


Haswell Associates Limited		Page 1
55 Pollards Green Chelmsford Essex	Herne House Network including soakaway 1 year	
Date 30/10/2019 File HERNE HOUSE SWS NETWORK PLUS	Designed by m.d.c. Checked by	
Micro Drainage	Network 2017.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD









FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
<b>M5-60 (mm) 26.250</b>		Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - 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
1.000	24.908	0.250	99.6	0.022	2.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	18.711	0.190	98.5	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	12.755	0.130	98.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	10.209	0.105	97.2	0.005	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	11.071	0.675	16.4	0.017	2.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	6.354	0.075	84.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	2.000	0.015	133.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
<b>1.006</b>	<b>1.000</b>	<b>0.008</b>	<b>125.0</b>	<b>0.000</b>	<b>0.00</b>	<b>0.0</b>	<b>0.600</b>	<b>o</b>	<b>100</b>	<b>Pipe/Conduit</b>	

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)
1.000	50.00	2.32	<b>8.275</b>	0.022	0.0	0.0	0.0	1.31	52.1	3.0
1.001	50.00	2.55	8.025	0.040	0.0	0.0	0.0	1.32	52.4	5.4
1.002	50.00	2.71	7.835	0.040	0.0	0.0	0.0	1.32	52.5	5.4
1.003	50.00	2.84	7.705	0.045	0.0	0.0	0.0	1.33	52.7	6.1
2.000	50.00	2.07	<b>8.350</b>	0.017	0.0	0.0	0.0	2.50	44.2	2.3
1.004	50.00	2.92	7.600	0.062	0.0	0.0	0.0	1.42	56.5	8.4
1.005	50.00	2.95	7.525	0.062	0.0	0.0	0.0	1.13	45.0	8.4
<b>1.006</b>	<b>50.00</b>	<b>2.97</b>	<b>7.723</b>	<b>0.062</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.69</b>	<b>5.4«</b>	<b>8.4</b>

**Pipe run 1.006 is a dummy pipe simply to cap off the system as it's not possible in MicroDrainage to put the soakaway at the end of the network**

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
ICS1	8.800	0.525	Open Manhole	600	1.000	8.275	225				
ICS2	8.800	0.775	Open Manhole	600	1.001	8.025	225	1.000	8.025	225	
ICS3	8.780	0.945	Open Manhole	600	1.002	7.835	225	1.001	7.835	225	
ICS4	8.800	1.095	Open Manhole	600	1.003	7.705	225	1.002	7.705	225	
RES5	8.800	0.450	Open Manhole	150	2.000	8.350	150				
ICS6	8.800	1.200	Open Manhole	600	1.004	7.600	225	1.003	7.600	225	
								2.000	7.675	150	
ICS7	8.700	1.175	Open Manhole	600	1.005	7.525	225	1.004	7.525	225	
SOAKAWAY	8.700	1.190	Open Manhole	10	1.006	7.723	100	1.005	7.510	225	
	8.700	0.985	Open Manhole	0		OUTFALL		1.006	7.715	100	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

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	225	ICS1	8.800	8.275	0.300	Open Manhole	600
1.001	o	225	ICS2	8.800	8.025	0.550	Open Manhole	600
1.002	o	225	ICS3	8.780	7.835	0.720	Open Manhole	600
1.003	o	225	ICS4	8.800	7.705	0.870	Open Manhole	600
2.000	o	150	RES5	8.800	8.350	0.300	Open Manhole	150
1.004	o	225	ICS6	8.800	7.600	0.975	Open Manhole	600
1.005	o	225	ICS7	8.700	7.525	0.950	Open Manhole	600
1.006	o	100	SOAKAWAY	8.700	7.723	0.877	Open Manhole	10

Downstream Manhole

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	24.908	99.6	ICS2	8.800	8.025	0.550	Open Manhole	600
1.001	18.711	98.5	ICS3	8.780	7.835	0.720	Open Manhole	600
1.002	12.755	98.1	ICS4	8.800	7.705	0.870	Open Manhole	600
1.003	10.209	97.2	ICS6	8.800	7.600	0.975	Open Manhole	600
2.000	11.071	16.4	ICS6	8.800	7.675	0.975	Open Manhole	600
1.004	6.354	84.7	ICS7	8.700	7.525	0.950	Open Manhole	600
1.005	2.000	133.3	SOAKAWAY	8.700	7.510	0.965	Open Manhole	10
1.006	1.000	125.0		8.700	7.715	0.885	Open Manhole	0

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Storage Structures for Storm

Cellular Storage Manhole: SOAKAWAY, DS/PN: 1.006

Invert Level (m) 6.535 Safety Factor 2.0

Infiltration Coefficient Base (m/hr) 0.32700

Porosity 0.95

Infiltration Coefficient Side (m/hr) 0.32700

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	31.5	31.5	1.200	31.5	59.1	1.201	0.0	59.1

MicroDrainage expresses the soil permeability rate in m/hr rather than in m/s as given in the ground investigation report. 0.327m/hr is equivalent to  $9.1 \times 10^{-5}$ m/s

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Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0 MADD Factor \* 10m<sup>3</sup>/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 Offline Controls 0 Number of Time/Area Diagrams 0  
Number of Online Controls 0 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 26.250 Cv (Summer) 0.750  
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0 DVD Status OFF  
Analysis Timestep Fine Inertia Status OFF  
DTS Status ON

Profile(s) Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440  
Return Period(s) (years) 1  
Climate Change (%) 0

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flow / Cap.	Pipe Flow (l/s)	Status
1.000	ICS1	15 minute 1 year Summer I+0%	15	8.800	8.325	-0.175	0.11	5.5	OK
1.001	ICS2	15 minute 1 year Summer I+0%	15	8.800	8.087	-0.163	0.16	7.8	OK
1.002	ICS3	15 minute 1 year Summer I+0%	15	8.780	7.899	-0.161	0.17	7.9	OK
1.003	ICS4	15 minute 1 year Summer I+0%	15	8.800	7.773	-0.157	0.20	8.8	OK
2.000	RES5	15 minute 1 year Summer I+0%	15	8.800	8.383	-0.117	0.11	4.3	OK
1.004	ICS6	15 minute 1 year Summer I+0%	15	8.800	7.690	-0.135	0.31	12.0	OK
1.005	ICS7	15 minute 1 year Summer I+0%	15	8.700	7.629	-0.121	0.43	12.3	OK
1.006	SOAKAWAY	60 minute 1 year Winter I+0%	60	8.700	6.711	-1.112	0.00	0.0	OK