

Betts Associates Ltd		Page 4
6 Old Marsh Farm Barns Welsh Road, Sealand Flintshire, CH5 2LY	Holling Cross Lane Glossop	
Date 06/01/2023	Designed by NR	
File EDE01 NETWORKS 28.07.21.MDX	Checked by	
Innovyze	Network 2020.1.3	

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)	2	PIMP (%)	100
M5-60 (mm)	19.200	Add Flow / Climate Change (%)	0
Ratio R	0.306	Minimum Backdrop Height (m)	0.750
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)	400

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.319	4-8	0.116

Total Area Contributing (ha) = 0.435

Total Pipe Volume (m³) = 155.911

Network Design Table for Surface Network 1

« - 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	22.191	0.148	149.9	0.052	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	20.000	0.050	400.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
1.002	39.294	0.099	396.9	0.133	0.00	0.0	0.600	o	1200	Pipe/Conduit	
1.003	28.080	1.541	18.2	0.022	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	7.241	0.693	10.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	15.187	1.466	10.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	14.877	1.488	10.0	0.030	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	30.745	2.597	11.8	0.011	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	25.482	0.064	398.2	0.040	0.00	0.0	0.600	o	1350	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	5.45	163.768	0.052	0.0	0.0	0.0	0.82	14.5	7.0
1.001	50.00	5.63	159.546	0.052	0.0	0.0	0.0	1.86	2108.6	7.0
1.002	50.00	5.98	159.496	0.185	0.0	0.0	0.0	1.87	2116.8	25.1
1.003	50.00	6.18	159.397	0.207	0.0	0.0	0.0	2.37	41.9	28.0
1.004	50.00	6.22	157.856	0.207	0.0	0.0	0.0	3.14	55.4	28.0
1.005	50.00	6.30	157.163	0.207	0.0	0.0	0.0	3.15	55.6	28.0
2.000	50.00	5.08	156.479	0.030	0.0	0.0	0.0	3.21	56.6	4.1
3.000	50.00	5.17	156.160	0.011	0.0	0.0	0.0	2.94	52.0	1.5
3.001	50.00	5.39	152.363	0.051	0.0	0.0	0.0	2.01	2876.0	6.9

Betts Associates Ltd				Page 5			
6 Old Marsh Farm Barns Welsh Road, Sealand Flintshire, CH5 2LY				Holling Cross Lane Glossop			
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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
3.002	22.513	0.057	395.0	0.074	0.00	0.0	0.600	o	1350	Pipe/Conduit	🔒
3.003	12.156	0.031	392.1	0.073	0.00	0.0	0.600	o	1350	Pipe/Conduit	🔒
1.006	16.584	0.166	99.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
1.007	20.829	0.920	22.6	0.000	0.00	0.0	0.600	o	150	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)
3.002	50.00	5.57	152.299	0.125	0.0	0.0	0.0	2.02	2887.7	16.9
3.003	50.00	5.67	152.242	0.198	0.0	0.0	0.0	2.02	2898.2	26.8
1.006	50.00	6.57	152.211	0.435	0.0	0.0	0.0	1.01	17.8«	58.9
1.007	50.00	6.74	152.045	0.435	0.0	0.0	0.0	2.13	37.6«	58.9

