STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Highways Phase 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	30
Ratio R	0.300	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	550	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.900
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Highways Phase 1

- Indicates pipe length does not match coordinates
« - 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
S1.000	38.860	1.926	20.2	0.043	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	30.071	1.361	22.1	0.030	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	17.395	0.871	20.0	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	12.734	0.350	36.4	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	22.806	0.684	33.4	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	17.905	0.526	34.0	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	5.613	0.150	37.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.007	11.800	0.409	28.9	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	29.505	1.504	19.6	0.035	5.00	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)
S1.000	76.66	5.29	51.391	0.043	0.0	0.0	3.6	2.25	39.8	15.6
S1.001	75.37	5.52	49.465	0.074	0.0	0.0	6.0	2.15	38.0	26.1
S1.002	74.84	5.62	48.029	0.080	0.0	0.0	6.5	2.94	117.0	28.3
S1.003	74.33	5.72	47.158	0.110	0.0	0.0	8.9	2.18	86.5	38.4
S1.004	73.47	5.88	46.808	0.142	0.0	0.0	11.3	2.27	90.4	49.1
S1.005	72.81	6.02	46.124	0.161	0.0	0.0	12.7	2.25	89.5	55.1
S1.006	72.59	6.06	45.598	0.161	0.0	0.0	12.7	2.15	85.4	55.1
S1.007	72.20	6.14	45.448	0.179	0.0	0.0	14.0	2.44	97.2	60.6
S2.000	77.06	5.22	51.348	0.035	0.0	0.0	2.9	2.28	40.4	12.5

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Network Design Table for Highways Phase 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
S2.001	15.578	0.749	20.8	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.002	28.533	1.184	24.1	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.003	23.844	0.728	32.7	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.004	23.029	0.690	33.4	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.005	17.540	0.516	34.0	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.006	12.925	0.054	240.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	13.982	0.155	90.2	0.016	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.007	14.388	0.048	299.8	0.040	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.008	6.387	0.027	240.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	13.354	0.058	230.2	0.019	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.010	9.706	0.105	92.4	0.003	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.011	4.500#	0.090	50.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.012	2.239	0.028	79.0	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.013	17.290	0.132	131.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.014	31.230	1.420	22.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.015	8.472	0.260	32.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	18.115	0.407	44.5	0.023	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	23.397	0.519	45.1	0.023	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)
S2.001	76.40	5.33	49.843	0.059	0.0	0.0	4.9	2.22	39.2	21.3
S2.002	75.14	5.56	49.094	0.070	0.0	0.0	5.7	2.06	36.4	24.7
S2.003	74.23	5.74	47.836	0.095	0.0	0.0	7.7	2.29	91.2	33.2
S2.004	73.36	5.91	47.108	0.130	0.0	0.0	10.3	2.27	90.4	44.6
S2.005	72.71	6.04	46.417	0.148	0.0	0.0	11.7	2.25	89.5	50.7
S2.006	71.68	6.25	45.827	0.148	0.0	0.0	11.7	1.01	71.4	50.7
S3.000	77.33	5.17	45.242	0.016	0.0	0.0	1.3	1.38	54.8	5.7
S2.007	70.60	6.48	44.937	0.204	0.0	0.0	15.6	1.04	115.0	67.7
S1.008	70.19	6.57	44.889	0.383	0.0	0.0	29.1	1.17	128.7	126.2
S1.009	69.35	6.76	44.862	0.403	0.0	0.0	30.2	1.19	131.4	131.0
S1.010	68.98	6.84	44.804	0.405	0.0	0.0	30.3	1.89	208.2	131.2
S1.011	68.85	6.87	44.699	0.405	0.0	0.0	30.3	2.57	283.6	131.2
S1.012	68.74	6.90	43.900	0.440	0.0	0.0	32.8	1.47	58.5«	142.0
S1.013	67.68	7.15	43.872	0.440	0.0	0.0	32.8	1.14	45.4«	142.0
S1.014	66.92	7.34	43.740	0.440	0.0	0.0	32.8	2.80	111.4«	142.0
S1.015	66.67	7.40	42.320	0.440	0.0	0.0	32.8	2.30	91.4«	142.0
S4.000	77.42	5.15	45.281	0.023	0.0	0.0	1.9	1.97	78.2	8.4
S4.001	76.29	5.35	44.874	0.046	0.0	0.0	3.8	1.95	77.7	16.6

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Network Design Table for Highways Phase 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
S4.002	11.304	0.250	45.2	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.003	11.234	0.427	26.3	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	10.091	0.275	36.7	0.018	5.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	10.847	0.270	40.2	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.002	10.267	0.259	39.7	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.003	15.574	0.100	155.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.004	2.223	0.111	20.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.004	7.915	0.396	20.0	0.012	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.005	4.693	0.132	35.6	0.029	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	38.408	0.230	167.0	0.058	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.006	2.764#	0.075	37.0	0.020	0.00	0.0	0.600	o	375	Pipe/Conduit	
S7.000	25.223	0.188	134.2	0.079	5.00	0.0	0.600	o	225	Pipe/Conduit	
S7.001	4.252#	0.035	121.5	0.071	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.007	4.039	0.040	100.0	0.043	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.016	27.177	0.776	35.0	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)
S4.002	75.76	5.45	44.355	0.062	0.0	0.0	5.1	1.95	77.6	21.9
S4.003	75.36	5.52	44.105	0.077	0.0	0.0	6.2	2.56	101.8	27.1
S5.000	77.86	5.08	44.693	0.018	0.0	0.0	1.5	2.17	86.1	6.6
S5.001	77.35	5.16	44.418	0.041	0.0	0.0	3.5	2.07	82.3	15.0
S5.002	76.88	5.25	44.148	0.065	0.0	0.0	5.4	2.08	82.8	23.5
S5.003	75.51	5.50	43.889	0.065	0.0	0.0	5.4	1.05	41.6	23.5
S5.004	75.44	5.51	43.789	0.065	0.0	0.0	5.4	2.94	116.9	23.5
S4.004	75.12	5.57	43.678	0.154	0.0	0.0	12.5	2.94	116.9	54.3
S4.005	74.93	5.60	43.282	0.183	0.0	0.0	14.8	2.20	87.5	64.3
S6.000	74.76	5.63	43.380	0.058	0.0	0.0	4.7	1.01	40.1	20.3
S4.006	74.68	5.65	43.000	0.261	0.0	0.0	21.1	2.99	329.9	91.4
S7.000	76.18	5.37	43.075	0.079	0.0	0.0	6.5	1.13	44.8	28.1
S7.001	75.90	5.42	42.812	0.149	0.0	0.0	12.3	1.43	100.7	53.2
S4.007	74.41	5.70	42.100	0.453	0.0	0.0	36.5	1.31	52.0«	158.4
S1.016	65.87	7.60	42.060	0.893	0.0	0.0	63.7	2.22	88.2«	276.2

