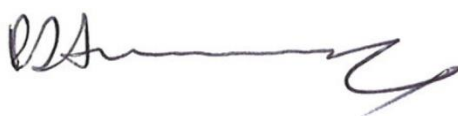


**34-38 Southampton Street
Reading, Berkshire**

Drainage Statement

Project No. W01869



Prepared by:
Richard Hemming BEng MEng CEng MICE



Structural
Engineering



Civil
Engineering



CDM
Consultants



Sustainability
and BREEAM



Traffic and
Transport



Flood Risk
Assessments



Highway
Engineering



Event
Engineering

Issue and Amendment Record:

Revision	Comment/Amendment	Prepared	Reviewed	Approved	Date
-	Initial Issue	RDH	HH	RDH	22/6/2018
A	MB - Client amendments	RDH/ASm	RDH	RDH	22/6/2018
B	Updated to Planning Comments	RDH	RDH	RDH	18/5/2020

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1.0 Introduction

- 1.1** This report has been prepared by Scott White and Hookins LLP to provide information on the proposed drainage strategy for the proposed redevelopment works at 34-38 Southampton Street, Reading.
- 1.2** This report has been prepared in accordance with the NPPF and the accompanying Planning Practice Guidance.

2.0 Site Proposals

- 2.1** The site is located close to the centre of Reading.
- 2.2** The site comprises of the former Red Lion Public House, and a residential unit at no. 38.
- 2.3** The proposal is to demolish the existing buildings and redevelop with a new block of residential apartments.

3.0 Drainage Strategy

3.1 Foul Drainage

- 3.1.1 The existing site has drainage connected to the adopted Thames Water drain in Southampton Street.
- 3.1.2 The proposal is to renew all the drainage within the site, and connect to the existing off site connection.
- 3.1.3 An application will be made to Thames Water to confirm the reconfigured layout on site.

3.2 Surface Water Drainage

- 3.2.1 Due to the nature of the ground conditions at the development site being clay based, infiltration into the sub soils is expected not to be possible. Also, proximity of other structures will make formal soakaway structures impossible to locate on site.
- 3.2.2 Therefore considering the hierarchy of discharge:
- Infiltration into ground
 - Discharge to a watercourse
 - Discharge to a sewer
- 3.2.3 As the first and second options are not available at the site, it is proposed that for our development, discharge to the existing adopted drains in Southampton Street is recommended. This mirrors the current site discharge.
- 3.2.4 It is proposed that sustainable drainage solutions will be utilised on site with surface water from the buildings discharging to cellular crate soakaways located in landscaping to the rear of the development. Pathways will be permeable paving to mirror a green space scenario.
- 3.2.5 Calculating the current site discharge rates, based on the 260m² impermeable area with a 60min storm duration, the existing flows are:
- | Return Period | Existing Flow Rate l/s |
|---------------|------------------------|
| 1 in 1 year | 2.3 |
| 1 in 30 year | 5.5 |
| 1 in 100 year | 7.3 |
- 3.2.6 The sustainable drainage solutions have been designed using current Microdrainage software. The design is based on a 1 in 100 year storm event plus 40% allowance for

climate change.

- 3.2.7 Therefore we propose that the following discharge rates will apply based on calculation for each of the return periods and all storm durations for an impermeable area of 290m²:

Return Period	Proposed Flow Rate l/s	Percentage Reduction on Existing Flow
1 in 1 year	1.7	21%
1 in 30 year	2.0	54%
1 in 100 year	2.2	58%

- 3.2.8 Attenuated rates will be achieved by using a Vortex Flow Control Chamber.
- 3.2.9 Based on the above design philosophy, the attenuated storage volume required is 7.4 m³. Please see **Appendix A** for design calculations
- 3.2.10 We have not included for 10% urban creep as the constraints to the site limited the likelihood of any further development.
- 3.2.11 Please refer to **Appendix B** for proposed drainage strategy drawing.

4.0 Inspection and Maintenance

- 4.1** This section sets out the inspection and maintenance requirements for long term management of the development's surface water drainage system. This work is to be undertaken by a private maintenance company.
- 4.2** All those responsible for maintenance should take appropriate health, safety and welfare precautions for all activities including lone working, if relevant, and risk assessments should always be undertaken. The site's infrastructure Health and Safety File should be consulted before carrying out any works either inside or outside of the development's boundary and information regarding the location of existing utilities passed on to operatives.
- 4.3** The requirements of the Health and Safety at Work Act 1974 and The Construction (Design and Management) Regulations 2015 should be adhered to and any residual risks identified in the Health and Safety File should be managed and information passed on to maintenance operatives through task specific risk assessments.
- 4.4** There are three types of maintenance activities associated with surface water drainage systems. The SuDS Manual, CIRIA C753, defines these as:
- Regular Maintenance – *'basic tasks undertaken on a frequent and predictable schedule' including vegetation management, litter and debris removal, and inspections.'*
 - Occasional Maintenance – *'tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).'*
 - Remedial Maintenance – *'intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.'*

