



LAND AT MILL LANE, GISBURN, LANCASHIRE.

DRAINAGE STRATEGY REPORT

HAMILTON TECHNICAL SERVICES

1 CHILTERN AVE, EUXTON, CHORLEY, LANCs, PR7 6NU

ISSUE 1

8/14/2018

C-0848

Document Control Sheet

Proposed Housing Development. Land at East Cote Farm, Skinburness, Cumbria.
Drainage Strategy and Flood Risk Assessment Report.

Job	Date	Issue	Copy
C0848	14th Aug 2018	1	

Originator.....G Hamilton... ..

Checker.....G Hamilton.....

Approver.....G Hamilton.....

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Appendix 1; Surface Water Run-off Calculations

1. Introduction

- 1.1. Hamilton Technical Services have been commissioned by 3DG Design, on behalf of Westbridge Developments, to prepare a Drainage Strategy and FRA Report, in support of a development scheme, for a site located on land at Mill Lane, Gisburn, Lancs. The site comprises an area of former agricultural land, which is accessed from Mill Lane.
- 1.2. The site location plan is attached to this report within **Figure 1**.
- 1.3. The national grid reference for the site is 382474E, 448941N.
- 1.4. It is understood that permission is being sought to provide three new residential properties along with associated shared access way, car parking and landscaping. A development plan is attached to this report as **Figure 2**.

2. Description of the existing site and drainage

- 2.1. The site is presently agricultural / grassland and is bounded to the north by Mill Lane and agricultural grassland. To the east the site is bounded by mixed residential and commercial properties. To the west lies agricultural land. To the south the boundary is onto railway land and beyond that lays commercial property.
- 2.2. As part of the site investigation works and to determine the permeability of the sub-strata on site, trial holes were excavated. The ground encountered in the excavations was consistent in its make-up, consisting of a shallow layer of poor topsoil overlying deep strata of gravely clay sub-soil that is unsuitable for infiltration drainage of surface water.
- 2.3. The substrata were investigated to ascertain its suitability for the use of soak-aways by excavating a trial hole and filling overnight with water. The water did not drain away as shown in before and after photos, attached as **Figure 3** of this report. This shows the sub-soil is not suitable for the use of infiltration techniques as a means of disposal of surface water run-off.
- 2.4. There are no watercourses within or adjacent to the site to which surface water could be discharged. There are no other surface water drains or sewers within the site area.
- 2.5. Public combined sewers are located close to the eastern boundary of the site.

3. Proposals for Redevelopment – Drainage Strategy

- 3.1. The redevelopment will consist of the construction of three new residential properties along with a shared driveway access and internal parking and landscaping to each plot.
- 3.2. The access road and parking areas for the new properties will be accessed off Mill Lane, Gisburn.
- 3.3. The proposed method of disposing of the foul and surface water run-off from the new development will be to construct separate systems to convey the foul run-off through the site to the south eastern corner. The two flows will then be combined and discharged into the existing combined public sewer situated in Mill Lane Industrial Estate, just outside the site boundary.
- 3.4. A copy of the proposed site drainage layout is attached as **Figure 4** of this report and a further plan showing the site catchment areas is attached as **Figure 5**.
- 3.5. Surface water flows will be controlled and attenuated before being combined with the foul run-off. Calculations indicate that the QBar Greenfield run-off from the site would be 4.8l/s; therefore it is proposed that the surface water run-off rate from the developed site will be restricted to a maximum of 5.0l/s in line with the general requirements of United Utilities for discharge rates.
- 3.6. A series of calculations have been carried out to illustrate the performance of the proposed surface water drainage of the site when a Hydro-brake unit is installed in the final surface water chamber on the site, with a maximum forward flow of 5.0l/s. These calculations are for a series of storms from 1 in 2 Yr return to 1 in 100 Yr return storms up to a 600 minute duration and are inclusive of a 30% climate change allowance. The system will also include an attenuation tank of 9.0 x 6.0 x 1.2m deep and with a storage capacity of 61.6 CuM and will prevent the creation of exceedance flows during all these events, thus preventing flooding within or outside the site. A copy of the calculations is attached as **Appendix 1** of this report.

4. Conclusions

- 4.1. Through the employment of the drainage techniques described above it will be possible to design and construct this development and its drainage systems in a highly sustainable manner, whilst providing suitable protection from flooding, to the site itself and to neighbouring land and premises.

Figures;

Figure 1 – Site Location Plan.

Figure 2 – Site Layout Plan.

Figure 3 – Trial Pit Photos.

Figure 4 – Proposed Drainage Layout.

