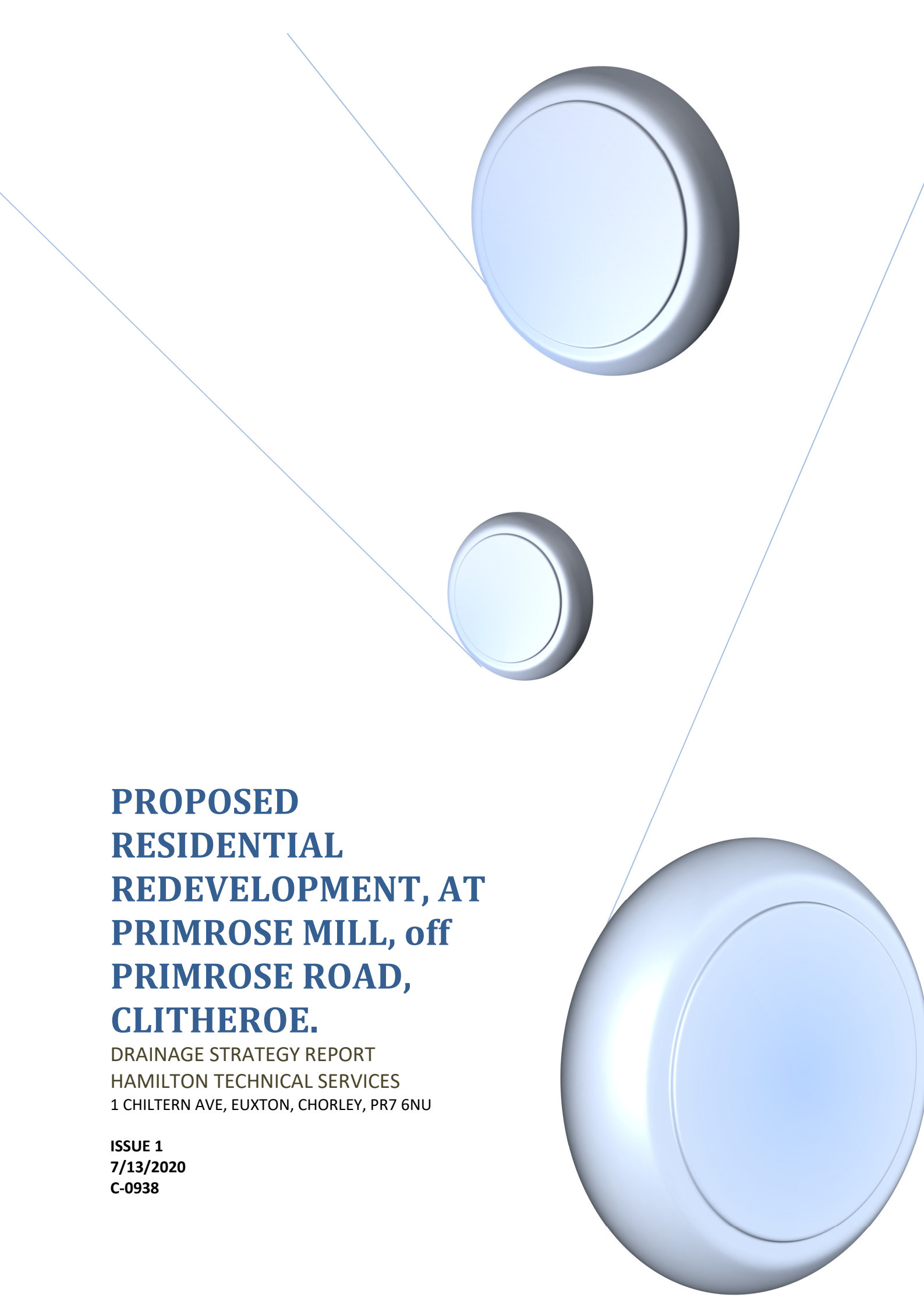




PROPOSED RESIDENTIAL REDEVELOPMENT, AT PRIMROSE MILL, off PRIMROSE ROAD, CLITHEROE.

**DRAINAGE STRATEGY REPORT
HAMILTON TECHNICAL SERVICES
1 CHILTERN AVE, EUXTON, CHORLEY, PR7 6NU**

**ISSUE 1
7/13/2020
C-0938**

Document Control Sheet

Proposed Residential Redevelopment, at Primrose Mill, off Primrose Road, Clitheroe.
Drainage Strategy Report

Job	Date	Issue	Copy
C0903	13 th July 2020	1	

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

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

Approver.....G Hamilton

© Hamilton Technical Services. All rights reserved.

No part of this report may be copied or reproduced by any means without prior written permission from Hamilton Technical Services. If you have received this report in error, please destroy all copies in your possession or control and notify Hamilton Technical Services.

This report has been prepared for the exclusive use of the commissioning party and unless otherwise agreed in writing by Hamilton Technical Services, no other party may use, make use of or rely on contents of the report. No liability is accepted by Hamilton Technical Services for any use of this report, other than for the purposes for which it was originally prepared and provided.

Opinions and information provided in the report are on the basis of Hamilton Technical Services using due skill, care and diligence in the preparation of the same and no explicit warranty is provided as to their accuracy. It should be noted that and it is expressly stated that no independent verification of any of the documents or information supplied to Hamilton Technical Services has been made.

Contents

- 1.0 Introduction**
- 2.0 Description of existing site**
- 3.0 Proposals for Development**
- 4.0 Maintenance**
- 5.0 Conclusions**

Figures and Plans

Appendices

1. Introduction

- 1.1. Hamilton Technical Services have been commissioned through Partington & Associates Ltd., to act on behalf of the developer Mr R Evans, to prepare a Drainage Strategy Report, in support of a redevelopment scheme, to provide residential apartment dwellings with car parking, associated access and landscaping.
- 1.2. The site comprises a number of buildings that form part of a large former mill complex located to the southwest of Primrose Road. The site lies close to the southern edge of Clitheroe. The location of the site is illustrated in **Figure 1** appended to this report.
- 1.3. The national grid reference for the site is 373710E, 440753N.
- 1.4. It is understood that permission is being sought to re-develop the site to provide a number of apartment style dwellings with parking, access and landscaping areas. A proposed site layout plan is attached as **Figure 3** of this report.

