STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm Network 2 - Outfall 5

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.700	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

Network Design Table for Storm Network 2 - Outfall 5

« - 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
S6.000	11.810	0.708	16.7	0.009	5.00	0.0	0.600	o	100	Pipe/Conduit	
S6.001	11.356	0.472	24.1	0.027	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.002	11.457	0.115	99.6	0.023	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.003	13.855	0.139	99.7	0.025	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.004	12.931	0.162	79.8	0.098	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.005	12.858	0.857	15.0	0.018	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.006	13.027	0.434	30.0	0.021	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.007	10.548	0.508	20.8	0.017	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.000	14.002	0.175	80.0	0.010	5.00	0.0	0.600	o	100	Pipe/Conduit	
S7.001	16.501	0.206	80.1	0.011	0.00	0.0	0.600	o	100	Pipe/Conduit	
S7.002	13.105	0.164	79.9	0.012	0.00	0.0	0.600	o	100	Pipe/Conduit	
S8.000	22.731	1.245	18.3	0.012	5.00	0.0	0.600	o	100	Pipe/Conduit	
S7.003	6.613	0.166	39.8	0.010	0.00	0.0	0.600	o	100	Pipe/Conduit	
S7.004	12.752	0.159	80.2	0.023	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.005	18.577	0.929	20.0	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.000	4.144	0.041	101.1	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S7.006	13.358	0.134	99.7	0.064	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)
S6.000	50.00	5.10	48.000	0.009	0.0	0.0	0.0	1.90	14.9	1.2
S6.001	50.00	5.22	47.292	0.036	0.0	0.0	0.0	1.58	12.4	4.9
S6.002	49.23	5.47	46.770	0.059	0.0	0.0	0.0	0.77	6.1«	7.9
S6.003	48.04	5.77	46.605	0.084	0.0	0.0	0.0	0.77	6.0«	10.9
S6.004	47.10	6.02	46.341	0.182	0.0	0.0	0.0	0.86	6.8«	23.2
S6.005	46.80	6.10	46.129	0.200	0.0	0.0	0.0	2.61	46.2	25.3
S6.006	46.37	6.22	45.272	0.221	0.0	0.0	0.0	1.84	32.6	27.8
S6.007	46.09	6.30	44.838	0.238	0.0	0.0	0.0	2.22	39.2	29.7
S7.000	50.00	5.27	47.500	0.010	0.0	0.0	0.0	0.86	6.8	1.4
S7.001	48.74	5.59	47.325	0.021	0.0	0.0	0.0	0.86	6.8	2.8
S7.002	47.76	5.84	47.119	0.033	0.0	0.0	0.0	0.86	6.8	4.3
S8.000	50.00	5.21	48.200	0.012	0.0	0.0	0.0	1.82	14.3	1.6
S7.003	47.42	5.93	46.955	0.055	0.0	0.0	0.0	1.23	9.6	7.1
S7.004	46.72	6.12	46.739	0.078	0.0	0.0	0.0	1.12	19.9	9.9
S7.005	46.35	6.23	46.505	0.101	0.0	0.0	0.0	2.94	116.9	12.7
S9.000	50.00	5.05	44.500	0.000	0.0	0.0	0.0	1.30	51.7	0.0
S7.006	45.75	6.40	44.459	0.165	0.0	0.0	0.0	1.31	52.1	20.4

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Network Design Table for Storm Network 2 - Outfall 5

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
S7.007	11.376	0.070	162.5	0.079	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.008	8.974	0.090	99.7	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.009	20.171	0.202	99.9	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.010	7.233	0.073	99.1	0.049	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.011	4.384	0.040	109.6	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)
S7.007	45.12	6.58	44.325	0.244	0.0	0.0	0.0	1.02	40.7	29.8
S6.008	44.75	6.70	44.255	0.500	0.0	0.0	0.0	1.31	52.1«	60.6
S6.009	43.92	6.96	44.165	0.518	0.0	0.0	0.0	1.31	52.0«	61.6
S6.010	43.64	7.05	43.963	0.567	0.0	0.0	0.0	1.31	52.2«	67.0
S6.011	43.40	7.12	43.890	0.567	0.0	0.0	0.0	0.96	17.0«	67.0