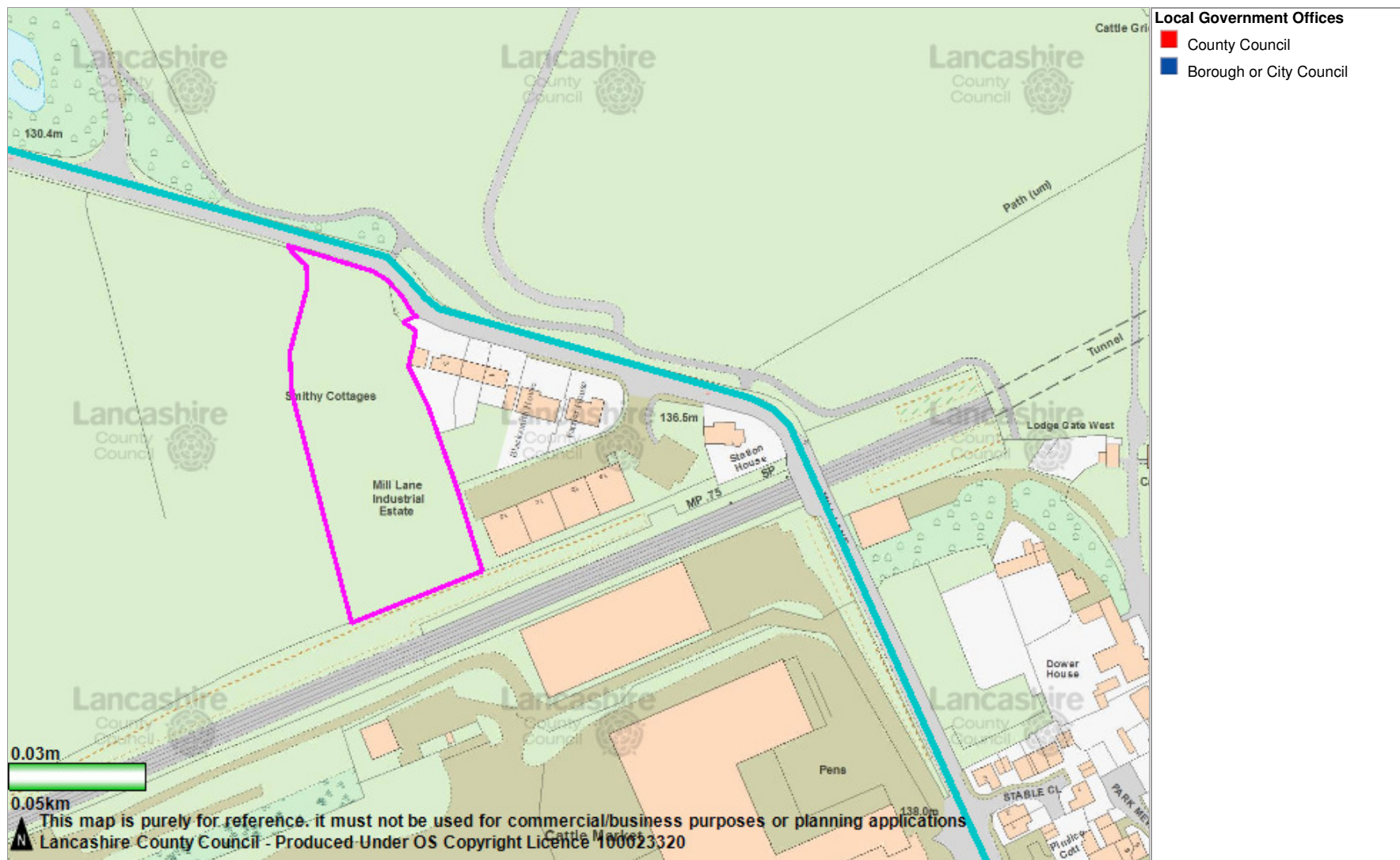
Figure 5 – Proposed SW Catchment Plan.

Appendix 1 – SW Storm Simulation Calculations.



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MILL LANE, GISBURN





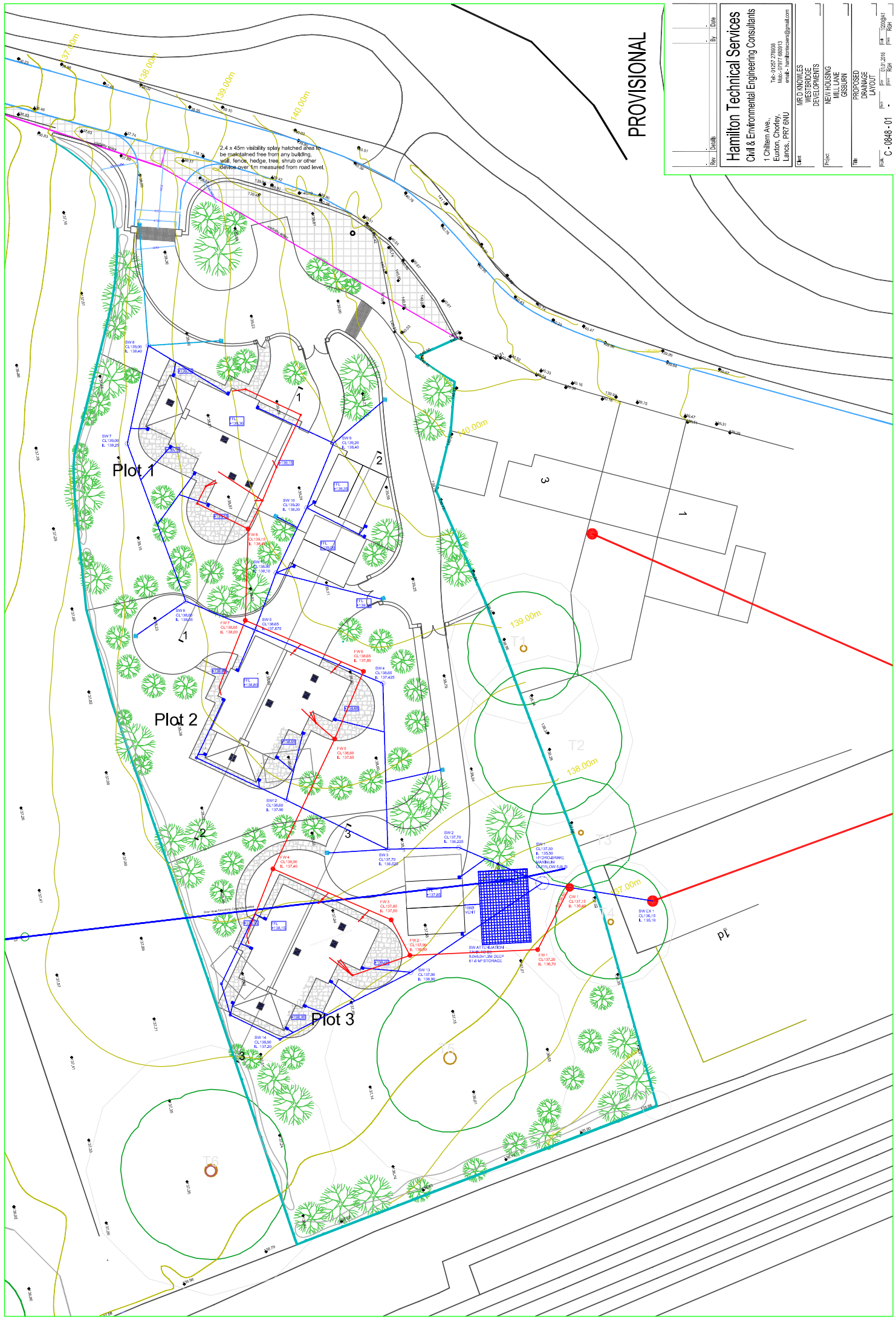
DO NOT SCALE FROM THIS DRAWING.
Use written dimensions only, if in doubt ASK
This drawing is protected under the copyright of 3D.G design

