STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.359	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.077	4-8	0.021

Total Area Contributing (ha) = 0.098

Total Pipe Volume (m³) = 2.054

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	33.459	0.340	98.4	0.033	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	8.723	0.340	25.7	0.026	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	6.504	0.110	59.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	13.279	0.230	57.7	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	4.010	0.050	80.0	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit	
2.001	2.509	0.030	83.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.000	6.101	0.065	93.9	0.009	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)
1.000	50.00	5.55	38.960	0.033	0.0	0.0	0.0	1.01	17.9	4.5
1.001	50.00	5.62	38.620	0.059	0.0	0.0	0.0	2.00	35.3	8.0
1.002	50.00	5.71	38.280	0.059	0.0	0.0	0.0	1.31	23.2	8.0
2.000	50.00	5.17	39.000	0.008	0.0	0.0	0.0	1.33	23.4	1.1
3.000	50.00	5.08	38.820	0.000	0.0	0.0	0.0	0.86	6.8	0.0
2.001	50.00	5.20	38.770	0.008	0.0	0.0	0.0	1.10	19.4	1.1
4.000	50.00	5.10	39.050	0.009	0.0	0.0	0.0	1.04	18.3	1.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.001	1.462	0.015	97.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.002	3.356	0.040	83.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.003	12.995	0.140	92.8	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	1.811	0.090	20.1	0.003	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.004	2.698	0.030	89.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.002	2.484	0.020	124.2	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.003	2.485	0.020	124.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.004	2.213	0.030	73.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	4.498	0.095	47.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	4.392	0.041	107.2	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)
4.001	50.00	5.12	38.985	0.009	0.0	0.0	0.0	1.02	18.0	1.2
4.002	50.00	5.17	38.970	0.009	0.0	0.0	0.0	1.10	19.4	1.2
4.003	50.00	5.38	38.930	0.014	0.0	0.0	0.0	1.04	18.4	1.9
5.000	50.00	5.01	38.860	0.003	0.0	0.0	0.0	2.26	39.9	0.4
4.004	50.00	5.42	38.770	0.017	0.0	0.0	0.0	1.06	18.7	2.3
2.002	50.00	5.47	38.740	0.039	0.0	0.0	0.0	0.90	15.9	5.3
2.003	50.00	5.51	38.620	0.039	0.0	0.0	0.0	0.90	15.9	5.3
2.004	50.00	5.55	38.600	0.039	0.0	0.0	0.0	1.18	20.8	5.3
1.003	50.00	5.76	38.170	0.098	0.0	0.0	0.0	1.46	25.9	13.3
1.004	50.00	5.82	38.000	0.098	0.0	0.0	0.0	1.26	50.2	13.3

