

RWO Associates		Page 0
73 Howard Street North Shields Tyne & Wear, NE30 1AF		
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW

Pipe Sizes Circular Manhole Sizes Adoptable

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	17.300	Add Flow / Climate Change (%)	100
Ratio R	0.346	Minimum Backdrop Height (m)	0.800
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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)	1.01
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	1000

Designed with Level Soffits

Time Area Diagram for SW

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.488	4-8	0.294

Total Area Contributing (ha) = 0.783

Total Pipe Volume (m³) = 30.649

Network Design Table for SW

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	19.827	1.159	17.1	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	14.796	1.193	12.4	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	18.051	0.975	18.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	20.378	0.206	98.9	0.003	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	52.662	0.176	299.2	0.242	0.00	0.0	0.600	o	375	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	5.13	9.756	0.008	0.0	0.0	1.0	2.45	43.3	2.1
2.000	50.00	5.09	9.790	0.008	0.0	0.0	1.1	2.88	50.8	2.2
1.001	50.00	5.26	7.100	0.016	0.0	0.0	2.1	2.35	41.6	4.2
3.000	50.00	5.34	7.956	0.003	0.0	0.0	0.4	1.01	17.9	0.7
1.002	50.00	6.18	6.050	0.260	0.0	0.0	35.2	1.04	115.1	70.5

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Network Design Table for SW

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
4.000	28.000	0.483	58.0	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	46.135	0.229	201.6	0.153	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.000	2.124	0.012	177.0	0.064	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	16.499	0.067	246.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	33.173	0.111	300.0	0.052	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.000	18.423	0.227	81.0	0.023	5.00	0.0	0.600	o	150	Pipe/Conduit	
6.001	22.351	0.624	35.8	0.101	0.00	0.0	0.600	o	225	Pipe/Conduit	
6.002	6.300	0.035	180.0	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	36.631	0.262	140.0	0.010	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.005	7.451	0.020	375.0	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
7.000	7.828	0.020	391.4	0.074	5.00	0.0	0.600	o	500	Pipe/Conduit	
8.000	5.748	0.038	150.0	0.010	5.00	0.0	0.600	o	225	Pipe/Conduit	
8.001	24.709	0.710	34.8	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit	
9.000	9.444	0.064	148.2	0.003	5.00	0.0	0.600	o	150	Pipe/Conduit	
8.002	13.726	0.286	48.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	4.741	0.028	169.3	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)
4.000	50.00	5.35	7.847	0.014	0.0	0.0	1.8	1.32	23.4	3.7
4.001	50.00	6.05	7.220	0.166	0.0	0.0	22.5	1.10	78.0	45.1
5.000	50.00	5.04	6.710	0.064	0.0	0.0	8.7	0.98	39.0	17.4
5.001	50.00	5.37	6.700	0.064	0.0	0.0	8.7	0.83	33.0	17.4
1.003	50.00	6.65	5.725	0.543	0.0	0.0	73.6	1.17	185.8	147.2
6.000	50.00	5.27	7.533	0.023	0.0	0.0	3.1	1.12	19.8	6.3
6.001	50.00	5.44	7.304	0.125	0.0	0.0	16.9	2.19	87.2	33.7
6.002	50.00	5.55	6.680	0.140	0.0	0.0	19.0	0.97	38.6	38.0
1.004	50.00	6.98	5.615	0.694	0.0	0.0	94.0	1.83	360.1	187.9
1.005	50.00	7.10	5.359	0.694	0.0	0.0	94.0	1.12	219.1	187.9
7.000	50.00	5.12	4.478	0.074	0.0	0.0	10.0	1.09	214.4	19.9
8.000	50.00	5.09	5.768	0.010	0.0	0.0	1.4	1.07	42.4	2.8
8.001	50.00	5.27	5.730	0.012	0.0	0.0	1.7	2.23	88.5	3.3
9.000	50.00	5.19	5.158	0.003	0.0	0.0	0.4	0.82	14.5	0.8
8.002	50.00	5.40	5.019	0.015	0.0	0.0	2.1	1.89	75.3	4.2
1.006	50.00	7.17	4.733	0.783	0.0	0.0	106.0	1.00	39.8«	212.0

