

Jelson Limited		Page 1
370 Loughborough Road	Normandy Fields	
Leicester	Hinckley	
LE4 5PR	FW Road 3	
Date 20/03/2024	Designed by EG	
File 2024-02-02 network.MDX	Checked by EG	
Micro Drainage	Network 2019.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Road 3

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	
Return Period (years)	2
FEH Rainfall Version	1999
Site Location	GB 440550 294500 SP 40550 94500
C (1km)	-0.028
D1 (1km)	0.364
D2 (1km)	0.347
D3 (1km)	0.258
E (1km)	0.307
F (1km)	2.353
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm - Road 3

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.555	4-8	0.084

Total Area Contributing (ha) = 0.640

Total Pipe Volume (m³) = 10.033

Network Design Table for Storm - Road 3

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
S3.000	26.229	0.327	80.2	0.119	4.00	0.0	0.600	o	300	Pipe/Conduit	
S3.001	20.281	0.253	80.2	0.091	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.002	26.268	0.465	56.5	0.038	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.003	14.575	0.265	55.0	0.066	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)
S3.000	50.00	4.25	102.116	0.119	0.0	0.0	0.0	1.76	124.2	16.1
S3.001	50.00	4.44	101.789	0.209	0.0	0.0	0.0	1.76	124.2	28.4
S3.002	50.00	4.65	101.536	0.247	0.0	0.0	0.0	2.10	148.2	33.4
S3.003	50.00	4.76	101.071	0.313	0.0	0.0	0.0	2.12	150.2	42.5

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Network Design Table for Storm - Road 3

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
S3.004	29.961	0.515	58.2	0.143	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.005	15.763	0.273	57.7	0.184	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)
S3.004	50.00	5.01	100.806	0.456	0.0	0.0	0.0	2.07	146.0	61.8
S3.005	50.00	5.12	100.216	0.640	0.0	0.0	0.0	2.39	263.8	86.6

Manhole Schedules for Storm - Road 3

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S9	103.772	1.656	Open Manhole	1200	S3.000	102.116	300				
S10	103.358	1.569	Open Manhole	1200	S3.001	101.789	300	S3.000	101.789	300	
S11	103.506	1.970	Open Manhole	1200	S3.002	101.536	300	S3.001	101.536	300	
S12	103.123	2.052	Open Manhole	1200	S3.003	101.071	300	S3.002	101.071	300	
S13	102.819	2.013	Open Manhole	1200	S3.004	100.806	300	S3.003	100.806	300	
S14	102.214	1.998	Open Manhole	1500	S3.005	100.216	375	S3.004	100.291	300	
S	101.884	1.941	Open Manhole	0		OUTFALL		S3.005	99.943	375	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S9	440601.910	295001.938	440601.910	295001.938	Required	
S10	440593.012	294977.264	440593.012	294977.264	Required	
S11	440586.461	294958.070	440586.461	294958.070	Required	
S12	440565.126	294942.746	440565.126	294942.746	Required	
S13	440560.164	294929.041	440560.164	294929.041	Required	
S14	440551.127	294900.475	440551.127	294900.475	Required	
S	440546.492	294885.409			No Entry	

PIPELINE SCHEDULES for Storm - Road 3

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S3.000	o	300	S9	103.772	102.116	1.356	Open Manhole	1200
S3.001	o	300	S10	103.358	101.789	1.269	Open Manhole	1200
S3.002	o	300	S11	103.506	101.536	1.670	Open Manhole	1200
S3.003	o	300	S12	103.123	101.071	1.752	Open Manhole	1200
S3.004	o	300	S13	102.819	100.806	1.713	Open Manhole	1200
S3.005	o	375	S14	102.214	100.216	1.623	Open Manhole	1500

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S3.000	26.229	80.2	S10	103.358	101.789	1.269	Open Manhole	1200
S3.001	20.281	80.2	S11	103.506	101.536	1.670	Open Manhole	1200
S3.002	26.268	56.5	S12	103.123	101.071	1.752	Open Manhole	1200
S3.003	14.575	55.0	S13	102.819	100.806	1.713	Open Manhole	1200
S3.004	29.961	58.2	S14	102.214	100.291	1.623	Open Manhole	1500
S3.005	15.763	57.7	S	101.884	99.943	1.566	Open Manhole	0