Operation and Maintenance Activity	SuDs Component		
	Piped Network / Inspection Chambers	Cellular / Modular Storage	Permeable Pavement
Regular Maintenance			
Inspection	■	■	■
Litter and debris removal	■	□	■
Grass cutting		□	□
Weed and invasive plant control			□
Occasional Maintenance			
Sediment management	■	■	■
Vacuum sweeping and brushing			■
Remedial Maintenance			
Structure rehabilitation/ repair	□	□	□
Infiltration surface reconditioning			□
■ Will be required □ May be required			
Extract from The SuDs Manual Table 32.1 : Typical key SuDs components operation and maintenance activities			

Piped Network/Chambers Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action	Monthly for three months, then six monthly
	Debris removal from catchment surface / gratings (where may cause risks to performance)	Monthly (and after large storms)
	Remove sediment from trapped sumps, manholes and catchpits.	Annually or as required
Remedial Maintenance	Repair / rehabilitation of gratings, inlets and outlets	As required
Monitoring	Inspect / check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed	Annually and after large storm events
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of features or pipework is required.	As required

Permeable Pavement Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over the whole surface). Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material if present. Any lost material should be replaced.	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers' recommendations – pay particular attention to areas where water runs from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weed or management using glyphosate applied directly to the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements
Remedial Maintenance	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structured performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 year or as required (if infiltration and filtration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and / or weed growth - If required, take remedial action.	Three-monthly, forty-eight hours after large rainfall events in the first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually
The SuDS Manual Table 20.15: Operation and maintenance requirements for pervious pavements		

Cellular Storage Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action	Monthly for three months, then annually.
	Remove debris from catchment surface (where may cause risks to performance)	Monthly
	Remove debris from catchment surface (where may cause risks to performance)	Annually or as required
Remedial Maintenance	Repair / rehabilitate inlets, outlets, overflows and vents	As required
Monitoring	Inspect / check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storm events
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of storage units is required.	As required
The SuDS Manual Table 21.3: Operation and maintenance requirements for attenuation storage tanks		

5.0 Summary

- 5.1.1 The site is an existing brownfield site
- 5.1.2 The drainage scheme proposed, reduces the current peak flow discharge from the site by at least 27%.
- 5.1.3 Attenuated storage of surface water will be provided of 7.4 m³

6.0 Appendices

Appendix A **Calculations**

Microdrainage Calculations:

