R	0.200	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	10	0	0
30	10	0	0
100	10	0	0

Node S1.5 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	115.420	Product Number	CTL-SHE-0054-2000-2500-2000
Design Depth (m)	2.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node TANK A Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	115.420
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	312.0	0.0	1.450	312.0	0.0	1.451	0.0	0.0

Results for 5 year +10% CC Critical Storm Duration. Lowest mass balance: 84.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1.1.1	10	116.846	0.070	16.0	0.1362	0.0000	OK
10080 minute summer	SA-1.0	6480	116.704	0.282	2.9	0.4872	0.0000	OK
15 minute summer	S6.0	10	116.761	0.127	34.6	0.1996	0.0000	OK
15 minute summer	S6.2	10	117.064	0.075	12.7	0.1435	0.0000	OK
15 minute summer	S6.1	10	116.815	0.128	25.9	0.2288	0.0000	OK
15 minute summer	S7.0	1	114.788	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S7.1	1	114.328	0.000	12.2	0.0000	0.0000	OK
10080 minute summer	S1.1	6480	116.704	0.363	3.0	0.4597	0.0000	SURCHARGED
10080 minute summer	S1.2	6480	116.704	0.530	3.3	0.6774	0.0000	SURCHARGED
10080 minute summer	S1.3	6480	116.703	0.660	3.5	0.8387	0.0000	SURCHARGED
10080 minute summer	S1.4	6480	116.704	0.725	4.7	1.1391	0.0000	SURCHARGED
15 minute summer	S1.4.2	10	116.877	0.061	11.7	0.1071	0.0000	OK
10080 minute summer	S1.4.1	6480	116.704	0.182	1.1	0.2564	0.0000	OK
15 minute summer	S1.5.2	10	116.752	0.026	2.2	0.0321	0.0000	OK
10080 minute summer	S1.5.1	6480	116.704	0.682	1.4	1.0587	0.0000	SURCHARGED
15 minute summer	S1.6	10	115.481	0.061	7.7	0.0821	0.0000	OK
10080 minute summer	S1.5	6480	116.704	1.284	5.5	1.8073	0.0000	SURCHARGED
15 minute summer	S2.0	10	116.718	0.018	4.3	0.0243	0.0000	OK
10080 minute summer	S2.1	6480	116.704	1.114	0.2	1.3286	0.0000	SURCHARGED
10080 minute summer	S2.2	6420	116.710	1.290	4.5	1.4872	0.0000	SURCHARGED
15 minute summer	S1.7	10	115.324	0.074	11.2	0.0927	0.0000	OK
10080 minute summer	TANK A	6480	116.703	1.283	4.2	401.7812	0.0000	SURCHARGED
15 minute summer	EX.S	10	115.122	0.071	11.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1.1.1	2.000	SA-1.0	16.0	0.560	0.122	0.8712	
10080 minute summer	SA-1.0	1.003	S1.1	2.9	0.562	0.034	0.9381	
15 minute summer	S6.0	1.002	SA-1.0	34.0	0.821	0.379	1.3731	
15 minute summer	S6.2	1.000	S6.1	12.6	0.603	0.141	0.9792	
15 minute summer	S6.1	1.001	S6.0	25.4	0.893	0.306	0.2687	
15 minute summer	S7.0	6.000	S7.1	0.0	0.000	0.000	0.0000	0.0
10080 minute summer	S1.1	1.004	S1.2	3.0	0.564	0.034	1.8675	
10080 minute summer	S1.2	1.005	S1.3	3.3	0.561	0.038	1.4806	
10080 minute summer	S1.2	5.000	S2.0	-0.1	-0.066	-0.002	0.1458	
10080 minute summer	S1.3	1.006	S1.4	3.4	0.575	0.041	0.7941	
10080 minute summer	S1.4	1.007	S1.5	4.6	0.717	0.035	1.8446	
15 minute summer	S1.4.2	3.000	S1.4.1	11.7	0.999	0.092	0.2625	
10080 minute summer	S1.4.1	3.001	S1.4	1.2	0.231	0.009	2.1897	
15 minute summer	S1.5.2	4.000	S1.5.1	2.1	0.279	0.016	1.4838	
10080 minute summer	S1.5.1	4.001	S1.5	-1.2	0.074	-0.008	2.1031	
15 minute summer	S1.6	1.009	S1.7	7.7	0.653	0.092	0.3514	
10080 minute summer	S1.5	Hydro-Brake®	S1.6	1.5				
15 minute summer	S2.0	5.001	S2.1	1.6	0.853	0.007	0.0556	
10080 minute summer	S2.1	5.002	TANK A	0.2	0.004	0.001	0.0704	
10080 minute summer	S2.2	5.004	S1.5	-4.5	-0.128	-0.064	0.4194	
15 minute summer	S1.7	1.010	EX.S	11.0	0.838	0.127	0.4309	26.9
10080 minute summer	TANK A	5.003	S2.2	-4.2	-0.216	-0.059	0.1849	

