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575- 599 Maxted Road Hemel Hempstead Herts HP2 7ED	Prop SW Strategy McD Barnsley	
Date 07/02/2018 12:53 File BARNSLEY PRELIM2018.02....	Designed by FG/FC Checked by HBG	
Micro Drainage	Network 2017.1.2	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Proposed

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.355	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	5	Maximum Backdrop Height (m)	1.500
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 - Proposed

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	14.800	0.135	110.0	0.020	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	36.137	0.145	249.2	0.041	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	7.334	0.037	200.0	0.037	4.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	8.655	0.043	201.3	0.009	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	26.250	1.680	15.6	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	41.295	0.206	200.5	0.032	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	15.080	1.150	13.1	0.073	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	11.384	0.951	12.0	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	5.00	4.20	112.750	0.020	0.0	0.0	0.0	1.25	49.5	0.3
S1.001	5.00	4.93	112.615	0.060	0.0	0.0	0.0	0.82	32.8	0.8
S2.000	5.00	4.13	112.510	0.037	0.0	0.0	0.0	0.92	36.6	0.5
S2.001	5.00	4.29	112.473	0.045	0.0	0.0	0.0	0.92	36.5	0.6
S1.002	5.00	5.06	112.430	0.161	0.0	0.0	0.0	3.33	132.3	2.2
S3.000	5.00	4.75	111.000	0.032	0.0	0.0	0.0	0.92	36.6	0.4
S1.003	5.00	5.12	110.675	0.265	0.0	0.0	0.0	4.36	308.5	3.6
S1.004	5.00	5.16	109.525	0.297	0.0	0.0	0.0	4.57	322.9	4.0

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Network Design Table for Storm - Proposed

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
S4.000	14.102	0.001	14102.0	0.000	4.00	0.0	0.600	oo	225	Double Pipe	
S1.005	7.319	0.238	30.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	1.990	0.150	13.3	0.000	0.00	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)
S4.000	5.00	6.31	108.650	0.000	0.0	0.0	0.0	0.10	8.1	0.0
S1.005	5.00	6.37	108.574	0.297	0.0	0.0	0.0	2.37	94.1	4.0
S1.006	5.00	6.38	108.336	0.297	0.0	0.0	0.0	3.61	143.6	4.0

Simulation Criteria for Storm - Proposed

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	3.000
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	FEH
Return Period (years)	2
FEH Rainfall Version	1999
Site Location	GB 434600 406250 SE 34600 06250
C (1km)	-0.025
D1 (1km)	0.375
D2 (1km)	0.422
D3 (1km)	0.238
E (1km)	0.298
F (1km)	2.359
Summer Storms	Yes
Winter Storms	No
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	15

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Online Controls for Storm - Proposed

ACO Q-Brake Manhole: S9, DS/PN: S1.005, Volume (m³): 3.4

Design Head (m) 1.000 Diameter (mm) 161
Design Flow (l/s) 15.0 Invert Level (m) 108.574

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.0	1.200	16.5	3.000	26.1	7.000	39.8
0.200	12.7	1.400	17.8	3.500	28.2	7.500	41.2
0.300	14.7	1.600	19.0	4.000	30.1	8.000	42.6
0.400	15.0	1.800	20.2	4.500	31.9	8.500	43.9
0.500	14.7	2.000	21.3	5.000	33.7	9.000	45.2
0.600	14.0	2.200	22.3	5.500	35.3	9.500	46.4
0.800	13.5	2.400	23.3	6.000	36.9		
1.000	15.1	2.600	24.3	6.500	38.4		

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Storage Structures for Storm - Proposed

Cellular Storage Manhole: S9, DS/PN: S4.000

Invert Level (m) 108.650 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	187.0	0.0	0.751	0.1	0.0
0.750	187.0	0.0			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	113.031	0.056	0.000	0.33		14.5	SURCHARGED	
S1.001	S1	113.003	0.163	0.000	1.42		43.8	SURCHARGED	
S2.000	S4	112.744	0.009	0.000	0.99		28.7	SURCHARGED	
S2.001	S5	112.708	0.009	0.000	1.18		35.2	SURCHARGED	
S1.002	S2	112.610	-0.045	0.000	0.96		117.1	OK	
S3.000	S3	111.141	-0.084	0.000	0.69		23.9	OK	
S1.003	S3	110.922	-0.054	0.000	0.74		191.7	OK	
S1.004	S3	110.310	0.484	0.000	0.87		211.3	FLOOD RISK	
S4.000	S9	109.211	0.336	0.000	0.84		18.6	SURCHARGED	
S1.005	S9	109.615	0.816	0.000	0.22		15.3	SURCHARGED	
S1.006	S5	108.417	-0.144	0.000	0.28		15.3	OK	