


JS Bloor (Tewkesbury) Ltd		Page 0
King John's Gallery Mythe Road Tewkesbury GL20 6EB		
Date 12/01/2024 13:37 File C3D-WE102 - 12.01.24.MDX	Designed by RBannis Checked by	
Micro Drainage		Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm Network 2








Pipe Sizes BH Pipes Manhole Sizes BH MHS

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.700	Add Flow / Climate Change (%)	0
Ratio R	0.408	Minimum Backdrop Height (m)	0.200
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	350

Designed with Level Soffits







Network Design Table for Storm Network 2

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	43.639	0.139	313.0	0.252	5.00	0.0	0.600	o	375	Pipe/Conduit	
2.000	29.028	1.511	19.2	0.124	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	26.446	0.084	313.0	0.072	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.000	47.191	0.581	81.2	0.155	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	41.030	0.117	350.7	0.037	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	48.916	0.140	350.0	0.214	0.00	0.0	0.600	o	450	Pipe/Conduit	
4.000	16.248	2.149	7.6	0.101	5.00	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)
1.000	50.00	5.71	147.600	0.252	0.0	0.0	0.0	1.02	112.5	34.1
2.000	50.00	5.16	149.122	0.124	0.0	0.0	0.0	3.00	119.3	16.8
1.001	50.00	6.15	147.461	0.448	0.0	0.0	0.0	1.02	112.5	60.7
3.000	50.00	5.45	148.032	0.155	0.0	0.0	0.0	1.75	123.4	21.0
1.002	50.00	6.78	147.301	0.640	0.0	0.0	0.0	1.08	171.7	86.7
1.003	50.00	7.53	147.184	0.854	0.0	0.0	0.0	1.08	171.9	115.6
4.000	50.00	5.06	149.418	0.101	0.0	0.0	0.0	4.79	190.4	13.7

Network Design Table for Storm Network 2

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
5.000	45.433	0.600	75.7	0.109	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	28.052	0.476	58.9	0.111	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.002	48.897	0.950	51.5	0.044	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.003	34.181	1.905	17.9	0.221	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	13.928	0.040	348.2	0.137	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.005	9.542	0.027	350.0	0.000	0.00	0.0	0.600	o	500	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)
5.000	50.00	5.50	151.200	0.109	0.0	0.0	0.0	1.50	59.8	14.8
5.001	50.00	5.78	150.600	0.220	0.0	0.0	0.0	1.71	67.9	29.8
5.002	50.00	6.22	150.124	0.264	0.0	0.0	0.0	1.83	72.7	35.7
5.003	50.00	6.38	149.099	0.485	0.0	0.0	0.0	3.73	263.6	65.7
1.004	50.00	7.73	146.994	1.577	0.0	0.0	0.0	1.16	227.5	213.5
1.005	50.00	7.87	146.954	1.577	0.0	0.0	0.0	1.16	226.9	213.5

Simulation Criteria for Storm Network 2

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	0.000
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 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)	19.700	Storm Duration (mins)	30
Ratio R	0.408		

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Micro Drainage		Network 2020.1.3