Existing 1 in 1 Year Storm

Proposed 1 in 100 plus 40% Year Storm

Scott-White & Hookins					Page 1
42 West Street London House Carshalton SM5 2PR					
Date 22/06/2018 10:51 File lin1 Exist 260m2.SRCX		Designed by R Hemming Checked by			
Micro Drainage		Source Control 2017.1			
Summary of Results for 1 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	48.672	0.072	3.7	0.1	O K
30 min Summer	48.667	0.067	3.1	0.1	O K
60 min Summer	48.656	0.056	2.3	0.1	O K
120 min Summer	48.646	0.046	1.5	0.1	O K
180 min Summer	48.640	0.040	1.2	0.0	O K
240 min Summer	48.636	0.036	1.0	0.0	O K
360 min Summer	48.631	0.031	0.7	0.0	O K
480 min Summer	48.627	0.027	0.6	0.0	O K
600 min Summer	48.624	0.024	0.5	0.0	O K
720 min Summer	48.623	0.023	0.4	0.0	O K
960 min Summer	48.620	0.020	0.4	0.0	O K
1440 min Summer	48.618	0.018	0.3	0.0	O K
2160 min Summer	48.616	0.016	0.2	0.0	O K
2880 min Summer	48.615	0.015	0.2	0.0	O K
4320 min Summer	48.613	0.013	0.1	0.0	O K
5760 min Summer	48.611	0.011	0.1	0.0	O K
7200 min Summer	48.610	0.010	0.1	0.0	O K
8640 min Summer	48.610	0.010	0.1	0.0	O K
10080 min Summer	48.609	0.009	0.1	0.0	O K
15 min Winter	48.672	0.072	3.6	0.1	O K
30 min Winter	48.662	0.062	2.7	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	29.060	0.0	1.4	10	
30 min Summer	18.884	0.0	1.8	17	
60 min Summer	11.942	0.0	2.3	32	
120 min Summer	7.400	0.0	2.9	62	
180 min Summer	5.566	0.0	3.3	92	
240 min Summer	4.542	0.0	3.5	122	
360 min Summer	3.408	0.0	4.0	182	
480 min Summer	2.762	0.0	4.3	240	
600 min Summer	2.346	0.0	4.6	304	
720 min Summer	2.053	0.0	4.8	362	
960 min Summer	1.664	0.0	5.2	480	
1440 min Summer	1.237	0.0	5.8	716	
2160 min Summer	0.921	0.0	6.5	1092	
2880 min Summer	0.747	0.0	7.0	1444	
4320 min Summer	0.555	0.0	7.8	2196	
5760 min Summer	0.450	0.0	8.4	2832	
7200 min Summer	0.382	0.0	9.0	3592	
8640 min Summer	0.335	0.0	9.4	4288	
10080 min Summer	0.299	0.0	9.8	5192	
15 min Winter	29.060	0.0	1.6	10	
30 min Winter	18.884	0.0	2.1	17	
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42 West Street London House Carshalton SM5 2PR					
Date 22/06/2018 10:51 File lin1 Exist 260m2.SRCX		Designed by R Hemming Checked by			
Micro Drainage		Source Control 2017.1			
Summary of Results for 1 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	48.650	0.050	1.8	0.1	O K
120 min Winter	48.639	0.039	1.1	0.0	O K
180 min Winter	48.634	0.034	0.9	0.0	O K
240 min Winter	48.630	0.030	0.7	0.0	O K
360 min Winter	48.625	0.025	0.5	0.0	O K
480 min Winter	48.622	0.022	0.4	0.0	O K
600 min Winter	48.620	0.020	0.4	0.0	O K
720 min Winter	48.619	0.019	0.3	0.0	O K
960 min Winter	48.617	0.017	0.3	0.0	O K
1440 min Winter	48.616	0.016	0.2	0.0	O K
2160 min Winter	48.614	0.014	0.2	0.0	O K
2880 min Winter	48.613	0.013	0.1	0.0	O K
4320 min Winter	48.611	0.011	0.1	0.0	O K
5760 min Winter	48.610	0.010	0.1	0.0	O K
7200 min Winter	48.609	0.009	0.1	0.0	O K
8640 min Winter	48.609	0.009	0.1	0.0	O K
10080 min Winter	48.608	0.008	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	11.942	0.0	2.6	32	
120 min Winter	7.400	0.0	3.2	60	
180 min Winter	5.566	0.0	3.6	92	
240 min Winter	4.542	0.0	4.0	124	
360 min Winter	3.408	0.0	4.5	188	
480 min Winter	2.762	0.0	4.8	248	
600 min Winter	2.346	0.0	5.1	302	
720 min Winter	2.053	0.0	5.4	360	
960 min Winter	1.664	0.0	5.8	488	
1440 min Winter	1.237	0.0	6.5	708	
2160 min Winter	0.921	0.0	7.2	1076	
2880 min Winter	0.747	0.0	7.8	1440	
4320 min Winter	0.555	0.0	8.7	2136	
5760 min Winter	0.450	0.0	9.4	2920	
7200 min Winter	0.382	0.0	10.0	3544	
8640 min Winter	0.335	0.0	10.5	4200	
10080 min Winter	0.299	0.0	11.0	4968	
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42 West Street London House Carshalton SM5 2PR																																			
Date 22/06/2018 10:51 File lin1 Exist 260m2.SRCX	Designed by R Hemming Checked by																																		
Micro Drainage		Source Control 2017.1																																	
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>1</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>18.800</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+0</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.026 <table> <tr> <th colspan="2">Time (mins)</th> <th>Area</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>(ha)</th> </tr> <tr> <td>0</td> <td>4</td> <td>0.026</td> </tr> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	1	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	18.800	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+0	Time (mins)		Area	From:	To:	(ha)	0	4	0.026
Rainfall Model	FSR	Winter Storms	Yes																																
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From:	To:	(ha)																																	
0	4	0.026																																	
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42 West Street London House Carshalton SM5 2PR		
Date 22/06/2018 10:51 File lin1 Exist 260m2.SRCX	Designed by R Hemming Checked by	
Micro Drainage Source Control 2017.1		
<u>Model Details</u> Storage is Online Cover Level (m) 49.600 <u>Pipe Structure</u> Diameter (m) 0.225 Length (m) 10.000 Slope (1:X) 50.000 Invert Level (m) 48.600 <u>Pipe Outflow Control</u> Diameter (m) 0.225 Entry Loss Coefficient 0.500 Slope (1:X) 50.0 Coefficient of Contraction 0.600 Length (m) 10.000 Upstream Invert Level (m) 48.600 Roughness k (mm) 0.600		
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42 West Street London House Carshalton SM5 2PR							
Date 18/05/2020 14:21 File lin100 plus 40% 290sqm....				Designed by wintempl Checked by			
Micro Drainage				Source Control 2020.1			
<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 36 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	48.845	0.345	0.0	2.0	2.0	5.4	O K
30 min Summer	48.896	0.396	0.0	2.0	2.0	6.2	O K
60 min Summer	48.902	0.402	0.0	2.1	2.1	6.3	O K
120 min Summer	48.868	0.368	0.0	2.0	2.0	5.8	O K
180 min Summer	48.826	0.326	0.0	1.9	1.9	5.1	O K
240 min Summer	48.783	0.283	0.0	1.9	1.9	4.4	O K
360 min Summer	48.708	0.208	0.0	1.7	1.7	3.3	O K
480 min Summer	48.650	0.150	0.0	1.6	1.6	2.4	O K
600 min Summer	48.605	0.105	0.0	1.5	1.5	1.6	O K
720 min Summer	48.570	0.070	0.0	1.4	1.4	1.1	O K
960 min Summer	48.523	0.023	0.0	1.3	1.3	0.4	O K
1440 min Summer	48.500	0.000	0.0	1.1	1.1	0.0	O K
2160 min Summer	48.500	0.000	0.0	0.8	0.8	0.0	O K
2880 min Summer	48.500	0.000	0.0	0.6	0.6	0.0	O K
4320 min Summer	48.500	0.000	0.0	0.4	0.4	0.0	O K
5760 min Summer	48.500	0.000	0.0	0.4	0.4	0.0	O K
7200 min Summer	48.500	0.000	0.0	0.3	0.3	0.0	O K
8640 min Summer	48.500	0.000	0.0	0.3	0.3	0.0	O K
10080 min Summer	48.500	0.000	0.0	0.2	0.2	0.0	O K
15 min Winter	48.896	0.396	0.0	2.0	2.0	6.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	129.089	0.0	7.0	16			
30 min Summer	84.848	0.0	9.2	28			
60 min Summer	53.188	0.0	11.5	44			
120 min Summer	32.259	0.0	14.0	80			
180 min Summer	23.779	0.0	15.5	112			
240 min Summer	19.047	0.0	16.6	146			
360 min Summer	13.827	0.0	18.0	210			
480 min Summer	11.024	0.0	19.1	270			
600 min Summer	9.241	0.0	20.1	330			
720 min Summer	7.997	0.0	20.9	390			
960 min Summer	6.361	0.0	22.1	502			
1440 min Summer	4.600	0.0	24.0	0			
2160 min Summer	3.321	0.0	26.0	0			
2880 min Summer	2.633	0.0	27.5	0			
4320 min Summer	1.896	0.0	29.7	0			
5760 min Summer	1.500	0.0	31.3	0			
7200 min Summer	1.251	0.0	32.6	0			
8640 min Summer	1.077	0.0	33.7	0			
10080 min Summer	0.949	0.0	34.7	0			
15 min Winter	129.089	0.0	7.9	16			

