

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	8.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SW1	0.030	8.00	53.300	1800	2.300
SW2	0.009	8.00	51.700	1800	4.076
SW3	0.095	8.00	51.100	1800	4.263
SW4	0.000		50.100	2100	4.208
SW5		8.00	48.700	2100	2.700
SW6	0.020	8.00	49.900	1800	4.701
SW7	0.080	8.00	49.400	2100	4.669
SW9		8.00	47.200	2700	4.895
SW10	0.100	8.00	46.300	2700	4.697
SW11			46.500	1800	5.697
SW7a			49.900	1800	4.900
SW7b		8.00	50.800	1800	5.400
SW8	0.000		47.200	2700	4.915

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	SW1	SW2	25.900	0.600	51.000	49.124	1.876	13.8	300	8.10	43.4
1.001	SW2	SW3	7.900	0.600	47.624	46.837	0.787	10.0	900	8.11	43.3
1.002	SW3	SW4	12.910	0.600	46.837	45.942	0.895	14.4	900	8.14	43.3
1.003	SW4	SW6	1.800	0.600	45.892	45.874	0.018	100.0	225	8.24	0.0
1.004	SW6	SW7	6.700	0.600	45.199	44.731	0.468	14.3	900	8.25	42.9
1.005	SW7	SW8	31.000	0.600	44.731	44.698	0.033	939.4	900	8.76	41.6
1.006	SW8	SW10	11.500	0.600	42.285	41.603	0.682	16.9	900	8.79	41.5
1.007	SW10	SW11	8.000	0.600	41.603	40.803	0.800	10.0	900	8.80	41.5

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	4.252	300.6	3.5	2.000	2.276	0.030	0.0	23	1.453
1.001	9.917	6309.0	4.6	3.176	3.363	0.039	0.0	18	1.492
1.002	8.271	5261.6	15.7	3.363	3.258	0.134	0.0	35	1.919
1.003	1.307	52.0	0.0	3.983	3.801	0.134	0.0	0	0.000
1.004	8.302	5281.5	17.9	3.801	3.769	0.154	0.0	37	2.020
1.005	1.014	644.9	26.4	3.769	1.602	0.234	0.0	122	0.509
1.006	7.649	4865.8	26.3	4.015	3.797	0.234	0.0	46	2.132
1.007	9.936	6321.0	37.6	3.797	4.797	0.334	0.0	48	2.839

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)
2.000	SW5	SW4	21.300	0.600	46.000	45.942	0.058	367.2	900	8.22	43.0
3.000	SW7b	SW7a	6.500	0.600	45.400	45.000	0.400	16.3	900	8.01	43.6
3.001	SW7a	SW7	10.900	0.600	45.000	44.781	0.219	49.8	900	8.05	43.5
4.000	SW9	SW8	7.600	0.600	42.305	42.285	0.020	380.0	900	8.08	43.4

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)
2.000	1.629	1036.2	0.0	1.800	3.258	0.000	0.0	0	0.000
3.000	7.792	4956.8	0.0	4.500	4.000	0.000	0.0	0	0.000
3.001	4.446	2828.7	0.0	4.000	3.719	0.000	0.0	0	0.000
4.000	1.601	1018.5	0.0	3.995	4.015	0.000	0.0	0	0.000

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	25.900	13.8	300	Circular	53.300	51.000	2.000	51.700	49.124	2.276
1.001	7.900	10.0	900	Circular	51.700	47.624	3.176	51.100	46.837	3.363
1.002	12.910	14.4	900	Circular	51.100	46.837	3.363	50.100	45.942	3.258
1.003	1.800	100.0	225	Circular	50.100	45.892	3.983	49.900	45.874	3.801
1.004	6.700	14.3	900	Circular	49.900	45.199	3.801	49.400	44.731	3.769
1.005	31.000	939.4	900	Circular	49.400	44.731	3.769	47.200	44.698	1.602
1.006	11.500	16.9	900	Circular	47.200	42.285	4.015	46.300	41.603	3.797
1.007	8.000	10.0	900	Circular	46.300	41.603	3.797	46.500	40.803	4.797
2.000	21.300	367.2	900	Circular	48.700	46.000	1.800	50.100	45.942	3.258
3.000	6.500	16.3	900	Circular	50.800	45.400	4.500	49.900	45.000	4.000
3.001	10.900	49.8	900	Circular	49.900	45.000	4.000	49.400	44.781	3.719

