

**Former Chatsworth Mill, Williams Road, Gorton,
Manchester, M18 7AY.**

**Information for the discharge of drainage related planning condition for
Application No: 129852/FO/2021.**

Before the Development is Commenced

6) Notwithstanding detail submitted, no development shall take place until surface water drainage works have been implemented in accordance with Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacements national standards and details that have been submitted to and approved in writing by the City Council as Local Planning Authority.

In order to discharge the above drainage condition the following additional information has to be provided: 129852/FO/2021 Page 4 of 12

- An updated assessment of alternative green SuDS solution (that is either utilising infiltration or attenuation) if practicable following site investigation works;*
- Details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. at least a 50% reduction in runoff rate compared to the existing rates, as the site is located within Conurbation Core Critical Drainage Area;*
- Average rainfall intensity calculations to accompany all discharge rates;*
- Evidence that the drainage system has been designed (unless an area is designated to hold and/or convey water as part of the design) so that flooding does not occur during a 1 in 100 year rainfall event with allowance for 40% climate change in any part of a building; Hydraulic calculations of the proposed drainage system;*
- Assessment of overland flow routes for extreme events that is diverted away from buildings (including basements). Overland flow routes need to be designed to convey the flood water in a safe manner in the event of a blockage or exceedance of the proposed drainage system capacity including inlet structures. A layout with overland flow routes needs to be presented with appreciation of these overland flow routes with regards to the properties on site and adjacent properties off site;*
- Where surface water is connected to the public sewer, agreement in principle from United Utilities is required that there is adequate spare capacity in the existing system taking future development requirements into account. An email of acceptance of proposed flows and/or new connection will suffice.*
- Construction details of flow control and SuDS elements.*

Reason - To promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution, pursuant to policies EN8 and EN14 of the Manchester Core Strategy.

Surface Water Drainage

General

The design for a surface water drainage system for the proposed development will be guided by the principles set out in the National Planning Policy Framework (NPPF) and the Building Regulations Approved Document H.

The NPPF provides the following advice with regards to drainage:

“Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems. Sustainable drainage systems cover the whole range of sustainable approaches to surface drainage management. They are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible.”

The Building Regulations Approved Document H states that rainwater shall discharge to one of the following, listed in order of priority:

1. An adequate soakaway or some other adequate infiltration system, or where this is not reasonably practical;
2. A watercourse, or where this is not reasonably practical;
3. A sewer.

Infiltration

The site is not suitable for infiltration. Trial pit data taken from the site investigation report conducted by LK Consult (LKC) identified the presence of made ground over cohesive soils with contamination present. Please see the trial pit data taken from the site investigation report in Appendix 1.

Discharge to Watercourse

There are no recorded ordinary watercourses within close vicinity of the site. The main River Gore Brooke culvert is located approximately 270m to the South of the site however due the length of the route required option can be discounted.

Highway Drain

A highway drain has been identified and investigated within Williams Road, following discussions with the LLFA however due to historic flooding of the highway drain it has been advised that the site does not discharge surface water run off directly through the Highway drains. Please see correspondence with the LLFA in Appendix 2

Discharge to Surface Water Sewer

There are no surface water sewers within close vicinity of the site therefore this option can be discounted. Please see the UU sewer map in Appendix 3

Discharge to Combined Sewer

Surface water flows will discharge into a combined chamber on site built on the line of the existing 225dia combined sewer that ultimately discharges into the combined sewer in Chatsworth Road. The approved point of connection and construction method has been agreed with United Utilities, please see correspondence with United Utilities in Appendix 2.

Foul Drainage

Proposed foul drainage to discharge into a new proposed combined chamber on site built on the line of the existing 225dia combined sewer that ultimately discharges into the combined sewer in Chatsworth Road . The approved point of connection and construction method has been agreed with United Utilities, please see correspondence with United Utilities in Appendix 2.

Evidence to discharge the planning conditions

- An updated assessment of alternative green SuDS solution (that is either utilising infiltration or attenuation) if practicable following site investigation works;

A SUDS drainage strategy has been produced to investigate the potential suitability of various SUDS components for the development. Please see Coopers Drg 7588 / PL01_A Drainage Strategy in Appendix 4.

- Details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. at least a 50% reduction in runoff rate compared to the existing rates, as the site is located within Conurbation Core Critical Drainage Area;

Surface water attenuation is provided within oversized pipes and tanked permeable paving restricted by a vortex flow control device to 5l/s as agreed with United Utilities, please see Appendix 2. Existing brownfield run off rates have been calculated based on a rainfall intensity of 50mm/hr = 21.83l/s therefore a betterment of over 75% has been provided.

- Average rainfall intensity calculations to accompany all discharge rates;

Please see Appendix 5 for rainfall intensity calculations.

- Evidence that the drainage system has been designed (unless an area is designate to hold and/or convey water as part of the design) so that flooding does not occur during a 1 in 100 year rainfall event with allowance for 40% climate change in any part of a building;

Please see Appendix 5 for microdrainage calculations.

- Assessment of overland flow routes for extreme events that is diverted away from buildings (including basements). Overland flow routes need to be designed to convey the flood water in a safe manner in the event of a blockage or exceedance of the proposed drainage system capacity including inlet structures. A layout with overland flow routes needs to be presented with appreciation of these overland flow routes with regards to the properties on site and adjacent properties off site;

Please see Coopers Drg 7588 / 13 Flood Exceedance Plan in Appendix 4

- Where surface water is connected to the public sewer, agreement in principle from United Utilities is required that there is adequate spare capacity in the existing system taking future development requirements into account. An email of acceptance of proposed flows and/or new connection will suffice.

Please see correspondence with United Utilities in Appendix 2

- Construction details of flow control and SuDS elements.

Please see Coopers Drg 7588 / PL01_A Drainage Strategy, Drg 7588 / 11 Flow Control Details & Drg 7588 / 12 SUDs details in Appendix 4

Appendix 1

Trial Pit Data

4 Ground Conditions

4.1 Geology – Generalised Sequence

The ground conditions beneath the site comprised made ground underlain by natural sandy gravelly clay. A summary section of the logs is provided in Plate 4-1, with additional comments below.

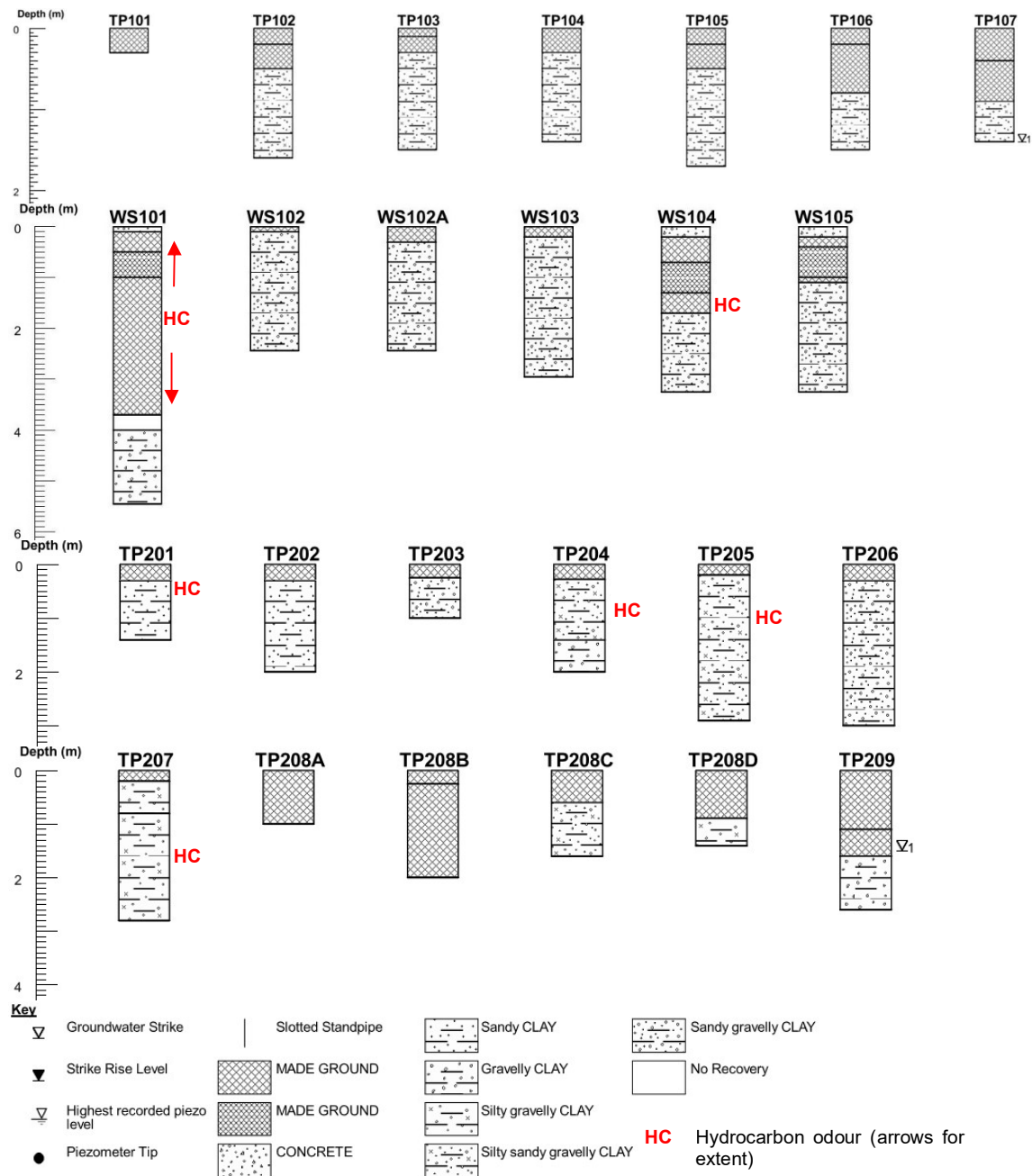


Plate 4-1: Summary of ground conditions.

Additional information on ground conditions:

- Made ground was recorded from depths of 0.30-2.00mbgl and generally consisted of sandy silty gravel / gravelly silty sand with brick, concrete, ash and clinker. Exceptions to this were:

Appendix 2

Correspondence



**MANCHESTER
CITY COUNCIL**

Lead Local Flood Authority

Highways Service
Growth and Neighbourhoods Directorate
Manchester City Council
PO Box 532
Town Hall
Manchester
M60 2LA

Email: floodriskmanagement@manchester.gov.uk

DATE 27/10/2021

Dear Sir or Madam,

RE: Our Ref: MCC001/09/2021

We acknowledge with thanks your payment for our LLFA data screen service.