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Manhole Schedules for Storm Network 2 - Outfall 5

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)
SS26	48.969	0.969	Open Manhole	450	S6.000	48.000	100				
SS27	48.198	0.906	Open Manhole	450	S6.001	47.292	100	S6.000	47.292	100	
SS28	47.527	0.757	Open Manhole	450	S6.002	46.770	100	S6.001	46.820	100	50
SS29	47.700	1.095	Open Manhole	450	S6.003	46.605	100	S6.002	46.655	100	50
SS30	47.534	1.193	Open Manhole	450	S6.004	46.341	100	S6.003	46.466	100	125
SS31	46.980	0.851	Open Manhole	450	S6.005	46.129	150	S6.004	46.179	100	
SS32	46.401	1.129	Open Manhole	450	S6.006	45.272	150	S6.005	45.272	150	
SS33	46.193	1.355	Open Manhole	450	S6.007	44.838	150	S6.006	44.838	150	
SS34	48.147	0.647	Open Manhole	450	S7.000	47.500	100				
SS35	48.179	0.854	Open Manhole	450	S7.001	47.325	100	S7.000	47.325	100	
SS36	48.725	1.606	Open Manhole	450	S7.002	47.119	100	S7.001	47.119	100	
SS37	48.928	0.728	Open Manhole	450	S8.000	48.200	100				
SS38	48.750	1.795	Open Manhole	450	S7.003	46.955	100	S7.002	46.955	100	
								S8.000	46.955	100	
SS39	48.800	2.061	Open Manhole	450	S7.004	46.739	150	S7.003	46.789	100	
SS40	48.050	1.545	Open Manhole	450	S7.005	46.505	225	S7.004	46.580	150	
SS41- TANK	47.000	2.500	Open Manhole	1200	S9.000	44.500	225				
SS42	46.800	2.341	Open Manhole	450	S7.006	44.459	225	S7.005	45.576	225	1117
								S9.000	44.459	225	
SS43	46.301	1.976	Open Manhole	450	S7.007	44.325	225	S7.006	44.325	225	
SS44	46.062	1.807	Open Manhole	450	S6.008	44.255	225	S6.007	44.330	150	
								S7.007	44.255	225	
SS45	45.967	1.802	Open Manhole	450	S6.009	44.165	225	S6.008	44.165	225	
SS46	45.735	1.772	Open Manhole	450	S6.010	43.963	225	S6.009	43.963	225	
SS47	45.500	1.610	Open Manhole	1800	S6.011	43.890	150	S6.010	43.890	225	
S	45.500	1.650	Open Manhole	0		OUTFALL		S6.011	43.850	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS26	470057.772	172021.741	470057.772	172021.741	Required	
SS27	470060.467	172010.243	470060.467	172010.243	Required	
SS28	470063.273	171999.239	470063.273	171999.239	Required	
SS29	470065.073	171987.924	470065.073	171987.924	Required	
SS30	470065.073	171974.069	470065.073	171974.069	Required	
SS31	470078.003	171974.236	470078.003	171974.236	Required	
SS32	470090.348	171970.639	470090.348	171970.639	Required	
SS33	470103.375	171970.596	470103.375	171970.596	Required	

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Manhole Schedules for Storm Network 2 - Outfall 5