Results for 30 year +10% CC Critical Storm Duration. Lowest mass balance: 84.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1.1.1	12	116.960	0.184	23.5	0.3581	0.0000	OK
15 minute summer	SA-1.0	12	116.951	0.529	86.8	0.9134	0.0000	SURCHARGED
15 minute summer	S6.0	11	117.011	0.377	46.6	0.5950	0.0000	SURCHARGED
15 minute summer	S6.2	10	117.081	0.092	18.7	0.1750	0.0000	OK
15 minute summer	S6.1	11	117.004	0.317	38.1	0.5668	0.0000	SURCHARGED
15 minute summer	S7.0	1	114.788	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S7.1	1	114.328	0.000	17.9	0.0000	0.0000	OK
15 minute summer	S1.1	11	116.885	0.544	79.8	0.6891	0.0000	SURCHARGED
8640 minute summer	S1.2	5520	116.875	0.702	4.6	0.8962	0.0000	SURCHARGED
4320 minute summer	S1.3	2940	116.874	0.831	6.6	1.0551	0.0000	SURCHARGED
10080 minute summer	S1.4	6120	116.874	0.895	5.7	1.4068	0.0000	SURCHARGED
15 minute summer	S1.4.2	10	116.891	0.075	17.1	0.1306	0.0000	OK
8640 minute summer	S1.4.1	5520	116.874	0.352	1.7	0.4950	0.0000	SURCHARGED
8640 minute summer	S1.5.2	4980	116.876	0.151	0.5	0.1832	0.0000	OK
10080 minute summer	S1.5.1	6300	116.873	0.851	1.0	1.3213	0.0000	SURCHARGED
15 minute summer	S1.6	10	115.492	0.072	10.8	0.0976	0.0000	OK
4320 minute summer	S1.5	2940	116.876	1.456	11.1	2.0506	0.0000	SURCHARGED
8640 minute summer	S2.0	5520	116.873	0.173	2.9	0.2375	0.0000	OK
10080 minute summer	S2.1	6240	116.878	1.288	4.7	1.5368	0.0000	SURCHARGED
8640 minute summer	S2.2	5340	116.880	1.460	6.4	1.6833	0.0000	SURCHARGED
15 minute summer	S1.7	10	115.339	0.089	16.0	0.1122	0.0000	OK
4320 minute summer	TANK A	2760	116.871	1.451	9.9	454.1894	0.0000	SURCHARGED
15 minute summer	EX.S	10	115.136	0.086	15.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1.1.1	2.000	SA-1.0	22.8	0.595	0.174	1.4720	
15 minute summer	SA-1.0	1.003	S1.1	75.0	1.205	0.873	0.9496	
15 minute summer	S6.0	1.002	SA-1.0	45.6	0.863	0.508	2.2823	
15 minute summer	S6.2	1.000	S6.1	18.6	0.660	0.208	2.0110	
15 minute summer	S6.1	1.001	S6.0	34.0	0.949	0.409	0.6657	
15 minute summer	S7.0	6.000	S7.1	0.0	0.000	0.000	0.0000	0.0
15 minute summer	S1.1	1.004	S1.2	75.6	1.109	0.857	1.8675	
8640 minute summer	S1.2	1.005	S1.3	4.4	0.592	0.051	1.4806	
8640 minute summer	S1.2	5.000	S2.0	2.8	-0.066	0.040	0.2329	
4320 minute summer	S1.3	1.006	S1.4	6.5	0.664	0.078	0.7941	
10080 minute summer	S1.4	1.007	S1.5	5.6	0.709	0.043	1.8446	
15 minute summer	S1.4.2	3.000	S1.4.1	17.2	1.105	0.134	0.4748	
8640 minute summer	S1.4.1	3.001	S1.4	1.8	0.238	0.013	2.6780	
8640 minute summer	S1.5.2	4.000	S1.5.1	-0.4	0.172	-0.003	2.6172	
10080 minute summer	S1.5.1	4.001	S1.5	1.1	0.055	0.007	2.1031	
15 minute summer	S1.6	1.009	S1.7	10.8	0.710	0.129	0.4550	
4320 minute summer	S1.5	Hydro-Brake®	S1.6	1.6				
8640 minute summer	S2.0	5.001	S2.1	3.0	0.115	0.013	1.3840	
10080 minute summer	S2.1	5.002	TANK A	6.2	0.088	0.013	0.0704	
8640 minute summer	S2.2	5.004	S1.5	-6.4	-0.153	-0.090	0.4194	
15 minute summer	S1.7	1.010	EX.S	15.8	0.927	0.183	0.5611	31.1
4320 minute summer	TANK A	5.003	S2.2	-9.9	-0.367	-0.140	0.1849	

Results for 100 year +10% CC Critical Storm Duration. Lowest mass balance: 84.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1.1.1	12	117.189	0.413	30.4	0.8018	0.0000	SURCHARGED
15 minute summer	SA-1.0	11	117.175	0.753	84.7	1.3008	0.0000	SURCHARGED
15 minute summer	S6.0	12	117.229	0.595	58.9	0.9384	0.0000	SURCHARGED
15 minute summer	S6.2	11	117.297	0.308	24.2	0.5868	0.0000	SURCHARGED
15 minute summer	S6.1	11	117.252	0.565	48.0	1.0107	0.0000	SURCHARGED
15 minute summer	S7.0	1	114.788	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S7.1	1	114.328	0.000	23.2	0.0000	0.0000	OK
15 minute summer	S1.1	11	117.066	0.725	87.9	0.9184	0.0000	SURCHARGED
7200 minute summer	S1.2	4800	116.874	0.701	5.6	0.8953	0.0000	SURCHARGED
2880 minute summer	S1.3	1680	116.875	0.832	9.9	1.0563	0.0000	SURCHARGED
7200 minute summer	S1.4	3900	116.874	0.895	7.8	1.4074	0.0000	SURCHARGED
15 minute summer	S1.4.2	9	116.902	0.085	22.2	0.1497	0.0000	OK
2880 minute summer	S1.4.1	1680	116.877	0.355	2.3	0.5004	0.0000	SURCHARGED
5760 minute summer	S1.5.2	3180	116.876	0.151	2.5	0.1827	0.0000	OK
7200 minute summer	S1.5.1	4560	116.876	0.854	3.5	1.3250	0.0000	SURCHARGED
15 minute summer	S1.6	10	115.502	0.082	13.7	0.1108	0.0000	OK
7200 minute summer	S1.5	3900	116.882	1.462	9.5	2.0580	0.0000	SURCHARGED
7200 minute summer	S2.0	3900	116.873	0.173	3.3	0.2373	0.0000	OK
8640 minute summer	S2.1	5520	116.878	1.288	15.9	1.5363	0.0000	SURCHARGED
8640 minute summer	S2.2	5640	116.883	1.463	7.2	1.6863	0.0000	SURCHARGED
15 minute summer	S1.7	10	115.352	0.102	20.5	0.1283	0.0000	OK
5760 minute summer	TANK A	3780	116.871	1.451	9.3	454.1900	0.0000	SURCHARGED
15 minute summer	EX.S	10	115.148	0.098	20.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1.1.1	2.000	SA-1.0	28.3	0.611	0.216	1.7898	
15 minute summer	SA-1.0	1.003	S1.1	84.8	1.205	0.987	0.9496	
15 minute summer	S6.0	1.002	SA-1.0	50.0	0.861	0.557	2.2823	
15 minute summer	S6.2	1.000	S6.1	23.6	0.693	0.263	3.2499	
15 minute summer	S6.1	1.001	S6.0	41.4	0.928	0.499	0.6657	
15 minute summer	S7.0	6.000	S7.1	0.0	0.000	0.000	0.0000	0.0
15 minute summer	S1.1	1.004	S1.2	90.0	1.279	1.020	1.8675	
7200 minute summer	S1.2	1.005	S1.3	5.3	0.595	0.061	1.4806	
7200 minute summer	S1.2	5.000	S2.0	3.1	-0.070	0.044	0.2325	
2880 minute summer	S1.3	1.006	S1.4	9.8	0.703	0.117	0.7941	
7200 minute summer	S1.4	1.007	S1.5	7.7	0.699	0.058	1.8446	
15 minute summer	S1.4.2	3.000	S1.4.1	22.2	1.155	0.174	0.8778	
2880 minute summer	S1.4.1	3.001	S1.4	2.3	0.278	0.017	2.6780	
5760 minute summer	S1.5.2	4.000	S1.5.1	-2.4	0.172	-0.018	2.6143	
7200 minute summer	S1.5.1	4.001	S1.5	2.4	0.048	0.015	2.1031	
15 minute summer	S1.6	1.009	S1.7	13.8	0.754	0.165	0.5465	
7200 minute summer	S1.5	Hydro-Brake®	S1.6	1.6				
7200 minute summer	S2.0	5.001	S2.1	3.7	0.143	0.016	1.3835	
8640 minute summer	S2.1	5.002	TANK A	-6.7	-0.095	-0.015	0.0704	
8640 minute summer	S2.2	5.004	S1.5	-7.1	-0.170	-0.101	0.4194	
15 minute summer	S1.7	1.010	EX.S	20.4	0.993	0.235	0.6746	33.3
5760 minute summer	TANK A	5.003	S2.2	-9.3	-0.363	-0.132	0.1849	