Please find enclosed plan showing the results of the data screen. The position of features shown on this plan is approximate only and is given in accordance with the best information currently available.

The enclosed plan cannot be used to substitute a competent site investigation.

The enclosed plan is being provided to you subject to Manchester City Council's terms and conditions which are shown attached.

I trust the above meets your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter, please do not hesitate to contact us.

Yours Faithfully,

A handwritten signature in black ink, appearing to read 'N.A. Bayliss-Rowe'.

Neil Bayliss-Rowe, Highways Development Control & Flood Risk Manager, Lead Local Flood Authority

TERMS AND CONDITIONS – LLFA DATA SCREEN

These provisions apply to LLFA data supplied by Manchester City Council (“MCC”).

TERMS AND CONDITIONS:

- This data Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- MCC has taken all reasonable care to compile this data Map. This data Map and any information supplied with it is provided for general guidance only and MCC makes no representation, undertaking or warranty of any kind as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position of any culverted assets shown on the data Map are approximate only. MCC strongly recommends that a comprehensive site investigation is undertaken in addition to reviewing this data Map to determine and ensure the precise location of any assets. The exact location, positions and depths should be obtained by an appropriate survey which may include but shall not be limited to GPR and CCTV.
- The data screened may be modified over time without notice and therefore this data Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the data Map have been made subsequent to issue and prior to any works being carried out.
- This data Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) or for the purpose of determining the suitability of a point of connection to discharge.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising from damages of any kind caused to assets by reason of the actual position and/or existence of assets being different from those shown on the data Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent MCC from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

DATA SCREEN SYMBOLOGY

Bridge

-  Good
-  Fair
-  Poor
-  Very Poor
-  Unknown

Trash Screen

-  Good
-  Fair
-  Poor
-  Very Poor
-  Unknown

Culvert Orifice

-  Very Good
-  Good
-  Fair
-  Poor
-  Very Poor
-  Unknown

Culvert Conduit

-  CCTV surveyed
-  Not CCTV surveyed
-  Ordinary Watercourse Conduit
-  MCC SuDS
-  MCC Flood Incident Points
-  MCC Section 19 Report
-  MCC Flood Incident Polygons
-  MCC Local Authority Boundary



Supplementary Information where available:

Critical Drainage Area – The site is within the Conurbation Core (CDA)

Flood Incidents –

MCC Flood Incident Polygon:

-Off Chatsworth Road, report of flooding on the scrapyard from the manhole in the road, dated 11/12/2013.

MCC Flood Incident Points (within close proximity to the site):

-Along Chatsworth Road, report of two blocked drains, 15/08/2012, additional carriageway inspections are carried out more frequently in this area to prevent the drains causing future issues.

Culvert Conduits – There are no known ordinary watercourse culverts located within close proximity of the site. However, the Main River Gore Brook culvert is located approximately 270m to the South of the site.

Survey and Design Archive – Extract from the 1984 survey of major drainage is included.

Any other information – The site would benefit from an assessment of surface water flood risk, main rivers & associated assets, fluvial flood risk, historic events & flood warning areas. We recommend the applicant screens appropriate EA datasets during their investigation.

Historic 1984 Mapping:



Chief Executive's Department
Manchester City Council PO Box 463
Manchester
M60 3NY

Your ref: 129852/FO/2021
Our ref: DC/21/2041
Date: 02-JUN-21

Dear Sir/Madam,

Location: Former Chatsworth Mill Williams Road Gorton Manchester M18 7AY.

Proposal: Erection of 4 storey building to 24 x 1 bedroom and 16 x 2 bedroom apartments (40 total) (Class C3), together with associated external works, car parking and landscaping.

With regards to the above development proposal, United Utilities Water Limited ('United Utilities') wishes to provide the following comments.

Drainage

In accordance with the National Planning Policy Framework (NPPF) and the National Planning Practice Guidance (NPPG), the site should be drained on a separate system with foul water draining to the public sewer and surface water draining in the most sustainable way.

We request the following drainage conditions are attached to any subsequent approval to reflect the above approach:

Condition 1 – Surface water

Prior to the commencement of any development, a surface water drainage scheme, based on the hierarchy of drainage options in the National Planning Practice Guidance with evidence of an assessment of the site conditions shall be submitted to and approved in writing by the Local Planning Authority.

The surface water drainage scheme must be in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacement national standards. In the event of surface water draining to the combined public sewer, the pass forward flow rate to the public sewer must be restricted to 5 l/s.

The development hereby permitted shall be carried out only in accordance with the approved drainage scheme.

Reason: To promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution. This condition is imposed in light of policies within the NPPF and NPPG.

The applicant can discuss any of the above with Developer Engineer, **Graham Perry**, by email at wastewaterdeveloperservices@uuplc.co.uk.

Please note, United Utilities are not responsible for advising on rates of discharge to the local watercourse system. This is a matter for discussion with the Lead Local Flood Authority and / or the Environment Agency (if the watercourse is classified as main river).

If the applicant intends to offer wastewater assets forward for adoption by United Utilities, the proposed detailed design will be subject to a technical appraisal by an Adoptions Engineer as we need to be sure that the proposal meets the requirements of Sewers for Adoption and United Utilities' Asset Standards. The detailed layout should be prepared with consideration of what is necessary to secure a development to an adoptable standard. This is important as drainage design can be a key determining factor of site levels and layout. The proposed design should give consideration to long term operability and give United Utilities a cost effective proposal for the life of the assets. Therefore, should this application be approved and the applicant wishes to progress a Section 104 agreement, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 agreement, has been assessed and accepted in writing by United Utilities. Any works carried out prior to the technical assessment being approved is done entirely at the developers own risk and could be subject to change.

Management and Maintenance of Sustainable Drainage Systems

Without effective management and maintenance, sustainable drainage systems can fail or become ineffective. As a provider of wastewater services, we believe we have a duty to advise the Local Planning Authority of this potential risk to ensure the longevity of the surface water drainage system and the service it provides to people. We also wish to minimise the risk of a sustainable drainage system having a detrimental impact on the public sewer network should the two systems interact. We therefore recommend the Local Planning Authority include a condition in their Decision Notice regarding a management and maintenance regime for any sustainable drainage system that is included as part of the proposed development.

For schemes of 10 or more units and other major development, we recommend the Local Planning Authority consults with the Lead Local Flood Authority regarding the exact wording of any condition. You may find the below a useful example:

Prior to occupation of the development a sustainable drainage management and maintenance plan for the lifetime of the development shall be submitted to the local planning authority and agreed in writing. The sustainable drainage management and maintenance plan shall include as a minimum:

- a. Arrangements for adoption by an appropriate public body or statutory undertaker, or, management and maintenance by a resident's management company; and*
- b. Arrangements for inspection and ongoing maintenance of all elements of the sustainable drainage system to secure the operation of the surface water drainage scheme throughout its lifetime.*

The development shall subsequently be completed, maintained and managed in accordance with the approved plan.

Reason: To ensure that management arrangements are in place for the sustainable drainage system in order to manage the risk of flooding and pollution during the lifetime of the development.

Please note United Utilities cannot provide comment on the management and maintenance of an asset that is owned by a third party management and maintenance company. We would not be involved in the discharge of the management and maintenance condition in these circumstances.

Water Supply

Although water supply in the area is compliant with current regulatory standards, we recommend the applicant provides water storage of 24 hours capacity to guarantee an adequate and constant supply.

Our water mains may need extending to serve any development on this site and the applicant may be required to pay a contribution.

Any necessary disconnection or diversion of the private main(s) must have the approval of the pipeline owner and be carried out to our standards at the applicant's expense.

The applicant must undertake a complete soil survey, as and when land proposals have progressed to a scheme design i.e. development, and results submitted along with an application for water. This will aid in our design of future pipework and materials to eliminate the risk of contamination to the local water supply.

Please note that for properties over two stories high and commercial properties we recommend the developer considers the installation of tanks and pumps.

The applicant should be instructed to lay their own private pipe, to United Utilities standards, back to the existing main. If this should involve passing through third party land United Utilities must receive a solicitor's letter confirming an easement, prior to connection.

The applicant has not stated whether provision of a new water supply is required. Use of the existing metered supply may be considered if it meets United Utilities standards. If not, a separate metered supply will be required at the applicant's expense.

We can readily supply water for domestic purposes, but for larger quantities for example, commercial/industrial we will need further information.

If the applicant intends to obtain a water supply from United Utilities for the proposed development, we strongly recommend they engage with us at the earliest opportunity. If reinforcement of the water network is required to meet the demand, this could be a significant project and the design and construction period should be accounted for.

To discuss a potential water supply or any of the water comments detailed above, the applicant can contact the team at DeveloperServicesWater@uuplc.co.uk.

Please note, all internal pipework must comply with current Water Supply (water fittings) Regulations 1999.

United Utilities' Property, Assets and Infrastructure

The applicant should be aware of water mains in the vicinity of the proposed development site. Whilst this infrastructure is located outside the applicant's proposed red line boundary, the applicant must comply with our 'Standard Conditions for Works Adjacent to Pipelines'. We provide this information to support the applicant in identifying the potential impacts from all construction activities on United Utilities infrastructure and to identify mitigation measures to protect and prevent any damage to this infrastructure both during and after construction. This includes advice regarding landscaping in the vicinity of pipelines.

A public sewer crosses this site and we may not permit building over it. We will require an access strip width of six metres, three metres either side of the centre line of the sewer which is in accordance with the minimum distances specified in the current issue of Part H of the Building Regulations, for maintenance or replacement. Therefore a modification of the site layout, or a diversion of the affected public sewer may be necessary. All costs associated with sewer diversions must be borne by the applicant.

To establish if a sewer diversion is feasible, the applicant must discuss this at an early stage with our Developer Engineer at wastewaterdeveloperservices@uuplc.co.uk as a lengthy lead in period may be required if a sewer diversion proves to be acceptable.

Deep rooted shrubs and trees should not be planted in the vicinity of the public sewer and overflow systems.

Where United Utilities' assets exist, the level of cover to the water mains and public sewers must not be compromised either during or after construction.

For advice regarding protection of United Utilities assets, the applicant should contact the teams as follows:

Water assets – DeveloperServicesWater@uuplc.co.uk

Wastewater assets – WastewaterDeveloperServices@uuplc.co.uk

It is the applicant's responsibility to investigate the possibility of any United Utilities' assets potentially impacted by their proposals and to demonstrate the exact relationship between any United Utilities' assets and the proposed development.