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS34	470139.801	172040.010	470139.801	172040.010	Required	
SS35	470126.142	172036.932	470126.142	172036.932	Required	
SS36	470110.045	172033.305	470110.045	172033.305	Required	
SS37	470075.152	172025.142	470075.152	172025.142	Required	
SS38	470097.266	172030.402	470097.266	172030.402	Required	
SS39	470098.853	172023.982	470098.853	172023.982	Required	
SS40	470102.010	172011.627	470102.010	172011.627	Required	
SS41- TANK	470102.563	171994.341	470102.563	171994.341	Required	
SS42	470106.646	171993.638	470106.646	171993.638	Required	
SS43	470109.680	171980.629	470109.680	171980.629	Required	
SS44	470113.910	171970.069	470113.910	171970.069	Required	
SS45	470122.763	171971.539	470122.763	171971.539	Required	
SS46	470142.328	171976.448	470142.328	171976.448	Required	
SS47	470149.145	171978.867	470149.145	171978.867	Required	
S	470153.383	171979.990			No Entry	

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PIPELINE SCHEDULES for Storm Network 2 - Outfall 5

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)
S6.000	o	100	SS26	48.969	48.000	0.869	Open Manhole	450
S6.001	o	100	SS27	48.198	47.292	0.806	Open Manhole	450
S6.002	o	100	SS28	47.527	46.770	0.657	Open Manhole	450
S6.003	o	100	SS29	47.700	46.605	0.995	Open Manhole	450
S6.004	o	100	SS30	47.534	46.341	1.093	Open Manhole	450
S6.005	o	150	SS31	46.980	46.129	0.701	Open Manhole	450
S6.006	o	150	SS32	46.401	45.272	0.979	Open Manhole	450
S6.007	o	150	SS33	46.193	44.838	1.205	Open Manhole	450
S7.000	o	100	SS34	48.147	47.500	0.547	Open Manhole	450
S7.001	o	100	SS35	48.179	47.325	0.754	Open Manhole	450
S7.002	o	100	SS36	48.725	47.119	1.506	Open Manhole	450
S8.000	o	100	SS37	48.928	48.200	0.628	Open Manhole	450
S7.003	o	100	SS38	48.750	46.955	1.695	Open Manhole	450
S7.004	o	150	SS39	48.800	46.739	1.911	Open Manhole	450
S7.005	o	225	SS40	48.050	46.505	1.320	Open Manhole	450
S9.000	o	225	SS41- TANK	47.000	44.500	2.275	Open Manhole	1200
S7.006	o	225	SS42	46.800	44.459	2.116	Open Manhole	450
S7.007	o	225	SS43	46.301	44.325	1.751	Open Manhole	450
S6.008	o	225	SS44	46.062	44.255	1.582	Open Manhole	450
S6.009	o	225	SS45	45.967	44.165	1.577	Open Manhole	450
S6.010	o	225	SS46	45.735	43.963	1.547	Open Manhole	450
S6.011	o	150	SS47	45.500	43.890	1.460	Open Manhole	1800

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)
S6.000	11.810	16.7	SS27	48.198	47.292	0.806	Open Manhole	450
S6.001	11.356	24.1	SS28	47.527	46.820	0.607	Open Manhole	450
S6.002	11.457	99.6	SS29	47.700	46.655	0.945	Open Manhole	450
S6.003	13.855	99.7	SS30	47.534	46.466	0.968	Open Manhole	450
S6.004	12.931	79.8	SS31	46.980	46.179	0.701	Open Manhole	450
S6.005	12.858	15.0	SS32	46.401	45.272	0.979	Open Manhole	450
S6.006	13.027	30.0	SS33	46.193	44.838	1.205	Open Manhole	450
S6.007	10.548	20.8	SS44	46.062	44.330	1.582	Open Manhole	450
S7.000	14.002	80.0	SS35	48.179	47.325	0.754	Open Manhole	450
S7.001	16.501	80.1	SS36	48.725	47.119	1.506	Open Manhole	450
S7.002	13.105	79.9	SS38	48.750	46.955	1.695	Open Manhole	450
S8.000	22.731	18.3	SS38	48.750	46.955	1.695	Open Manhole	450
S7.003	6.613	39.8	SS39	48.800	46.789	1.911	Open Manhole	450
S7.004	12.752	80.2	SS40	48.050	46.580	1.320	Open Manhole	450
S7.005	18.577	20.0	SS42	46.800	45.576	0.999	Open Manhole	450
S9.000	4.144	101.1	SS42	46.800	44.459	2.116	Open Manhole	450
S7.006	13.358	99.7	SS43	46.301	44.325	1.751	Open Manhole	450
S7.007	11.376	162.5	SS44	46.062	44.255	1.582	Open Manhole	450
S6.008	8.974	99.7	SS45	45.967	44.165	1.577	Open Manhole	450
S6.009	20.171	99.9	SS46	45.735	43.963	1.547	Open Manhole	450
S6.010	7.233	99.1	SS47	45.500	43.890	1.385	Open Manhole	1800
S6.011	4.384	109.6	S	45.500	43.850	1.500	Open Manhole	0