2. Description of the existing site.

- 2.1. The site is bounded to the north and northwest by residential and commercial properties. To the southeast and south are industrial and commercial properties. The southwest boundary is onto agricultural land. The site is occupied by former mill buildings and access roadways.
- 2.2. The site generally slopes steeply from north to south and the existing site layout and drainage layout is shown on **Figure 2** of this report.
- 2.3. The site is served by systems of foul and surface water drains. These are in small part separate system but combine on exiting the buildings to form a combined collection system that exits the site and flows away in a south westerly direction. Where this system passes along the southern edge of the site it connects with the primary combined system serving the main mill complex.
- 2.4. The site is largely covered by hard surfacing consisting of a mix of roof areas, tarmac, concrete and compacted hard-core. The surface water run-off from all these areas runs into the existing combined outfall system and has done so for many decades since the mill complex was constructed. The re-development site is a brown field site, having been in industrial use for a very long time.
- 2.5. The catchment areas discharging to the existing drainage systems have been shown on a site plan showing the original site layout and appended as **Figure 2** of this report. A series of calculations have been carried out to determine the flow rates generated through the outfall into the surface water drain during a 1 in 1 Yr, 1 in 2 Yr, 1 in 30 Yr and 1 in 100 Yr return storm event. These calculations show flow rates from the site of 16.50 l/s during a 1 in 1 Yr storm, 21.40 l/s during a 1 in 2 Yr storm, with outflow rising to 42.30 l/s in a 1 in 30 Yr event and to 54.80 l/s during a 1 in 100 Yr event. Copies of these calculations are attached in **Appendix 1** of this report.
- 2.6. A site investigation report carried out on the site has revealed that the ground is surfaced with a mix of tarmac, concrete and hard-core as described above. These materials overly clay strata across most of the site, which is not capable of sustaining a soak-away system of drainage. In attempting to follow SUDS best practice, percolation testing has been attempted but met with failure. Photographs showing the failed tests are attached as **Figures 4 & 5** of this report.

- 2.7. Additionally, due to the constricted nature of the site there is insufficient space in which to construct a suitably sized soak-away, as nowhere is capable of being more than 5.0m from any building, boundary or existing retaining wall.
- 2.8. The second option in the SUDS train is to outfall surface water to a watercourse. A large watercourse does flow approximately north to south close to the eastern boundary of the site. However, approaches to request permission to cross the private land to the east of the site have been rejected by the land owners.
- 2.9. There are no private surface water drains or sewers available for discharge of surface water run-off and no local highway drains that can be used.
- 2.10. The site is presently drained by a combined system that connects to a system serving the wider mill complex and outfalling towards the west. This will be maintained as the method of draining the re-developed site, with surface water flows being controlled and attenuated within the development boundary.

3. Proposals for Development

- 3.1. The redevelopment of the site will consist of the refurbishment and partial reconstruction of the existing buildings, foundations and hard standing areas. The construction of new parking areas and associated access road, driveways and landscaping.
- 3.2. The site will be served by new separate foul and surface water drainage systems that will be combined at the last chamber on site prior to discharging to the existing combined system serving the overall mill complex and eventually to the public combined system. A proposed drainage layout plan is attached as **Figure 6** of this report.
- 3.3. Having been previously developed, the site is classified as a brownfield site and it is therefore required that the rate of surface water discharge from the redeveloped site be reduced by 50% during future rainfall events. As can be seen from the simulation calculations in **Appendix 1**, the rate of discharge from the existing site during a 1 in 1 Yr event would be approximately 16.50 l/s.
- 3.4. Based on the above and the requirement to reduce as much as possible the rate of surface water run-off the new surface water drainage will be designed to allow a maximum available discharge rate of 10.00 l/s into the downstream system in all storm conditions up to a 1 in 100 Yr event of 600 Mins duration. The design allows for the 1 in 30 and 1 in 100 Yr storm events with a climate change allowance of 35% included. Design calculations show the system to be robust and capable of containing the run-off from all storm events with the exception of some minor exceedance flows occurring during a short duration 1 in 100 Yr event. A summary of these calculations is attached as **Appendix 2** of this report.
- 3.5. The calculations show that during 1 in 100 Yr events in the range of 5 to 20 minutes duration, a small volume of exceedance may be created. The maximum volume will occur during a 15 minute storm and would release 0.024 CuM of rainwater from the system. This small volume will be retained on the surface of the west car parking area around the new “Aco” channel drain shown on the proposed drainage layout.
- 3.6. The reduction of the design rate of discharge to 10.0l/s will result in a reduction in offsite flows by 56% during 1 in 1 Yr events, 61% during 1 in 2 Yr events, 77% during 1 in 30 Yr events and 82% during the 1 in 100 Yr events. The rate of discharge will be controlled by means of a Hydro-brake unit located in the final surface water manhole prior to combining with the foul flows and leaving the site.

- 3.7. Foul flows from the redeveloped site will be collected in a new system of foul water drains and discharged into the existing outfall pipes as described above. These pipes will be surveyed by CCTV to ascertain their suitability for this purpose and will be repaired or renewed as required.
- 3.8. A plan illustrating the new surface water catchment areas is attached as **Figure 7** of this report. Attenuation will be provided on site within the attenuation tank, surface water chambers and pipework and discharge will be controlled by a “Hydro-brake” unit or approved alternative unit.

4. Maintenance

4.1 The entirety of the site will remain in private ownership.

4.2 On completion of the redevelopment works a suitably qualified management company will be employed and will carry out the future inspection, maintenance and repair of the communal areas of the site.

4.3 The communal areas of the access ways, parking and drainage elements will be inspected at six monthly intervals and any accumulated silt and debris will be removed to an off-site tip and necessary repairs carried out.

4.3 Maintenance and repair of the drainage systems will be amalgamated with the general site programme and will be financed through annual fees charged to residents on the site.

5. Conclusions

Based on the above details and proposals it will be possible to design, construct and install the proposed works in a sustainable manner that will not increase any flood risk and that will prevent the occurrence of flooding on or out-with the development site.

Figures;

- Figure 1 – Site Location Plan
- Figure 2 - Existing Site Layout Plan
- Figure 3 – Proposed Site Layout Plan
- Figure 4– Photo of Perc Test 1 Failed
- Figure 5 – Photo of Perc test 2 Failed
- Figure 6 – Proposed Drainage Plan
- Figure 7 – Proposed Catchment Areas Plan