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Area Summary for Storm - Road 3

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
3.000	User	-	100	0.063	0.063	0.063
	User	-	100	0.006	0.006	0.069
	User	-	100	0.006	0.006	0.075
	User	-	100	0.044	0.044	0.119
3.001	User	-	100	0.008	0.008	0.008
	User	-	100	0.013	0.013	0.021
	User	-	100	0.009	0.009	0.031
	User	-	100	0.010	0.010	0.041
3.002	User	-	100	0.050	0.050	0.091
	User	-	100	0.016	0.016	0.016
	User	-	100	0.021	0.021	0.038
	User	-	100	0.026	0.026	0.026
3.003	User	-	100	0.008	0.008	0.034
	User	-	100	0.008	0.008	0.042
	User	-	100	0.024	0.024	0.066
	User	-	100	0.030	0.030	0.030
3.004	User	-	100	0.009	0.009	0.039
	User	-	100	0.009	0.009	0.048
	User	-	100	0.009	0.009	0.057
	User	-	100	0.051	0.051	0.108
3.005	User	-	100	0.014	0.014	0.123
	User	-	100	0.006	0.006	0.128
	User	-	100	0.014	0.014	0.143
	User	-	100	0.025	0.025	0.025
	User	-	100	0.006	0.006	0.031
	User	-	100	0.023	0.023	0.055
	User	-	100	0.020	0.020	0.075
	User	-	100	0.009	0.009	0.084
	User	-	100	0.009	0.009	0.094
	User	-	100	0.004	0.004	0.098
	User	-	100	0.016	0.016	0.114
	User	-	100	0.011	0.011	0.125
	User	-	100	0.007	0.007	0.133
	User	-	100	0.005	0.005	0.138
	User	-	100	0.028	0.028	0.167
	User	-	100	0.017	0.017	0.184
				Total	Total	Total
				0.640	0.640	0.640

Free Flowing Outfall Details for Storm - Road 3

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
S3.005	S	101.884	99.943	0.000	0	0

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Simulation Criteria for Storm - Road 3

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/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 Offline Controls 0 Number of Time/Area Diagrams 0			
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0			

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	1999
Site Location	GB 440550 294500 SP 40550 94500
C (1km)	-0.028
D1 (1km)	0.364
D2 (1km)	0.347
D3 (1km)	0.258
E (1km)	0.307
F (1km)	2.353
Summer Storms	Yes
Winter Storms	No
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Road 3

Simulation Criteria

Areal Reduction Factor 1.000

Hot Start (mins) 0

Hot Start Level (mm) 0

Manhole Headloss Coeff (Global) 0.500

Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000

MADD Factor * 10m³/ha Storage 0.000

Inlet Coeffiecient 0.800

Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0

Number of Offline Controls 0

Number of Time/Area Diagrams 0

Number of Online Controls 0

Number of Storage Structures 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH

FEH Rainfall Version 1999

Site Location GB 440550 294500 SP 40550 94500

C (1km) -0.028

D1 (1km) 0.364

D2 (1km) 0.347

D3 (1km) 0.258

E (1km) 0.307

F (1km) 2.353

Cv (Summer) 0.750

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep DTS Status ON

DVD Status OFF

Fine Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

US/MH		Return Climate		First (X)		First (Y)		First (Z)		Water	Surcharged
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Overflow	Act.	Level (m)	Depth (m)
S3.000	S9	15 Winter	1	+0%	100/15 Summer					102.188	-0.228
S3.001	S10	15 Winter	1	+0%	100/15 Summer					101.883	-0.206
S3.002	S11	15 Winter	1	+0%	100/15 Summer					101.628	-0.208
S3.003	S12	15 Winter	1	+0%	30/15 Summer					101.176	-0.195
S3.004	S13	15 Winter	1	+0%	30/15 Summer					100.929	-0.177
S3.005	S14	15 Winter	1	+0%	30/15 Winter					100.360	-0.231