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S3.3.1	0.078	4.00	117.659	1200	-59.348	30.721	1.227
S3.3	0.041	4.00	117.559	1200	-45.344	64.094	1.552
S3.2.1	0.061	4.00	117.706	1200	-90.458	90.526	1.258
S3.0	0.056	4.00	117.700	1200	-13.994	113.503	0.921
S3.1	0.067	4.00	117.653	1200	-70.802	99.670	1.317
S3.2	0.025	4.00	117.606	1200	-72.665	75.752	1.413
S3.4	0.055	4.00	117.512	1200	-34.389	59.739	1.569
S3.5	0.004	4.00	117.462	1200	-24.955	69.927	1.602
TANK B	0.000		117.460	1200	-20.589	74.031	1.720
S7.2	0.008	4.00	117.700	1200	-36.915	74.705	1.728
S7.1	0.009	4.00	117.455	1200	-18.712	79.788	1.724
S7.0	0.004	4.00	117.210	1200	-13.689	80.931	1.524
EX.S CATCH B	0.039		116.973	1200	0.360	69.873	1.503

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S3.0	S3.1	65.872	0.600	116.779	116.336	0.443	148.7	300	4.85	50.0
1.001	S3.1	S3.2	22.555	0.600	116.336	116.193	0.143	157.7	300	5.15	50.0
2.000	S3.2.1	S3.2	22.406	0.600	116.448	116.193	0.255	87.9	300	4.22	50.0
1.002	S3.2	S3.3	28.200	0.600	116.193	116.007	0.186	151.6	300	5.52	50.0
3.000	S3.3.1	S3.3	34.371	0.600	116.432	116.007	0.425	80.9	225	4.39	50.0
1.003	S3.3	S3.4	11.362	0.600	116.007	115.943	0.064	177.5	300	5.68	50.0
1.004	S3.4	S3.5	13.405	0.600	115.943	115.860	0.083	161.5	300	5.86	50.0
1.005	S3.5	TANK B	1.500	0.600	115.860	115.740	0.120	12.5	300	5.87	50.0
1.006	TANK B	S7.1	1.400	0.600	115.740	115.731	0.009	155.6	300	5.89	50.0
4.000	S7.2	S7.1	17.631	0.600	115.972	115.731	0.241	73.2	100	4.33	50.0
1.007	S7.1	S7.0	4.746	0.600	115.731	115.686	0.045	105.5	300	5.94	50.0
1.008	S7.0	EX.S CATCH B	17.651	0.600	115.686	115.470	0.216	81.7	300	6.11	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.287	91.0	10.1	0.621	1.017	0.056	0.0	67	0.856
1.001	1.249	88.3	22.2	1.017	1.113	0.123	0.0	102	1.045
2.000	1.678	118.6	11.0	0.958	1.113	0.061	0.0	61	1.060
1.002	1.274	90.1	37.8	1.113	1.252	0.209	0.0	136	1.221
3.000	1.455	57.9	14.1	1.002	1.327	0.078	0.0	75	1.203
1.003	1.177	83.2	59.3	1.252	1.269	0.328	0.0	188	1.275
1.004	1.234	87.2	69.2	1.269	1.302	0.383	0.0	202	1.364
1.005	4.470	316.0	69.9	1.302	1.420	0.387	0.0	95	3.611
1.006	1.258	88.9	69.9	1.420	1.424	0.387	0.0	201	1.388
4.000	0.901	7.1	1.4	1.628	1.624	0.008	0.0	31	0.709
1.007	1.530	108.2	73.0	1.424	1.224	0.404	0.0	181	1.638
1.008	1.740	123.0	73.7	1.224	1.203	0.408	0.0	167	1.815

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	65.872	148.7	300	Circular	117.700	116.779	0.621	117.653	116.336	1.017
1.001	22.555	157.7	300	Circular	117.653	116.336	1.017	117.606	116.193	1.113
2.000	22.406	87.9	300	Circular	117.706	116.448	0.958	117.606	116.193	1.113
1.002	28.200	151.6	300	Circular	117.606	116.193	1.113	117.559	116.007	1.252
3.000	34.371	80.9	225	Circular	117.659	116.432	1.002	117.559	116.007	1.327
1.003	11.362	177.5	300	Circular	117.559	116.007	1.252	117.512	115.943	1.269
1.004	13.405	161.5	300	Circular	117.512	115.943	1.269	117.462	115.860	1.302
1.005	1.500	12.5	300	Circular	117.462	115.860	1.302	117.460	115.740	1.420
1.006	1.400	155.6	300	Circular	117.460	115.740	1.420	117.455	115.731	1.424