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Network Design Table for Highways Phase 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
S1.017	27.177	0.859	31.6	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)
S1.017	65.13	7.80	41.284	0.893	0.0	0.0	63.7	2.33	92.8«	276.2

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Manhole Schedules for Highways Phase 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)
S1	52.441	1.050	Open Manhole	1200	S1.000	51.391	150				
S2	50.515	1.050	Open Manhole	1200	S1.001	49.465	150	S1.000	49.465	150	
S3	49.154	1.125	Open Manhole	1200	S1.002	48.029	225	S1.001	48.104	150	
S4	48.583	1.425	Open Manhole	1200	S1.003	47.158	225	S1.002	47.158	225	
S5	48.233	1.425	Open Manhole	1200	S1.004	46.808	225	S1.003	46.808	225	
S6	47.549	1.425	Open Manhole	1200	S1.005	46.124	225	S1.004	46.124	225	
S7	47.023	1.425	Open Manhole	1200	S1.006	45.598	225	S1.005	45.598	225	
S8	46.873	1.425	Open Manhole	1200	S1.007	45.448	225	S1.006	45.448	225	
S9	52.398	1.050	Open Manhole	1200	S2.000	51.348	150				
S10	50.893	1.050	Open Manhole	1200	S2.001	49.843	150	S2.000	49.843	150	
S11	50.144	1.050	Open Manhole	1200	S2.002	49.094	150	S2.001	49.094	150	
S12	48.961	1.125	Open Manhole	1200	S2.003	47.836	225	S2.002	47.911	150	
S13	48.233	1.125	Open Manhole	1200	S2.004	47.108	225	S2.003	47.108	225	
S14	47.542	1.125	Open Manhole	1200	S2.005	46.417	225	S2.004	46.417	225	
S15	47.027	1.200	Open Manhole	1200	S2.006	45.827	300	S2.005	45.902	225	
S16	46.367	1.125	Open Manhole	1200	S3.000	45.242	225				
S16	46.513	1.576	Open Manhole	1350	S2.007	44.937	375	S2.006	45.773	300	761
								S3.000	45.087	225	
S17	46.569	1.680	Open Manhole	1350	S1.008	44.889	375	S1.007	45.039	225	
								S2.007	44.889	375	
S18	46.406	1.544	Open Manhole	1350	S1.009	44.862	375	S1.008	44.862	375	
S19	46.106	1.302	Open Manhole	1350	S1.010	44.804	375	S1.009	44.804	375	
S20	45.874	1.175	Open Manhole	1350	S1.011	44.699	375	S1.010	44.699	375	
S23	45.400	1.500	Open Manhole	1350	S1.012	43.900	225	S1.011	44.609	375	859
S24	45.797	1.925	Open Manhole	1200	S1.013	43.872	225	S1.012	43.872	225	
S24	45.173	1.433	Open Manhole	1200	S1.014	43.740	225	S1.013	43.740	225	
S25	45.316	2.996	Open Manhole	1200	S1.015	42.320	225	S1.014	42.320	225	
S27	46.406	1.125	Open Manhole	1200	S4.000	45.281	225				
S28	45.999	1.125	Open Manhole	1200	S4.001	44.874	225	S4.000	44.874	225	
S29	45.480	1.125	Open Manhole	1200	S4.002	44.355	225	S4.001	44.355	225	
S30	45.230	1.125	Open Manhole	1200	S4.003	44.105	225	S4.002	44.105	225	
S29	45.818	1.125	Open Manhole	1200	S5.000	44.693	225				
S32	45.543	1.125	Open Manhole	1200	S5.001	44.418	225	S5.000	44.418	225	
S30	45.273	1.125	Open Manhole	1200	S5.002	44.148	225	S5.001	44.148	225	
S31	45.015	1.125	Open Manhole	1200	S5.003	43.889	225	S5.002	43.889	225	
S32	44.962	1.173	Open Manhole	1200	S5.004	43.789	225	S5.003	43.789	225	
S30	44.981	1.303	Open Manhole	1200	S4.004	43.678	225	S4.003	43.678	225	
								S5.004	43.678	225	

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Manhole Schedules for Highways Phase 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)
S31	44.772	1.490	Open Manhole	1200	S4.005	43.282	225	S4.004	43.282	225	
S39	44.345	0.965	Open Manhole	1200	S6.000	43.380	225				
S33	44.648	1.648	Open Manhole	1350	S4.006	43.000	375	S4.005	43.150	225	
								S6.000	43.150	225	
S32	44.089	1.014	Open Manhole	1200	S7.000	43.075	225				
S45	44.084	1.272	Open Manhole	1200	S7.001	42.812	300	S7.000	42.887	225	
S34	43.600	1.500	Open Manhole	1350	S4.007	42.100	225	S4.006	42.925	375	975
								S7.001	42.777	300	752
S26	44.872	2.812	Open Manhole	1200	S1.016	42.060	225	S1.015	42.060	225	
								S4.007	42.060	225	
S40	44.699	3.416	Open Manhole	1200	S1.017	41.284	225	S1.016	41.284	225	
S	44.705	4.280	Open Manhole	0		OUTFALL		S1.017	40.425	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	423348.122	419511.491	423348.122	419511.491	Required	
S2	423369.990	419543.613	423369.990	419543.613	Required	
S3	423386.866	419568.503	423386.866	419568.503	Required	
S4	423396.611	419582.912	423396.611	419582.912	Required	
S5	423403.749	419593.458	423403.749	419593.458	Required	
S6	423416.527	419612.348	423416.527	419612.348	Required	
S7	423426.558	419627.179	423426.558	419627.179	Required	
S8	423429.703	419631.828	423429.703	419631.828	Required	