Flooded		Pipe		Level	
US/MH	Volume	Flow / Overflow	Pipe	Flow	Level
PN	Name	(m³)	Cap.	(l/s)	Status Exceeded
S3.000	S9	0.000	0.13	14.4	OK
S3.001	S10	0.000	0.21	22.9	OK
S3.002	S11	0.000	0.20	26.8	OK
S3.003	S12	0.000	0.27	33.2	OK
S3.004	S13	0.000	0.35	46.6	OK
S3.005	S14	0.000	0.31	63.3	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm -
Road 3

Simulation Criteria

Areal Reduction Factor 1.000

Hot Start (mins) 0

Hot Start Level (mm) 0

Manhole Headloss Coeff (Global) 0.500

Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000

MADD Factor * 10m³/ha Storage 0.000

Inlet Coeffiecient 0.800

Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0

Number of Offline Controls 0

Number of Time/Area Diagrams 0

Number of Online Controls 0

Number of Storage Structures 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model

FEH Rainfall Version

Site Location GB 440550 294500 SP 40550 94500

C (1km)

D1 (1km)

D2 (1km)

FEH

1999

F (1km)

-0.028 Cv (Summer)

0.364 Cv (Winter)

0.347

D3 (1km) 0.258

E (1km) 0.307

F (1km) 2.353

Cv (Summer) 0.750

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep

DTS Status

DVD Status OFF

Fine Inertia Status OFF

ON

Profile(s)

Duration(s) (mins)

Return Period(s) (years)

Climate Change (%)

Summer and Winter

15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

1, 30, 100

0, 0, 40

US/MH		Return Climate		First (X)		First (Y)		First (Z)		Water	Surcharged
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Overflow	Act.	Level (m)	Depth (m)
S3.000	S9	15 Winter	30	+0%	100/15 Summer					102.251	-0.165
S3.001	S10	15 Winter	30	+0%	100/15 Summer					101.986	-0.103
S3.002	S11	15 Summer	30	+0%	100/15 Summer					101.727	-0.109
S3.003	S12	15 Winter	30	+0%	30/15 Summer					101.490	0.119
S3.004	S13	15 Winter	30	+0%	30/15 Summer					101.288	0.182
S3.005	S14	15 Winter	30	+0%	30/15 Winter					100.596	0.005

Flooded		Pipe		Level	
US/MH	Volume	Flow / Overflow	Flow	Level	Exceeded
PN	Name	(m³)	Cap. (l/s)	(l/s)	Status
S3.000	S9	0.000	0.42	46.7	OK
S3.001	S10	0.000	0.75	81.7	OK
S3.002	S11	0.000	0.71	95.0	OK
S3.003	S12	0.000	0.88	110.5	SURCHARGED
S3.004	S13	0.000	1.15	152.6	SURCHARGED
S3.005	S14	0.000	1.01	207.0	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm -
Road 3

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 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	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.258
FEH Rainfall Version	1999	E (1km)	0.307
Site Location	GB 440550 294500 SP 40550 94500	F (1km)	2.353
C (1km)	-0.028	Cv (Summer)	0.750
D1 (1km)	0.364	Cv (Winter)	0.840
D2 (1km)	0.347		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	Surcharged
PN	Name								
	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level (m)	Depth (m)
S3.000	S9 15 Winter	100	+40%	100/15 Summer				103.351	0.935
S3.001	S10 15 Winter	100	+40%	100/15 Summer				103.277	1.188
S3.002	S11 15 Winter	100	+40%	100/15 Summer				103.088	1.252
S3.003	S12 15 Winter	100	+40%	30/15 Summer				102.766	1.395
S3.004	S13 15 Winter	100	+40%	30/15 Summer				102.452	1.346
S3.005	S14 15 Winter	100	+40%	30/15 Winter				101.064	0.473

		Flooded		Pipe		
	US/MH	Volume	Flow / Overflow	Flow		Level
PN	Name	(m³)	Cap.	(l/s)	(l/s)	Status
S3.000	S9	0.000	0.65		73.0	SURCHARGED
S3.001	S10	0.000	0.94		101.8	FLOOD RISK
S3.002	S11	0.000	0.89		118.9	SURCHARGED
S3.003	S12	0.000	1.19		149.2	SURCHARGED
S3.004	S13	0.000	1.66		220.0	SURCHARGED
S3.005	S14	0.000	1.66		338.8	SURCHARGED