A number of providers offer a paid for mapping service including United Utilities. To find out how to purchase a sewer and water plan from United Utilities, please visit the Property Searches website; <https://www.unitedutilities.com/property-searches/>

You can also view the plans for free. To make an appointment to view our sewer records at your local authority please contact them direct, alternatively if you wish to view the water and the sewer records at our Lingley Mere offices based in Warrington please ring [0370 751 0101](tel:03707510101) to book an appointment.

Due to the public sewer transfer in 2011, not all sewers are currently shown on the statutory sewer records and we do not always show private pipes on our plans. If a sewer is discovered during construction; please contact a Building Control Body to discuss the matter further.

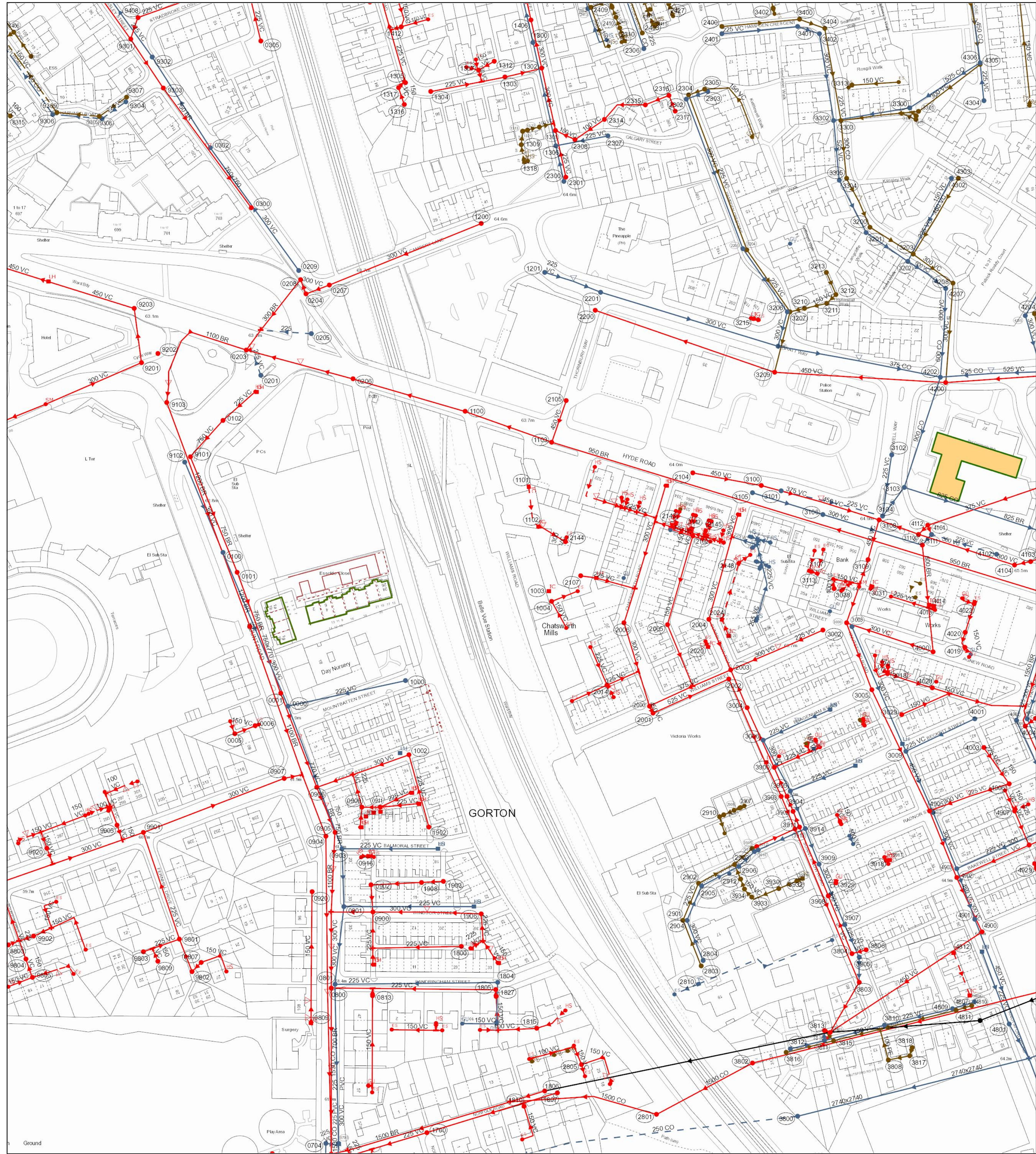
Should this planning application be approved the applicant should contact United Utilities regarding a potential water supply or connection to public sewers. Additional information is available on our website <http://www.unitedutilities.com/builders-developers.aspx>

Yours faithfully

David Talbot
Planning Analyst
Planning, Landscape and Ecology

Appendix 3

Sewer Map



The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Reho	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad	Reho	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
4202	65.46	SW	800	150			VC	64.19501	1 in 272	6315	64.76	SW	62.81	225			VC	12.07327	1 in 149
9820	64.97	SW	62.06	150			VC	9.424267	1 in 139	3309	64.66	SW	63.02	300			VC	37.16181	1 in 149
4101	65.01	SW	0	600			BR	81.54949	1 in 139	1104	64.56	SW	61.54	225			VC	20	1 in 14
9803	65.51	CO	0	225			VC	8.875145	1 in 140	3301	66.16	FO	61.12	300			VC	21.09502	1 in 234
9901	60.68	CO	54.82	300			VC	83.57033	1 in 140	3302	63.1	FO	61.12	300			VC	46.02772	1 in 184
3916	63.51	CO	61.87	150			VC	26.86226	1 in 140	3303	63.1	FO	61.12	300			VC	3.305752	1 in 38
3910	63.51	CO	0	225			VC	23.34743	1 in 140	3304	63.1	FO	61.12	300			VC	32.89377	1 in 38
1302	63.29	CO	53.01	100			BR	6.82079	1 in 140	3305	63.05	CO	59.51	150			VC	6.382656	1 in 12
3207	64.76	FO	60.87	225			VC	34.56939	1 in 22	3306	63.31	SW	61.89	300			VC	22.46688	1 in 12
1314	62.81	CO	53.26	750			VC	9.80248	1 in 173	3307	63.59	SW	61.37	300			VC	23.90271	1 in 131
9101	62.81	CO	53.26	750			BR	69.07967	1 in 173	3308	63.15	CO	57.72	300			VC	19.69772	1 in 60
0807	64.27	CO	62.39	150			VC	2.229134	1 in 140	3309	63.05	CO	59.51	150			VC	2.268068	1 in 140
4803	64.27	CO	62.39	150			VC	2.204432	1 in 140	3310	64.71	FO	62.73	150			VC	53.18392	1 in 354
9802	60.87	CO	59.23	225			VC	19.31321	1 in 74	3311	64.71	FO	62.73	150			VC	20.1553	1 in 224
9307	62.18	CO	60.38	150			VC	18.39922	1 in 74	3312	64.71	FO	62.73	150			VC	74.24958	1 in 354
3801	64.71	CO	0	450			VC	27.09003	1 in 140	3313	64.71	FO	62.73	150			VC	20.1553	1 in 224
3213	63.08	CO	61.45	750			VC	8.340296	1 in 140	3314	64.71	FO	62.73	150			VC	2.268068	1 in 140
3818	64.71	CO	0	450			VC	13.13293	1 in 140	3315	64.71	FO	62.73	150			VC	21.9545	1 in 7
1815	64.71	CO	0	450			VC	4.839955	1 in 140	3316	64.71	FO	62.73	150			VC	27.86078	1 in 11
4811	64.39	FO	62.43	150			VC	21.38121	1 in 60	3317	64.71	FO	62.73	150			VC	2.782616	1 in 11
2316	63.64	CO	62.13	100			VC	38.80812	1 in 60	3318	64.71	FO	62.73	150			VC	12.49528	1 in 11
3804	63.64	CO	62.13	100			VC	14.10599	1 in 72	3319	64.71	FO	62.73	150			VC	82.49227	1 in 27
0205	63.31	SW	60.1	225			VC	34.59863	1 in 72	3320	64.71	FO	62.73	150			VC	27.4737	1 in 27
0809	61.88	FO	60.1	225			VC	28.07134	1 in 113	3321	64.71	FO	62.73	150			VC	10.88553	1 in 13
3400	65.82	FO	61.86	225			VC	18.85154	1 in 113	3322	64.71	FO	62.73	150			VC	2.687553	1 in 13
0102	63.08	FO	61.45	750			VC	14.86967	1 in 99	3323	64.71	FO	62.73	150			VC	3.789158	1 in 150
3800	63.16	SW	60.1	225			VC	29.07725	1 in 3	3324	64.71	FO	62.73	150			VC	16.78489	1 in 480
2904	63.16	SW	60.1	225			VC	304.8047	1 in 3	3325	64.71	FO	62.73	150			VC	24.02682	1 in 480
3815	63.16	SW	60.1	225			VC	20.0573	1 in 3	3326	64.71	FO	62.73	150			VC	30.40339	1 in 74
3802	63.16	SW	60.1	225			VC	7.6932	1 in 3	3327	64.71	FO	62.73	150			VC	90.00169	1 in 167
3808	63.16	SW	60.1	225			VC	60.26858	1 in 3	3328	64.71	FO	62.73	150			VC	27.18883	1 in 167
3812	63.53	SW	62.17	225			VC	23.6955	1 in 75	3329	64.71	FO	62.73	150			VC	44.1271	1 in 167
3810	63.53	SW	62.17	225			VC	19.06747	1 in 75	3330	64.71	FO	62.73	150			VC	53.08702	1 in 138
3100	64.17	CO	60.59	375			VC	34.20526	1 in 489	3331	64.71	FO	62.73	150			VC	25.79992	1 in 221
4303	66.38	CO	60.59	375			VC	24.16077	1 in 56	3332	64.71	FO	62.73	150			VC	23.17461	1 in 138
4905	64.88	CO	59.89	450			VC	39.92493	1 in 181	3333	64.71	FO	62.73	150			VC	13.01564	1 in 13
0801	61.41	SW	59.52	300			VC	88.02273	1 in 121	3334	64.71	FO	62.73	150			VC	33.13608	1 in 221
3203	65.82	CO	59.89	450			VC	27.2024	1 in 453	3335	64.71	FO	62.73	150			VC	58.43874	1 in 195
0801	60.87	CO	59.89	450			VC	62.26767	1 in 92	3336	64.71	FO	62.73	150			VC	25.79992	1 in 221
1006	62.23	CO	59.89	450			VC	30.01666	1 in 158	3337	64.71	FO	62.73	150			VC	13.01564	1 in 13
0207	63.73	CO	62.74	300			VC	13.92838	1 in 144	3338	64.71	FO	62.73	150			VC	28.01785	1 in 380
4200	65.41	CO	59.89	450			VC	94.93588	1 in 144	3339	64.71	FO	62.73	150			VC	102.9407	1 in 195
1800	62.11	CO	61.76	225			VC	49.0102	1 in 59	3340	64.71	FO	62.73	150			VC	29.2039	1 in 195
3004	63.2	CO	61.76	225			VC	22.74752	1 in 59	3341	64.71	FO	62.73	150			VC	12.49491	1 in 67
1305	64.7	CO	61.76	225			VC	65.50266	1 in 59	3342	64.71	FO	62.73	150			VC	11.58415	1 in 13
3803	64.25	CO	59.75	450			VC	31.83904	1 in 42	3343	64.71	FO	62.73	150			VC	58.55476	1 in 145
9102	62.79	SW	60.1	225			VC	54.23999	1 in 142	3344	64.71	FO	62.73	150			VC	75.98512	1 in 145
1805	61.46	CO	59.04	225			VC	91.05459	1 in 134	3345	64.71	FO	62.73	150			VC	51.88449	1 in 145
2315	62.23	CO	59.04	225			VC	26.3124	1 in 10	3346	64.71	FO	62.73	150			VC	1.802523	1 in 114
4205	66.42	SW	63.71	300			VC	32.28033	1 in 25	3347	64.71	FO	62.73	150			VC	7.080733	1 in 114
1802	62.23	CO	61.09	150			VC	41.46494	1 in 66	3348	64.71	FO	62.73	150			VC	8.627048	1 in 114
2805	62.23	CO	61.09	150			VC	6.649991	1 in 66	3349	64.71	FO	62.73	150			VC	35.23006	1 in 114
0906	61.94	CO	58.02	770			VC	13	1 in 1	3350	64.71	FO	62.73	150			VC	8.849864	1 in 114
3813	63.8	CO	60.65	225			VC	3.4272	1 in 1	3351	64.71	FO	62.73	150			VC	8.248798	1 in 114
3000	64.01	CO	60.2	450			VC	39.96008	1 in 485	3352	64.71	FO	62.73	150			VC	54.626	1 in 65
4206	66	CO	60.2	450			VC	55.14326	1 in 485	3353	64.71	FO	62.73	150			VC	46.6621	1 in 65
3912	63.99	SW	0	375			VC	2.177425	1 in 153	3354	64.71	FO	62.73	150			VC	19.68886	1 in 68
4406	63.99	SW	0	375			VC	21.1207	1 in 153	3355	64.71	FO	62.73	150			VC	25.55988	1 in 130
4810	64.26	FO	62.65	150			VC	9.041881	1 in 29	3356	64.71	FO	62.73	150			VC	13.0384	1 in 326
4112	65.17	CO	62.39	375			VC	7.071988	1 in 45	3357	64.71	FO	62.73	150			VC	29.09477	1 in 130
0202	62.63	CO	59.89	450			BR	123.3778	1 in 228	3358	64.83	SW	62.16	300			VC	62.16	1 in 130
9203	63.07	CO	59.89	450			VC	106.9019	1 in 167	3359	64.71	FO	62.73	150			VC	22.63877	1 in 130
3008	63.49	CO	61.01	300			VC	41.2108	1 in 168	3360	64.71	FO	62.73	150			VC	32.64665	1 in 181
3604	63.32	CO	60.72	300			VC	17.46425	1 in 55	3361	64.71	FO	62.73	150			VC	45.54072	1 in 180
4019	63.99	SW	60.1	225			VC	8.507594	1 in 153	3362	64.71	FO	62.73	150			VC	45.54072	1 in 180
3805	63.64	SW	61.12	300			VC	7	1 in 2	3363	64.71	FO	62.73	150			VC	45.54072	1 in 180
1201	64	CO	62.04	225			VC	16.76365	1 in 55	3364	64.71	FO	62.73	150			VC	5.94516	1 in 2

