

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Inverts
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)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Tank			36.500	1200	3.000
SW1	0.052	5.00	36.500	1200	1.500
SW2	0.045	5.00	36.500	1200	2.000
SW3	0.053	5.00	36.850	1200	1.500
SW4	0.028	5.00	36.750	1200	2.750
SW5			36.600	1200	2.100
SW6	0.110	5.00	36.500	1200	1.300
SW7	0.095	5.00	36.850	1200	0.850
SW8			36.850	1200	1.250
SW9	0.039	5.00	36.850	1200	1.500
SW10			36.850	1200	1.850
SW11	0.083	5.00	36.850	1200	0.850
SW12	0.027	5.00	36.850	1200	1.456
Pump			36.750	1800	3.350
SW13			36.600	1200	3.300

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	45.200	0.600	35.000	34.500	0.500	90.4	225	5.55	50.0
2.000	SW3	SW2	23.700	0.600	35.350	34.500	0.850	27.9	225	5.16	50.0
1.001	SW2	SW4	32.300	0.600	34.500	34.000	0.500	64.6	300	5.82	50.0
3.000	SW6	SW5	14.700	0.600	35.200	34.500	0.700	21.0	225	5.09	50.0
3.001	SW5	SW4	5.500	0.600	34.500	34.000	0.500	11.0	225	5.11	50.0
1.002	SW4	Tank	6.200	0.600	34.000	33.900	0.100	62.0	375	5.87	50.0
4.000	SW7	SW8	42.500	0.600	36.000	35.600	0.400	106.3	225	5.56	50.0
4.001	SW8	SW9	19.000	0.600	35.600	35.350	0.250	76.0	225	5.77	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	1.375	54.7	7.0	1.275	1.775	0.052	0.0	54	0.950
2.000	2.487	98.9	7.2	1.275	1.775	0.053	0.0	41	1.462
1.001	1.959	138.5	20.3	1.700	2.450	0.150	0.0	77	1.411
3.000	2.868	114.0	14.9	1.075	1.875	0.110	0.0	55	2.003
3.001	3.967	157.7	14.9	1.875	2.525	0.110	0.0	46	2.509
1.002	2.304	254.5	39.0	2.375	2.225	0.288	0.0	99	1.685
4.000	1.268	50.4	12.9	0.625	1.025	0.095	0.0	77	1.061
4.001	1.501	59.7	12.9	1.025	1.275	0.095	0.0	71	1.203

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)
4.002	SW9	SW10	21.000	0.600	35.350	35.000	0.350	60.0	225	5.98	50.0
5.000	SW11	SW12	60.600	0.600	36.000	35.394	0.606	100.0	225	5.77	50.0
5.001	SW12	SW10	19.500	0.600	35.394	35.000	0.394	49.5	225	5.95	50.0
4.003	SW10	Tank	9.600	0.600	35.000	34.750	0.250	38.4	225	6.05	50.0
1.003	Tank	Pump	4.400	0.600	33.500	33.400	0.100	44.0	450	6.08	50.0
1.004	Pump	SW13	4.000	0.600	33.400	33.300	0.100	40.0	450	6.10	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)
4.002	1.691	67.2	18.2	1.275	1.625	0.134	0.0	80	1.441
5.000	1.307	52.0	11.2	0.625	1.231	0.083	0.0	71	1.047
5.001	1.863	74.1	14.9	1.231	1.625	0.110	0.0	68	1.464
4.003	2.117	84.2	33.1	1.625	1.525	0.244	0.0	98	1.995
1.003	3.071	488.4	72.1	2.550	2.900	0.532	0.0	116	2.222
1.004	3.222	512.4	72.1	2.900	2.850	0.532	0.0	113	2.302

