


Drainage Strategy Report


Garden House Close, Barnsley
For Big City Co. MD
Date 23/06/2022
Ref **4136/DSR001**



Report Details

Client	Big City Co. MD
Report Title	Drainage Strategy Report
Project	Garden House Close, Barnsley
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Quality Assurance

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INTRODUCTION

Project Understanding

Big City Co. MD intend to develop an parcel of land at Garden House Close, Monk Bretton, Barnsley, in accordance with design proposals by Nieman Architects to provide 76 new build houses and apartments.

Bright Young Consulting Ltd have been engaged to prepare a Drainage Strategy Report in support of a detailed planning application for the development.

Scope of Works

- Review existing conditions including existing sewer infrastructure plans, ground conditions information and available topographical information
- Review LLFA drainage policies
- Estimate existing and proposed impermeable areas.
- Determine current drainage regime for site and estimate the current surface water discharge rate from site.
- Review site appropriate methods of surface water disposal including infiltration options.
- Estimate required attenuation storage volumes using Microdrainage software.
- Advise on a suitable drainage and storage options for the development.
- Advise on suitable range of drainage system maintenance measures.
- Determine suitable outfall location for the foul water drainage.
- Advise on likely constraints for foul drainage.
- Prepare outline drainage strategy proposals

Sources of Information

The following sources of information have been reviewed and assessed for the purpose of this Drainage Strategy Report:

- Yorkshire Water sewer records.
- Topographical survey by CT Surveys.
- Drainage survey by GP Drains.
- Infiltration assessment by Delta Simons.

SITE DESCRIPTION

The site is adjacent to Garden House Close Barnsley at Grid reference SE 36269 08045 (436269E, 408045N).

The pre-development site is a large vacant school building on the west of the development site, existing houses and buildings centrally and then an area of open grass land to the east side of the development. For this FRA, the site should be considered a mixture of brown and greenfield.

A topographical survey has been undertaken of the site and the gross area of the development site is approximately 2 Hectares. The site slopes from west to east, from levels around 106.0m – 108m in the west down to around 100m – 97.0m in the east.

An aerial location plan of the site is shown below, outlined red.



Site Location Plan

RELEVANT POLICY AND GUIDANCE

Introduction

The aim of this section of the report is to discuss the main aspects of the local and national planning policies that are relevant to any proposed development on the site and relevant guidance and legislation.

Local Policy

The Lead Local Flood Authority (LLFA) is Barnsley MBC who will be responsible for approving the surface water system on the development to ensure that it complies with current standards and will remain satisfactory for the lifetime of the development.

The local sewerage undertaker is Yorkshire Water and any connections to the public sewers and / or any amendments to public sewers would be to Yorkshire Water standards and approval. All proposed adoptable sewers would have to be approved by Yorkshire Water and an appropriate agreement entered into for adoption of the sewers.

Consultations

No consultation has taken place at this point with the approving local authorities in respect of surface water and foul drainage. Public sewer records have been obtained and used as part of this report.

It is expected that detailed consultation will take place as the scheme develops with the LLFA in respect of surface water and with Yorkshire Water for proposed sewers and connection to the public sewer network.

DRAINAGE STRATEGY

Pre-development Site – Existing Sewers

The public sewer records for the development site have been obtained from Yorkshire Water and a copy of the records are shown below.



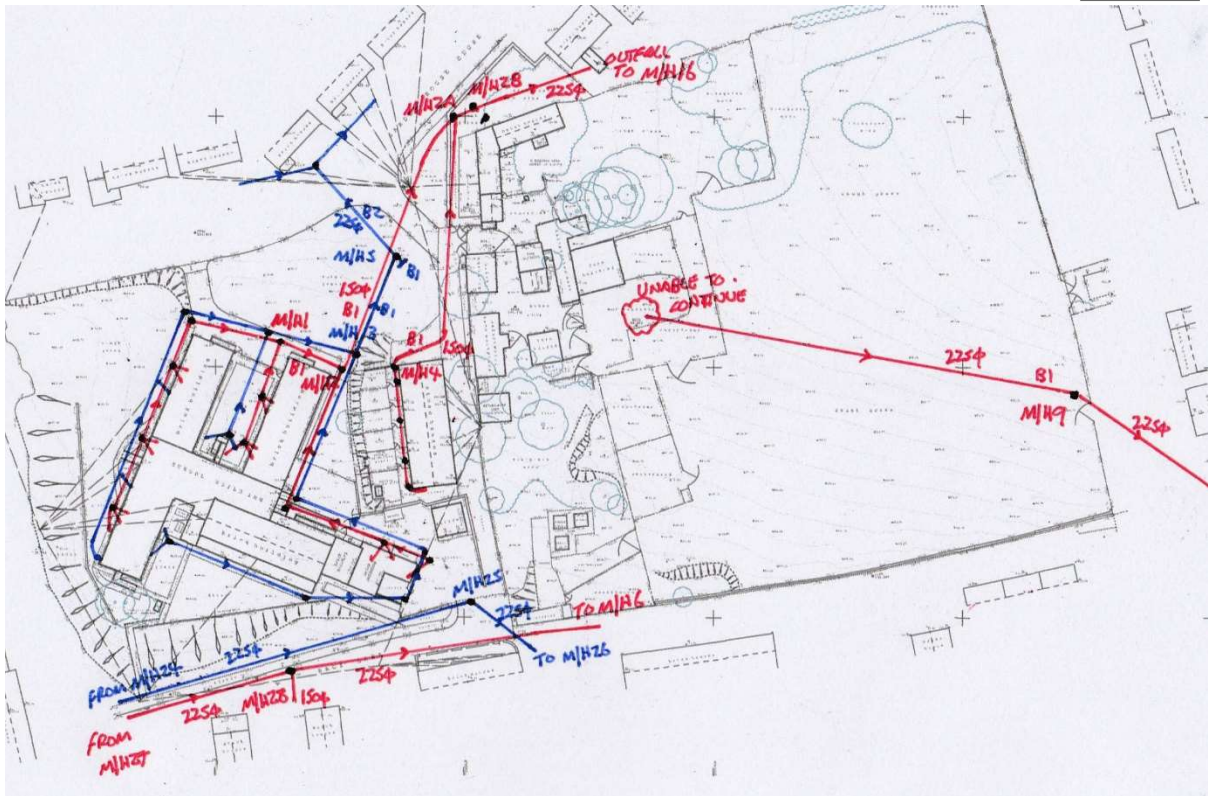
Public Sewer Records

The sewer records show that both surface water and foul sewers exist on and close to the site.