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Manhole Schedules for Highways Phase 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S9	423338.097	419520.208	423338.097	419520.208	Required	
S10	423354.698	419544.599	423354.698	419544.599	Required	
S11	423363.417	419557.509	423363.417	419557.509	Required	
S12	423379.340	419581.185	423379.340	419581.185	Required	
S13	423392.763	419600.892	423392.763	419600.892	Required	
S14	423405.687	419619.953	423405.687	419619.953	Required	
S15	423415.499	419634.492	423415.499	419634.492	Required	
S16	423410.457	419652.609	423410.457	419652.609	Required	
S16	423422.435	419645.398	423422.435	419645.398	Required	
S17	423436.314	419641.602	423436.314	419641.602	Required	
S18	423439.893	419646.893	423439.893	419646.893	Required	
S19	423447.374	419657.954	423447.374	419657.954	Required	
S20	423453.031	419665.841	423453.031	419665.841	Required	
S23	423482.194	419662.813	423482.194	419662.813	Required	
S24	423483.242	419664.792	423483.242	419664.792	Required	

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Manhole Schedules for Highways Phase 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S24	423476.177	419680.573	423476.177	419680.573	Required	
S25	423450.524	419698.384	423450.524	419698.384	Required	
S27	423428.912	419654.314	423428.912	419654.314	Required	
S28	423439.064	419669.317	423439.064	419669.317	Required	
S29	423453.801	419687.489	423453.801	419687.489	Required	
S30	423462.432	419694.789	423462.432	419694.789	Required	
S29	423454.468	419667.394	423454.468	419667.394	Required	
S32	423462.111	419673.984	423462.111	419673.984	Required	
S30	423471.120	419680.025	423471.120	419680.025	Required	
S31	423479.954	419685.257	423479.954	419685.257	Required	
S32	423472.781	419699.081	423472.781	419699.081	Required	
S30	423471.757	419701.054	423471.757	419701.054	Required	
S31	423478.326	419705.469	423478.326	419705.469	Required	
S39	423517.697	419700.274	423517.697	419700.274	Required	
S33	423480.452	419709.653	423480.452	419709.653	Required	

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Manhole Schedules for Highways Phase 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S32	423504.242	419724.909	423504.242	419724.909	Required	
S45	423479.084	419723.087	423479.084	419723.087	Required	
S34	423455.131	419706.401	423455.131	419706.401	Required	
S26	423451.116	419706.835	423451.116	419706.835	Required	
S40	423424.097	419709.760	423424.097	419709.760	Required	
S	423397.078	419712.684			No Entry	

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PIPELINE SCHEDULES for Highways Phase 1

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	52.441	51.391	0.900	Open Manhole	1200
S1.001	o	150	S2	50.515	49.465	0.900	Open Manhole	1200
S1.002	o	225	S3	49.154	48.029	0.900	Open Manhole	1200
S1.003	o	225	S4	48.583	47.158	1.200	Open Manhole	1200
S1.004	o	225	S5	48.233	46.808	1.200	Open Manhole	1200
S1.005	o	225	S6	47.549	46.124	1.200	Open Manhole	1200
S1.006	o	225	S7	47.023	45.598	1.200	Open Manhole	1200
S1.007	o	225	S8	46.873	45.448	1.200	Open Manhole	1200
S2.000	o	150	S9	52.398	51.348	0.900	Open Manhole	1200
S2.001	o	150	S10	50.893	49.843	0.900	Open Manhole	1200
S2.002	o	150	S11	50.144	49.094	0.900	Open Manhole	1200
S2.003	o	225	S12	48.961	47.836	0.900	Open Manhole	1200
S2.004	o	225	S13	48.233	47.108	0.900	Open Manhole	1200
S2.005	o	225	S14	47.542	46.417	0.900	Open Manhole	1200
S2.006	o	300	S15	47.027	45.827	0.900	Open Manhole	1200
S3.000	o	225	S16	46.367	45.242	0.900	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)
S1.000	38.860	20.2	S2	50.515	49.465	0.900	Open Manhole	1200
S1.001	30.071	22.1	S3	49.154	48.104	0.900	Open Manhole	1200
S1.002	17.395	20.0	S4	48.583	47.158	1.200	Open Manhole	1200
S1.003	12.734	36.4	S5	48.233	46.808	1.200	Open Manhole	1200
S1.004	22.806	33.4	S6	47.549	46.124	1.200	Open Manhole	1200
S1.005	17.905	34.0	S7	47.023	45.598	1.200	Open Manhole	1200
S1.006	5.613	37.4	S8	46.873	45.448	1.200	Open Manhole	1200
S1.007	11.800	28.9	S17	46.569	45.039	1.304	Open Manhole	1350
S2.000	29.505	19.6	S10	50.893	49.843	0.900	Open Manhole	1200
S2.001	15.578	20.8	S11	50.144	49.094	0.900	Open Manhole	1200
S2.002	28.533	24.1	S12	48.961	47.911	0.900	Open Manhole	1200
S2.003	23.844	32.7	S13	48.233	47.108	0.900	Open Manhole	1200
S2.004	23.029	33.4	S14	47.542	46.417	0.900	Open Manhole	1200
S2.005	17.540	34.0	S15	47.027	45.902	0.900	Open Manhole	1200
S2.006	12.925	240.0	S16	46.513	45.773	0.441	Open Manhole	1350
S3.000	13.982	90.2	S16	46.513	45.087	1.201	Open Manhole	1350

