

The Civil Engineering Practice										Page 1																																																																																																																																																																																																																
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<u>STORM SEWER DESIGN by the Modified Rational Method</u> <u>Design Criteria for NETWORK 6.SWS</u> Pipe Sizes NETWORK 9 Manhole Sizes NETWORK 9 FSR Rainfall Model - England and Wales <table><tr><td>Return Period (years)</td><td>2</td><td>PIMP (%)</td><td>100</td></tr><tr><td>M5-60 (mm)</td><td>19.600</td><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>Ratio R</td><td>0.350</td><td>Minimum Backdrop Height (m)</td><td>0.500</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>50</td><td>Maximum Backdrop Height (m)</td><td>1.000</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>0.75</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> Designed with Level Soffits												Return Period (years)	2	PIMP (%)	100	M5-60 (mm)	19.600	Add Flow / Climate Change (%)	0	Ratio R	0.350	Minimum Backdrop Height (m)	0.500	Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.000	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)	0.75	Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500																																																																																																																																																																																			
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<u>PIPELINE SCHEDULES for NETWORK 6.SWS</u> <u>Upstream Manhole</u> <table><tr><th>PN</th><th>Hyd Sect</th><th>Diam (mm)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr><tr><td>1.000</td><td>o</td><td>100</td><td>1</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.001</td><td>o</td><td>100</td><td>2</td><td>16.250</td><td>15.524</td><td>0.627</td><td>Open Manhole</td><td>1200</td></tr><tr><td>2.000</td><td>o</td><td>100</td><td>8</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.002</td><td>o</td><td>100</td><td>3</td><td>16.250</td><td>15.426</td><td>0.724</td><td>Open Manhole</td><td>1200</td></tr><tr><td>3.000</td><td>o</td><td>100</td><td>9</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.003</td><td>o</td><td>100</td><td>4</td><td>16.250</td><td>15.413</td><td>0.737</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.004</td><td>o</td><td>100</td><td>5</td><td>16.250</td><td>15.361</td><td>0.789</td><td>Open Manhole</td><td>1200</td></tr><tr><td>4.000</td><td>o</td><td>100</td><td>10</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>5.000</td><td>o</td><td>100</td><td>11</td><td>16.250</td><td>15.650</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.005</td><td>o</td><td>100</td><td>6</td><td>16.250</td><td>15.307</td><td>0.843</td><td>Open Manhole</td><td>1200</td></tr></table> <u>Downstream Manhole</u> <table><tr><th>PN</th><th>Length (m)</th><th>Slope (1:X)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr><tr><td>1.000</td><td>13.024</td><td>103.0</td><td>2</td><td>16.250</td><td>15.524</td><td>0.627</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.001</td><td>10.052</td><td>103.0</td><td>3</td><td>16.250</td><td>15.426</td><td>0.724</td><td>Open Manhole</td><td>1200</td></tr><tr><td>2.000</td><td>14.867</td><td>66.3</td><td>3</td><td>16.250</td><td>15.426</td><td>0.724</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.002</td><td>1.369</td><td>103.0</td><td>4</td><td>16.250</td><td>15.413</td><td>0.737</td><td>Open Manhole</td><td>1200</td></tr><tr><td>3.000</td><td>15.130</td><td>63.7</td><td>4</td><td>16.250</td><td>15.413</td><td>0.737</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.003</td><td>5.348</td><td>103.0</td><td>5</td><td>16.250</td><td>15.361</td><td>0.789</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.004</td><td>5.497</td><td>102.9</td><td>6</td><td>16.250</td><td>15.307</td><td>0.843</td><td>Open Manhole</td><td>1200</td></tr><tr><td>4.000</td><td>7.128</td><td>20.8</td><td>6</td><td>16.250</td><td>15.307</td><td>0.843</td><td>Open Manhole</td><td>1200</td></tr><tr><td>5.000</td><td>7.444</td><td>21.7</td><td>6</td><td>16.250</td><td>15.307</td><td>0.843</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.005</td><td>9.975</td><td>102.9</td><td>7</td><td>16.300</td><td>15.210</td><td>0.990</td><td>Open Manhole</td><td>0</td></tr></table>										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	100	1	16.250	15.650	0.500	Open Manhole	1200	1.001	o	100	2	16.250	15.524	0.627	Open Manhole	1200	2.000	o	100	8	16.250	15.650	0.500	Open Manhole	1200	1.002	o	100	3	16.250	15.426	0.724	Open Manhole	1200	3.000	o	100	9	16.250	15.650	0.500	Open Manhole	1200	1.003	o	100	4	16.250	15.413	0.737	Open Manhole	1200	1.004	o	100	5	16.250	15.361	0.789	Open Manhole	1200	4.000	o	100	10	16.250	15.650	0.500	Open Manhole	1200	5.000	o	100	11	16.250	15.650	0.500	Open Manhole	1200	1.005	o	100	6	16.250	15.307	0.843	Open Manhole	1200	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	13.024	103.0	2	16.250	15.524	0.627	Open Manhole	1200	1.001	10.052	103.0	3	16.250	15.426	0.724	Open Manhole	1200	2.000	14.867	66.3	3	16.250	15.426	0.724	Open Manhole	1200	1.002	1.369	103.0	4	16.250	15.413	0.737	Open Manhole	1200	3.000	15.130	63.7	4	16.250	15.413	0.737	Open Manhole	1200	1.003	5.348	103.0	5	16.250	15.361	0.789	Open Manhole	1200	1.004	5.497	102.9	6	16.250	15.307	0.843	Open Manhole	1200	4.000	7.128	20.8	6	16.250	15.307	0.843	Open Manhole	1200	5.000	7.444	21.7	6	16.250	15.307	0.843	Open Manhole	1200	1.005	9.975	102.9	7	16.300	15.210	0.990	Open Manhole	0
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)																																																																																																																																																																																																							
