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Merchant Exchange 17-19 Whitworth Street West Manchester M1 5WG		
Date 01/07/2022 12:02 File Proposed Drainage nort ...	Designed by Marta.Wolska Checked by	
Micro Drainage		Network 2018.1.1

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW north

« - 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
1.000	13.607	0.045	302.4	0.072	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	13.607	0.045	300.0	0.000	0.00	0.0	0.600	ooo	-1	Pipe/Conduit	
1.002	19.830	0.066	300.5	0.057	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	12.151	0.081	150.0	0.047	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)
1.000	50.00	5.25	71.800	0.072	0.0	0.0	0.0	0.90	63.5	9.7
1.001	50.00	5.50	71.755	0.072	0.0	0.0	0.0	0.90	191.4	9.7
1.002	50.00	5.79	71.560	0.129	0.0	0.0	0.0	1.17	185.7	17.5
1.003	50.00	6.03	71.494	0.176	0.0	0.0	0.0	0.82	14.5«	23.8

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PIPELINE SCHEDULES for SW north

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	N1	74.460	71.800	2.360	Open Manhole	1200
1.001	ooo	-1	tank	73.805	71.755	1.750	Open Manhole	100
1.002	o	450	n2	73.150	71.560	1.140	Open Manhole	3000
1.003	o	150	n3	73.150	71.494	1.506	Open Manhole	1350

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)
1.000	13.607	302.4	tank	73.805	71.755	1.750	Open Manhole	100
1.001	13.607	300.0	n2	73.150	71.710	1.140	Open Manhole	3000
1.002	19.830	300.5	n3	73.150	71.494	1.206	Open Manhole	1350
1.003	12.151	150.0		72.740	71.413	1.177	Open Manhole	0

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Area Summary for SW north

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.072	0.072	0.072
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.057	0.057	0.057
1.003	-	-	100	0.047	0.047	0.047
				Total	Total	Total
				0.176	0.176	0.176

Surcharged Outfall Details for SW north

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003		72.740	71.413	71.340	0	0

Datum (m) 71.490 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
60	1.250	300	1.250	540	1.250	780	1.250	1020	1.250	1260	1.250
120	1.250	360	1.250	600	1.250	840	1.250	1080	1.250	1320	1.250
180	1.250	420	1.250	660	1.250	900	1.250	1140	1.250	1380	1.250
240	1.250	480	1.250	720	1.250	960	1.250	1200	1.250	1440	1.250

Simulation Criteria for SW north

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.347
Return Period (years)	1	Profile Type	Summer
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.500	Cv (Winter)	0.840