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42 West Street London House Carshalton SM5 2PR							
Date 18/05/2020 14:21 File lin100 plus 40% 290sqm....			Designed by wintempl Checked by				
Micro Drainage			Source Control 2020.1				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	48.963	0.463	0.0	2.1	2.1	7.3	O K
60 min Winter	48.970	0.470	0.0	2.2	2.2	7.4	O K
120 min Winter	48.913	0.413	0.0	2.1	2.1	6.5	O K
180 min Winter	48.847	0.347	0.0	2.0	2.0	5.4	O K
240 min Winter	48.784	0.284	0.0	1.9	1.9	4.4	O K
360 min Winter	48.679	0.179	0.0	1.7	1.7	2.8	O K
480 min Winter	48.604	0.104	0.0	1.5	1.5	1.6	O K
600 min Winter	48.551	0.051	0.0	1.4	1.4	0.8	O K
720 min Winter	48.514	0.014	0.0	1.3	1.3	0.2	O K
960 min Winter	48.500	0.000	0.0	1.1	1.1	0.0	O K
1440 min Winter	48.500	0.000	0.0	0.8	0.8	0.0	O K
2160 min Winter	48.500	0.000	0.0	0.6	0.6	0.0	O K
2880 min Winter	48.500	0.000	0.0	0.5	0.5	0.0	O K
4320 min Winter	48.500	0.000	0.0	0.3	0.3	0.0	O K
5760 min Winter	48.500	0.000	0.0	0.3	0.3	0.0	O K
7200 min Winter	48.500	0.000	0.0	0.2	0.2	0.0	O K
8640 min Winter	48.500	0.000	0.0	0.2	0.2	0.0	O K
10080 min Winter	48.500	0.000	0.0	0.2	0.2	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	84.848	0.0	10.3	30			
60 min Winter	53.188	0.0	12.9	48			
120 min Winter	32.259	0.0	15.7	86			
180 min Winter	23.779	0.0	17.3	122			
240 min Winter	19.047	0.0	18.5	156			
360 min Winter	13.827	0.0	20.2	220			
480 min Winter	11.024	0.0	21.5	280			
600 min Winter	9.241	0.0	22.5	338			
720 min Winter	7.997	0.0	23.4	388			
960 min Winter	6.361	0.0	24.8	0			
1440 min Winter	4.600	0.0	26.9	0			
2160 min Winter	3.321	0.0	29.1	0			
2880 min Winter	2.633	0.0	30.8	0			
4320 min Winter	1.896	0.0	33.3	0			
5760 min Winter	1.500	0.0	35.1	0			
7200 min Winter	1.251	0.0	36.6	0			
8640 min Winter	1.077	0.0	37.8	0			
10080 min Winter	0.949	0.0	38.9	0			
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Date 18/05/2020 14:21 File lin100 plus 40% 290sqm....	Designed by wintempl Checked by	
Micro Drainage Source Control 2020.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.800	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.029

