STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	45
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.500	4-8	0.174

Total Area Contributing (ha) = 0.674

Total Pipe Volume (m³) = 34.216

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	31.038	0.290	107.0	0.063	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	33.466	0.270	123.9	0.040	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	16.768	0.180	93.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	13.503	0.200	67.5	0.022	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	17.009	0.875	19.4	0.030	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	9.412	0.215	43.8	0.023	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.34	110.675	0.063	0.0	0.0	3.8	1.52	107.4	12.4
1.001	50.00	5.74	110.385	0.103	0.0	0.0	6.3	1.41	99.7	20.2
1.002	50.00	5.91	110.115	0.103	0.0	0.0	6.3	1.63	115.2	20.2
1.003	50.00	6.02	109.935	0.125	0.0	0.0	7.6	1.92	135.5	24.5
2.000	50.00	5.10	110.900	0.030	0.0	0.0	1.8	2.98	118.6	5.9
2.001	50.00	5.16	109.950	0.053	0.0	0.0	3.2	2.38	168.4	10.4

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Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.004	18.179	0.240	75.7	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	16.297	0.180	90.5	0.023	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	27.283	1.200	22.7	0.042	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.007	9.900	0.530	18.7	0.005	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.008	22.909	0.345	66.4	0.023	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.000	34.498	1.817	19.0	0.087	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	34.280	1.723	19.9	0.041	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	19.561	0.650	30.1	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.002	26.836	1.500	17.9	0.026	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.003	21.129	2.071	10.2	0.018	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.004	20.457	0.324	63.1	0.028	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.000	14.340	0.125	114.7	0.050	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	25.045	1.062	23.6	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.002	11.290	0.452	25.0	0.010	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.003	13.005	0.200	65.0	0.027	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.004	14.451	0.240	60.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.005	25.884	1.695	15.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.004	50.00	6.19	109.735	0.187	0.0	0.0	11.4	1.81	127.8	36.7
1.005	50.00	6.36	109.495	0.210	0.0	0.0	12.8	1.65	116.8	41.2
1.006	50.00	6.48	109.240	0.252	0.0	0.0	15.4	3.81	421.3	49.5
1.007	50.00	6.52	108.040	0.257	0.0	0.0	15.7	4.21	464.9	50.5
1.008	50.00	6.69	107.510	0.280	0.0	0.0	17.1	2.23	245.9	55.0
3.000	50.00	5.19	115.125	0.087	0.0	0.0	5.3	3.02	120.0	17.1
3.001	50.00	5.38	113.308	0.128	0.0	0.0	7.8	2.95	117.2	25.1
4.000	50.00	5.14	112.310	0.085	0.0	0.0	5.2	2.39	95.2	16.7
3.002	50.00	5.50	111.585	0.239	0.0	0.0	14.6	3.73	264.0	46.9
3.003	50.00	5.58	110.085	0.257	0.0	0.0	15.7	4.95	349.9	50.5
3.004	50.00	5.72	107.939	0.285	0.0	0.0	17.4	2.28	252.2	56.0
5.000	50.00	5.20	111.539	0.050	0.0	0.0	3.0	1.22	48.5	9.8
5.001	50.00	5.35	111.414	0.056	0.0	0.0	3.4	2.71	107.6	11.0
5.002	50.00	5.41	110.277	0.066	0.0	0.0	4.0	3.16	223.3	13.0
5.003	50.00	5.52	109.825	0.093	0.0	0.0	5.7	1.95	138.0	18.3
5.004	50.00	5.64	109.625	0.093	0.0	0.0	5.7	2.03	143.5	18.3
5.005	50.00	5.75	109.385	0.093	0.0	0.0	5.7	4.04	285.8	18.3

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Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.005	6.501	0.315	20.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.006	7.436	0.135	55.1	0.016	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.009	6.665	0.445	15.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.005	50.00	5.77	107.615	0.378	0.0	0.0	23.0	4.00	442.2	74.2
3.006	50.00	5.82	107.300	0.394	0.0	0.0	24.0	2.45	270.1	77.4
1.009	50.00	6.72	107.165	0.674	0.0	0.0	41.1	3.40	135.1	132.3