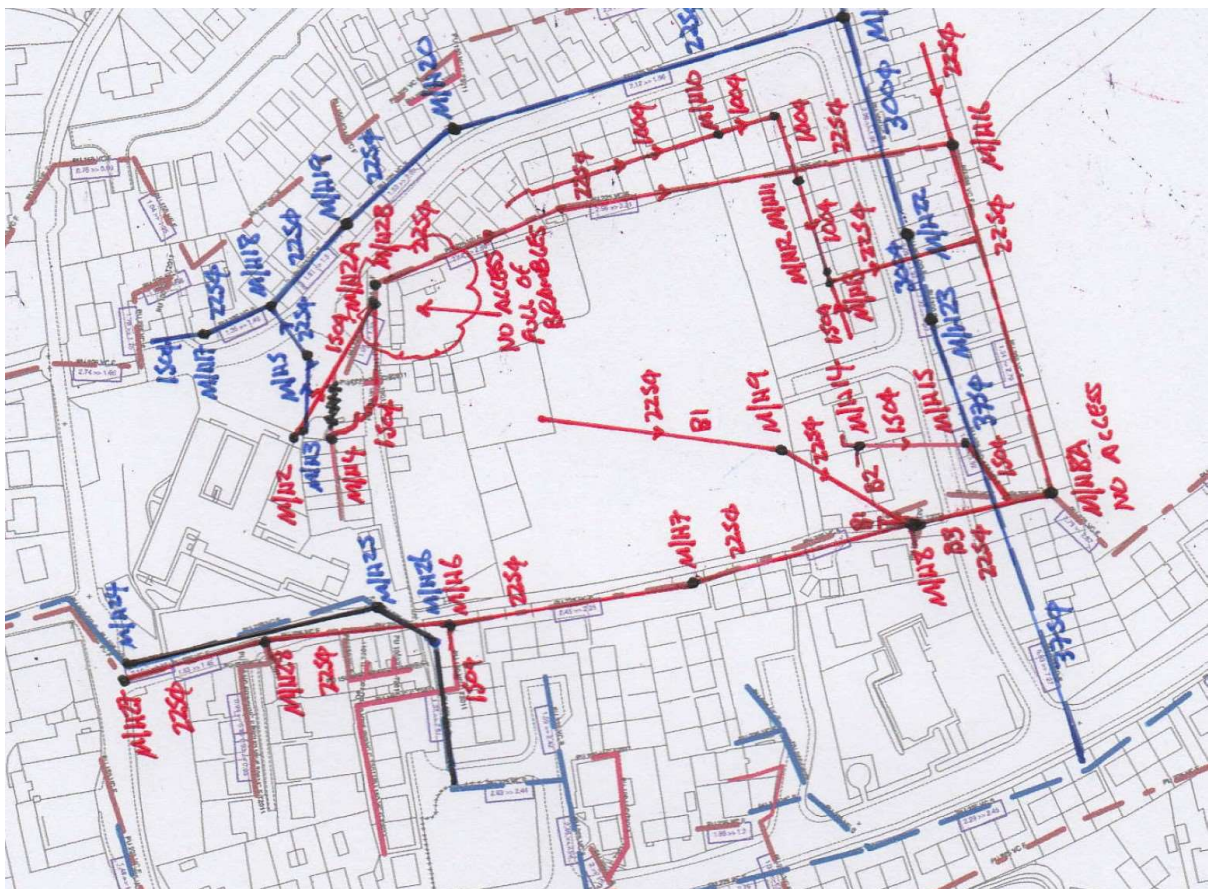
Pre-development Site – Existing Drainage

To determine the pre-development drainage on site as well as the location and details of the public sewers, a comprehensive drainage survey has been undertaken.

The drainage survey has proven that the pre-development (partly) developed site has positive drainage connections to the public sewer system (see drainage survey below). Foul and surface water systems are both connected to the public sewers by gravity connections from the school buildings as well as the cottages on site.



Drainage Survey 1



Drainage Survey 2

Post Development Site

The site is proposed to be developed with 76 new houses and apartments and a plan of the proposals are shown below.



Post Development Foul Drainage Strategy

The foul and surface water systems will be separate systems on site.

It is proposed that foul drainage from the development will connect to the public foul sewerage system under gravity via a single connection to the existing 225mm public sewer located in the rear gardens of properties on Well Lane.

The existing foul connection from the cottages of Walkers Terrace will be collected in to the new proposed sewers. It is intended that all the proposed sewers will be offered for adoption through a Section 104 Agreement.

Surface Water Drainage Hierarchy

The recommended surface water drainage hierarchy (Paragraph 60 of the NPPG: Flood Risk and Coastal Change) is to utilise soakaway or infiltration systems as the preferred option of surface water disposal. Then by connection to a local watercourse. If this is not feasible, the final option is to discharge to an existing public sewer.

Consideration should, therefore, be given to one or more of the following, in this order of priority.

- **Discharge to the ground (infiltration).**
- **Discharge to a surface water body.**
- **Discharge to a surface water sewer, highway drain or other drain.**
- **Discharge to a combined sewer.**

Surface Water Discharge to Ground (Infiltration)

The first consideration for the disposal of surface water is by infiltration (soakaways and permeable surfaces).

To test the suitability of the site to accept infiltration as a means of disposal of surface water, comprehensive infiltration testing to BRE Digest 365 was undertaken. The details of the testing is appended to the rear of this report.

The tests show that the site is unsuitable for infiltration and an alternative means of surface water disposal is required.

Surface Water Discharge to Watercourse

Where soakaways are not suitable a connection to watercourse is the next consideration.

The nearest recorded watercourse is over 150m to the north of the site and is inaccessible for the proposed development.

Surface Water Discharge to Surface Water Sewer

Where disposal of surface water to watercourse is not possible, a connection to the public surface water sewer system is the next consideration. The existing surface water public sewer has been investigated and shown to comprise of a continuous system with a 225mm diameter sewer in Garden House Close that discharges into a 300mm diameter sewer running from north to south within the front gardens of existing properties in Well Lane.

Pre-Development Surface Water Run-off

The Flood Risk Assessment (FRA) has determined, through a detailed pre-development drainage survey, that part of the development site is positively connected to sewer. To avoid any increase in flood risk, post-development flows should remain at or below pre-development levels.

Therefore, it is recommend that the post-development surface water discharge to sewer is limited to the 1 in 1 year pre-development discharge rate, with a reduction of 30% in line with good practice and Yorkshire Water requirements.