Appendix 4

Coopers Drawings



SUDS Strategy

The Secretary of State for Communities and Local Government delivered a written ministerial statement on the implementation of sustainable drainage systems (SuDS) in parliament on 18 December 2014. The statement made changes to the National Planning Policy Framework (NPPF) which in turn made SuDS a material consideration in the determination of planning applications for major developments. These changes came into effect on 6 April 2015.

Alongside the changes to NPPF the Town and County Planning (Development Management procedure) (England) Order was amended making Lead Local Flood Authorities (LLFA), a statutory consultee in the planning process for major development proposals which have surface water implications, starting from 15 April 2015.

Consequently, developers need to provide SuDS on major developments where appropriate, while paying due regard to the following:

- National Planning Policy Framework
- Written statement on sustainable drainage systems (HCWS161)
- Planning practice guidance
- Non-statutory technical standards for sustainable drainage systems
- District local plan policies (please visit individual district councils)

The prime function of SuDS, as with conventional drainage, is to provide effective surface water drainage, ensuring the greatest degree of flood risk protection over the long term both within and downstream of the development and prevent pollution. However, SuDS approaches can bring wider benefits too. Appropriately designed, constructed and maintained, SuDS are more sustainable than conventional drainage systems and can help to:

- Reduce run-off surface water flow-rates and/or volumes and hence reduce the risk of flooding
- Encourage natural groundwater re-charge
- Reduce pollutant concentrations in storm water
- Provide habitat for wildlife.

There are many site-specific factors which will influence the choice of any single or combination of SuDS devices used within a development. The primary factors are:

- Whether the development is domestic, commercial or industrial
- Whether the underlying ground is contaminated. If so, infiltration systems will most probably not be permitted.
- Whether the underlying ground is permeable enough for infiltration systems to be considered.
- Whether the ground water levels are deep enough for infiltration systems to be considered
- Whether the site is steeply sloping and its general topography
- The availability of space inside the development for each potential SuDS facility.
- Health & Safety aspects should the development be likely to be inhabited or used by children.

To ensure no increased flood risk to offsite land and development, disposal of surface water to the ground is encouraged and runoff volumes will be reduced through the SuDS management train where ground conditions permit. Where ground conditions are unsuitable, a discharge to an open water body / sewer will be necessary with rates restricted to the existing site conditions.

SUDS Methods

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	Not suitable: Architectural proposals for the development involve a pitched roof arrangement which are not suitable for green roofs. No access for safe maintenance of a green roof.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site, and reduces treated water consumption.	Not suitable: Can not be used for multi residential apartment blocks.
Infiltration	Reduces total run off volume from the development	Not Suitable: Trial pit data has identified made ground over clay therefore the site is not suitable for infiltration
Permeable Surfacing (Infiltration)	Reduces total run off volume from the development. Can be used to enhance quality of run-off water.	Not Suitable: Trial pit data has identified made ground over clay therefore the site is not suitable for infiltration
Permeable Surfacing (Tanked)	Can be used to enhance quality of run-off water. Sub-base provides 'source' storage and reduces the volume of storage downstream. The storage can be created with selection of the stone fill or use of plastic box systems. Impermeable membrane at base of construction to prevent impact on pavement stability	Suitable: Tanked permeable paving proposed in parking bays to improve water quality and provide storage for 100yr storm event + 40% Climate Change.
Swales, basins and ponds	Provide areas for above ground surface run off storage. Swales also allow filtering of particulate matter, improving water quality.	Suitable: Shallow rain garden in amenity area taking roof run off to improve water quality before discharging into piped system.
Bio-Retention Areas	Collect and retain run-off to help improve water quality, prior to discharge in piped system or infiltration	Suitable: Shallow rain garden in amenity area taking roof run off to improve water quality before discharging into piped system.
Geocellular storage	Suitable for sites with insufficient space for basins etc. Suitable for sites where topography prevents the use of open basins etc. Can be very effective infiltration devices subject to ground conditions.	Suitable: The site is suitable for geocellular storage crates however the developers preference to use a combination of oversized pipes and tanked permeable surfacing.
Large Pipes, conduits and tanks	Suitable for sites with insufficient space for basins etc. Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. Generally, be suitable for adoption by the statutory water company (e.g. United Utilities).	Suitable: Large diameter on-line pipes and manholes can be located within the highway corridor

Surface Water Flow Rates

Developable Site Area = 3,280sq.m.

Existing Brownfield Run-off Rates

(Based on 2,930sq.m. existing impermeable area)

1yr = 21.77 l/s (26.77 mm/hr rainfall)
30yr = 53.31 l/s (65.50 mm/hr rainfall)
100yr = 68.82 l/s (84.56 mm/hr rainfall)

Proposed impermeable areas = 2,050sq.m.

Agreed discharge rate 5l/s as agreed with UU.

Design based on Layout:

