

Tier Consult Group		Page 1
Unit 5 Office Village Chester Business Park Chester CH4 9QZ	Barberry Bardon LTD Project Excellence Battram	
Date 08/05/2025 10:57 File REPLAN.MDX	Designed by JHale Checked by	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	21.000	Add Flow / Climate Change (%)	0
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 Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	3.651	4-8	6.816	8-12	1.168

Total Area Contributing (ha) = 11.634

Total Pipe Volume (m³) = 1205.411

Network Design Table for Storm

« - Indicates pipe capacity < flow

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	90.000	0.180	500.0	0.797	4.00	0.0	0.600	o	1050	Pipe/Conduit	
1.001	90.000	0.180	500.0	1.526	0.00	0.0	0.600	o	1050	Pipe/Conduit	
2.000	24.008	0.060	400.1	0.138	4.00	0.0	0.600	o	450	Pipe/Conduit	
2.001	26.000	0.065	400.0	0.000	0.00	0.0	0.600	o	450	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	4.98	153.665	0.797	0.0	0.0	0.0	1.53	1328.5	107.9
1.001	50.00	5.96	153.485	2.323	0.0	0.0	0.0	1.53	1328.5	314.6
2.000	50.00	4.40	156.000	0.138	0.0	0.0	0.0	1.01	160.7	18.7
2.001	50.00	4.83	155.940	0.138	0.0	0.0	0.0	1.01	160.7	18.7

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Network Design Table for Storm													
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		
3.000	24.008	0.060	400.1	0.028	4.00	0.0	0.600	o	450	Pipe/Conduit			
2.002	75.000	1.970	38.1	0.075	0.00	0.0	0.600	o	450	Pipe/Conduit			
1.002	22.000	0.044	500.0	0.525	0.00	0.0	0.600	o	1050	Pipe/Conduit			
1.003	70.000	0.140	500.0	0.303	0.00	0.0	0.600	o	1050	Pipe/Conduit			
4.000	65.000	0.650	100.0	0.096	4.00	0.0	0.600	o	150	Pipe/Conduit			
4.001	90.000	0.529	170.1	0.092	0.00	0.0	0.600	o	225	Pipe/Conduit			
4.002	11.498	0.068	169.1	0.050	0.00	0.0	0.600	o	225	Pipe/Conduit			
5.000	57.000	0.570	100.0	0.113	4.00	0.0	0.600	o	150	Pipe/Conduit			
5.001	90.000	0.535	168.2	0.137	0.00	0.0	0.600	o	225	Pipe/Conduit			
4.003	18.451	0.098	188.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit			
6.000	65.000	0.673	96.6	0.039	4.00	0.0	0.600	o	100	Pipe/Conduit			
6.001	90.000	0.909	99.0	0.051	0.00	0.0	0.600	o	150	Pipe/Conduit			
4.004	25.848	0.321	80.5	0.043	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)			
3.000	50.00	4.40	156.000	0.028	0.0	0.0	0.0	1.01	160.7	3.8			
2.002	50.00	5.20	155.875	0.241	0.0	0.0	0.0	3.30	525.3	32.6			
1.002	50.00	6.19	153.305	3.089	0.0	0.0	0.0	1.53	1328.5	418.3			
1.003	50.00	6.95	153.261	3.392	0.0	0.0	0.0	1.53	1328.5	459.3			
4.000	50.00	5.08	156.033	0.096	0.0	0.0	0.0	1.00	17.8	13.0			
4.001	50.00	6.58	155.308	0.188	0.0	0.0	0.0	1.00	39.7	25.5			
4.002	50.00	6.77	154.779	0.238	0.0	0.0	0.0	1.00	39.9	32.2			
5.000	50.00	4.95	156.143	0.113	0.0	0.0	0.0	1.00	17.8	15.3			
5.001	50.00	6.44	155.498	0.250	0.0	0.0	0.0	1.01	40.0	33.9			
4.003	50.00	7.04	154.636	0.488	0.0	0.0	0.0	1.14	80.8	66.1			
6.000	50.00	5.38	155.751	0.039	0.0	0.0	0.0	0.78	6.1	5.3			
6.001	50.00	6.87	155.028	0.090	0.0	0.0	0.0	1.01	17.8	12.2			
4.004	50.00	7.28	153.969	0.621	0.0	0.0	0.0	1.75	124.0	84.1			
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Network Design Table for Storm

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	67.000	0.134	500.0	0.131	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.005	24.000	0.048	500.0	0.152	0.00	0.0	0.600	o	1050	Pipe/Conduit	
7.000	19.000	0.038	500.0	0.341	4.00	0.0	0.600	o	1050	Pipe/Conduit	
1.006	32.598	0.065	501.5	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
8.000	15.000	0.030	500.0	0.583	4.00	0.0	0.600	o	1050	Pipe/Conduit	
8.001	22.000	0.044	500.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
8.002	90.000	0.180	500.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
8.003	50.000	0.100	500.0	2.072	0.00	0.0	0.600	o	1050	Pipe/Conduit	
9.000	20.000	0.031	645.2	0.683	4.00	0.0	0.600	o	1050	Pipe/Conduit	
8.004	51.000	0.102	500.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.007	3.874	0.008	484.3	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
10.000	90.000	0.180	500.0	1.180	4.00	0.0	0.600	o	1050	Pipe/Conduit	
11.000	40.000	0.080	500.0	0.060	4.00	0.0	0.600	o	1050	Pipe/Conduit	
11.001	70.000	0.140	500.0	0.220	0.00	0.0	0.600	o	1050	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	8.01	152.898	4.144	0.0	0.0	0.0	1.53	1328.5	561.1
1.005	50.00	8.27	152.764	4.296	0.0	0.0	0.0	1.53	1328.5	581.7
7.000	50.00	4.21	152.500	0.341	0.0	0.0	0.0	1.53	1328.5	46.2
1.006	50.00	8.63	152.462	4.637	0.0	0.0	0.0	1.53	1326.5	627.9
8.000	50.00	4.16	153.250	0.583	0.0	0.0	0.0	1.53	1328.5	78.9
8.001	50.00	4.40	153.220	0.583	0.0	0.0	0.0	1.53	1328.5	78.9
8.002	50.00	5.38	153.176	0.583	0.0	0.0	0.0	1.53	1328.5	78.9
8.003	50.00	5.92	152.996	2.655	0.0	0.0	0.0	1.53	1328.5	359.5
9.000	50.00	4.25	154.000	0.683	0.0	0.0	0.0	1.35	1168.3	92.5
8.004	50.00	6.48	152.896	3.338	0.0	0.0	0.0	1.53	1328.5	452.0
1.007	50.00	8.67	152.397	7.975	0.0	0.0	0.0	1.56	1350.1	1079.9
10.000	50.00	4.98	153.900	1.180	0.0	0.0	0.0	1.53	1328.5	159.8
11.000	50.00	4.43	154.500	0.060	0.0	0.0	0.0	1.53	1328.5	8.1
11.001	50.00	5.19	154.420	0.280	0.0	0.0	0.0	1.53	1328.5	37.9