Time (mins)		Area
From:	To:	(ha)
0	4	0.029

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Model Details

Storage is Online Cover Level (m) 49.600

Cellular Storage Structure

Invert Level (m) 48.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	16.5	0.0	1.300	16.5	0.0
0.100	16.5	0.0	1.400	16.5	0.0
0.200	16.5	0.0	1.500	16.5	0.0
0.300	16.5	0.0	1.600	16.5	0.0
0.400	16.5	0.0	1.700	16.5	0.0
0.500	16.5	0.0	1.800	16.5	0.0
0.600	16.5	0.0	1.900	16.5	0.0
0.700	16.5	0.0	2.000	16.5	0.0
0.800	16.5	0.0	2.100	16.5	0.0
0.900	16.5	0.0	2.200	16.5	0.0
1.000	16.5	0.0	2.300	16.5	0.0
1.100	16.5	0.0	2.400	16.5	0.0
1.200	16.5	0.0	2.500	16.5	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0049-2200-0700-2200
Design Head (m)	0.700
Design Flow (l/s)	2.2
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	49
Invert Level (m)	48.300
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	2.2
Flush-Flo™	0.074	0.8
Kick-Flo®	0.074	0.8
Mean Flow over Head Range	-	1.5

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

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Micro Drainage		Source Control 2020.1					
<u>Hydro-Brake® Optimum Outflow Control</u>							
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.9	1.200	2.8	3.000	4.3	7.000	6.5
0.200	1.3	1.400	3.0	3.500	4.6	7.500	6.7
0.300	1.5	1.600	3.2	4.000	5.0	8.000	6.9
0.400	1.7	1.800	3.4	4.500	5.2	8.500	7.1
0.500	1.9	2.000	3.6	5.000	5.5	9.000	7.3
0.600	2.1	2.200	3.7	5.500	5.8	9.500	7.5
0.800	2.3	2.400	3.9	6.000	6.0		
1.000	2.6	2.600	4.0	6.500	6.2		
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Appendix B

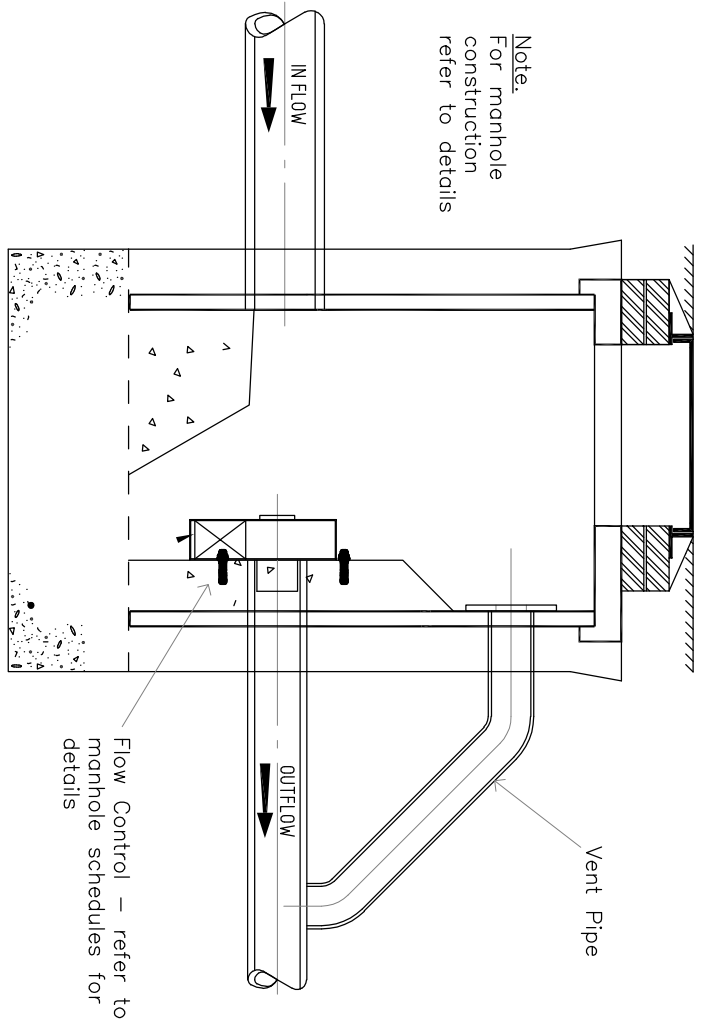
Drainage Strategy layout

DRAINAGE

- Any information given on this drawing regarding existing services is believed to be correct. The contractor must check this information and determine the nature and location of other existing services from the various statutory authorities before commencing excavation works.
- Drainage works to be constructed in accordance with BS EN 752 and Approved Document H
- All soft spots and unacceptable material encountered in drainage excavations is to be removed and replaced with granular material to the requirements of the building control officer.