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PIPELINE SCHEDULES for Highways Phase 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)
S2.007	o	375	S16	46.513	44.937	1.201	Open Manhole	1350
S1.008	o	375	S17	46.569	44.889	1.305	Open Manhole	1350
S1.009	o	375	S18	46.406	44.862	1.169	Open Manhole	1350
S1.010	o	375	S19	46.106	44.804	0.927	Open Manhole	1350
S1.011	o	375	S20	45.874	44.699	0.800	Open Manhole	1350
S1.012	o	225	S23	45.400	43.900	1.275	Open Manhole	1350
S1.013	o	225	S24	45.797	43.872	1.700	Open Manhole	1200
S1.014	o	225	S24	45.173	43.740	1.208	Open Manhole	1200
S1.015	o	225	S25	45.316	42.320	2.771	Open Manhole	1200
S4.000	o	225	S27	46.406	45.281	0.900	Open Manhole	1200
S4.001	o	225	S28	45.999	44.874	0.900	Open Manhole	1200
S4.002	o	225	S29	45.480	44.355	0.900	Open Manhole	1200
S4.003	o	225	S30	45.230	44.105	0.900	Open Manhole	1200
S5.000	o	225	S29	45.818	44.693	0.900	Open Manhole	1200
S5.001	o	225	S32	45.543	44.418	0.900	Open Manhole	1200
S5.002	o	225	S30	45.273	44.148	0.900	Open Manhole	1200
S5.003	o	225	S31	45.015	43.889	0.900	Open Manhole	1200
S5.004	o	225	S32	44.962	43.789	0.948	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)
S2.007	14.388	299.8	S17	46.569	44.889	1.305	Open Manhole	1350
S1.008	6.387	240.0	S18	46.406	44.862	1.169	Open Manhole	1350
S1.009	13.354	230.2	S19	46.106	44.804	0.927	Open Manhole	1350
S1.010	9.706	92.4	S20	45.874	44.699	0.800	Open Manhole	1350
S1.011	4.500#	50.0	S23	45.400	44.609	0.416	Open Manhole	1350
S1.012	2.239	79.0	S24	45.797	43.872	1.700	Open Manhole	1200
S1.013	17.290	131.0	S24	45.173	43.740	1.208	Open Manhole	1200
S1.014	31.230	22.0	S25	45.316	42.320	2.771	Open Manhole	1200
S1.015	8.472	32.6	S26	44.872	42.060	2.587	Open Manhole	1200
S4.000	18.115	44.5	S28	45.999	44.874	0.900	Open Manhole	1200
S4.001	23.397	45.1	S29	45.480	44.355	0.900	Open Manhole	1200
S4.002	11.304	45.2	S30	45.230	44.105	0.900	Open Manhole	1200
S4.003	11.234	26.3	S30	44.981	43.678	1.078	Open Manhole	1200
S5.000	10.091	36.7	S32	45.543	44.418	0.900	Open Manhole	1200
S5.001	10.847	40.2	S30	45.273	44.148	0.900	Open Manhole	1200
S5.002	10.267	39.7	S31	45.015	43.889	0.900	Open Manhole	1200
S5.003	15.574	155.7	S32	44.962	43.789	0.947	Open Manhole	1200
S5.004	2.223	20.0	S30	44.981	43.678	1.078	Open Manhole	1200

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PIPELINE SCHEDULES for Highways Phase 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)
S4.004	o	225	S30	44.981	43.678	1.078	Open Manhole	1200
S4.005	o	225	S31	44.772	43.282	1.265	Open Manhole	1200
S6.000	o	225	S39	44.345	43.380	0.740	Open Manhole	1200
S4.006	o	375	S33	44.648	43.000	1.273	Open Manhole	1350
S7.000	o	225	S32	44.089	43.075	0.789	Open Manhole	1200
S7.001	o	300	S45	44.084	42.812	0.972	Open Manhole	1200
S4.007	o	225	S34	43.600	42.100	1.275	Open Manhole	1350
S1.016	o	225	S26	44.872	42.060	2.587	Open Manhole	1200
S1.017	o	225	S40	44.699	41.284	3.190	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)
S4.004	7.915	20.0	S31	44.772	43.282	1.265	Open Manhole	1200
S4.005	4.693	35.6	S33	44.648	43.150	1.273	Open Manhole	1350
S6.000	38.408	167.0	S33	44.648	43.150	1.273	Open Manhole	1350
S4.006	2.764#	37.0	S34	43.600	42.925	0.300	Open Manhole	1350
S7.000	25.223	134.2	S45	44.084	42.887	0.972	Open Manhole	1200
S7.001	4.252#	121.5	S34	43.600	42.777	0.523	Open Manhole	1350
S4.007	4.039	100.0	S26	44.872	42.060	2.587	Open Manhole	1200
S1.016	27.177	35.0	S40	44.699	41.284	3.191	Open Manhole	1200
S1.017	27.177	31.6	S	44.705	40.425	4.055	Open Manhole	0

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Area Summary for Highways Phase 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Road, Foot and Cycle Path	100	0.020	0.020	0.020
	Classification	Road, Foot and Cycle Path	100	0.007	0.007	0.026
	Classification	Swales	100	0.008	0.008	0.035
	Classification	Bridleway	100	0.008	0.008	0.043
1.001	Classification	Road, Foot and Cycle Path	100	0.013	0.013	0.013
	Classification	Road, Foot and Cycle Path	100	0.005	0.005	0.019
	Classification	Swales	100	0.007	0.007	0.026
	Classification	Bridleway	100	0.005	0.005	0.030
1.002	Classification	Swales	100	0.001	0.001	0.001
	Classification	Road, Foot and Cycle Path	100	0.005	0.005	0.005
	Classification	Bridleway	100	0.001	0.001	0.007
1.003	Classification	Road, Foot and Cycle Path	100	0.013	0.013	0.013
	Classification	Road, Foot and Cycle Path	100	0.004	0.004	0.017
	Classification	Bridleway	100	0.013	0.013	0.030
1.004	Classification	Swales	100	0.006	0.006	0.006
	Classification	Road, Foot and Cycle Path	100	0.017	0.017	0.024
	Classification	Road, Foot and Cycle Path	100	0.006	0.006	0.030
	Classification	Bridleway	100	0.003	0.003	0.032
1.005	Classification	Swales	100	0.005	0.005	0.005
	Classification	Road, Foot and Cycle Path	100	0.010	0.010	0.015
	Classification	Road, Foot and Cycle Path	100	0.004	0.004	0.019
1.006	-	-	100	0.000	0.000	0.000
1.007	Classification	Swales	100	0.004	0.004	0.004
	Classification	Road, Foot and Cycle Path	100	0.010	0.010	0.013
	Classification	Road, Foot and Cycle Path	100	0.004	0.004	0.018
2.000	Classification	Road, Foot and Cycle Path	100	0.019	0.019	0.019
	Classification	Road, Foot and Cycle Path	100	0.008	0.008	0.027
	Classification	Swales	100	0.008	0.008	0.035
2.001	Classification	Road, Foot and Cycle Path	100	0.013	0.013	0.013
	Classification	Road, Foot and Cycle Path	100	0.005	0.005	0.018
	Classification	Swales	100	0.006	0.006	0.025
2.002	Classification	Swales	100	0.001	0.001	0.001
	Classification	Road, Foot and Cycle Path	100	0.004	0.004	0.004
	Classification	Bridleway	100	0.006	0.006	0.011
2.003	Classification	Road, Foot and Cycle Path	100	0.014	0.014	0.014
	Classification	Bridleway	100	0.011	0.011	0.025
2.004	Classification	Swales	100	0.006	0.006	0.006
	Classification	Road, Foot and Cycle Path	100	0.017	0.017	0.023
	Classification	Road, Foot and Cycle Path	100	0.006	0.006	0.029
	Classification	Bridleway	100	0.005	0.005	0.034
2.005	Classification	Swales	100	0.005	0.005	0.005
	Classification	Road, Foot and Cycle Path	100	0.010	0.010	0.015
	Classification	Road, Foot and Cycle Path	100	0.004	0.004	0.019
2.006	-	-	100	0.000	0.000	0.000
3.000	Classification	Road, Foot and Cycle Path	100	0.016	0.016	0.016
2.007	Classification	Road, Foot and Cycle Path	100	0.040	0.040	0.040
1.008	-	-	100	0.000	0.000	0.000
1.009	Classification	Swales	100	0.004	0.004	0.004
	Classification	Road, Foot and Cycle Path	100	0.010	0.010	0.015
	Classification	Road, Foot and Cycle Path	100	0.005	0.005	0.019
1.010	Classification	Road, Foot and Cycle Path	100	0.003	0.003	0.003