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Network Design Table for Storm

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
10.001	90.000	0.180	500.0	0.480	0.00	0.0	0.600	o	1050	Pipe/Conduit	
10.002	90.000	0.180	500.0	0.516	0.00	0.0	0.600	o	1050	Pipe/Conduit	
10.003	60.000	0.120	500.0	0.813	0.00	0.0	0.600	o	1050	Pipe/Conduit	
10.004	72.464	0.072	1006.4	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
10.005	107.000	0.214	500.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
10.006	36.000	0.072	500.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
12.000	85.000	1.453	58.5	0.163	4.00	0.0	0.600	o	300	Pipe/Conduit	
12.001	60.000	1.147	52.3	0.099	0.00	0.0	0.600	o	300	Pipe/Conduit	
12.002	74.000	0.708	104.5	0.128	0.00	0.0	0.600	o	300	Pipe/Conduit	
12.003	69.067	0.750	92.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	23.772	3.087	7.7	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)
10.001	50.00	6.17	153.720	1.940	0.0	0.0	0.0	1.53	1328.5	262.7
10.002	50.00	7.15	153.540	2.456	0.0	0.0	0.0	1.53	1328.5	332.6
10.003	50.00	7.80	153.360	3.269	0.0	0.0	0.0	1.53	1328.5	442.7
10.004	50.00	8.92	153.240	3.269	0.0	0.0	0.0	1.08	933.3	442.7
10.005	50.00	10.08	153.168	3.269	0.0	0.0	0.0	1.53	1328.5	442.7
10.006	50.00	10.48	152.954	3.269	0.0	0.0	0.0	1.53	1328.5	442.7
12.000	50.00	4.69	158.200	0.163	0.0	0.0	0.0	2.06	145.6	22.1
12.001	50.00	5.15	156.747	0.262	0.0	0.0	0.0	2.18	154.0	35.5
12.002	50.00	5.95	155.600	0.390	0.0	0.0	0.0	1.54	108.7	52.8
12.003	50.00	6.65	154.892	0.390	0.0	0.0	0.0	1.64	115.8	52.8
1.008	50.00	10.55	152.292	11.634	0.0	0.0	0.0	5.70	402.9	1575.4

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	155.868	2.203	Open Manhole	2100	1.000	153.665	1050				
2	155.858	2.373	Open Manhole	2100	1.001	153.485	1050	1.000	153.485	1050	
3	157.875	1.875	Open Manhole	1350	2.000	156.000	450				
4	157.726	1.786	Open Manhole	1350	2.001	155.940	450	2.000	155.940	450	
5	157.891	1.891	Open Manhole	1350	3.000	156.000	450				
6	157.723	1.848	Open Manhole	1350	2.002	155.875	450	2.001	155.875	450	
								3.000	155.940	450	65
7	155.851	2.546	Open Manhole	2100	1.002	153.305	1050	1.001	153.305	1050	
								2.002	153.905	450	
8	155.969	2.708	Open Manhole	2100	1.003	153.261	1050	1.002	153.261	1050	
9	158.000	1.967	Open Manhole	600	4.000	156.033	150				
10	156.100	0.792	Open Manhole	600	4.001	155.308	225	4.000	155.383	150	
11	156.172	1.393	Open Manhole	1200	4.002	154.779	225	4.001	154.779	225	
12	158.150	2.007	Open Manhole	600	5.000	156.143	150				
13	156.300	0.802	Open Manhole	600	5.001	155.498	225	5.000	155.573	150	
14	155.954	1.318	Open Manhole	1200	4.003	154.636	300	4.002	154.711	225	
								5.001	154.963	225	252
15	158.200	2.449	Open Manhole	600	6.000	155.751	100				
16	156.525	1.497	Open Manhole	600	6.001	155.028	150	6.000	155.078	100	
17	155.748	1.779	Open Manhole	1200	4.004	153.969	300	4.003	154.538	300	569
								6.001	154.119	150	
18	155.750	2.852	Open Manhole	2100	1.004	152.898	1050	1.003	153.121	1050	223
								4.004	153.648	300	
19	156.127	3.363	Open Manhole	2100	1.005	152.764	1050	1.004	152.764	1050	
20	155.183	2.683	Open Manhole	2400	7.000	152.500	1050				
21	155.844	3.382	Open Manhole	2100	1.006	152.462	1050	1.005	152.716	1050	254
								7.000	152.462	1050	
22	155.844	2.594	Open Manhole	2100	8.000	153.250	1050				
23	155.700	2.480	Open Manhole	2100	8.001	153.220	1050	8.000	153.220	1050	
24	155.897	2.721	Open Manhole	2100	8.002	153.176	1050	8.001	153.176	1050	
25	155.981	2.985	Open Manhole	2100	8.003	152.996	1050	8.002	152.996	1050	
26	155.904	1.904	Open Manhole	2100	9.000	154.000	1050				
27	155.918	3.022	Open Manhole	2100	8.004	152.896	1050	8.003	152.896	1050	
								9.000	153.969	1050	1073
28	155.500	3.103	Open Manhole	2100	1.007	152.397	1050	1.006	152.397	1050	
								8.004	152.794	1050	397
29	155.629	1.729	Open Manhole	2100	10.000	153.900	1050				
30	156.961	2.461	Open Manhole	2100	11.000	154.500	1050				

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backd (mm)
31	156.920	2.500	Open Manhole	2100	11.001	154.420	1050	11.000	154.420	1050
32	155.553	1.833	Open Manhole	2100	10.001	153.720	1050	10.000	153.720	1050
								11.001	154.280	1050
33	155.369	1.829	Open Manhole	2100	10.002	153.540	1050	10.001	153.540	1050
34	154.988	1.628	Open Manhole	2100	10.003	153.360	1050	10.002	153.360	1050
headwall	154.995	1.755	Open Manhole	2100	10.004	153.240	1050	10.003	153.240	1050
headwall	154.995	1.827	Open Manhole	2100	10.005	153.168	1050	10.004	153.168	1050
35	154.900	1.946	Open Manhole	2100	10.006	152.954	1050	10.005	152.954	1050
36	159.596	1.396	Open Manhole	1200	12.000	158.200	300			
37	158.294	1.547	Open Manhole	1200	12.001	156.747	300	12.000	156.747	300
38	157.300	1.700	Open Manhole	1200	12.002	155.600	300	12.001	155.600	300
39	156.592	1.700	Open Manhole	1200	12.003	154.892	300	12.002	154.892	300
40	155.500	3.208	Open Manhole	2100	1.008	152.292	300	1.007	152.389	1050
								10.006	152.882	1050
								12.003	154.142	300
	150.220	1.015	Open Manhole	0		OUTFALL		1.008	149.205	300

No coordinates have been specified, layout information cannot be produced.