Betts Associates Ltd				Page 6			
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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)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	165.118	1.350	Open Manhole	1500	1.000	163.768	150				
S2	164.992	5.446	Open Manhole	2100	1.001	159.546	1200	1.000	163.620	150	3024
S3	164.305	4.809	Open Manhole	2100	1.002	159.496	1200	1.001	159.496	1200	
S4HB	161.947	2.550	Open Manhole	2700	1.003	159.397	150	1.002	159.397	1200	
S5	159.206	1.350	Open Manhole	1200	1.004	157.856	150	1.003	157.856	150	
S6	158.513	1.350	Open Manhole	1200	1.005	157.163	150	1.004	157.163	150	
S7	157.979	1.500	Open Manhole	1200	2.000	156.479	150				
S8	157.510	1.350	Open Manhole	1500	3.000	156.160	150				
S9	154.913	2.550	Open Manhole	2400	3.001	152.363	1350	3.000	153.563	150	
S10	155.192	2.893	Open Manhole	2400	3.002	152.299	1350	3.001	152.299	1350	
S11	156.277	4.035	Open Manhole	2400	3.003	152.242	1350	3.002	152.242	1350	
S12HB	157.400	5.189	Open Manhole	3000	1.006	152.211	150	1.005	155.697	150	3486
								2.000	154.991	150	2780
								3.003	152.211	1350	
S13	153.620	1.575	Open Manhole	1200	1.007	152.045	150	1.006	152.045	150	
S14HW	151.800	0.675	Open Manhole	900 x 675		OUTFALL		1.007	151.125	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	403156.735	393575.590	403156.735	393575.590	Required	
S2	403138.283	393563.264	403138.283	393563.264	Required	
S3	403121.652	393552.155	403121.652	393552.155	Required	
S4HB	403082.404	393554.051	403082.404	393554.051	Required	
S5	403081.049	393526.003	403081.049	393526.003	Required	
S6	403080.356	393518.795	403080.356	393518.795	Required	
S7	403090.376	393501.057	403090.376	393501.057	Required	
S8	403024.056	393574.723	403024.056	393574.723	Required	
S9	403038.913	393547.806	403038.913	393547.806	Required	
S10	403048.892	393524.360	403048.892	393524.360	Required	

Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S11	403064.245	393507.893	403064.245	393507.893	Required	
S12HB	403075.855	393504.290	403075.855	393504.290	Required	
S13	403077.329	393487.772	403077.329	393487.772	Required	
S14HW	403064.235	393471.573			No Entry	

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	150	S1	165.118	163.768	1.200	Open Manhole	1500
1.001	o	1200	S2	164.992	159.546	4.246	Open Manhole	2100
1.002	o	1200	S3	164.305	159.496	3.609	Open Manhole	2100
1.003	o	150	S4HB	161.947	159.397	2.400	Open Manhole	2700
1.004	o	150	S5	159.206	157.856	1.200	Open Manhole	1200
1.005	o	150	S6	158.513	157.163	1.200	Open Manhole	1200
2.000	o	150	S7	157.979	156.479	1.350	Open Manhole	1200
3.000	o	150	S8	157.510	156.160	1.200	Open Manhole	1500
3.001	o	1350	S9	154.913	152.363	1.200	Open Manhole	2400
3.002	o	1350	S10	155.192	152.299	1.543	Open Manhole	2400
3.003	o	1350	S11	156.277	152.242	2.685	Open Manhole	2400
1.006	o	150	S12HB	157.400	152.211	5.039	Open Manhole	3000
1.007	o	150	S13	153.620	152.045	1.425	Open Manhole	1200

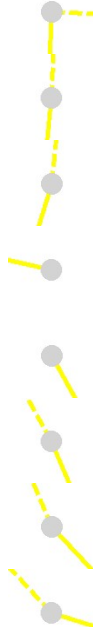
Downstream Manhole

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	22.191	149.9	S2	164.992	163.620	1.222	Open Manhole	2100
1.001	20.000	400.0	S3	164.305	159.496	3.609	Open Manhole	2100
1.002	39.294	396.9	S4HB	161.947	159.397	1.350	Open Manhole	2700
1.003	28.080	18.2	S5	159.206	157.856	1.200	Open Manhole	1200
1.004	7.241	10.4	S6	158.513	157.163	1.200	Open Manhole	1200
1.005	15.187	10.4	S12HB	157.400	155.697	1.553	Open Manhole	3000
2.000	14.877	10.0	S12HB	157.400	154.991	2.259	Open Manhole	3000
3.000	30.745	11.8	S9	154.913	153.563	1.200	Open Manhole	2400
3.001	25.482	398.2	S10	155.192	152.299	1.543	Open Manhole	2400
3.002	22.513	395.0	S11	156.277	152.242	2.685	Open Manhole	2400
3.003	12.156	392.1	S12HB	157.400	152.211	3.839	Open Manhole	3000
1.006	16.584	99.9	S13	153.620	152.045	1.425	Open Manhole	1200
1.007	20.829	22.6	S14HW	151.800	151.125	0.525	Open Manhole	900 x 675