- Post and rail fence to western boundary
- 1800mm high stone wall
- 900mm high wall
- 1800mm high close boarded fence

Rev	Description	Date
Project: Mill Lane, Gisburn.		
Status: Sketch Scheme		
Client: Westbridge Developments		
Drawing Title: Proposed Site Plan		
Project No: 010-509		
Drg No: 03	Rev: B	3D.Gdesign architectural consultants 13 Leyland House Lancashire Business Park Centurion Way Leyland Lancashire PR26 6TY t: 01772 367 150 e: studio@3dgdesign.co.uk w: www.3dgdesign.co.uk
Scale: 1:500 @ A3		







PROVISIONAL

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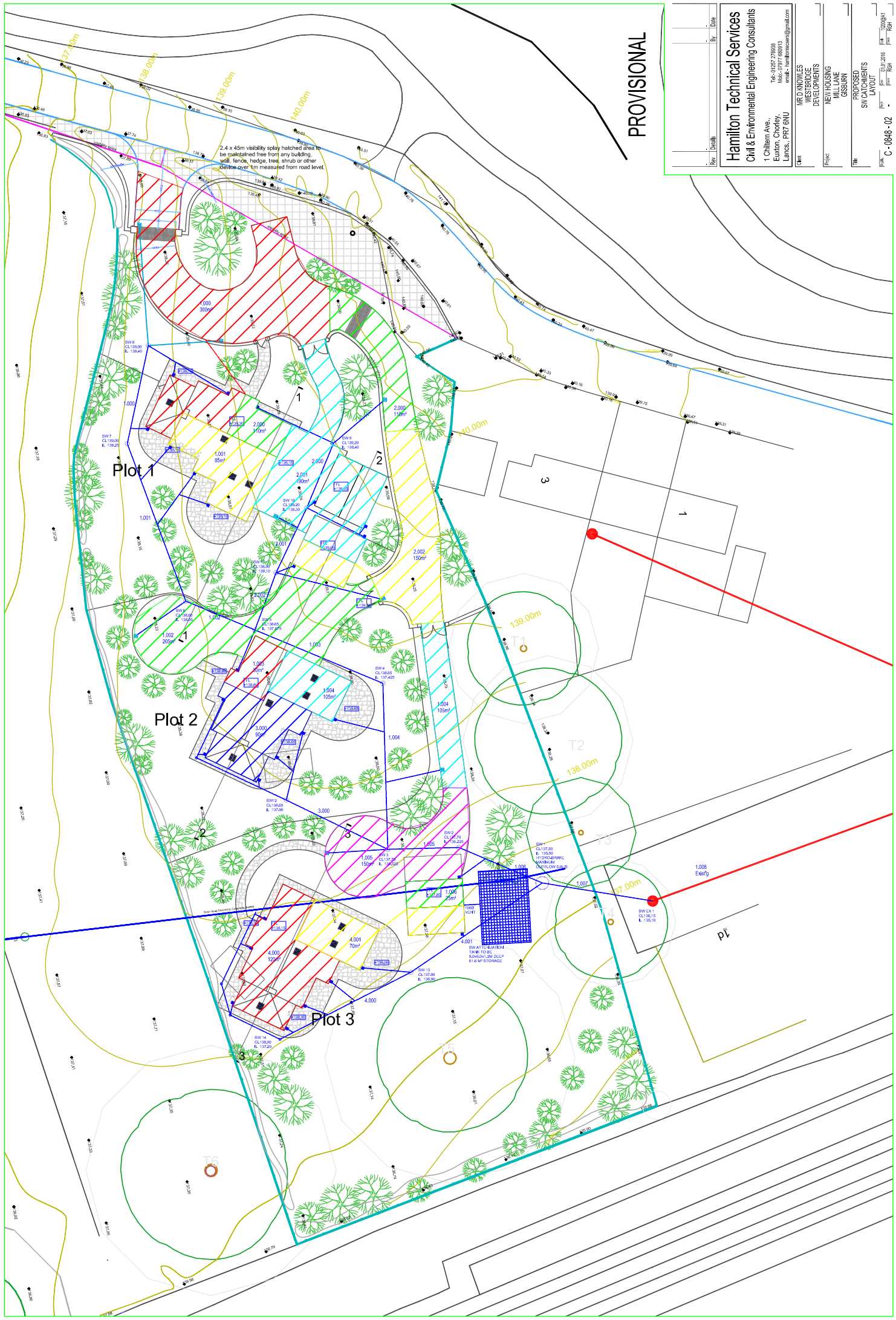
Client: MR D KNOWLES
WESTBRIDGE
DEVELOPMENTS