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Setting Out Information - True Coordinates (Storm Network 2 - Outfall 5)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S6.000	SS26	450		470057.772	172021.741	470057.772	172021.741	
S6.001	SS27	450		470060.467	172010.243	470060.467	172010.243	
S6.002	SS28	450		470063.273	171999.239	470063.273	171999.239	
S6.003	SS29	450		470065.073	171987.924	470065.073	171987.924	
S6.004	SS30	450		470065.073	171974.069	470065.073	171974.069	
S6.005	SS31	450		470078.003	171974.236	470078.003	171974.236	
S6.006	SS32	450		470090.348	171970.639	470090.348	171970.639	
S6.007	SS33	450		470103.375	171970.596	470103.375	171970.596	
S7.000	SS34	450		470139.801	172040.010	470139.801	172040.010	
S7.001	SS35	450		470126.142	172036.932	470126.142	172036.932	
S7.002	SS36	450		470110.045	172033.305	470110.045	172033.305	
S8.000	SS37	450		470075.152	172025.142	470075.152	172025.142	
S7.003	SS38	450		470097.266	172030.402	470097.266	172030.402	
S7.004	SS39	450		470098.853	172023.982	470098.853	172023.982	
S7.005	SS40	450		470102.010	172011.627	470102.010	172011.627	
S9.000	SS41- TANK	1200		470102.563	171994.341	470102.563	171994.341	
S7.006	SS42	450		470106.646	171993.638	470106.646	171993.638	
S7.007	SS43	450		470109.680	171980.629	470109.680	171980.629	
S6.008	SS44	450		470113.910	171970.069	470113.910	171970.069	

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Setting Out Information - True Coordinates (Storm Network 2 - Outfall 5)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S6.009	SS45	450		470122.763	171971.539	470122.763	171971.539	
S6.010	SS46	450		470142.328	171976.448	470142.328	171976.448	
S6.011	SS47	1800		470149.145	171978.867	470149.145	171978.867	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S6.011	S	0		470153.383	171979.990	

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Area Summary for Storm Network 2 - Outfall 5

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
6.000	-	-	100	0.009	0.009	0.009
6.001	-	-	100	0.027	0.027	0.027
6.002	-	-	100	0.023	0.023	0.023
6.003	-	-	100	0.025	0.025	0.025
6.004	-	-	100	0.098	0.098	0.098
6.005	-	-	100	0.018	0.018	0.018
6.006	-	-	100	0.021	0.021	0.021
6.007	-	-	100	0.017	0.017	0.017
7.000	-	-	100	0.010	0.010	0.010
7.001	-	-	100	0.011	0.011	0.011
7.002	-	-	100	0.012	0.012	0.012
8.000	-	-	100	0.012	0.012	0.012
7.003	-	-	100	0.010	0.010	0.010
7.004	-	-	100	0.023	0.023	0.023
7.005	-	-	100	0.023	0.023	0.023
9.000	-	-	100	0.000	0.000	0.000
7.006	-	-	100	0.064	0.064	0.064
7.007	-	-	100	0.079	0.079	0.079
6.008	-	-	100	0.018	0.018	0.018
6.009	-	-	100	0.018	0.018	0.018
6.010	-	-	100	0.049	0.049	0.049
6.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.567	0.567	0.567

