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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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Area Summary for NETWORK 1 20.05.13.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.100	0.100	0.100
1.001	-	-	100	0.080	0.080	0.080
1.002	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.045	0.045	0.045
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	Total	Total
				0.388	0.388	0.388

Free Flowing Outfall Details for NETWORK 1 20.05.13.SWS

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

Simulation Criteria for NETWORK 1 20.05.13.SWS

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
Number of Online Controls		1	Number of Time/Area Diagrams
Number of Offline Controls		0	Number of Real Time Controls

Synthetic Rainfall Details

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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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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Storage Structures for NETWORK 1 20.05.13.SWS

Cellular Storage Manhole: SCS1, DS/PN: S1.006

Invert Level (m) 5.200 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	150.0	150.0	1.201	0.0	208.8
1.200	150.0	208.8			

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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)	100
Climate Change (%)	30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S2	15 Winter	100	+30%	100/15 Summer	100/15 Summer		
S1.001	S4	15 Winter	100	+30%	100/15 Summer			
S1.002	S6	15 Winter	100	+30%	100/15 Summer			
S2.000	S8	240 Winter	100	+30%	100/15 Summer	100/15 Winter		
S1.003	S10	240 Winter	100	+30%	100/15 Summer			
S3.000	S12	15 Winter	100	+30%	100/15 Summer			
S1.004	S14	240 Winter	100	+30%	100/15 Summer			
S1.005	SCP1	240 Winter	100	+30%	100/15 Summer			
S1.006	SCS1	240 Winter	100	+30%	100/15 Summer			
S1.007	SHB1	240 Winter	100	+30%	100/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Pipe		Status	Level Exceeded
					Flow / Cap. (l/s)	Overflow (l/s)		
S1.000	S2	7.436	1.300	4.677	1.44	54.1	FLOOD	4
S1.001	S4	7.393	1.439	0.000	1.89	69.9	SURCHARGED	

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Cavendish House 10-11 Birmingham Street Halesowen W.Midlands B63 3HN				Littlehampton					
Date 17/08/2019				Designed by TB					
File STORM NETWORK 1 20.05.1...				Checked by					
XP Solutions				Network 2018.1.1					
Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 1 20.05.13.SWS									
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S6	6.947	1.147	0.000	1.04		66.7	SURCHARGED	3
S2.000	S8	6.867	0.999	2.211	0.12		4.7	FLOOD	
S1.003	S10	6.875	1.185	0.000	0.53		34.0	SURCHARGED	
S3.000	S12	6.948	0.446	0.000	0.73		22.3	SURCHARGED	
S1.004	S14	6.872	1.272	0.000	0.68		41.6	SURCHARGED	
S1.005	SCP1	6.869	1.309	0.000	0.81		41.1	SURCHARGED	
S1.006	SCS1	6.864	1.364	0.000	0.18		6.8	SURCHARGED	
S1.007	SHB1	6.862	1.532	0.000	0.32		4.7	SURCHARGED	
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