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Manhole Schedules for Surface Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S35	112.691	2.016	Open Manhole	1200	1.000	110.675	300				
S36	111.999	1.614	Open Manhole	1350	1.001	110.385	300	1.000	110.385	300	
S37	112.230	2.115	Open Manhole	1200	1.002	110.115	300	1.001	110.115	300	
S38	112.130	2.195	Open Manhole	1200	1.003	109.935	300	1.002	109.935	300	
S40	112.703	1.803	Open Manhole	1350	2.000	110.900	225				
S41	112.511	2.561	Open Manhole	1350	2.001	109.950	300	2.000	110.025	225	
S42	112.429	2.694	Open Manhole	1200	1.004	109.735	300	1.003	109.735	300	
								2.001	109.735	300	
S43	112.226	2.731	Open Manhole	1200	1.005	109.495	300	1.004	109.495	300	
S44	112.040	2.800	Open Manhole	1350	1.006	109.240	375	1.005	109.315	300	
S45	109.940	1.900	Open Manhole	1350	1.007	108.040	375	1.006	108.040	375	
S46	109.141	1.631	Open Manhole	1200	1.008	107.510	375	1.007	107.510	375	
S80	116.900	1.775	Open Manhole	1200	3.000	115.125	225				
S47	115.376	2.068	Open Manhole	1350	3.001	113.308	225	3.000	113.308	225	
S48	113.713	1.403	Open Manhole	1350	4.000	112.310	225				
S49	113.649	2.064	Open Manhole	1350	3.002	111.585	300	3.001	111.585	225	
								4.000	111.660	225	
S50	111.897	1.812	Open Manhole	1350	3.003	110.085	300	3.002	110.085	300	
S53	110.678	2.739	Open Manhole	1350	3.004	107.939	375	3.003	108.014	300	
S39	112.964	1.425	Open Manhole	1350	5.000	111.539	225				
S60	112.839	1.425	Open Manhole	1350	5.001	111.414	225	5.000	111.414	225	
S61	112.018	1.741	Open Manhole	1350	5.002	110.277	300	5.001	110.352	225	
S51	111.610	1.785	Open Manhole	1350	5.003	109.825	300	5.002	109.825	300	
S52	111.154	1.529	Open Manhole	1350	5.004	109.625	300	5.003	109.625	300	
S78	110.885	1.500	Open Manhole	1350	5.005	109.385	300	5.004	109.385	300	
S79	109.447	1.832	Open Manhole	1350	3.005	107.615	375	3.004	107.615	375	
								5.005	107.690	300	
S54	109.078	1.778	Open Manhole	1200	3.006	107.300	375	3.005	107.300	375	
S55	108.900	1.735	Open Manhole	1350	1.009	107.165	225	1.008	107.165	375	
								3.006	107.165	375	
S56	107.000	0.280	Open Manhole	0		OUTFALL		1.009	106.720	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S35	537221.695	133027.628	537221.695	133027.628	Required	

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Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S36	537190.771	133030.286	537190.771	133030.286	Required	
S37	537193.303	133063.656	537193.303	133063.656	Required	
S38	537195.151	133080.322	537195.151	133080.322	Required	
S40	537221.702	133080.721	537221.702	133080.721	Required	
S41	537204.802	133082.643	537204.802	133082.643	Required	
S42	537202.368	133091.735	537202.368	133091.735	Required	
S43	537202.690	133109.912	537202.690	133109.912	Required	
S44	537206.859	133125.667	537206.859	133125.667	Required	
S45	537216.296	133151.265	537216.296	133151.265	Required	
S46	537220.305	133160.317	537220.305	133160.317	Required	
S80	537355.663	133067.277	537355.663	133067.277	Required	
S47	537328.928	133089.079	537328.928	133089.079	Required	
S48	537288.352	133095.313	537288.352	133095.313	Required	
S49	537301.569	133109.733	537301.569	133109.733	Required	
S50	537280.002	133125.702	537280.002	133125.702	Required	

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Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S53	537264.799	133140.375	537264.799	133140.375	Required	
S39	537243.459	133070.501	537243.459	133070.501	Required	
S60	537231.523	133078.450	537231.523	133078.450	Required	
S61	537234.541	133103.313	537234.541	133103.313	Required	
S51	537238.964	133113.700	537238.964	133113.700	Required	
S52	537244.912	133125.265	537244.912	133125.265	Required	
S78	537233.546	133134.189	537233.546	133134.189	Required	
S79	537249.825	133154.313	537249.825	133154.313	Required	
S54	537245.052	133158.727	537245.052	133158.727	Required	
S55	537242.565	133165.734	537242.565	133165.734	Required	
S56	537248.428	133168.905			No Entry	