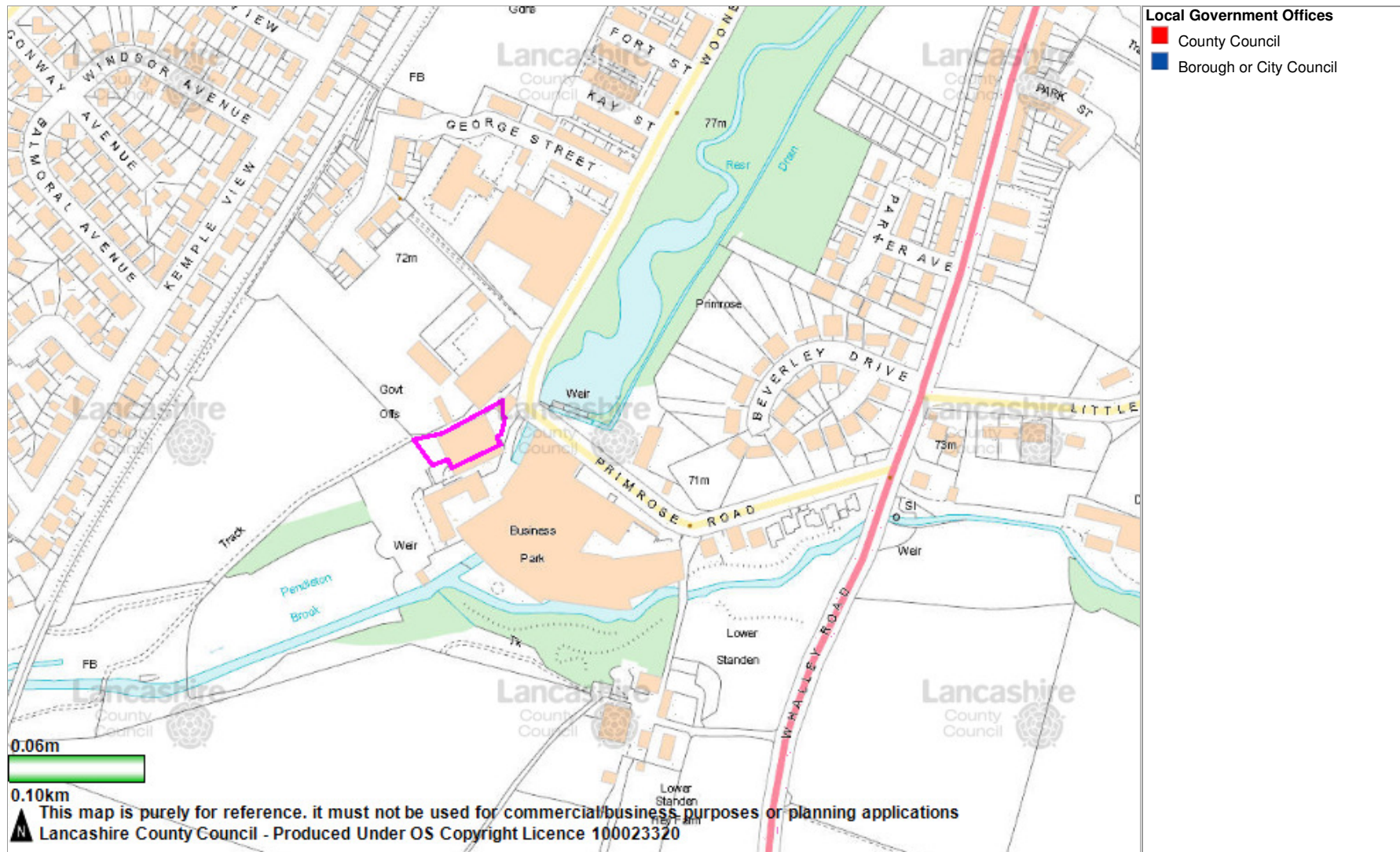
Appendix 1 – Existing SW Simulation Calculations

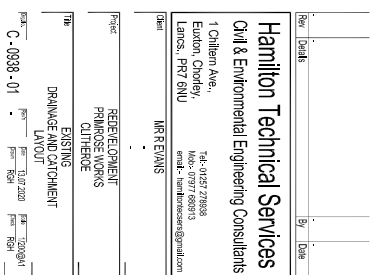
Appendix 2 – New SW Simulation Calculations

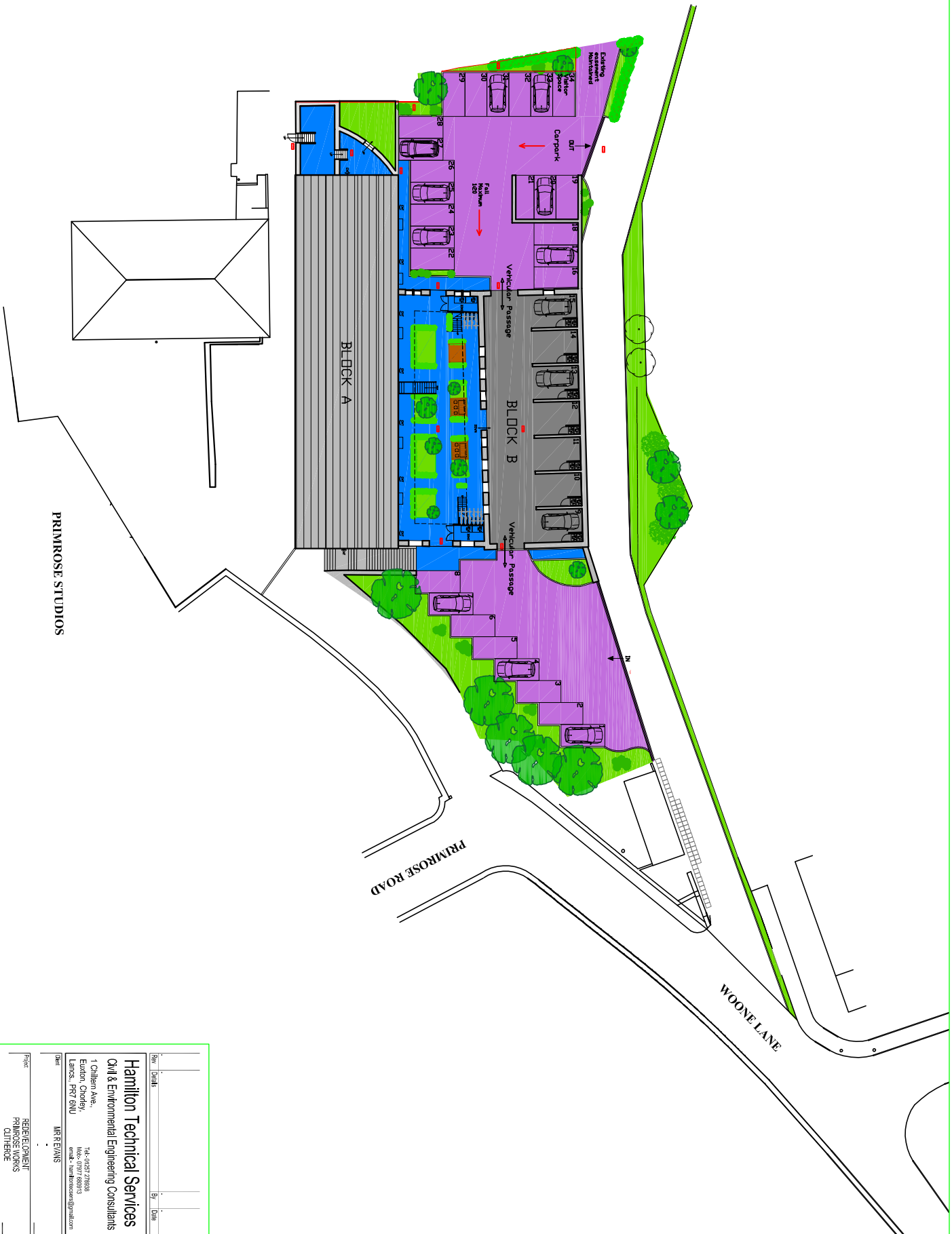


This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown Copyright. Unauthorised reproduction may lead to prosecution or civil proceedings. Lancashire County Council - OS Licence 100023320. This map is purely for reference, it must not be used for commercial/business purposes or planning applications.