Project: NEW HOUSING
MILL LANE
GRSBURN

Proposed: DRAINAGE
LAYOUT

Drawn: C-0848-01

Scale: 1:500



Rev	Details	By	Date
1			

Hamilton Technical Services Civil & Environmental Engineering Consultants	
1 Chiltern Ave., Luton, Bedfordshire, MK7 6NU	
Client	MR D KNOWLES WESTBRIDGE DEVELOPMENTS
Project	NEW HOUSING MILL LANE GRBURN
Drawn	MR D KNOWLES
Checked	MR D KNOWLES
Scale	1:1000
Sheet	1 of 1
File	C-0848-02
Project	NEW HOUSING MILL LANE GRBURN
Drawn	MR D KNOWLES
Checked	MR D KNOWLES
Scale	1:1000
Sheet	1 of 1
File	C-0848-02

Mill Lane, Gisburn, Lancs.

Appendix 1

Surface Water Simulation Calculations

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Estimated Greenfield Run-off	
Date 14.08.2018 File	Designed by Geoff Hamilton Checked by	
Micro Drainage Source Control 2014.1		

ICP SUDS Mean Annual Flood

Input

Return Period (years)	10	Soil	0.450
Area (ha)	0.580	Urban	0.000
SAAR (mm)	1200	Region Number	Region 10

Results l/s

QBAR Rural	4.8
QBAR Urban	4.8
Q10 years	6.6
Q1 year	4.2
Q30 years	8.1
Q100 years	10.0

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Hamilton Technical Services		Page 1								
1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms									
Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by									
Micro Drainage		Network 2014.1								
Time Area Diagram for Storm <table><thead><tr><th>Time (mins)</th><th>Area (ha)</th><th>Time (mins)</th><th>Area (ha)</th></tr></thead><tbody><tr><td>0-4</td><td>0.138</td><td>4-8</td><td>0.027</td></tr></tbody></table> Total Area Contributing (ha) = 0.165 Total Pipe Volume (m³) = 4.608			Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.138	4-8	0.027
Time (mins)	Area (ha)	Time (mins)	Area (ha)							
0-4	0.138	4-8	0.027							
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Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

Hamilton Technical Services		Page 5																		
1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms																			
Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by																			
Micro Drainage	Network 2014.1																			
Storage Structures for Storm Cellular Storage Manhole: SW 1, DS/PN: 1.007 Invert Level (m) 135.500 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><thead><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></thead><tbody><tr><td>0.000</td><td>54.0</td><td>0.0</td><td>1.200</td><td>54.0</td><td>0.0</td></tr><tr><td>0.600</td><td>54.0</td><td>0.0</td><td>1.201</td><td>0.0</td><td>0.0</td></tr></tbody></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	54.0	0.0	1.200	54.0	0.0	0.600	54.0	0.0	1.201	0.0	0.0
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)															
0.000	54.0	0.0	1.200	54.0	0.0															
0.600	54.0	0.0	1.201	0.0	0.0															
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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage		Network 2014.1

Summary of Results for 15 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	
1.000	SW 8	138.453	-0.097	0.000	0.27	0.0	4.8	OK
1.001	SW 7	138.312	-0.088	0.000	0.35	0.0	5.8	OK
1.002	SW 6	138.106	-0.094	0.000	0.30	0.0	8.5	OK
2.000	SW 9	138.432	-0.118	0.000	0.10	0.0	1.8	OK
2.001	SW 10	138.342	-0.108	0.000	0.18	0.0	4.1	OK
2.002	SW 11	138.147	-0.103	0.000	0.21	0.0	6.0	OK
1.003	SW 5	137.754	-0.146	0.000	0.27	0.0	15.0	OK
1.004	SW 4	137.486	-0.164	0.000	0.16	0.0	16.4	OK
3.000	SW 12	137.918	-0.132	0.000	0.03	0.0	1.4	OK
1.005	SW 3	136.602	-0.148	0.000	0.25	0.0	19.5	OK
1.006	SW 2	136.289	-0.161	0.000	0.18	0.0	19.8	OK
4.000	SW 14	137.230	-0.120	0.000	0.09	0.0	1.9	OK
4.001	SW 13	136.924	-0.126	0.000	0.06	0.0	2.8	OK
1.007	SW 1	135.671	0.021	0.000	0.14	0.0	4.0	SURCHARGE

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.264		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
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Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
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Micro Drainage		Network 2014.1

Summary of Results for 30 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	
1.000	SW 8	138.447	-0.103	0.000	0.21	0.0	3.8	OK
1.001	SW 7	138.305	-0.095	0.000	0.29	0.0	4.8	OK
1.002	SW 6	138.101	-0.099	0.000	0.25	0.0	7.2	OK
2.000	SW 9	138.429	-0.121	0.000	0.08	0.0	1.4	OK
2.001	SW 10	138.339	-0.111	0.000	0.15	0.0	3.5	OK
2.002	SW 11	138.144	-0.106	0.000	0.19	0.0	5.2	OK
1.003	SW 5	137.748	-0.152	0.000	0.23	0.0	12.7	OK
1.004	SW 4	137.481	-0.169	0.000	0.14	0.0	14.0	OK
3.000	SW 12	137.916	-0.134	0.000	0.03	0.0	1.1	OK
1.005	SW 3	136.596	-0.154	0.000	0.22	0.0	16.8	OK
1.006	SW 2	136.284	-0.166	0.000	0.15	0.0	17.1	OK
4.000	SW 14	137.226	-0.124	0.000	0.07	0.0	1.5	OK
4.001	SW 13	136.922	-0.128	0.000	0.05	0.0	2.3	OK
1.007	SW 1	135.715	0.065	0.000	0.15	0.0	4.2	SURCHARGE