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PIPELINE SCHEDULES for SW

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	IC01	10.350	9.756	0.444	Open Manhole	450
2.000	o	150	IC02	10.350	9.790	0.410	Open Manhole	450
1.001	o	150	MH1	10.350	7.100	3.025	Open Manhole	1200
3.000	o	150	IC03	8.650	7.956	0.544	Open Manhole	1200
1.002	o	375	MH2	8.622	6.050	2.272	Open Manhole	1200
4.000	o	150	IC04	8.897	7.847	0.825	Open Manhole	1200
4.001	o	300	MH3	8.583	7.220	1.063	Open Manhole	1200
5.000	o	225	Rain Garden	7.819	6.710	0.959	Open Manhole	450
5.001	o	225	IC4	7.819	6.700	-0.031	Open Manhole	450
1.003	o	450	MH4	8.339	5.725	2.164	Open Manhole	1200
6.000	o	150	IC06	8.475	7.533	0.792	Open Manhole	1200
6.001	o	225	MH6	8.234	7.304	0.705	Open Manhole	1200
6.002	o	225	MH7	7.319	6.680	0.414	Open Manhole	1200
1.004	o	500	MH8	7.865	5.615	1.800	Open Manhole	1800
1.005	o	500	MH9	7.246	5.359	1.437	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)
1.000	19.827	17.1	MH1	10.350	8.597	1.603	Open Manhole	1200
2.000	14.796	12.4	MH1	10.350	8.597	1.603	Open Manhole	1200
1.001	18.051	18.5	MH2	8.622	6.125	2.272	Open Manhole	1200
3.000	20.378	98.9	MH2	8.622	7.750	0.722	Open Manhole	1200
1.002	52.662	299.2	MH4	8.339	5.874	2.165	Open Manhole	1200
4.000	28.000	58.0	MH3	8.583	7.364	0.994	Open Manhole	1200
4.001	46.135	201.6	MH4	8.339	6.991	1.048	Open Manhole	1200
5.000	2.124	177.0	IC4	7.819	6.698	0.971	Open Manhole	450
5.001	16.499	246.3	MH4	8.339	6.633	0.556	Open Manhole	1200
1.003	33.173	300.0	MH8	7.865	5.614	1.801	Open Manhole	1800
6.000	18.423	81.0	MH6	8.234	7.306	0.778	Open Manhole	1200
6.001	22.351	35.8	MH7	7.319	6.680	0.414	Open Manhole	1200
6.002	6.300	180.0	MH8	7.865	6.645	0.995	Open Manhole	1800
1.004	36.631	140.0	MH9	7.246	5.353	1.443	Open Manhole	1800
1.005	7.451	375.0	MH11	7.226	5.339	1.437	Open Manhole	1800

PIPELINE SCHEDULES for SW

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)
7.000	o	500	MH10 (TANK)	6.978	4.478	1.975	Open Manhole	1800
8.000	o	225	IC5	6.818	5.768	0.825	Open Manhole	1200
8.001	o	225	IC6	6.845	5.730	0.890	Open Manhole	1200
9.000	o	150	IC7	7.131	5.158	1.823	Open Manhole	1200
8.002	o	225	IC8	6.885	5.019	1.641	Open Manhole	1200
1.006	o	225	MH11	7.226	4.733	2.268	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)
7.000	7.828	391.4	MH11	7.226	4.458	2.243	Open Manhole	1800
8.000	5.748	150.0	IC6	6.845	5.730	0.890	Open Manhole	1200
8.001	24.709	34.8	IC8	6.885	5.019	1.641	Open Manhole	1200
9.000	9.444	148.2	IC8	6.885	5.094	1.641	Open Manhole	1200
8.002	13.726	48.0	MH11	7.226	4.733	2.268	Open Manhole	1800
1.006	4.741	169.3	Outfall	6.243	4.705	1.313	Open Manhole	1800

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Area Summary for SW

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.008	0.008	0.008
2.000	User	-	100	0.008	0.008	0.008
1.001	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.003	0.003	0.003
1.002	User	-	100	0.114	0.114	0.114
	User	-	100	0.061	0.061	0.175
	User	-	100	0.067	0.067	0.242
4.000	User	-	100	0.014	0.014	0.014
4.001	User	-	100	0.153	0.153	0.153
5.000	User	-	100	0.064	0.064	0.064
5.001	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.007	0.007	0.007
	User	-	100	0.026	0.026	0.033
	User	-	100	0.020	0.020	0.052
6.000	User	-	100	0.006	0.006	0.006
	User	-	100	0.018	0.018	0.023
6.001	User	-	100	0.101	0.101	0.101
6.002	User	-	100	0.005	0.005	0.005
	User	-	100	0.010	0.010	0.016
1.004	User	-	100	0.010	0.010	0.010
1.005	-	-	100	0.000	0.000	0.000
7.000	User	-	100	0.074	0.074	0.074
8.000	User	-	100	0.010	0.010	0.010
8.001	User	-	100	0.002	0.002	0.002
9.000	User	-	100	0.003	0.003	0.003
8.002	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.783	0.783	0.783