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	45.200	90.4	225	Circular	36.500	35.000	1.275	36.500	34.500	1.775
2.000	23.700	27.9	225	Circular	36.850	35.350	1.275	36.500	34.500	1.775
1.001	32.300	64.6	300	Circular	36.500	34.500	1.700	36.750	34.000	2.450
3.000	14.700	21.0	225	Circular	36.500	35.200	1.075	36.600	34.500	1.875
3.001	5.500	11.0	225	Circular	36.600	34.500	1.875	36.750	34.000	2.525
1.002	6.200	62.0	375	Circular	36.750	34.000	2.375	36.500	33.900	2.225
4.000	42.500	106.3	225	Circular	36.850	36.000	0.625	36.850	35.600	1.025
4.001	19.000	76.0	225	Circular	36.850	35.600	1.025	36.850	35.350	1.275
4.002	21.000	60.0	225	Circular	36.850	35.350	1.275	36.850	35.000	1.625
5.000	60.600	100.0	225	Circular	36.850	36.000	0.625	36.850	35.394	1.231
5.001	19.500	49.5	225	Circular	36.850	35.394	1.231	36.850	35.000	1.625
4.003	9.600	38.4	225	Circular	36.850	35.000	1.625	36.500	34.750	1.525
1.003	4.400	44.0	450	Circular	36.500	33.500	2.550	36.750	33.400	2.900
1.004	4.000	40.0	450	Circular	36.750	33.400	2.900	36.600	33.300	2.850

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW1	1200	Manhole	Adoptable	SW2	1200	Manhole	Adoptable
2.000	SW3	1200	Manhole	Adoptable	SW2	1200	Manhole	Adoptable
1.001	SW2	1200	Manhole	Adoptable	SW4	1200	Manhole	Adoptable
3.000	SW6	1200	Manhole	Adoptable	SW5	1200	Manhole	Adoptable
3.001	SW5	1200	Manhole	Adoptable	SW4	1200	Manhole	Adoptable
1.002	SW4	1200	Manhole	Adoptable	Tank	1200	Manhole	Adoptable
4.000	SW7	1200	Manhole	Adoptable	SW8	1200	Manhole	Adoptable
4.001	SW8	1200	Manhole	Adoptable	SW9	1200	Manhole	Adoptable
4.002	SW9	1200	Manhole	Adoptable	SW10	1200	Manhole	Adoptable
5.000	SW11	1200	Manhole	Adoptable	SW12	1200	Manhole	Adoptable
5.001	SW12	1200	Manhole	Adoptable	SW10	1200	Manhole	Adoptable
4.003	SW10	1200	Manhole	Adoptable	Tank	1200	Manhole	Adoptable
1.003	Tank	1200	Manhole	Adoptable	Pump	1800	Manhole	Adoptable
1.004	Pump	1800	Manhole	Adoptable	SW13	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
Tank	36.500	3.000	1200		1	4.003	34.750	225
					2	1.002	33.900	375
					0	1.003	33.500	450
SW1	36.500	1.500	1200		0	1.000	35.000	225
SW2	36.500	2.000	1200		1	2.000	34.500	225
					2	1.000	34.500	225
					0	1.001	34.500	300
SW3	36.850	1.500	1200		0	2.000	35.350	225
SW4	36.750	2.750	1200		1	3.001	34.000	225
					2	1.001	34.000	300
					0	1.002	34.000	375
SW5	36.600	2.100	1200		1	3.000	34.500	225
					0	3.001	34.500	225
SW6	36.500	1.300	1200		0	3.000	35.200	225
					0	3.000	35.200	225
SW7	36.850	0.850	1200		0	4.000	36.000	225
					0	4.000	36.000	225
SW8	36.850	1.250	1200		1	4.000	35.600	225
					0	4.001	35.600	225
					0	4.001	35.600	225
SW9	36.850	1.500	1200		1	4.001	35.350	225
					0	4.002	35.350	225
					0	4.002	35.350	225
SW10	36.850	1.850	1200		1	5.001	35.000	225
					2	4.002	35.000	225
					0	4.003	35.000	225
SW11	36.850	0.850	1200		0	5.000	36.000	225
					0	5.000	36.000	225
SW12	36.850	1.456	1200		1	5.000	35.394	225
					0	5.001	35.394	225

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Pump	36.750	3.350	1800	1 	1.003	33.400	450
				0	1.004	33.400	450
SW13	36.600	3.300	1200	1 	1.004	33.300	450

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m ³ /ha)	20.0
Ratio-R	0.400	Starting Level (m)	
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	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	40	0	0

Node Pump Online Pump Control

Flap Valve	x	Design Depth (m)	1.600	Switch off depth (m)	0.005
Replaces Downstream Link	✓	Design Flow (l/s)	2.5		
Invert Level (m)	33.400	Switch on depth (m)	0.100		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.500	1.500	2.500	1.600	2.500