Free Flowing Outfall Details for Storm Network 2 - Outfall 5

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S6.011	S	45.500	43.850	0.000	0	0

Simulation Criteria for Storm Network 2 - Outfall 5

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	1	Number of Storage Structures	17	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.700	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm Network 2 - Outfall 5

Hydro-Brake® Optimum Manhole: SS47, DS/PN: S6.011, Volume (m³): 4.3

Unit Reference	MD-SHE-0098-4600-1200-4600
Design Head (m)	1.200
Design Flow (l/s)	4.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	43.890
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)	1.200	4.6	Kick-Flo®	0.744	3.7
Flush-Flo™	0.357	4.6	Mean Flow over Head Range	-	4.0

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	3.2	1.200	4.6	3.000	7.1	7.000	10.5
0.200	4.3	1.400	4.9	3.500	7.6	7.500	10.9
0.300	4.6	1.600	5.3	4.000	8.1	8.000	11.2
0.400	4.6	1.800	5.6	4.500	8.5	8.500	11.6
0.500	4.5	2.000	5.8	5.000	9.0	9.000	11.9
0.600	4.3	2.200	6.1	5.500	9.4	9.500	12.2
0.800	3.8	2.400	6.4	6.000	9.8		
1.000	4.2	2.600	6.6	6.500	10.2		

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Storage Structures for Storm Network 2 - Outfall 5

Porous Car Park Manhole: SS26, DS/PN: S6.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.6
Membrane Percolation (mm/hr)	1000	Length (m)	6.6
Max Percolation (l/s)	12.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.000	Cap Volume Depth (m)	0.600

Porous Car Park Manhole: SS27, DS/PN: S6.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	13.0
Membrane Percolation (mm/hr)	1000	Length (m)	13.0
Max Percolation (l/s)	46.9	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	47.292	Cap Volume Depth (m)	0.700

Porous Car Park Manhole: SS28, DS/PN: S6.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.3
Membrane Percolation (mm/hr)	1000	Length (m)	12.3
Max Percolation (l/s)	42.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.820	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SS29, DS/PN: S6.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.3
Membrane Percolation (mm/hr)	1000	Length (m)	12.3
Max Percolation (l/s)	42.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.655	Cap Volume Depth (m)	0.700

Porous Car Park Manhole: SS30, DS/PN: S6.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.4
Membrane Percolation (mm/hr)	1000	Length (m)	9.4
Max Percolation (l/s)	24.5	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.466	Cap Volume Depth (m)	0.700

Porous Car Park Manhole: SS31, DS/PN: S6.005

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.5
Membrane Percolation (mm/hr)	1000	Length (m)	9.5
Max Percolation (l/s)	25.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.179	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SS32, DS/PN: S6.006

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.1
Membrane Percolation (mm/hr)	1000	Length (m)	12.1
Max Percolation (l/s)	40.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	45.272	Cap Volume Depth (m)	0.700

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Porous Car Park Manhole: SS33, DS/PN: S6.007

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.7
Membrane Percolation (mm/hr)	1000	Length (m)	10.7
Max Percolation (l/s)	31.8	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.838	Cap Volume Depth (m)	1.000

Porous Car Park Manhole: SS34, DS/PN: S7.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.9
Membrane Percolation (mm/hr)	1000	Length (m)	7.9
Max Percolation (l/s)	17.3	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	47.500	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SS35, DS/PN: S7.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.6
Membrane Percolation (mm/hr)	1000	Length (m)	8.6
Max Percolation (l/s)	20.5	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	47.325	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: SS36, DS/PN: S7.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.6
Membrane Percolation (mm/hr)	1000	Length (m)	8.6
Max Percolation (l/s)	20.5	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	47.119	Cap Volume Depth (m)	1.000