To assess the pre-development surface water run-off rate, it is assumed that the existing former school roof only is connected to sewer. The school roof extends to 1218 sq m, as determined by the topographical survey. The 1 in 1 year discharge rate is taken as 140l/s/hectare.

The pre-development discharge rate is $1218\text{sq m} \times 140\text{l/s/hectare} = 17\text{l/s}$.

Post-development discharge rate is proposed to be a maximum of $17\text{l/s} - 30\% = 11.9\text{l/s}$.

Post Development Surface Water Strategy

The main surface water sewerage system on site is to be offered for adoption through a Section 104 agreement with Yorkshire Water, including the necessary attenuation and flow control installations which have been sized and located in accordance with YW requirements as outlined below.

This main sewerage system is to be provided by an attenuation storage tank installation (Carlow or similar approved). The discharge from the surface water system will be attenuated by the use of a Hydrobrake. The discharge rate to the public sewer system is to be 11.9l/s.

The surface water system of the proposed development needs to satisfactorily manage the 1 in 100 year storm plus 40% added for climate change and urban creep.

Post Development Surface Water Design

The post-development sewerage system has been modelled in the Microdrainage program. This shows that the proposed sewerage system, including the attenuation storage tank, works satisfactorily for all storm durations.

The calculations are based on the following criteria:

Post Development impermeable area = 11 417 sq.m

1 in 100 year storm + 40% CC/urban creep.

Discharge = 11.9l/s

FEH rainfall data Cv=0.84 winter, 0.75 summer

The detailed Microdrainage calculations have been run for all storm durations and the 360 minute storm is the critical duration.

The Microdrainage calculations are appended to this report.

A plan of the sewer system proposed is shown below. A larger plan is provided as Bright Young Consulting drawing 4019/SK001.



Flood Route

If the on-site drainage system is blocked or design standards exceeded, then a flood route is available on this site. Flood water would flow from the site to the east and would be kept from entering any property.

The flood route is shown on Bright Young Consulting's drawing 4136/SK001.

Surface Water System Maintenance

The surface water system on this development will be maintained for the lifetime of the development. It will be offered for adoption to Yorkshire Water through a Section 104 agreement and Yorkshire Water will maintain the system as required.

Climate Change and Urban Creep

The calculations within this drainage strategy includes an allowance for climate change and urban creep where 40% has been added to allow for these possible increases in flow in the future.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

- Foul drainage will connect to the existing public foul sewer under gravity.
- Existing connections from cottage properties will be picked up and taken into the new site and to the sewers within the access roads.
- Surface water will connect to the public sewer system along Well Lane.
- Post-development surface water flows will be limited to 11.9l/s.
- Surface water storage will be provided in an attenuation tank positioned close to the eastern Boundary.
- Surface water storage has been estimated as 655Cu m for the 1 in 100 year storm plus 40%.

Recommendations

- Complete any consultations with regulators through the planning process.
- All final sewerage systems including surface water storage volumes to be confirmed through the detailed design process.
- Develop design to adoptable standards in preparation for submission for technical approval under the Section 104 process.

APPENDICES

Appendix A – Topographical Survey

Appendix B – Drainage Survey Details

Appendix C – Infiltration test Results

Appendix D – Drainage Strategy Drawing

Appendix E– Microdrainage Calculations

1 in 100 year storm plus 40% climate change/urban creep.

Design details; network table; simulation criteria and rainfall details

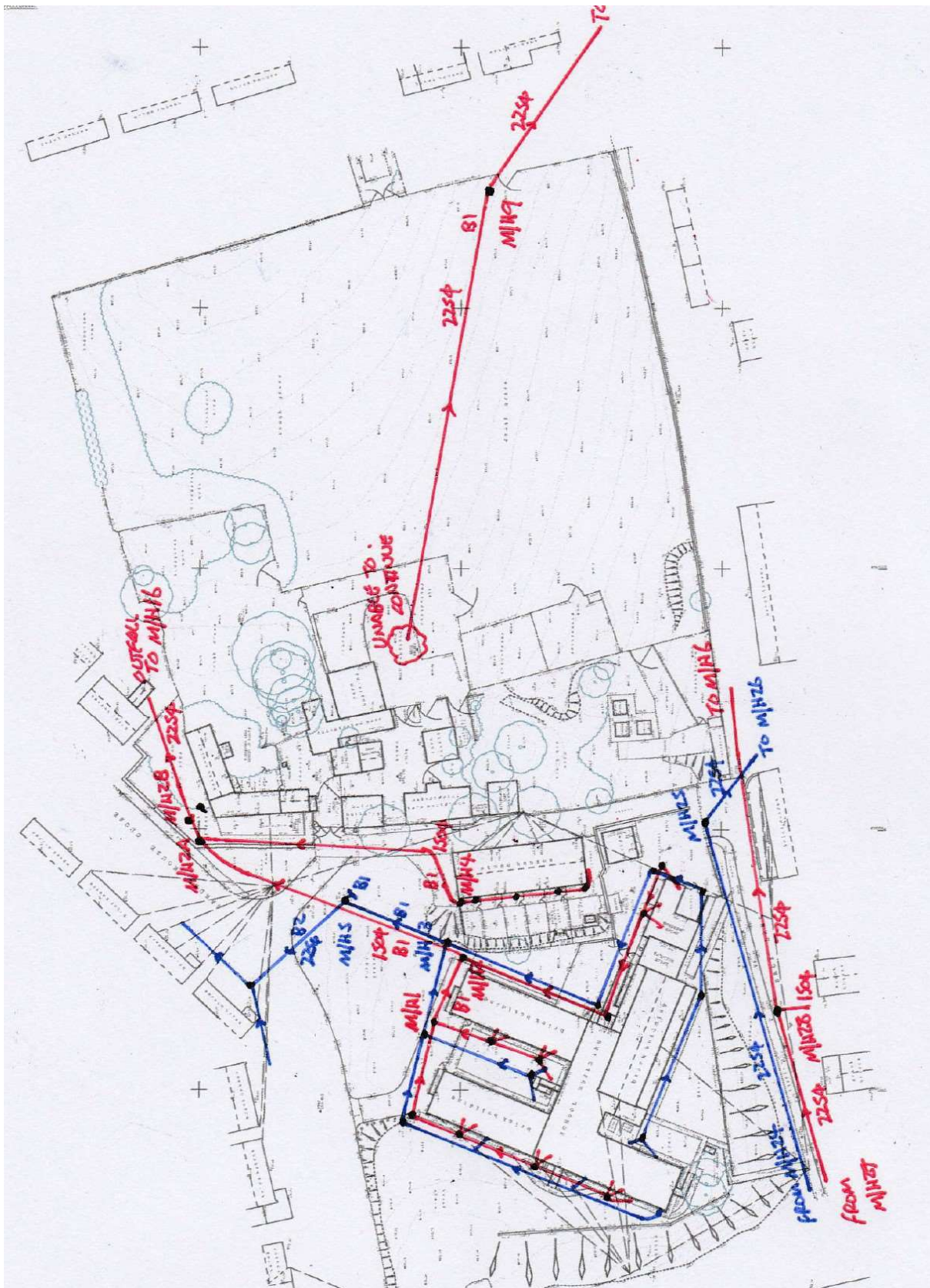
360 minute storm (critical)