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PIPELINE SCHEDULES for Storm

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	1050	1	155.868	153.665	1.153	Open Manhole	2100
1.01	o	1050	2	155.858	153.485	1.323	Open Manhole	2100
2.000	o	450	3	157.875	156.000	1.425	Open Manhole	1350
2.01	o	450	4	157.726	155.940	1.336	Open Manhole	1350
3.000	o	450	5	157.891	156.000	1.441	Open Manhole	1350
2.02	o	450	6	157.723	155.875	1.398	Open Manhole	1350
1.02	o	1050	7	155.851	153.305	1.496	Open Manhole	2100
1.03	o	1050	8	155.969	153.261	1.658	Open Manhole	2100
4.000	o	150	9	158.000	156.033	1.817	Open Manhole	600
4.01	o	225	10	156.100	155.308	0.567	Open Manhole	600
4.02	o	225	11	156.172	154.779	1.168	Open Manhole	1200
5.000	o	150	12	158.150	156.143	1.857	Open Manhole	600
5.01	o	225	13	156.300	155.498	0.577	Open Manhole	600
4.003	o	300	14	155.954	154.636	1.018	Open Manhole	1200

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	90.000	500.0	2	155.858	153.485	1.323	Open Manhole	2100
1.01	90.000	500.0	7	155.851	153.305	1.496	Open Manhole	2100
2.000	24.008	400.1	4	157.726	155.940	1.336	Open Manhole	1350
2.01	26.000	400.0	6	157.723	155.875	1.398	Open Manhole	1350
3.000	24.008	400.1	6	157.723	155.940	1.333	Open Manhole	1350
2.02	75.000	38.1	7	155.851	153.905	1.496	Open Manhole	2100
1.02	22.000	500.0	8	155.969	153.261	1.658	Open Manhole	2100
1.03	70.000	500.0	18	155.750	153.121	1.579	Open Manhole	2100
4.000	65.000	100.0	10	156.100	155.383	0.567	Open Manhole	600
4.01	90.000	170.1	11	156.172	154.779	1.168	Open Manhole	1200
4.02	11.498	169.1	14	155.954	154.711	1.018	Open Manhole	1200
5.000	57.000	100.0	13	156.300	155.573	0.577	Open Manhole	600
5.01	90.000	168.2	14	155.954	154.963	0.766	Open Manhole	1200
4.003	18.451	188.3	17	155.748	154.538	0.910	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

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)
6.000	o	100	15	158.200	155.751	2.349	Open Manhole	600
6.001	o	150	16	156.525	155.028	1.347	Open Manhole	600
4.004	o	300	17	155.748	153.969	1.479	Open Manhole	1200
1.04	o	1050	18	155.750	152.898	1.802	Open Manhole	2100
1.05	o	1050	19	156.127	152.764	2.313	Open Manhole	2100
7.000	o	1050	20	155.183	152.500	1.633	Open Manhole	2400
1.06	o	1050	21	155.844	152.462	2.332	Open Manhole	2100
8.000	o	1050	22	155.844	153.250	1.544	Open Manhole	2100
8.01	o	1050	23	155.700	153.220	1.430	Open Manhole	2100
8.02	o	1050	24	155.897	153.176	1.671	Open Manhole	2100
8.03	o	1050	25	155.981	152.996	1.935	Open Manhole	2100
9.000	o	1050	26	155.904	154.000	0.854	Open Manhole	2100
8.04	o	1050	27	155.918	152.896	1.972	Open Manhole	2100

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)
6.000	65.000	96.6	16	156.525	155.078	1.347	Open Manhole	600
6.001	90.000	99.0	17	155.748	154.119	1.479	Open Manhole	1200
4.004	25.848	80.5	18	155.750	153.648	1.802	Open Manhole	2100
1.04	67.000	500.0	19	156.127	152.764	2.313	Open Manhole	2100
1.05	24.000	500.0	21	155.844	152.716	2.078	Open Manhole	2100
7.000	19.000	500.0	21	155.844	152.462	2.332	Open Manhole	2100
1.06	32.598	501.5	28	155.500	152.397	2.053	Open Manhole	2100
8.000	15.000	500.0	23	155.700	153.220	1.430	Open Manhole	2100
8.01	22.000	500.0	24	155.897	153.176	1.671	Open Manhole	2100
8.02	90.000	500.0	25	155.981	152.996	1.935	Open Manhole	2100
8.03	50.000	500.0	27	155.918	152.896	1.972	Open Manhole	2100
9.000	20.000	645.2	27	155.918	153.969	0.899	Open Manhole	2100
8.04	51.000	500.0	28	155.500	152.794	1.656	Open Manhole	2100

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PIPELINE SCHEDULES for Storm

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)
1.007	o	1050	28	155.500	152.397	2.053	Open Manhole	2100
10.000	o	1050	29	155.629	153.900	0.679	Open Manhole	2100
11.000	o	1050	30	156.961	154.500	1.411	Open Manhole	2100
11.01	o	1050	31	156.920	154.420	1.450	Open Manhole	2100
10.01	o	1050	32	155.553	153.720	0.783	Open Manhole	2100
10.02	o	1050	33	155.369	153.540	0.779	Open Manhole	2100
10.03	o	1050	34	154.988	153.360	0.578	Open Manhole	2100
10.04	o	1050	headwall	154.995	153.240	0.705	Open Manhole	2100
10.05	o	1050	headwall	154.995	153.168	0.777	Open Manhole	2100
10.06	o	1050	35	154.900	152.954	0.896	Open Manhole	2100
12.000	o	300	36	159.596	158.200	1.096	Open Manhole	1200
12.01	o	300	37	158.294	156.747	1.247	Open Manhole	1200
12.02	o	300	38	157.300	155.600	1.400	Open Manhole	1200
12.03	o	300	39	156.592	154.892	1.400	Open Manhole	1200
1.008	o	300	40	155.500	152.292	2.908	Open Manhole	2100