- Pipes to be installed to manufacturers recommendations.

- Pipes entering buildings to be laid in a fall of 1:40 minimum unless noted otherwise.
 - Plastic plain wall pipes to be PVC-U to BS EN 14011-1, class SN4, with flexible joints. Kitemark certified. Structured wall plastic pipes to be to MS 04-35-01. Kitemark certified
 - Clay pipes to be vitrified clay to BS EN 295-1, with flexible joints, Kitemark certified. Clayware pipes must be extra strength classification protected in accordance with the specified details.
 - Concrete pipes to be precast concrete to BS 5911-1 and BS EN 1916, with flexible joints.
 - Bedding of pipes to be in accordance with approved document H11
 - Rocker pipes with flexible joints are to be provided at a distance of 150mm and 750mm from the face of construction to manholes, where pipes pass above, below or through ground beams or foundations, at gully connectors and soil stack exits.
 - Manhole access covers are to be located at the outgoing side of manholes.
 - Cover frames are to be fixed on site to suit finished levels. Covers and frames to be BS EN124, Grade D to be used in areas subject to heavy vehicular loading, Grade C in areas subject to light vehicular loading and Grade B to be used elsewhere.
- RE = Ridding Eve
ST = Silt Trap Manhole
YU = Yard Gully



PRECAST CONCRETE FLOW CONTROL CHAMBER WITH HIGH LEVEL OVERFLOW

Kitemark certified. Clayware pipes must be extra strength classification protected in accordance with the specified details.

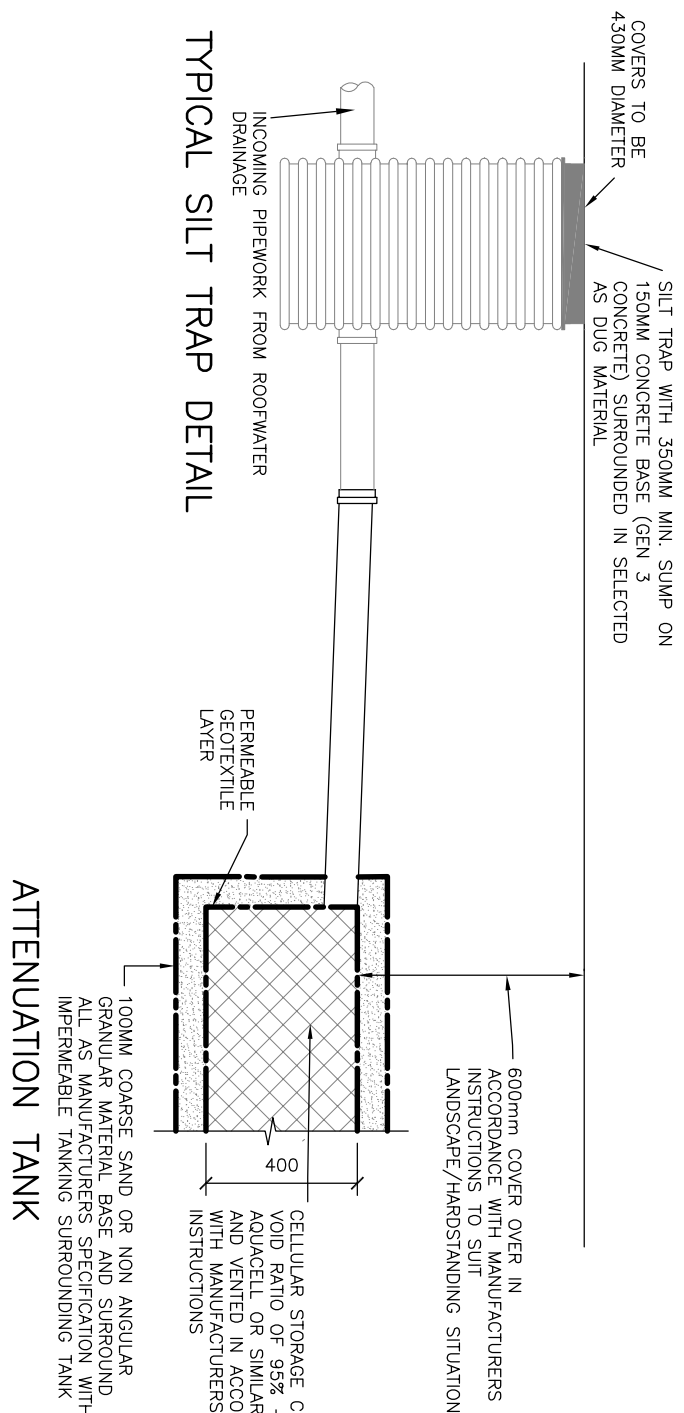


FIGURE B.21
TYPICAL INSPECTION CHAMBER DETAIL TYPE A (Elevable mechanical draft)

