

	Drainage Design Report	
	Flow	
	V3.0	
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	Network	Storm Network
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Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Inverts
Minimum Backdrop Type (m)	0.200
Preferred Cover Depth (m)	0.600
Enforce best practice design rules	✓

	Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)	Notes
✓	MH1	0.005	5.00		98.600	Manhole	Adoptable	450				0.700	
✓	MH2	0.005	5.00		98.600	Manhole	Adoptable	450				1.073	
✓	MH3	0.005	5.00		98.000	Manhole	Adoptable	450				0.700	
✓	MH4	0.005	5.00		98.000	Manhole	Adoptable	450				0.794	
✓	MH5	0.040	5.00		98.000	Manhole	Adoptable	450				0.890	
✓	MH6				98.190	Manhole	Adoptable	1200				1.161	
✓	MH7				100.350	Manhole	Adoptable	450				3.778	
✓	MH8				100.600	Manhole	Adoptable	450				4.073	

	Name	US Node	DS Node	Length (m)	k (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)	C.Offset (m)	Min DS IL (m)	Vel (m/s)	Cap (%)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)	Notes
F	1.000	MH1	MH2	10.400	0.600	Colebrook-White	97.393	97.794	0.104	100.0	100 Circular	5.23	50.0	0.769	6.0	0.7	0.650	0.704	0.005	0.0	0.0	0.0	0.0	23	0.511	Velocity is less than the specified minimum
F	1.001	MH2	MH5	12.700	0.600	Colebrook-White	97.527	97.400	0.127	100.0	100 Circular	5.50	50.0	0.769	6.0	1.4	0.973	0.500	0.010	0.0	0.0	0.0	32	0.621	Velocity is less than the specified minimum Downstream Depth is less than the specified minimum	
F	2.000	MH3	MH4	9.400	0.600	Colebrook-White	97.300	97.208	0.094	100.0	100 Circular	5.20	50.0	0.769	6.0	0.7	0.600	0.694	0.005	0.0	0.0	0.0	23	0.511	Velocity is less than the specified minimum	
F	2.001	MH4	MH5	9.600	0.600	Colebrook-White	97.208	97.110	0.096	100.0	100 Circular	5.41	50.0	0.769	6.0	1.4	0.694	0.790	0.010	0.0	0.0	0.0	32	0.621	Velocity is less than the specified minimum	
✓	1.002	MH5	MH6	6.100	0.600	Colebrook-White	97.110	97.029	0.081	100.0	150 Circular	5.04	50.0	1.005	17.8	8.1	0.740	1.011	0.040	0.0	0.0	0.0	71	0.963		
F	1.003	MH6	MH7	46.100	0.600	Colebrook-White	97.029	95.572	0.457	100.0	150 Circular	6.40	50.0	1.000	17.7	8.1	1.011	3.626	0.060	0.0	0.0	0.0	71	0.978	Downstream Depth is more than twice the specified minimum	
F	1.004	MH7	MH8	4.500	0.600	Colebrook-White	95.572	95.527	0.045	100.0	150 Circular	6.40	50.0	1.005	17.8	8.1	3.626	3.923	0.060	0.0	0.0	0.0	71	0.983	Upstream Depth is more than twice the specified minimum Downstream Depth is more than twice the specified minimum	

Name	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)	US Node	Dia (mm)	Width (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
1.000	10.400	100.0	100	Circular	98.600	97.900	0.600	98.600	97.796	0.704	MH1	450		Manhole	Adoptable	MH2	450		Manhole	Adoptable
1.001	12.700	100.0	100	Circular	98.600	97.527	0.973	98.000	97.400	0.500	MH2	450		Manhole	Adoptable	MH5	450		Manhole	Adoptable
2.000	9.400	100.0	100	Circular	98.000	97.300	0.600	98.000	97.206	0.694	MH3	450		Manhole	Adoptable	MH4	450		Manhole	Adoptable
2.001	9.600	100.0	100	Circular	98.000	97.206	0.694	98.000	97.110	0.790	MH4	450		Manhole	Adoptable	MH5	450		Manhole	Adoptable
1.002	8.100	100.0	150	Circular	98.000	97.110	0.740	98.190	97.029	1.011	MH5	450		Manhole	Adoptable	MH6	1200		Manhole	Adoptable
1.003	46.100	100.9	150	Circular	98.190	97.029	1.011	100.350	96.572	3.628	MH6	1200		Manhole	Adoptable	MH7	450		Manhole	Adoptable
1.004	4.500	100.0	150	Circular	100.350	96.572	3.628	100.600	96.527	3.923	MH7	450		Manhole	Adoptable	MH8	450		Manhole	Adoptable

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Node Type	MH Type	Connections		Link Name	IL (m)	Dia (mm)	Link Type
MH1			98.600	0.700	450		Manhole	Adoptable						
														
										0	1.000	97.900	100	Circular
MH2			98.600	1.073	450		Manhole	Adoptable		1	1.000	97.796	100	Circular
														
