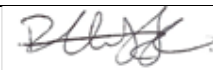




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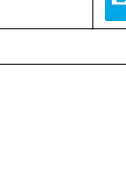
**786 Stockport Road
Manchester**

**Hydraulic Calculations
December 2024**

	Initials	Signature	Date
Prepared by:	R.C		12/24
Checked by:	S.J.B		12/24
Approved by:	S.J.B		12/24

Bell Munro Consulting Ltd.
Consulting Civil and Structural Engineers
Turing House
5 Archway
Manchester
M15 5RL
Tel: 0161 209 8032
Fax: 0161 209 8033
E-Mail: consulting@bellmunro.co.uk
Ref: J8683

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XP Solutions		Network 2020.1.3																												
<p style="text-align: center;"><u>STORM SEWER DESIGN by the Modified Rational Method</u></p> <p style="text-align: center;"><u>Design Criteria for Storm</u></p> <p style="text-align: center;">Pipe Sizes STANDARD Manhole Sizes STANDARD</p> <p style="text-align: center;">FSR Rainfall Model - England and Wales</p> <table> <tr> <td>Return Period (years)</td> <td>100</td> <td>PIMP (%)</td> <td>100</td> </tr> <tr> <td>M5-60 (mm)</td> <td>18.000</td> <td>Add Flow / Climate Change (%)</td> <td>0</td> </tr> <tr> <td>Ratio R</td> <td>0.361</td> <td>Minimum Backdrop Height (m)</td> <td>0.200</td> </tr> <tr> <td>Maximum Rainfall (mm/hr)</td> <td>50</td> <td>Maximum Backdrop Height (m)</td> <td>1.500</td> </tr> <tr> <td>Maximum Time of Concentration (mins)</td> <td>30</td> <td>Min Design Depth for Optimisation (m)</td> <td>1.200</td> </tr> <tr> <td>Foul Sewage (l/s/ha)</td> <td>0.000</td> <td>Min Vel for Auto Design only (m/s)</td> <td>1.00</td> </tr> <tr> <td>Volumetric Runoff Coeff.</td> <td>0.750</td> <td>Min Slope for Optimisation (1:X)</td> <td>500</td> </tr> </table> <p style="text-align: center;">Designed with Level Soffits</p>			Return Period (years)	100	PIMP (%)	100	M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0	Ratio R	0.361	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
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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	User	-	100	0.044	0.044	0.044
2.000	User	-	100	0.009	0.009	0.009
	User	-	100	0.003	0.003	0.012
	User	-	100	0.015	0.015	0.027
3.000	User	-	100	0.018	0.018	0.018
3.001	User	-	100	0.006	0.006	0.006
1.001	User	-	100	0.007	0.007	0.007
	User	-	100	0.005	0.005	0.012
4.000	User	-	100	0.012	0.012	0.012
	User	-	100	0.003	0.003	0.015
5.000	User	-	100	0.007	0.007	0.007
6.000	User	-	100	0.003	0.003	0.003
	User	-	100	0.009	0.009	0.012
5.001	User	-	100	0.007	0.007	0.007
1.002	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.013	0.013	0.013
				Total	Total	Total
				0.162	0.162	0.162

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)
1.003		19.920	18.303	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	0.000
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	M5-60 (mm)	18.000
Return Period (years)	100	Ratio R	0.361
Region England and Wales Profile Type Summer			

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<div>Synthetic Rainfall Details</div> <div>Cv (Summer) 0.750 Storm Duration (mins) 30 Cv (Winter) 0.840</div>		
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S12, DS/PN: 1.003, Volume (m³): 4.1

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level	18.449
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)	1.500	5.0	Kick-Flo®	0.878	3.9
Flush-Flo™	0.431	4.9	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)
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.7
0.300	4.8	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.4	4.500	8.4	8.500	11.3
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.8	2.200	6.0	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.5	6.500	10.0		

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Storage Structures for Storm

Cellular Storage Manhole: S11, DS/PN: 1.002

Invert Level (m) 18.504 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	96.0	96.0	0.801	0.0	128.0
0.800	96.0	128.0			

