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Morgan House, Mount View Standard Way Northallerton, DL6 2YD	Parkmount Road, Manchester Northern Network -lin30 UU	
Date 04/04/2024 File P07 - SW Calcs - North ...	Designed by ZS Checked by ZS	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for North - SW lin100+45CC (P07)

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.400	Add Flow / Climate Change (%)	0
Ratio R	0.344	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.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for North - SW lin100+45CC (P07)

« - 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	14.115	0.036	395.0	0.036	5.00	0.0	0.600	o	900	Pipe/Conduit	
S1.001	42.945	0.109	394.0	0.078	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S1.002	12.023	0.150	80.2	0.037	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	17.986	1.026	17.5	0.001	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)
S1.000	50.00	5.15	78.525	0.036	0.0	0.0	0.0	1.57	999.0	4.9
S1.001	50.00	5.56	78.339	0.114	0.0	0.0	0.0	1.73	1498.0	15.4
S1.002	50.00	5.74	78.230	0.151	0.0	0.0	0.0	1.12	19.9«	20.4
S1.003	50.00	5.82	76.136	0.152	0.0	0.0	0.0	3.77	266.7	20.6

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Manhole Schedules for North - SW lin100+45CC (P07)

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)
S1	82.291	3.766	Open Manhole	2100	S1.000	78.525	900			
S2	82.416	4.077	Open Manhole	2400	S1.001	78.339	1050	S1.000	78.489	900
S3 - HB	82.265	4.035	Open Manhole	2400	S1.002	78.230	150	S1.001	78.230	1050
S9	81.631	5.495	Open Manhole	1800	S1.003	76.136	300	S1.002	78.080	150
S - Exg. CWS01	80.200	5.090	Open Manhole	1500		OUTFALL		S1.003	75.110	300

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	386015.567	402207.720	386015.567	402207.720	Required	
S2	386018.191	402193.802	386018.191	402193.802	Required	
S3 - HB	386026.294	402151.628	386026.294	402151.628	Required	
S9	386017.312	402143.636	386017.312	402143.636	Required	
S - Exg. CWS01	385999.646	402140.260			No Entry	

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PIPELINE SCHEDULES for North - SW lin100+45CC (P07)

Upstream Manhole

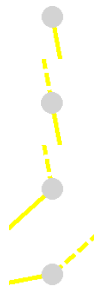
PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S1.000	o	900	S1	82.291	78.525	2.866	Open Manhole	2100
S1.001	o	1050	S2	82.416	78.339	3.027	Open Manhole	2400
S1.002	o	150	S3 - HB	82.265	78.230	3.885	Open Manhole	2400
S1.003	o	300	S9	81.631	76.136	5.195	Open Manhole	1800

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	14.115	395.0	S2	82.416	78.489	3.027	Open Manhole	2400
S1.001	42.945	394.0	S3 - HB	82.265	78.230	2.985	Open Manhole	2400
S1.002	12.023	80.2	S9	81.631	78.080	3.401	Open Manhole	1800
S1.003	17.986	17.5	S - Exg. CWS01	80.200	75.110	4.790	Open Manhole	1500

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Setting Out Information - True Coordinates (North - SW lin100+45CC (P07))

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S1.000	S1	2100		386015.567	402207.720	386015.567	402207.720	
S1.001	S2	2400		386018.191	402193.802	386018.191	402193.802	
S1.002	S3 - HB	2400		386026.294	402151.628	386026.294	402151.628	
S1.003	S9	1800		386017.312	402143.636	386017.312	402143.636	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.003	S - Exg. CWS01	1500		385999.646	402140.260	

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Area Summary for North - SW lin100+45CC (P07)

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.036	0.036	0.036
1.001	-	-	100	0.078	0.078	0.078
1.002	-	-	100	0.037	0.037	0.037
1.003	-	-	100	0.001	0.001	0.001
				Total	Total	Total
				0.152	0.152	0.152

Free Flowing Outfall Details for North - SW lin100+45CC (P07)

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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Sl.003 S - Exg.	CWS01	80.200	75.110	0.000	1500	0
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Simulation Criteria for North - SW lin100+45CC (P07)

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 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)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.300	Storm Duration (mins)	30
Ratio R	0.344		

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Online Controls for North - SW lin100+45CC (P07)

Hydro-Brake® Optimum Manhole: S3 - HB, DS/PN: S1.002, Volume (m³): 53.4

Unit Reference	MD-SHE-0100-5600-1750-5600
Design Head (m)	1.750
Design Flow (l/s)	5.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	78.230
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.750	5.6
Flush-Flo™	0.437	5.2
Kick-Flo®	0.896	4.1
Mean Flow over Head Range	-	4.7

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)
0.100	3.3	1.200	4.7	3.000	7.2	7.000	10.8
0.200	4.7	1.400	5.0	3.500	7.7	7.500	11.1
0.300	5.0	1.600	5.4	4.000	8.2	8.000	11.5
0.400	5.1	1.800	5.7	4.500	8.7	8.500	11.8
0.500	5.1	2.000	6.0	5.000	9.2	9.000	12.1
0.600	5.1	2.200	6.2	5.500	9.6	9.500	12.4
0.800	4.6	2.400	6.5	6.000	10.0		
1.000	4.3	2.600	6.7	6.500	10.4		

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<u>Storage Structures for North - SW lin100+45CC (P07)</u> <u>Cellular Storage Manhole: S3 - HB, DS/PN: S1.002</u> Invert Level (m) 79.100 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>30.0</td><td>0.0</td><td>1.001</td><td>0.0</td><td>0.0</td></tr><tr><td>1.000</td><td>30.0</td><td>0.0</td><td></td><td></td><td></td></tr></table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	30.0	0.0	1.001	0.0	0.0	1.000	30.0	0.0			
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)															
0.000	30.0	0.0	1.001	0.0	0.0															
1.000	30.0	0.0																		
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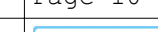
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for North - SW 1in100+45CC (P07)

Simulation Criteria

Synthetic Rainfall Details

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

									Water
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
S1.000	S1	60 Winter	30	+0%	100/30 Summer				78.966
S1.001	S2	60 Winter	30	+0%	100/30 Summer				78.966
S1.002	S3 - HB	60 Winter	30	+0%	2/15 Summer				78.965
S1.003	S9	15 Summer	30	+0%					76.168

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for North - SW 1in100+45CC (P07)

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 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		

Synthetic Rainfall Details

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

PN	US/MH		Return Period	Climate Change	First (X) SurchARGE	First (Y) Flood	First (Z) Overflow	Overflow Act.
	Name	Storm						
S1.000	S1	120 Winter	100	+45%	100/30 Summer			
S1.001	S2	120 Winter	100	+45%	100/30 Summer			
S1.002	S3 - HB	120 Winter	100	+45%	2/15 Summer			
S1.003	S9	15 Summer	100	+45%				

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Innovyze	Network 2020.1.3	
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for North - SW lin100+45CC (P07)</u>		