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	33.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	230.0	230.0	1.600	230.0	316.0	1.601	0.0	316.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
240 minute winter	Tank	228	33.758	0.258	19.8	56.7257	0.0000	OK
15 minute winter	SW1	10	35.055	0.055	7.3	0.0995	0.0000	OK
15 minute winter	SW2	11	34.577	0.077	20.8	0.1221	0.0000	OK
15 minute winter	SW3	10	35.392	0.042	7.5	0.0764	0.0000	OK
15 minute winter	SW4	11	34.114	0.114	39.3	0.1525	0.0000	OK
15 minute winter	SW5	10	34.547	0.047	15.4	0.0534	0.0000	OK
15 minute winter	SW6	10	35.260	0.060	15.5	0.1693	0.0000	OK
15 minute winter	SW7	10	36.081	0.081	13.4	0.2711	0.0000	OK
15 minute winter	SW8	11	35.673	0.073	13.1	0.0829	0.0000	OK
15 minute winter	SW9	11	35.430	0.080	18.3	0.1324	0.0000	OK
15 minute winter	SW10	11	35.110	0.110	33.5	0.1245	0.0000	OK
15 minute winter	SW11	10	36.073	0.073	11.7	0.2243	0.0000	OK
15 minute winter	SW12	11	35.462	0.068	15.1	0.1028	0.0000	OK
240 minute winter	Pump	224	33.760	0.360	13.4	0.9172	0.0000	OK
15 minute summer	SW13	1	33.300	0.000	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
240 minute winter	Tank	1.003	Pump	13.4	0.331	0.027	0.5073	
15 minute winter	SW1	1.000	SW2	7.1	0.740	0.130	0.4380	
15 minute winter	SW2	1.001	SW4	20.4	1.057	0.148	0.6288	
15 minute winter	SW3	2.000	SW2	7.4	0.892	0.075	0.2010	
15 minute winter	SW4	1.002	Tank	39.3	1.532	0.154	0.1592	
15 minute winter	SW5	3.001	SW4	15.3	1.208	0.097	0.0718	
15 minute winter	SW6	3.000	SW5	15.4	2.127	0.135	0.1066	
15 minute winter	SW7	4.000	SW8	13.1	1.104	0.259	0.5035	
15 minute winter	SW8	4.001	SW9	13.1	1.100	0.220	0.2268	
15 minute winter	SW9	4.002	SW10	18.4	1.156	0.274	0.3357	
15 minute winter	SW10	4.003	Tank	33.4	1.865	0.397	0.1722	
15 minute winter	SW11	5.000	SW12	11.3	1.074	0.218	0.6413	
15 minute winter	SW12	5.001	SW10	15.1	1.033	0.203	0.2875	
240 minute winter	Pump	Pump	SW13	2.5				64.9