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Manhole Schedules for Storm

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)
SW01	39.980	1.020	Open Manhole	600	1.000	38.960	150				
SW02	39.980	1.360	Open Manhole	600	1.001	38.620	150	1.000	38.620	150	
SW03	40.100	1.820	Open Manhole	1200	1.002	38.280	150	1.001	38.280	150	
SW04	40.035	1.035	Open Manhole	600	2.000	39.000	150				
SW05	40.035	1.215	Open Manhole	1200	3.000	38.820	100				
SW06	40.035	1.265	Open Manhole	1200	2.001	38.770	150	2.000	38.770	150	
								3.000	38.770	100	
SW07C	40.240	1.190	Open Manhole	1200	4.000	39.050	150				
SW07B	40.200	1.215	Open Manhole	1200	4.001	38.985	150	4.000	38.985	150	
SW07A	40.200	1.230	Open Manhole	1200	4.002	38.970	150	4.001	38.970	150	
SW07	40.060	1.130	Open Manhole	600	4.003	38.930	150	4.002	38.930	150	
SW08	40.140	1.280	Open Manhole	600	5.000	38.860	150				
SW09	40.110	1.340	Open Manhole	600	4.004	38.770	150	4.003	38.790	150	20
								5.000	38.770	150	
SW10	40.035	1.295	Open Manhole	1200	2.002	38.740	150	2.001	38.740	150	
								4.004	38.740	150	
Seperator	40.035	1.415	Open Manhole	1200	2.003	38.620	150	2.002	38.720	150	100
SW11	40.090	1.490	Open Manhole	1200	2.004	38.600	150	2.003	38.600	150	
Tank	40.090	1.920	Open Manhole	1200	1.003	38.170	150	1.002	38.170	150	
								2.004	38.570	150	400
SW12	40.250	2.250	Open Manhole	1500	1.004	38.000	225	1.003	38.075	150	
Ex MH	40.310	2.351	Open Manhole	1500		OUTFALL		1.004	37.959	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW01	385040.371	396337.735	385040.371	396337.735	Required	
SW02	385045.732	396370.762	385045.732	396370.762	Required	
SW03	385054.342	396369.365	385054.342	396369.365	Required	
SW04	385050.592	396344.886	385050.592	396344.886	Required	
SW05	385052.955	396353.959	385052.955	396353.959	Required	
SW06	385052.870	396357.968	385052.870	396357.968	Required	
SW07C	385061.741	396350.972	385061.741	396350.972	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW07B	385060.503	396344.998	385060.503	396344.998	Required	
SW07A	385059.281	396344.196	385059.281	396344.196	Required	
SW07	385055.968	396344.734	385055.968	396344.734	Required	
SW08	385058.339	396359.349	385058.339	396359.349	Required	
SW09	385058.043	396357.562	385058.043	396357.562	Required	
SW10	385055.379	396357.992	385055.379	396357.992	Required	
Seperator	385055.797	396360.441	385055.797	396360.441	Required	
SW11	385056.216	396362.890	385056.216	396362.890	Required	
Tank	385058.022	396364.169	385058.022	396364.169	Required	
SW12	385060.721	396360.656	385060.721	396360.656	Required	
Ex MH	385064.612	396362.693			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	SW01	39.980	38.960	0.870	Open Manhole	600
1.001	o	150	SW02	39.980	38.620	1.210	Open Manhole	600
1.002	o	150	SW03	40.100	38.280	1.670	Open Manhole	1200
2.000	o	150	SW04	40.035	39.000	0.885	Open Manhole	600
3.000	o	100	SW05	40.035	38.820	1.115	Open Manhole	1200
2.001	o	150	SW06	40.035	38.770	1.115	Open Manhole	1200
4.000	o	150	SW07C	40.240	39.050	1.040	Open Manhole	1200
4.001	o	150	SW07B	40.200	38.985	1.065	Open Manhole	1200
4.002	o	150	SW07A	40.200	38.970	1.080	Open Manhole	1200
4.003	o	150	SW07	40.060	38.930	0.980	Open Manhole	600
5.000	o	150	SW08	40.140	38.860	1.130	Open Manhole	600
4.004	o	150	SW09	40.110	38.770	1.190	Open Manhole	600
2.002	o	150	SW10	40.035	38.740	1.145	Open Manhole	1200
2.003	o	150	Seperator	40.035	38.620	1.265	Open Manhole	1200
2.004	o	150	SW11	40.090	38.600	1.340	Open Manhole	1200
1.003	o	150	Tank	40.090	38.170	1.770	Open Manhole	1200
1.004	o	225	SW12	40.250	38.000	2.025	Open Manhole	1500

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	33.459	98.4	SW02	39.980	38.620	1.210	Open Manhole	600
1.001	8.723	25.7	SW03	40.100	38.280	1.670	Open Manhole	1200
1.002	6.504	59.1	Tank	40.090	38.170	1.770	Open Manhole	1200
2.000	13.279	57.7	SW06	40.035	38.770	1.115	Open Manhole	1200
3.000	4.010	80.0	SW06	40.035	38.770	1.165	Open Manhole	1200
2.001	2.509	83.6	SW10	40.035	38.740	1.145	Open Manhole	1200
4.000	6.101	93.9	SW07B	40.200	38.985	1.065	Open Manhole	1200
4.001	1.462	97.5	SW07A	40.200	38.970	1.080	Open Manhole	1200
4.002	3.356	83.9	SW07	40.060	38.930	0.980	Open Manhole	600
4.003	12.995	92.8	SW09	40.110	38.790	1.170	Open Manhole	600
5.000	1.811	20.1	SW09	40.110	38.770	1.190	Open Manhole	600
4.004	2.698	89.9	SW10	40.035	38.740	1.145	Open Manhole	1200
2.002	2.484	124.2	Seperator	40.035	38.720	1.165	Open Manhole	1200
2.003	2.485	124.2	SW11	40.090	38.600	1.340	Open Manhole	1200
2.004	2.213	73.2	Tank	40.090	38.570	1.370	Open Manhole	1200
1.003	4.498	47.5	SW12	40.250	38.075	2.025	Open Manhole	1500
1.004	4.392	107.2	Ex MH	40.310	37.959	2.126	Open Manhole	1500