Setting Out Information - True Coordinates (Surface Network 1)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
1.000	S1	1500		403156.735	393575.590	403156.735	393575.590	
1.001	S2	2100		403138.283	393563.264	403138.283	393563.264	
1.002	S3	2100		403121.652	393552.155	403121.652	393552.155	
1.003	S4HB	2700		403082.404	393554.051	403082.404	393554.051	
1.004	S5	1200		403081.049	393526.003	403081.049	393526.003	
1.005	S6	1200		403080.356	393518.795	403080.356	393518.795	
2.000	S7	1200		403090.376	393501.057	403090.376	393501.057	
3.000	S8	1500		403024.056	393574.723	403024.056	393574.723	
3.001	S9	2400		403038.913	393547.806	403038.913	393547.806	
3.002	S10	2400		403048.892	393524.360	403048.892	393524.360	
3.003	S11	2400		403064.245	393507.893	403064.245	393507.893	
1.006	S12HB	3000		403075.855	393504.290	403075.855	393504.290	
1.007	S13	1200		403077.329	393487.772	403077.329	393487.772	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
1.007	S14HW	900	675	403064.235	393471.573	

Setting Out Information - Site Coordinates (Surface Network 1)											
PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)			
1.000	S1	1500		403156.735	393575.590	403156.735	393575.590				
1.001	S2	2100		403138.283	393563.264	403138.283	393563.264				
1.002	S3	2100		403121.652	393552.155	403121.652	393552.155				
1.003	S4HB	2700		403082.404	393554.051	403082.404	393554.051				
1.004	S5	1200		403081.049	393526.003	403081.049	393526.003				
1.005	S6	1200		403080.356	393518.795	403080.356	393518.795				
2.000	S7	1200		403090.376	393501.057	403090.376	393501.057				
3.000	S8	1500		403024.056	393574.723	403024.056	393574.723				
3.001	S9	2400		403038.913	393547.806	403038.913	393547.806				
3.002	S10	2400		403048.892	393524.360	403048.892	393524.360				
3.003	S11	2400		403064.245	393507.893	403064.245	393507.893				
1.006	S12HB	3000		403075.855	393504.290	403075.855	393504.290				
1.007	S13	1200		403077.329	393487.772	403077.329	393487.772				
PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)					
1.007	S14HW	900	675	403064.235	393471.573						

Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.052	0.052	0.052
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.133	0.133	0.133
1.003	-	-	100	0.022	0.022	0.022
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.030	0.030	0.030
3.000	-	-	100	0.011	0.011	0.011
3.001	-	-	100	0.040	0.040	0.040
3.002	-	-	100	0.074	0.074	0.074
3.003	-	-	100	0.073	0.073	0.073
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.435	0.435	0.435

Surcharged 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)
1.007	S14HW	151.800	151.125	0.000	900	675
Datum (m) 0.000 Offset (mins) 0						

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
5	151.980	160	151.980	315	151.980	470	151.980	625	151.980	780	151.980	935	151.980
10	151.980	165	151.980	320	151.980	475	151.980	630	151.980	785	151.980	940	151.980
15	151.980	170	151.980	325	151.980	480	151.980	635	151.980	790	151.980	945	151.980
20	151.980	175	151.980	330	151.980	485	151.980	640	151.980	795	151.980	950	151.980
25	151.980	180	151.980	335	151.980	490	151.980	645	151.980	800	151.980	955	151.980
30	151.980	185	151.980	340	151.980	495	151.980	650	151.980	805	151.980	960	151.980
35	151.980	190	151.980	345	151.980	500	151.980	655	151.980	810	151.980	965	151.980
40	151.980	195	151.980	350	151.980	505	151.980	660	151.980	815	151.980	970	151.980
45	151.980	200	151.980	355	151.980	510	151.980	665	151.980	820	151.980	975	151.980
50	151.980	205	151.980	360	151.980	515	151.980	670	151.980	825	151.980	980	151.980
55	151.980	210	151.980	365	151.980	520	151.980	675	151.980	830	151.980	985	151.980
60	151.980	215	151.980	370	151.980	525	151.980	680	151.980	835	151.980	990	151.980
65	151.980	220	151.980	375	151.980	530	151.980	685	151.980	840	151.980	995	151.980
70	151.980	225	151.980	380	151.980	535	151.980	690	151.980	845	151.980	1000	151.980
75	151.980	230	151.980	385	151.980	540	151.980	695	151.980	850	151.980	1005	151.980
80	151.980	235	151.980	390	151.980	545	151.980	700	151.980	855	151.980	1010	151.980
85	151.980	240	151.980	395	151.980	550	151.980	705	151.980	860	151.980	1015	151.980
90	151.980	245	151.980	400	151.980	555	151.980	710	151.980	865	151.980	1020	151.980
95	151.980	250	151.980	405	151.980	560	151.980	715	151.980	870	151.980	1025	151.980
100	151.980	255	151.980	410	151.980	565	151.980	720	151.980	875	151.980	1030	151.980
105	151.980	260	151.980	415	151.980	570	151.980	725	151.980	880	151.980	1035	151.980
110	151.980	265	151.980	420	151.980	575	151.980	730	151.980	885	151.980	1040	151.980
115	151.980	270	151.980	425	151.980	580	151.980	735	151.980	890	151.980	1045	151.980
120	151.980	275	151.980	430	151.980	585	151.980	740	151.980	895	151.980	1050	151.980
125	151.980	280	151.980	435	151.980	590	151.980	745	151.980	900	151.980	1055	151.980
130	151.980	285	151.980	440	151.980	595	151.980	750	151.980	905	151.980	1060	151.980
135	151.980	290	151.980	445	151.980	600	151.980	755	151.980	910	151.980	1065	151.980
140	151.980	295	151.980	450	151.980	605	151.980	760	151.980	915	151.980	1070	151.980
145	151.980	300	151.980	455	151.980	610	151.980	765	151.980	920	151.980	1075	151.980
150	151.980	305	151.980	460	151.980	615	151.980	770	151.980	925	151.980	1080	151.980
155	151.980	310	151.980	465	151.980	620	151.980	775	151.980	930	151.980	1085	151.980