Maximum depth from cover level to soffit of pipe 2 m, non-entry

	Ed c/cv 12% S/N C-1 80d
	D/menaf/z, 100kway 9, 13K
	D/menaf/z, 100kway 9, 13K
	Indurite

	Ed c/cv 12% S/N C-1 80d
	D/menaf/z, 100kays 13K
	D/menaf/z, 100kays 13K
	Indover

Detail of the connection between the column and the beam. The diagram shows a cross-section of a concrete column and a steel beam. The column has a diameter of 225 mm. The beam has a height of 225 mm. The connection is made using a steel plate with bolts. The bolts are spaced at 100 mm. The column is reinforced with longitudinal bars and stirrups. The beam is reinforced with longitudinal bars and stirrups. The diagram is labeled with dimensions and material specifications.

Diagram illustrating the cross-section of a road structure, showing various layers and components:

- Surface and subgrade:** The top layer, labeled "Surface and subgrade", showing the road surface and the underlying subgrade.
- Base and sub-base:** The middle layer, labeled "Base and sub-base", showing the base and sub-base layers.
- Drainage and protection:** The bottom layer, labeled "Drainage and protection", showing the drainage layer and the protection layer.
- Subgrade:** The bottom-most layer, labeled "Subgrade", showing the natural ground or compacted material.
- Base:** The layer above the sub-base, labeled "Base", showing the granular material.
- Sub-base:** The layer above the subgrade, labeled "Sub-base", showing the granular material.
- Drainage layer:** The layer above the protection layer, labeled "Drainage layer", showing the granular material.
- Protection layer:** The layer above the subgrade, labeled "Protection layer", showing the geotextile or similar material.
- Surface:** The top-most layer, labeled "Surface", showing the asphalt or concrete.
- Roadway:** The area between the shoulders, labeled "Roadway", showing the paved area.
- Shoulder:** The area outside the roadway, labeled "Shoulder", showing the unpaved area.

HAZARDS LEADING TO UNUSUAL OR
SIGNIFICANT RISKS DURING THE CONSTRUCTION
PROCESS ARE IDENTIFIED ON THIS DRAWING AS:

NOTE: THE LIST BELOW IDENTIFIES CERTAIN RISKS WHICH ARE DEEMED TO BE
UNUSUAL, ABNORMAL OR UNEXPECTED TO A COMPETENT CONTRACTOR

CONCRETE PAVING

HAZARD: TRIPPING OVER MATERIAL

RISK: PERSONAL INJURY

CONTROL MEASURES: 1. CLEAR WORK AREA OF OBSTACLES 2. WEAR SAFETY VEST 3. WEAR SAFETY SHOES 4. WEAR SAFETY HELMET 5. WEAR SAFETY GLASSES 6. WEAR SAFETY GLOVES 7. WEAR SAFETY BOOTS 8. WEAR SAFETY CAP 9. WEAR SAFETY GOGGLES 10. WEAR SAFETY VEST 11. WEAR SAFETY SHOES 12. WEAR SAFETY HELMET 13. WEAR SAFETY GLASSES 14. WEAR SAFETY GLOVES 15. WEAR SAFETY BOOTS 16. WEAR SAFETY CAP 17. WEAR SAFETY GOGGLES 18. WEAR SAFETY VEST 19. WEAR SAFETY SHOES 20. WEAR SAFETY HELMET 21. WEAR SAFETY GLASSES 22. WEAR SAFETY GLOVES 23. WEAR SAFETY BOOTS 24. WEAR SAFETY CAP 25. WEAR SAFETY GOGGLES 26. WEAR SAFETY VEST 27. WEAR SAFETY SHOES 28. WEAR SAFETY HELMET 29. WEAR SAFETY GLASSES 30. WEAR SAFETY GLOVES 31. WEAR SAFETY BOOTS 32. WEAR SAFETY CAP 33. WEAR SAFETY GOGGLES 34. WEAR SAFETY VEST 35. WEAR SAFETY SHOES 36. WEAR SAFETY HELMET 37. WEAR SAFETY GLASSES 38. WEAR SAFETY GLOVES 39. WEAR SAFETY BOOTS 40. WEAR SAFETY CAP 41. WEAR SAFETY GOGGLES 42. WEAR SAFETY VEST 43. WEAR SAFETY SHOES 44. 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over and insert to clean B7.7
spoil

Minimum internal dimensions
of excavation:
• minimum width to be 800 mm
• a 100 mm diameter pipe and
• a 100 mm diameter manhole
can be used to allow entry of
disturbance equipment
into between boxes and shaft
Base will have all connections
within top of the main pipe
then top of the shaft pipe

See Clause E2.32
Internal dimensions
225 mm x 100 mm
DOT Type 1 with base
or concrete surround

Situations which may be encountered during the construction process it is therefore the main contractor's responsibility to identify any further risks/hazards and take appropriate action.

