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Cornerstone Court 62 Foxhall Road Didcot OX11 7AD	The Anchor Inn Hitchin, SG4 0JH SW Network	
Date 01/05/2024 14:59 File 8240287 - T1 - The Anch...	Designed by S McNair Checked by L Moxon	
Micro Drainage	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	2013
Site Location GB 519800 230050 TL 19800 30050	
Data Type	Catchment
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	15
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
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

Network Design Table for Storm

- Indicates pipe length does not match coordinates

« - 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
S1.000	8.084	0.015	539.0	0.049	15.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	21.696	0.075	289.3	0.059	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	11.046	0.390	28.3	0.026	15.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	19.687	0.135	145.8	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.002	4.004	0.030	133.5	0.029	0.00	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)
S1.000	50.00	15.00	54.440	0.049	0.0	0.0	0.0	0.43	7.5«	8.9
S1.001	50.00	15.00	54.325	0.108	0.0	0.0	0.0	0.92	65.0	19.4
S2.000	50.00	15.00	54.800	0.026	0.0	0.0	0.0	1.90	33.6	4.6
S2.001	50.00	15.00	54.565	0.033	0.0	0.0	0.0	0.83	14.7	6.0
S2.002	50.00	15.00	54.430	0.063	0.0	0.0	0.0	0.87	15.3	11.3

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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)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S7.0	55.685	1.245	Open Manhole	600	S1.000	54.440	150				
S6.0	55.700	1.375	Open Manhole	1240 x 900	S1.001	54.325	300	S1.000	54.425	150	
S5.3	55.400	0.600	Open Manhole	450	S2.000	54.800	150				
S5.2	55.300	0.890	Open Manhole	600	S2.001	54.565	150	S2.000	54.410	150	
S5.1	55.350	0.920	Open Manhole	600	S2.002	54.430	150	S2.001	54.430	150	
S5.0	55.375	1.125	Open Manhole	600	S1.002	54.250	225	S1.001	54.250	300	
								S2.002	54.400	150	75
S2.0	54.965	0.845	Open Manhole	1350	S1.003	54.120	225	S1.002	54.170	225	50
S1.0	55.000	0.905	Open Manhole	1200		OUTFALL		S1.003	54.095	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S7.0	519889.424	230009.630	519889.424	230009.630	Required	
S6.0	519891.217	230017.513	519891.217	230017.513	Required	
S5.3	519881.426	229970.420	519881.426	229970.420	Required	
S5.2	519874.841	229979.289	519874.841	229979.289	Required	
S5.1	519881.045	229997.973	519881.045	229997.973	Required	
S5.0	519877.868	230000.410	519877.868	230000.410	Required	
S2.0	519845.006	230014.668	519845.006	230014.668	Required	
S1.0	519840.707	230011.260			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S7.0	55.685	54.440	1.095	Open Manhole	600
S1.001	o	300	S6.0	55.700	54.325	1.075	Open Manhole	1240 x 900
S2.000	o	150	S5.3	55.400	54.800	0.450	Open Manhole	450
S2.001	o	150	S5.2	55.300	54.565	0.585	Open Manhole	600
S2.002	o	150	S5.1	55.350	54.430	0.770	Open Manhole	600
S1.002	o	225	S5.0	55.375	54.250	0.900	Open Manhole	600
S1.003	o	225	S2.0	54.965	54.120	0.620	Open Manhole	1350

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)
S1.000	8.084	539.0	S6.0	55.700	54.425	1.125	Open Manhole	1240 x 900
S1.001	21.696	289.3	S5.0	55.375	54.250	0.825	Open Manhole	600
S2.000	11.046	28.3	S5.2	55.300	54.410	0.740	Open Manhole	600
S2.001	19.687	145.8	S5.1	55.350	54.430	0.770	Open Manhole	600
S2.002	4.004	133.5	S5.0	55.375	54.400	0.825	Open Manhole	600
S1.002	10.000#	125.0	S2.0	54.965	54.170	0.570	Open Manhole	1350
S1.003	5.486	219.5	S1.0	55.000	54.095	0.680	Open Manhole	1200

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
------------------------	-----------------	-----------------	-----------------	------------------------	--------------	-----------

S1.003 S1.0 55.000 54.095 54.095 1200 0

Datum (m) 54.095 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
100	0.300	400	0.300	700	0.300	1000	0.300	1300	0.300
200	0.300	500	0.300	800	0.300	1100	0.300	1400	0.300
300	0.300	600	0.300	900	0.300	1200	0.300	1500	0.300

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Micro Drainage Network 2020.1.3		
<u>Simulation Criteria for Storm</u> Volumetric Runoff Coeff 1.000 Additional Flow - % of Total Flow 0.000 Areal Reduction Factor 1.000 MADD Factor * 10m³/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) 1440 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 2 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FEH Return Period (years) 100 FEH Rainfall Version 2013 Site Location GB 519800 230050 TL 19800 30050 Data Type Catchment Summer Storms No Winter Storms Yes Cv (Summer) 0.900 Cv (Winter) 1.000 Storm Duration (mins) 360		
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S6.0, DS/PN: S1.001, Volume (m³): 1.7