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)
1.007	3.874	484.3	40	155.500	152.389	2.061	Open Manhole	2100
10.000	90.000	500.0	32	155.553	153.720	0.783	Open Manhole	2100
11.000	40.000	500.0	31	156.920	154.420	1.450	Open Manhole	2100
11.01	70.000	500.0	32	155.553	154.280	0.223	Open Manhole	2100
10.01	90.000	500.0	33	155.369	153.540	0.779	Open Manhole	2100
10.02	90.000	500.0	34	154.988	153.360	0.578	Open Manhole	2100
10.03	60.000	500.0	headwall	154.995	153.240	0.705	Open Manhole	2100
10.04	72.464	1006.4	headwall	154.995	153.168	0.777	Open Manhole	2100
10.05	107.000	500.0	35	154.900	152.954	0.896	Open Manhole	2100
10.06	36.000	500.0	40	155.500	152.882	1.568	Open Manhole	2100
12.000	85.000	58.5	37	158.294	156.747	1.247	Open Manhole	1200
12.01	60.000	52.3	38	157.300	155.600	1.400	Open Manhole	1200
12.02	74.000	104.5	39	156.592	154.892	1.400	Open Manhole	1200
12.03	69.067	92.1	40	155.500	154.142	1.058	Open Manhole	2100
1.008	23.772	7.7		150.220	149.205	0.715	Open Manhole	0

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Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.008	150.220	149.205	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	13
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 40, DS/PN: 1.008, Volume (m³): 46.8

Unit Reference	MD-SHE-0293-5490-2000-5490
Design Head (m)	2.000
Design Flow (l/s)	54.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	293
Invert Level (m)	152.292
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	54.8
Flush-Flo™	0.613	54.9
Kick-Flo®	1.341	45.2
Mean Flow over Head Range	-	47.1

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	9.0	1.200	49.8	3.000	66.7	7.000	100.7
0.200	30.2	1.400	46.2	3.500	71.9	7.500	104.2
0.300	50.5	1.600	49.3	4.000	76.7	8.000	107.5
0.400	53.2	1.800	52.1	4.500	81.2	8.500	110.7
0.500	54.5	2.000	54.8	5.000	85.5	9.000	113.8
0.600	54.9	2.200	57.4	5.500	89.6	9.500	116.9
0.800	54.3	2.400	59.9	6.000	93.4		
1.000	52.8	2.600	62.3	6.500	97.1		