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PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	S35	112.691	110.675	1.716	Open Manhole	1200
1.001	o	300	S36	111.999	110.385	1.314	Open Manhole	1350
1.002	o	300	S37	112.230	110.115	1.815	Open Manhole	1200
1.003	o	300	S38	112.130	109.935	1.895	Open Manhole	1200
2.000	o	225	S40	112.703	110.900	1.578	Open Manhole	1350
2.001	o	300	S41	112.511	109.950	2.261	Open Manhole	1350
1.004	o	300	S42	112.429	109.735	2.394	Open Manhole	1200
1.005	o	300	S43	112.226	109.495	2.431	Open Manhole	1200
1.006	o	375	S44	112.040	109.240	2.425	Open Manhole	1350
1.007	o	375	S45	109.940	108.040	1.525	Open Manhole	1350
1.008	o	375	S46	109.141	107.510	1.256	Open Manhole	1200
3.000	o	225	S80	116.900	115.125	1.550	Open Manhole	1200
3.001	o	225	S47	115.376	113.308	1.843	Open Manhole	1350
4.000	o	225	S48	113.713	112.310	1.178	Open Manhole	1350
3.002	o	300	S49	113.649	111.585	1.764	Open Manhole	1350
3.003	o	300	S50	111.897	110.085	1.512	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	31.038	107.0	S36	111.999	110.385	1.314	Open Manhole	1350
1.001	33.466	123.9	S37	112.230	110.115	1.815	Open Manhole	1200
1.002	16.768	93.2	S38	112.130	109.935	1.895	Open Manhole	1200
1.003	13.503	67.5	S42	112.429	109.735	2.394	Open Manhole	1200
2.000	17.009	19.4	S41	112.511	110.025	2.261	Open Manhole	1350
2.001	9.412	43.8	S42	112.429	109.735	2.394	Open Manhole	1200
1.004	18.179	75.7	S43	112.226	109.495	2.431	Open Manhole	1200
1.005	16.297	90.5	S44	112.040	109.315	2.425	Open Manhole	1350
1.006	27.283	22.7	S45	109.940	108.040	1.525	Open Manhole	1350
1.007	9.900	18.7	S46	109.141	107.510	1.256	Open Manhole	1200
1.008	22.909	66.4	S55	108.900	107.165	1.360	Open Manhole	1350
3.000	34.498	19.0	S47	115.376	113.308	1.843	Open Manhole	1350
3.001	34.280	19.9	S49	113.649	111.585	1.839	Open Manhole	1350
4.000	19.561	30.1	S49	113.649	111.660	1.764	Open Manhole	1350
3.002	26.836	17.9	S50	111.897	110.085	1.512	Open Manhole	1350
3.003	21.129	10.2	S53	110.678	108.014	2.364	Open Manhole	1350

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PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
3.004	o	375	S53	110.678	107.939	2.364	Open Manhole	1350
5.000	o	225	S39	112.964	111.539	1.200	Open Manhole	1350
5.001	o	225	S60	112.839	111.414	1.200	Open Manhole	1350
5.002	o	300	S61	112.018	110.277	1.441	Open Manhole	1350
5.003	o	300	S51	111.610	109.825	1.485	Open Manhole	1350
5.004	o	300	S52	111.154	109.625	1.229	Open Manhole	1350
5.005	o	300	S78	110.885	109.385	1.200	Open Manhole	1350
3.005	o	375	S79	109.447	107.615	1.457	Open Manhole	1350
3.006	o	375	S54	109.078	107.300	1.403	Open Manhole	1200
1.009	o	225	S55	108.900	107.165	1.510	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
3.004	20.457	63.1	S79	109.447	107.615	1.457	Open Manhole	1350
5.000	14.340	114.7	S60	112.839	111.414	1.200	Open Manhole	1350
5.001	25.045	23.6	S61	112.018	110.352	1.441	Open Manhole	1350
5.002	11.290	25.0	S51	111.610	109.825	1.485	Open Manhole	1350
5.003	13.005	65.0	S52	111.154	109.625	1.229	Open Manhole	1350
5.004	14.451	60.2	S78	110.885	109.385	1.200	Open Manhole	1350
5.005	25.884	15.3	S79	109.447	107.690	1.457	Open Manhole	1350
3.005	6.501	20.6	S54	109.078	107.300	1.403	Open Manhole	1200
3.006	7.436	55.1	S55	108.900	107.165	1.360	Open Manhole	1350
1.009	6.665	15.0	S56	107.000	106.720	0.055	Open Manhole	0

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	S56	107.000	106.720	0.000	0	0

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Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S42, DS/PN: 1.004, Volume (m³): 4.5

Unit Reference	MD-SHE-0094-5000-1800-5000
Design Head (m)	1.800
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	94
Invert Level (m)	109.735
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	5.0
Flush-Flo™	0.411	4.4
Kick-Flo®	0.838	3.5
Mean Flow over Head Range	-	4.1

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	3.0	1.200	4.1	3.000	6.3	7.000	9.5
0.200	4.0	1.400	4.4	3.500	6.8	7.500	9.8
0.300	4.3	1.600	4.7	4.000	7.3	8.000	10.1
0.400	4.4	1.800	5.0	4.500	7.7	8.500	10.4
0.500	4.4	2.000	5.2	5.000	8.1	9.000	10.7
0.600	4.3	2.200	5.5	5.500	8.4	9.500	11.0
0.800	3.7	2.400	5.7	6.000	8.8		
1.000	3.8	2.600	5.9	6.500	9.1		