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW1	1800	Manhole	Adoptable	SW2	1800	Manhole	Adoptable
1.001	SW2	1800	Manhole	Adoptable	SW3	1800	Manhole	Adoptable
1.002	SW3	1800	Manhole	Adoptable	SW4	2100	Manhole	Adoptable
1.003	SW4	2100	Manhole	Adoptable	SW6	1800	Manhole	Adoptable
1.004	SW6	1800	Manhole	Adoptable	SW7	2100	Manhole	Adoptable
1.005	SW7	2100	Manhole	Adoptable	SW8	2700	Manhole	Adoptable
1.006	SW8	2700	Manhole	Adoptable	SW10	2700	Manhole	Adoptable
1.007	SW10	2700	Manhole	Adoptable	SW11	1800	Manhole	Adoptable
2.000	SW5	2100	Manhole	Adoptable	SW4	2100	Manhole	Adoptable
3.000	SW7b	1800	Manhole	Adoptable	SW7a	1800	Manhole	Adoptable
3.001	SW7a	1800	Manhole	Adoptable	SW7	2100	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	7.600	380.0	900	Circular	47.200	42.305	3.995	47.200	42.285	4.015

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
4.000	SW9	2700	Manhole	Adoptable	SW8	2700	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW1	53.300	2.300	1800				
					0	1.000	51.000 300
SW2	51.700	4.076	1800				
					1	1.000	49.124 300
SW3	51.100	4.263	1800				
					0	1.001	47.624 900
					1	1.001	46.837 900
SW4	50.100	4.208	2100				
					0	1.002	46.837 900
					1	2.000	45.942 900
					2	1.002	45.942 900
SW5	48.700	2.700	2100				
					0	1.003	45.892 225
SW6	49.900	4.701	1800				
					0	2.000	46.000 900
					1	1.003	45.874 225
SW7	49.400	4.669	2100				
					0	1.004	45.199 900
					1	3.001	44.781 900
					2	1.004	44.731 900
SW9	47.200	4.895	2700				
					0	1.005	44.731 900
					1	4.000	42.305 900
SW10	46.300	4.697	2700				
					1	1.006	41.603 900
					0	1.007	41.603 900
SW11	46.500	5.697	1800				
					1	1.007	40.803 900

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW7a	49.900	4.900	1800	1	3.000	45.000	900
				0	3.001	45.000	900
SW7b	50.800	5.400	1800	0	3.000	45.400	900
				1	4.000	42.285	900
				2	1.005	44.698	900
SW8	47.200	4.915	2700	0	1.006	42.285	900

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.850	Check Discharge Volume	x

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Node SW10 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	41.603	Product Number	CTL-SHE-0076-4500-3500-4500
Design Depth (m)	3.500	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	4.5	Min Node Diameter (mm)	1200