Dwg No.4402/101

Rev: A

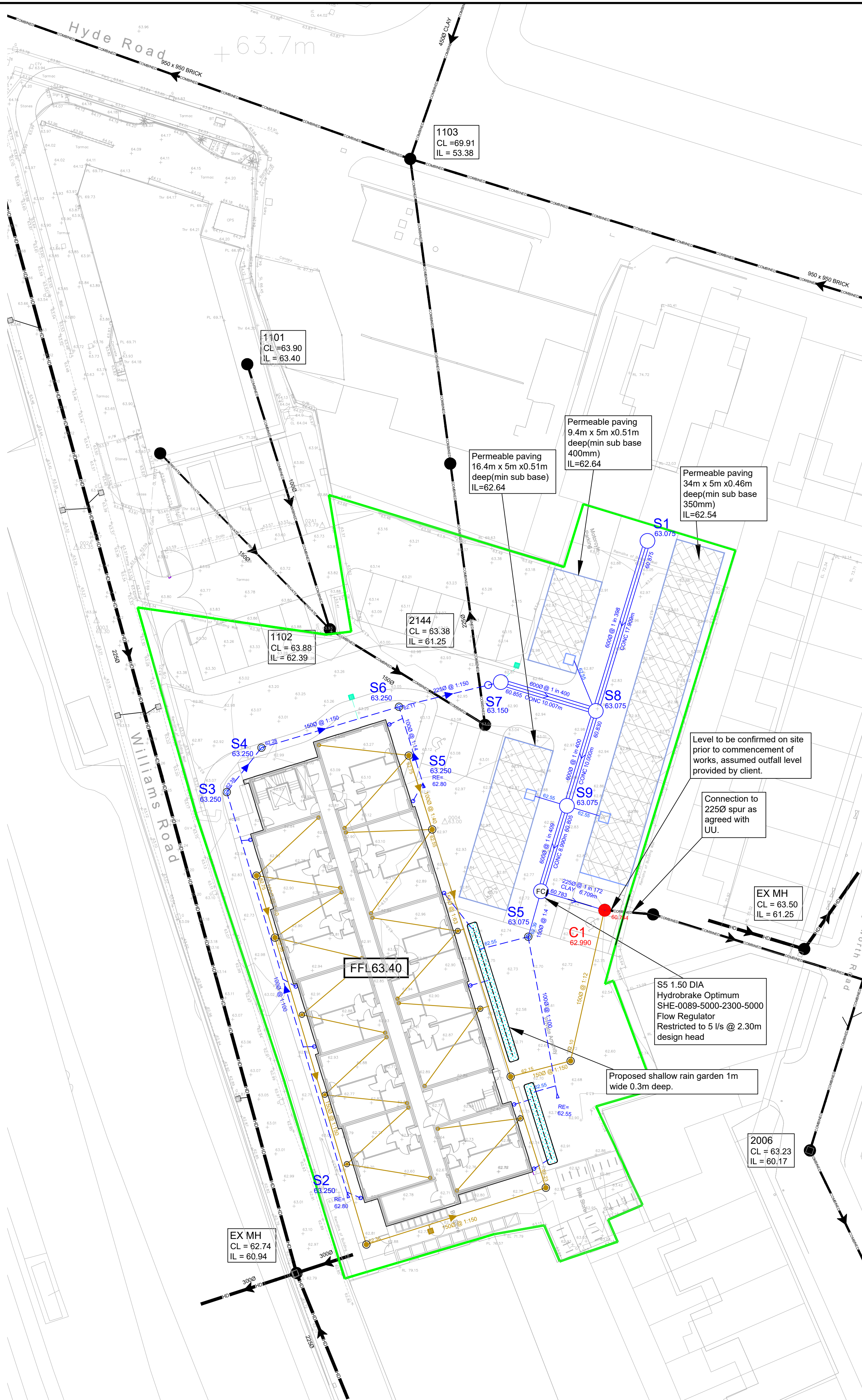
Grid/Level datum based on Topo:

Dwg No. RBS - 18/1178/001

Rev: B

Legend

	Development Boundary
	Existing Combined Sewer
	Existing Highway Drain
	Private Surface Water Sewer
	Private Foul Sewer
	Adoptable Combined Sewer
	Permeable Paving & Distributor Box
	Flow Control Device Manhole
	Catchpit Manhole
	Shallow Rain Garden
	Private Surface Water Drain
	Private Foul Drain
	SVP
	RWP
	Rodding Eye
	Private Road Gully
	Private Foul Gully
	Plot Slab Level

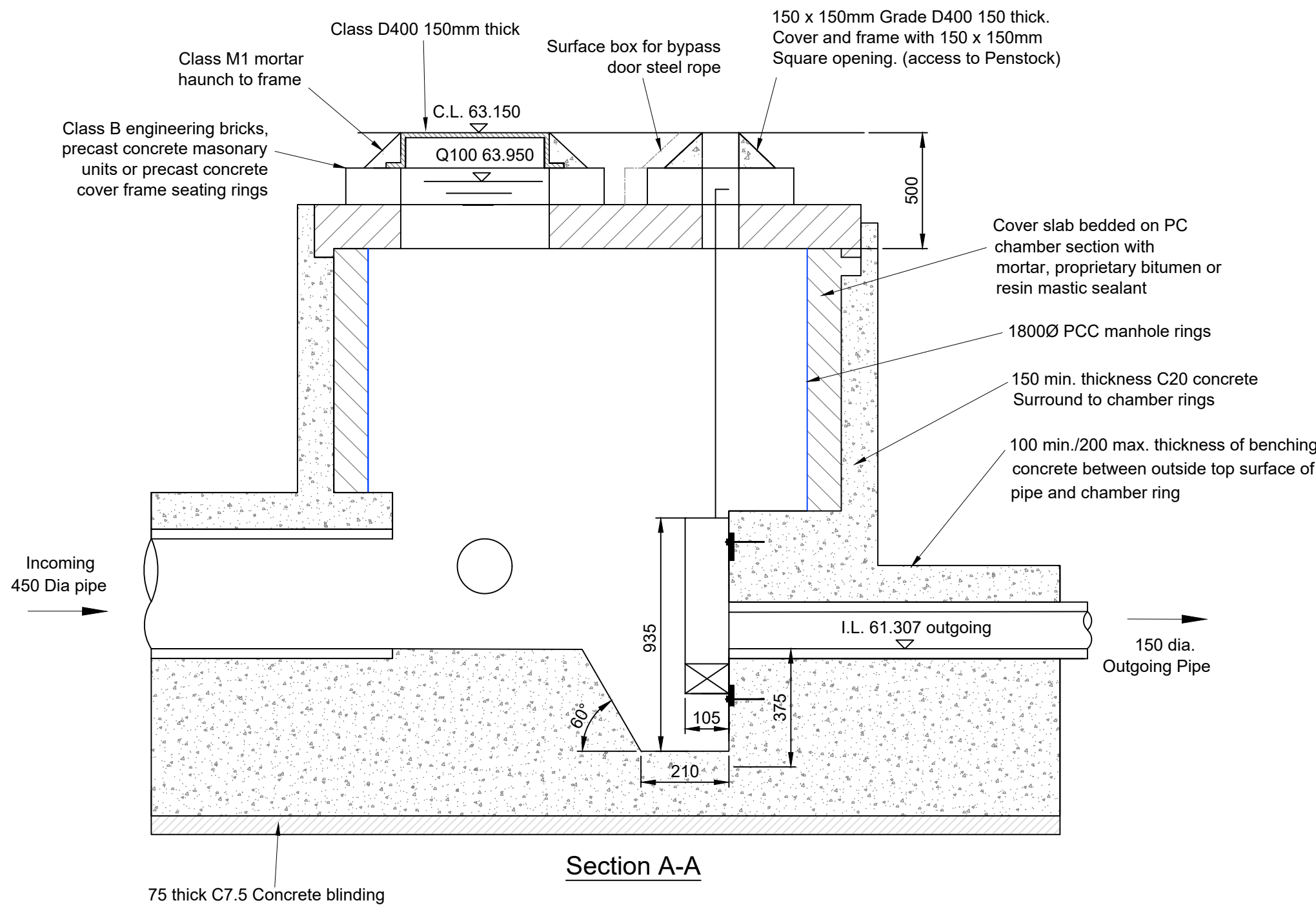
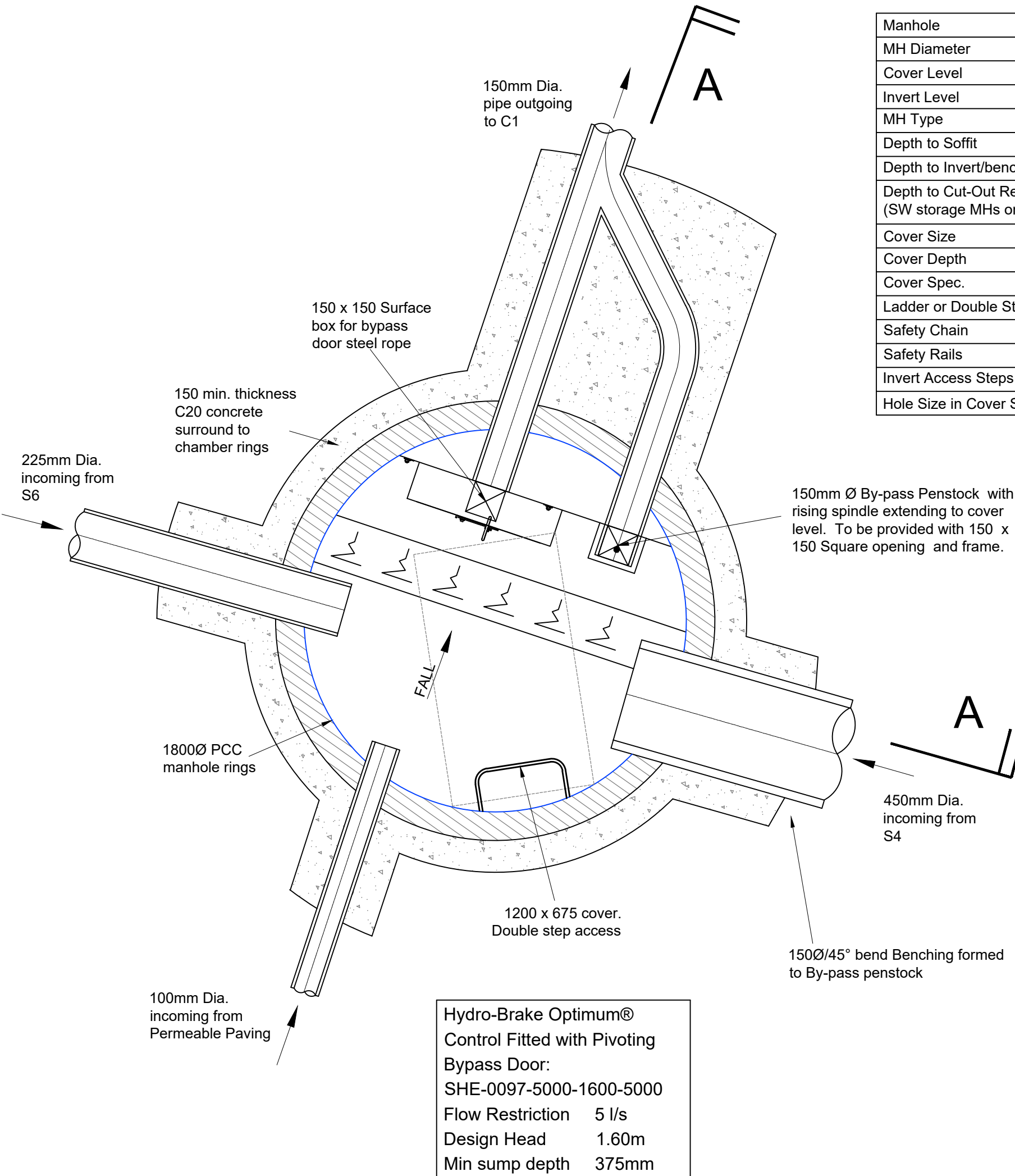


