STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 4950 HD NETWORK8.sws

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.323	Minimum Backdrop Height (m)	1.200
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	2.500
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 4950 HD NETWORK8.sws

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.153	4-8	0.023

Total Area Contributing (ha) = 0.176

Total Pipe Volume (m³) = 9.325

Network Design Table for 4950 HD NETWORK8.sws

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	55.692	2.400	23.2	0.055	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	59.500	1.800	33.1	0.056	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	36.100	3.050	11.8	0.065	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	300	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	0.00	4.34	158.300	0.055	0.0	0.0	0.0	2.73	108.5	0.0
1.001	0.00	4.70	155.825	0.111	0.0	0.0	0.0	2.74	194.0	0.0
1.002	0.00	4.83	154.025	0.176	0.0	0.0	0.0	4.59	324.8	0.0
1.003	0.00	4.89	150.975	0.176	0.0	0.0	0.0	1.57	111.1	0.0

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Manhole Schedules for 4950 HD NETWORK8.sws

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)
HD8-1	159.745	1.445	Open Manhole	1500	1.000	158.300	225				
HD8-2	157.368	1.543	Open Manhole	1500	1.001	155.825	300	1.000	155.900	225	
HD8-3	155.572	1.547	Open Manhole	1500	1.002	154.025	300	1.001	154.025	300	
HSA08	152.500	1.525	Open Manhole	2400	1.003	150.975	300	1.002	150.975	300	
OF	152.500	1.575	Open Manhole	1200		OUTFALL		1.003	150.925	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
HD8-1	412989.030	412581.550	412989.030	412581.550	Required	
HD8-2	413017.672	412629.312	413017.672	412629.312	Required	
HD8-3	413069.118	412599.419	413069.118	412599.419	Required	
HSA08	413088.898	412629.618	413088.898	412629.618	Required	
OF	413091.779	412633.704			No Entry	

Free Flowing Outfall Details for 4950 HD NETWORK8.sws

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003	OF	152.500	150.925	1.900	1200	0

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Simulation Criteria for 4950 HD NETWORK8.sws

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.323		

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Online Controls for 4950 HD NETWORK8.sws

Pump Manhole: HSA08, DS/PN: 1.003, Volume (m^3): 9.3

Invert Level (m) 150.975

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Storage Structures for 4950 HD NETWORK8.sws

Lined Soakaway Manhole: HSA08, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.10980	Ring Diameter (m)	2.40
Infiltration Coefficient Side (m/hr)	0.07320	Pit Multiplier	2.1
Safety Factor	2.0	Number Required	3
Porosity	0.30	Cap Volume Depth (m)	2.500
Invert Level (m)	149.500	Cap Infiltration Depth (m)	2.500

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 4950 HD NETWORK8.sws

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 1
Number of Online Controls 1 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 0.323
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

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) 2, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	HD8-1	15 Winter	2	+0%					158.345
1.001	HD8-2	15 Winter	2	+0%					155.886
1.002	HD8-3	15 Winter	2	+0%					154.084
1.003	HSA08	180 Winter	2	+0%	100/60 Winter				150.064

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
1.000	HD8-1	-0.180	0.000	0.09			9.4	OK	
1.001	HD8-2	-0.239	0.000	0.09			16.6	OK	
1.002	HD8-3	-0.241	0.000	0.09			25.5	OK	
1.003	HSA08	-1.211	0.000	0.00		153	0.0	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 4950 HD NETWORK8.sws

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 1
Number of Online Controls 1 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 0.323
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

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) 2, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	HD8-1	15 Winter	30	+0%					158.362
1.001	HD8-2	15 Winter	30	+0%					155.914
1.002	HD8-3	15 Winter	30	+0%					154.113
1.003	HSA08	240 Winter	30	+0%	100/60 Winter				150.742

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
1.000	HD8-1	-0.163	0.000	0.17			17.7	OK	
1.001	HD8-2	-0.211	0.000	0.19			35.5	OK	
1.002	HD8-3	-0.212	0.000	0.19			56.2	OK	
1.003	HSA08	-0.533	0.000	0.00		236	0.0	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 4950 HD NETWORK8.sws

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 1
Number of Online Controls 1 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 0.323
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

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) 2, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	HD8-1	15 Winter	100	+30%					158.382
1.001	HD8-2	15 Winter	100	+30%					155.942
1.002	HD8-3	15 Winter	100	+30%					154.141
1.003	HSA08	240 Winter	100	+30%	100/60 Winter				151.827

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
1.000	HD8-1	-0.143	0.000	0.28			29.7	OK	
1.001	HD8-2	-0.183	0.000	0.32			59.5	OK	
1.002	HD8-3	-0.184	0.000	0.31			94.2	OK	
1.003	HSA08	0.552	0.000	0.00		340	0.0	SURCHARGED	

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