Hydro-Brake® Optimum Manhole: S47, DS/PN: 3.001, Volume (m³): 4.3

Unit Reference	MD-SHE-0061-1800-1200-1800
Design Head (m)	1.200
Design Flow (l/s)	1.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	61
Invert Level (m)	113.308
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

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Hydro-Brake® Optimum Manhole: S47, DS/PN: 3.001, Volume (m³): 4.3

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.8
Flush-Flo™	0.265	1.5
Kick-Flo®	0.542	1.3
Mean Flow over Head Range	-	1.4

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	1.3	1.200	1.8	3.000	2.7	7.000	4.1
0.200	1.5	1.400	1.9	3.500	2.9	7.500	4.2
0.300	1.5	1.600	2.0	4.000	3.1	8.000	4.3
0.400	1.5	1.800	2.2	4.500	3.3	8.500	4.4
0.500	1.4	2.000	2.3	5.000	3.5	9.000	4.6
0.600	1.3	2.200	2.4	5.500	3.6	9.500	4.7
0.800	1.5	2.400	2.5	6.000	3.8		
1.000	1.7	2.600	2.6	6.500	3.9		

Hydro-Brake® Optimum Manhole: S49, DS/PN: 3.002, Volume (m³): 5.0

Unit Reference	MD-SHE-0042-1000-1600-1000
Design Head (m)	1.600
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	42
Invert Level (m)	111.585
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	1.0
Flush-Flo™	0.185	0.6
Kick-Flo®	0.373	0.5
Mean Flow over Head Range	-	0.7

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	0.6	0.300	0.6	0.500	0.6	0.800	0.7
0.200	0.6	0.400	0.5	0.600	0.6	1.000	0.8

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Hydro-Brake® Optimum Manhole: S49, DS/PN: 3.002, Volume (m³): 5.0

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.200	0.9	2.400	1.2	5.000	1.7	8.000	2.1
1.400	0.9	2.600	1.2	5.500	1.7	8.500	2.1
1.600	1.0	3.000	1.3	6.000	1.8	9.000	2.2
1.800	1.1	3.500	1.4	6.500	1.9	9.500	2.3
2.000	1.1	4.000	1.5	7.000	2.0		
2.200	1.1	4.500	1.6	7.500	2.0		

Hydro-Brake® Optimum Manhole: S53, DS/PN: 3.004, Volume (m³): 5.3

Unit Reference	MD-SHE-0044-1000-1250-1000
Design Head (m)	1.250
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	44
Invert Level (m)	107.939
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.250	1.0
Flush-Flo™	0.196	0.7
Kick-Flo®	0.394	0.6
Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.0	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.3
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.2	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.5
0.800	0.8	2.400	1.3	6.000	2.0		
1.000	0.9	2.600	1.4	6.500	2.1		

Hydro-Brake® Optimum Manhole: S51, DS/PN: 5.003, Volume (m³): 3.3

Unit Reference	MD-SHE-0045-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	1.0
Flush-Flo™	Calculated

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Hydro-Brake® Optimum Manhole: S51, DS/PN: 5.003, Volume (m³): 3.3

Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	109.825
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.200	1.0
Flush-Flo™	0.196	0.7
Kick-Flo®	0.398	0.6
Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.2		

Hydro-Brake® Optimum Manhole: S55, DS/PN: 1.009, Volume (m³): 5.6

Unit Reference	MD-SHE-0085-3700-1400-3700
Design Head (m)	1.400
Design Flow (l/s)	3.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	85
Invert Level (m)	107.165
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.400	3.7
Flush-Flo™	0.376	3.5
Kick-Flo®	0.763	2.8
Mean Flow over Head Range	-	3.1

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

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Hydro-Brake® Optimum Manhole: S55, DS/PN: 1.009, Volume (m³): 5.6

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	2.6	1.200	3.4	3.000	5.3	7.000	7.9
0.200	3.3	1.400	3.7	3.500	5.7	7.500	8.1
0.300	3.4	1.600	3.9	4.000	6.0	8.000	8.4
0.400	3.5	1.800	4.2	4.500	6.4	8.500	8.6
0.500	3.4	2.000	4.4	5.000	6.7	9.000	8.9
0.600	3.3	2.200	4.6	5.500	7.0	9.500	9.1
0.800	2.9	2.400	4.7	6.000	7.3		
1.000	3.2	2.600	4.9	6.500	7.6		

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Storage Structures for Surface Network 1