Node SW4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	45.892	Product Number	CTL-SHE-0078-5000-3900-5000
Design Depth (m)	3.900	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW1	12	51.022	0.022	3.3	0.0569	0.0000	OK
15 minute winter	SW2	12	47.643	0.019	4.3	0.0475	0.0000	OK
15 minute winter	SW3	12	46.872	0.035	14.9	0.0892	0.0000	OK
30 minute winter	SW4	30	46.267	0.375	13.4	1.2975	0.0000	SURCHARGED
30 minute winter	SW5	30	46.267	0.266	4.3	0.9231	0.0000	OK
15 minute winter	SW6	12	45.221	0.022	5.0	0.0547	0.0000	OK
15 minute winter	SW7	13	44.822	0.091	13.9	0.3141	0.0000	OK
180 minute winter	SW9	172	42.953	0.648	2.6	3.7109	0.0000	OK
180 minute winter	SW10	172	42.953	1.350	8.1	7.7305	0.0000	SURCHARGED
15 minute summer	SW11	1	40.803	0.000	2.6	0.0000	0.0000	OK
15 minute summer	SW7a	1	45.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SW7b	1	45.400	0.000	0.0	0.0000	0.0000	OK
180 minute winter	SW8	172	42.953	0.668	7.2	3.8255	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 winter	SW1	1.000	SW2	3.3	1.408	0.011	0.0607	
15 minute winter	SW2	1.001	SW3	4.3	0.826	0.001	0.0426	
15 minute winter	SW3	1.002	SW4	14.9	1.129	0.003	1.1630	
30 minute winter	SW4	Hydro-Brake®	SW6	2.8				
30 minute winter	SW5	2.000	SW4	-4.3	-0.150	-0.004	3.8629	
15 minute winter	SW6	1.004	SW7	5.0	0.414	0.001	0.1232	
15 minute winter	SW7	1.005	SW8	13.7	0.526	0.021	0.8157	
180 minute winter	SW9	4.000	SW8	-2.6	-0.165	-0.003	3.7756	
180 minute winter	SW10	Hydro-Brake®	SW11	2.9				51.0
15 minute summer	SW7a	3.001	SW7	0.0	0.000	0.000	0.0469	
15 minute summer	SW7b	3.000	SW7a	0.0	0.000	0.000	0.0000	
180 minute winter	SW8	1.006	SW10	5.2	0.167	0.001	6.5465	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW1	12	51.034	0.034	8.2	0.0878	0.0000	OK
15 minute winter	SW2	12	47.652	0.028	10.7	0.0707	0.0000	OK
60 minute winter	SW3	61	46.969	0.132	23.2	0.3347	0.0000	OK
60 minute winter	SW4	61	46.968	1.076	23.2	3.7257	0.0000	SURCHARGED
60 minute winter	SW5	60	46.967	0.967	8.5	3.3496	0.0000	SURCHARGED
15 minute winter	SW6	11	45.226	0.027	8.3	0.0684	0.0000	OK
15 minute winter	SW7	12	44.860	0.129	30.2	0.4453	0.0000	OK
180 minute winter	SW9	176	44.795	2.490	5.5	14.2564	0.0000	SURCHARGED
180 minute winter	SW10	176	44.795	3.192	8.4	18.2760	0.0000	SURCHARGED
15 minute summer	SW11	1	40.803	0.000	3.0	0.0000	0.0000	OK
15 minute summer	SW7a	1	45.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SW7b	1	45.400	0.000	0.0	0.0000	0.0000	OK
180 minute winter	SW8	176	44.795	2.510	11.6	14.3709	0.0000	SURCHARGED
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 winter	SW1	1.000	SW2	8.2	1.853	0.027	0.1146	
15 minute winter	SW2	1.001	SW3	10.7	1.098	0.002	0.0804	
60 minute winter	SW3	1.002	SW4	23.2	1.108	0.004	4.4603	
60 minute winter	SW4	Hydro-Brake®	SW6	2.8				
60 minute winter	SW5	2.000	SW4	-8.5	-0.096	-0.008	13.4994	
15 minute winter	SW6	1.004	SW7	8.3	0.416	0.002	0.2029	
15 minute winter	SW7	1.005	SW8	29.9	0.660	0.046	1.4171	
180 minute winter	SW9	4.000	SW8	-5.5	-0.074	-0.005	4.8167	
180 minute winter	SW10	Hydro-Brake®	SW11	4.3				88.0
15 minute summer	SW7a	3.001	SW7	0.0	0.000	0.000	0.1295	
15 minute summer	SW7b	3.000	SW7a	0.0	0.000	0.000	0.0000	
180 minute winter	SW8	1.006	SW10	4.4	0.163	0.001	7.2884	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW1	12	51.047	0.047	15.4	0.1193	0.0000	OK
120 minute winter	SW2	96	48.702	1.078	12.3	2.7436	0.0000	SURCHARGED
120 minute winter	SW3	96	48.702	1.865	27.8	4.7455	0.0000	SURCHARGED
120 minute winter	SW4	94	48.702	2.810	25.3	9.7330	0.0000	SURCHARGED
120 minute winter	SW5	90	48.700	2.700	9.5	9.3528	1.9587	FLOOD
360 minute winter	SW6	352	46.289	1.090	5.0	2.7750	0.0000	SURCHARGED
360 minute winter	SW7	352	46.289	1.558	15.1	5.3981	0.0000	SURCHARGED
360 minute winter	SW9	352	46.289	3.984	4.9	22.8108	0.0000	SURCHARGED
360 minute winter	SW10	352	46.289	4.686	9.0	26.8303	0.0000	FLOOD RISK
15 minute summer	SW11	1	40.803	0.000	4.0	0.0000	0.0000	OK
360 minute winter	SW7a	352	46.289	1.289	3.7	3.2817	0.0000	SURCHARGED
360 minute winter	SW7b	352	46.289	0.889	1.8	2.2637	0.0000	OK
360 minute winter	SW8	352	46.289	4.004	11.8	22.9256	0.0000	SURCHARGED

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 winter	SW1	1.000	SW2	15.4	2.233	0.051	0.1787	
120 minute winter	SW2	1.001	SW3	8.1	0.979	0.001	5.0068	
120 minute winter	SW3	1.002	SW4	25.3	1.108	0.005	8.1820	
120 minute winter	SW4	Hydro-Brake®	SW6	4.3				
120 minute winter	SW5	2.000	SW4	-9.5	-0.099	-0.009	13.4994	
360 minute winter	SW6	1.004	SW7	9.6	0.335	0.002	4.2463	
360 minute winter	SW7	1.005	SW8	10.5	0.485	0.016	19.6470	
360 minute winter	SW9	4.000	SW8	-4.9	-0.042	-0.005	4.8167	
360 minute winter	SW10	Hydro-Brake®	SW11	5.2				151.9
360 minute winter	SW7a	3.001	SW7	-3.7	-0.024	-0.001	6.9081	
360 minute winter	SW7b	3.000	SW7a	-1.8	-0.012	0.000	4.1155	
360 minute winter	SW8	1.006	SW10	5.0	0.222	0.001	7.2884	