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage		Network 2014.1

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.007	SEWER	136.150	135.100	135.100	1200	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	60
Ratio R	0.264		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
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Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
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Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 2 Yr Storms	
Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage		Network 2014.1

Summary of Results for 60 minute 2 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

		Water	Surcharged	Flooded			Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow	Flow	
PN	Name	(m)	(m)	(m ³)	Cap.	(l/s)	(l/s)	Status
1.000	SW 8	138.438	-0.112	0.000	0.15	0.0	2.7	OK
1.001	SW 7	138.296	-0.104	0.000	0.21	0.0	3.4	OK
1.002	SW 6	138.093	-0.107	0.000	0.18	0.0	5.2	OK
2.000	SW 9	138.423	-0.127	0.000	0.06	0.0	1.0	OK
2.001	SW 10	138.333	-0.117	0.000	0.11	0.0	2.6	OK
2.002	SW 11	138.137	-0.113	0.000	0.14	0.0	3.9	OK
1.003	SW 5	137.736	-0.164	0.000	0.17	0.0	9.4	OK
1.004	SW 4	137.473	-0.177	0.000	0.10	0.0	10.3	OK
3.000	SW 12	137.913	-0.137	0.000	0.02	0.0	0.8	OK
1.005	SW 3	136.585	-0.165	0.000	0.16	0.0	12.3	OK
1.006	SW 2	136.275	-0.175	0.000	0.11	0.0	12.6	OK
4.000	SW 14	137.221	-0.129	0.000	0.05	0.0	1.1	OK
4.001	SW 13	136.918	-0.132	0.000	0.04	0.0	1.7	OK
1.007	SW 1	135.742	0.092	0.000	0.15	0.0	4.3	SURCHARGED

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Micro Drainage		Network 2014.1

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.007	SEWER	136.150	135.100	135.100	1200	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.264		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	-	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Micro Drainage		Network 2014.1

Summary of Results for 15 minute 30 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded	Pipe		Status
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	
1.000	SW 8	138.489	-0.061	0.000	0.66	0.0	11.8 OK
1.001	SW 7	138.363	-0.037	0.000	0.92	0.0	15.1 OK
1.002	SW 6	138.154	-0.046	0.000	0.81	0.0	23.0 OK
2.000	SW 9	138.451	-0.099	0.000	0.26	0.0	4.3 OK
2.001	SW 10	138.375	-0.075	0.000	0.50	0.0	11.8 OK
2.002	SW 11	138.187	-0.063	0.000	0.63	0.0	17.6 OK
1.003	SW 5	137.821	-0.079	0.000	0.74	0.0	41.5 OK
1.004	SW 4	137.533	-0.117	0.000	0.46	0.0	45.3 OK
3.000	SW 12	137.928	-0.122	0.000	0.08	0.0	3.5 OK
1.005	SW 3	136.667	-0.083	0.000	0.70	0.0	54.2 OK
1.006	SW 2	136.339	-0.111	0.000	0.50	0.0	55.7 OK
4.000	SW 14	137.247	-0.103	0.000	0.22	0.0	4.7 OK
4.001	SW 13	136.941	-0.109	0.000	0.17	0.0	7.5 OK
1.007	SW 1	135.971	0.321	0.000	0.16	0.0	4.4 SURCHARGED

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.264		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Micro Drainage		Network 2014.1

Summary of Results for 30 minute 30 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

		Water	Surcharged	Flooded				Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow	Flow		
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)	Status	
1.000	SW 8	138.478	-0.072	0.000	0.52	0.0	9.4	OK	
1.001	SW 7	138.347	-0.053	0.000	0.74	0.0	12.1	OK	
1.002	SW 6	138.139	-0.061	0.000	0.66	0.0	18.6	OK	
2.000	SW 9	138.446	-0.104	0.000	0.20	0.0	3.4	OK	
2.001	SW 10	138.366	-0.084	0.000	0.40	0.0	9.3	OK	
2.002	SW 11	138.175	-0.075	0.000	0.50	0.0	14.0	OK	
1.003	SW 5	137.801	-0.099	0.000	0.60	0.0	33.6	OK	
1.004	SW 4	137.520	-0.130	0.000	0.37	0.0	37.0	OK	
3.000	SW 12	137.925	-0.125	0.000	0.06	0.0	2.8	OK	
1.005	SW 3	136.648	-0.102	0.000	0.58	0.0	44.4	OK	
1.006	SW 2	136.325	-0.125	0.000	0.41	0.0	45.3	OK	
4.000	SW 14	137.242	-0.108	0.000	0.17	0.0	3.7	OK	
4.001	SW 13	136.936	-0.114	0.000	0.13	0.0	5.9	OK	
1.007	SW 1	136.129	0.479	0.000	0.16	0.0	4.4	SURCHARGE	

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	60
Ratio R	0.264		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 30 Yr Storms + CC	
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Micro Drainage		Network 2014.1

Summary of Results for 60 minute 30 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	
1.000	SW 8	138.463	-0.087	0.000	0.37	0.0	6.6	OK
1.001	SW 7	138.327	-0.073	0.000	0.52	0.0	8.5	OK
1.002	SW 6	138.122	-0.078	0.000	0.46	0.0	13.1	OK
2.000	SW 9	138.438	-0.112	0.000	0.14	0.0	2.4	OK
2.001	SW 10	138.354	-0.096	0.000	0.28	0.0	6.6	OK
2.002	SW 11	138.161	-0.089	0.000	0.35	0.0	9.9	OK
1.003	SW 5	137.777	-0.123	0.000	0.42	0.0	23.7	OK
1.004	SW 4	137.503	-0.147	0.000	0.26	0.0	26.1	OK
3.000	SW 12	137.920	-0.130	0.000	0.04	0.0	2.0	OK
1.005	SW 3	136.624	-0.126	0.000	0.41	0.0	31.3	OK
1.006	SW 2	136.307	-0.143	0.000	0.29	0.0	31.9	OK
4.000	SW 14	137.235	-0.115	0.000	0.12	0.0	2.6	OK
4.001	SW 13	136.931	-0.119	0.000	0.09	0.0	4.2	OK
1.007	SW 1	136.273	0.623	0.000	0.16	0.0	4.4	SURCHARGE