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<u>Synthetic Rainfall Details</u> Storm Duration (mins) 30		
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Online Controls for SW north Hydro-Brake® Optimum Manhole: n3, DS/PN: 1.003, Volume (m³): 5.2 Unit Reference MD-SHE-0103-5000-1200-5000 Design Head (m)1.200 Design Flow (l/s)5.0 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)103 Invert Level (m)71.494 Minimum Outlet Pipe Diameter (mm)150 Suggested Manhole Diameter (mm)1200 <table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>1.200</td><td>5.0</td><td>Kick-Flo®</td><td>0.745</td><td>4.0</td></tr><tr><td>Flush-Flo™</td><td>0.354</td><td>5.0</td><td>Mean Flow over Head Range</td><td>-</td><td>4.4</td></tr></table> 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 <table><tr><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td></tr><tr><td>0.100</td><td>3.4</td><td>1.200</td><td>5.0</td><td>3.000</td><td>7.7</td><td>7.000</td><td>11.5</td></tr><tr><td>0.200</td><td>4.7</td><td>1.400</td><td>5.4</td><td>3.500</td><td>8.3</td><td>7.500</td><td>11.8</td></tr><tr><td>0.300</td><td>5.0</td><td>1.600</td><td>5.7</td><td>4.000</td><td>8.8</td><td>8.000</td><td>12.2</td></tr><tr><td>0.400</td><td>5.0</td><td>1.800</td><td>6.0</td><td>4.500</td><td>9.3</td><td>8.500</td><td>12.6</td></tr><tr><td>0.500</td><td>4.9</td><td>2.000</td><td>6.3</td><td>5.000</td><td>9.8</td><td>9.000</td><td>12.9</td></tr><tr><td>0.600</td><td>4.7</td><td>2.200</td><td>6.6</td><td>5.500</td><td>10.2</td><td>9.500</td><td>13.3</td></tr><tr><td>0.800</td><td>4.1</td><td>2.400</td><td>6.9</td><td>6.000</td><td>10.7</td><td></td><td></td></tr><tr><td>1.000</td><td>4.6</td><td>2.600</td><td>7.2</td><td>6.500</td><td>11.1</td><td></td><td></td></tr></table> <tr><td colspan="3">©1982-2018 Innovyze</td></tr>			Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.200	5.0	Kick-Flo®	0.745	4.0	Flush-Flo™	0.354	5.0	Mean Flow over Head Range	-	4.4	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	3.4	1.200	5.0	3.000	7.7	7.000	11.5	0.200	4.7	1.400	5.4	3.500	8.3	7.500	11.8	0.300	5.0	1.600	5.7	4.000	8.8	8.000	12.2	0.400	5.0	1.800	6.0	4.500	9.3	8.500	12.6	0.500	4.9	2.000	6.3	5.000	9.8	9.000	12.9	0.600	4.7	2.200	6.6	5.500	10.2	9.500	13.3	0.800	4.1	2.400	6.9	6.000	10.7			1.000	4.6	2.600	7.2	6.500	11.1			©1982-2018 Innovyze		
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SW north

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 Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Rainfall Model	FSR	Ratio R	0.347
Region	England and Wales	Cv (Summer)	0.740
M5-60 (mm)	18.500	Cv (Winter)	0.850

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Analysis Timestep 2.5 Second Increment (Extended)
      DTS Status                                OFF
      DVD Status                                ON
      Inertia Status                            ON
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Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Time Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

Water Level									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
1.000	N1 1440	Winter	1	+0%	30/600	Winter			71.966
1.001	tank 1440	Winter	1	+0%	30/360	Winter			71.966
1.002	n2 1440	Winter	1	+0%	30/180	Winter			71.966
1.003	n3 1440	Winter	1	+0%	1/15	Summer			71.966

PN	US/MH	Surcharged	Flooded	Flow / Cap.	Overflow (1/s)	Pipe	Status	Level
	Name	Depth (m)	Volume (m³)			Flow (1/s)		Exceeded
1.000	N1	-0.134	0.000	0.01		0.6	OK	
1.001	tank	-0.089	0.000	0.03		4.8	OK	
1.002	n2	-0.044	0.000	0.03		5.2	OK	
1.003	n3	0.322	0.000	0.38		5.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for SW north

Simulation Criteria

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	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep 2.5 Second Increment (Extended)	
DTS Status	OFF
DVD Status	ON
Inertia 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

										Water
	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name		Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
1.000	N1	1440	Winter	100	+40%	30/600	Winter			72.767
1.001	tank	1440	Winter	100	+40%	30/360	Winter			72.767
1.002	n2	1440	Winter	100	+40%	30/180	Winter			72.767
1.003	n3	1440	Winter	100	+40%	1/15	Summer			72.767

PN	US/MH	Surcharged	Flooded			Pipe	Status	Level Exceeded
	Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		
1.000	N1	0.667	0.000	0.04		2.2	SURCHARGED	
1.001	tank	0.712	0.000	0.06		9.8	SURCHARGED	
1.002	n2	0.757	0.000	0.04		6.1	SURCHARGED	
1.003	n3	1.123	0.000	0.38		5.0	SURCHARGED	