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1090	151.980	1145	151.980	1200	151.980	1255	151.980	1310	151.980	1365	151.980	1420	151.980
1095	151.980	1150	151.980	1205	151.980	1260	151.980	1315	151.980	1370	151.980	1425	151.980
1100	151.980	1155	151.980	1210	151.980	1265	151.980	1320	151.980	1375	151.980	1430	151.980
1105	151.980	1160	151.980	1215	151.980	1270	151.980	1325	151.980	1380	151.980	1435	151.980
1110	151.980	1165	151.980	1220	151.980	1275	151.980	1330	151.980	1385	151.980	1440	151.980
1115	151.980	1170	151.980	1225	151.980	1280	151.980	1335	151.980	1390	151.980		
1120	151.980	1175	151.980	1230	151.980	1285	151.980	1340	151.980	1395	151.980		
1125	151.980	1180	151.980	1235	151.980	1290	151.980	1345	151.980	1400	151.980		
1130	151.980	1185	151.980	1240	151.980	1295	151.980	1350	151.980	1405	151.980		
1135	151.980	1190	151.980	1245	151.980	1300	151.980	1355	151.980	1410	151.980		
1140	151.980	1195	151.980	1250	151.980	1305	151.980	1360	151.980	1415	151.980		

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff 0.750
Additional Flow - % of Total Flow 0.000

Areal Reduction Factor 1.000
MADD Factor * 10m³/ha Storage 2.000

Hot Start (mins) 0
Inlet Coeffiecient 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 Offline Controls 0
Number of Time/Area Diagrams 0

Number of Online Controls 2
Number of Storage Structures 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)

19.200

Storm Duration (mins) 30

Ratio R

0.306

Betts Associates Ltd		Page 13
6 Old Marsh Farm Barns Welsh Road, Sealand Flintshire, CH5 2LY	Holling Cross Lane Glossop	
Date 06/01/2023	Designed by NR	
File EDE01 NETWORKS 28.07.21.MDX	Checked by	
Innovyze	Network 2020.1.3	

Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S4HB, DS/PN: 1.003, Volume (m³): 56.3

Unit Reference MD-SHE-0100-5000-1400-5000
Design Head (m) 1.400
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 100
Invert Level (m) 159.397
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.0	Kick-Flo®	0.855	4.0
Flush-Flo™	0.416	5.0	Mean Flow over Head Range	-	4.4

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)	Depth (m)	Flow (l/s)
0.100	3.3	0.800	4.3	2.000	5.9	4.000	8.2	7.000	10.7
0.200	4.6	1.000	4.3	2.200	6.2	4.500	8.6	7.500	11.0
0.300	4.9	1.200	4.7	2.400	6.4	5.000	9.1	8.000	11.4
0.400	5.0	1.400	5.0	2.600	6.7	5.500	9.5	8.500	11.7
0.500	5.0	1.600	5.3	3.000	7.1	6.000	9.9	9.000	12.0
0.600	4.9	1.800	5.6	3.500	7.7	6.500	10.3	9.500	12.3