Surcharged Outfall Details for SW

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
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1.006 Outfall 6.243 4.705 3.131 1800 0

Datum (m) 4.573 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1440	0.000	4320	0.000	7200	0.000	10080	0.000	12960	0.000	15840	0.000	18720	0.000
2880	0.000	5760	0.000	8640	0.000	11520	0.000	14400	0.000	17280	0.000	20160	0.000

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Simulation Criteria for SW

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Offline Controls	0
Number of Online Controls	1	Number of Storage Structures	2
		Number of Time/Area Diagrams	0
		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)	20.000	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for SW

Hydro-Brake® Optimum Manhole: MH11, DS/PN: 1.006, Volume (m³): 9.1

Unit Reference	MD-SHE-0083-3700-1600-3700
Design Head (m)	1.600
Design Flow (l/s)	3.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	83
Invert Level (m)	4.733
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	3.7	Kick-Flo®	0.737	2.6
Flush-Flo™	0.362	3.2	Mean Flow over Head Range	-	3.0

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)	Depth (m)	Flow (l/s)
0.100	2.4	0.800	2.7	2.000	4.1	4.000	5.7	7.000	7.4
0.200	3.0	1.000	3.0	2.200	4.3	4.500	6.0	7.500	7.6
0.300	3.2	1.200	3.2	2.400	4.5	5.000	6.3	8.000	7.9
0.400	3.2	1.400	3.5	2.600	4.6	5.500	6.6	8.500	8.1
0.500	3.2	1.600	3.7	3.000	5.0	6.000	6.9	9.000	8.3
0.600	3.0	1.800	3.9	3.500	5.3	6.500	7.1	9.500	8.5

Storage Structures for SW

Bio-Retention Area Manhole: Rain Garden, DS/PN: 5.000

Invert Level (m)	6.450	Infiltration Coefficient Side (m/hr)	0.00000
Porosity	0.35	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000		

Depth (m)	Area (m²)	Perimeter (m)	Depth (m)	Area (m²)	Perimeter (m)	Depth (m)	Area (m²)	Perimeter (m)
0.000	65.0	25.066	0.300	100.0	25.066	0.301	0.0	25.066

Complex Manhole: MH10 (TANK), DS/PN: 7.000

Cellular Storage

Invert Level (m)	4.837	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	330.0	0.0	1.600	330.0	0.0	1.601	0.0	0.0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1	Length (m)	30.0
Max Percolation (l/s)	0.1	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	6.978	Membrane Depth (mm)	300

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.300 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.346 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Surcharged	
									Level (m)	Depth (m)
1.000	IC01	15 Winter	1	+0%					9.771	-0.135
2.000	IC02	15 Winter	1	+0%					9.803	-0.137
1.001	MH1	15 Winter	1	+0%					7.121	-0.129
3.000	IC03	15 Winter	1	+0%					7.969	-0.137
1.002	MH2	15 Winter	1	+0%	100/15 Summer				6.171	-0.254
4.000	IC04	15 Winter	1	+0%					7.874	-0.123
4.001	MH3	15 Winter	1	+0%	100/15 Summer				7.320	-0.200
5.000	Rain Garden	480 Winter	1	+0%	100/15 Summer				6.731	-0.204
5.001	IC4	480 Winter	1	+0%	100/15 Winter				6.722	-0.203
1.003	MH4	15 Winter	1	+0%	100/15 Summer				5.904	-0.271
6.000	IC06	15 Winter	1	+0%					7.570	-0.113
6.001	MH6	15 Winter	1	+0%	100/15 Summer				7.362	-0.167
6.002	MH7	15 Winter	1	+0%	30/15 Summer				6.799	-0.106
1.004	MH8	15 Winter	1	+0%	100/15 Summer				5.770	-0.345
1.005	MH9	15 Winter	1	+0%	100/15 Summer				5.606	-0.253
7.000	MH10 (TANK)	360 Winter	1	+0%	1/60 Winter				5.045	0.067
8.000	IC5	15 Winter	1	+0%	100/240 Summer				5.797	-0.196
8.001	IC6	15 Winter	1	+0%	100/120 Winter				5.748	-0.207
9.000	IC7	15 Winter	1	+0%	30/120 Summer				5.175	-0.133
8.002	IC8	360 Winter	1	+0%	30/60 Winter				5.045	-0.199
1.006	MH11	360 Winter	1	+0%	1/30 Winter				5.045	0.087