Primrose Mill







PRIMROSE STUDIOS

Rev	Drawn	By	Date

Hamilton Technical Services
Civil & Environmental Engineering Consultants
1 Chiltern Ave.,
Eaton, Chichester,
Lancs, PR7 6NU
Tel: 01257 278688
Mob: 07977 660913
email: hts@hamilton-ts.co.uk

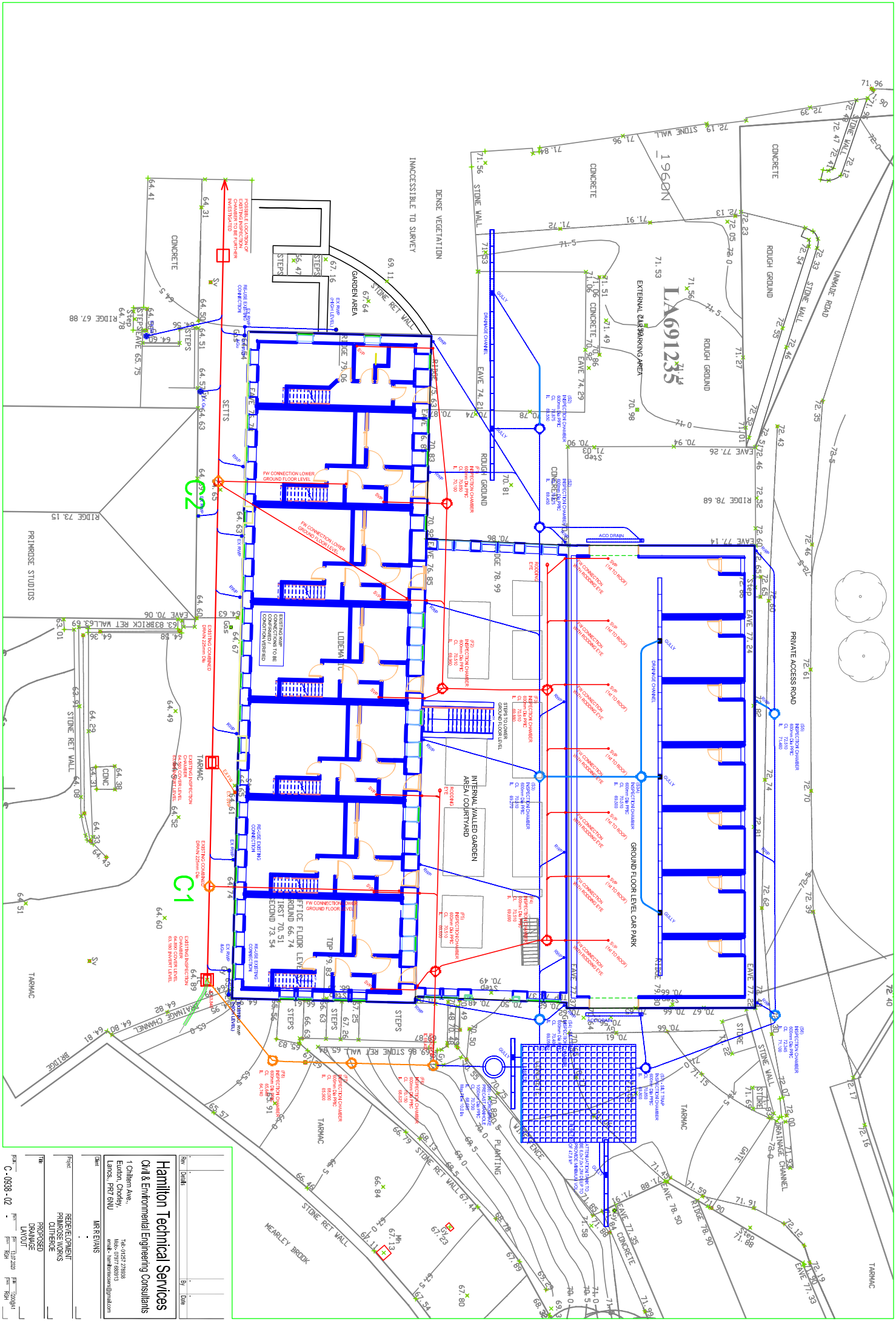
MR REWINS

Project	REDEVELOPMENT PRIMROSE WORKS CLIFFENCE
TITLE	PROPOSED SITE LAYOUT

PKS: C-0838-04 Rev: 01.07.2020 Date: 20.08.2020
Rev: 10.01 Date: 10.01





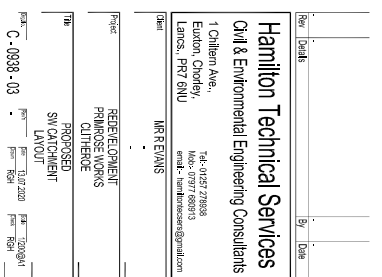


Rev	Details	By	Date

Hamilton Technical Services
Civil & Environmental Engineering Consultants
1 Chilton Ave.,
Eaton, Chichester,
Lancs. PR7 6NU
Tel: 01757 27868
Mob: 07977 66013
web: hts@hilton.com

MR REVIEWS

Project	REDEVELOPMENT PRIMROSE WORKS CLINTON
File	PROPOSED DRAINAGE LAYOUT
Print	Rev: 01/07/2020 Rev: 1/01/2021
Print	Rev: 01/07/2020 Rev: 1/01/2021

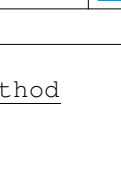


Primrose Mill, Clitheroe, Re-development.

Appendix 1

Existing SW Drainage System, Simulation Calculations.