Hydro-Brake® Optimum Manhole: S12HB, DS/PN: 1.006, Volume (m³): 50.7

Unit Reference MD-SHE-0132-1000-1900-1000
Design Head (m) 1.900
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 132
Invert Level (m) 152.211
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.900	10.0	Kick-Flo®	1.148	7.9
Flush-Flo™	0.556	10.0	Mean Flow over Head Range	-	8.7

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)	Depth (m)	Flow (l/s)
0.100	4.8	0.800	9.7	2.000	10.2	4.000	14.2	7.000	18.6
0.200	8.4	1.000	9.0	2.200	10.7	4.500	15.0	7.500	19.2
0.300	9.3	1.200	8.0	2.400	11.1	5.000	15.8	8.000	19.8
0.400	9.8	1.400	8.6	2.600	11.6	5.500	16.5	8.500	20.4
0.500	10.0	1.600	9.2	3.000	12.4	6.000	17.2	9.000	20.9
0.600	10.0	1.800	9.7	3.500	13.3	6.500	17.9	9.500	21.5

Manhole Headloss for Surface Network 1

PN	US/MH Name	US/MH Headloss
1.000	S1	0.500
1.001	S2	0.500
1.002	S3	0.500
1.003	S4HB	0.500
1.004	S5	0.500
1.005	S6	0.500
2.000	S7	0.500
3.000	S8	0.500
3.001	S9	0.500
3.002	S10	0.500
3.003	S11	0.500
1.006	S12HB	0.500
1.007	S13	0.500

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 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 Offline Controls	0
Number of Online Controls	2	Number of Storage Structures	0
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0
Synthetic Rainfall Details			
Rainfall Model	FSR M5-60 (mm)	19.200 Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.306 Cv (Winter)
			0.840
Margin for Flood Risk Warning (mm)			300.0
Analysis Timestep	2.5 Second Increment (Extended)		
DTS Status			OFF
DVD Status			OFF
Inertia Status			OFF
Profile(s)			Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440		
Return Period(s) (years)			1, 2, 30, 100
Climate Change (%)			0, 0, 0, 45

US/MH				Return Climate		First (X)	First (Y)	First (Z)	Overflow	Water	Surcharged	Flooded
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level	Depth	Volume	
1.000	S1	15 Winter	1	+0%	30/15 Summer				163.840	-0.078	0.000	
1.001	S2	60 Winter	1	+0%	100/60 Winter				159.729	-1.017	0.000	
1.002	S3	60 Winter	1	+0%	100/60 Winter				159.729	-0.967	0.000	
1.003	S4HB	60 Winter	1	+0%	1/15 Summer				159.729	0.182	0.000	
1.004	S5	60 Winter	1	+0%					157.888	-0.118	0.000	
1.005	S6	60 Winter	1	+0%					157.194	-0.119	0.000	
2.000	S7	15 Winter	1	+0%					156.505	-0.124	0.000	
3.000	S8	15 Winter	1	+0%					156.176	-0.134	0.000	
3.001	S9	60 Winter	1	+0%	100/120 Winter				152.569	-1.144	0.000	
3.002	S10	60 Winter	1	+0%	100/120 Winter				152.569	-1.080	0.000	
3.003	S11	60 Winter	1	+0%	100/120 Winter				152.569	-1.023	0.000	
1.006	S12HB	60 Winter	1	+0%	1/15 Summer				152.569	0.208	0.000	
1.007	S13	60 Winter	1	+0%					152.098	-0.097	0.000	

Half Drain				Pipe			
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded
1.000	S1	0.46			6.3	OK	
1.001	S2	0.00			3.0	OK	
1.002	S3	0.01			10.2	OK	
1.003	S4HB	0.12			4.9	SURCHARGED	
1.004	S5	0.10			4.9	OK	
1.005	S6	0.10			4.9	OK	
2.000	S7	0.07			3.7	OK	
3.000	S8	0.03			1.3	OK	
3.001	S9	0.00			2.4	OK	
3.002	S10	0.00			4.6	OK	
3.003	S11	0.00			5.5	OK	
1.006	S12HB	0.58			9.6	SURCHARGED	
1.007	S13	0.27			9.6	OK	