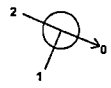
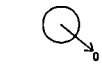
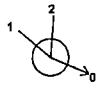
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S3.0	1200	Manhole	Adoptable	S3.1	1200	Manhole	Adoptable
1.001	S3.1	1200	Manhole	Adoptable	S3.2	1200	Manhole	Adoptable
2.000	S3.2.1	1200	Manhole	Adoptable	S3.2	1200	Manhole	Adoptable
1.002	S3.2	1200	Manhole	Adoptable	S3.3	1200	Manhole	Adoptable
3.000	S3.3.1	1200	Manhole	Adoptable	S3.3	1200	Manhole	Adoptable
1.003	S3.3	1200	Manhole	Adoptable	S3.4	1200	Manhole	Adoptable
1.004	S3.4	1200	Manhole	Adoptable	S3.5	1200	Manhole	Adoptable
1.005	S3.5	1200	Manhole	Adoptable	TANK B	1200	Manhole	Adoptable
1.006	TANK B	1200	Manhole	Adoptable	S7.1	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
4.000	17.631	73.2	100	Circular	117.700	115.972	1.628	117.455	115.731	1.624
1.007	4.746	105.5	300	Circular	117.455	115.731	1.424	117.210	115.686	1.224
1.008	17.651	81.7	300	Circular	117.210	115.686	1.224	116.973	115.470	1.203

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
4.000	S7.2	1200	Manhole	Adoptable	S7.1	1200	Manhole	Adoptable
1.007	S7.1	1200	Manhole	Adoptable	S7.0	1200	Manhole	Adoptable
1.008	S7.0	1200	Manhole	Adoptable	EX.S CATCH B	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S3.3.1	-59.348	30.721	117.659	1.227	1200				
						0	3.000	116.432	225
S3.3	-45.344	64.094	117.559	1.552	1200		1	3.000	116.007	225
							2	1.002	116.007	300
							0	1.003	116.007	300
S3.2.1	-90.458	90.526	117.706	1.258	1200					
						0	2.000	116.448	300	
S3.0	-13.994	113.503	117.700	0.921	1200					
						0	1.000	116.779	300	
S3.1	-70.802	99.670	117.653	1.317	1200		1	1.000	116.336	300
							0	1.001	116.336	300
S3.2	-72.665	75.752	117.606	1.413	1200		1	2.000	116.193	300
							2	1.001	116.193	300
							0	1.002	116.193	300
S3.4	-34.389	59.739	117.512	1.569	1200		1	1.003	115.943	300
							0	1.004	115.943	300
S3.5	-24.955	69.927	117.462	1.602	1200		1	1.004	115.860	300
							0	1.005	115.860	300
TANK B	-20.589	74.031	117.460	1.720	1200		1	1.005	115.740	300
							0	1.006	115.740	300
S7.2	-36.915	74.705	117.700	1.728	1200					
						0	4.000	115.972	100	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S7.1	-18.712	79.788	117.455	1.724	1200	1	4.000	115.731	100
						2	1.006	115.731	300
						0	1.007	115.731	300
S7.0	-13.689	80.931	117.210	1.524	1200	1	1.007	115.686	300
						0	1.008	115.686	300
EX.S CATCH B	0.360	69.873	116.973	1.503	1200	1	1.008	115.470	300

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	Scotland and Ireland	Drain Down Time (mins)	360
M5-60 (mm)	18.500	Additional Storage (m³/ha)	20.0
Ratio-R	0.200	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	10	0	0
30	10	0	0
100	10	0	0

Node S7.1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	115.731	Product Number	CTL-SHE-0059-2000-1720-2000
Design Depth (m)	1.720	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node TANK B Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	115.740
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	85.0	0.0	1.300	85.0	0.0	1.301	0.0	0.0

Results for 5 year +10% CC Critical Storm Duration. Lowest mass balance: 54.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute summer	S3.3.1	1560	117.048	0.616	1.9	1.4796	0.0000	SURCHARGED
960 minute summer	S3.3	540	117.045	1.038	13.0	1.7222	0.0000	SURCHARGED
10080 minute summer	S3.2.1	5820	117.046	0.598	0.7	1.2567	0.0000	SURCHARGED
960 minute summer	S3.0	600	117.053	0.274	3.5	0.6436	0.0000	OK
4320 minute summer	S3.1	2280	117.046	0.710	4.0	1.5260	0.0000	SURCHARGED
4320 minute summer	S3.2	2280	117.046	0.853	4.7	1.2662	0.0000	SURCHARGED
600 minute summer	S3.4	360	117.044	1.101	18.7	2.0170	0.0000	SURCHARGED
2880 minute summer	S3.5	1680	117.079	1.219	32.9	1.4399	0.0000	SURCHARGED
360 minute summer	TANK B	296	117.056	1.316	23.8	112.0306	0.0000	SURCHARGED
600 minute summer	S7.2	375	117.044	1.072	0.5	1.3118	0.0000	SURCHARGED
2880 minute summer	S7.1	1680	117.098	1.367	51.3	1.6879	0.0000	SURCHARGED
15 minute summer	S7.0	10	115.716	0.030	2.5	0.0354	0.0000	OK
15 minute summer	EX.S CATCH B	10	115.499	0.029	13.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2880 minute summer	S3.3.1	3.000	S3.3	4.2	0.251	0.073	1.3670	
960 minute summer	S3.3	1.003	S3.4	12.8	0.548	0.154	0.8001	
10080 minute summer	S3.2.1	2.000	S3.2	1.1	0.234	0.009	1.5778	
960 minute summer	S3.0	1.000	S3.1	3.3	0.372	0.036	4.5429	
4320 minute summer	S3.1	1.001	S3.2	4.1	0.379	0.046	1.5883	
4320 minute summer	S3.2	1.002	S3.3	4.3	0.403	0.048	1.9858	
600 minute summer	S3.4	1.004	S3.5	18.3	0.781	0.210	0.9440	
2880 minute summer	S3.5	1.005	TANK B	10.5	0.519	0.033	0.1056	
360 minute summer	TANK B	1.006	S7.1	5.1	0.085	0.058	0.0986	
600 minute summer	S7.2	4.000	S7.1	0.5	0.058	0.064	0.1380	
2880 minute summer	S7.1	Hydro-Brake®	S7.0	1.8				
15 minute summer	S7.0	1.008	EX.S CATCH B	2.5	0.692	0.020	0.0632	31.6