Cellular Storage Manhole: S41, DS/PN: 2.001

Invert Level (m) 109.950 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.7	60.7	1.300	0.1	99.7
0.100	60.7	63.8	1.400	0.1	99.8
0.200	60.7	66.9	1.500	0.1	100.0
0.300	60.7	70.0	1.600	0.1	100.1
0.400	60.7	73.2	1.700	0.1	100.2
0.500	60.7	76.3	1.800	0.1	100.4
0.600	60.7	79.4	1.900	0.1	100.5
0.700	60.7	82.5	2.000	0.1	100.6
0.800	60.7	85.6	2.100	0.1	100.7
0.900	60.7	88.7	2.200	0.1	100.9
1.000	60.7	91.9	2.300	0.1	101.0
1.100	60.7	95.0	2.400	0.1	101.1
1.200	60.7	98.1	2.500	0.1	101.2

Cellular Storage Manhole: S47, DS/PN: 3.001

Invert Level (m) 113.320 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	71.3	71.3	1.300	0.1	113.6
0.100	71.3	74.7	1.400	0.1	113.7
0.200	71.3	78.1	1.500	0.1	113.8
0.300	71.3	81.4	1.600	0.1	114.0
0.400	71.3	84.8	1.700	0.1	114.1
0.500	71.3	88.2	1.800	0.1	114.2
0.600	71.3	91.6	1.900	0.1	114.3
0.700	71.3	94.9	2.000	0.1	114.5
0.800	71.3	98.3	2.100	0.1	114.6
0.900	71.3	101.7	2.200	0.1	114.7
1.000	71.3	105.1	2.300	0.1	114.8
1.100	71.3	108.5	2.400	0.1	115.0
1.200	71.3	111.8	2.500	0.1	115.1

Cellular Storage Manhole: S49, DS/PN: 3.002

Invert Level (m) 111.985 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

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Cellular Storage Manhole: S49, DS/PN: 3.002

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	141.8	141.8	1.300	0.1	201.4
0.100	141.8	146.6	1.400	0.1	201.5
0.200	141.8	151.3	1.500	0.1	201.7
0.300	141.8	156.1	1.600	0.1	201.8
0.400	141.8	160.9	1.700	0.1	201.9
0.500	141.8	165.6	1.800	0.1	202.0
0.600	141.8	170.4	1.900	0.1	202.2
0.700	141.8	175.1	2.000	0.1	202.3
0.800	141.8	179.9	2.100	0.1	202.4
0.900	141.8	184.7	2.200	0.1	202.5
1.000	141.8	189.4	2.300	0.1	202.7
1.100	141.8	194.2	2.400	0.1	202.8
1.200	141.8	199.0	2.500	0.1	202.9

Cellular Storage Manhole: S53, DS/PN: 3.004

Invert Level (m) 107.939 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	115.0	115.0	1.300	0.1	168.7
0.100	115.0	119.3	1.400	0.1	168.8
0.200	115.0	123.6	1.500	0.1	168.9
0.300	115.0	127.9	1.600	0.1	169.1
0.400	115.0	132.2	1.700	0.1	169.2
0.500	115.0	136.4	1.800	0.1	169.3
0.600	115.0	140.7	1.900	0.1	169.4
0.700	115.0	145.0	2.000	0.1	169.6
0.800	115.0	149.3	2.100	0.1	169.7
0.900	115.0	153.6	2.200	0.1	169.8
1.000	115.0	157.9	2.300	0.1	169.9
1.100	115.0	162.2	2.400	0.1	170.1
1.200	115.0	166.5	2.500	0.1	170.2

Cellular Storage Manhole: S51, DS/PN: 5.003

Invert Level (m) 109.825 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	129.0	129.0	0.600	129.0	156.3
0.100	129.0	133.5	0.700	129.0	160.8
0.200	129.0	138.1	0.800	129.0	165.3
0.300	129.0	142.6	0.900	0.1	167.7
0.400	129.0	147.2	1.000	0.1	167.8
0.500	129.0	151.7	1.100	0.1	167.9

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Cellular Storage Manhole: S51, DS/PN: 5.003

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
1.200	0.1	168.1	1.900	0.1	168.9
1.300	0.1	168.2	2.000	0.1	169.1
1.400	0.1	168.3	2.100	0.1	169.2
1.500	0.1	168.4	2.200	0.1	169.3
1.600	0.1	168.6	2.300	0.1	169.5
1.700	0.1	168.7	2.400	0.1	169.6
1.800	0.1	168.8	2.500	0.1	169.7

Complex Manhole: S55, DS/PN: 1.009

Cellular Storage

Invert Level (m) 107.165 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	142.5	142.5	1.300	0.1	202.2
0.100	142.5	147.3	1.400	0.1	202.4
0.200	142.5	152.0	1.500	0.1	202.5
0.300	142.5	156.8	1.600	0.1	202.6
0.400	142.5	161.6	1.700	0.1	202.8
0.500	142.5	166.4	1.800	0.1	202.9
0.600	142.5	171.1	1.900	0.1	203.0
0.700	142.5	175.9	2.000	0.1	203.1
0.800	142.5	180.7	2.100	0.1	203.3
0.900	142.5	185.5	2.200	0.1	203.4
1.000	142.5	190.2	2.300	0.1	203.5
1.100	142.5	195.0	2.400	0.1	203.6
1.200	142.5	199.8	2.500	0.1	203.8