300 minute storm summary

420 minute storm summary

APPENDIX A – TOPOGRAPHICAL SURVEY

APPENDIX B – DRAINAGE SURVEY





APPENDIX C – INFILTRATION TEST RESULTS



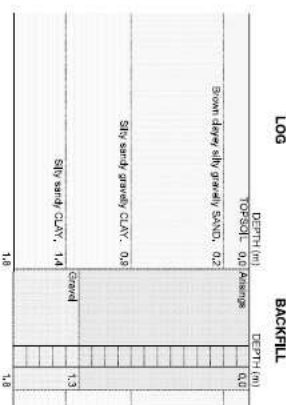
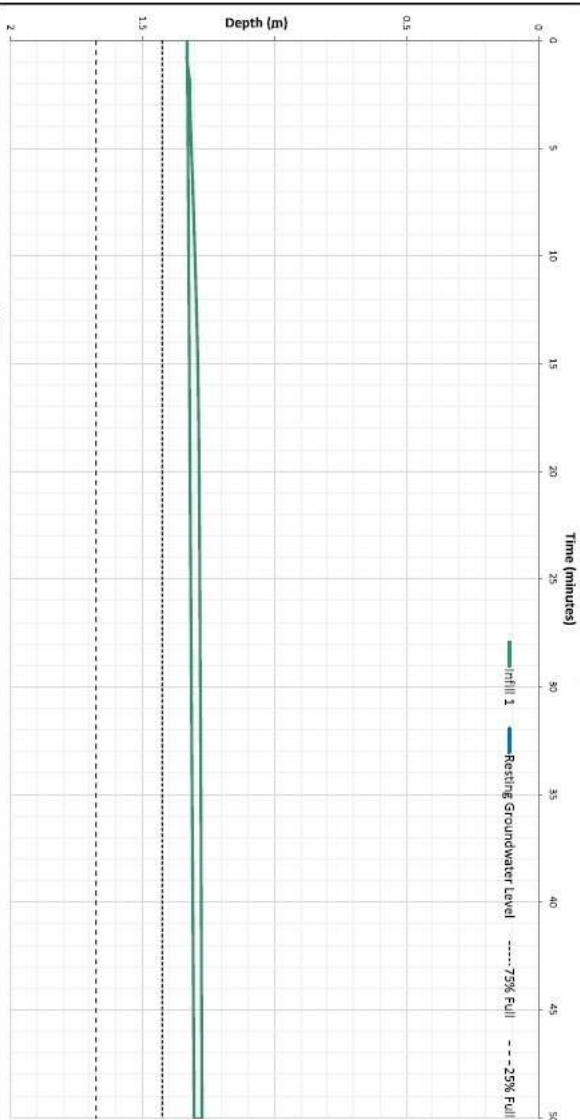
Length	m	Infill 1	Infill 2
Width	m	2.40	0.60
Depth	m	1.33	1.80
Gravel type		20mm single size	
Void ratio		0.40	5.00
Resting groundwater level at time of testing	m	1.33	
Depth of first reading	m	1.33	
Did soakage test reach 25% of maximum fill depth?	m	No	
Did soakage test reach near empty?	m	1.33	
Depth at 75% full/effective depth	m	1.33	
Time at 75% full/effective depth	mins	N/A	
Time at 25% full/effective depth	mins	N/A	
V ₀ 75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m ³	0.00	
Mean surface area for outflow (50% full/effective depth)	m ²	1.44	
t _p 75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	N/A	
Soil infiltration rate, $f =$	m/s	Failed Test	
or		Failed Test	

Recommended soil infiltration rate

Failed Test

m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Fail' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.



	TITLE	Soakaway Test Results Monk Bretton ASGF Construction Ltd	In accordance with BRE Digest 365 (2016)
	DRAWN BY: TP109 (SA) CHECKED BY: 1 DATE: 02/03/2022	PROJECT NUMBER: 22-0220.01 SOAKAWAY NUMBER: TP109 (SA)	

