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4 Market Square Old Amersham Buckinghamshire, HP7 0DQ	Beyer Close Surface Water Network Calculations	
Date 02/08/2021 File SW Network Calculations...	Designed by MDS Checked by MDS	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	1999
Site Location GB 388450 396650 SJ 88450 96650	
C (1km)	-0.027
D1 (1km)	0.333
D2 (1km)	0.400
D3 (1km)	0.293
E (1km)	0.303
F (1km)	2.458
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 (%)	40
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
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	0.019	4-8	0.002

Total Area Contributing (ha) = 0.021

Total Pipe Volume (m³) = 0.730

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
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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)
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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)	Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	66.500	0.600	Open Manhole	460	1.000	65.900	150				
S2	66.850	1.060	Open Manhole	460	1.001	65.790	150	1.000	65.790	150	
S3	66.750	0.935	Open Manhole	460	2.000	65.815	150				
S4	66.850	1.225	Open Manhole	1200	1.002	65.625	150	1.001	65.625	150	
								2.000	65.625	150	
S5	66.800	1.700	Open Manhole	1200	1.003	65.100	100	1.002	65.600	150	550
SW Sewer	66.700	1.683	Open Manhole	0		OUTFALL		1.003	65.017	100	

No coordinates have been specified, layout information cannot be produced.

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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	150	S1	66.500	65.900	0.450	Open Manhole	460
1.001	o	150	S2	66.850	65.790	0.910	Open Manhole	460
2.000	o	150	S3	66.750	65.815	0.785	Open Manhole	460
1.002	o	150	S4	66.850	65.625	1.075	Open Manhole	1200
1.003	o	100	S5	66.800	65.100	1.600	Open Manhole	1200

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	8.800	80.0	S2	66.850	65.790	0.910	Open Manhole	460
1.001	13.050	79.1	S4	66.850	65.625	1.075	Open Manhole	1200
2.000	15.500	81.6	S4	66.850	65.625	1.075	Open Manhole	1200
1.002	1.000	40.0	S5	66.800	65.600	1.050	Open Manhole	1200
1.003	6.600	79.5	SW Sewer	66.700	65.017	1.583	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)
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1.003	SW Sewer	66.700	65.017	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	1.000
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	2
Number of Online Controls	1	Number of Time/Area Diagrams	2
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model FEH
Return Period (years) 30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S5, DS/PN: 1.003, Volume (m³): 1.9

Unit Reference	MD-SHE-0031-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	0.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	31
Invert Level (m)	65.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	0.5
Flush-Flo™	0.137	0.3
Kick-Flo®	0.275	0.3
Mean Flow over Head Range	-	0.4

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	0.3	1.200	0.5	3.000	0.7	7.000	1.1
0.200	0.3	1.400	0.5	3.500	0.8	7.500	1.1
0.300	0.3	1.600	0.6	4.000	0.9	8.000	1.2
0.400	0.3	1.800	0.6	4.500	0.9	8.500	1.2
0.500	0.3	2.000	0.6	5.000	0.9	9.000	1.2
0.600	0.4	2.200	0.7	5.500	1.0	9.500	1.3
0.800	0.4	2.400	0.7	6.000	1.0		
1.000	0.5	2.600	0.7	6.500	1.1		

