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11 Bridgewater Road Worsley Manchester, M28 3JE	13881 - 1468 ASHTON OLD ROAD PROPOSED SW DRAINAGE CALCS	
Date 14/01/2025 File	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)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	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	0.010	4-8	0.000

Total Area Contributing (ha) = 0.010

Total Pipe Volume (m³) = 0.414

Network Design Table for Storm

- Indicates pipe length does not match coordinates

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	3.600#	0.050	72.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	14.000#	0.160	87.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	3.200#	0.060	53.3	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	2.600#	0.130	20.0	0.000	0.00	0.0	0.600	o	150	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	50.00	5.05	88.250	0.000	0.0	0.0	0.0	1.19	21.0	0.0
S1.001	50.00	5.27	88.200	0.000	0.0	0.0	0.0	1.08	19.0	0.0
S1.002	50.00	5.31	88.040	0.010	0.0	0.0	0.0	1.38	24.4	1.8
S1.003	50.00	5.33	87.980	0.010	0.0	0.0	0.0	2.26	40.0	1.8

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)
SSW PPIC 1	88.850	0.600	Open Manhole	600	S1.000	88.250	150				
SSW PPIC 2	88.850	0.650	Open Manhole	600	S1.001	88.200	150	S1.000	88.200	150	
SSW PPIC 3	88.850	0.810	Open Manhole	600	S1.002	88.040	150	S1.001	88.040	150	
SSW MH 4 HB	88.850	0.870	Open Manhole	1200	S1.003	87.980	150	S1.002	87.980	150	
S	88.850	1.000	Open Manhole	0		OUTFALL		S1.003	87.850	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SSW PPIC 1	136.578	38.313	136.578	38.313	Required	
SSW PPIC 2	136.313	80.281	136.313	80.281	Required	
SSW PPIC 3	280.547	81.078	280.547	81.078	Required	
SSW MH 4 HB	323.313	77.359	323.313	77.359	Required	
S	331.547	58.234			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	SSW PPIC 1	88.850	88.250	0.450	Open Manhole	600
S1.001	o	150	SSW PPIC 2	88.850	88.200	0.500	Open Manhole	600
S1.002	o	150	SSW PPIC 3	88.850	88.040	0.660	Open Manhole	600
S1.003	o	150	SSW MH 4 HB	88.850	87.980	0.720	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	3.600#	72.0	SSW PPIC 2	88.850	88.200	0.500	Open Manhole	600
S1.001	14.000#	87.5	SSW PPIC 3	88.850	88.040	0.660	Open Manhole	600
S1.002	3.200#	53.3	SSW MH 4 HB	88.850	87.980	0.720	Open Manhole	1200
S1.003	2.600#	20.0	S	88.850	87.850	0.850	Open Manhole	0

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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	SSW PPIC 1	600		136.578 #	38.313 #	136.578	38.313	
S1.001	SSW PPIC 2	600		136.313 #	80.281 #	136.313	80.281	
S1.002	SSW PPIC 3	600		280.547 #	81.078 #	280.547	81.078	
S1.003	SSW MH 4 HB	1200		323.313 #	77.359 #	323.313	77.359	

- Indicates pipe length does not match coordinates

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout
S1.003	S	0		331.547 #	58.234 #	

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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	0.000	0.000	0.000
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.010	0.010	0.010
1.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.010	0.010	0.010

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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S1.003	S	88.850	87.850	87.850	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 * 10m³/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)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SSW MH 4 HB, DS/PN: S1.003, Volume (m³): 1.0

Unit Reference	MD-SHE-0110-5000-0700-5000
Design Head (m)	0.700
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	110
Invert Level (m)	87.980
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	5.0	Kick-Flo®	0.483	4.2
Flush-Flo™	0.215	5.0	Mean Flow over Head Range	-	4.3

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	3.8	0.800	5.3	2.000	8.2	4.000	11.3	7.000	14.8
0.200	5.0	1.000	5.9	2.200	8.5	4.500	12.0	7.500	15.3
0.300	4.9	1.200	6.4	2.400	8.9	5.000	12.6	8.000	15.8
0.400	4.7	1.400	6.9	2.600	9.2	5.500	13.2	8.500	16.3
0.500	4.3	1.600	7.3	3.000	9.9	6.000	13.7	9.000	16.7
0.600	4.7	1.800	7.8	3.500	10.6	6.500	14.3	9.500	17.2

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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) 18.000 Cv (Summer) 1.000
 Region England and Wales Ratio R 0.360 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, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
									(m)	(m)
S1.000	SSW PPIC 1	120 Winter	1	+0%					88.250	-0.150
S1.001	SSW PPIC 2	120 Winter	1	+0%					88.200	-0.150
S1.002	SSW PPIC 3	15 Summer	1	+0%	100/15 Summer				88.069	-0.121
S1.003	SSW MH 4 HB	15 Summer	1	+0%	100/15 Summer				88.030	-0.100

PN	US/MH Name	Flooded		Pipe		Level Exceeded
		Volume (m³)	Flow / Cap.	Flow (l/s)	Status	
S1.000	SSW PPIC 1	0.000	0.00	0.0	OK	
S1.001	SSW PPIC 2	0.000	0.00	0.0	OK	
S1.002	SSW PPIC 3	0.000	0.08	1.3	OK	
S1.003	SSW MH 4 HB	0.000	0.06	1.3	OK	

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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) 18.000 Cv (Summer) 1.000
 Region England and Wales Ratio R 0.360 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, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
									(m)	(m)
S1.000	SSW PPIC 1	120 Winter	30	+0%					88.250	-0.150
S1.001	SSW PPIC 2	120 Winter	30	+0%					88.200	-0.150
S1.002	SSW PPIC 3	15 Summer	30	+0%	100/15 Summer				88.097	-0.093
S1.003	SSW MH 4 HB	15 Summer	30	+0%	100/15 Summer				88.089	-0.041

PN	US/MH Name	Flooded		Pipe		Level Exceeded
		Volume (m³)	Flow / Cap.	Flow (l/s)	Status	
S1.000	SSW PPIC 1	0.000	0.00	0.0	OK	
S1.001	SSW PPIC 2	0.000	0.00	0.0	OK	
S1.002	SSW PPIC 3	0.000	0.27	4.2	OK	
S1.003	SSW MH 4 HB	0.000	0.18	4.1	OK	

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100 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

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 Region England and Wales Ratio R 0.360 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, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
									(m)	(m)
S1.000	SSW PPIC 1	15 Summer	100	+45%					88.261	-0.139
S1.001	SSW PPIC 2	15 Summer	100	+45%					88.271	-0.079
S1.002	SSW PPIC 3	15 Summer	100	+45%	100/15	Summer			88.280	0.090
S1.003	SSW MH 4 HB	15 Summer	100	+45%	100/15	Summer			88.272	0.142

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level
							Exceeded
S1.000	SSW PPIC 1	0.000	0.00		0.0	OK	
S1.001	SSW PPIC 2	0.000	0.02		0.4	OK	
S1.002	SSW PPIC 3	0.000	0.40		6.2	SURCHARGED	
S1.003	SSW MH 4 HB	0.000	0.22		5.0	SURCHARGED	