PN	US/MH Name	Flooded		Half Drain	Pipe	Status	Level Exceeded
		Volume (m³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)		
1.000	IC01	0.000	0.02		0.9		OK
2.000	IC02	0.000	0.02		0.9		OK
1.001	MH1	0.000	0.05		1.8		OK
3.000	IC03	0.000	0.02		0.3		OK

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	MH2	0.000	0.23			25.7	OK	
4.000	IC04	0.000	0.07			1.5	OK	
4.001	MH3	0.000	0.24			16.4	OK	
5.000	Rain Garden	0.000	0.02			0.6	OK	
5.001	IC4	0.000	0.02			0.6	OK	
1.003	MH4	0.000	0.33			46.1	OK	
6.000	IC06	0.000	0.13			2.6	OK	
6.001	MH6	0.000	0.15			12.4	OK	
6.002	MH7	0.000	0.55			14.0	OK	
1.004	MH8	0.000	0.21			60.0	OK	
1.005	MH9	0.000	0.49			59.4	OK	
7.000	MH10 (TANK)	0.000	0.02		241	3.3	SURCHARGED	
8.000	IC5	0.000	0.04			1.2	OK	
8.001	IC6	0.000	0.02			1.4	OK	
9.000	IC7	0.000	0.03			0.4	OK	
8.002	IC8	0.000	0.00			0.3	OK	
1.006	MH11	0.000	0.11			3.2	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.300 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.346 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 45

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) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
									(m)	(m)
1.000	IC01	15 Winter	30	+0%					9.778	-0.128
2.000	IC02	15 Winter	30	+0%					9.810	-0.130
1.001	MH1	15 Winter	30	+0%					7.134	-0.116
3.000	IC03	15 Winter	30	+0%					7.976	-0.130
1.002	MH2	15 Winter	30	+0%	100/15 Summer				6.279	-0.146
4.000	IC04	15 Winter	30	+0%					7.890	-0.107
4.001	MH3	15 Winter	30	+0%	100/15 Summer				7.411	-0.109
5.000	Rain Garden	60 Winter	30	+0%	100/15 Summer				6.799	-0.136
5.001	IC4	60 Winter	30	+0%	100/15 Winter				6.781	-0.144
1.003	MH4	15 Winter	30	+0%	100/15 Summer				6.077	-0.098
6.000	IC06	15 Winter	30	+0%					7.593	-0.090
6.001	MH6	15 Winter	30	+0%	100/15 Summer				7.407	-0.122
6.002	MH7	15 Summer	30	+0%	30/15 Summer				6.952	0.047
1.004	MH8	15 Winter	30	+0%	100/15 Summer				5.956	-0.159
1.005	MH9	15 Winter	30	+0%	100/15 Summer				5.859	0.000
7.000	MH10 (TANK)	480 Winter	30	+0%	1/60 Winter				5.548	0.570
8.000	IC5	15 Winter	30	+0%	100/240 Summer				5.815	-0.178
8.001	IC6	15 Winter	30	+0%	100/120 Winter				5.760	-0.195
9.000	IC7	480 Winter	30	+0%	30/120 Summer				5.548	0.240
8.002	IC8	480 Winter	30	+0%	30/60 Winter				5.548	0.304
1.006	MH11	480 Winter	30	+0%	1/30 Winter				5.548	0.590

PN	US/MH Name	Flooded		Half Drain	Pipe	Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)		
1.000	IC01	0.000	0.05		2.2	OK	