2 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 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 Offline Controls	0
Number of Online Controls	2	Number of Storage Structures	0
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0
Synthetic Rainfall Details			
Rainfall Model	FSR M5-60 (mm)	19.200 Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.306 Cv (Winter)
			0.840
Margin for Flood Risk Warning (mm)			300.0
Analysis Timestep	2.5 Second Increment (Extended)		
DTS Status			OFF
DVD Status			OFF
Inertia Status			OFF
Profile(s)			Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440		
Return Period(s) (years)			1, 2, 30, 100
Climate Change (%)			0, 0, 0, 45

									Water	Surcharged	Flooded		
	US/MH			Return	Climate	First (X)		First (Y)	First (Z)	Overflow	Level	Depth	Volume
PN	Name	Storm	Period		Change	Surcharge		Flood	Overflow	Act.	(m)	(m)	(m³)
1.000	S1	15	Winter	2	+0%	30/15	Summer				163.852	-0.066	0.000
1.001	S2	60	Winter	2	+0%	100/60	Winter				159.801	-0.945	0.000
1.002	S3	60	Winter	2	+0%	100/60	Winter				159.801	-0.895	0.000
1.003	S4HB	60	Winter	2	+0%	1/15	Summer				159.801	0.254	0.000
1.004	S5	60	Winter	2	+0%						157.888	-0.118	0.000
1.005	S6	60	Winter	2	+0%						157.194	-0.119	0.000
2.000	S7	15	Winter	2	+0%						156.509	-0.120	0.000
3.000	S8	15	Winter	2	+0%						156.178	-0.132	0.000
3.001	S9	60	Winter	2	+0%	100/120	Winter				152.639	-1.074	0.000
3.002	S10	60	Winter	2	+0%	100/120	Winter				152.639	-1.010	0.000
3.003	S11	60	Winter	2	+0%	100/120	Winter				152.639	-0.953	0.000
1.006	S12HB	60	Winter	2	+0%	1/15	Summer				152.640	0.279	0.000
1.007	S13	60	Winter	2	+0%						152.099	-0.096	0.000

Half Drain Pipe							
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded
1.000	S1	0.60			8.2	OK	
1.001	S2	0.00			3.8	OK	
1.002	S3	0.01			12.1	OK	
1.003	S4HB	0.12			5.0	SURCHARGED	
1.004	S5	0.11			5.0	OK	
1.005	S6	0.10			5.0	OK	
2.000	S7	0.09			4.7	OK	
3.000	S8	0.03			1.7	OK	
3.001	S9	0.00			3.2	OK	
3.002	S10	0.00			5.2	OK	
3.003	S11	0.00			5.9	OK	
1.006	S12HB	0.60			9.9	SURCHARGED	
1.007	S13	0.28			9.9	OK	

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 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 Offline Controls 0 Number of Time/Area Diagrams 0			
Number of Online Controls 2 Number of Storage Structures 0 Number of Real Time Controls 0			
Synthetic Rainfall Details			
Rainfall Model	FSR M5-60 (mm)	19.200 Cv (Summer)	0.750
Region England and Wales	Ratio R	0.306 Cv (Winter)	0.840
Margin for Flood Risk Warning (mm)		300.0	
Analysis Timestep		2.5 Second Increment (Extended)	
DTS Status		OFF	
DVD Status		OFF	
Inertia Status		OFF	
Profile(s)		Summer and Winter	
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440		
Return Period(s) (years)	1, 2, 30, 100		
Climate Change (%)	0, 0, 0, 45		