RISKS/HAZARDS SPECIFIC TO THIS DRAWING:

-- All services to be located prior to any excavation works

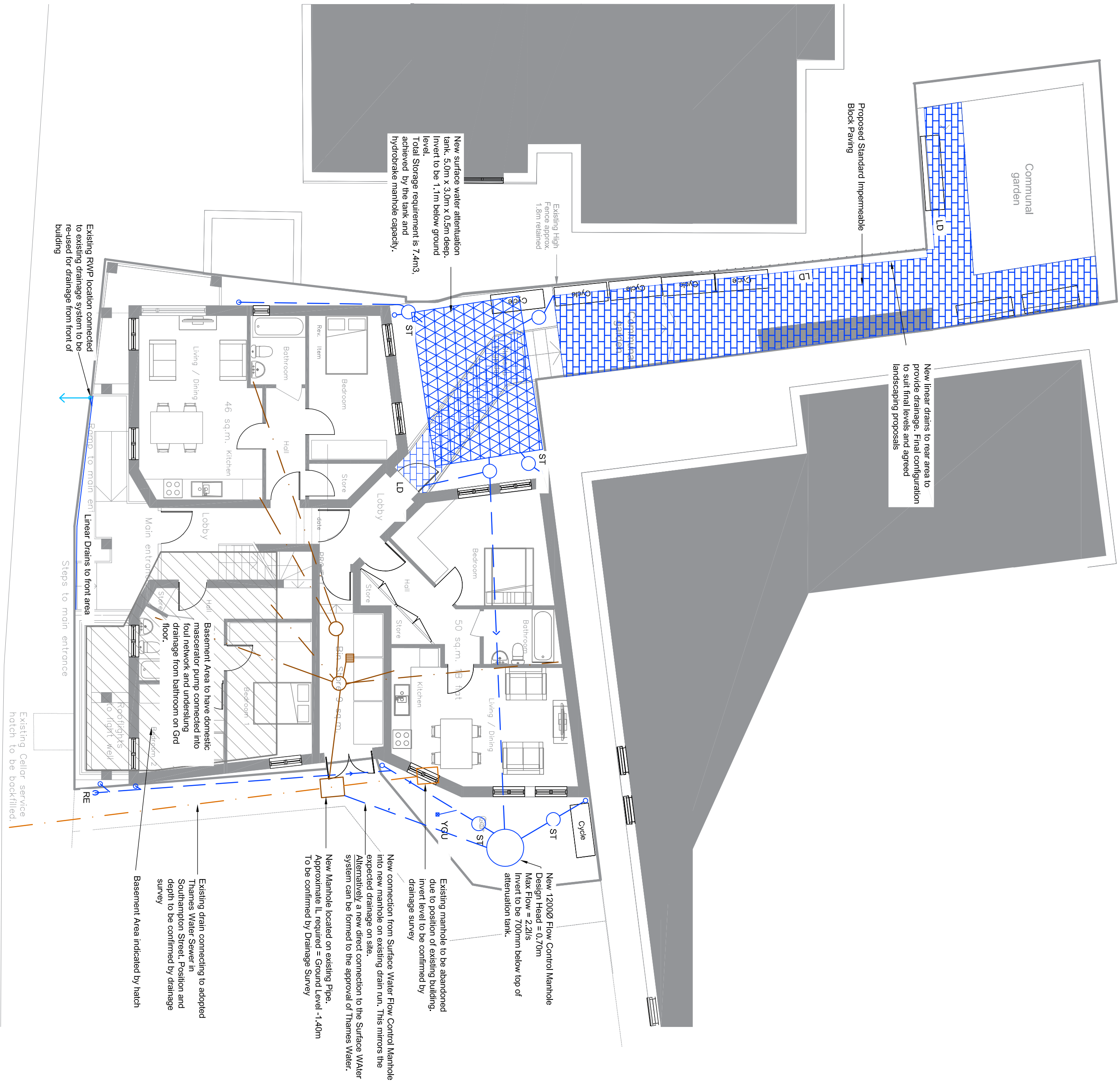
Joint to be as close as possible to face of chamber to permit satisfactory joint and subsequent movement

PRELIMINARY - NOT FOR CONSTRUCTION

Used inlet to be

P03	Permeable Flow around Obstructions Added	RCH	RCH	14.02.2020
P02	Ground Floor Plan Amended	RCH	RCH	22.08.18
P01	Initial Issue	RCH	RCH	21.06.18

Project	Not to scale	Highway Authority can have specific requirements	Note: Where the access chamber is in the highway the
94 00 Southminster Street			



Southampton Street

(maximum angle: 45°)

Approximate Depth = 25m

natural water Adopted Surface Water Drain 30mm Ø.

light to be drawn as close as possible

Approximate Depth = 3.6m

Unused hole to be sealed and well/light

Project	Not to scale	Highway Authority can have specific requirements
Thames Water Adopted Surface Water Drain 800x770	✓	✓
Approximate Depth = 3.0m	✓	✓

Proposed Drainage Strategy Layout