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.264		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Micro Drainage		Network 2014.1

Summary of Results for 15 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded	Pipe		Status
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	
1.000	SW 8	138.536	-0.014	0.000	0.80	0.0	14.3 OK
1.001	SW 7	138.438	0.038	0.000	1.10	0.0	18.2 SURCHARGED
1.002	SW 6	138.171	-0.029	0.000	0.98	0.0	27.8 OK
2.000	SW 9	138.459	-0.091	0.000	0.33	0.0	5.6 OK
2.001	SW 10	138.388	-0.062	0.000	0.64	0.0	15.2 OK
2.002	SW 11	138.203	-0.047	0.000	0.81	0.0	22.7 OK
1.003	SW 5	137.846	-0.054	0.000	0.92	0.0	51.7 OK
1.004	SW 4	137.548	-0.102	0.000	0.57	0.0	56.8 OK
3.000	SW 12	137.932	-0.118	0.000	0.10	0.0	4.5 OK
1.005	SW 3	136.692	-0.058	0.000	0.88	0.0	68.2 OK
1.006	SW 2	136.356	-0.094	0.000	0.63	0.0	69.9 OK
4.000	SW 14	137.254	-0.096	0.000	0.28	0.0	6.1 OK
4.001	SW 13	136.947	-0.103	0.000	0.21	0.0	9.6 OK
1.007	SW 1	136.121	0.471	0.000	0.16	0.0	4.4 SURCHARGED

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.264		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Summary of Results for 30 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Overflow		Pipe	Status
		Level (m)	Depth (m)	Volume (m ³)			Flow (l/s)	
1.000	SW 8	138.492	-0.058	0.000	0.68	0.0	12.2	OK
1.001	SW 7	138.367	-0.033	0.000	0.96	0.0	15.8	OK
1.002	SW 6	138.157	-0.043	0.000	0.85	0.0	24.3	OK
2.000	SW 9	138.453	-0.097	0.000	0.27	0.0	4.5	OK
2.001	SW 10	138.377	-0.073	0.000	0.52	0.0	12.2	OK
2.002	SW 11	138.189	-0.061	0.000	0.65	0.0	18.2	OK
1.003	SW 5	137.826	-0.074	0.000	0.78	0.0	43.8	OK
1.004	SW 4	137.536	-0.114	0.000	0.48	0.0	48.2	OK
3.000	SW 12	137.929	-0.121	0.000	0.08	0.0	3.7	OK
1.005	SW 3	136.671	-0.079	0.000	0.75	0.0	57.8	OK
1.006	SW 2	136.354	-0.096	0.000	0.53	0.0	58.9	OK
4.000	SW 14	137.248	-0.102	0.000	0.23	0.0	4.9	OK
4.001	SW 13	136.942	-0.108	0.000	0.17	0.0	7.7	OK
1.007	SW 1	136.348	0.698	0.000	0.16	0.0	4.4	SURCHARGED

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	60
Ratio R	0.264		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference	MD-SHE-0095-5000-1700-5000
Design Head (m)	1.700
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	95
Invert Level (m)	135.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Summary of Results for 60 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

		Water	Surcharged	Flooded			Pipe	
	US/MH	Level	Depth	Volume	Flow /	Overflow	Flow	
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)	Status
1.000	SW 8	138.474	-0.076	0.000	0.48	0.0	8.6	OK
1.001	SW 7	138.341	-0.059	0.000	0.68	0.0	11.2	OK
1.002	SW 6	138.135	-0.065	0.000	0.61	0.0	17.3	OK
2.000	SW 9	138.444	-0.106	0.000	0.19	0.0	3.2	OK
2.001	SW 10	138.363	-0.087	0.000	0.37	0.0	8.6	OK
2.002	SW 11	138.172	-0.078	0.000	0.46	0.0	12.9	OK
1.003	SW 5	137.795	-0.105	0.000	0.55	0.0	31.1	OK
1.004	SW 4	137.516	-0.134	0.000	0.34	0.0	34.3	OK
3.000	SW 12	137.923	-0.127	0.000	0.06	0.0	2.6	OK
1.005	SW 3	136.642	-0.108	0.000	0.53	0.0	41.1	OK
1.006	SW 2	136.573	0.123	0.000	0.38	0.0	42.0	SURCHARGED
4.000	SW 14	137.240	-0.110	0.000	0.16	0.0	3.5	OK
4.001	SW 13	136.935	-0.115	0.000	0.12	0.0	5.5	OK
1.007	SW 1	136.567	0.917	0.000	0.16	0.0	4.4	SURCHARGE

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	120
Ratio R	0.264		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference	MD-SHE-0095-5000-1700-5000
Design Head (m)	1.700
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	95
Invert Level (m)	135.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Micro Drainage	Network 2014.1	

