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20 East Sands	Character Area 5	
Burbage Marlborough	Ageas Bowl	
Wiltshire SN8 3AN	Network 2	
Date 01/07/2022	Designed by JE	
File 19320-CHARACTERAREA5	Checked by AC	
Micro Drainage	Network 2018.1	

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)	100	PIMP (%)	100
M5-60 (mm)	19.800	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.141	4-8	0.054

Total Area Contributing (ha) = 0.195

Total Pipe Volume (m³) = 5.353

Network Design Table for Storm

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	12.510	1.001	12.5	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	28.466	0.290	98.2	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	29.029	0.710	40.9	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	14.390	1.000	14.4	0.028	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	14.656	1.000	14.7	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	13.325	0.950	14.0	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	8.310	0.675	12.3	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.007	27.902	0.124	225.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	28.999	2.660	10.9	0.023	5.00	0.0	0.600	o	150	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)
1.000	50.00	5.07	54.900	0.000	0.0	0.0	0.0	2.87	50.6	0.0
1.001	50.00	5.54	53.900	0.011	0.0	0.0	0.0	1.01	17.9	1.5
1.002	50.00	5.85	53.610	0.022	0.0	0.0	0.0	1.58	27.9	3.0
1.003	50.00	5.94	52.900	0.050	0.0	0.0	0.0	2.67	47.2	6.8
1.004	50.00	6.03	51.900	0.064	0.0	0.0	0.0	2.65	46.7	8.7
1.005	50.00	6.09	50.900	0.078	0.0	0.0	0.0	3.51	139.7	10.6
1.006	50.00	6.13	49.950	0.092	0.0	0.0	0.0	3.75	149.1	12.5
1.007	50.00	6.67	49.275	0.092	0.0	0.0	0.0	0.87	34.5	12.5
2.000	50.00	5.16	51.811	0.023	0.0	0.0	0.0	3.07	54.2	3.1

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Network Design Table for Storm

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
1.008	25.089	0.044	570.2	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	3.083	0.018	171.3	0.057	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)
1.008	50.00	7.44	49.151	0.138	0.0	0.0	0.0	0.54	21.5	18.7
1.009	50.00	7.49	49.107	0.195	0.0	0.0	0.0	1.00	39.6	26.4

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
1.001	-	-	100	0.011	0.011	0.011
1.002	-	-	100	0.011	0.011	0.011
1.003	-	-	100	0.028	0.028	0.028
1.004	-	-	100	0.014	0.014	0.014
1.005	-	-	100	0.014	0.014	0.014
1.006	-	-	100	0.014	0.014	0.014
1.007	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.023	0.023	0.023
1.008	-	-	100	0.023	0.023	0.023
1.009	-	-	100	0.057	0.057	0.057
				Total	Total	Total
				0.195	0.195	0.195

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.009		51.530	49.089	0.000	0	0

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Online Controls for Storm

Orifice Manhole: S59, DS/PN: 1.009, Volume (m³): 2.0

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 49.107

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Storage Structures for Storm

Porous Car Park Manhole: S59, DS/PN: 1.009

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	19.3
Membrane Percolation (mm/hr)	1000	Length (m)	30.0
Max Percolation (l/s)	160.8	Slope (1:X)	0.0
Safety Factor	1.5	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.107	Membrane Depth (mm)	0

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	S51	0.679	0.200	0.000	0.878
1.001	S52	0.679	0.482	0.000	1.160
1.002	S53	1.007	0.492	0.000	1.498
1.003	S54	0.679	0.233	0.000	0.912
1.004	S55	0.679	0.238	0.000	0.916
1.005	S56	0.679	0.482	0.000	1.161
1.006	S57	0.983	0.283	0.000	1.266
1.007	S58	0.820	1.062	0.000	1.882
2.000	S61	1.527	0.491	0.000	2.018
1.008	S62	3.162	0.950	0.000	4.112
1.009	S59	1.010	0.099	155.114	156.223
Total		11.901	5.011	155.114	172.026

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30 year Return Period 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 * 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.800 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 30
 Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S51	60 Winter	30	+40%					54.900	-0.150	0.000
1.001	S52	15 Winter	30	+40%					53.957	-0.093	0.000
1.002	S53	15 Winter	30	+40%					53.676	-0.084	0.000
1.003	S54	15 Winter	30	+40%					52.980	-0.070	0.000
1.004	S55	15 Winter	30	+40%					51.994	-0.056	0.000
1.005	S56	15 Winter	30	+40%					50.986	-0.139	0.000
1.006	S57	15 Winter	30	+40%					50.046	-0.129	0.000
1.007	S58	15 Winter	30	+40%	30/15 Summer				49.937	0.437	0.000
2.000	S61	15 Winter	30	+40%					51.857	-0.104	0.000
1.008	S62	15 Winter	30	+40%	30/15 Summer				49.738	0.362	0.000
1.009	S59	960 Winter	30	+40%	30/30 Summer				49.652	0.320	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
1.000	S51	0.00		0.0	OK
1.001	S52	0.31		5.3	OK
1.002	S53	0.39		10.5	OK
1.003	S54	0.55		23.9	OK
1.004	S55	0.71		30.6	OK
1.005	S56	0.31		37.1	OK
1.006	S57	0.38		43.7	OK
1.007	S58	1.29		41.4	FLOOD RISK
2.000	S61	0.20		10.4	OK
1.008	S62	3.13		59.4	SURCHARGED
1.009	S59	0.06		1.5	SURCHARGED