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Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
1.000	SW01	150	0.870	1.210	Unclassified	600	0	0.870	Unclassified
1.001	SW02	150	1.210	1.670	Unclassified	600	0	1.210	Unclassified
1.002	SW03	150	1.670	1.770	Unclassified	1200	0	1.670	Unclassified
2.000	SW04	150	0.885	1.115	Unclassified	600	0	0.885	Unclassified
3.000	SW05	100	1.115	1.165	Unclassified	1200	0	1.115	Unclassified
2.001	SW06	150	1.115	1.145	Unclassified	1200	0	1.115	Unclassified
4.000	SW07C	150	1.040	1.065	Unclassified	1200	0	1.040	Unclassified
4.001	SW07B	150	1.065	1.080	Unclassified	1200	0	1.065	Unclassified
4.002	SW07A	150	0.980	1.080	Unclassified	1200	0	1.080	Unclassified
4.003	SW07	150	0.980	1.170	Unclassified	600	0	0.980	Unclassified
5.000	SW08	150	1.130	1.190	Unclassified	600	0	1.130	Unclassified
4.004	SW09	150	1.145	1.190	Unclassified	600	0	1.190	Unclassified
2.002	SW10	150	1.145	1.165	Unclassified	1200	0	1.145	Unclassified
2.003	Seperator	150	1.265	1.340	Unclassified	1200	0	1.265	Unclassified
2.004	SW11	150	1.340	1.370	Unclassified	1200	0	1.340	Unclassified
1.003	Tank	150	1.770	2.025	Unclassified	1200	0	1.770	Unclassified
1.004	SW12	225	2.025	2.126	Unclassified	1500	0	2.025	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	Ex MH	40.310	37.959	37.800	1500	0

Simulation Criteria for Storm

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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.359		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW12, DS/PN: 1.004, Volume (m³): 4.0

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)	38.000
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

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Storage Structures for Storm

Cellular Storage Manhole: Tank, DS/PN: 1.003

Invert Level (m) 38.170 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)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	15.0	0.0	0.800	15.0	0.0	0.801	0.0	0.0

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.000
Region	England and Wales	Ratio R	0.359
Cv (Summer)	0.750		
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, 2, 30, 100
Climate Change (%)	0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	15 Winter	1	+0%	100/15 Summer				39.009	-0.101
1.001	SW02	15 Winter	1	+0%	100/15 Summer				38.667	-0.103
1.002	SW03	15 Winter	1	+0%	30/15 Summer				38.340	-0.090
2.000	SW04	15 Winter	1	+0%	100/15 Winter				39.020	-0.130
3.000	SW05	60 Winter	1	+0%	100/15 Summer				38.820	-0.100
2.001	SW06	15 Winter	1	+0%	100/15 Summer				38.808	-0.112
4.000	SW07C	15 Winter	1	+0%	100/30 Summer				39.076	-0.124
4.001	SW07B	15 Winter	1	+0%	100/15 Winter				39.017	-0.118
4.002	SW07A	15 Winter	1	+0%	100/15 Winter				38.999	-0.121
4.003	SW07	15 Winter	1	+0%	100/15 Winter				38.961	-0.119
5.000	SW08	15 Winter	1	+0%	100/15 Summer				38.874	-0.136
4.004	SW09	15 Winter	1	+0%	100/15 Summer				38.813	-0.107
2.002	SW10	15 Winter	1	+0%	100/15 Summer				38.805	-0.085
2.003	Seperator	15 Winter	1	+0%	100/15 Summer				38.685	-0.085
2.004	SW11	15 Winter	1	+0%	100/15 Summer				38.664	-0.086
1.003	Tank	15 Winter	1	+0%	2/15 Summer				38.302	-0.018
1.004	SW12	15 Winter	1	+0%	1/15 Summer				38.293	0.068

