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Date 10-11-2017 File 47420-C-001 Rev.-.mdx	Designed by Z. Collins Checked by P. Keating	
Micro Drainage	Network 2015.1	

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.131	4-8	0.081

Total Area Contributing (ha) = 0.212

Total Pipe Volume (m³) = 49.683

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Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
1.000	34.000	0.070	485.7	0.057	5.00	0.0		0.045	3 \=/	3000
1.001	4.500	0.015	300.0	0.000	0.00	0.0	0.600		oo	300
1.002	12.500	0.040	312.5	0.004	0.00	0.0	0.600		oo	300
1.003	32.100	0.105	305.7	0.070	0.00	0.0	0.600		oo	300
2.000	5.100	0.040	127.5	0.081	5.00	0.0	0.600		o	225
1.004	15.800	0.050	316.0	0.000	0.00	0.0	0.600		o	300

Network Results Table


PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	49.490	0.057	0.0	0.40	481.8
1.001	49.420	0.057	0.0	0.90	127.6
1.002	49.405	0.061	0.0	0.88	125.0
1.003	49.365	0.131	0.0	0.89	126.4
2.000	49.300	0.081	0.0	1.16	46.0
1.004	49.260	0.212	0.0	0.88	62.1

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
BASIN	49.800	0.310	Junction		1.000	49.490	3000				
BASIN OUT	49.800	0.380	Junction	0	1.001	49.420	300	1.000	49.420	3000	
S1	49.950	0.545	Open Manhole	1200 x 750	1.002	49.405	300	1.001	49.405	300	
S2	49.950	0.585	Open Manhole	1200 x 750	1.003	49.365	300	1.002	49.365	300	
S3	49.900	0.600	Open Manhole	1200 x 675	2.000	49.300	225				
S4	49.850	0.590	Open Manhole	1200 x 750	1.004	49.260	300	1.003	49.260	300	
								2.000	49.260	225	
S5Exist.	50.300	1.090	Open Manhole	0		OUTFALL		1.004	49.210	300	

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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	3 \=/	3000	BASIN	49.800	49.490	0.160	Junction	
1.001	oo	300	BASIN OUT	49.800	49.420	0.080	Junction	
1.002	oo	300	S1	49.950	49.405	0.245	Open Manhole	1200 x 750
1.003	oo	300	S2	49.950	49.365	0.285	Open Manhole	1200 x 750
2.000	o	225	S3	49.900	49.300	0.375	Open Manhole	1200 x 675
1.004	o	300	S4	49.850	49.260	0.290	Open Manhole	1200 x 750

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	34.000	485.7	BASIN OUT	49.800	49.420	0.230	Junction	
1.001	4.500	300.0	S1	49.950	49.405	0.245	Open Manhole	1200 x 750
1.002	12.500	312.5	S2	49.950	49.365	0.285	Open Manhole	1200 x 750
1.003	32.100	305.7	S4	49.850	49.260	0.290	Open Manhole	1200 x 750
2.000	5.100	127.5	S4	49.850	49.260	0.365	Open Manhole	1200 x 750
1.004	15.800	316.0	S5Exist.	50.300	49.210	0.790	Open Manhole	0

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)
1.004	S5Exist.	50.300	49.210	49.210	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.422		

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Online Controls for Storm


Hydro-Brake Optimum® Manhole: S4, DS/PN: 1.004, Volume (m³): 5.1

Unit Reference MD-SHE-0209-2100-0500-2100
 Design Head (m) 0.500
 Design Flow (l/s) 21.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Diameter (mm) 209
 Invert Level (m) 49.260
 Minimum Outlet Pipe Diameter (mm) 225
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	20.9	Kick-Flo®	0.431	19.5
Flush-Flo™	0.288	20.9	Mean Flow over Head Range	-	15.6

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	7.1	1.200	31.8	3.000	49.5	7.000	74.6
0.200	20.1	1.400	34.3	3.500	53.4	7.500	77.2
0.300	20.9	1.600	36.6	4.000	57.0	8.000	79.8
0.400	20.1	1.800	38.7	4.500	60.3	8.500	82.3
0.500	20.9	2.000	40.7	5.000	63.5	9.000	84.7
0.600	22.8	2.200	42.6	5.500	66.0	9.500	87.0
0.800	26.2	2.400	44.5	6.000	69.0		
1.000	29.2	2.600	46.2	6.500	71.8		

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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 * 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 0 Number of Real Time Controls 0

Synthetic Rainfall Details


Rainfall Model FSR Ratio R 0.422
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720,
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,
10080
Return Period(s) (years) 100
Climate Change (%) 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	BASIN	30 Winter	100	+20%					49.700
1.001	BASIN OUT	30 Winter	100	+20%					49.699
1.002	S1	30 Winter	100	+20%					49.697
1.003	S2	15 Summer	100	+20%	100/15 Summer				49.734
2.000	S3	15 Winter	100	+20%	100/15 Summer				49.878
1.004	S4	15 Summer	100	+20%	100/15 Summer				49.779

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	BASIN	-0.100	0.000	0.04		21.5	FLOOD RISK*	
1.001	BASIN OUT	-0.021	0.000	0.17		20.6	FLOOD RISK*	

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PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Cap.	(l/s)	Flow (l/s)		
1.002	S1	-0.008	0.000	0.21		20.8	FLOOD RISK	
1.003	S2	0.069	0.000	0.17		19.9	FLOOD RISK	
2.000	S3	0.353	0.000	1.52		45.3	FLOOD RISK	
1.004	S4	0.219	0.000	0.40		21.0	FLOOD RISK	