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<u>Storage Structures for Storm</u> <u>Porous Car Park Manhole: S4, DS/PN: 1.002</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>7.5</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>24.0</td></tr><tr><td>Max Percolation (l/s)</td><td>50.0</td><td>Slope (1:X)</td><td>100.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>66.300</td><td>Cap Volume Depth (m)</td><td>0.300</td></tr></table> <u>Cellular Storage Manhole: S5, DS/PN: 1.003</u> <table><tr><td>Invert Level (m)</td><td>65.125</td><td>Safety Factor</td><td>2.0</td></tr><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Porosity</td><td>0.95</td></tr><tr><td>Infiltration Coefficient Side (m/hr)</td><td>0.00000</td><td></td><td></td></tr></table> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>21.0</td><td>0.0</td><td>2.600</td><td>0.0</td><td>0.0</td></tr><tr><td>0.200</td><td>21.0</td><td>0.0</td><td>2.800</td><td>0.0</td><td>0.0</td></tr><tr><td>0.400</td><td>21.0</td><td>0.0</td><td>3.000</td><td>0.0</td><td>0.0</td></tr><tr><td>0.600</td><td>21.0</td><td>0.0</td><td>3.200</td><td>0.0</td><td>0.0</td></tr><tr><td>0.800</td><td>21.0</td><td>0.0</td><td>3.400</td><td>0.0</td><td>0.0</td></tr><tr><td>1.000</td><td>21.0</td><td>0.0</td><td>3.600</td><td>0.0</td><td>0.0</td></tr><tr><td>1.200</td><td>21.0</td><td>0.0</td><td>3.800</td><td>0.0</td><td>0.0</td></tr><tr><td>1.400</td><td>0.0</td><td>0.0</td><td>4.000</td><td>0.0</td><td>0.0</td></tr><tr><td>1.600</td><td>0.0</td><td>0.0</td><td>4.200</td><td>0.0</td><td>0.0</td></tr><tr><td>1.800</td><td>0.0</td><td>0.0</td><td>4.400</td><td>0.0</td><td>0.0</td></tr><tr><td>2.000</td><td>0.0</td><td>0.0</td><td>4.600</td><td>0.0</td><td>0.0</td></tr><tr><td>2.200</td><td>0.0</td><td>0.0</td><td>4.800</td><td>0.0</td><td>0.0</td></tr><tr><td>2.400</td><td>0.0</td><td>0.0</td><td>5.000</td><td>0.0</td><td>0.0</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.5	Membrane Percolation (mm/hr)	1000	Length (m)	24.0	Max Percolation (l/s)	50.0	Slope (1:X)	100.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	66.300	Cap Volume Depth (m)	0.300	Invert Level (m)	65.125	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	21.0	0.0	2.600	0.0	0.0	0.200	21.0	0.0	2.800	0.0	0.0	0.400	21.0	0.0	3.000	0.0	0.0	0.600	21.0	0.0	3.200	0.0	0.0	0.800	21.0	0.0	3.400	0.0	0.0	1.000	21.0	0.0	3.600	0.0	0.0	1.200	21.0	0.0	3.800	0.0	0.0	1.400	0.0	0.0	4.000	0.0	0.0	1.600	0.0	0.0	4.200	0.0	0.0	1.800	0.0	0.0	4.400	0.0	0.0	2.000	0.0	0.0	4.600	0.0	0.0	2.200	0.0	0.0	4.800	0.0	0.0	2.400	0.0	0.0	5.000	0.0	0.0
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1 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	1.000
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	2
Number of Online Controls	1	Number of Time/Area Diagrams	2
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 388450 396650 SJ 88450 96650
C (1km)	-0.027
D1 (1km)	0.333
D2 (1km)	0.400
D3 (1km)	0.293
E (1km)	0.303
F (1km)	2.458
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

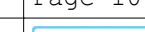
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	60 Winter	1	+0%	100/15 Summer				65.912
1.001	S2	15 Winter	1	+0%	100/15 Summer				65.828
2.000	S3	60 Winter	1	+0%	100/30 Winter				65.833
1.002	S4	15 Winter	1	+0%	100/15 Summer				65.680
1.003	S5	240 Winter	1	+0%	1/15 Summer				65.299

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

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow (l/s)		
1.000	S1	-0.138	0.000	0.02			0.3		OK	
1.001	S2	-0.112	0.000	0.14			2.6		OK	
2.000	S3	-0.132	0.000	0.03			0.6		OK	
1.002	S4	-0.095	0.000	0.29		11	3.2		OK	
1.003	S5	0.099	0.000	0.05		142	0.3		SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	2
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

									Water
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
1.000	S1	15	Winter	30	+0%	100/15	Summer		65.921
1.001	S2	15	Winter	30	+0%	100/15	Summer		65.870
2.000	S3	30	Winter	30	+0%	100/30	Winter		65.847
1.002	S4	15	Winter	30	+0%	100/15	Summer		65.769
1.003	S5	240	Winter	30	+0%	1/15	Summer		65.728

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow (l/s)		
1.000	S1	-0.129	0.000	0.05			0.8		OK	
1.001	S2	-0.070	0.000	0.56			10.2		OK	
2.000	S3	-0.118	0.000	0.10			1.8		OK	
1.002	S4	-0.006	0.000	1.00		3	10.8		OK	
1.003	S5	0.528	0.000	0.06			0.4		SURCHARGED	

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4 Market Square Old Amersham Buckinghamshire, HP7 0DQ	Beyer Close Surface Water Network Calculations	
Date 02/08/2021	Designed by MDS	
File SW Network Calculations...	Checked by MDS	
Innovyze	Network 2020.1.3	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow		
1.000	S1	0.307	0.000	0.04			0.7	FLOOD RISK		
1.001	S2	0.416	0.000	0.15			2.7	SURCHARGED		
2.000	S3	0.391	0.000	0.08			1.4	SURCHARGED		
1.002	S4	0.580	0.000	0.35			3.8	SURCHARGED		
1.003	S5	1.155	0.000	0.08			0.5	SURCHARGED		