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<u>Storage Structures for Storm</u> <u>Porous Car Park Manhole: 9, DS/PN: 4.000</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>5.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>60.0</td></tr><tr><td>Max Percolation (l/s)</td><td>83.3</td><td>Slope (1:X)</td><td>500.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>157.400</td><td>Membrane Depth (mm)</td><td>120</td></tr></table> <u>Porous Car Park Manhole: 10, DS/PN: 4.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>5.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>90.0</td></tr><tr><td>Max Percolation (l/s)</td><td>125.0</td><td>Slope (1:X)</td><td>500.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>155.308</td><td>Membrane Depth (mm)</td><td>120</td></tr></table> <u>Porous Car Park Manhole: 12, DS/PN: 5.000</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>10.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>57.0</td></tr><tr><td>Max Percolation (l/s)</td><td>158.3</td><td>Slope (1:X)</td><td>500.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>156.143</td><td>Membrane Depth (mm)</td><td>120</td></tr></table> <u>Porous Car Park Manhole: 13, DS/PN: 5.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>10.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>90.0</td></tr><tr><td>Max Percolation (l/s)</td><td>250.0</td><td>Slope (1:X)</td><td>120.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>155.498</td><td>Membrane Depth (mm)</td><td>120</td></tr></table> <u>Porous Car Park Manhole: 15, DS/PN: 6.000</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>5.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>57.0</td></tr><tr><td>Max Percolation (l/s)</td><td>79.2</td><td>Slope (1:X)</td><td>500.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>155.751</td><td>Membrane Depth (mm)</td><td>110</td></tr></table> <u>Porous Car Park Manhole: 16, DS/PN: 6.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Max Percolation (l/s)</td><td>125.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Safety Factor</td><td>2.0</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0	Membrane Percolation (mm/hr)	1000	Length (m)	60.0	Max Percolation (l/s)	83.3	Slope (1:X)	500.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	157.400	Membrane Depth (mm)	120	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0	Membrane Percolation (mm/hr)	1000	Length (m)	90.0	Max Percolation (l/s)	125.0	Slope (1:X)	500.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	155.308	Membrane Depth (mm)	120	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	57.0	Max Percolation (l/s)	158.3	Slope (1:X)	500.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	156.143	Membrane Depth (mm)	120	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	90.0	Max Percolation (l/s)	250.0	Slope (1:X)	120.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	155.498	Membrane Depth (mm)	120	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0	Membrane Percolation (mm/hr)	1000	Length (m)	57.0	Max Percolation (l/s)	79.2	Slope (1:X)	500.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	155.751	Membrane Depth (mm)	110	Infiltration Coefficient Base (m/hr)	0.00000	Max Percolation (l/s)	125.0	Membrane Percolation (mm/hr)	1000	Safety Factor	2.0
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<u>Porous Car Park Manhole: 16, DS/PN: 6.001</u> Porosity 0.30 Slope (1:X) 500.0 Invert Level (m) 155.078 Depression Storage (mm) 5 Width (m) 5.0 Evaporation (mm/day) 3 Length (m) 90.0 Membrane Depth (mm) 110 <u>Cellular Storage Manhole: 20, DS/PN: 7.000</u> Invert Level (m) 152.500 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>280.0</td><td>280.0</td><td>1.501</td><td>0.0</td><td>380.4</td></tr><tr><td>1.500</td><td>280.0</td><td>380.4</td><td></td><td></td><td></td></tr></table> <u>Cellular Storage Manhole: 28, DS/PN: 1.007</u> Invert Level (m) 152.300 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>1000.0</td><td>1000.0</td><td>1.501</td><td>0.0</td><td>1189.8</td></tr><tr><td>1.500</td><td>1000.0</td><td>1189.7</td><td></td><td></td><td></td></tr></table> <u>Cellular Storage Manhole: headwall, DS/PN: 10.004</u> Invert Level (m) 153.240 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>1600.0</td><td>1600.0</td><td>0.851</td><td>0.0</td><td>1736.1</td></tr><tr><td>0.850</td><td>1600.0</td><td>1736.0</td><td></td><td></td><td></td></tr></table> <u>Tank or Pond Manhole: headwall, DS/PN: 10.005</u> Invert Level (m) 153.168 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>220.0</td><td>1.500</td><td>940.0</td></tr></table> <u>Cellular Storage Manhole: 35, DS/PN: 10.006</u> Invert Level (m) 152.954 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	280.0	280.0	1.501	0.0	380.4	1.500	280.0	380.4				Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	1000.0	1000.0	1.501	0.0	1189.8	1.500	1000.0	1189.7				Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	1600.0	1600.0	0.851	0.0	1736.1	0.850	1600.0	1736.0				Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	220.0	1.500	940.0
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																											
0.000	280.0	280.0	1.501	0.0	380.4																																																											
1.500	280.0	380.4																																																														
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																											
0.000	1000.0	1000.0	1.501	0.0	1189.8																																																											
1.500	1000.0	1189.7																																																														
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																											
0.000	1600.0	1600.0	0.851	0.0	1736.1																																																											
0.850	1600.0	1736.0																																																														
Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																													
0.000	220.0	1.500	940.0																																																													
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Innovyze	Network 2020.1.3																																																							
Cellular Storage Manhole: 35, DS/PN: 10.006 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>2310.0</td><td>2310.0</td><td>1.251</td><td>0.0</td><td>2550.4</td></tr><tr><td>1.250</td><td>2310.0</td><td>2550.3</td><td></td><td></td><td></td></tr></tbody></table> Cellular Storage Manhole: 38, DS/PN: 12.002 Invert Level (m) 155.600 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>150.0</td><td>150.0</td><td>1.001</td><td>0.0</td><td>199.0</td></tr><tr><td>1.000</td><td>150.0</td><td>199.0</td><td></td><td></td><td></td></tr></tbody></table> Cellular Storage Manhole: 40, DS/PN: 1.008 Invert Level (m) 152.292 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>160.0</td><td>160.0</td><td>1.001</td><td>0.0</td><td>210.6</td></tr><tr><td>1.000</td><td>160.0</td><td>210.6</td><td></td><td></td><td></td></tr></tbody></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	2310.0	2310.0	1.251	0.0	2550.4	1.250	2310.0	2550.3				Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	150.0	150.0	1.001	0.0	199.0	1.000	150.0	199.0				Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	160.0	160.0	1.001	0.0	210.6	1.000	160.0	210.6			
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																			
0.000	2310.0	2310.0	1.251	0.0	2550.4																																																			
1.250	2310.0	2550.3																																																						
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																			
0.000	150.0	150.0	1.001	0.0	199.0																																																			
1.000	150.0	199.0																																																						
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0.000	160.0	160.0	1.001	0.0	210.6																																																			
1.000	160.0	210.6																																																						
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Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	1	7.630	76.113	0.000	83.743
1.001	2	8.219	76.113	0.000	84.332
2.000	3	2.684	3.604	0.000	6.287
2.001	4	2.556	3.920	0.000	6.477
3.000	5	2.707	3.604	0.000	6.310
2.002	6	2.645	11.654	0.000	14.299
1.002	7	8.818	17.231	0.000	26.050
1.003	8	9.379	58.795	0.000	68.174
4.000	9	0.556	1.138	43.200	44.894
4.001	10	0.224	3.543	89.370	93.137
4.002	11	1.575	0.409	0.000	1.985
5.000	12	0.567	0.997	322.677	324.241
5.001	13	0.227	3.543	112.698	116.467
4.003	14	1.491	1.219	0.000	2.710
6.000	15	0.692	0.506	199.978	201.177
6.001	16	0.423	1.575	178.657	180.655
4.004	17	2.012	1.710	0.000	3.722
1.004	18	9.878	56.197	0.000	66.075
1.005	19	11.648	18.963	0.000	30.611
7.000	20	12.138	14.504	399.089	425.730
1.006	21	11.714	26.408	0.000	38.122
8.000	22	8.985	11.170	0.000	20.155
8.001	23	8.590	17.231	0.000	25.821
8.002	24	9.424	76.113	0.000	85.537
8.003	25	10.339	41.477	0.000	51.816
9.000	26	6.595	15.500	0.000	22.094
8.004	27	10.467	42.343	0.000	52.810
1.007	28	10.748	1.536	1425.317	1437.600
10.000	29	5.989	76.113	0.000	82.101
11.000	30	8.524	32.818	0.000	41.342
11.001	31	8.659	58.795	0.000	67.454
10.001	32	6.349	76.113	0.000	82.462
10.002	33	6.335	76.113	0.000	82.448
10.003	34	5.639	50.136	0.000	55.774
10.04	headwall	6.079	60.928	1292.507	1359.514
10.05	headwall	6.328	90.833	1114.756	1211.917
10.006	35	6.740	29.354	2743.857	2779.951
12.000	36	1.579	5.923	0.000	7.502
12.001	37	1.750	4.156	0.000	5.906
12.002	38	1.923	5.146	142.548	149.616
12.003	39	1.923	4.765	0.000	6.688
1.008	40	11.111	1.606	152.051	164.768
Total		241.858	1159.914	8216.704	9618.476

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

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Overflow		Half Drain	Pipe	Status	Level Exceeded
		Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)		
1.000	1	153.939	-0.776	0.000	0.10			114.8	OK	
1.001	2	153.876	-0.659	0.000	0.22			254.8	OK	
2.000	3	156.126	-0.324	0.000	0.16			21.4	OK	
2.01	4	156.059	-0.331	0.000	0.15			20.9	OK	
3.000	5	156.053	-0.397	0.000	0.03			4.4	OK	
2.02	6	155.953	-0.372	0.000	0.07			34.2	OK	
1.02	7	153.772	-0.583	0.000	0.41			329.1	OK	
1.03	8	153.667	-0.644	0.000	0.31			347.4	OK	
4.000	9	156.141	-0.042	0.000	0.87		5	15.1	OK	
4.01	10	155.407	-0.126	0.000	0.39		9	15.1	OK	
4.02	11	154.899	-0.105	0.000	0.55			18.6	OK	
5.000	12	156.209	-0.084	0.000	0.39		13	6.8	OK	
5.01	13	155.603	-0.120	0.000	0.45		9	17.4	OK	
4.003	14	154.789	-0.147	0.000	0.51			35.8	OK	
6.000	15	155.796	-0.055	0.000	0.40		10	2.5	OK	
6.001	16	155.093	-0.085	0.000	0.39		5	6.8	OK	
4.004	17	154.102	-0.167	0.000	0.41			45.4	OK	