Summary of Results for 120 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded	Pipe		Status
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	
1.000	SW 8	138.458	-0.092	0.000	0.32	0.0	5.7 OK
1.001	SW 7	138.320	-0.080	0.000	0.45	0.0	7.4 OK
1.002	SW 6	138.116	-0.084	0.000	0.40	0.0	11.4 OK
2.000	SW 9	138.435	-0.115	0.000	0.12	0.0	2.1 OK
2.001	SW 10	138.350	-0.100	0.000	0.24	0.0	5.7 OK
2.002	SW 11	138.156	-0.094	0.000	0.30	0.0	8.6 OK
1.003	SW 5	137.769	-0.131	0.000	0.36	0.0	20.5 OK
1.004	SW 4	137.497	-0.153	0.000	0.23	0.0	22.6 OK
3.000	SW 12	137.919	-0.131	0.000	0.04	0.0	1.7 OK
1.005	SW 3	136.841	0.091	0.000	0.35	0.0	27.2 SURCHARGED
1.006	SW 2	136.836	0.386	0.000	0.25	0.0	27.7 SURCHARGED
4.000	SW 14	137.232	-0.118	0.000	0.11	0.0	2.3 OK
4.001	SW 13	136.928	-0.122	0.000	0.08	0.0	3.6 OK
1.007	SW 1	136.831	1.181	0.000	0.16	0.0	4.5 SURCHARGED

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1 Chiltern Ave Euxton Chorley PR7 6NU	Mill Lane, Gisburn Proposed SW Simulations 1 in 100 Yr Storms + CC	
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Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	180
Ratio R	0.264		

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Date 14.08.2018 File MILL LANE SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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Micro Drainage		Network 2014.1

Summary of Results for 180 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Pipe	Status
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	
1.000	SW 8	138.450	-0.100	0.000	0.24	0.0	4.4	OK
1.001	SW 7	138.311	-0.089	0.000	0.34	0.0	5.7	OK
1.002	SW 6	138.107	-0.093	0.000	0.31	0.0	8.7	OK
2.000	SW 9	138.431	-0.119	0.000	0.10	0.0	1.6	OK
2.001	SW 10	138.343	-0.107	0.000	0.18	0.0	4.4	OK
2.002	SW 11	138.149	-0.101	0.000	0.23	0.0	6.5	OK
1.003	SW 5	137.756	-0.144	0.000	0.28	0.0	15.7	OK
1.004	SW 4	137.488	-0.162	0.000	0.17	0.0	17.3	OK
3.000	SW 12	137.917	-0.133	0.000	0.03	0.0	1.3	OK
1.005	SW 3	136.936	0.186	0.000	0.27	0.0	20.8	SURCHARGED
1.006	SW 2	136.931	0.481	0.000	0.19	0.0	21.2	SURCHARGED
4.000	SW 14	137.228	-0.122	0.000	0.08	0.0	1.7	OK
4.001	SW 13	136.928	-0.122	0.000	0.06	0.0	2.8	OK
1.007	SW 1	136.925	1.275	0.000	0.16	0.0	4.6	SURCHARGED

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Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	240
Ratio R	0.264		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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Micro Drainage		Network 2014.1

Summary of Results for 240 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded	Pipe		Status
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	
1.000	SW 8	138.445	-0.105	0.000	0.20	0.0	3.6 OK
1.001	SW 7	138.304	-0.096	0.000	0.28	0.0	4.6 OK
1.002	SW 6	138.101	-0.099	0.000	0.25	0.0	7.1 OK
2.000	SW 9	138.428	-0.122	0.000	0.08	0.0	1.3 OK
2.001	SW 10	138.339	-0.111	0.000	0.15	0.0	3.6 OK
2.002	SW 11	138.144	-0.106	0.000	0.19	0.0	5.4 OK
1.003	SW 5	137.748	-0.152	0.000	0.23	0.0	12.9 OK
1.004	SW 4	137.481	-0.169	0.000	0.14	0.0	14.2 OK
3.000	SW 12	137.916	-0.134	0.000	0.02	0.0	1.1 OK
1.005	SW 3	136.871	0.121	0.000	0.22	0.0	17.0 SURCHARGED
1.006	SW 2	136.867	0.417	0.000	0.16	0.0	17.4 SURCHARGED
4.000	SW 14	137.225	-0.125	0.000	0.07	0.0	1.4 OK
4.001	SW 13	136.921	-0.129	0.000	0.05	0.0	2.3 OK
1.007	SW 1	136.861	1.211	0.000	0.16	0.0	4.5 SURCHARGED

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Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	300
Ratio R	0.264		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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Micro Drainage		Network 2014.1

Summary of Results for 300 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded			Pipe	Status
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	
1.000	SW 8	138.442	-0.108	0.000	0.17	0.0	3.1	OK
1.001	SW 7	138.300	-0.100	0.000	0.24	0.0	4.0	OK
1.002	SW 6	138.097	-0.103	0.000	0.22	0.0	6.1	OK
2.000	SW 9	138.425	-0.125	0.000	0.07	0.0	1.1	OK
2.001	SW 10	138.336	-0.114	0.000	0.13	0.0	3.1	OK
2.002	SW 11	138.140	-0.110	0.000	0.16	0.0	4.6	OK
1.003	SW 5	137.742	-0.158	0.000	0.20	0.0	11.0	OK
1.004	SW 4	137.477	-0.173	0.000	0.12	0.0	12.2	OK
3.000	SW 12	137.915	-0.135	0.000	0.02	0.0	0.9	OK
1.005	SW 3	136.706	-0.044	0.000	0.19	0.0	14.6	OK
1.006	SW 2	136.702	0.252	0.000	0.13	0.0	14.9	SURCHARGED
4.000	SW 14	137.223	-0.127	0.000	0.06	0.0	1.2	OK
4.001	SW 13	136.920	-0.130	0.000	0.04	0.0	1.9	OK
1.007	SW 1	136.696	1.046	0.000	0.16	0.0	4.4	SURCHARGED