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Area Summary for Highways Phase 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.011	-	-	100	0.000	0.000	0.000
1.012	Classification	Basin	100	0.035	0.035	0.035
	Classification	Green	100	0.028	0.028	0.063
1.013	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.000	0.000	0.000
1.015	-	-	100	0.000	0.000	0.000
4.000	Classification	Swales	100	0.005	0.005	0.005
	Classification	Road, Foot and Cycle Path	100	0.014	0.014	0.019
	Classification	Road, Foot and Cycle Path	100	0.004	0.004	0.023
4.001	Classification	Swales	100	0.006	0.006	0.006
	Classification	Road, Foot and Cycle Path	100	0.013	0.013	0.019
	Classification	Road, Foot and Cycle Path	100	0.005	0.005	0.023
4.002	Classification	Swales	100	0.003	0.003	0.003
	Classification	Road, Foot and Cycle Path	100	0.010	0.010	0.013
	Classification	Road, Foot and Cycle Path	100	0.002	0.002	0.015
4.003	Classification	Swales	100	0.003	0.003	0.003
	Classification	Road, Foot and Cycle Path	100	0.010	0.010	0.013
	Classification	Road, Foot and Cycle Path	100	0.002	0.002	0.015
5.000	Classification	Swales	100	0.003	0.003	0.003
	Classification	Road, Foot and Cycle Path	100	0.012	0.012	0.015
	Classification	Road, Foot and Cycle Path	100	0.003	0.003	0.018
5.001	Classification	Swales	100	0.003	0.003	0.003
	Classification	Road, Foot and Cycle Path	100	0.006	0.006	0.009
	Classification	Road, Foot and Cycle Path	100	0.002	0.002	0.011
	Classification	Road, Foot and Cycle Path	100	0.012	0.012	0.023
5.002	Classification	Swales	100	0.003	0.003	0.003
	Classification	Road, Foot and Cycle Path	100	0.006	0.006	0.010
	Classification	Road, Foot and Cycle Path	100	0.003	0.003	0.013
	Classification	Road, Foot and Cycle Path	100	0.011	0.011	0.024
5.003	-	-	100	0.000	0.000	0.000
5.004	-	-	100	0.000	0.000	0.000
4.004	Classification	Swales	100	0.003	0.003	0.003
	Classification	Road, Foot and Cycle Path	100	0.007	0.007	0.010
	Classification	Road, Foot and Cycle Path	100	0.003	0.003	0.012
4.005	Classification	Road, Foot and Cycle Path	100	0.029	0.029	0.029
6.000	Classification	Road, Foot and Cycle Path	100	0.058	0.058	0.058
4.006	Classification	Road, Foot and Cycle Path	100	0.020	0.020	0.020
7.000	Classification	Road, Foot and Cycle Path	100	0.079	0.079	0.079
7.001	Classification	Road, Foot and Cycle Path	100	0.071	0.071	0.071
4.007	Classification	Basin	100	0.043	0.043	0.043
	Classification	Green	100	0.009	0.009	0.052
	Classification	Green	100	0.017	0.017	0.069
1.016	-	-	100	0.000	0.000	0.000
1.017	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.947	0.947	0.947

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Online Controls for Highways Phase 1

Hydro-Brake® Optimum Manhole: S23, DS/PN: S1.012, Volume (m³): 2.5

Unit Reference	MD-SHE-0135-8900-1200-8900
Design Head (m)	1.200
Design Flow (l/s)	8.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	135
Invert Level (m)	43.900
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	8.9
Flush-Flo™	0.357	8.9
Kick-Flo®	0.771	7.2
Mean Flow over Head Range	-	7.7

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	4.9	1.200	8.9	3.000	13.7	7.000	20.6
0.200	8.4	1.400	9.6	3.500	14.8	7.500	21.2
0.300	8.8	1.600	10.2	4.000	15.7	8.000	21.9
0.400	8.8	1.800	10.8	4.500	16.6	8.500	22.6
0.500	8.7	2.000	11.3	5.000	17.5	9.000	23.2
0.600	8.4	2.200	11.8	5.500	18.3	9.500	23.8
0.800	7.4	2.400	12.3	6.000	19.1		
1.000	8.2	2.600	12.8	6.500	19.8		

Hydro-Brake® Optimum Manhole: S34, DS/PN: S4.007, Volume (m³): 2.5

Unit Reference	MD-SHE-0104-5100-1200-5100
Design Head (m)	1.200
Design Flow (l/s)	5.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	104
Invert Level (m)	42.100
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

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Hydro-Brake® Optimum Manhole: S34, DS/PN: S4.007, Volume (m³): 2.5

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.1
Flush-Flo™	0.358	5.1
Kick-Flo®	0.749	4.1
Mean Flow over Head Range	-	4.5

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	3.5	1.200	5.1	3.000	7.8	7.000	11.7
0.200	4.8	1.400	5.5	3.500	8.4	7.500	12.1
0.300	5.1	1.600	5.8	4.000	9.0	8.000	12.5
0.400	5.1	1.800	6.2	4.500	9.5	8.500	12.8
0.500	5.0	2.000	6.5	5.000	10.0	9.000	13.2
0.600	4.8	2.200	6.8	5.500	10.4	9.500	13.5
0.800	4.2	2.400	7.0	6.000	10.9		
1.000	4.7	2.600	7.3	6.500	11.3		

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Storage Structures for Highways Phase 1

Tank or Pond Manhole: S23, DS/PN: S1.012

Invert Level (m) 43.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	89.0	1.500	440.0

Tank or Pond Manhole: S34, DS/PN: S4.007

Invert Level (m) 42.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	156.0	1.500	473.0