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1_year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.04	18	15 Winter	1	+0%	100/15 Summer			
1.05	19	15 Winter	1	+0%	100/15 Summer			
7.000	20	360 Winter	1	+0%	30/240 Winter			
1.06	21	360 Winter	1	+0%	30/120 Winter			
8.000	22	15 Winter	1	+0%	100/15 Summer			
8.01	23	15 Winter	1	+0%	100/15 Summer			
8.02	24	15 Winter	1	+0%	100/15 Summer			
8.03	25	15 Winter	1	+0%	100/15 Summer			
9.000	26	15 Winter	1	+0%				
8.04	27	15 Winter	1	+0%	100/15 Summer			
1.007	28	360 Winter	1	+0%	30/60 Winter			
10.000	29	15 Winter	1	+0%				
11.000	30	15 Winter	1	+0%				
11.01	31	15 Winter	1	+0%				
10.01	32	15 Winter	1	+0%	100/480 Winter			
10.02	33	15 Winter	1	+0%	100/15 Summer			
10.03	34	15 Winter	1	+0%	100/15 Summer			
10.04	headwall	180 Winter	1	+0%	100/360 Winter			
10.05	headwall	180 Winter	1	+0%	100/240 Winter			
10.06	35	360 Winter	1	+0%	100/120 Winter			
12.000	36	15 Winter	1	+0%				
12.01	37	15 Winter	1	+0%	100/15 Summer			
12.02	38	30 Winter	1	+0%	100/15 Summer			
12.03	39	30 Winter	1	+0%	100/15 Winter			
1.008	40	360 Winter	1	+0%	1/15 Summer			

PN	US/MH Name	Water Surcharged Flooded			Flow / Overflow		Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Cap.	(l/s)	Time (mins)	Flow (l/s)	
1.04	18	153.377	-0.571	0.000	0.34			379.2	OK
1.05	19	153.250	-0.564	0.000	0.44			378.8	OK
7.000	20	153.060	-0.490	0.000	0.01		280	7.7	OK
1.06	21	153.060	-0.452	0.000	0.08			78.4	OK
8.000	22	153.529	-0.771	0.000	0.15			91.1	OK
8.01	23	153.486	-0.784	0.000	0.11			85.9	OK
8.02	24	153.455	-0.771	0.000	0.07			75.5	OK
8.03	25	153.429	-0.617	0.000	0.29			299.3	OK
9.000	26	154.303	-0.747	0.000	0.19			107.2	OK
8.04	27	153.318	-0.628	0.000	0.34			358.8	OK
1.007	28	153.039	-0.408	0.000	0.09		317	64.4	OK
10.000	29	154.201	-0.749	0.000	0.15			170.8	OK
11.000	30	154.584	-0.966	0.000	0.01			8.9	OK
11.01	31	154.543	-0.927	0.000	0.03			35.9	OK
10.01	32	154.060	-0.710	0.000	0.20			234.4	OK
10.02	33	153.911	-0.679	0.000	0.23			266.8	OK
10.03	34	153.764	-0.646	0.000	0.31			339.7	OK

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

PN	US/MH Name	Water Surcharged Flooded				Half Drain Pipe		Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)	
10.04	headwall	153.438	-0.852	0.000	0.07	133	54.6	OK
10.05	headwall	153.311	-0.907	0.000	0.05		53.5	OK
10.06	35	153.083	-0.921	0.000	0.03	262	25.8	OK
12.000	36	158.286	-0.214	0.000	0.18		24.9	OK
12.01	37	156.850	-0.197	0.000	0.25		36.8	OK
12.02	38	155.709	-0.191	0.000	0.28	16	29.4	OK
12.03	39	154.997	-0.195	0.000	0.27		29.4	OK
1.008	40	153.037	0.445	0.000	0.15	321	54.9	SURCHARGED

PN	US/MH Name	Level Exceeded
1.004		18
1.005		19
7.000		20
1.006		21
8.000		22
8.001		23
8.002		24
8.003		25
9.000		26
8.004		27
1.007		28
10.000		29
11.000		30
11.001		31
10.001		32
10.002		33
10.003		34
10.04	headwall	
10.05	headwall	
10.006	35	
12.000	36	
12.001	37	
12.002	38	
12.003	39	
1.008	40	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coefficient 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 13
Number of Online Controls 1 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) 0.750
M5-60 (mm) 21.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
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, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880, 4320, 5760,
7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	30	+0%	100/15 Summer	100/60 Winter		
1.01	2	15 Winter	30	+0%	100/15 Summer	100/60 Winter		
2.000	3	15 Winter	30	+0%				
2.01	4	15 Winter	30	+0%				
3.000	5	15 Winter	30	+0%				
2.02	6	15 Winter	30	+0%				
1.02	7	15 Winter	30	+0%	100/15 Summer			
1.03	8	15 Winter	30	+0%	100/15 Summer			
4.000	9	15 Winter	30	+0%	30/15 Summer			
4.01	10	15 Winter	30	+0%	100/15 Summer			
4.02	11	30 Winter	30	+0%	30/15 Summer			
5.000	12	30 Winter	30	+0%	100/15 Summer			
5.01	13	15 Winter	30	+0%	100/15 Summer			
4.003	14	30 Winter	30	+0%	30/15 Summer			