Cellular Storage

Invert Level (m) 107.165 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	40.0	40.0	0.900	0.1	61.6
0.100	40.0	42.5	1.000	0.1	61.7
0.200	40.0	45.1	1.100	0.1	61.8
0.300	40.0	47.6	1.200	0.1	61.9
0.400	40.0	50.1	1.300	0.1	62.1
0.500	40.0	52.6	1.400	0.1	62.2
0.600	40.0	55.2	1.500	0.1	62.3
0.700	40.0	57.7	1.600	0.1	62.5
0.800	40.0	60.2	1.700	0.1	62.6

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Cellular Storage

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
1.800	0.1	62.7	2.200	0.1	63.2
1.900	0.1	62.8	2.300	0.1	63.3
2.000	0.1	63.0	2.400	0.1	63.5
2.100	0.1	63.1	2.500	0.1	63.6

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 6
Number of Online Controls 6 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 20.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 35, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S35	15 Summer	1	+0%	100/15 Summer			
1.001	S36	15 Summer	1	+0%	30/15 Summer	100/120 Summer		
1.002	S37	15 Summer	1	+0%	30/15 Summer			
1.003	S38	15 Summer	1	+0%	30/15 Summer			
2.000	S40	15 Summer	1	+0%	100/60 Summer			
2.001	S41	60 Summer	1	+0%	30/15 Summer			
1.004	S42	15 Summer	1	+0%	1/15 Summer			
1.005	S43	15 Summer	1	+0%				
1.006	S44	15 Summer	1	+0%				
1.007	S45	15 Summer	1	+0%	100/960 Summer			
1.008	S46	15 Summer	1	+0%	30/360 Summer			
3.000	S80	15 Summer	1	+0%				
3.001	S47	120 Summer	1	+0%	30/15 Summer			
4.000	S48	15 Summer	1	+0%	30/240 Summer			
3.002	S49	480 Winter	1	+0%	1/15 Summer	100/1440 Summer		
3.003	S50	15 Summer	1	+0%				
3.004	S53	1440 Summer	1	+0%	30/360 Summer			
5.000	S39	15 Summer	1	+0%				
5.001	S60	15 Summer	1	+0%				

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S35	110.742	-0.233	0.000	0.11			11.0	OK
1.001	S36	110.473	-0.212	0.000	0.18			16.9	OK
1.002	S37	110.242	-0.173	0.000	0.17			16.3	OK
1.003	S38	110.231	-0.004	0.000	0.13			15.0	OK
2.000	S40	110.932	-0.193	0.000	0.05			5.3	OK
2.001	S41	110.120	-0.130	0.000	0.03		36	3.8	OK
1.004	S42	110.204	0.169	0.000	0.04			4.4	SURCHARGED
1.005	S43	109.551	-0.244	0.000	0.08			7.8	OK
1.006	S44	109.287	-0.328	0.000	0.04			14.0	OK
1.007	S45	108.095	-0.320	0.000	0.05			14.7	OK
1.008	S46	107.585	-0.300	0.000	0.09			18.1	OK
3.000	S80	115.180	-0.170	0.000	0.14			15.4	OK
3.001	S47	113.514	-0.019	0.000	0.01		101	1.5	OK
4.000	S48	112.373	-0.162	0.000	0.17			15.0	OK
3.002	S49	112.243	0.358	0.000	0.00		537	0.7	SURCHARGED
3.003	S50	110.100	-0.285	0.000	0.01			3.2	OK
3.004	S53	108.084	-0.230	0.000	0.00		911	0.7	OK
5.000	S39	111.609	-0.155	0.000	0.21			8.8	OK
5.001	S60	111.461	-0.178	0.000	0.10			9.7	OK

PN	US/MH Name	Level Exceeded
1.000	S35	
1.001	S36	2
1.002	S37	
1.003	S38	
2.000	S40	
2.001	S41	
1.004	S42	
1.005	S43	
1.006	S44	
1.007	S45	
1.008	S46	
3.000	S80	
3.001	S47	
4.000	S48	
3.002	S49	2
3.003	S50	
3.004	S53	
5.000	S39	
5.001	S60	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
5.002	S61	15 Summer	1	+0%					110.328
5.003	S51	360 Summer	1	+0%	30/120 Summer				109.931
5.004	S52	480 Summer	1	+0%					109.633
5.005	S78	480 Summer	1	+0%					109.389
3.005	S79	480 Summer	1	+0%	30/960 Summer				107.626
3.006	S54	480 Summer	1	+0%	30/120 Summer				107.405
1.009	S55	480 Summer	1	+0%	1/240 Summer				107.404