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

PN	US/MH Name	Flooded		Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)				
2.000	IC02	0.000	0.04		2.2	OK	
1.001	MH1	0.000	0.12		4.3	OK	
3.000	IC03	0.000	0.04		0.7	OK	
1.002	MH2	0.000	0.65		73.7	OK	
4.000	IC04	0.000	0.18		3.7	OK	
4.001	MH3	0.000	0.72		49.0	OK	
5.000	Rain Garden	0.000	0.28		8.4	OK	
5.001	IC4	0.000	0.27		8.0	OK	
1.003	MH4	0.000	0.95		132.3	OK	
6.000	IC06	0.000	0.33		6.4	OK	
6.001	MH6	0.000	0.43		36.6	OK	
6.002	MH7	0.000	1.60		41.1	SURCHARGED	
1.004	MH8	0.000	0.59		167.7	OK	
1.005	MH9	0.000	1.37		166.2	OK	
7.000	MH10 (TANK)	0.000	0.02		3.0	SURCHARGED	
8.000	IC5	0.000	0.10		2.9	OK	
8.001	IC6	0.000	0.04		3.4	OK	
9.000	IC7	0.000	0.01		0.1	SURCHARGED	
8.002	IC8	0.000	0.01		0.4	SURCHARGED	
1.006	MH11	0.000	0.11		3.2	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.300 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.346 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 45

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) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
									(m)	(m)
1.000	IC01	15 Winter	100	+45%					9.787	-0.119
2.000	IC02	15 Winter	100	+45%					9.819	-0.121
1.001	MH1	15 Winter	100	+45%					7.148	-0.102
3.000	IC03	15 Winter	100	+45%					7.985	-0.121
1.002	MH2	15 Winter	100	+45%	100/15 Summer				6.894	0.469
4.000	IC04	15 Winter	100	+45%					7.907	-0.090
4.001	MH3	15 Winter	100	+45%	100/15 Summer				7.693	0.173
5.000	Rain Garden	15 Winter	100	+45%	100/15 Summer				7.011	0.076
5.001	IC4	15 Winter	100	+45%	100/15 Winter				6.945	0.020
1.003	MH4	15 Winter	100	+45%	100/15 Summer				6.712	0.537
6.000	IC06	15 Winter	100	+45%					7.622	-0.061
6.001	MH6	15 Winter	100	+45%	100/15 Summer				7.538	0.009
6.002	MH7	15 Winter	100	+45%	30/15 Summer				7.152	0.247
1.004	MH8	960 Winter	100	+45%	100/15 Summer				6.363	0.248
1.005	MH9	960 Winter	100	+45%	100/15 Summer				6.361	0.502
7.000	MH10 (TANK)	960 Winter	100	+45%	1/60 Winter				6.361	1.383
8.000	IC5	960 Winter	100	+45%	100/240 Summer				6.361	0.368
8.001	IC6	960 Winter	100	+45%	100/120 Winter				6.361	0.406
9.000	IC7	960 Winter	100	+45%	30/120 Summer				6.361	1.053
8.002	IC8	960 Winter	100	+45%	30/60 Winter				6.361	1.116
1.006	MH11	960 Winter	100	+45%	1/30 Winter				6.361	1.403

PN	US/MH Name	Flooded		Half Drain	Pipe	Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)		
1.000	IC01	0.000	0.09		4.0	OK	

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

PN	US/MH Name	Flooded		Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)				
2.000	IC02	0.000	0.08		4.2	OK	
1.001	MH1	0.000	0.22		8.1	OK	
3.000	IC03	0.000	0.08		1.4	OK	
1.002	MH2	0.000	1.16		130.0	SURCHARGED	
4.000	IC04	0.000	0.33		6.9	OK	
4.001	MH3	0.000	1.33		90.2	SURCHARGED	
5.000	Rain Garden	0.000	0.94		28.1	SURCHARGED	
5.001	IC4	0.000	0.98		28.6	SURCHARGED	
1.003	MH4	0.000	1.76		245.8	SURCHARGED	
6.000	IC06	0.000	0.62		11.9	OK	
6.001	MH6	0.000	0.77		65.3	SURCHARGED	
6.002	MH7	0.000	2.87		73.7	FLOOD RISK	
1.004	MH8	0.000	0.10		27.4	SURCHARGED	
1.005	MH9	0.000	0.21		26.1	SURCHARGED	
7.000	MH10 (TANK)	0.000	0.02		3.9	SURCHARGED	
8.000	IC5	0.000	0.01		0.4	SURCHARGED	
8.001	IC6	0.000	0.01		0.5	SURCHARGED	
9.000	IC7	0.000	0.01		0.1	SURCHARGED	
8.002	IC8	0.000	0.01		0.4	SURCHARGED	
1.006	MH11	0.000	0.13		3.7	SURCHARGED	