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Highways Phase 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	2
Number of Online Controls	2	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 0.300
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	20.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS 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 (%)	30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	1	+30%					51.440
S1.001	S2	15 Summer	1	+30%	30/15 Summer				49.530
S1.002	S3	15 Summer	1	+30%					48.087
S1.003	S4	15 Summer	1	+30%	100/15 Summer				47.239
S1.004	S5	15 Summer	1	+30%	30/15 Summer				46.896
S1.005	S6	15 Summer	1	+30%	30/15 Summer				46.219
S1.006	S7	15 Summer	1	+30%	30/15 Summer				45.717
S1.007	S8	15 Summer	1	+30%	30/15 Summer				45.546
S2.000	S9	15 Summer	1	+30%					51.391
S2.001	S10	15 Summer	1	+30%	100/15 Summer				49.902
S2.002	S11	15 Summer	1	+30%	30/15 Summer				49.160
S2.003	S12	15 Summer	1	+30%					47.906
S2.004	S13	15 Summer	1	+30%	100/15 Summer				47.190
S2.005	S14	15 Summer	1	+30%	30/15 Summer				46.508
S2.006	S15	15 Summer	1	+30%	30/15 Summer				45.971
S3.000	S16	15 Summer	1	+30%	30/15 Summer				45.281
S2.007	S16	15 Summer	1	+30%	30/15 Summer				45.168
S1.008	S17	15 Summer	1	+30%	30/15 Summer				45.149
S1.009	S18	15 Summer	1	+30%	30/15 Summer				45.095

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

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
S1.000	S1	-0.101	0.000	0.23			9.0	OK	
S1.001	S2	-0.084	0.000	0.39			14.3	OK	
S1.002	S3	-0.167	0.000	0.15			15.4	OK	
S1.003	S4	-0.144	0.000	0.28			20.6	OK	
S1.004	S5	-0.137	0.000	0.32			26.2	OK	
S1.005	S6	-0.130	0.000	0.37			29.5	OK	
S1.006	S7	-0.106	0.000	0.54			29.6	OK	
S1.007	S8	-0.127	0.000	0.39			32.6	OK	
S2.000	S9	-0.106	0.000	0.19			7.2	OK	
S2.001	S10	-0.091	0.000	0.32			11.5	OK	
S2.002	S11	-0.085	0.000	0.38			13.3	OK	
S2.003	S12	-0.154	0.000	0.21			17.7	OK	
S2.004	S13	-0.142	0.000	0.29			23.7	OK	
S2.005	S14	-0.134	0.000	0.34			27.0	OK	
S2.006	S15	-0.156	0.000	0.46			27.2	OK	
S3.000	S16	-0.186	0.000	0.07			3.3	OK	
S2.007	S16	-0.144	0.000	0.40			36.4	OK	
S1.008	S17	-0.115	0.000	0.81			68.6	OK	
S1.009	S18	-0.142	0.000	0.70			71.9	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.010	S19	15 Summer	1	+30%	30/15 Summer				45.007
S1.011	S20	15 Summer	1	+30%	30/15 Summer				44.912
S1.012	S23	180 Summer	1	+30%	1/15 Summer				44.365
S1.013	S24	360 Summer	1	+30%					43.943
S1.014	S24	360 Summer	1	+30%					43.784
S1.015	S25	360 Summer	1	+30%					42.372
S4.000	S27	15 Summer	1	+30%					45.320
S4.001	S28	15 Summer	1	+30%					44.927
S4.002	S29	15 Summer	1	+30%					44.419
S4.003	S30	15 Summer	1	+30%	100/15 Summer				44.166
S5.000	S29	15 Summer	1	+30%					44.726
S5.001	S32	15 Summer	1	+30%					44.468
S5.002	S30	15 Summer	1	+30%	100/15 Summer				44.212
S5.003	S31	15 Summer	1	+30%	30/15 Summer				43.979
S5.004	S32	15 Summer	1	+30%	30/15 Summer				43.866
S4.004	S30	15 Summer	1	+30%	30/15 Summer				43.766
S4.005	S31	15 Summer	1	+30%	30/15 Summer				43.415
S6.000	S39	15 Summer	1	+30%	100/15 Summer				43.467
S4.006	S33	15 Summer	1	+30%	30/15 Summer				43.178
S7.000	S32	15 Summer	1	+30%	30/15 Summer				43.174
S7.001	S45	15 Summer	1	+30%	30/15 Summer				42.957
S4.007	S34	360 Summer	1	+30%	1/30 Summer				42.537
S1.016	S26	360 Summer	1	+30%					42.122
S1.017	S40	360 Summer	1	+30%					41.344

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.010	S19	-0.172	0.000	0.57			72.3	OK	
S1.011	S20	-0.162	0.000	0.61			71.7	OK	
S1.012	S23	0.240	0.000	0.30			8.8	SURCHARGED	
S1.013	S24	-0.154	0.000	0.22			8.8	OK	
S1.014	S24	-0.181	0.000	0.08			8.8	OK	
S1.015	S25	-0.173	0.000	0.12			8.8	OK	
S4.000	S27	-0.186	0.000	0.07			4.8	OK	
S4.001	S28	-0.172	0.000	0.13			8.9	OK	
S4.002	S29	-0.161	0.000	0.18			11.5	OK	
S4.003	S30	-0.164	0.000	0.16			14.1	OK	
S5.000	S29	-0.192	0.000	0.05			3.8	OK	
S5.001	S32	-0.175	0.000	0.11			7.8	OK	
S5.002	S30	-0.162	0.000	0.17			12.0	OK	
S5.003	S31	-0.136	0.000	0.33			12.0	OK	
S5.004	S32	-0.148	0.000	0.26			12.1	OK	
S4.004	S30	-0.137	0.000	0.32			28.4	OK	
S4.005	S31	-0.092	0.000	0.65			33.3	OK	
S6.000	S39	-0.138	0.000	0.32			12.0	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S4.006	S33	-0.197	0.000	0.45			48.7	OK	
S7.000	S32	-0.126	0.000	0.39			16.2	OK	
S7.001	S45	-0.155	0.000	0.47			28.5	OK	
S4.007	S34	0.212	0.000	0.17			5.1	SURCHARGED	
S1.016	S26	-0.163	0.000	0.17			13.9	OK	
S1.017	S40	-0.165	0.000	0.16			13.9	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Highways Phase 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	2
Number of Online Controls	2	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	0.300
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	20.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS 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 (%)	30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	30	+30%					51.473
S1.001	S2	15 Summer	30	+30%	30/15 Summer				49.695
S1.002	S3	15 Summer	30	+30%					48.127
S1.003	S4	15 Summer	30	+30%	100/15 Summer				47.339
S1.004	S5	15 Summer	30	+30%	30/15 Summer				47.166
S1.005	S6	15 Summer	30	+30%	30/15 Summer				46.754
S1.006	S7	15 Summer	30	+30%	30/15 Summer				46.353
S1.007	S8	15 Summer	30	+30%	30/15 Summer				46.116
S2.000	S9	15 Summer	30	+30%					51.419
S2.001	S10	15 Summer	30	+30%	100/15 Summer				49.953
S2.002	S11	15 Summer	30	+30%	30/15 Summer				49.341
S2.003	S12	15 Summer	30	+30%					47.962
S2.004	S13	15 Summer	30	+30%	100/15 Summer				47.267
S2.005	S14	15 Summer	30	+30%	30/15 Summer				46.669
S2.006	S15	15 Summer	30	+30%	30/15 Summer				46.158
S3.000	S16	15 Summer	30	+30%	30/15 Summer				45.852
S2.007	S16	15 Summer	30	+30%	30/15 Summer				45.841
S1.008	S17	15 Summer	30	+30%	30/15 Summer				45.784
S1.009	S18	15 Summer	30	+30%	30/15 Summer				45.590