US/MH		Return Climate		First (X)		First (Y)		First (Z)		Overflow		Water	Surcharged	Flooded
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level	Depth	Volume	(m)	(m)	(m³)
1.000	S1	15 Winter	30	+0%	30/15 Summer				163.938	0.020	0.000			
1.001	S2	120 Winter	30	+0%	100/60 Winter				160.106	-0.640	0.000			
1.002	S3	120 Winter	30	+0%	100/60 Winter				160.106	-0.590	0.000			
1.003	S4HB	120 Winter	30	+0%	1/15 Summer				160.106	0.559	0.000			
1.004	S5	600 Summer	30	+0%					157.888	-0.118	0.000			
1.005	S6	360 Winter	30	+0%					157.194	-0.119	0.000			
2.000	S7	15 Winter	30	+0%					156.521	-0.108	0.000			
3.000	S8	15 Winter	30	+0%					156.185	-0.125	0.000			
3.001	S9	120 Winter	30	+0%	100/120 Winter				152.940	-0.773	0.000			
3.002	S10	120 Winter	30	+0%	100/120 Winter				152.940	-0.709	0.000			
3.003	S11	120 Winter	30	+0%	100/120 Winter				152.940	-0.652	0.000			
1.006	S12HB	120 Winter	30	+0%	1/15 Summer				152.940	0.579	0.000			
1.007	S13	360 Winter	30	+0%					152.099	-0.096	0.000			

Half Drain Pipe							
US/MH		Flow / Overflow		Time	Flow	Level	
PN	Name	Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded
1.000	S1	1.08			14.8	SURCHARGED	
1.001	S2	0.00			4.8	OK	
1.002	S3	0.01			14.1	OK	
1.003	S4HB	0.12			5.0	SURCHARGED	
1.004	S5	0.11			5.0	OK	
1.005	S6	0.10			5.0	OK	
2.000	S7	0.17			9.0	OK	
3.000	S8	0.07			3.3	OK	
3.001	S9	0.00			4.4	OK	
3.002	S10	0.00			5.3	OK	
3.003	S11	0.01			6.3	OK	
1.006	S12HB	0.60			10.0	SURCHARGED	
1.007	S13	0.28			10.0	OK	

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 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 Offline Controls	0
Number of Online Controls	2	Number of Storage Structures	0
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0
Synthetic Rainfall Details			
Rainfall Model	FSR M5-60 (mm)	19.200 Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.306 Cv (Winter)
			0.840
Margin for Flood Risk Warning (mm)			300.0
Analysis Timestep	2.5 Second Increment (Extended)		
DTS Status			OFF
DVD Status			OFF
Inertia Status			OFF
Profile(s)			Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440		
Return Period(s) (years)			1, 2, 30, 100
Climate Change (%)			0, 0, 0, 45

US/MH			Return Climate		First (X)	First (Y)	First (Z)	Overflow	Water	Surcharged	Flooded
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level (m)	Depth (m)	Volume (m³)
1.000	S1	15 Winter	100	+45%	30/15 Summer				164.327	0.409	0.000
1.001	S2	120 Winter	100	+45%	100/60 Winter				161.538	0.792	0.000
1.002	S3	120 Winter	100	+45%	100/60 Winter				161.538	0.842	0.000
1.003	S4HB	120 Winter	100	+45%	1/15 Summer				161.538	1.991	0.000
1.004	S5	120 Winter	100	+45%					157.892	-0.114	0.000
1.005	S6	120 Winter	100	+45%					157.197	-0.116	0.000
2.000	S7	15 Winter	100	+45%					156.538	-0.091	0.000
3.000	S8	15 Winter	100	+45%					156.195	-0.115	0.000
3.001	S9	180 Winter	100	+45%	100/120 Winter				154.013	0.300	0.000
3.002	S10	180 Winter	100	+45%	100/120 Winter				154.013	0.364	0.000
3.003	S11	180 Winter	100	+45%	100/120 Winter				154.013	0.421	0.000
1.006	S12HB	180 Winter	100	+45%	1/15 Summer				154.013	1.652	0.000
1.007	S13	1440 Winter	100	+45%					152.099	-0.096	0.000

Half Drain				Pipe			
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded
1.000	S1	1.93			26.4	SURCHARGED	
1.001	S2	0.01			9.1	SURCHARGED	
1.002	S3	0.02			24.2	SURCHARGED	
1.003	S4HB	0.15			6.1	SURCHARGED	
1.004	S5	0.13			6.1	OK	
1.005	S6	0.12			6.1	OK	
2.000	S7	0.32			16.8	OK	
3.000	S8	0.12			6.1	OK	
3.001	S9	0.00			6.4	SURCHARGED	
3.002	S10	0.00			6.2	SURCHARGED	
3.003	S11	0.01			7.2	SURCHARGED	
1.006	S12HB	0.60			10.0	SURCHARGED	
1.007	S13	0.28			10.0	OK	