

Carley Daines and Partners Limited		Page 1
11 Bridgewater Road Worsley Manchester, M28 3JE	13947 Fletcher Fold Road Section 104 SW Calculations 1:30 Year Flows - No Tank	
Date 20/02/2025 File 13947 FLETCHER FOLD ROAD MD M...	Designed by A Mulligan Checked by D Middleton	
Innovyze	Network 2019.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.304	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	1.500
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.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.245	4-8	0.050

Total Area Contributing (ha) = 0.295

Total Pipe Volume (m³) = 64.929

Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - 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
S1.000	20.000#	0.080	250.0	0.070	5.00	0.0	0.600	o	600	Pipe/Conduit	
S1.001	27.100#	0.110	246.4	0.026	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.002	29.000#	0.120	241.7	0.170	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.003	13.200#	0.045	293.3	0.029	0.00	0.0	0.600	o	1500	Pipe/Conduit	
S1.004	6.500#	0.040	162.5	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)
S1.000	100.00	5.22	72.700	0.070	0.0	0.0	0.0	1.54	434.2	25.3
S1.001	100.00	5.44	72.320	0.096	0.0	0.0	0.0	1.99	1267.1	34.7
S1.002	100.00	5.68	72.210	0.266	0.0	0.0	0.0	2.01	1279.4	96.1
S1.003	100.00	5.77	71.490	0.295	0.0	0.0	0.0	2.50	4416.8	106.5
S1.004	99.47	5.88	71.445	0.295	0.0	0.0	0.0	1.02	40.7«	106.5

Manhole Schedules for Storm											
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)
SS100	75.350	2.650	Open Manhole	1800	S1.000	72.700	600				
SS101	75.350	3.030	Open Manhole	2100	S1.001	72.320	900	S1.000	72.620	600	
SS102	74.850	2.640	Open Manhole	2700	S1.002	72.210	900	S1.001	72.210	900	
SS103	74.850	3.360	Open Manhole	2700	S1.003	71.490	1500	S1.002	72.090	900	
SS104 HB	74.850	3.405	Open Manhole	3000	S1.004	71.445	225	S1.003	71.445	1500	
SComb 1	75.000	3.595	Open Manhole	0		OUTFALL		S1.004	71.405	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS100	187.246	18.457	187.246	18.457	Required	
SS101	186.914	81.875	186.914	81.875	Required	
SS102	272.578	81.543	272.578	81.543	Required	
SS103	272.578	-6.113	272.578	-6.113	Required	
SS104 HB	272.910	-39.980	272.910	-39.980	Required	
SComb 1	284.199	-49.941			No Entry	

Carley Daines and Partners Limited		Page 3
11 Bridgewater Road Worsley Manchester, M28 3JE	13947 Fletcher Fold Road Section 104 SW Calculations 1:30 Year Flows - No Tank	
Date 20/02/2025 File 13947 FLETCHER FOLD ROAD MD M...	Designed by A Mulligan Checked by D Middleton	
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PIPELINE SCHEDULES for Storm

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	o	600	SS100	75.350	72.700	2.050	Open Manhole	1800
S1.001	o	900	SS101	75.350	72.320	2.130	Open Manhole	2100
S1.002	o	900	SS102	74.850	72.210	1.740	Open Manhole	2700
S1.003	o	1500	SS103	74.850	71.490	1.860	Open Manhole	2700
S1.004	o	225	SS104 HB	74.850	71.445	3.180	Open Manhole	3000

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)
S1.000	20.000#	250.0	SS101	75.350	72.620	2.130	Open Manhole	2100
S1.001	27.100#	246.4	SS102	74.850	72.210	1.740	Open Manhole	2700
S1.002	29.000#	241.7	SS103	74.850	72.090	1.860	Open Manhole	2700
S1.003	13.200#	293.3	SS104 HB	74.850	71.445	1.905	Open Manhole	3000
S1.004	6.500#	162.5	SComb 1	75.000	71.405	3.370	Open Manhole	0

Carley Daines and Partners Limited		Page 4
11 Bridgewater Road Worsley Manchester, M28 3JE	13947 Fletcher Fold Road Section 104 SW Calculations 1:30 Year Flows - No Tank	
Date 20/02/2025 File 13947 FLETCHER FOLD ROAD MD M...	Designed by A Mulligan Checked by D Middleton	
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Setting Out Information - Site Coordinates (Storm)

- Indicates pipe length does not match coordinates

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S1.000	SS100	1800		187.246 #	18.457 #	187.246	18.457	
S1.001	SS101	2100		186.914 #	81.875 #	186.914	81.875	
S1.002	SS102	2700		272.578 #	81.543 #	272.578	81.543	
S1.003	SS103	2700		272.578 #	-6.113 #	272.578	-6.113	
S1.004	SS104 HB	3000		272.910 #	-39.980 #	272.910	-39.980	

- Indicates pipe length does not match coordinates

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.004	SComb 1	0		284.199 #	-49.941 #	

Carley Daines and Partners Limited		Page 5
11 Bridgewater Road Worsley Manchester, M28 3JE	13947 Fletcher Fold Road Section 104 SW Calculations 1:30 Year Flows - No Tank	
Date 20/02/2025 File 13947 FLETCHER FOLD ROAD MD M...	Designed by A Mulligan Checked by D Middleton	
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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.070	0.070	0.070
1.001	-	-	100	0.026	0.026	0.026
1.002	-	-	100	0.170	0.170	0.170
1.003	-	-	100	0.029	0.029	0.029
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.295	0.295	0.295