Results for 30 year +10% CC Critical Storm Duration. Lowest mass balance: 54.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	S3.3.1	200	117.078	0.646	8.9	1.5508	0.0000	SURCHARGED
480 minute summer	S3.3	256	117.072	1.065	24.9	1.7660	0.0000	SURCHARGED
360 minute summer	S3.2.1	200	117.073	0.625	7.0	1.3131	0.0000	SURCHARGED
360 minute summer	S3.0	208	117.073	0.294	6.4	0.6897	0.0000	OK
360 minute summer	S3.1	200	117.076	0.740	13.1	1.5904	0.0000	SURCHARGED
360 minute summer	S3.2	200	117.072	0.879	23.4	1.3052	0.0000	SURCHARGED
480 minute summer	S3.4	256	117.062	1.119	29.6	2.0492	0.0000	SURCHARGED
720 minute summer	S3.5	390	117.171	1.311	90.6	1.5482	0.0000	SURCHARGED
600 minute summer	TANK B	315	117.083	1.343	35.2	112.0604	0.0000	SURCHARGED
360 minute summer	S7.2	200	117.057	1.085	0.9	1.3283	0.0000	SURCHARGED
480 minute summer	S7.1	264	117.095	1.364	11.5	1.6846	0.0000	SURCHARGED
15 minute summer	S7.0	10	115.719	0.033	3.0	0.0391	0.0000	OK
15 minute summer	EX.S CATCH B	10	115.502	0.032	18.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	S3.3.1	3.000	S3.3	9.2	0.335	0.159	1.3670	
480 minute summer	S3.3	1.003	S3.4	24.5	0.607	0.294	0.8001	
360 minute summer	S3.2.1	2.000	S3.2	6.6	0.371	0.056	1.5778	
360 minute summer	S3.0	1.000	S3.1	9.5	0.467	0.104	4.6270	
360 minute summer	S3.1	1.001	S3.2	15.5	0.568	0.175	1.5883	
360 minute summer	S3.2	1.002	S3.3	25.7	0.561	0.285	1.9858	
480 minute summer	S3.4	1.004	S3.5	29.1	0.863	0.333	0.9440	
720 minute summer	S3.5	1.005	TANK B	27.6	1.350	0.087	0.1056	
600 minute summer	TANK B	1.006	S7.1	14.6	0.208	0.165	0.0986	
360 minute summer	S7.2	4.000	S7.1	3.3	0.426	0.471	0.1380	
480 minute summer	S7.1	Hydro-Brake®	S7.0	1.8				
15 minute summer	S7.0	1.008	EX.S CATCH B	3.0	0.736	0.025	0.0729	29.0

Results for 100 year +10% CC Critical Storm Duration. Lowest mass balance: 54.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	S3.3.1	70	117.175	0.743	21.5	1.7846	0.0000	SURCHARGED
120 minute summer	S3.3	70	117.156	1.149	70.2	1.9056	0.0000	SURCHARGED
120 minute summer	S3.2.1	70	117.185	0.736	16.8	1.5474	0.0000	SURCHARGED
240 minute summer	S3.0	128	117.218	0.439	10.0	1.0296	0.0000	SURCHARGED
120 minute summer	S3.1	70	117.191	0.855	31.1	1.8363	0.0000	SURCHARGED
120 minute summer	S3.2	70	117.183	0.990	43.1	1.4699	0.0000	SURCHARGED
120 minute summer	S3.4	70	117.114	1.171	83.7	2.1450	0.0000	SURCHARGED
120 minute summer	S3.5	88	117.172	1.312	82.8	1.5491	0.0000	SURCHARGED
360 minute summer	TANK B	264	117.083	1.343	57.1	112.0616	0.0000	SURCHARGED
360 minute summer	S7.2	184	117.055	1.083	2.0	1.3257	0.0000	SURCHARGED
120 minute summer	S7.1	88	117.222	1.491	79.0	1.8409	0.0000	FLOOD RISK
15 minute summer	S7.0	10	115.722	0.035	3.5	0.0420	0.0000	OK
15 minute summer	EX.S CATCH B	10	115.505	0.035	23.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	S3.3.1	3.000	S3.3	18.5	0.586	0.319	1.3670	
120 minute summer	S3.3	1.003	S3.4	68.5	0.972	0.823	0.8001	
120 minute summer	S3.2.1	2.000	S3.2	14.7	0.537	0.124	1.5778	
240 minute summer	S3.0	1.000	S3.1	10.0	0.500	0.110	4.6387	
120 minute summer	S3.1	1.001	S3.2	25.9	0.780	0.293	1.5883	
120 minute summer	S3.2	1.002	S3.3	41.9	0.713	0.466	1.9858	
120 minute summer	S3.4	1.004	S3.5	81.7	1.237	0.937	0.9440	
120 minute summer	S3.5	1.005	TANK B	81.6	2.112	0.258	0.1056	
360 minute summer	TANK B	1.006	S7.1	15.3	0.217	0.172	0.0986	
360 minute summer	S7.2	4.000	S7.1	2.3	0.296	0.328	0.1380	
120 minute summer	S7.1	Hydro-Brake®	S7.0	1.8				
15 minute summer	S7.0	1.008	EX.S CATCH B	3.5	0.769	0.029	0.0812	29.5