Porous Car Park Manhole: SS37, DS/PN: S8.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.6
Membrane Percolation (mm/hr)	1000	Length (m)	6.6
Max Percolation (l/s)	12.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.200	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SS38, DS/PN: S7.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.9
Membrane Percolation (mm/hr)	1000	Length (m)	7.9
Max Percolation (l/s)	17.3	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.955	Cap Volume Depth (m)	1.000

Cellular Storage Manhole: SS41- TANK, DS/PN: S9.000

Invert Level (m)	44.500	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	183.0	0.0	0.810	0.0	0.0
0.800	183.0	0.0			

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Porous Car Park Manhole: SS44, DS/PN: S6.008

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.5
Membrane Percolation (mm/hr)	1000	Length (m)	11.5
Max Percolation (l/s)	36.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.330	Cap Volume Depth (m)	1.530

Porous Car Park Manhole: SS45, DS/PN: S6.009

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.5
Membrane Percolation (mm/hr)	1000	Length (m)	11.5
Max Percolation (l/s)	36.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.165	Cap Volume Depth (m)	1.630

Porous Car Park Manhole: SS46, DS/PN: S6.010

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	17.8
Membrane Percolation (mm/hr)	1000	Length (m)	17.8
Max Percolation (l/s)	88.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	43.963	Cap Volume Depth (m)	1.500

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 17 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.000	SS26	15 Winter	1	+0%					48.018
S6.001	SS27	30 Winter	1	+0%					47.324
S6.002	SS28	30 Winter	1	+0%	30/15 Summer				46.834
S6.003	SS29	30 Winter	1	+0%	30/15 Summer				46.683
S6.004	SS30	30 Winter	1	+0%	1/15 Summer				46.557
S6.005	SS31	15 Summer	1	+0%					46.178
S6.006	SS32	30 Winter	1	+0%					45.334
S6.007	SS33	30 Winter	1	+0%	100/15 Winter				44.897
S7.000	SS34	30 Winter	1	+0%					47.522
S7.001	SS35	30 Winter	1	+0%					47.355
S7.002	SS36	60 Winter	1	+0%	100/15 Summer				47.154
S8.000	SS37	15 Winter	1	+0%					48.221
S7.003	SS38	30 Winter	1	+0%	100/15 Summer				46.994
S7.004	SS39	30 Winter	1	+0%	100/15 Summer				46.789
S7.005	SS40	30 Winter	1	+0%					46.540
S9.000	SS41- TANK	30 Winter	1	+0%	100/30 Winter				44.501
S7.006	SS42	15 Winter	1	+0%	30/15 Summer				44.539
S7.007	SS43	15 Winter	1	+0%	30/15 Summer				44.452
S6.008	SS44	30 Winter	1	+0%	30/15 Summer				44.388
S6.009	SS45	120 Winter	1	+0%	30/15 Summer				44.324
S6.010	SS46	120 Winter	1	+0%	1/30 Summer				44.315
S6.011	SS47	120 Winter	1	+0%	1/15 Summer				44.311

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
S6.000	SS26	-0.082	0.000	0.07		5	1.0	OK	
S6.001	SS27	-0.068	0.000	0.23		8	2.6	OK	
S6.002	SS28	-0.036	0.000	0.73		4	4.2	OK	
S6.003	SS29	-0.022	0.000	0.96		5	5.5	OK	
S6.004	SS30	0.116	0.000	1.32		8	8.5	SURCHARGED	
S6.005	SS31	-0.101	0.000	0.22		13	9.2	OK	
S6.006	SS32	-0.088	0.000	0.36		15	10.6	OK	
S6.007	SS33	-0.091	0.000	0.32		15	11.3	OK	
S7.000	SS34	-0.078	0.000	0.11		7	0.7	OK	
S7.001	SS35	-0.070	0.000	0.19		9	1.2	OK	
S7.002	SS36	-0.065	0.000	0.26		13	1.7	OK	
S8.000	SS37	-0.079	0.000	0.10		5	1.4	OK	
S7.003	SS38	-0.061	0.000	0.32		12	2.8	OK	
S7.004	SS39	-0.100	0.000	0.23			4.2	OK	
S7.005	SS40	-0.190	0.000	0.06			6.0	OK	
S9.000	SS41- TANK	-0.224	0.000	0.00			0.0	OK	
S7.006	SS42	-0.145	0.000	0.27			12.2	OK	
S7.007	SS43	-0.098	0.000	0.60			20.8	OK	
S6.008	SS44	-0.092	0.000	0.66		6	27.8	OK	
S6.009	SS45	-0.066	0.000	0.44		51	20.5	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5