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.000	0.23		3.9	OK	
1.001	SW02	0.000	0.21		6.5	OK	
1.002	SW03	0.000	0.34		6.6	OK	
2.000	SW04	0.000	0.04		1.0	OK	
3.000	SW05	0.000	0.00		0.0	OK	
2.001	SW06	0.000	0.08		0.9	OK	
4.000	SW07C	0.000	0.07		1.1	OK	
4.001	SW07B	0.000	0.10		1.1	OK	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.002	SW07A	0.000	0.08		1.1	OK	
4.003	SW07	0.000	0.09		1.5	OK	
5.000	SW08	0.000	0.02		0.4	OK	
4.004	SW09	0.000	0.17		1.9	OK	
2.002	SW10	0.000	0.38		4.1	OK	
2.003	Seperator	0.000	0.38		4.2	OK	
2.004	SW11	0.000	0.38		4.2	OK	
1.003	Tank	0.000	0.36		7.0	OK	
1.004	SW12	0.000	0.16		4.9	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 18.000	Cv (Summer) 0.750
Region England and Wales		Ratio R 0.359	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, 2, 30, 100
Climate Change (%)	0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	15 Winter	2	+0%	100/15 Summer				39.016	-0.094
1.001	SW02	15 Winter	2	+0%	100/15 Summer				38.674	-0.096
1.002	SW03	30 Winter	2	+0%	30/15 Summer				38.379	-0.051
2.000	SW04	15 Winter	2	+0%	100/15 Winter				39.023	-0.127
3.000	SW05	60 Winter	2	+0%	100/15 Summer				38.820	-0.100
2.001	SW06	15 Winter	2	+0%	100/15 Summer				38.818	-0.102
4.000	SW07C	15 Winter	2	+0%	100/30 Summer				39.081	-0.119
4.001	SW07B	15 Winter	2	+0%	100/15 Winter				39.021	-0.114
4.002	SW07A	15 Winter	2	+0%	100/15 Winter				39.003	-0.117
4.003	SW07	15 Winter	2	+0%	100/15 Winter				38.965	-0.115
5.000	SW08	15 Winter	2	+0%	100/15 Summer				38.876	-0.134
4.004	SW09	15 Winter	2	+0%	100/15 Summer				38.822	-0.098
2.002	SW10	15 Winter	2	+0%	100/15 Summer				38.816	-0.074
2.003	Seperator	15 Winter	2	+0%	100/15 Summer				38.695	-0.075
2.004	SW11	15 Winter	2	+0%	100/15 Summer				38.675	-0.075
1.003	Tank	30 Winter	2	+0%	2/15 Summer				38.372	0.052
1.004	SW12	30 Winter	2	+0%	1/15 Summer				38.363	0.138

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.000	0.29		5.0	OK	
1.001	SW02	0.000	0.27		8.5	OK	
1.002	SW03	0.000	0.36		7.0	OK	
2.000	SW04	0.000	0.06		1.2	OK	
3.000	SW05	0.000	0.00		0.0	OK	
2.001	SW06	0.000	0.11		1.2	OK	
4.000	SW07C	0.000	0.09		1.4	OK	
4.001	SW07B	0.000	0.13		1.4	OK	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.002	SW07A	0.000	0.11		1.4	OK	
4.003	SW07	0.000	0.12		2.0	OK	
5.000	SW08	0.000	0.02		0.5	OK	
4.004	SW09	0.000	0.23		2.5	OK	
2.002	SW10	0.000	0.50		5.4	OK	
2.003	Seperator	0.000	0.50		5.4	OK	
2.004	SW11	0.000	0.50		5.4	OK	
1.003	Tank	0.000	0.35		6.8	SURCHARGED	
1.004	SW12	0.000	0.17		5.0	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.000
Region	England and Wales	Ratio R	0.359
Cv (Summer)	0.750		
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, 2, 30, 100
Climate Change (%)	0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	15 Winter	30	+0%	100/15 Summer				39.041	-0.069
1.001	SW02	30 Winter	30	+0%	100/15 Summer				38.744	-0.026
1.002	SW03	30 Winter	30	+0%	30/15 Summer				38.736	0.306
2.000	SW04	15 Winter	30	+0%	100/15 Winter				39.033	-0.117
3.000	SW05	15 Winter	30	+0%	100/15 Summer				38.851	-0.069
2.001	SW06	15 Winter	30	+0%	100/15 Summer				38.869	-0.051
4.000	SW07C	15 Winter	30	+0%	100/30 Summer				39.092	-0.108
4.001	SW07B	15 Winter	30	+0%	100/15 Winter				39.035	-0.100
4.002	SW07A	15 Winter	30	+0%	100/15 Winter				39.017	-0.103
4.003	SW07	15 Winter	30	+0%	100/15 Winter				38.981	-0.099
5.000	SW08	15 Winter	30	+0%	100/15 Summer				38.881	-0.129
4.004	SW09	15 Winter	30	+0%	100/15 Summer				38.873	-0.047
2.002	SW10	15 Winter	30	+0%	100/15 Summer				38.867	-0.023
2.003	Seperator	15 Winter	30	+0%	100/15 Summer				38.740	-0.030
2.004	SW11	30 Winter	30	+0%	100/15 Summer				38.731	-0.019
1.003	Tank	30 Winter	30	+0%	2/15 Summer				38.729	0.409
1.004	SW12	30 Winter	30	+0%	1/15 Summer				38.721	0.496