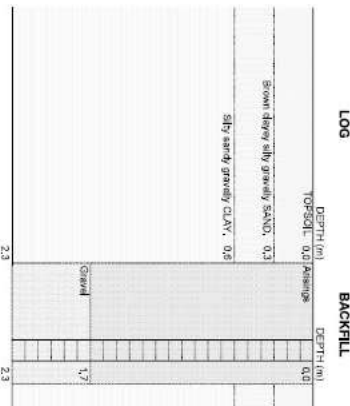
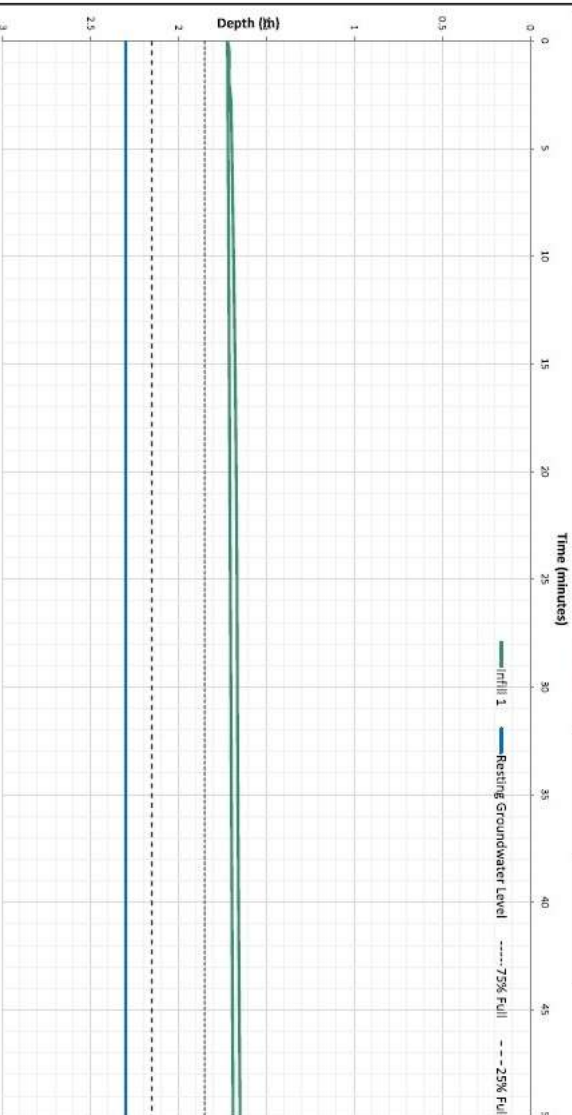
Length	m	Infill 1	Infill 2
Width	m		2.20
Depth	m		0.60
Gravel type			20mm single size
Void ratio			0.40
Resting groundwater level at time of testing	m		2.30
Depth of first reading	m	1.72	
Depth of final reading	m	1.72	
Did soakage test reach 25% of maximum fill depth?		No	
Did soakage test reach near empty?		No	
Depth at 75% full/effective depth	m	1.72	
Depth at 25% full/effective depth	m	1.72	
Time at 75% full/effective depth	mins	N/A	
Time at 25% full/effective depth	mins	N/A	
V _{0.75} - 25 (volume outflowing between 75% and 25% full/effective depth)	m ³	0.00	
Mean surface area for outflow (50% full/effective depth)	m ²	1.32	
t _{0.75} (time for the water level to fall from 75% to 25% full/effective depth)	mins	N/A	
Soil infiltration rate, I =	m/s	Failed Test	
or	m/s	Failed Test	

Recommended soil infiltration rate

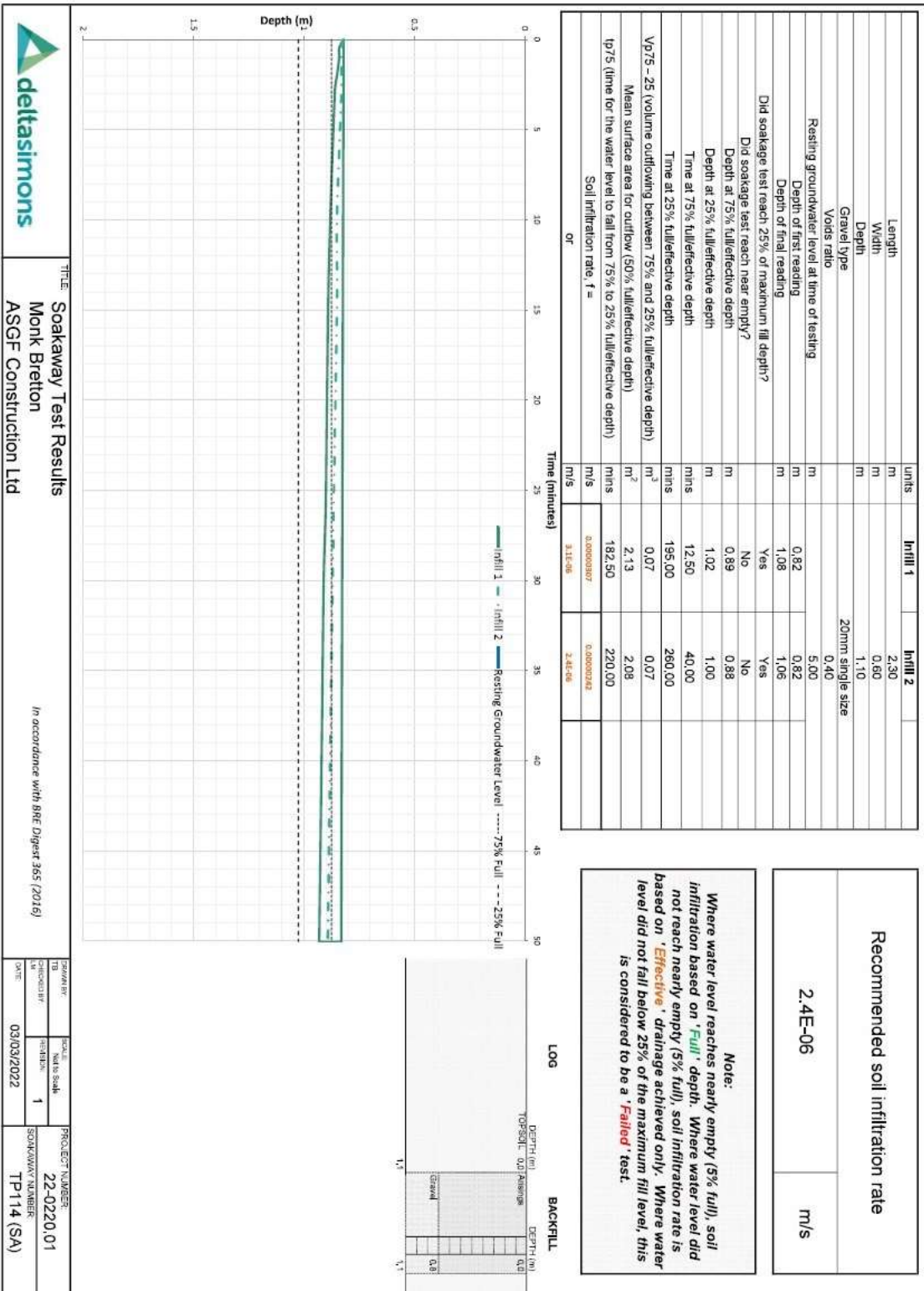
Failed Test

m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.