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
S6.010	SS46	0.127	0.000	0.18		90	7.0	SURCHARGED	
S6.011	SS47	0.271	0.000	0.37			4.6	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 17 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 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.	Water Level (m)
S6.000	SS26	15 Winter	30	+0%					48.030
S6.001	SS27	15 Winter	30	+0%					47.353
S6.002	SS28	30 Winter	30	+0%	30/15 Summer				46.919
S6.003	SS29	60 Winter	30	+0%	30/15 Summer				46.832
S6.004	SS30	30 Winter	30	+0%	1/15 Summer				46.779
S6.005	SS31	15 Winter	30	+0%					46.193
S6.006	SS32	15 Winter	30	+0%					45.361
S6.007	SS33	15 Winter	30	+0%	100/15 Winter				44.924
S7.000	SS34	15 Winter	30	+0%					47.541
S7.001	SS35	30 Winter	30	+0%					47.380
S7.002	SS36	30 Winter	30	+0%	100/15 Summer				47.188
S8.000	SS37	15 Winter	30	+0%					48.235
S7.003	SS38	30 Winter	30	+0%	100/15 Summer				47.037
S7.004	SS39	15 Winter	30	+0%	100/15 Summer				46.839
S7.005	SS40	15 Winter	30	+0%					46.573
S9.000	SS41- TANK	240 Winter	30	+0%	100/30 Winter				44.689
S7.006	SS42	15 Winter	30	+0%	30/15 Summer				44.745
S7.007	SS43	240 Winter	30	+0%	30/15 Summer				44.723
S6.008	SS44	240 Winter	30	+0%	30/15 Summer				44.730
S6.009	SS45	240 Winter	30	+0%	30/15 Summer				44.724
S6.010	SS46	240 Winter	30	+0%	1/30 Summer				44.717
S6.011	SS47	240 Winter	30	+0%	1/15 Summer				44.713

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
S6.000	SS26	-0.070	0.000	0.19		5	2.7	OK	
S6.001	SS27	-0.039	0.000	0.68		6	7.9	OK	
S6.002	SS28	0.049	0.000	1.10		12	6.2	SURCHARGED	
S6.003	SS29	0.127	0.000	1.08		22	6.2	SURCHARGED	
S6.004	SS30	0.338	0.000	1.77		21	11.3	SURCHARGED	
S6.005	SS31	-0.086	0.000	0.38		4	15.8	OK	
S6.006	SS32	-0.061	0.000	0.66		16	19.5	OK	
S6.007	SS33	-0.064	0.000	0.62		14	21.9	OK	
S7.000	SS34	-0.059	0.000	0.35		6	2.2	OK	
S7.001	SS35	-0.045	0.000	0.58		9	3.8	OK	
S7.002	SS36	-0.031	0.000	0.81		11	5.2	OK	
S8.000	SS37	-0.065	0.000	0.26		5	3.6	OK	
S7.003	SS38	-0.018	0.000	1.00		11	8.7	OK	
S7.004	SS39	-0.050	0.000	0.73			13.1	OK	
S7.005	SS40	-0.157	0.000	0.19			19.9	OK	
S9.000	SS41- TANK	-0.036	0.000	0.07		156	2.0	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5