										0	1.001	97.527	100	Circular
MH3			98.000	0.700	450		Manhole	Adoptable						
														
										0	2.000	97.300	100	Circular
MH4			98.000	0.794	450		Manhole	Adoptable		1	2.000	97.206	100	Circular
														
										0	2.001	97.206	100	Circular
MH5			98.000	0.890	450		Manhole	Adoptable		1	2.001	97.110	100	Circular
										2	1.001	97.400	100	Circular
										0	1.002	97.110	150	Circular
MH6			98.190	1.161	1200		Manhole	Adoptable		1	1.002	97.029	150	Circular
														
										0	1.003	97.029	150	Circular
MH7			100.350	3.778	450		Manhole	Adoptable		1	1.003	96.572	150	Circular
														
										0	1.004	96.572	150	Circular
MH8			100.600	4.073	450		Manhole	Adoptable		1	1.004	96.527	150	Circular
														

Rainfall Methodology	FSR		Return Period (years)	Climate Change (%)
FSR Region	England and Wales		100	30
M5-60 (mm)	20.000			
Ratio-R	0.400			
Summer CV	0.750			
Winter CV	0.840			
Analysis Speed	Normal			
Drain Down Time (mins)	240			
Additional Storage (m³/ha)	20.0			
Storm Durations (mins)	15			
	30			
	60			
	120			
	180			
	240			
	360			
	480			
	600			
	720			
	960			
	1440			
Check Discharge Rate(s)	x			
1 year (l/s)				
30 year (l/s)				
100 year (l/s)				
Check Discharge Volume	x			
100 year 360 minute (m³)				

<u>Head/Flow</u>							
Node	Flap Valve	Online / Offline	Replaces Downstream Link	Loop to Node	Invert Level (m)	Head (m)	Flow (l/s)
MH6	x	Online	✓		97.029	0.021	0.149
						0.041	0.503
						0.062	0.870
						0.083	1.132
						0.103	1.344
						0.124	1.527
						0.144	1.652
						0.165	1.649
						0.186	1.309
						0.206	1.011
						0.227	0.978
						0.248	1.007
						0.268	1.047
						0.289	1.086
						0.309	1.123
						0.330	1.159
						0.351	1.194
						0.371	1.228
						0.392	1.261
						0.413	1.293
						0.433	1.324
						0.454	1.354
						0.475	1.384
						0.495	1.413
						0.516	1.442
						0.536	1.470
						0.557	1.497
						0.578	1.524
						0.598	1.550
						0.619	1.576
						0.640	1.602

						0.660	1.627
						0.681	1.651
						0.702	1.676
						0.722	1.700
						0.743	1.723
						0.763	1.746
						0.784	1.769
						0.805	1.792
						0.825	1.814
						0.846	1.836
						0.867	1.858
						0.887	1.880
						0.908	1.901
						0.928	1.922
						0.949	1.943
						0.970	1.963
						0.990	1.984
						1.011	2.004
						1.112	2.099
						1.213	2.191

<u>Depth/Area/Inf Area</u>									
Node	Base Infiltration Coefficient (m/hr)	Side Infiltration Coefficient (m/hr)	Safety Factor	Porosity	Invert Level (m)	Time to half empty (mins)	Depth (m)	Area (m²)	Inf. Area (m²)
MH6	0.00000	0.00000	2.0	0.95	97.029	164	0.000	24.0	0.0
							0.800	24.0	0.0
							0.801	0.0	0.0
							1.000	0.0	0.0

<u>Default Values</u>			<u>Overrides</u>					
Entry Loss (manhole)	0.250		Link	Entry Loss	Exit Loss		Node	Flood Risk (m)
Exit Loss (manhole)	0.250							
Entry Loss (junction)	0.000							
Exit Loss (junction)	0.000							
Flood Risk (m)	0.300							

Results for 100 year +30% Critical Storm Duration. Largest routing error: 0.14%															
Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Name	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	MH1	114	97.992	0.092	0.9	0.0278	0.0000	OK	1.000	MH2	0.9	0.547	0.149	0.0799	
120 minute winter	MH2	114	97.992	0.465	1.8	0.1172	0.0000	SURCHARGED	1.001	MH5	1.8	0.655	0.298	0.0994	
120 minute winter	MH3	114	97.992	0.692	0.9	0.2090	0.0000	FLOOD RISK	2.000	MH4	0.7	0.358	0.113	0.0735	
120 minute winter	MH4	114	97.992	0.786	1.5	0.2239	0.0000	FLOOD RISK	2.001	MH5	1.2	0.279	0.191	0.0751	
120 minute winter	MH5	114	97.991	0.881	10.3	0.9323	0.0000	FLOOD RISK	1.002	MH6	9.8	0.895	0.553	0.1426	
120 minute winter	MH6	114	97.990	0.961	9.8	19.3381	0.0000	FLOOD RISK	Head/Flow		2.0				
120 minute winter	MH7	114	96.608	0.036	2.0	0.0057	0.0000	OK	1.004	MH8	2.0	0.638	0.110	0.0138	29.5
120 minute winter	MH8	114	96.561	0.034	2.0	0.0000	0.0000	OK							