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.068	0.000	0.57			22.0	OK	
S1.001	S2	0.080	0.000	1.03			37.5	SURCHARGED	
S1.002	S3	-0.127	0.000	0.39			40.8	OK	
S1.003	S4	-0.044	0.000	0.77			57.4	OK	
S1.004	S5	0.133	0.000	0.86			70.8	SURCHARGED	
S1.005	S6	0.405	0.000	0.92			73.6	SURCHARGED	
S1.006	S7	0.530	0.000	1.30			70.8	SURCHARGED	
S1.007	S8	0.443	0.000	0.92			76.6	SURCHARGED	
S2.000	S9	-0.078	0.000	0.46			17.7	OK	
S2.001	S10	-0.040	0.000	0.88			31.8	OK	
S2.002	S11	0.097	0.000	1.04			36.2	SURCHARGED	
S2.003	S12	-0.099	0.000	0.59			49.8	OK	
S2.004	S13	-0.066	0.000	0.84			69.2	OK	
S2.005	S14	0.027	0.000	0.98			78.5	SURCHARGED	
S2.006	S15	0.031	0.000	1.35			78.9	SURCHARGED	
S3.000	S16	0.385	0.000	0.16			7.7	SURCHARGED	
S2.007	S16	0.529	0.000	1.08			98.7	SURCHARGED	
S1.008	S17	0.520	0.000	2.03			171.2	SURCHARGED	
S1.009	S18	0.353	0.000	1.73			177.7	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.010	S19	15 Summer	30	+30%	30/15 Summer				45.379
S1.011	S20	15 Summer	30	+30%	30/15 Summer				45.173
S1.012	S23	180 Winter	30	+30%	1/15 Summer				44.886
S1.013	S24	600 Winter	30	+30%					43.943
S1.014	S24	2880 Summer	30	+30%					43.784
S1.015	S25	2880 Summer	30	+30%					42.372
S4.000	S27	15 Summer	30	+30%					45.343
S4.001	S28	15 Summer	30	+30%					44.967
S4.002	S29	15 Summer	30	+30%					44.470
S4.003	S30	15 Summer	30	+30%	100/15 Summer				44.217
S5.000	S29	15 Summer	30	+30%					44.747
S5.001	S32	15 Summer	30	+30%					44.506
S5.002	S30	15 Summer	30	+30%	100/15 Summer				44.264
S5.003	S31	15 Summer	30	+30%	30/15 Summer				44.205
S5.004	S32	15 Summer	30	+30%	30/15 Summer				44.130
S4.004	S30	15 Summer	30	+30%	30/15 Summer				44.079
S4.005	S31	15 Summer	30	+30%	30/15 Summer				43.793
S6.000	S39	15 Summer	30	+30%	100/15 Summer				43.532
S4.006	S33	15 Summer	30	+30%	30/15 Summer				43.390
S7.000	S32	15 Summer	30	+30%	30/15 Summer				43.336
S7.001	S45	15 Summer	30	+30%	30/15 Summer				43.162
S4.007	S34	480 Winter	30	+30%	1/30 Summer				43.063
S1.016	S26	240 Summer	30	+30%					42.122
S1.017	S40	240 Winter	30	+30%					41.344

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.010	S19	0.200	0.000	1.41			178.4	SURCHARGED	
S1.011	S20	0.099	0.000	1.51			177.8	SURCHARGED	
S1.012	S23	0.761	0.000	0.30			8.8	SURCHARGED	
S1.013	S24	-0.154	0.000	0.22			8.8	OK	
S1.014	S24	-0.181	0.000	0.08			8.8	OK	
S1.015	S25	-0.173	0.000	0.12			8.8	OK	
S4.000	S27	-0.163	0.000	0.17			11.8	OK	
S4.001	S28	-0.132	0.000	0.35			25.1	OK	
S4.002	S29	-0.110	0.000	0.51			33.8	OK	
S4.003	S30	-0.113	0.000	0.49			42.3	OK	
S5.000	S29	-0.171	0.000	0.13			9.3	OK	
S5.001	S32	-0.137	0.000	0.32			22.5	OK	
S5.002	S30	-0.109	0.000	0.52			36.2	OK	
S5.003	S31	0.091	0.000	0.89			32.6	SURCHARGED	
S5.004	S32	0.116	0.000	0.74			34.8	SURCHARGED	
S4.004	S30	0.176	0.000	0.85			75.5	SURCHARGED	
S4.005	S31	0.286	0.000	1.74			88.9	SURCHARGED	
S6.000	S39	-0.073	0.000	0.77			29.1	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S4.006	S33	0.015	0.000	1.19			127.6	SURCHARGED	
S7.000	S32	0.036	0.000	0.96			39.6	SURCHARGED	
S7.001	S45	0.050	0.000	1.23			75.7	SURCHARGED	
S4.007	S34	0.738	0.000	0.17			5.1	SURCHARGED	
S1.016	S26	-0.163	0.000	0.17			13.9	OK	
S1.017	S40	-0.165	0.000	0.16			13.9	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Highways Phase 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	2
Number of Online Controls	2	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	0.300
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	20.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS 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 (%)	30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	100	+30%					51.488
S1.001	S2	15 Summer	100	+30%	30/15 Summer				50.271
S1.002	S3	15 Summer	100	+30%					48.137
S1.003	S4	15 Summer	100	+30%	100/15 Summer				47.893
S1.004	S5	15 Summer	100	+30%	30/15 Summer				47.684
S1.005	S6	15 Summer	100	+30%	30/15 Summer				47.196
S1.006	S7	15 Summer	100	+30%	30/15 Summer				46.712
S1.007	S8	15 Summer	100	+30%	30/15 Summer				46.414
S2.000	S9	15 Summer	100	+30%					51.431
S2.001	S10	15 Summer	100	+30%	100/15 Summer				50.382
S2.002	S11	15 Summer	100	+30%	30/15 Summer				49.666
S2.003	S12	15 Summer	100	+30%					47.974
S2.004	S13	15 Summer	100	+30%	100/15 Summer				47.459
S2.005	S14	15 Summer	100	+30%	30/15 Summer				46.837
S2.006	S15	15 Summer	100	+30%	30/15 Summer				46.197
S3.000	S16	15 Summer	100	+30%	30/15 Summer				46.094
S2.007	S16	15 Summer	100	+30%	30/15 Summer				46.080
S1.008	S17	15 Summer	100	+30%	30/15 Summer				46.001
S1.009	S18	15 Summer	100	+30%	30/15 Summer				45.758