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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 Storage Structures		0																																																																																																																																				
Number of Online Controls		0		Number of Time/Area Diagrams		0																																																																																																																																				
Number of Offline Controls		0		Number of Real Time Controls		0																																																																																																																																				
<u>Synthetic Rainfall Details</u>																																																																																																																																										
Rainfall Model		FSR		Ratio R		0.350																																																																																																																																				
Region England and Wales		Cv (Summer)		0.750																																																																																																																																						
M5-60 (mm)		19.500		Cv (Winter)		0.840																																																																																																																																				
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, 240, 360, 480, 960, 1440																																																																																																																																								
Return Period(s) (years)		100																																																																																																																																								
Climate Change (%)		40																																																																																																																																								
<table><tr><td></td><td>US/MH</td><td></td><td>Return</td><td>Climate</td><td>First (X)</td><td>First (Y)</td><td>First (Z)</td><td>Overflow</td><td>Water</td></tr><tr><td>PN</td><td>Name</td><td>Storm</td><td>Period</td><td>Change</td><td>Surcharge</td><td>Flood</td><td>Overflow</td><td>Act.</td><td>Level</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>(m)</td></tr><tr><td>1.000</td><td>1</td><td>60 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.650</td></tr><tr><td>1.001</td><td>2</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Winter</td><td></td><td></td><td></td><td>15.633</td></tr><tr><td>2.000</td><td>8</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.689</td></tr><tr><td>1.002</td><td>3</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>15.622</td></tr><tr><td>3.000</td><td>9</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.683</td></tr><tr><td>1.003</td><td>4</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>15.614</td></tr><tr><td>1.004</td><td>5</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>15.556</td></tr><tr><td>4.000</td><td>10</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.675</td></tr><tr><td>5.000</td><td>11</td><td>15 Winter</td><td>100</td><td>+40%</td><td></td><td></td><td></td><td></td><td>15.664</td></tr><tr><td>1.005</td><td>6</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>15.489</td></tr></table>										US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level										(m)	1.000	1	60 Winter	100	+40%					15.650	1.001	2	15 Winter	100	+40%	100/15 Winter				15.633	2.000	8	15 Winter	100	+40%					15.689	1.002	3	15 Winter	100	+40%	100/15 Summer				15.622	3.000	9	15 Winter	100	+40%					15.683	1.003	4	15 Winter	100	+40%	100/15 Summer				15.614	1.004	5	15 Winter	100	+40%	100/15 Summer				15.556	4.000	10	15 Winter	100	+40%					15.675	5.000	11	15 Winter	100	+40%					15.664	1.005	6	15 Winter	100	+40%	100/15 Summer				15.489
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water																																																																																																																																	
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<table><tr><td colspan="5">Surcharged Flooded</td><td colspan="2">Pipe</td><td colspan="2"></td></tr><tr><td>PN</td><td>US/MH</td><td>Depth</td><td>Volume</td><td>Flow /</td><td>Overflow</td><td>Flow</td><td></td><td>Level</td><td></td></tr><tr><td></td><td>Name</td><td>(m)</td><td>(m³)</td><td>Cap.</td><td>(l/s)</td><td>(l/s)</td><td>Status</td><td>Exceeded</td><td></td></tr><tr><td>1.000</td><td>1</td><td>-0.100</td><td>0.000</td><td>0.00</td><td></td><td>0.0</td><td>OK</td><td></td><td></td></tr><tr><td>1.001</td><td>2</td><td>0.010</td><td>0.000</td><td>0.42</td><td></td><td>2.3</td><td>SURCHARGED</td><td></td><td></td></tr><tr><td>2.000</td><td>8</td><td>-0.061</td><td>0.000</td><td>0.32</td><td></td><td>2.3</td><td>OK</td><td></td><td></td></tr><tr><td>1.002</td><td>3</td><td>0.096</td><td>0.000</td><td>0.82</td><td></td><td>3.2</td><td>SURCHARGED</td><td></td><td></td></tr><tr><td>3.000</td><td>9</td><td>-0.067</td><td>0.000</td><td>0.23</td><td></td><td>1.7</td><td>OK</td><td></td><td></td></tr><tr><td>1.003</td><td>4</td><td>0.102</td><td>0.000</td><td>1.06</td><td></td><td>5.5</td><td>SURCHARGED</td><td></td><td></td></tr></table>									Surcharged Flooded					Pipe				PN	US/MH	Depth	Volume	Flow /	Overflow	Flow		Level			Name	(m)	(m³)	Cap.	(l/s)	(l/s)	Status	Exceeded		1.000	1	-0.100	0.000	0.00		0.0	OK			1.001	2	0.010	0.000	0.42		2.3	SURCHARGED			2.000	8	-0.061	0.000	0.32		2.3	OK			1.002	3	0.096	0.000	0.82		3.2	SURCHARGED			3.000	9	-0.067	0.000	0.23		1.7	OK			1.003	4	0.102	0.000	1.06		5.5	SURCHARGED																																											
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Innovyze				Network 2017.1.2				
<u>Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 6.SWS</u>								
PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Pipe Flow	Status	Level Exceeded
		Depth (m)	Volume (m³)	Cap.	(l/s)	(l/s)		
1.004	5	0.096	0.000	1.12		5.9	SURCHARGED	
4.000	10	-0.075	0.000	0.14		1.7	OK	
5.000	11	-0.086	0.000	0.05		0.6	OK	
1.005	6	0.082	0.000	1.37		7.6	SURCHARGED	
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