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
5.002	S61	-0.249	0.000	0.07			11.2	OK	
5.003	S51	-0.194	0.000	0.01		243	0.7	OK	
5.004	S52	-0.292	0.000	0.01			0.7	OK	
5.005	S78	-0.296	0.000	0.00			0.7	OK	
3.005	S79	-0.364	0.000	0.01			1.4	OK	
3.006	S54	-0.270	0.000	0.01			1.8	OK	
1.009	S55	0.014	0.000	0.04		282	3.3	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 6
Number of Online Controls 6 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 20.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 35, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S35	30 Summer	30	+35%	100/15 Summer			
1.001	S36	120 Winter	30	+35%	30/15 Summer	100/120 Summer		
1.002	S37	120 Winter	30	+35%	30/15 Summer			
1.003	S38	120 Winter	30	+35%	30/15 Summer			
2.000	S40	15 Summer	30	+35%	100/60 Summer			
2.001	S41	120 Winter	30	+35%	30/15 Summer			
1.004	S42	120 Winter	30	+35%	1/15 Summer			
1.005	S43	15 Summer	30	+35%				
1.006	S44	15 Summer	30	+35%				
1.007	S45	15 Summer	30	+35%	100/960 Summer			
1.008	S46	960 Winter	30	+35%	30/360 Summer			
3.000	S80	15 Summer	30	+35%				
3.001	S47	240 Winter	30	+35%	30/15 Summer			
4.000	S48	1440 Winter	30	+35%	30/240 Summer			
3.002	S49	1440 Winter	30	+35%	1/15 Summer	100/1440 Summer		
3.003	S50	15 Summer	30	+35%				
3.004	S53	1440 Winter	30	+35%	30/360 Summer			
5.000	S39	15 Summer	30	+35%				
5.001	S60	15 Summer	30	+35%				

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S35	110.906	-0.069	0.000	0.34			33.0	OK
1.001	S36	110.878	0.193	0.000	0.19			17.6	SURCHARGED
1.002	S37	110.875	0.460	0.000	0.15			15.1	SURCHARGED
1.003	S38	110.872	0.637	0.000	0.16			18.3	SURCHARGED
2.000	S40	110.962	-0.163	0.000	0.17			17.6	OK
2.001	S41	110.871	0.621	0.000	0.03		153	3.8	SURCHARGED
1.004	S42	110.870	0.835	0.000	0.04			4.4	SURCHARGED
1.005	S43	109.585	-0.210	0.000	0.20			19.4	OK
1.006	S44	109.329	-0.286	0.000	0.13			47.0	OK
1.007	S45	108.146	-0.269	0.000	0.18			50.4	OK
1.008	S46	108.051	0.166	0.000	0.04			7.6	SURCHARGED
3.000	S80	115.231	-0.119	0.000	0.45			51.1	OK
3.001	S47	114.147	0.614	0.000	0.01		355	1.5	SURCHARGED
4.000	S48	112.956	0.421	0.000	0.02			2.1	SURCHARGED
3.002	S49	112.956	1.071	0.000	0.00			0.9	SURCHARGED
3.003	S50	110.124	-0.261	0.000	0.04			12.4	OK
3.004	S53	108.532	0.218	0.000	0.00			0.7	SURCHARGED
5.000	S39	111.678	-0.086	0.000	0.69			29.3	OK
5.001	S60	111.504	-0.135	0.000	0.33			33.0	OK

PN	US/MH Name	Level Exceeded
1.000	S35	
1.001	S36	2
1.002	S37	
1.003	S38	
2.000	S40	
2.001	S41	
1.004	S42	
1.005	S43	
1.006	S44	
1.007	S45	
1.008	S46	
3.000	S80	
3.001	S47	
4.000	S48	
3.002	S49	2
3.003	S50	
3.004	S53	
5.000	S39	
5.001	S60	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
5.002	S61	15 Summer	30	+35%					110.376
5.003	S51	480 Winter	30	+35%	30/120 Summer				110.221
5.004	S52	1440 Summer	30	+35%					109.634
5.005	S78	15 Winter	30	+35%					109.389
3.005	S79	960 Winter	30	+35%	30/960 Summer				108.051
3.006	S54	960 Winter	30	+35%	30/120 Summer				108.050
1.009	S55	960 Winter	30	+35%	1/240 Summer				108.050