		TITLE Soakaway Test Results Monk Breton ASGF Construction Ltd	In accordance with BRE Digest 365 (2016)
DRAWN BY: TB CHECKED BY: DATE: 02/03/2022	SCALE: 1:1 DATE: 02/03/2022	PROJECT NUMBER: 22-0220-01 SOAKAWAY NUMBER: TP111 (SA)	



APPENDIX D – DRAINAGE STRATEGY DRAWING

APPENDIX E – MICRODRAINAGE CALCULATIONS

		Page 1								
GARDEN HOUSE CLOSE MONK BRETTON										
Date 27/07/2022 File MONK BRETTON SW_Rev A.MDX	Designed by HM Checked by									
Micro Drainage		Network 2020.1								
<u>STORM SEWER DESIGN by the Modified Rational Method</u>										
<u>Design Criteria for MONK BRETTON SW REV A.SWS</u>										
Pipe Sizes MONK BRETTON SW Manhole Sizes MONK BRETTON SW										
FEH Rainfall Model										
Return Period (years)		2								
FEH Rainfall Version		2013								
Site Location	GB 436326 408055 SE 36326 08055									
Data Type		Point								
Maximum Rainfall (mm/hr)		10								
Maximum Time of Concentration (mins)		30								
Foul Sewage (l/s/ha)		0.000								
Volumetric Runoff Coeff.		0.750								
PIMP (%)		100								
Add Flow / Climate Change (%)		0								
Minimum Backdrop Height (m)		0.000								
Maximum Backdrop Height (m)		0.000								
Min Design Depth for Optimisation (m)		1.200								
Min Vel for Auto Design only (m/s)		0.75								
Min Slope for Optimisation (1:X)		500								
Designed with Level Soffits										
<u>Network Design Table for MONK BRETTON SW REV A.SWS</u>										
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.000	17.364	1.500	11.6	0.038	5.00	0.0	0.600	o	225	Pipe/Conduit
2.000	12.735	0.300	42.5	0.057	5.00	0.0	0.600	o	225	Pipe/Conduit
1.001	18.751	0.525	35.7	0.064	0.00	0.0	0.600	o	225	Pipe/Conduit
1.002	56.718	2.500	22.7	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit
3.000	15.811	0.250	63.2	0.134	5.00	0.0	0.600	o	225	Pipe/Conduit
<u>Network Results Table</u>										
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	10.00	5.07	104.700	0.038	0.0	0.0	0.0	3.87	153.8	1.0
2.000	10.00	5.11	103.500	0.057	0.0	0.0	0.0	2.01	80.1	1.5
1.001	10.00	5.25	103.200	0.159	0.0	0.0	0.0	2.20	87.3	4.3
1.002	10.00	5.53	102.600	0.198	0.0	0.0	0.0	3.32	234.3	5.4
3.000	10.00	5.16	100.500	0.134	0.0	0.0	0.0	1.65	65.5	3.6
©1982-2020 Innovyze										


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GARDEN HOUSE CLOSE MONK BRETTON		
Date 27/07/2022	Designed by HM	
File MONK BRETTON SW_Rev A.MDX	Checked by	
Micro Drainage		Network 2020.1

Network Design Table for MONK BRETTON SW REV A.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.003	5.586	0.200	27.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
1.004	10.073	0.200	50.4	0.066	0.00	0.0	0.600	o	375	Pipe/Conduit
1.005	23.701	0.300	79.0	0.053	0.00	0.0	0.600	o	375	Pipe/Conduit
1.006	49.624	1.300	38.2	0.161	0.00	0.0	0.600	o	375	Pipe/Conduit
1.007	27.000	2.250	12.0	0.083	0.00	0.0	0.600	o	375	Pipe/Conduit
1.008	3.872	0.350	11.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
1.009	19.367	1.900	10.2	0.065	0.00	0.0	0.600	o	375	Pipe/Conduit
1.010	10.811	0.740	14.6	0.014	0.00	0.0	0.600	o	375	Pipe/Conduit
4.000	23.493	1.320	17.8	0.103	5.00	0.0	0.600	o	225	Pipe/Conduit
4.001	5.987	0.300	20.0	0.064	0.00	0.0	0.600	o	225	Pipe/Conduit
4.002	17.852	0.705	25.3	0.036	0.00	0.0	0.600	o	225	Pipe/Conduit
4.003	4.643	0.220	21.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
4.004	20.197	0.100	202.0	0.065	0.00	0.0	0.600	o	300	Pipe/Conduit
4.005	3.655	0.100	36.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
4.006	14.881	0.074	201.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit
4.007	3.076	0.040	76.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit
4.008	13.520	0.090	150.2	0.068	0.00	0.0	0.600	o	450	Pipe/Conduit
4.009	5.264	0.060	87.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit
1.011	13.298	0.130	102.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.012	8.297	0.080	103.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.003	10.00	5.56	100.100	0.332	0.0	0.0	0.0	2.99	211.1	9.0
1.004	10.00	5.63	99.825	0.398	0.0	0.0	0.0	2.56	282.6	10.8
1.005	10.00	5.82	99.625	0.451	0.0	0.0	0.0	2.04	225.3	12.2
1.006	10.00	6.10	99.325	0.612	0.0	0.0	0.0	2.94	324.8	16.6
1.007	10.00	6.19	98.025	0.695	0.0	0.0	0.0	5.25	580.4	18.8
1.008	10.00	6.20	95.775	0.695	0.0	0.0	0.0	5.47	604.6	18.8
1.009	10.00	6.26	95.425	0.760	0.0	0.0	0.0	5.70	629.9	20.6
1.010	10.00	6.30	93.525	0.774	0.0	0.0	0.0	4.76	525.9	21.0
4.000	10.00	5.13	97.200	0.103	0.0	0.0	0.0	3.12	123.9	2.8
4.001	10.00	5.16	95.880	0.167	0.0	0.0	0.0	2.94	117.0	4.5
4.002	10.00	5.27	95.580	0.203	0.0	0.0	0.0	2.61	103.8	5.5
4.003	10.00	5.30	94.800	0.203	0.0	0.0	0.0	3.44	243.0	5.5
4.004	10.00	5.60	94.580	0.268	0.0	0.0	0.0	1.10	77.9	7.3
4.005	10.00	5.62	94.480	0.268	0.0	0.0	0.0	2.61	184.4	7.3
4.006	10.00	5.80	92.974	0.268	0.0	0.0	0.0	1.43	227.4	7.3
4.007	10.00	5.82	92.900	0.268	0.0	0.0	0.0	2.32	369.0	7.3
4.008	10.00	5.96	92.860	0.336	0.0	0.0	0.0	1.66	263.5	9.1
4.009	10.00	6.00	92.770	0.336	0.0	0.0	0.0	2.17	345.4	9.1
1.011	10.00	6.47	92.660	1.110	0.0	0.0	0.0	1.29	51.4	30.1
1.012	10.00	6.58	92.530	1.110	0.0	0.0	0.0	1.28	51.0	30.1


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GARDEN HOUSE CLOSE MONK BRETTON		
Date 27/07/2022 File MONK BRETTON SW_Rev A.MDX	Designed by HM Checked by	
Micro Drainage		Network 2020.1

