

Opus International Consultants (UK) Ltd										Page 1																																																																																																															
Modulus House Salterns Lane Fareham PO16 0QS					90 Rose Green Road Bognor Regis																																																																																																																				
Date 05.02.2018					Designed by JPS																																																																																																																				
File E-E1644 SW MODEL.MDX					Checked by APT																																																																																																																				
XP Solutions					Network 2015.2																																																																																																																				
<u>STORM SEWER DESIGN by the Modified Rational Method</u> <u>Design Criteria for Storm</u> Pipe Sizes STANDARD Manhole Sizes STANDARD FSR Rainfall Model - England and Wales <table><tr><td>Return Period (years)</td><td>1</td><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>M5-60 (mm)</td><td>19.000</td><td>Minimum Backdrop Height (m)</td><td>0.200</td></tr><tr><td>Ratio R</td><td>0.350</td><td>Maximum Backdrop Height (m)</td><td>1.500</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>50</td><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Maximum Time of Concentration (mins)</td><td>30</td><td>Min Vel for Auto Design only (m/s)</td><td>1.00</td></tr><tr><td>Foul Sewage (l/s/ha)</td><td>0.000</td><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr><tr><td>Volumetric Runoff Coeff.</td><td>0.750</td><td></td><td></td></tr></table> Designed with Level Soffits												Return Period (years)	1	Add Flow / Climate Change (%)	0	M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200	Ratio R	0.350	Maximum Backdrop Height (m)	1.500	Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200	Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00	Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500	Volumetric Runoff Coeff.	0.750																																																																																				
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XP Solutions	Network 2015.2	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.014	0.014	0.014
	User	-	100	0.010	0.010	0.024
	User	-	100	0.010	0.010	0.035
	User	-	100	0.010	0.010	0.045
	User	-	100	0.048	0.048	0.093
1.001	User	-	100	0.007	0.007	0.007
1.002	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.005	0.005	0.005
				Total	Total	Total
				0.105	0.105	0.105

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	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 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)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: S4, DS/PN: S1.003, Volume (m³): 2.4

Unit Reference	MD-SHE-0099-5000-1400-5000
Design Head (m)	1.400
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	99
Invert Level (m)	4.290
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.0
Flush-Flo™	0.413	5.0
Kick-Flo®	0.852	4.0
Mean Flow over Head Range	-	4.4

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	4.6	3.000	7.1	7.000	10.6
0.200	4.6	1.400	5.0	3.500	7.7	7.500	11.0
0.300	4.9	1.600	5.3	4.000	8.2	8.000	11.3
0.400	5.0	1.800	5.6	4.500	8.6	8.500	11.7
0.500	4.9	2.000	5.9	5.000	9.1	9.000	12.0
0.600	4.8	2.200	6.2	5.500	9.5	9.500	12.3
0.800	4.3	2.400	6.4	6.000	9.9		
1.000	4.3	2.600	6.7	6.500	10.3		

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Margin for Flood Risk Warning (mm)					300.0																																																																									
Analysis Timestep		2.5 Second Increment (Extended)																																																																												
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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																																																																												
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