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S4.0	0.007	4.00	115.130	1200	0.920
S4.1	0.016	4.00	115.119	1200	1.039
S4.2	0.032	4.00	115.051	1200	1.101
S4.3	0.011	4.00	115.270	1200	1.410
AJ	0.073	4.00	115.251	1200	1.251
S4.4	0.007	4.00	115.251	1200	1.441
TANK C	0.000		115.300	1200	1.545
S4.5	0.009	4.00	115.400	1200	1.645
S4.6	0.003	4.00	115.000	1200	1.287
EX.S CATCH C	0.000		114.943	1200	1.243

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S4.0	S4.1	20.860	0.600	114.210	114.080	0.130	160.5	300	4.28	50.0
1.001	S4.1	S4.2	27.246	0.600	114.080	113.950	0.130	209.6	300	4.70	50.0
1.002	S4.2	S4.3	8.647	0.600	113.950	113.860	0.090	96.1	300	4.79	50.0
1.003	S4.3	S4.4	7.750	0.600	113.860	113.810	0.050	155.0	300	4.89	50.0
2.000	AJ	S4.4	8.838	0.600	114.000	113.810	0.190	46.5	300	4.06	50.0
1.004	S4.4	TANK C	7.162	0.600	113.810	113.755	0.055	130.2	300	4.98	50.0
1.005	TANK C	S4.5	1.700	0.600	113.755	113.755	0.000	0.0	300	5.01	50.0
1.006	S4.5	S4.6	4.310	0.600	113.755	113.713	0.042	102.6	300	5.05	50.0
1.007	S4.6	EX.S CATCH C	4.310	0.600	113.713	113.700	0.013	331.5	300	5.14	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.238	87.5	1.3	0.620	0.739	0.007	0.0	25	0.446
1.001	1.082	76.5	4.2	0.739	0.801	0.023	0.0	47	0.584
1.002	1.604	113.4	9.9	0.801	1.110	0.055	0.0	59	0.996
1.003	1.260	89.1	11.9	1.110	1.141	0.066	0.0	74	0.883
2.000	2.311	163.3	13.2	0.951	1.141	0.073	0.0	57	1.404
1.004	1.376	97.3	26.4	1.141	1.245	0.146	0.0	106	1.175
1.005	1.000	70.7	26.4	1.245	1.345	0.146	0.0	0	∞
1.006	1.552	109.7	28.0	1.345	0.987	0.155	0.0	103	1.303
1.007	0.858	60.6	28.6	0.987	0.943	0.158	0.0	145	0.846

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	20.860	160.5	300	Circular	115.130	114.210	0.620	115.119	114.080	0.739
1.001	27.246	209.6	300	Circular	115.119	114.080	0.739	115.051	113.950	0.801
1.002	8.647	96.1	300	Circular	115.051	113.950	0.801	115.270	113.860	1.110
1.003	7.750	155.0	300	Circular	115.270	113.860	1.110	115.251	113.810	1.141
2.000	8.838	46.5	300	Circular	115.251	114.000	0.951	115.251	113.810	1.141
1.004	7.162	130.2	300	Circular	115.251	113.810	1.141	115.300	113.755	1.245
1.005	1.700	0.0	300	Circular	115.300	113.755	1.245	115.400	113.755	1.345
1.006	4.310	102.6	300	Circular	115.400	113.755	1.345	115.000	113.713	0.987
1.007	4.310	331.5	300	Circular	115.000	113.713	0.987	114.943	113.700	0.943

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S4.0	1200	Manhole	Adoptable	S4.1	1200	Manhole	Adoptable
1.001	S4.1	1200	Manhole	Adoptable	S4.2	1200	Manhole	Adoptable
1.002	S4.2	1200	Manhole	Adoptable	S4.3	1200	Manhole	Adoptable
1.003	S4.3	1200	Manhole	Adoptable	S4.4	1200	Manhole	Adoptable
2.000	AJ	1200	Manhole	Adoptable	S4.4	1200	Manhole	Adoptable
1.004	S4.4	1200	Manhole	Adoptable	TANK C	1200	Manhole	Adoptable
1.005	TANK C	1200	Manhole	Adoptable	S4.5	1200	Manhole	Adoptable
1.006	S4.5	1200	Manhole	Adoptable	S4.6	1200	Manhole	Adoptable
1.007	S4.6	1200	Manhole	Adoptable	EX.S CATCH C	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S4.0	115.130	0.920	1200	0	1.000	114.210	300
S4.1	115.119	1.039	1200	1	1.000	114.080	300
				0	1.001	114.080	300
S4.2	115.051	1.101	1200	1	1.001	113.950	300
				0	1.002	113.950	300
S4.3	115.270	1.410	1200	1	1.002	113.860	300
				0	1.003	113.860	300
AJ	115.251	1.251	1200	0	2.000	114.000	300
S4.4	115.251	1.441	1200	1	2.000	113.810	300
				2	1.003	113.810	300
				0	1.004	113.810	300
TANK C	115.300	1.545	1200	1	1.004	113.755	300
				0	1.005	113.755	300
S4.5	115.400	1.645	1200	1	1.005	113.755	300
				0	1.006	113.755	300
S4.6	115.000	1.287	1200	1	1.006	113.713	300
				0	1.007	113.713	300
EX.S CATCH C	114.943	1.243	1200	1	1.007	113.700	300

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	Scotland and Ireland	Drain Down Time (mins)	360
M5-60 (mm)	18.500	Additional Storage (m³/ha)	20.0
Ratio-R	0.200	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	10	0	0
30	10	0	0
100	10	0	0

Node S4.5 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	113.755	Product Number	CTL-SHE-0060-2000-1640-2000
Design Depth (m)	1.640	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node TANK C Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	113.755
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	68.0	0.0	1.000	68.0	0.0	1.001	0.0	0.0