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Tank	352	34.236	0.736	31.6	161.6369	0.0000	SURCHARGED
15 minute winter	SW1	10	35.087	0.087	18.0	0.1592	0.0000	OK
15 minute winter	SW2	10	34.624	0.124	51.4	0.1966	0.0000	OK
15 minute winter	SW3	10	35.415	0.065	18.3	0.1196	0.0000	OK
360 minute winter	SW4	352	34.238	0.238	13.6	0.3175	0.0000	OK
15 minute winter	SW5	10	34.577	0.077	37.9	0.0870	0.0000	OK
15 minute winter	SW6	10	35.299	0.099	38.1	0.2782	0.0000	OK
15 minute winter	SW7	10	36.136	0.136	32.9	0.4582	0.0000	OK
15 minute winter	SW8	11	35.725	0.125	32.2	0.1410	0.0000	OK
15 minute winter	SW9	10	35.492	0.142	44.9	0.2341	0.0000	OK
15 minute winter	SW10	11	35.292	0.292	81.7	0.3299	0.0000	SURCHARGED
15 minute winter	SW11	10	36.121	0.121	28.7	0.3723	0.0000	OK
15 minute winter	SW12	10	35.507	0.113	37.3	0.1697	0.0000	OK
360 minute winter	Pump	352	34.236	0.836	12.7	2.1274	0.0000	SURCHARGED
15 minute summer	SW13	1	33.300	0.000	2.5	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 winter	Tank	1.003	Pump	12.7	0.396	0.026	0.6972	
15 minute winter	SW1	1.000	SW2	17.6	0.962	0.323	0.8299	
15 minute winter	SW2	1.001	SW4	50.3	1.324	0.363	1.2288	
15 minute winter	SW3	2.000	SW2	18.2	1.147	0.184	0.3792	
360 minute winter	SW4	1.002	Tank	25.5	1.167	0.100	0.5512	
15 minute winter	SW5	3.001	SW4	37.7	1.502	0.239	0.1335	
15 minute winter	SW6	3.000	SW5	37.9	2.645	0.332	0.2108	
15 minute winter	SW7	4.000	SW8	32.2	1.358	0.639	1.0075	
15 minute winter	SW8	4.001	SW9	32.2	1.329	0.540	0.4639	
15 minute winter	SW9	4.002	SW10	44.6	1.313	0.663	0.6934	
15 minute winter	SW10	4.003	Tank	80.9	2.164	0.961	0.3499	
15 minute winter	SW11	5.000	SW12	28.0	1.354	0.538	1.2616	
15 minute winter	SW12	5.001	SW10	37.3	1.194	0.503	0.5791	
360 minute winter	Pump	Pump	SW13	2.5				84.2

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Tank	585	35.021	1.521	45.6	334.0934	0.0000	SURCHARGED
15 minute winter	SW1	10	35.123	0.123	32.7	0.2245	0.0000	OK
600 minute winter	SW2	600	35.022	0.522	8.6	0.8247	0.0000	SURCHARGED
15 minute winter	SW3	10	35.439	0.089	33.3	0.1640	0.0000	OK
600 minute winter	SW4	585	35.023	1.023	16.4	1.3652	0.0000	SURCHARGED
600 minute winter	SW5	585	35.024	0.524	6.2	0.5927	0.0000	SURCHARGED
15 minute winter	SW6	10	35.340	0.140	69.1	0.3959	0.0000	OK
15 minute winter	SW7	12	36.750	0.750	59.7	2.5241	0.0000	FLOOD RISK
15 minute winter	SW8	12	36.353	0.753	52.2	0.8514	0.0000	SURCHARGED
15 minute winter	SW9	12	36.156	0.806	67.3	1.3307	0.0000	SURCHARGED
15 minute winter	SW10	12	35.736	0.736	121.3	0.8321	0.0000	SURCHARGED
15 minute winter	SW11	12	36.466	0.466	52.2	1.4358	0.0000	SURCHARGED
15 minute winter	SW12	12	36.020	0.626	62.6	0.9396	0.0000	SURCHARGED
600 minute winter	Pump	585	35.021	1.621	5.6	4.1258	0.0000	SURCHARGED
15 minute summer	SW13	1	33.300	0.000	2.5	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)
600 minute winter	Tank	1.003	Pump	5.6	0.275	0.011	0.6972	
15 minute winter	SW1	1.000	SW2	32.2	1.102	0.589	1.3005	
600 minute winter	SW2	1.001	SW4	8.6	0.821	0.062	2.2745	
15 minute winter	SW3	2.000	SW2	33.1	1.294	0.335	0.5922	
600 minute winter	SW4	1.002	Tank	31.8	1.147	0.125	0.6838	
600 minute winter	SW5	3.001	SW4	6.2	0.914	0.039	0.2187	
15 minute winter	SW6	3.000	SW5	68.7	2.800	0.603	0.3621	
15 minute winter	SW7	4.000	SW8	52.2	1.426	1.036	1.6903	
15 minute winter	SW8	4.001	SW9	47.0	1.290	0.787	0.7557	
15 minute winter	SW9	4.002	SW10	65.6	1.650	0.976	0.8352	
15 minute winter	SW10	4.003	Tank	121.2	3.048	1.440	0.3818	
15 minute winter	SW11	5.000	SW12	46.6	1.412	0.896	2.4101	
15 minute winter	SW12	5.001	SW10	55.7	1.401	0.752	0.7755	
600 minute winter	Pump	Pump	SW13	2.5				119.4