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
5.002	S61	-0.201	0.000	0.23			39.3	OK	
5.003	S51	0.096	0.000	0.01		610	0.7	SURCHARGED	
5.004	S52	-0.291	0.000	0.01			0.7	OK	
5.005	S78	-0.296	0.000	0.00			0.7	OK	
3.005	S79	0.061	0.000	0.01			1.5	SURCHARGED	
3.006	S54	0.375	0.000	0.01			1.9	SURCHARGED	
1.009	S55	0.660	0.000	0.04		839	3.3	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 6
Number of Online Controls 6 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 20.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 35, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S35	120 Winter	100	+45%	100/15 Summer			
1.001	S36	120 Winter	100	+45%	30/15 Summer	100/120 Summer		
1.002	S37	120 Winter	100	+45%	30/15 Summer			
1.003	S38	120 Winter	100	+45%	30/15 Summer			
2.000	S40	120 Winter	100	+45%	100/60 Summer			
2.001	S41	120 Winter	100	+45%	30/15 Summer			
1.004	S42	120 Winter	100	+45%	1/15 Summer			
1.005	S43	15 Summer	100	+45%				
1.006	S44	15 Summer	100	+45%				
1.007	S45	1440 Winter	100	+45%	100/960 Summer			
1.008	S46	1440 Winter	100	+45%	30/360 Summer			
3.000	S80	15 Summer	100	+45%				
3.001	S47	240 Winter	100	+45%	30/15 Summer			
4.000	S48	1440 Winter	100	+45%	30/240 Summer			
3.002	S49	1440 Winter	100	+45%	1/15 Summer	100/1440 Summer		
3.003	S50	15 Summer	100	+45%				
3.004	S53	1440 Winter	100	+45%	30/360 Summer			
5.000	S39	15 Summer	100	+45%				
5.001	S60	15 Summer	100	+45%				

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S35	112.005	1.030	0.000	0.16			15.2	SURCHARGED
1.001	S36	112.003	1.318	3.539	0.23			20.9	FLOOD
1.002	S37	112.000	1.585	0.000	0.21			20.3	FLOOD RISK
1.003	S38	111.999	1.764	0.000	0.22			24.7	FLOOD RISK
2.000	S40	112.006	0.881	0.000	0.07			7.4	SURCHARGED
2.001	S41	112.001	1.751	0.000	0.03		247	4.0	SURCHARGED
1.004	S42	111.998	1.963	0.000	0.05			5.6	FLOOD RISK
1.005	S43	109.597	-0.198	0.000	0.25			25.2	OK
1.006	S44	109.344	-0.271	0.000	0.17			63.8	OK
1.007	S45	108.887	0.472	0.000	0.02			6.8	SURCHARGED
1.008	S46	108.885	1.000	0.000	0.04			7.6	FLOOD RISK
3.000	S80	115.255	-0.095	0.000	0.63			71.2	OK
3.001	S47	114.555	1.022	0.000	0.02		459	1.8	SURCHARGED
4.000	S48	113.651	1.116	0.000	0.03			2.9	FLOOD RISK
3.002	S49	113.651	1.766	1.603	0.00			1.1	FLOOD
3.003	S50	110.130	-0.255	0.000	0.06			17.1	OK
3.004	S53	108.817	0.503	0.000	0.00			0.9	SURCHARGED
5.000	S39	111.715	-0.049	0.000	0.96			40.8	OK
5.001	S60	111.523	-0.116	0.000	0.46			45.9	OK

PN	US/MH Name	Level Exceeded
1.000	S35	
1.001	S36	2
1.002	S37	
1.003	S38	
2.000	S40	
2.001	S41	
1.004	S42	
1.005	S43	
1.006	S44	
1.007	S45	
1.008	S46	
3.000	S80	
3.001	S47	
4.000	S48	
3.002	S49	2
3.003	S50	
3.004	S53	
5.000	S39	
5.001	S60	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
5.002	S61	480 Winter	100	+45%					110.407
5.003	S51	480 Winter	100	+45%	30/120 Summer				110.407
5.004	S52	480 Winter	100	+45%					109.634
5.005	S78	480 Winter	100	+45%					109.389
3.005	S79	1440 Winter	100	+45%	30/960 Summer				108.883
3.006	S54	1440 Winter	100	+45%	30/120 Summer				108.883
1.009	S55	1440 Winter	100	+45%	1/240 Summer				108.883

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
5.002	S61	-0.170	0.000	0.03			5.6	OK	
5.003	S51	0.282	0.000	0.01		915	0.7	SURCHARGED	
5.004	S52	-0.291	0.000	0.01			0.7	OK	
5.005	S78	-0.296	0.000	0.00			0.7	OK	
3.005	S79	0.893	0.000	0.01			1.6	SURCHARGED	
3.006	S54	1.208	0.000	0.01			1.9	FLOOD RISK	
1.009	S55	1.493	0.000	0.04		1289	4.1	FLOOD RISK	

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