Hamilton Technical Services		Page 1								
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Mill Clitheroe Ex SW Simulation Calcs 1 in 1 Yr - 1 in 100 Yr Storms									
Date 08.07.2020 File PRIMROSE EX 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>0.130</td><td>4-8</td><td>0.010</td></tr></tbody></table> Total Area Contributing (ha) = 0.140 Total Pipe Volume (m³) = 1.335			Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.130	4-8	0.010
Time (mins)	Area (ha)	Time (mins)	Area (ha)							
0-4	0.130	4-8	0.010							
©1982-2014 XP Solutions										

Hamilton Technical Services				Page 2	
1 Chiltern Ave Euxton Chorley PR7 6NU		Primrose Mill Clitheroe Ex SW Simulation Calcs 1 in 1 Yr - 1 in 100 Yr Storms			
Date 08.07.2020 File PRIMROSE EX SW.MDX		Designed by Geoff Hamilton Checked by			
Micro Drainage		Network 2014.1			

STORM SEWER DESIGN by the Modified Rational Method

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)
1.000	38.900	1.150	33.8	0.070	4.00	0.0	0.600	o	150
2.000	18.000	2.150	8.4	0.040	4.00	0.0	0.600	o	150
1.001	6.620	2.200	3.0	0.030	0.00	0.0	0.600	o	150
1.002	12.000	2.520	4.8	0.000	0.00	0.0	0.600	o	150

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	4.37	70.200	0.070	0.0	0.0	0.0	1.74	30.7	0.0
2.000	0.00	4.09	71.200	0.040	0.0	0.0	0.0	3.50	61.9	0.0
1.001	0.00	4.39	69.050	0.140	0.0	0.0	0.0	5.85	103.4	0.0
1.002	0.00	4.44	66.850	0.140	0.0	0.0	0.0	4.65	82.2	0.0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002	EX MH	64.890	64.330	63.180	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	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Mill Clitheroe Ex SW Simulation Calcs 1 in 1 Yr - 1 in 100 Yr Storms	
Date 08.07.2020 File PRIMROSE EX SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Summary of Results for 15 minute 1 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	1	70.255	-0.095	0.000	0.29	0.0	8.7	OK
2.000	2	71.230	-0.120	0.000	0.09	0.0	5.0	OK
1.001	3	69.094	-0.106	0.000	0.19	0.0	16.6	OK
1.002	4	66.898	-0.102	0.000	0.22	0.0	16.5	OK

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Mill Clitheroe Ex SW Simulation Calcs 1 in 1 Yr - 1 in 100 Yr Storms	
Date 08.07.2020 File PRIMROSE EX 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

		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	1	70.264	-0.086	0.000	0.38	0.0	11.3	OK
2.000	2	71.233	-0.117	0.000	0.11	0.0	6.5	OK
1.001	3	69.100	-0.100	0.000	0.25	0.0	21.5	OK
1.002	4	66.905	-0.095	0.000	0.29	0.0	21.4	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Mill Clitheroe Ex SW Simulation Calcs 1 in 1 Yr - 1 in 100 Yr Storms	
Date 08.07.2020 File PRIMROSE EX 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	0.130	4-8	0.010

Total Area Contributing (ha) = 0.140

Total Pipe Volume (m³) = 1.335

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)
1.002	EX MH	64.890	64.330	63.180	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	0
Number of Online Controls	0	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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Mill Clitheroe Ex SW Simulation Calcs 1 in 1 Yr - 1 in 100 Yr Storms	
Date 08.07.2020 File PRIMROSE EX 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	0.130	4-8	0.010

Total Area Contributing (ha) = 0.140

Total Pipe Volume (m³) = 1.335

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)
1.002	EX MH	64.890	64.330	63.180	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	0
Number of Online Controls	0	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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Mill Clitheroe Ex SW Simulation Calcs 1 in 1 Yr - 1 in 100 Yr Storms	
Date 08.07.2020 File PRIMROSE EX SW.MDX	Designed by Geoff Hamilton Checked by	
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

		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	1	70.313	-0.037	0.000	0.92	0.0	27.5	OK
2.000	2	71.253	-0.097	0.000	0.27	0.0	15.7	OK
1.001	3	69.136	-0.064	0.000	0.63	0.0	55.0	OK
1.002	4	66.946	-0.054	0.000	0.74	0.0	54.8	OK

Primrose Mill, Clitheroe, Re-development.

Appendix 2

Proposed SW Drainage System, Simulation Calculations.

Hamilton Technical Services		Page 1								
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms									
Date 10.07.2020 File PRIMROSE NEW 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>0.148</td><td>4-8</td><td>0.019</td></tr></tbody></table> Total Area Contributing (ha) = 0.167 Total Pipe Volume (m³) = 1.829			Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.148	4-8	0.019
Time (mins)	Area (ha)	Time (mins)	Area (ha)							
0-4	0.148	4-8	0.019							
©1982-2014 XP Solutions										

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU		
Date 10.07.2020 File PRIMROSE NEW SW.MDX		
Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms		
Designed by Geoff Hamilton Checked by		
Micro Drainage		Network 2014.1

STORM SEWER DESIGN by the Modified Rational Method

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)
1.000	6.030	0.100	60.3	0.053	4.00	0.0	0.600	o	150
1.001	15.250	0.180	84.7	0.032	0.00	0.0	0.600	o	150
2.000	6.210	0.230	27.0	0.004	4.00	0.0	0.600	o	150
1.002	14.860	0.220	67.5	0.024	0.00	0.0	0.600	o	150
1.003	5.000	0.400	12.5	0.004	0.00	0.0	0.600	o	150
3.000	18.450	0.360	51.3	0.013	4.00	0.0	0.600	o	150
3.001	9.400	1.300	7.2	0.003	0.00	0.0	0.600	o	150
3.002	8.410	1.150	7.3	0.034	0.00	0.0	0.600	o	150
1.004	3.720	0.025	148.8	0.000	0.00	0.0	0.600	o	150
1.005	5.000	2.725	1.8	0.000	0.00	0.0	0.600	o	150
1.006	4.840	1.160	4.2	0.000	0.00	0.0	0.600	o	150
1.007	6.330	0.900	7.0	0.000	0.00	0.0	0.600	o	150