DO NOT SCALE

Manhole S18
Plan

Scale 1:20

Manhole	S7
MH Diameter	1800mm
Cover Level	63.150
Invert Level	61.307
MH Type	Flow Control
Depth to Soffit	1.850
Depth to Invert/benching	2
Depth to Cut-Out Recess (SW storage MHs only)	N/A
Cover Size	1200 x 675mm
Cover Depth	150mm
Cover Spec.	D400
Ladder or Double Steps?	Double Steps
Safety Chain	No
Safety Rails	No
Invert Access Steps	No
Hole Size in Cover Slab	1200 x 675mm



TYPICAL SECTION
Scale 1:20

Notes

- Setting out shall be undertaken using only the information given. Distances should not be scaled from this drawing.
- The minimum gravity pipe diameter under adoptable highways shall be 150mm
- It is the responsibility of the Contractor to verify all information given with regards to existing services and drainage connections etc. prior to commencing the works. The rates shall include for hand dig around services where necessary. The Contractor shall adhere to the CDM Regulations at all times
- Existing flows in watercourses, sewers and land drains shall be maintained at all times
- Only trained personnel shall be permitted to enter confined spaces
- All materials to bear the relevant B.S. Kitemark and comply fully with the specifications. All concrete & concrete products must use Sulphate resistant cement to withstand Class 3 condition (unless the site investigation report proves that sulphate attack from soils and groundwater will not occur).
- All opening notices etc. as required under Highways Acts etc. are to be obtained prior to commencement of works. All works are to be inspected by L.A., NHBC or the Network Operator as applicable.
- Trench backfill in highways to within 1m of highway shall, as directed by the Highway Authority be a suitable granular material all in accordance with Sewers for Adoption.
- Slab levels shall not be varied without reference to the Engineer for guidance.
- Pipes have not been designed to accommodate construction traffic loading. The contractor is responsible for providing adequate protection to the pipes during construction.
- All SVP and RWP connections are indicative and shall be confirmed by architect.
- Pipe gradients out of the building to connecting manhole to be laid at 1:40 in accordance with Building Regulations, Part H, Table 6.
- Where pipe sizes are not indicated 100Ø to be used for surface and foul unless stated otherwise.
- Minimum surface water gradients shall be:
100Ø laid at 1:100
150Ø laid at 1:150
- Minimum 100Ø foul drainage gradient to be 1:80 with the exception of the first connection which shall be maximum 1:40.
- Manhole covers to be marked FWS or SW as appropriate.
- All manhole covers and frames shall comply with BS EN124. Covers in roads to be grade D400 and be 150mm deep. Manhole covers in car parking areas and drives to be grade B125 and covers in landscaping areas to be grade A15. All to be sized in accordance with Building Regulations Part H, Tables 11 & 12.
- Precast concrete rings to be reinforced.
- Backdrops in private manholes / inspection chambers to be internal
- Private drains laid under adopted / private roads to be Class S granular bed and surround with a minimum of 1.2m cover, where this cannot be achieved a Class Z concrete bed and surround shall be provided.
- Private drains located under landscape areas or driveways / car parking bays to be Class F granular bed and surround with a minimum 0.6m cover, where this cannot be achieved a Class Z concrete bed and surround shall be provided.

TENDER

Rev	Date	Revision	By	Appd.
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coopers
chartered consulting engineers

Tel: 01244 684910
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Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Client
MANGROVE ESTATES LTD

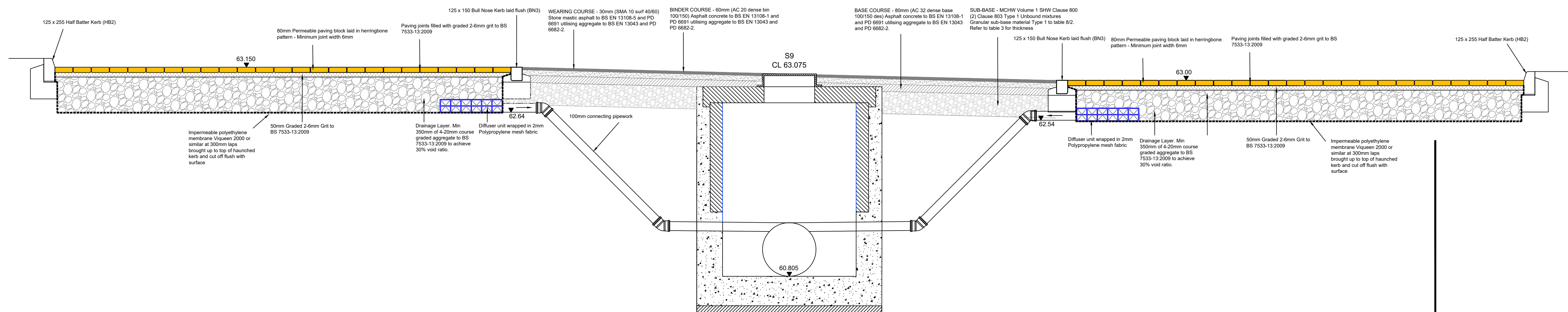
Project
**CHATSWORTH MILL,
WILLIAMS ROAD, GORTON**

Title
Flow Control Detail

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	DATE	11.01.22	REVISION
	DRAWN	LW	-
	CHECKED	AJ	

7588 / 11

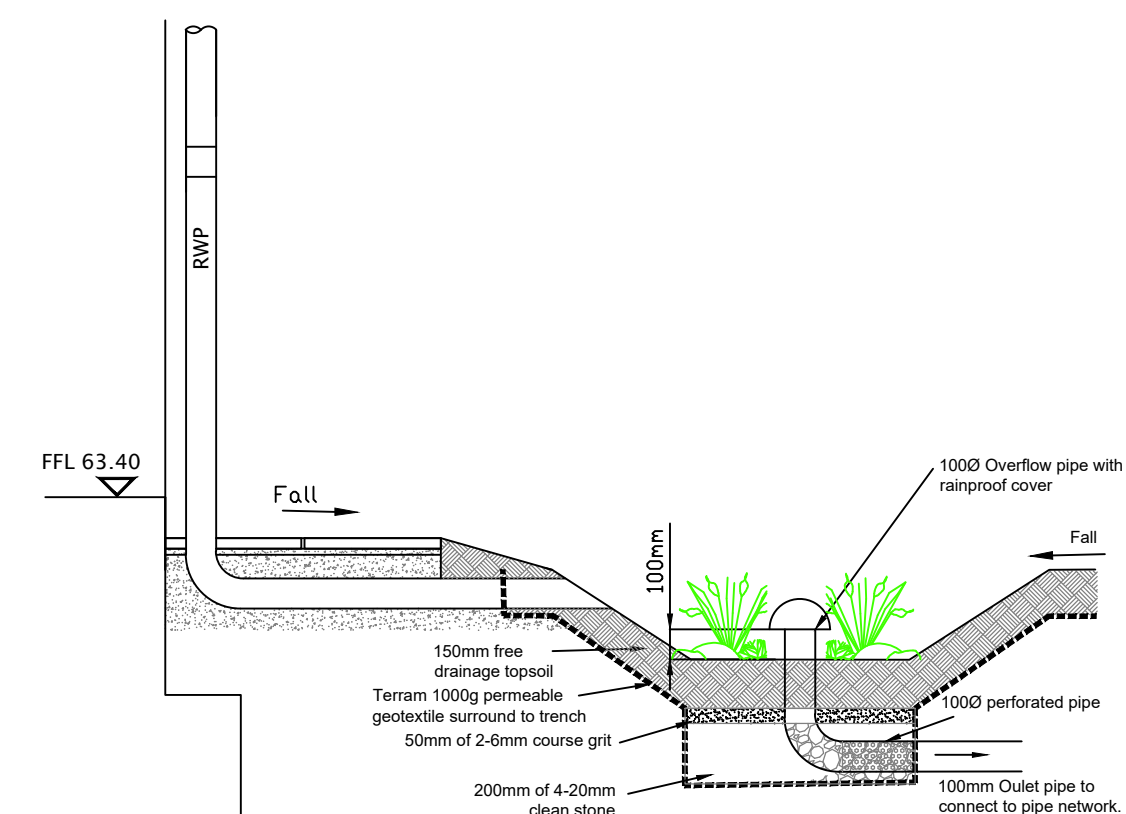
DO NOT SCALE



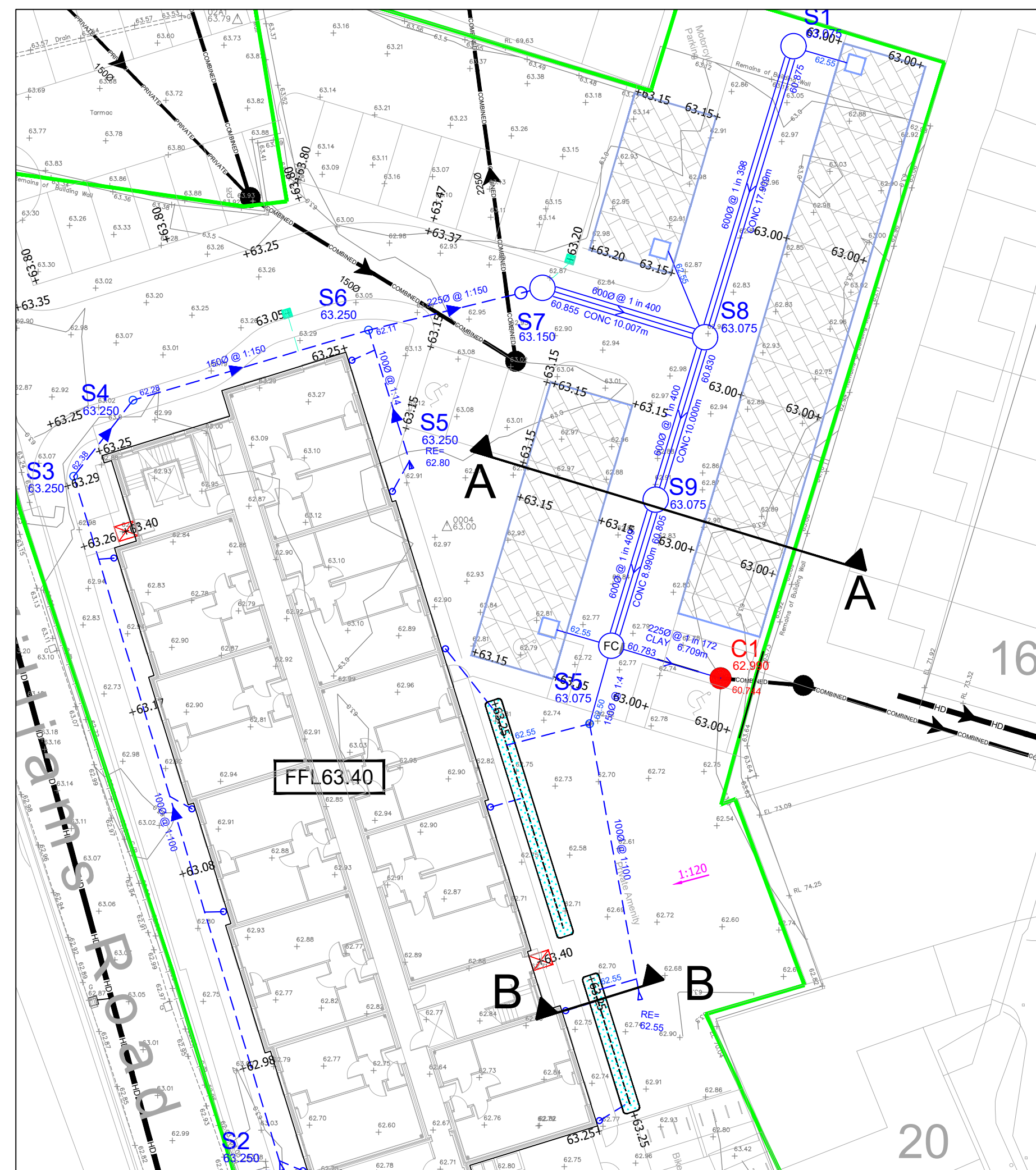
Section Through Attenuated
Permeable Paving
A - A