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Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.007	SEWER	136.150	135.100	135.100	1200	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	400
Ratio R	0.264		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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Summary of Results for 400 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded	Pipe		Status
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	
1.000	SW 8	138.437	-0.113	0.000	0.14	0.0	2.5 OK
1.001	SW 7	138.295	-0.105	0.000	0.20	0.0	3.3 OK
1.002	SW 6	138.092	-0.108	0.000	0.18	0.0	5.0 OK
2.000	SW 9	138.422	-0.128	0.000	0.05	0.0	0.9 OK
2.001	SW 10	138.332	-0.118	0.000	0.11	0.0	2.5 OK
2.002	SW 11	138.136	-0.114	0.000	0.13	0.0	3.8 OK
1.003	SW 5	137.735	-0.165	0.000	0.16	0.0	9.0 OK
1.004	SW 4	137.472	-0.178	0.000	0.10	0.0	9.9 OK
3.000	SW 12	137.912	-0.138	0.000	0.02	0.0	0.8 OK
1.005	SW 3	136.654	-0.096	0.000	0.15	0.0	11.9 OK
1.006	SW 2	136.650	0.200	0.000	0.11	0.0	12.2 SURCHARGED
4.000	SW 14	137.221	-0.129	0.000	0.05	0.0	1.0 OK
4.001	SW 13	136.918	-0.132	0.000	0.04	0.0	1.6 OK
1.007	SW 1	136.644	0.994	0.000	0.16	0.0	4.4 SURCHARGED

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Micro Drainage Network 2014.1		

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	500
Ratio R	0.264		

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Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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Summary of Results for 500 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded	Pipe		Status
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	
1.000	SW 8	138.434	-0.116	0.000	0.12	0.0	2.1 OK
1.001	SW 7	138.291	-0.109	0.000	0.17	0.0	2.8 OK
1.002	SW 6	138.089	-0.111	0.000	0.15	0.0	4.3 OK
2.000	SW 9	138.421	-0.129	0.000	0.05	0.0	0.8 OK
2.001	SW 10	138.330	-0.120	0.000	0.09	0.0	2.1 OK
2.002	SW 11	138.134	-0.116	0.000	0.11	0.0	3.2 OK
1.003	SW 5	137.730	-0.170	0.000	0.14	0.0	7.7 OK
1.004	SW 4	137.469	-0.181	0.000	0.09	0.0	8.5 OK
3.000	SW 12	137.910	-0.140	0.000	0.01	0.0	0.6 OK
1.005	SW 3	136.592	-0.158	0.000	0.13	0.0	10.2 OK
1.006	SW 2	136.588	0.138	0.000	0.09	0.0	10.4 SURCHARGED
4.000	SW 14	137.219	-0.131	0.000	0.04	0.0	0.9 OK
4.001	SW 13	136.917	-0.133	0.000	0.03	0.0	1.4 OK
1.007	SW 1	136.583	0.933	0.000	0.16	0.0	4.4 SURCHARGED

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Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.138	4-8	0.027

Total Area Contributing (ha) = 0.165

Total Pipe Volume (m³) = 4.608

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	SEWER	136.150	135.100	135.100	1200 0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	1440
Manhole Headloss Coeff (Global)	0.500	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		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	600
Ratio R	0.264		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: SW 1, DS/PN: 1.007, Volume (m³): 2.8

Unit Reference MD-SHE-0095-5000-1700-5000
Design Head (m) 1.700
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 95
Invert Level (m) 135.500
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	5.0
Flush-Flo™	0.417	4.5
Kick-Flo®	0.851	3.6
Mean Flow over Head Range	–	4.1

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	3.1	1.200	4.3	3.000	6.5	7.000	9.7
0.200	4.2	1.400	4.6	3.500	7.0	7.500	10.1
0.300	4.5	1.600	4.9	4.000	7.5	8.000	10.4
0.400	4.5	1.800	5.1	4.500	7.9	8.500	10.7
0.500	4.5	2.000	5.4	5.000	8.3	9.000	11.0
0.600	4.4	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.9	2.400	5.9	6.000	9.0		
1.000	3.9	2.600	6.1	6.500	9.4		

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Storage Structures for Storm

Cellular Storage Manhole: SW 1, DS/PN: 1.007

Invert Level (m) 135.500 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	54.0	0.0	1.200	54.0	0.0
0.600	54.0	0.0	1.201	0.0	0.0

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Summary of Results for 600 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 200.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

PN	US/MH Name	Water	Surcharged	Flooded	Pipe		Status
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	
1.000	SW 8	138.432	-0.118	0.000	0.11	0.0	1.9 OK
1.001	SW 7	138.288	-0.112	0.000	0.15	0.0	2.4 OK
1.002	SW 6	138.086	-0.114	0.000	0.13	0.0	3.8 OK
2.000	SW 9	138.419	-0.131	0.000	0.04	0.0	0.7 OK
2.001	SW 10	138.328	-0.122	0.000	0.08	0.0	1.9 OK
2.002	SW 11	138.132	-0.118	0.000	0.10	0.0	2.8 OK
1.003	SW 5	137.727	-0.173	0.000	0.12	0.0	6.8 OK
1.004	SW 4	137.465	-0.185	0.000	0.07	0.0	7.5 OK
3.000	SW 12	137.909	-0.141	0.000	0.01	0.0	0.6 OK
1.005	SW 3	136.576	-0.174	0.000	0.12	0.0	9.0 OK
1.006	SW 2	136.519	0.069	0.000	0.08	0.0	9.1 SURCHARGED
4.000	SW 14	137.218	-0.132	0.000	0.04	0.0	0.8 OK
4.001	SW 13	136.916	-0.134	0.000	0.03	0.0	1.2 OK
1.007	SW 1	136.514	0.864	0.000	0.16	0.0	4.4 SURCHARGED