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	0.000
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 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	0.406
	Region England and Wales	Cv (Summer)	0.750
M5-60 (mm)		19.600 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	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, 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.
1.000	S1	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
2.000	S10	15 Winter	1	+0%	100/15 Summer			
1.001	S2 1440	Winter	1	+0%	30/15 Summer			
3.000	S20	15 Winter	1	+0%	30/15 Winter	100/15 Summer		
1.002	S3 1440	Winter	1	+0%	30/15 Summer			
1.003	S4 1440	Winter	1	+0%	1/960 Winter			
4.000	S30	15 Winter	1	+0%				
5.000	S40	15 Winter	1	+0%	100/15 Summer	100/15 Summer		
5.001	S41	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
5.002	S42	15 Winter	1	+0%	30/15 Summer			
5.003	S43	15 Winter	1	+0%	100/15 Summer			
1.004	S5 1440	Winter	1	+0%	1/360 Winter			
1.005	S6 1440	Winter	1	+0%	1/360 Winter			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S1	147.750	-0.225	0.000	0.33		33.5	OK
2.000	S10	149.181	-0.166	0.000	0.15		17.0	OK
1.001	S2	147.705	-0.130	0.000	0.03		3.4	OK
3.000	S20	148.119	-0.213	0.000	0.18		20.8	OK
1.002	S3	147.706	-0.045	0.000	0.03		4.8	OK
1.003	S4	147.706	0.072	0.000	0.04		6.1	SURCHARGED
4.000	S30	149.461	-0.182	0.000	0.08		13.9	OK
5.000	S40	151.278	-0.147	0.000	0.26		14.6	OK
5.001	S41	150.705	-0.120	0.000	0.44		27.5	OK
5.002	S42	150.233	-0.116	0.000	0.47		32.4	OK
5.003	S43	149.198	-0.201	0.000	0.24		57.6	OK
1.004	S5	147.706	0.212	0.000	0.07		11.0	SURCHARGED
1.005	S6	147.706	0.252	0.000	0.00		0.0	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	S1	4
2.000	S10	
1.001	S2	
3.000	S20	4
1.002	S3	
1.003	S4	
4.000	S30	
5.000	S40	3
5.001	S41	4
5.002	S42	
5.003	S43	
1.004	S5	
1.005	S6	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
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 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 0.406
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.600 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 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, 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.
1.000	S1	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
2.000	S10	15 Winter	30	+0%	100/15 Summer			
1.001	S2	15 Winter	30	+0%	30/15 Summer			
3.000	S20	15 Winter	30	+0%	30/15 Winter	100/15 Summer		
1.002	S3	1440 Winter	30	+0%	30/15 Summer			
1.003	S4	1440 Winter	30	+0%	1/960 Winter			
4.000	S30	15 Winter	30	+0%				
5.000	S40	15 Winter	30	+0%	100/15 Summer	100/15 Summer		
5.001	S41	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
5.002	S42	15 Winter	30	+0%	30/15 Summer			
5.003	S43	15 Winter	30	+0%	100/15 Summer			
1.004	S5	1440 Winter	30	+0%	1/360 Winter			
1.005	S6	1440 Winter	30	+0%	1/360 Winter			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S1	148.551	0.576	0.000	0.73		74.9	SURCHARGED
2.000	S10	149.218	-0.129	0.000	0.38		41.8	OK
1.001	S2	148.469	0.633	0.000	1.34		131.0	SURCHARGED
3.000	S20	148.455	0.123	0.000	0.43		49.3	SURCHARGED
1.002	S3	148.334	0.583	0.000	0.07		10.0	SURCHARGED
1.003	S4	148.334	0.700	0.000	0.08		13.2	SURCHARGED
4.000	S30	149.487	-0.156	0.000	0.20		34.0	OK
5.000	S40	151.332	-0.093	0.000	0.63		35.8	OK
5.001	S41	151.101	0.276	0.000	1.05		66.4	SURCHARGED
5.002	S42	150.574	0.225	0.000	1.11		77.3	SURCHARGED
5.003	S43	149.273	-0.126	0.000	0.63		151.7	OK
1.004	S5	148.334	0.840	0.000	0.16		24.3	SURCHARGED
1.005	S6	148.334	0.880	0.000	0.00		0.0	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	S1	4
2.000	S10	
1.001	S2	
3.000	S20	4
1.002	S3	
1.003	S4	
4.000	S30	
5.000	S40	3
5.001	S41	4
5.002	S42	
5.003	S43	
1.004	S5	
1.005	S6	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	0.000
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 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	0.406
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.600	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			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, 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.
1.000	S1	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
2.000	S10	15 Winter	100	+40%	100/15 Summer			
1.001	S2	15 Summer	100	+40%	30/15 Summer			
3.000	S20	15 Winter	100	+40%	30/15 Winter	100/15 Summer		
1.002	S3	15 Winter	100	+40%	30/15 Summer			
1.003	S4	15 Winter	100	+40%	1/960 Winter			
4.000	S30	15 Winter	100	+40%				
5.000	S40	15 Winter	100	+40%	100/15 Summer	100/15 Summer		
5.001	S41	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
5.002	S42	15 Winter	100	+40%	30/15 Summer			
5.003	S43	15 Winter	100	+40%	100/15 Summer			
1.004	S5	1440 Winter	100	+40%	1/360 Winter			
1.005	S6	1440 Winter	100	+40%	1/360 Winter			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S1	149.747	1.772	13.939	1.23		127.1	FLOOD
2.000	S10	150.479	1.132	0.000	0.68		75.7	FLOOD RISK
1.001	S2	149.774	1.939	0.000	1.93		189.4	SURCHARGED
3.000	S20	149.539	1.207	6.693	0.69		80.4	FLOOD
1.002	S3	149.537	1.786	0.000	1.80		275.4	SURCHARGED
1.003	S4	149.290	1.656	0.000	2.25		351.3	SURCHARGED
4.000	S30	149.512	-0.131	0.000	0.37		61.8	OK
5.000	S40	152.993	1.568	1.629	0.90		51.3	FLOOD
5.001	S41	152.509	1.684	6.316	1.51		95.0	FLOOD
5.002	S42	151.969	1.620	0.000	1.48		102.8	FLOOD RISK
5.003	S43	150.115	0.716	0.000	0.92		223.4	SURCHARGED
1.004	S5	149.077	1.583	0.000	0.28		43.0	SURCHARGED
1.005	S6	149.077	1.623	0.000	0.00		0.0	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	S1	4
2.000	S10	
1.001	S2	
3.000	S20	4
1.002	S3	
1.003	S4	
4.000	S30	
5.000	S40	3
5.001	S41	4
5.002	S42	
5.003	S43	
1.004	S5	
1.005	S6	