Private drains laid under adopted / private roads to be Class S granular bed and surround with a minimum of 1.2m cover, where this cannot be achieved a Class Z concrete bed and surround shall be provided.

Private drains located under landscape areas to be Class F granular bed and surround with a minimum 0.6m cover, where this cannot be achieved a Class Z concrete bed and surround shall be provided.



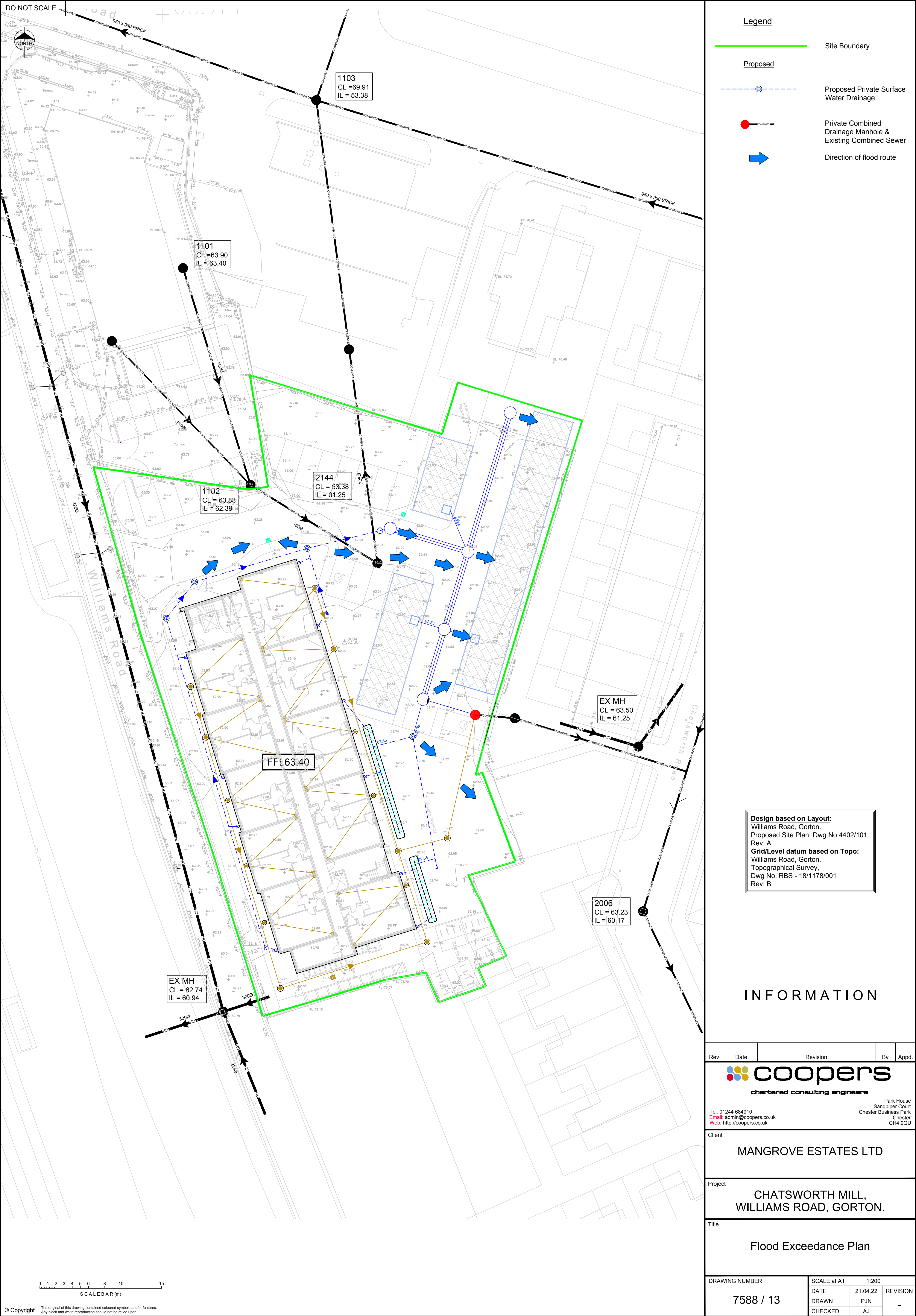
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Rain Garden Detail
B - B



Layout Plan
Scale 1:250

TENDER

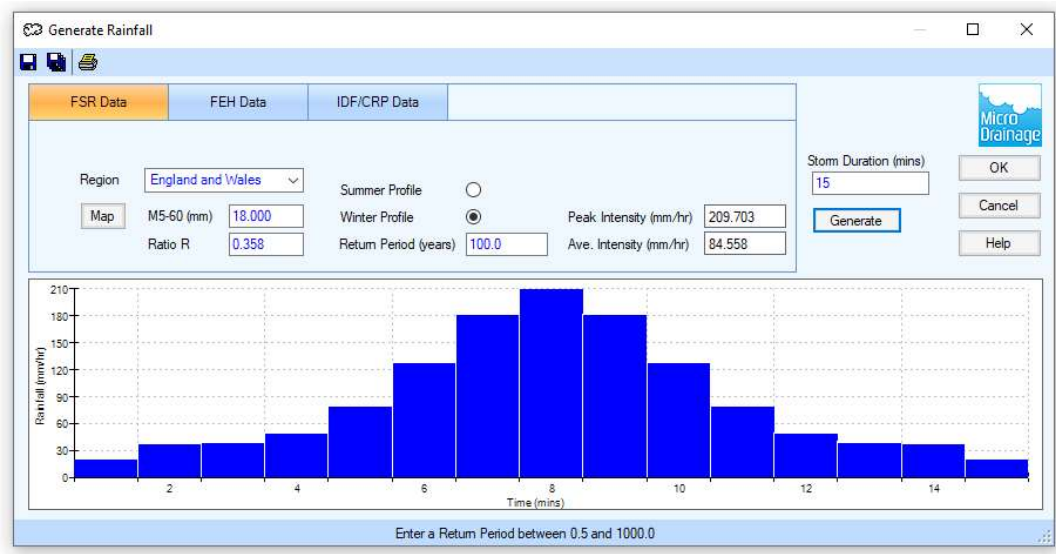
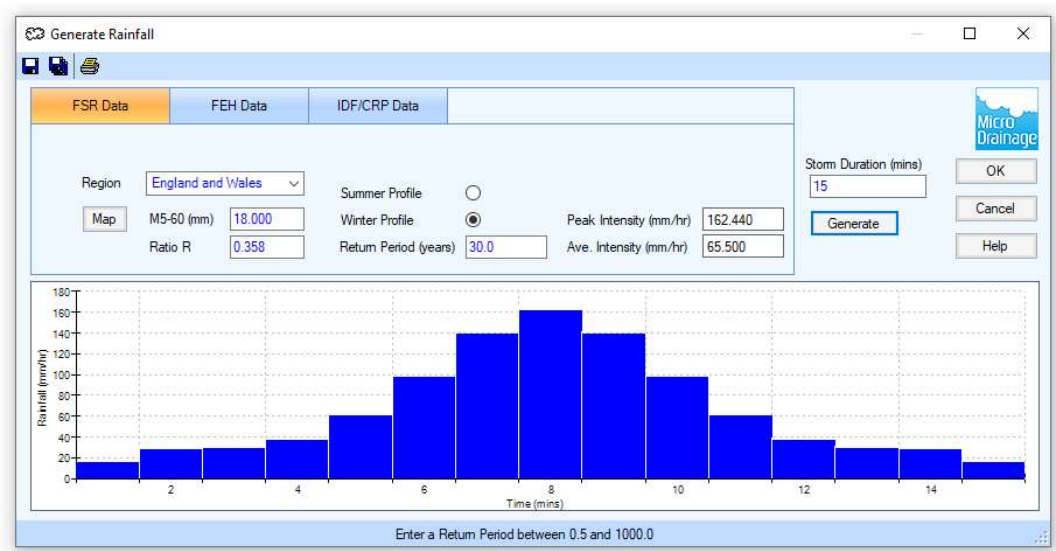
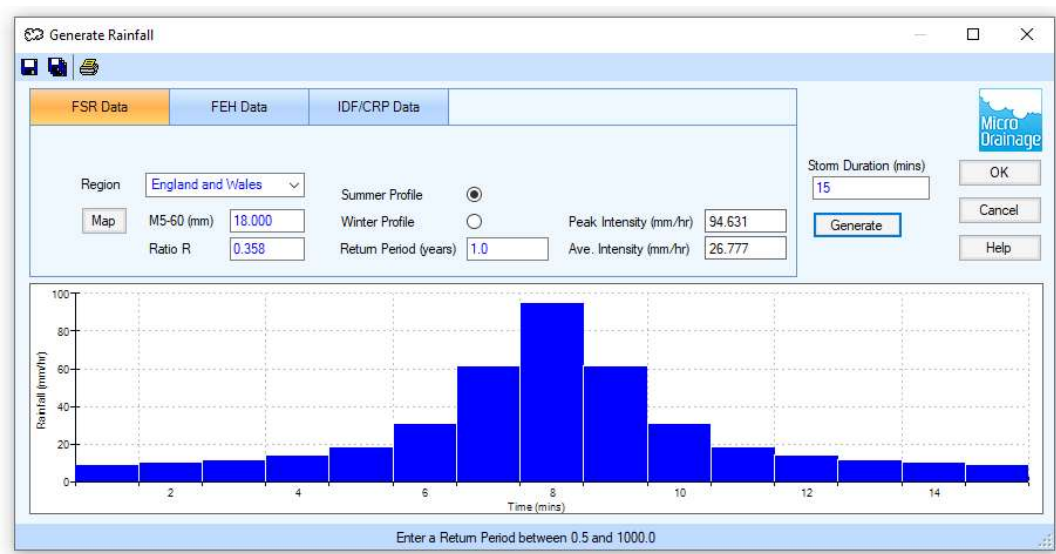
Rev.	Date	Revision	By	Appd
 coopers chartered consulting engineers				
Tel: 01244 684910 Fax: 01244 684911 Email: admin@coopers.co.uk Web: http://coopers.co.uk		Park House Sandpiper Court Chester Business Park Chester CH4 9QU		
Client MANGROVES ESTATES LTD				
Project CHATSWORTH MILL, WILLIAMS ROAD, GORTON.				
Title SUDS Details				
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7588 / 12		NTS		REVISION
		DATE	20.04.22	
		DRAWN	LW	
		CHECKED	AJ	-