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.052	0.000	0.74			28.5	OK	
S1.001	S2	0.656	0.000	1.20			43.8	FLOOD RISK	
S1.002	S3	-0.117	0.000	0.46			47.7	OK	
S1.003	S4	0.510	0.000	0.82			60.8	SURCHARGED	
S1.004	S5	0.651	0.000	0.90			74.4	SURCHARGED	
S1.005	S6	0.846	0.000	0.96			77.2	SURCHARGED	
S1.006	S7	0.888	0.000	1.41			77.2	SURCHARGED	
S1.007	S8	0.741	0.000	1.01			83.5	SURCHARGED	
S2.000	S9	-0.066	0.000	0.59			22.9	OK	
S2.001	S10	0.389	0.000	0.98			35.6	SURCHARGED	
S2.002	S11	0.421	0.000	1.16			40.4	SURCHARGED	
S2.003	S12	-0.087	0.000	0.68			57.0	OK	
S2.004	S13	0.126	0.000	0.94			78.2	SURCHARGED	
S2.005	S14	0.195	0.000	1.12			89.7	SURCHARGED	
S2.006	S15	0.070	0.000	1.53			89.2	SURCHARGED	
S3.000	S16	0.627	0.000	0.17			8.0	FLOOD RISK	
S2.007	S16	0.768	0.000	1.22			111.5	SURCHARGED	
S1.008	S17	0.737	0.000	2.29			193.2	SURCHARGED	
S1.009	S18	0.521	0.000	1.94			200.1	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.010	S19	15 Summer	100	+30%	30/15 Summer				45.495
S1.011	S20	15 Summer	100	+30%	30/15 Summer				45.230
S1.012	S23	240 Winter	100	+30%	1/15 Summer				45.103
S1.013	S24	600 Summer	100	+30%					43.943
S1.014	S24	2160 Winter	100	+30%					43.784
S1.015	S25	2160 Winter	100	+30%					42.372
S4.000	S27	15 Summer	100	+30%					45.352
S4.001	S28	15 Summer	100	+30%					44.981
S4.002	S29	15 Summer	100	+30%					44.560
S4.003	S30	15 Summer	100	+30%	100/15 Summer				44.481
S5.000	S29	15 Summer	100	+30%					44.755
S5.001	S32	15 Summer	100	+30%					44.625
S5.002	S30	15 Summer	100	+30%	100/15 Summer				44.591
S5.003	S31	15 Summer	100	+30%	30/15 Summer				44.518
S5.004	S32	15 Summer	100	+30%	30/15 Summer				44.424
S4.004	S30	15 Summer	100	+30%	30/15 Summer				44.362
S4.005	S31	15 Summer	100	+30%	30/15 Summer				43.981
S6.000	S39	15 Summer	100	+30%	100/15 Summer				43.653
S4.006	S33	15 Summer	100	+30%	30/15 Summer				43.433
S7.000	S32	15 Summer	100	+30%	30/15 Summer				43.513
S7.001	S45	480 Winter	100	+30%	30/15 Summer				43.297
S4.007	S34	480 Winter	100	+30%	1/30 Summer				43.296
S1.016	S26	240 Summer	100	+30%					42.122
S1.017	S40	240 Summer	100	+30%					41.344

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.010	S19	0.316	0.000	1.58			200.3	SURCHARGED	
S1.011	S20	0.156	0.000	1.71			200.5	SURCHARGED	
S1.012	S23	0.978	0.000	0.30			8.8	FLOOD RISK	
S1.013	S24	-0.154	0.000	0.22			8.8	OK	
S1.014	S24	-0.181	0.000	0.08			8.8	OK	
S1.015	S25	-0.173	0.000	0.12			8.8	OK	
S4.000	S27	-0.154	0.000	0.22			15.3	OK	
S4.001	S28	-0.118	0.000	0.46			32.5	OK	
S4.002	S29	-0.020	0.000	0.65			42.6	OK	
S4.003	S30	0.151	0.000	0.55			47.8	SURCHARGED	
S5.000	S29	-0.163	0.000	0.17			12.0	OK	
S5.001	S32	-0.018	0.000	0.40			28.1	OK	
S5.002	S30	0.218	0.000	0.60			41.7	SURCHARGED	
S5.003	S31	0.404	0.000	0.98			35.9	SURCHARGED	
S5.004	S32	0.410	0.000	0.91			42.6	SURCHARGED	
S4.004	S30	0.459	0.000	1.00			88.3	SURCHARGED	
S4.005	S31	0.474	0.000	2.00			102.5	SURCHARGED	
S6.000	S39	0.048	0.000	0.96			36.5	SURCHARGED	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S4.006	S33	0.058	0.000	1.40			150.6	SURCHARGED	
S7.000	S32	0.213	0.000	1.23			50.9	SURCHARGED	
S7.001	S45	0.185	0.000	0.21			12.8	SURCHARGED	
S4.007	S34	0.971	0.000	0.17			5.1	SURCHARGED	
S1.016	S26	-0.163	0.000	0.17			13.9	OK	
S1.017	S40	-0.165	0.000	0.16			13.9	OK	

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