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

PN	US/MH Name	Water	Surcharged	Flooded			Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
1.000	1	154.277	-0.438	0.000	0.24			279.2	OK
1.01	2	154.225	-0.310	0.000	0.54			620.0	OK
2.000	3	156.204	-0.246	0.000	0.39			52.7	OK
2.01	4	156.134	-0.256	0.000	0.38			51.4	OK
3.000	5	156.085	-0.365	0.000	0.08			10.7	OK
2.02	6	156.004	-0.321	0.000	0.18			87.9	OK
1.02	7	154.145	-0.210	0.000	0.99			801.7	OK
1.03	8	153.954	-0.357	0.000	0.75			834.7	OK
4.000	9	157.448	1.265	0.000	1.71		3	29.7	SURCHARGED
4.01	10	155.486	-0.047	0.000	0.90		6	35.1	OK
4.02	11	155.065	0.061	0.000	1.25			42.5	SURCHARGED
5.000	12	156.259	-0.034	0.000	0.95		12	16.5	OK
5.01	13	155.703	-0.020	0.000	1.00		7	39.0	OK
4.003	14	154.958	0.022	0.000	1.17			81.5	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
2.000	3	
2.001	4	
3.000	5	
2.002	6	
1.002	7	
1.003	8	
4.000	9	
4.001	10	
4.002	11	
5.000	12	
5.001	13	
4.003	14	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
6.000	15	30 Winter	30	+0%	100/15 Summer			
6.001	16	15 Winter	30	+0%	100/15 Summer			
4.004	17	30 Winter	30	+0%	100/15 Summer			
1.04	18	15 Winter	30	+0%	100/15 Summer			
1.05	19	15 Winter	30	+0%	100/15 Summer			
7.000	20	480 Winter	30	+0%	30/240 Winter			
1.06	21	480 Winter	30	+0%	30/120 Winter			
8.000	22	15 Winter	30	+0%	100/15 Summer			
8.01	23	15 Winter	30	+0%	100/15 Summer			
8.02	24	15 Winter	30	+0%	100/15 Summer			
8.03	25	15 Winter	30	+0%	100/15 Summer			
9.000	26	15 Winter	30	+0%				
8.04	27	15 Winter	30	+0%	100/15 Summer			
1.007	28	480 Winter	30	+0%	30/60 Winter			
10.000	29	15 Winter	30	+0%				
11.000	30	15 Winter	30	+0%				
11.01	31	15 Winter	30	+0%				
10.01	32	15 Winter	30	+0%	100/480 Winter			
10.02	33	15 Winter	30	+0%	100/15 Summer			
10.03	34	15 Winter	30	+0%	100/15 Summer			
10.04	headwall	60 Winter	30	+0%	100/360 Winter			
10.05	headwall	480 Winter	30	+0%	100/240 Winter			
10.06	35	480 Winter	30	+0%	100/120 Winter			
12.000	36	15 Winter	30	+0%				
12.01	37	15 Winter	30	+0%	100/15 Summer			
12.02	38	15 Winter	30	+0%	100/15 Summer			
12.03	39	15 Winter	30	+0%	100/15 Winter			
1.008	40	480 Winter	30	+0%	1/15 Summer			

PN	US/MH Name	Water Surcharged Flooded			Flow / Overflow Cap. (l/s)		Half Drain Pipe		Status
		Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)	
6.000	15	155.838	-0.013	0.000	1.00		11	6.1	OK
6.001	16	155.146	-0.032	0.000	0.93		5	16.3	OK
4.004	17	154.200	-0.069	0.000	0.95			105.1	OK
1.04	18	153.760	-0.188	0.000	0.81			888.8	OK
1.05	19	153.647	-0.167	0.000	1.00			864.3	OK
7.000	20	153.594	0.044	0.000	0.01			7.9	SURCHARGED
1.06	21	153.594	0.082	0.000	0.14			134.7	SURCHARGED
8.000	22	153.832	-0.468	0.000	0.37			219.6	OK
8.01	23	153.824	-0.446	0.000	0.24			196.3	OK
8.02	24	153.810	-0.416	0.000	0.14			164.3	OK
8.03	25	153.755	-0.291	0.000	0.68			714.7	OK
9.000	26	154.495	-0.555	0.000	0.45			263.2	OK
8.04	27	153.645	-0.301	0.000	0.86			907.2	OK
1.007	28	153.593	0.146	0.000	0.26			183.2	SURCHARGED

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

PN	US/MH Name	Water Surcharged		Flooded		Half Drain Pipe		Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)	
10.000	29	154.420	-0.530	0.000	0.36		418.4	OK
11.000	30	154.660	-0.890	0.000	0.02		22.3	OK
11.01	31	154.638	-0.832	0.000	0.10		105.8	OK
10.01	32	154.316	-0.454	0.000	0.53		607.9	OK
10.02	33	154.191	-0.399	0.000	0.58		664.8	OK
10.03	34	154.057	-0.353	0.000	0.76		823.6	OK
10.04	headwall	153.614	-0.676	0.000	0.27	73	215.7	OK
10.05	headwall	153.596	-0.622	0.000	0.09		100.2	OK
10.06	35	153.592	-0.412	0.000	0.04		42.0	OK
12.000	36	158.340	-0.160	0.000	0.44		61.2	OK
12.01	37	156.930	-0.117	0.000	0.66		96.1	OK
12.02	38	155.818	-0.082	0.000	0.85	10	89.0	OK
12.03	39	155.097	-0.095	0.000	0.80		88.7	OK
1.008	40	153.593	1.001	0.000	0.15		54.9	SURCHARGED

PN	US/MH Name	Level Exceeded
6.000	15	
6.001	16	
4.004	17	
1.004	18	
1.005	19	
7.000	20	
1.006	21	
8.000	22	
8.001	23	
8.002	24	
8.003	25	
9.000	26	
8.004	27	
1.007	28	
10.000	29	
11.000	30	
11.001	31	
10.001	32	
10.002	33	
10.003	34	
10.04	headwall	
10.05	headwall	
10.006	35	
12.000	36	
12.001	37	
12.002	38	
12.003	39	
1.008	40	

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

Simulation Criteria

Number of Input Hydrographs	0	Number of Storage Structures	13
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Margin for Flood Risk Warning (mm)	300.0
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, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

US/MH				Return Climate		First (X)		First (Y)		First (Z)		Overflow
PN	Name	Storm	Period	Change		Surcharge		Flood		Overflow		Act.
1.000	1	120	Winter	100	+40%	100/15	Summer	100/60	Winter			
1.001	2	120	Winter	100	+40%	100/15	Summer	100/60	Winter			
2.000	3	15	Winter	100	+40%							
2.01	4	15	Winter	100	+40%							
3.000	5	15	Winter	100	+40%							
2.02	6	15	Winter	100	+40%							
1.02	7	60	Winter	100	+40%	100/15	Summer					
1.03	8	60	Winter	100	+40%	100/15	Summer					
4.000	9	15	Winter	100	+40%	30/15	Summer					
4.01	10	30	Winter	100	+40%	100/15	Summer					
4.02	11	60	Winter	100	+40%	30/15	Summer					
5.000	12	30	Winter	100	+40%	100/15	Summer					
5.01	13	30	Winter	100	+40%	100/15	Summer					
4.003	14	60	Winter	100	+40%	30/15	Summer					
6.000	15	30	Winter	100	+40%	100/15	Summer					
6.001	16	30	Winter	100	+40%	100/15	Summer					
4.004	17	60	Winter	100	+40%	100/15	Summer					