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	4.08	69.550	0.053	0.0	0.0	0.0	1.30	22.9	0.0
1.001	0.00	4.31	69.450	0.085	0.0	0.0	0.0	1.09	19.3	0.0
2.000	0.00	4.05	69.500	0.004	0.0	0.0	0.0	1.95	34.4	0.0
1.002	0.00	4.51	69.270	0.113	0.0	0.0	0.0	1.23	21.7	0.0
1.003	0.00	4.54	69.050	0.117	0.0	0.0	0.0	2.87	50.6	0.0
3.000	0.00	4.22	71.460	0.013	0.0	0.0	0.0	1.41	24.9	0.0
3.001	0.00	4.26	71.100	0.016	0.0	0.0	0.0	3.77	66.6	0.0
3.002	0.00	4.30	69.800	0.050	0.0	0.0	0.0	3.75	66.3	0.0
1.004	0.00	4.62	68.650	0.167	0.0	0.0	0.0	0.82	14.5	0.0
1.005	0.00	4.63	68.625	0.167	0.0	0.0	0.0	7.50	132.5	0.0
1.006	0.00	4.64	65.900	0.167	0.0	0.0	0.0	4.97	87.8	0.0
1.007	0.00	4.67	64.740	0.167	0.0	0.0	0.0	3.82	67.6	0.0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	1200	0

©1982-2014 XP Solutions

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage Network 2014.1		
<u>Simulation Criteria for Storm</u> 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 * 10m³/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 <u>Synthetic Rainfall Details</u> Rainfall Model FSR Profile Type Winter Return Period (years) 1 Cv (Summer) 0.750 Region England and Wales Cv (Winter) 0.840 M5-60 (mm) 19.000 Storm Duration (mins) 15 Ratio R 0.275		
©1982-2014 XP Solutions		

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference	MD-SHE-0131-1000-2000-1000
Design Head (m)	2.000
Design Flow (l/s)	10.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	131
Invert Level (m)	68.650
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	-	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 5
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage		Network 2014.1

Summary of Results for 30 minute 1 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	1	69.603	-0.097	0.000	0.27	0.0	5.2	OK
1.001	2	69.521	-0.079	0.000	0.45	0.0	8.0	OK
2.000	3	69.510	-0.140	0.000	0.01	0.0	0.4	OK
1.002	4	69.347	-0.073	0.000	0.53	0.0	10.6	OK
1.003	5	69.103	-0.097	0.000	0.27	0.0	10.9	OK
3.000	6	71.483	-0.127	0.000	0.05	0.0	1.3	OK
3.001	7	71.116	-0.134	0.000	0.03	0.0	1.5	OK
3.002	8	69.828	-0.122	0.000	0.08	0.0	4.6	OK
1.004	9	68.822	0.022	0.000	0.66	0.0	7.2	SURCHARGED
1.005	10	68.651	-0.124	0.000	0.07	0.0	7.2	OK
1.006	11	65.932	-0.118	0.000	0.11	0.0	7.2	OK
1.007	12	64.775	-0.115	0.000	0.13	0.0	7.2	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

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

1.007 EX DRAIN 64.890 63.840 63.840 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 * 10m³/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) 1 Cv (Summer) 0.750
 Region England and Wales Cv (Winter) 0.840
 M5-60 (mm) 19.000 Storm Duration (mins) 60
 Ratio R 0.275

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 1 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage		Network 2014.1

Summary of Results for 60 minute 1 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 / Cap.	Overflow (l/s)	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)	
1.000	1	69.595	-0.105	0.000	0.19	0.0	3.7	OK
1.001	2	69.509	-0.091	0.000	0.33	0.0	5.8	OK
2.000	3	69.507	-0.143	0.000	0.01	0.0	0.3	OK
1.002	4	69.335	-0.085	0.000	0.39	0.0	7.7	OK
1.003	5	69.096	-0.104	0.000	0.20	0.0	8.0	OK
3.000	6	71.479	-0.131	0.000	0.04	0.0	0.9	OK
3.001	7	71.113	-0.137	0.000	0.02	0.0	1.1	OK
3.002	8	69.823	-0.127	0.000	0.06	0.0	3.4	OK
1.004	9	68.821	0.021	0.000	0.66	0.0	7.1	SURCHARGED
1.005	10	68.651	-0.124	0.000	0.07	0.0	7.1	OK
1.006	11	65.932	-0.118	0.000	0.11	0.0	7.1	OK
1.007	12	64.775	-0.115	0.000	0.13	0.0	7.1	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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)	15
Ratio R	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW 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	Flow / Cap.	Overflow (l/s)	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)	
1.000	1	69.620	-0.080	0.000	0.45	0.0	8.6	OK
1.001	2	69.544	-0.056	0.000	0.71	0.0	12.7	OK
2.000	3	69.515	-0.135	0.000	0.02	0.0	0.6	OK
1.002	4	69.374	-0.046	0.000	0.81	0.0	16.2	OK
1.003	5	69.119	-0.081	0.000	0.43	0.0	16.9	OK
3.000	6	71.490	-0.120	0.000	0.09	0.0	2.1	OK
3.001	7	71.120	-0.130	0.000	0.04	0.0	2.5	OK
3.002	8	69.834	-0.116	0.000	0.12	0.0	6.8	OK
1.004	9	68.847	0.047	0.000	0.73	0.0	7.9	SURCHARGED
1.005	10	68.652	-0.123	0.000	0.08	0.0	7.9	OK
1.006	11	65.934	-0.116	0.000	0.12	0.0	8.0	OK
1.007	12	64.777	-0.113	0.000	0.14	0.0	8.0	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

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

1.007	EX DRAIN	64.890	63.840	63.840	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	0.275		

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
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 (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	
1.000	1	69.612	-0.088	0.000	0.35	0.0	6.7	OK
1.001	2	69.532	-0.068	0.000	0.58	0.0	10.4	OK
2.000	3	69.513	-0.137	0.000	0.02	0.0	0.5	OK
1.002	4	69.361	-0.059	0.000	0.68	0.0	13.6	OK
1.003	5	69.112	-0.088	0.000	0.35	0.0	14.0	OK
3.000	6	71.486	-0.124	0.000	0.07	0.0	1.6	OK
3.001	7	71.118	-0.132	0.000	0.03	0.0	2.0	OK
3.002	8	69.832	-0.118	0.000	0.10	0.0	5.9	OK
1.004	9	68.876	0.076	0.000	0.77	0.0	8.4	SURCHARGED
1.005	10	68.653	-0.122	0.000	0.08	0.0	8.4	OK
1.006	11	65.935	-0.115	0.000	0.12	0.0	8.4	OK
1.007	12	64.778	-0.112	0.000	0.15	0.0	8.4	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

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

1.007	EX DRAIN	64.890	63.840	63.840	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)	60
Ratio R	0.275		

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 2 Yr Storms	
Date 10.07.2020 File PRIMROSE NEW 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