Network Design Table for MONK BRETTON SW REV A.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.013	45.435	0.450	101.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.013	10.00	7.16	92.450	1.110	0.0	0.0	0.0	1.30	51.7	30.1

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GARDEN HOUSE CLOSE MONK BRETTON		
Date 27/07/2022 File MONK BRETTON SW_Rev A.MDX	Designed by HM Checked by	
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PIPELINE SCHEDULES for MONK BRETTON SW REV A.SWS


Upstream Manhole


PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W
1.000	o	225	1	106.420	104.700	1.495	Open Manhole	1200	
2.000	o	225	16	105.198	103.500	1.473	Open Manhole	1200	
1.001	o	225	2	105.609	103.200	2.184	Open Manhole	1200	
1.002	o	300	3	104.897	102.600	1.997	Open Manhole	1200	
3.000	o	225	17	102.408	100.500	1.683	Open Manhole	1200	
1.003	o	300	4	102.212	100.100	1.812	Open Manhole	1200	
1.004	o	375	5	102.172	99.825	1.972	Open Manhole	1350	
1.005	o	375	6	102.290	99.625	2.290	Open Manhole	1350	
1.006	o	375	7	103.137	99.325	3.437	Open Manhole	1350	
1.007	o	375	8	100.485	98.025	2.085	Open Manhole	1350	
1.008	o	375	9	98.981	95.775	2.831	Open Manhole	1350	
1.009	o	375	10	98.817	95.425	3.017	Open Manhole	1350	
1.010	o	375	11	97.666	93.525	3.766	Open Manhole	1350	
4.000	o	225	18	99.307	97.200	1.882	Open Manhole	1200	
4.001	o	225	19	98.109	95.880	2.004	Open Manhole	1200	
4.002	o	225	20	97.735	95.580	1.930	Open Manhole	1200	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W
1.000	17.364	11.6	2	105.609	103.200	2.184	Open Manhole	1200	
2.000	12.735	42.5	2	105.609	103.200	2.184	Open Manhole	1200	
1.001	18.751	35.7	3	104.897	102.675	1.997	Open Manhole	1200	
1.002	56.718	22.7	4	102.212	100.100	1.812	Open Manhole	1200	
3.000	15.811	63.2	4	102.212	100.250	1.737	Open Manhole	1200	
1.003	5.586	27.9	5	102.172	99.900	1.972	Open Manhole	1350	
1.004	10.073	50.4	6	102.290	99.625	2.290	Open Manhole	1350	
1.005	23.701	79.0	7	103.137	99.325	3.437	Open Manhole	1350	
1.006	49.624	38.2	8	100.485	98.025	2.085	Open Manhole	1350	
1.007	27.000	12.0	9	98.981	95.775	2.831	Open Manhole	1350	
1.008	3.872	11.1	10	98.817	95.425	3.017	Open Manhole	1350	
1.009	19.367	10.2	11	97.666	93.525	3.766	Open Manhole	1350	
1.010	10.811	14.6	12	96.736	92.785	3.576	Open Manhole	1350	
4.000	23.493	17.8	19	98.109	95.880	2.004	Open Manhole	1200	
4.001	5.987	20.0	20	97.735	95.580	1.930	Open Manhole	1200	
4.002	17.852	25.3	21	96.905	94.875	1.805	Open Manhole	1200	

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GARDEN HOUSE CLOSE MONK BRETTON								
Date 27/07/2022 File MONK BRETTON SW_Rev A.MDX	Designed by HM Checked by							
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<u>PIPELINE SCHEDULES for MONK BRETTON SW REV A.SWS</u>								
<u>Upstream Manhole</u>								
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.003	o 300	21	96.905	94.800	1.805	Open Manhole	1200	
4.004	o 300	22	96.791	94.580	1.911	Open Manhole	1200	
4.005	o 300	23	96.414	94.480	1.634	Open Manhole	1200	
4.006	o 450	24	96.500	92.974	3.076	Open Manhole	1350	
4.007	o 450	25	97.000	92.900	3.650	Open Manhole	1350	
4.008	o 450	26	97.000	92.860	3.690	Open Manhole	1350	
4.009	o 450	27	97.000	92.770	3.780	Open Manhole	1350	
1.011	o 225	12	96.736	92.660	3.851	Open Manhole	1350	
1.012	o 225	13	95.769	92.530	3.014	Open Manhole	1200	
1.013	o 225	14	95.229	92.450	2.554	Open Manhole	1200	
<u>Downstream Manhole</u>								
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.003	4.643	21.1	22	96.791	94.580	1.911	Open Manhole	1200
4.004	20.197	202.0	23	96.414	94.480	1.634	Open Manhole	1200
4.005	3.655	36.6	24	96.500	94.380	1.820	Open Manhole	1350
4.006	14.881	201.1	25	97.000	92.900	3.650	Open Manhole	1350
4.007	3.076	76.9	26	97.000	92.860	3.690	Open Manhole	1350
4.008	13.520	150.2	27	97.000	92.770	3.780	Open Manhole	1350
4.009	5.264	87.7	12	96.736	92.710	3.576	Open Manhole	1350
1.011	13.298	102.3	13	95.769	92.530	3.014	Open Manhole	1200
1.012	8.297	103.7	14	95.229	92.450	2.554	Open Manhole	1200
1.013	45.435	101.0	15	93.400	92.000	1.175	Open Manhole	0
<u>Simulation Criteria for MONK BRETTON SW REV A.SWS</u>								
Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000					
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	40.000					
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	0.000					
Hot Start Level (mm)	0	Run Time (mins)	720					
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	6					
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	FEH							
Return Period (years)	100							
FEH Rainfall Version	2013							
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	GARDEN HOUSE CLOSE MONK BRETTON	
Date 27/07/2022 File MONK BRETTON SW_Rev A.MDX	Designed by HM Checked by	
Micro Drainage	Network 2020.1	
<u>Synthetic Rainfall Details</u>		
<pre> Site Location GB 436326 408055 SE 36326 08055 Data Type Point Summer Storms No Winter Storms Yes Cv (Summer) 0.750 Cv (Winter) 0.840 Storm Duration (mins) 360 </pre>		
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Online Controls for MONK BRETTON SW REV A.SWS