Results for 5 year +10% CC Critical Storm Duration. Lowest mass balance: 87.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	S4.0	990	114.402	0.192	0.8	0.2464	0.0000	OK
1440 minute summer	S4.1	960	114.402	0.322	0.8	0.4630	0.0000	SURCHARGED
1440 minute summer	S4.2	960	114.401	0.451	1.9	0.7714	0.0000	SURCHARGED
1440 minute summer	S4.3	960	114.401	0.541	2.3	0.6964	0.0000	SURCHARGED
1440 minute summer	AJ	960	114.401	0.401	2.6	0.9218	0.0000	SURCHARGED
1440 minute summer	S4.4	960	114.401	0.591	4.2	0.7258	0.0000	SURCHARGED
1440 minute summer	TANK C	960	114.401	0.646	4.4	44.6868	0.0000	SURCHARGED
1440 minute summer	S4.5	960	114.401	0.646	2.8	0.8011	0.0000	SURCHARGED
30 minute summer	S4.6	17	113.753	0.039	2.2	0.0465	0.0000	OK
30 minute summer	EX.S CATCH C	18	113.734	0.034	2.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	S4.0	1.000	S4.1	-0.7	0.156	-0.008	1.2315	
1440 minute summer	S4.1	1.001	S4.2	0.8	0.275	0.010	1.9186	
1440 minute summer	S4.2	1.002	S4.3	1.9	0.413	0.016	0.6089	
1440 minute summer	S4.3	1.003	S4.4	2.0	0.286	0.023	0.5457	
1440 minute summer	AJ	2.000	S4.4	2.4	0.375	0.015	0.6224	
1440 minute summer	S4.4	1.004	TANK C	4.4	0.469	0.045	0.5043	
1440 minute summer	TANK C	1.005	S4.5	2.6	0.096	0.036	0.1197	
1440 minute summer	S4.5	Hydro-Brake®	S4.6	1.5				
30 minute summer	S4.6	1.007	EX.S CATCH C	2.1	0.436	0.035	0.0211	22.6

Results for 30 year +10% CC Critical Storm Duration. Lowest mass balance: 87.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	S4.0	990	114.733	0.522	0.3	0.6704	0.0000	SURCHARGED
1440 minute summer	S4.1	990	114.733	0.653	0.9	0.9393	0.0000	SURCHARGED
1440 minute summer	S4.2	990	114.733	0.783	2.1	1.3408	0.0000	SURCHARGED
1440 minute summer	S4.3	990	114.732	0.872	2.2	1.1224	0.0000	SURCHARGED
1440 minute summer	AJ	990	114.731	0.731	3.4	1.6796	0.0000	SURCHARGED
1440 minute summer	S4.4	990	114.731	0.921	6.4	1.1312	0.0000	SURCHARGED
1440 minute summer	TANK C	990	114.730	0.975	5.7	67.4061	0.0000	SURCHARGED
1440 minute summer	S4.5	990	114.729	0.974	2.6	1.2079	0.0000	SURCHARGED
15 minute summer	S4.6	10	113.757	0.044	2.6	0.0512	0.0000	OK
15 minute summer	EX.S CATCH C	10	113.738	0.038	2.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	S4.0	1.000	S4.1	0.3	0.170	0.004	1.4689	
1440 minute summer	S4.1	1.001	S4.2	0.8	0.259	0.011	1.9186	
1440 minute summer	S4.2	1.002	S4.3	1.8	0.392	0.016	0.6089	
1440 minute summer	S4.3	1.003	S4.4	2.5	0.293	0.028	0.5457	
1440 minute summer	AJ	2.000	S4.4	3.6	0.351	0.022	0.6224	
1440 minute summer	S4.4	1.004	TANK C	5.7	0.451	0.059	0.5043	
1440 minute summer	TANK C	1.005	S4.5	2.6	0.096	0.037	0.1197	
1440 minute summer	S4.5	Hydro-Brake®	S4.6	1.6				
15 minute summer	S4.6	1.007	EX.S CATCH C	2.6	0.456	0.043	0.0245	23.1

Results for 100 year +10% CC Critical Storm Duration. Lowest mass balance: 87.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	S4.0	240	114.771	0.561	1.1	0.7191	0.0000	SURCHARGED
480 minute summer	S4.1	296	114.768	0.687	2.1	0.9893	0.0000	SURCHARGED
480 minute summer	S4.2	296	114.767	0.817	5.2	1.3994	0.0000	SURCHARGED
480 minute summer	S4.3	296	114.767	0.907	6.2	1.1678	0.0000	SURCHARGED
480 minute summer	AJ	296	114.766	0.766	8.4	1.7608	0.0000	SURCHARGED
600 minute summer	S4.4	360	114.767	0.957	11.8	1.1754	0.0000	SURCHARGED
480 minute summer	TANK C	296	114.773	1.018	20.6	69.1853	0.0000	SURCHARGED
480 minute summer	S4.5	336	114.779	1.024	17.5	1.2703	0.0000	SURCHARGED
30 minute summer	S4.6	17	113.760	0.047	3.0	0.0548	0.0000	OK
30 minute summer	EX.S CATCH C	17	113.740	0.040	3.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	S4.0	1.000	S4.1	-0.7	0.214	-0.008	1.4689	
480 minute summer	S4.1	1.001	S4.2	1.9	0.309	0.025	1.9186	
480 minute summer	S4.2	1.002	S4.3	4.9	0.428	0.043	0.6089	
480 minute summer	S4.3	1.003	S4.4	5.8	0.308	0.066	0.5457	
480 minute summer	AJ	2.000	S4.4	8.0	0.409	0.049	0.6224	
600 minute summer	S4.4	1.004	TANK C	13.1	0.665	0.134	0.5043	
480 minute summer	TANK C	1.005	S4.5	-9.8	-0.139	-0.138	0.1197	
480 minute summer	S4.5	Hydro-Brake®	S4.6	1.6				
30 minute summer	S4.6	1.007	EX.S CATCH C	3.0	0.470	0.049	0.0271	33.3

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S5.0	0.037	4.00	115.000	1200	1.795
S5.1	0.044	4.00	115.003	1200	1.803
TANK D	0.000		115.033	1200	1.833
S5.2	0.023	4.00	115.376	1200	2.176
S5.3	0.022	4.00	114.900	1200	1.820
EX.S CATCH D	0.023		114.850	1200	2.050

