

Banners Gate Ltd		Page 0
Cavendish House 10-11 Birmingham Street Halesowen W.Midlands B63 3HN		Littlehampton
Date 17/08/2019 File STORM NETWORK 1 20.05.1...		Designed by TB Checked by
XP Solutions		Network 2018.1.1



STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for NETWORK 1 20.05.13.SWS

Pipe Sizes NETWORK 1 19.08.20 Manhole Sizes NETWORK 1 19.08.20

FEH Rainfall Model	
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 503220 103890
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for NETWORK 1 20.05.13.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.164	4-8	0.210	8-12	0.014

Total Area Contributing (ha) = 0.388

Total Pipe Volume (m³) = 10.118

Network Design Table for NETWORK 1 20.05.13.SWS

« - 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	30.491	0.182	167.5	0.100	6.00	0.0	0.600	o	225	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	6.50	5.911	0.100	0.0	0.0	0.0	1.01	40.1	13.5

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1.003	-	-	100	0.092	0.092	0.092																																																																																																																																																						
3.000	-	-	100	0.045	0.045	0.045																																																																																																																																																						
1.004	-	-	100	0.026	0.026	0.026																																																																																																																																																						
1.005	-	-	100	0.000	0.000	0.000																																																																																																																																																						
1.006	-	-	100	0.000	0.000	0.000																																																																																																																																																						
1.007	-	-	100	0.000	0.000	0.000																																																																																																																																																						
Total				0.388	0.388	0.388																																																																																																																																																						
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)																																																																																																																																																						
S1.007	SSWA2_01	6.900	5.000	0.000	1200	0																																																																																																																																																						
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 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																																																																																																																																																									
Rainfall Model	FEH	Summer Storms	Yes																																																																																																																																																									
Return Period (years)	2	Winter Storms	Yes																																																																																																																																																									
FEH Rainfall Version	2013	Cv (Summer)	0.750																																																																																																																																																									
Site Location GB	503220 103890	Cv (Winter)	0.840																																																																																																																																																									
Data Type	Point Storm Duration (mins)		30																																																																																																																																																									
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XP Solutions		Network 2018.1.1

Online Controls for NETWORK 1 20.05.13.SWS

Hydro-Brake® Optimum Manhole: SHB1, DS/PN: S1.007, Volume (m³): 7.4

Unit Reference	MD-SHE-0093-5000-1891-5000
Design Head (m)	1.891
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	93
Invert Level (m)	5.180
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.891	5.0
Flush-Flo™	0.408	4.3
Kick-Flo®	0.832	3.4
Mean Flow over Head Range	-	4.0

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	2.9	1.200	4.0	3.000	6.2	7.000	9.3
0.200	3.9	1.400	4.3	3.500	6.7	7.500	9.6
0.300	4.2	1.600	4.6	4.000	7.1	8.000	9.9
0.400	4.3	1.800	4.9	4.500	7.5	8.500	10.2
0.500	4.2	2.000	5.1	5.000	7.9	9.000	10.4
0.600	4.1	2.200	5.4	5.500	8.3	9.500	10.7
0.800	3.6	2.400	5.6	6.000	8.6		
1.000	3.7	2.600	5.8	6.500	8.9		

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Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 1
20.05.13.SWS

Simulation Criteria

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	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	FEH	Data Type	Point
FEH Rainfall Version	2013 Cv (Summer)		0.750
Site Location	GB 503220 103890	Cv (Winter)	0.840

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)	30
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S2	15 Winter	30	+0%	30/15 Summer				6.600
S1.001	S4	15 Winter	30	+0%	30/15 Summer				6.484
S1.002	S6	15 Winter	30	+0%	30/15 Summer				6.186
S2.000	S8	15 Winter	30	+0%	30/15 Summer				6.134
S1.003	S10	15 Winter	30	+0%	30/15 Summer				6.100
S3.000	S12	15 Winter	30	+0%					6.428
S1.004	S14	15 Winter	30	+0%	30/15 Summer				5.934
S1.005	SCP1	180 Winter	30	+0%	30/15 Summer				5.915
S1.006	SCS1	180 Winter	30	+0%	30/15 Summer				5.911
S1.007	SHB1	180 Winter	30	+0%	30/15 Summer				5.909

PN	US/MH Name	Depth (m)	Surcharged Volume (m³)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2	0.464	0.000	0.84		31.5		SURCHARGED	
S1.001	S4	0.530	0.000	1.37		50.6		SURCHARGED	

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Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 1 20.05.13.SWS								
PN	US/MH Name	Depth (m)	Surcharged Volume (m³)	Flooded Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S6	0.386	0.000	0.79		50.8	SURCHARGED	
S2.000	S8	0.266	0.000	0.37		14.2	SURCHARGED	
S1.003	S10	0.410	0.000	1.34		85.8	SURCHARGED	
S3.000	S12	-0.074	0.000	0.52		15.7	OK	
S1.004	S14	0.334	0.000	1.75		107.1	SURCHARGED	
S1.005	SCP1	0.355	0.000	0.62		31.3	SURCHARGED	
S1.006	SCS1	0.411	0.000	0.13		4.9	SURCHARGED	
S1.007	SHB1	0.579	0.000	0.29		4.3	SURCHARGED	
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