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
S7.006	SS42	0.061	0.000	0.61			27.5	SURCHARGED	
S7.007	SS43	0.173	0.000	0.40			13.8	SURCHARGED	
S6.008	SS44	0.250	0.000	0.55		292	23.4	SURCHARGED	
S6.009	SS45	0.334	0.000	0.42			19.6	SURCHARGED	
S6.010	SS46	0.529	0.000	0.15			5.9	SURCHARGED	
S6.011	SS47	0.673	0.000	0.37			4.6	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 17 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 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.	Water Level (m)
S6.000	SS26	15 Winter	100	+40%					48.041
S6.001	SS27	15 Winter	100	+40%					47.391
S6.002	SS28	60 Winter	100	+40%	30/15 Summer				47.107
S6.003	SS29	60 Winter	100	+40%	30/15 Summer				47.057
S6.004	SS30	30 Winter	100	+40%	1/15 Summer				47.066
S6.005	SS31	15 Winter	100	+40%					46.208
S6.006	SS32	15 Winter	100	+40%					45.395
S6.007	SS33	240 Winter	100	+40%	100/15 Winter				45.146
S7.000	SS34	15 Winter	100	+40%					47.561
S7.001	SS35	30 Winter	100	+40%					47.422
S7.002	SS36	30 Winter	100	+40%	100/15 Summer				47.280
S8.000	SS37	15 Winter	100	+40%					48.249
S7.003	SS38	30 Winter	100	+40%	100/15 Summer				47.139
S7.004	SS39	15 Winter	100	+40%	100/15 Summer				46.949
S7.005	SS40	15 Winter	100	+40%					46.595
S9.000	SS41- TANK	360 Winter	100	+40%	100/30 Winter				45.122
S7.006	SS42	360 Winter	100	+40%	30/15 Summer				45.123
S7.007	SS43	360 Winter	100	+40%	30/15 Summer				45.121
S6.008	SS44	360 Winter	100	+40%	30/15 Summer				45.119
S6.009	SS45	360 Winter	100	+40%	30/15 Summer				45.114
S6.010	SS46	360 Winter	100	+40%	1/30 Summer				45.105
S6.011	SS47	360 Winter	100	+40%	1/15 Summer				45.100

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
S6.000	SS26	-0.059	0.000	0.35		5	4.9	OK	
S6.001	SS27	-0.001	0.000	0.98		6	11.4	OK	
S6.002	SS28	0.237	0.000	1.07		36	6.1	SURCHARGED	
S6.003	SS29	0.352	0.000	1.34		46	7.7	SURCHARGED	
S6.004	SS30	0.625	0.000	2.21		26	14.1	SURCHARGED	
S6.005	SS31	-0.071	0.000	0.54		4	22.8	OK	
S6.006	SS32	-0.027	0.000	0.99		9	29.4	OK	
S6.007	SS33	0.158	0.000	0.49		155	17.4	SURCHARGED	
S7.000	SS34	-0.039	0.000	0.67		6	4.3	OK	
S7.001	SS35	-0.003	0.000	0.93		10	6.0	OK	
S7.002	SS36	0.061	0.000	1.02		11	6.6	SURCHARGED	
S8.000	SS37	-0.051	0.000	0.48		6	6.6	OK	
S7.003	SS38	0.084	0.000	1.24		15	10.7	SURCHARGED	
S7.004	SS39	0.060	0.000	1.17			21.2	SURCHARGED	
S7.005	SS40	-0.135	0.000	0.34			35.3	OK	
S9.000	SS41- TANK	0.397	0.000	0.07			2.1	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5

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
S7.006	SS42	0.439	0.000	0.20			8.9	SURCHARGED	
S7.007	SS43	0.571	0.000	0.39			13.6	SURCHARGED	
S6.008	SS44	0.639	0.000	0.46			19.3	SURCHARGED	
S6.009	SS45	0.724	0.000	0.31			14.8	SURCHARGED	
S6.010	SS46	0.917	0.000	0.15			5.6	SURCHARGED	
S6.011	SS47	1.060	0.000	0.37			4.6	SURCHARGED	

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