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

PN	US/MH Name	Water			Surcharged		Flow / Overflow Cap.	Half Drain Time (mins)	Pipe Flow (l/s)	Status
		Level (m)	Depth (m)	Volume (m³)	Flow	Overflow				
1.000	1	155.674	0.959	0.000	0.14				166.2	FLOOD RISK
1.001	2	155.678	1.143	0.000	0.41				470.8	FLOOD RISK
2.000	3	156.293	-0.157	0.000	0.72				96.0	OK
2.01	4	156.220	-0.170	0.000	0.69				93.6	OK
3.000	5	156.120	-0.330	0.000	0.15				19.4	OK
2.02	6	156.054	-0.271	0.000	0.32				159.7	OK
1.02	7	155.585	1.230	0.000	1.17				946.3	FLOOD RISK
1.03	8	155.812	1.501	0.000	0.92				1022.4	FLOOD RISK
4.000	9	157.558	1.375	0.000	1.75			7	30.5	SURCHARGED
4.01	10	155.615	0.082	0.000	0.99			10	38.3	SURCHARGED
4.02	11	155.530	0.526	0.000	1.47				49.7	SURCHARGED
5.000	12	156.346	0.053	0.000	1.00			19	17.4	SURCHARGED
5.01	13	155.853	0.130	0.000	1.12			14	43.8	SURCHARGED
4.003	14	155.368	0.432	0.000	1.31				90.9	SURCHARGED
6.000	15	155.900	0.049	0.000	1.01			17	6.1	SURCHARGED
6.001	16	155.220	0.042	0.000	0.99			15	17.4	SURCHARGED
4.004	17	155.382	1.113	0.000	1.09				121.4	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
2.000	3	
2.001	4	
3.000	5	
2.002	6	
1.002	7	
1.003	8	
4.000	9	
4.001	10	
4.002	11	
5.000	12	
5.001	13	
4.003	14	
6.000	15	
6.001	16	
4.004	17	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
18	60	Winter	100	+40%	100/15	Summer		
19	60	Winter	100	+40%	100/15	Summer		
	7.000	20	60	Winter	100	+40%	30/240	Winter
21	60	Winter	100	+40%	30/120	Winter		
	8.000	22	60	Winter	100	+40%	100/15	Summer
	8.01	23	60	Winter	100	+40%	100/15	Summer
	8.02	24	60	Winter	100	+40%	100/15	Summer
	8.03	25	60	Winter	100	+40%	100/15	Summer
	9.000	26	60	Winter	100	+40%		
	8.04	27	720	Winter	100	+40%	100/15	Summer
	1.007	28	60	Winter	100	+40%	30/60	Winter
	10.000	29	720	Winter	100	+40%		
	11.000	30	720	Winter	100	+40%		
	11.01	31	720	Winter	100	+40%		
	10.01	32	720	Winter	100	+40%	100/480	Winter
	10.02	33	720	Winter	100	+40%	100/15	Summer
	10.03	34	720	Winter	100	+40%	100/15	Summer
	10.04	headwall	720	Winter	100	+40%	100/360	Winter
	10.05	headwall	720	Winter	100	+40%	100/240	Winter
	10.06	35	720	Winter	100	+40%	100/120	Winter
	12.000	36	15	Winter	100	+40%		
	12.01	37	15	Winter	100	+40%	100/15	Summer
	12.02	38	15	Winter	100	+40%	100/15	Summer
	12.03	39	30	Winter	100	+40%	100/15	Winter
	1.008	40	720	Winter	100	+40%	1/15	Summer

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
1.04	18	155.595	1.647	0.000	1.05			1161.6	FLOOD RISK
1.05	19	154.955	1.141	0.000	1.38			1189.3	SURCHARGED
7.000	20	154.941	1.391	0.000	0.07		1185	52.7	FLOOD RISK
1.06	21	154.926	1.414	0.000	0.87			834.7	SURCHARGED
8.000	22	155.201	0.901	0.000	0.33			197.8	SURCHARGED
8.01	23	155.194	0.924	0.000	0.23			189.4	SURCHARGED
8.02	24	155.156	0.930	0.000	0.16			180.0	SURCHARGED
8.03	25	155.082	1.036	0.000	0.80			837.8	SURCHARGED
9.000	26	154.955	-0.095	0.000	0.40			234.5	OK
8.04	27	154.900	0.954	0.000	0.15			159.8	SURCHARGED
1.007	28	154.908	1.461	0.000	1.89		1441	1350.3	SURCHARGED
10.000	29	154.915	-0.035	0.000	0.05			61.1	OK
11.000	30	154.896	-0.654	0.000	0.00			3.1	OK
11.01	31	154.896	-0.574	0.000	0.01			14.5	OK
10.01	32	154.896	0.126	0.000	0.09			100.3	SURCHARGED
10.02	33	154.896	0.306	0.000	0.11			126.3	SURCHARGED
10.03	34	154.896	0.486	0.000	0.15			166.4	FLOOD RISK

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

		Water	Surcharged	Flooded				Half Drain	Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow	Time	Flow		
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status	
10.04	headwall	154.895	0.605	0.000	0.15		1300	114.6	FLOOD RISK	
10.05	headwall	154.895	0.677	0.000	0.08			97.4	FLOOD RISK	
10.06	35	154.897	0.893	0.000	0.05		1468	53.2	FLOOD RISK	
12.000	36	158.406	-0.094	0.000	0.79			111.4	OK	
12.01	37	157.405	0.358	0.000	1.13			165.3	SURCHARGED	
12.02	38	156.028	0.128	0.000	1.09		9	113.9	SURCHARGED	
12.03	39	155.226	0.034	0.000	1.00			110.9	SURCHARGED	
1.008	40	154.897	2.305	0.000	0.17		2396	62.3	SURCHARGED	

PN	US/MH Name	Level Exceeded
1.004		18
1.005		19
7.000		20
1.006		21
8.000		22
8.001		23
8.002		24
8.003		25
9.000		26
8.004		27
1.007		28
10.000		29
11.000		30
11.001		31
10.001		32
10.002		33
10.003		34
10.04	headwall	
10.05	headwall	
10.006		35
12.000		36
12.001		37
12.002		38
12.003		39
1.008		40