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)	
1.000	1	69.600	-0.100	0.000	0.25	0.0	4.7	OK
1.001	2	69.517	-0.083	0.000	0.42	0.0	7.4	OK
2.000	3	69.509	-0.141	0.000	0.01	0.0	0.4	OK
1.002	4	69.344	-0.076	0.000	0.49	0.0	9.8	OK
1.003	5	69.101	-0.099	0.000	0.26	0.0	10.2	OK
3.000	6	71.481	-0.129	0.000	0.05	0.0	1.2	OK
3.001	7	71.116	-0.134	0.000	0.02	0.0	1.4	OK
3.002	8	69.827	-0.123	0.000	0.07	0.0	4.3	OK
1.004	9	68.873	0.073	0.000	0.77	0.0	8.3	SURCHARGED
1.005	10	68.653	-0.122	0.000	0.08	0.0	8.3	OK
1.006	11	65.935	-0.115	0.000	0.12	0.0	8.3	OK
1.007	12	64.778	-0.112	0.000	0.15	0.0	8.3	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
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

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)	
1.000	1	70.140	0.440	0.000	0.76	0.0	14.5	SURCHARGED
1.001	2	70.084	0.484	0.000	1.28	0.0	22.9	SURCHARGED
2.000	3	69.815	0.165	0.000	0.05	0.0	1.5	SURCHARGED
1.002	4	69.813	0.393	0.000	1.46	0.0	29.1	SURCHARGED
1.003	5	69.425	0.225	0.000	0.72	0.0	28.6	SURCHARGED
3.000	6	71.503	-0.107	0.000	0.18	0.0	4.2	OK
3.001	7	71.130	-0.120	0.000	0.09	0.0	5.2	OK
3.002	8	69.854	-0.096	0.000	0.28	0.0	16.3	OK
1.004	9	69.375	0.575	0.000	0.90	0.0	9.8	SURCHARGED
1.005	10	68.656	-0.119	0.000	0.09	0.0	9.8	OK
1.006	11	65.938	-0.112	0.000	0.15	0.0	9.8	OK
1.007	12	64.782	-0.108	0.000	0.17	0.0	9.8	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 30 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
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	1	69.787	0.087	0.000	0.58	0.0	11.1	SURCHARGED	
1.001	2	69.759	0.159	0.000	0.99	0.0	17.7	SURCHARGED	
2.000	3	69.619	-0.031	0.000	0.03	0.0	0.9	OK	
1.002	4	69.618	0.198	0.000	1.14	0.0	22.8	SURCHARGED	
1.003	5	69.463	0.263	0.000	0.57	0.0	22.5	SURCHARGED	
3.000	6	71.495	-0.115	0.000	0.13	0.0	3.0	OK	
3.001	7	71.124	-0.126	0.000	0.06	0.0	3.6	OK	
3.002	8	69.845	-0.105	0.000	0.20	0.0	11.4	OK	
1.004	9	69.443	0.643	0.000	0.90	0.0	9.8	SURCHARGED	
1.005	10	68.656	-0.119	0.000	0.09	0.0	9.8	OK	
1.006	11	65.938	-0.112	0.000	0.15	0.0	9.8	OK	
1.007	12	64.782	-0.108	0.000	0.17	0.0	9.8	OK	

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
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	Flow / Overflow		Pipe	Status
		Level (m)	Depth (m)	Volume (m ³)			Flow (l/s)	
1.000	1	70.875	1.175	0.024	1.02	0.0	19.6	FLOOD
1.001	2	70.780	1.180	0.000	1.71	0.0	30.6	FLOOD RISK
2.000	3	70.293	0.643	0.000	0.09	0.0	2.6	SURCHARGED
1.002	4	70.291	0.871	0.000	1.88	0.0	37.6	SURCHARGED
1.003	5	69.558	0.358	0.000	0.96	0.0	37.8	SURCHARGED
3.000	6	71.516	-0.094	0.000	0.30	0.0	6.9	OK
3.001	7	71.138	-0.112	0.000	0.14	0.0	8.5	OK
3.002	8	69.871	-0.079	0.000	0.46	0.0	26.6	OK
1.004	9	69.409	0.609	0.000	0.90	0.0	9.8	SURCHARGED
1.005	10	68.656	-0.119	0.000	0.09	0.0	9.8	OK
1.006	11	65.938	-0.112	0.000	0.15	0.0	9.8	OK
1.007	12	64.782	-0.108	0.000	0.17	0.0	9.8	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage		Network 2014.1

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 / Cap.	Overflow (l/s)	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)	
1.000	1	70.718	1.018	0.000	0.90	0.0	17.3	FLOOD RISK
1.001	2	70.643	1.043	0.000	1.53	0.0	27.2	SURCHARGED
2.000	3	70.252	0.602	0.000	0.07	0.0	1.9	SURCHARGED
1.002	4	70.250	0.830	0.000	1.71	0.0	34.2	SURCHARGED
1.003	5	69.689	0.489	0.000	0.87	0.0	34.6	SURCHARGED
3.000	6	71.510	-0.100	0.000	0.24	0.0	5.5	OK
3.001	7	71.134	-0.116	0.000	0.12	0.0	6.8	OK
3.002	8	69.863	-0.087	0.000	0.37	0.0	21.3	OK
1.004	9	69.632	0.832	0.000	0.90	0.0	9.8	SURCHARGED
1.005	10	68.656	-0.119	0.000	0.09	0.0	9.8	OK
1.006	11	65.938	-0.112	0.000	0.15	0.0	9.8	OK
1.007	12	64.782	-0.108	0.000	0.17	0.0	9.8	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage		Network 2014.1