Hydro-Brake® Optimum Manhole: 12, DS/PN: 1.011, Volume (m³): 7.5


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Unit Reference MD-SHE-0138-1190-2300-1190
Design Head (m) 2.300
Design Flow (l/s) 11.9
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 138
Invert Level (m) 92.660
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1500
  
```

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	11.9
Flush-Flo™	0.603	11.2
Kick-Flo®	1.235	8.9
Mean Flow over Head Range	-	10.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0	1.200	9.2	3.000	13.5	7.000	20.2
0.200	9.3	1.400	9.4	3.500	14.5	7.500	20.9
0.300	10.3	1.600	10.0	4.000	15.5	8.000	21.6
0.400	10.9	1.800	10.6	4.500	16.4	8.500	22.2
0.500	11.2	2.000	11.1	5.000	17.2	9.000	22.8
0.600	11.2	2.200	11.7	5.500	18.0	9.500	23.4
0.800	11.1	2.400	12.1	6.000	18.8		
1.000	10.5	2.600	12.6	6.500	19.5		

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	GARDEN HOUSE CLOSE MONK BRETTON													
Date 27/07/2022 File MONK BRETTON SW_Rev A.MDX	Designed by HM Checked by													
Micro Drainage	Network 2020.1													
<p><u>Storage Structures for MONK BRETTON SW REV A.SWS</u></p> <p><u>Tank or Pond Manhole: 25, DS/PN: 4.007</u></p> <p>Invert Level (m) 92.900</p> <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>319.7</td> <td>2.100</td> <td>319.7</td> <td>2.101</td> <td>0.0</td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	0.000	319.7	2.100	319.7	2.101	0.0
Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)									
0.000	319.7	2.100	319.7	2.101	0.0									
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GARDEN HOUSE CLOSE MONK BRETTON		
Date 27/07/2022	Designed by HM	
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Micro Drainage		Network 2020.1

Summary of Results for 360 minute 100 year Winter (MONK BRETTON SW REV A.SWS)

Margin for Flood Risk Warning (mm) 100.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status OFF
 Inertia Status OFF

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	104.724	-0.201	0.000	0.03		3.6	OK
2.000	16	103.541	-0.184	0.000	0.08		5.4	OK
1.001	2	103.266	-0.159	0.000	0.19		14.9	OK
1.002	3	102.658	-0.242	0.000	0.08		18.6	OK
3.000	17	100.571	-0.154	0.000	0.22		12.6	OK
1.003	4	100.207	-0.193	0.000	0.28		31.2	OK
1.004	5	99.942	-0.258	0.000	0.21		37.4	OK
1.005	6	99.743	-0.257	0.000	0.22		42.4	OK
1.006	7	99.436	-0.264	0.000	0.19		57.5	OK
1.007	8	98.114	-0.286	0.000	0.13		65.3	OK
1.008	9	95.910	-0.240	0.000	0.28		65.3	OK
1.009	10	95.516	-0.284	0.000	0.14		71.5	OK
1.010	11	94.934	1.034	0.000	0.21		72.1	SURCHARGED
4.000	18	97.244	-0.181	0.000	0.09		9.7	OK
4.001	19	95.949	-0.156	0.000	0.20		15.7	OK
4.002	20	95.649	-0.156	0.000	0.21		19.1	OK
4.003	21	94.915	-0.185	0.000	0.16		19.1	OK
4.004	22	94.914	0.034	0.000	0.37		25.2	SURCHARGED
4.005	23	94.910	0.130	0.000	0.32		25.2	SURCHARGED
4.006	24	94.909	1.485	0.000	0.15		24.8	SURCHARGED
4.007	25	94.908	1.558	0.000	0.07		12.6	SURCHARGED
4.008	26	94.937	1.627	0.000	0.07		12.4	SURCHARGED
4.009	27	94.942	1.722	0.000	0.07		12.1	SURCHARGED
1.011	12	94.938	2.053	0.000	0.27		11.8	SURCHARGED
1.012	13	92.613	-0.142	0.000	0.30		11.8	OK
1.013	14	92.524	-0.151	0.000	0.24		11.8	OK

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		GARDEN HOUSE CLOSE MONK BRETTON						
Date 27/07/2022		Designed by HM						
File MONK BRETTON SW_Rev A.MDX		Checked by						
Micro Drainage		Network 2020.1						
<p>Summary of Results for 300 minute 100 year Winter (MONK BRETTON SW REV A.SWS)</p>								
Margin for Flood Risk Warning (mm)		100.0						
Analysis Timestep		2.5 Second Increment (Extended)						
DTS Status		OFF						
DVD Status		OFF						
Inertia Status		OFF						
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	104.725	-0.200	0.000	0.03		4.1	OK
2.000	16	103.545	-0.180	0.000	0.09		6.2	OK
1.001	2	103.271	-0.154	0.000	0.22		17.2	OK
1.002	3	102.662	-0.238	0.000	0.10		21.4	OK
3.000	17	100.576	-0.149	0.000	0.25		14.5	OK
1.003	4	100.216	-0.184	0.000	0.32		35.9	OK
1.004	5	99.951	-0.249	0.000	0.25		43.0	OK
1.005	6	99.752	-0.248	0.000	0.25		48.8	OK
1.006	7	99.444	-0.256	0.000	0.22		66.2	OK
1.007	8	98.121	-0.279	0.000	0.15		75.2	OK
1.008	9	95.921	-0.229	0.000	0.32		75.2	OK
1.009	10	95.523	-0.277	0.000	0.16		82.2	OK
1.010	11	94.942	1.042	0.000	0.25		82.9	SURCHARGED
4.000	18	97.247	-0.178	0.000	0.10		11.1	OK
4.001	19	95.953	-0.152	0.000	0.23		18.1	OK
4.002	20	95.654	-0.151	0.000	0.24		22.0	OK
4.003	21	94.914	-0.186	0.000	0.19		22.0	OK
4.004	22	94.913	0.033	0.000	0.43		29.0	SURCHARGED
4.005	23	94.909	0.129	0.000	0.37		29.0	SURCHARGED
4.006	24	94.908	1.484	0.000	0.17		28.5	SURCHARGED
4.007	25	94.907	1.557	0.000	0.08		14.2	SURCHARGED
4.008	26	94.925	1.615	0.000	0.08		13.4	SURCHARGED
4.009	27	94.963	1.743	0.000	0.07		12.6	SURCHARGED
1.011	12	94.961	2.076	0.000	0.26		11.8	SURCHARGED
1.012	13	92.613	-0.142	0.000	0.30		11.8	OK
1.013	14	92.524	-0.151	0.000	0.24		11.8	OK
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APPENDIX F – Limitations

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