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S1.004	SComb 1	75.000	71.405	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	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 Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.304		

Carley Daines and Partners Limited		Page 6
11 Bridgewater Road Worsley Manchester, M28 3JE	13947 Fletcher Fold Road Section 104 SW Calculations 1:30 Year Flows - No Tank	
Date 20/02/2025 File 13947 FLETCHER FOLD ROAD MD M...	Designed by A Mulligan Checked by D Middleton	
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SS104 HB, DS/PN: S1.004, Volume (m³): 42.4

Unit Reference	MD-SHE-0083-5000-3000-5000
Design Head (m)	3.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	83
Invert Level (m)	71.445
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)	3.000	5.0	Kick-Flo®	0.741	2.6
Flush-Flo™	0.360	3.3	Mean Flow over Head Range	-	3.7

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	2.5	0.800	2.7	2.000	4.1	4.000	5.7	7.000	7.4
0.200	3.1	1.000	3.0	2.200	4.3	4.500	6.0	7.500	7.7
0.300	3.3	1.200	3.3	2.400	4.5	5.000	6.4	8.000	7.9
0.400	3.3	1.400	3.5	2.600	4.7	5.500	6.6	8.500	8.2
0.500	3.2	1.600	3.7	3.000	5.0	6.000	6.9	9.000	8.4
0.600	3.1	1.800	3.9	3.500	5.4	6.500	7.2	9.500	8.6

Carley Daines and Partners Limited		Page 7
11 Bridgewater Road Worsley Manchester, M28 3JE	13947 Fletcher Fold Road Section 104 SW Calculations 1:30 Year Flows - No Tank	
Date 20/02/2025 File 13947 FLETCHER FOLD ROAD MD M...	Designed by A Mulligan Checked by D Middleton	
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

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 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 1.000
 Region England and Wales Ratio R 0.305 Cv (Winter) 1.000

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

									Water	Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)
S1.000	SS100	15 Summer	1	+0%					72.771	-0.529
S1.001	SS101	180 Summer	1	+0%					72.430	-0.790
S1.002	SS102	180 Summer	1	+0%	30/120 Summer				72.430	-0.680
S1.003	SS103	180 Summer	1	+0%	30/120 Summer				72.430	-0.560
S1.004	SS104 HB	180 Summer	1	+0%	1/15 Summer				72.429	0.759

		Flooded		Pipe		Level	
PN	US/MH Name	Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)	Status	Exceeded	
S1.000	SS100	0.000	0.03	10.6	OK		
S1.001	SS101	0.000	0.01	6.0	OK		
S1.002	SS102	0.000	0.02	16.4	OK		
S1.003	SS103	0.000	0.01	14.5	OK		
S1.004	SS104 HB	0.000	0.11	3.3	SURCHARGED		

Carley Daines and Partners Limited		Page 8
11 Bridgewater Road Worsley Manchester, M28 3JE	13947 Fletcher Fold Road Section 104 SW Calculations 1:30 Year Flows - No Tank	
Date 20/02/2025 File 13947 FLETCHER FOLD ROAD MD M...	Designed by A Mulligan Checked by D Middleton	
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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

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 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 1.000
 Region England and Wales Ratio R 0.305 Cv (Winter) 1.000

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

										Water Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)
S1.000	SS100	15 Summer	2	+0%					72.779	-0.521
S1.001	SS101	180 Summer	2	+0%					72.547	-0.673
S1.002	SS102	180 Summer	2	+0%	30/120 Summer				72.547	-0.563
S1.003	SS103	180 Summer	2	+0%	30/120 Summer				72.547	-0.443
S1.004	SS104 HB	180 Summer	2	+0%	1/15 Summer				72.547	0.877

		Flooded		Pipe		Level	
PN	US/MH Name	Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)	Status	Exceeded	
S1.000	SS100	0.000	0.04	13.8	OK		
S1.001	SS101	0.000	0.01	7.4	OK		
S1.002	SS102	0.000	0.02	19.7	OK		
S1.003	SS103	0.000	0.01	15.6	OK		
S1.004	SS104 HB	0.000	0.11	3.3	SURCHARGED		

Carley Daines and Partners Limited		Page 9
11 Bridgewater Road Worsley Manchester, M28 3JE	13947 Fletcher Fold Road Section 104 SW Calculations 1:30 Year Flows - No Tank	
Date 20/02/2025 File 13947 FLETCHER FOLD ROAD MD M...	Designed by A Mulligan Checked by D Middleton	
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

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 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 1.000
 Region England and Wales Ratio R 0.305 Cv (Winter) 1.000

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged
									Level (m)	Depth (m)
S1.000	SS100	180 Winter	30	+0%					73.205	-0.095
S1.001	SS101	180 Winter	30	+0%					73.205	-0.015
S1.002	SS102	180 Winter	30	+0%	30/120 Summer				73.205	0.095
S1.003	SS103	180 Winter	30	+0%	30/120 Summer				73.205	0.215
S1.004	SS104 HB	180 Winter	30	+0%	1/15 Summer				73.205	1.535

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level
							Exceeded
S1.000	SS100	0.000	0.02		6.8	OK	
S1.001	SS101	0.000	0.01		8.1	OK	
S1.002	SS102	0.000	0.02		16.1	SURCHARGED	
S1.003	SS103	0.000	0.01		12.5	SURCHARGED	
S1.004	SS104 HB	0.000	0.13		3.9	SURCHARGED	