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

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Overflow Cap. (l/s)		Pipe	Status
		Level (m)	Depth (m)	Volume (m ³)			Flow (l/s)	
1.000	1	70.297	0.597	0.000	0.70	0.0	13.4	SURCHARGED
1.001	2	70.254	0.654	0.000	1.19	0.0	21.2	SURCHARGED
2.000	3	70.037	0.387	0.000	0.03	0.0	1.0	SURCHARGED
1.002	4	70.035	0.615	0.000	1.36	0.0	27.1	SURCHARGED
1.003	5	69.785	0.585	0.000	0.69	0.0	27.4	SURCHARGED
3.000	6	71.501	-0.109	0.000	0.17	0.0	3.9	OK
3.001	7	71.128	-0.122	0.000	0.08	0.0	4.8	OK
3.002	8	69.852	-0.098	0.000	0.26	0.0	15.0	OK
1.004	9	69.773	0.973	0.000	0.90	0.0	9.8	SURCHARGED
1.005	10	68.656	-0.119	0.000	0.09	0.0	9.8	OK
1.006	11	65.938	-0.112	0.000	0.15	0.0	9.8	OK
1.007	12	64.782	-0.108	0.000	0.17	0.0	9.8	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	-	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
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)	Flow (l/s)	
1.000	1	69.911	0.211	0.000	0.51	0.0	9.8	SURCHARGED
1.001	2	69.893	0.293	0.000	0.85	0.0	15.2	SURCHARGED
2.000	3	69.831	0.181	0.000	0.03	0.0	0.8	SURCHARGED
1.002	4	69.830	0.410	0.000	0.95	0.0	19.0	SURCHARGED
1.003	5	69.795	0.595	0.000	0.49	0.0	19.3	SURCHARGED
3.000	6	71.493	-0.117	0.000	0.11	0.0	2.6	OK
3.001	7	71.122	-0.128	0.000	0.05	0.0	3.1	OK
3.002	8	69.841	-0.109	0.000	0.17	0.0	9.8	OK
1.004	9	69.782	0.982	0.000	0.90	0.0	9.8	SURCHARGED
1.005	10	68.656	-0.119	0.000	0.09	0.0	9.8	OK
1.006	11	65.938	-0.112	0.000	0.15	0.0	9.8	OK
1.007	12	64.782	-0.108	0.000	0.17	0.0	9.8	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
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	Flow / Cap.	Overflow (l/s)	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)	
1.000	1	69.750	0.050	0.000	0.41	0.0	7.9	SURCHARGED
1.001	2	69.741	0.141	0.000	0.71	0.0	12.6	SURCHARGED
2.000	3	69.716	0.066	0.000	0.02	0.0	0.6	SURCHARGED
1.002	4	69.715	0.295	0.000	0.81	0.0	16.1	SURCHARGED
1.003	5	69.688	0.488	0.000	0.40	0.0	16.0	SURCHARGED
3.000	6	71.489	-0.121	0.000	0.08	0.0	1.9	OK
3.001	7	71.119	-0.131	0.000	0.04	0.0	2.4	OK
3.002	8	69.836	-0.114	0.000	0.13	0.0	7.5	OK
1.004	9	69.675	0.875	0.000	0.90	0.0	9.8	SURCHARGED
1.005	10	68.656	-0.119	0.000	0.09	0.0	9.8	OK
1.006	11	65.938	-0.112	0.000	0.15	0.0	9.8	OK
1.007	12	64.782	-0.108	0.000	0.17	0.0	9.8	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
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	Flow / Cap.	Overflow (l/s)	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)	
1.000	1	69.621	-0.079	0.000	0.34	0.0	6.5	OK
1.001	2	69.613	0.013	0.000	0.58	0.0	10.4	SURCHARGED
2.000	3	69.590	-0.060	0.000	0.02	0.0	0.5	OK
1.002	4	69.589	0.169	0.000	0.69	0.0	13.8	SURCHARGED
1.003	5	69.561	0.361	0.000	0.35	0.0	13.8	SURCHARGED
3.000	6	71.485	-0.125	0.000	0.07	0.0	1.6	OK
3.001	7	71.118	-0.132	0.000	0.03	0.0	2.0	OK
3.002	8	69.832	-0.118	0.000	0.11	0.0	6.1	OK
1.004	9	69.547	0.747	0.000	0.90	0.0	9.8	SURCHARGED
1.005	10	68.656	-0.119	0.000	0.09	0.0	9.8	OK
1.006	11	65.938	-0.112	0.000	0.15	0.0	9.8	OK
1.007	12	64.782	-0.108	0.000	0.17	0.0	9.8	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

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	Flow / Cap.	Overflow (l/s)	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)	
1.000	1	69.599	-0.101	0.000	0.24	0.0	4.5	OK
1.001	2	69.516	-0.084	0.000	0.41	0.0	7.2	OK
2.000	3	69.508	-0.142	0.000	0.01	0.0	0.3	OK
1.002	4	69.343	-0.077	0.000	0.48	0.0	9.6	OK
1.003	5	69.259	0.059	0.000	0.25	0.0	10.0	SURCHARGED
3.000	6	71.481	-0.129	0.000	0.05	0.0	1.1	OK
3.001	7	71.115	-0.135	0.000	0.02	0.0	1.4	OK
3.002	8	69.827	-0.123	0.000	0.07	0.0	4.3	OK
1.004	9	69.245	0.445	0.000	0.90	0.0	9.8	SURCHARGED
1.005	10	68.656	-0.119	0.000	0.09	0.0	9.8	OK
1.006	11	65.938	-0.112	0.000	0.15	0.0	9.8	OK
1.007	12	64.782	-0.108	0.000	0.17	0.0	9.8	OK

Hamilton Technical Services		Page 1
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW 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	0.148	4-8	0.019

Total Area Contributing (ha) = 0.167

Total Pipe Volume (m³) = 1.829

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	EX DRAIN	64.890	63.840	63.840	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	35.000
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	0.275		

©1982-2014 XP Solutions

Hamilton Technical Services		Page 2
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: 9, DS/PN: 1.004, Volume (m³): 2.5

Unit Reference MD-SHE-0131-1000-2000-1000
Design Head (m) 2.000
Design Flow (l/s) 10.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 131
Invert Level (m) 68.650
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	–	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

Hamilton Technical Services		Page 3
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage	Network 2014.1	

Storage Structures for Storm

Cellular Storage Manhole: 9, DS/PN: 1.004

Invert Level (m) 68.650 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	40.0	0.0	1.200	40.0	0.0
0.600	40.0	0.0	1.201	0.0	0.0

Hamilton Technical Services		Page 4
1 Chiltern Ave Euxton Chorley PR7 6NU	Primrose Works, Clitheroe Proposed SW Drainage Sims 1 in 100 Yr Storms + CC	
Date 10.07.2020 File PRIMROSE NEW SW.MDX	Designed by Geoff Hamilton Checked by	
Micro Drainage		Network 2014.1

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	Flow / Overflow		Pipe	Status
		Level (m)	Depth (m)	Volume (m ³)			Flow (l/s)	
1.000	1	69.592	-0.108	0.000	0.18	0.0	3.4	OK
1.001	2	69.506	-0.094	0.000	0.30	0.0	5.4	OK
2.000	3	69.506	-0.144	0.000	0.01	0.0	0.3	OK
1.002	4	69.332	-0.088	0.000	0.36	0.0	7.2	OK
1.003	5	69.094	-0.106	0.000	0.19	0.0	7.5	OK
3.000	6	71.478	-0.132	0.000	0.04	0.0	0.8	OK
3.001	7	71.112	-0.138	0.000	0.02	0.0	1.0	OK
3.002	8	69.823	-0.127	0.000	0.06	0.0	3.2	OK
1.004	9	68.989	0.189	0.000	0.85	0.0	9.3	SURCHARGED
1.005	10	68.655	-0.120	0.000	0.09	0.0	9.3	OK
1.006	11	65.937	-0.113	0.000	0.14	0.0	9.3	OK
1.007	12	64.780	-0.110	0.000	0.16	0.0	9.3	OK