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.000	0.55		9.5	OK	
1.001	SW02	0.000	0.45		13.8	OK	
1.002	SW03	0.000	0.63		12.4	SURCHARGED	
2.000	SW04	0.000	0.11		2.4	OK	
3.000	SW05	0.000	0.05		0.3	OK	
2.001	SW06	0.000	0.22		2.3	OK	
4.000	SW07C	0.000	0.17		2.6	OK	
4.001	SW07B	0.000	0.24		2.6	OK	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.002	SW07A	0.000	0.21		2.7	OK	
4.003	SW07	0.000	0.24		4.0	OK	
5.000	SW08	0.000	0.05		0.9	OK	
4.004	SW09	0.000	0.45		4.9	OK	
2.002	SW10	0.000	1.00		10.8	OK	
2.003	Seperator	0.000	1.00		10.8	OK	
2.004	SW11	0.000	0.82		9.0	OK	
1.003	Tank	0.000	0.34		6.6	SURCHARGED	
1.004	SW12	0.000	0.17		5.0	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.000
Region	England and Wales	Ratio R	0.359
Cv (Summer)	0.750		
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, 2, 30, 100
Climate Change (%)	0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	60 Winter	100	+45%	100/15 Summer				39.582	0.472
1.001	SW02	60 Winter	100	+45%	100/15 Summer				39.571	0.801
1.002	SW03	60 Winter	100	+45%	30/15 Summer				39.561	1.131
2.000	SW04	60 Winter	100	+45%	100/15 Winter				39.562	0.412
3.000	SW05	60 Winter	100	+45%	100/15 Summer				39.560	0.640
2.001	SW06	60 Winter	100	+45%	100/15 Summer				39.560	0.640
4.000	SW07C	60 Winter	100	+45%	100/30 Summer				39.566	0.366
4.001	SW07B	60 Winter	100	+45%	100/15 Winter				39.565	0.430
4.002	SW07A	60 Winter	100	+45%	100/15 Winter				39.564	0.444
4.003	SW07	60 Winter	100	+45%	100/15 Winter				39.564	0.484
5.000	SW08	60 Winter	100	+45%	100/15 Summer				39.561	0.551
4.004	SW09	60 Winter	100	+45%	100/15 Summer				39.561	0.641
2.002	SW10	60 Winter	100	+45%	100/15 Summer				39.560	0.670
2.003	Seperator	60 Winter	100	+45%	100/15 Summer				39.557	0.787
2.004	SW11	60 Winter	100	+45%	100/15 Summer				39.555	0.805
1.003	Tank	60 Winter	100	+45%	2/15 Summer				39.553	1.233
1.004	SW12	60 Winter	100	+45%	1/15 Summer				39.543	1.318

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.000	0.57		9.8	SURCHARGED	
1.001	SW02	0.000	0.49		15.0	SURCHARGED	
1.002	SW03	0.000	0.71		13.9	SURCHARGED	
2.000	SW04	0.000	0.11		2.4	SURCHARGED	
3.000	SW05	0.000	0.06		0.3	SURCHARGED	
2.001	SW06	0.000	0.19		2.0	SURCHARGED	
4.000	SW07C	0.000	0.18		2.7	SURCHARGED	
4.001	SW07B	0.000	0.25		2.7	SURCHARGED	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.002	SW07A	0.000	0.22		2.7	SURCHARGED	
4.003	SW07	0.000	0.25		4.2	SURCHARGED	
5.000	SW08	0.000	0.05		0.9	SURCHARGED	
4.004	SW09	0.000	0.45		4.8	SURCHARGED	
2.002	SW10	0.000	1.00		10.8	SURCHARGED	
2.003	Seperator	0.000	0.94		10.2	SURCHARGED	
2.004	SW11	0.000	0.92		10.0	SURCHARGED	
1.003	Tank	0.000	0.43		8.2	SURCHARGED	
1.004	SW12	0.000	0.17		5.2	SURCHARGED	

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