Unit Reference	MD-SHE-0041-7000-0775-7000
Design Head (m)	0.775
Design Flow (l/s)	0.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	41
Invert Level (m)	54.325
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.775	0.7
Flush-Flo™	0.181	0.6
Kick-Flo®	0.366	0.5
Mean Flow over Head Range	-	0.6

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	0.6	1.200	0.8	3.000	1.3	7.000	1.9
0.200	0.6	1.400	0.9	3.500	1.4	7.500	2.0
0.300	0.6	1.600	1.0	4.000	1.5	8.000	2.0
0.400	0.5	1.800	1.0	4.500	1.5	8.500	2.1
0.500	0.6	2.000	1.1	5.000	1.6	9.000	2.1
0.600	0.6	2.200	1.1	5.500	1.7	9.500	2.2
0.800	0.7	2.400	1.2	6.000	1.8		
1.000	0.8	2.600	1.2	6.500	1.8		

Hydro-Brake® Optimum Manhole: S2.0, DS/PN: S1.003, Volume (m³): 1.6

Unit Reference	MD-SHE-0072-2000-0660-2000
Design Head (m)	0.660
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	72
Invert Level (m)	54.120
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

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<table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>0.660</td><td>2.0</td></tr><tr><td>Flush-Flo™</td><td>0.198</td><td>2.0</td></tr><tr><td>Kick-Flo®</td><td>0.431</td><td>1.7</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>1.7</td></tr></table>			Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	0.660	2.0	Flush-Flo™	0.198	2.0	Kick-Flo®	0.431	1.7	Mean Flow over Head Range	-	1.7																																																									
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Storage Structures for Storm

Complex Manhole: S6.0, DS/PN: S1.001

Cellular Storage

Invert Level (m) 54.325 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	126.5	126.5	0.850	0.0	164.8
0.750	126.5	164.8			

Porous Car Park

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 25.0
Membrane Percolation (mm/hr) 1000 Length (m) 5.0
Max Percolation (l/s) 34.7 Slope (1:X) 30.0
Safety Factor 2.0 Depression Storage (mm) 5
Porosity 0.30 Evaporation (mm/day) 3
Invert Level (m) 54.795 Cap Volume Depth (m) 0.400

Complex Manhole: S2.0, DS/PN: S1.003

Porous Car Park

Infiltration Coefficient Base (m/hr) 0.00000
Membrane Percolation (mm/hr) 1000
Max Percolation (l/s) 125.3
Safety Factor 2.0
Porosity 0.30
Invert Level (m) 54.170
Width (m) 47.5
Length (m) 9.5
Slope (1:X) 100000.0
Depression Storage (mm) 5
Evaporation (mm/day) 3
Cap Volume Depth (m) 0.300

Cellular Storage

Invert Level (m) 54.470 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

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Cellular Storage

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	215.0	215.0	0.400	0.0	252.2
0.300	215.0	252.2			

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Micro Drainage

The Anchor Inn
Hitchin, SG4 0JH
SW Network

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100 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 Storage Structures 2

Number of Online Controls 2

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH

FEH Rainfall Version 2013

Site Location GB 519800 230050 TL 19800 30050

Data Type Catchment

Cv (Summer) 1.000

Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0

DVD Status OFF

Analysis Timestep Fine

Inertia Status OFF

DTS Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 60, 120, 240, 360, 480, 960, 1440, 5760

Return Period(s) (years) 100

Climate Change (%) 40

Water Surcharged Flooded

US/MH

US/CL

Level

Depth

Volume

Flow /

PN

Name

Event

(m)

(m)

(m)

(m³)

Cap.

S1.000

S7.0

480 minute

100 year Winter I+40%

55.685

55.016

0.426

0.000

0.62

S1.001

S6.0

480 minute

100 year Winter I+40%

55.700

55.015

0.390

0.000

0.01

S2.000

S5.3

60 minute

100 year Summer I+40%

55.400

54.856

-0.094

0.000

0.30

S2.001

S5.2

60 minute

100 year Summer I+40%

55.300

54.818

0.103

0.000

0.88

S2.002

S5.1

480 minute

100 year Summer I+40%

55.350

54.753

0.173

0.000

0.71

S1.002

S5.0

480 minute

100 year Summer I+40%

55.375

54.752

0.277

0.000

0.21

S1.003

S2.0

480 minute

100 year Summer I+40%

54.965

54.750

0.405

0.000

0.08

Half Drain Pipe

US/MH

US/CL

Level

Depth

Volume

Flow /

PN

Name

Event

(m)

(m)

(m)

(m³)

Cap.

S1.000

S7.0

0.162

4.1

SURCHARGED

S1.001

S6.0

88.948

0.6

SURCHARGED

S2.000

S5.3

0.008

9.2

OK

S2.001

S5.2

0.270

12.1

SURCHARGED

S2.002

S5.1

0.427

7.7

SURCHARGED

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