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S5.0	S5.1	9.117	0.600	113.205	113.200	0.005	1823.4	225	4.51	50.0
1.001	S5.1	TANK D	2.000	0.600	113.200	113.200	0.000	0.0	225	4.54	50.0
1.002	TANK D	S5.2	2.000	0.600	113.200	113.200	0.000	0.0	225	4.58	50.0
1.003	S5.2	S5.3	28.645	0.600	113.200	113.080	0.120	238.7	225	5.14	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.297	11.8	6.7	1.570	1.578	0.037	0.0	121	0.306
1.001	1.000	39.8	14.6	1.578	1.608	0.081	0.0	0	∞
1.002	1.000	39.8	14.6	1.608	1.951	0.081	0.0	0	∞
1.003	0.842	33.5	18.8	1.951	1.595	0.104	0.0	121	0.866

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.004	S5.3	EX.S CATCH D	15.030	0.600	113.080	112.800	0.280	53.7	225	5.28	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.004	1.789	71.1	22.8	1.595	1.825	0.126	0.0	87	1.597

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	9.117	1823.4	225	Circular	115.000	113.205	1.570	115.003	113.200	1.578
1.001	2.000	0.0	225	Circular	115.003	113.200	1.578	115.033	113.200	1.608
1.002	2.000	0.0	225	Circular	115.033	113.200	1.608	115.376	113.200	1.951
1.003	28.645	238.7	225	Circular	115.376	113.200	1.951	114.900	113.080	1.595
1.004	15.030	53.7	225	Circular	114.900	113.080	1.595	114.850	112.800	1.825

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S5.0	1200	Manhole	Adoptable	S5.1	1200	Manhole	Adoptable
1.001	S5.1	1200	Manhole	Adoptable	TANK D	1200	Manhole	Adoptable
1.002	TANK D	1200	Manhole	Adoptable	S5.2	1200	Manhole	Adoptable
1.003	S5.2	1200	Manhole	Adoptable	S5.3	1200	Manhole	Adoptable
1.004	S5.3	1200	Manhole	Adoptable	EX.S CATCH D	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S5.0	115.000	1.795	1200	0	1.000	113.205	225
S5.1	115.003	1.803	1200	1	1.000	113.200	225
				0	1.001	113.200	225
TANK D	115.033	1.833	1200	1	1.001	113.200	225
				0	1.002	113.200	225
S5.2	115.376	2.176	1200	1	1.002	113.200	225
				0	1.003	113.200	225
S5.3	114.900	1.820	1200	1	1.003	113.080	225
				0	1.004	113.080	225
EX.S CATCH D	114.850	2.050	1200	1	1.004	112.800	225

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	Scotland and Ireland	Drain Down Time (mins)	360
M5-60 (mm)	18.500	Additional Storage (m³/ha)	20.0
Ratio-R	0.200	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	10	0	0
30	10	0	0
100	10	0	0

Node S5.2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	113.200	Product Number	CTL-SHE-0056-2000-2170-2000
Design Depth (m)	2.170	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node TANK D Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	113.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	540

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	56.0	0.0	1.200	56.0	0.0	1.201	0.0	0.0

Results for 5 year +10% CC Critical Storm Duration. Lowest mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	S5.0	930	113.708	0.503	1.3	0.7758	0.0000	SURCHARGED
1440 minute summer	S5.1	930	113.708	0.508	2.8	0.8221	0.0000	SURCHARGED
1440 minute summer	TANK D	930	113.708	0.508	2.8	29.0080	0.0000	SURCHARGED
1440 minute summer	S5.2	930	113.708	0.508	1.3	0.6814	0.0000	SURCHARGED
15 minute summer	S5.3	10	113.129	0.049	7.1	0.0679	0.0000	OK
15 minute summer	EX.S CATCH D	10	112.848	0.048	13.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	S5.0	1.000	S5.1	1.2	0.091	0.105	0.3626	
1440 minute summer	S5.1	1.001	TANK D	2.8	0.295	0.070	0.0795	
1440 minute summer	TANK D	1.002	S5.2	1.2	-0.108	0.030	0.0795	
1440 minute summer	S5.2	Hydro-Brake®	S5.3	1.3				
15 minute summer	S5.3	1.004	EX.S CATCH D	7.1	1.127	0.100	0.0945	12.7

Results for 30 year +10% CC Critical Storm Duration. Lowest mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	S5.0	660	113.979	0.774	2.3	1.1949	0.0000	SURCHARGED
960 minute summer	S5.1	660	113.979	0.779	4.9	1.2618	0.0000	SURCHARGED
960 minute summer	TANK D	660	113.979	0.779	4.9	44.5261	0.0000	SURCHARGED
960 minute summer	S5.2	660	113.979	0.779	1.4	1.0459	0.0000	SURCHARGED
15 minute summer	S5.3	10	113.139	0.059	9.9	0.0808	0.0000	OK
15 minute summer	EX.S CATCH D	10	112.856	0.056	19.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	S5.0	1.000	S5.1	2.2	0.115	0.183	0.3626	
960 minute summer	S5.1	1.001	TANK D	4.7	0.464	0.119	0.0795	
960 minute summer	TANK D	1.002	S5.2	1.2	-0.116	0.031	0.0795	
960 minute summer	S5.2	Hydro-Brake®	S5.3	1.3				
15 minute summer	S5.3	1.004	EX.S CATCH D	9.9	1.235	0.139	0.1204	18.7

Results for 100 year +10% CC Critical Storm Duration. Lowest mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	S5.0	660	114.214	1.009	2.8	1.5562	0.0000	SURCHARGED
960 minute summer	S5.1	660	114.214	1.014	5.9	1.6409	0.0000	SURCHARGED
960 minute summer	TANK D	660	114.214	1.013	6.3	57.9022	0.0000	SURCHARGED
960 minute summer	S5.2	660	114.214	1.013	1.7	1.3601	0.0000	SURCHARGED
15 minute summer	S5.3	10	113.147	0.067	12.5	0.0917	0.0000	OK
15 minute summer	EX.S CATCH D	10	112.864	0.064	24.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	S5.0	1.000	S5.1	2.6	0.107	0.223	0.3626	
960 minute summer	S5.1	1.001	TANK D	5.8	0.489	0.145	0.0795	
960 minute summer	TANK D	1.002	S5.2	1.3	-0.106	0.032	0.0795	
960 minute summer	S5.2	Hydro-Brake®	S5.3	1.4				
15 minute summer	S5.3	1.004	EX.S CATCH D	12.5	1.317	0.176	0.1432	24.2