Appendix 5

Calculations

Rainfall Intensity Data



Coopers		Page 0
Park House Sandpiper Court Chester CH4 9QU		
Date 01/01/0001	Designed by lworthington	
File 7588 SW04.MDX	Checked by	
Micro Drainage	Network 2019.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 7588 SW01.SWS

Pipe Sizes 7588 SW01 Manhole Sizes 7588 SW01

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.314	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for 7588 SW01.SWS

- Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	17.909	0.045	398.0	0.049	5.00	0.0	0.600	o	600	Pipe/Conduit	
2.000	42.206	0.420	100.5	0.038	5.00	0.0	0.600	o	100	Pipe/Conduit	
2.001	5.678	0.055	103.2	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
2.002	14.472	0.096	150.0	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	8.073	0.571	14.1	0.011	5.00	0.0	0.600	o	100	Pipe/Conduit	
2.003	10.548	0.070	150.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.004	10.007	0.025	400.3	0.031	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.001	10.000	0.025	400.0	0.007	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.002	8.990	0.022	408.6	0.011	0.00	0.0	0.600	o	600	Pipe/Conduit	
4.000	22.305#	0.223	100.0	0.013	5.00	0.0	0.600	o	100	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)
1.000	50.00	5.25	60.875	0.049	0.0	0.0	0.0	1.21	343.4	6.6
2.000	50.00	5.92	62.800	0.038	0.0	0.0	0.0	0.77	6.0	5.1
2.001	50.00	6.04	62.380	0.038	0.0	0.0	0.0	0.76	5.9	5.1
2.002	50.00	6.34	62.275	0.053	0.0	0.0	0.0	0.82	14.5	7.2
3.000	50.00	5.07	62.800	0.011	0.0	0.0	0.0	2.07	16.2	1.5
2.003	50.00	6.50	62.104	0.064	0.0	0.0	0.0	1.06	42.3	8.7
2.004	49.67	6.64	60.855	0.095	0.0	0.0	0.0	1.21	342.4	12.8
1.001	49.23	6.78	60.830	0.151	0.0	0.0	0.0	1.21	342.5	20.1
1.002	48.83	6.90	60.805	0.162	0.0	0.0	0.0	1.20	338.8	21.4
4.000	50.00	5.48	62.800	0.013	0.0	0.0	0.0	0.77	6.0	1.8

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Park House Sandpiper Court Chester CH4 9QU		
Date 01/01/0001 File 7588 SW04.MDX	Designed by lworthington Checked by	
Micro Drainage Network 2019.1		

Network 2019.1

Network Design Table for 7588 SW01.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	Auto Design
4.001	4.771	1.294	3.7	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	6.709	0.039	172.0	0.000	0.00	0.0	0.600	o	600	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)
4.001	50.00	5.50	62.527	0.029	0.0	0.0	0.0	5.29	93.4	3.9
1.003	48.65	6.96	60.783	0.191	0.0	0.0	0.0	1.85	524.1	25.2

Manhole Schedules for 7588 SW01.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	63.075	2.200	Open Manhole	1500	1.000	60.875	600				
2	63.250	0.450	Junction		2.000	62.800	100				
3	63.250	0.870	Open Manhole	450	2.001	62.380	100	2.000	62.380	100	
4	63.250	0.975	Open Manhole	450	2.002	62.275	150	2.001	62.325	100	
5	63.250	0.450	Junction		3.000	62.800	100				
6	63.120	1.016	Open Manhole	450	2.003	62.104	225	2.002	62.179	150	
								3.000	62.229	100	
7	63.150	2.295	Open Manhole	1500	2.004	60.855	600	2.003	62.034	225	804
8	63.075	2.245	Open Manhole	1500	1.001	60.830	600	1.000	60.830	600	
								2.004	60.830	600	
9	63.075	2.270	Open Manhole	1500	1.002	60.805	600	1.001	60.805	600	
10	63.250	0.450	Junction		4.000	62.800	100				
12	63.250	0.723	Open Manhole	450	4.001	62.527	150	4.000	62.577	100	
13	63.075	2.292	Open Manhole	1500	1.003	60.783	600	1.002	60.783	600	
								4.001	61.233	150	
14	62.990	2.246	Open Manhole	0		OUTFALL		1.003	60.744	600	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	388217.596	396136.411	388217.596	396136.411	Required	
2	388187.346	396070.663			No Entry	
3	388175.207	396111.085	388175.207	396111.085	Required	
4	388178.697	396115.564	388178.697	396115.564	Required	
5	388194.973	396111.991			No Entry	
6	388192.566	396119.697	388192.566	396119.697	Required	
7	388202.817	396122.181	388202.817	396122.181	Required	
8	388212.392	396119.274	388212.392	396119.274	Required	
9	388209.481	396109.707	388209.481	396109.707	Required	

Manhole Schedules for 7588 SW01.SWS

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
10	388207.951	396074.120			No Entry	
12	388205.586	396096.510	388205.586	396096.510	Required	
13	388206.869	396101.105	388206.869	396101.105	Required	
14	388213.297	396099.184			No Entry	

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Park House Sandpiper Court Chester CH4 9QU		
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PIPELINE SCHEDULES for 7588 SW01.SWS

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	600	1	63.075	60.875	1.600	Open Manhole	1500
2.000	o	100	2	63.250	62.800	0.350	Junction	
2.001	o	100	3	63.250	62.380	0.770	Open Manhole	450
2.002	o	150	4	63.250	62.275	0.825	Open Manhole	450
3.000	o	100	5	63.250	62.800	0.350	Junction	
2.003	o	225	6	63.120	62.104	0.791	Open Manhole	450
2.004	o	600	7	63.150	60.855	1.695	Open Manhole	1500
1.001	o	600	8	63.075	60.830	1.645	Open Manhole	1500
1.002	o	600	9	63.075	60.805	1.670	Open Manhole	1500
4.000	o	100	10	63.250	62.800	0.350	Junction	
4.001	o	150	12	63.250	62.527	0.573	Open Manhole	450
1.003	o	600	13	63.075	60.783	1.692	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	17.909	398.0	8	63.075	60.830	1.645	Open Manhole	1500
2.000	42.206	100.5	3	63.250	62.380	0.770	Open Manhole	450
2.001	5.678	103.2	4	63.250	62.325	0.825	Open Manhole	450
2.002	14.472	150.0	6	63.120	62.179	0.791	Open Manhole	450
3.000	8.073	14.1	6	63.120	62.229	0.791	Open Manhole	450
2.003	10.548	150.7	7	63.150	62.034	0.891	Open Manhole	1500
2.004	10.007	400.3	8	63.075	60.830	1.645	Open Manhole	1500
1.001	10.000	400.0	9	63.075	60.805	1.670	Open Manhole	1500
1.002	8.990	408.6	13	63.075	60.783	1.692	Open Manhole	1500
4.000	22.305#	100.0	12	63.250	62.577	0.573	Open Manhole	450
4.001	4.771	3.7	13	63.075	61.233	1.692	Open Manhole	1500
1.003	6.709	172.0	14	62.990	60.744	1.646	Open Manhole	0

Free Flowing Outfall Details for 7588 SW01.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003	14	62.990	60.744	0.000	0	0

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Simulation Criteria for 7588 SW01.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0			
Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0			

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.314		

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Online Controls for 7588 SW01.SWS

Hydro-Brake® Optimum Manhole: 13, DS/PN: 1.003, Volume (m³): 6.2

Unit Reference	MD-SHE-0089-5000-2300-5000
Design Head (m)	2.300
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	89
Invert Level (m)	60.783
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	5.0	Kick-Flo®	0.790	3.1
Flush-Flo™	0.384	3.8	Mean Flow over Head Range	-	3.8

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)	Depth (m)	Flow (l/s)
0.100	2.7	0.800	3.1	2.000	4.7	4.000	6.5	7.000	8.4
0.200	3.6	1.000	3.4	2.200	4.9	4.500	6.8	7.500	8.7
0.300	3.8	1.200	3.7	2.400	5.1	5.000	7.2	8.000	9.0
0.400	3.8	1.400	4.0	2.600	5.3	5.500	7.5	8.500	9.3
0.500	3.8	1.600	4.2	3.000	5.7	6.000	7.8	9.000	9.5
0.600	3.7	1.800	4.5	3.500	6.1	6.500	8.1	9.500	9.8

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Storage Structures for 7588 SW01.SWS

Porous Car Park Manhole: 1, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	17.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	47.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	62.540	Membrane Depth (mm)	0

Porous Car Park Manhole: 8, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.7
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	13.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	62.640	Membrane Depth (mm)	0

Porous Car Park Manhole: 13, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.2
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	22.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	62.640	Membrane Depth (mm)	0

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	1	3.888	5.064	27.285	36.236
2.000	2	0.000	0.331	0.000	0.331
2.001	3	0.138	0.045	0.000	0.183
2.002	4	0.155	0.256	0.000	0.411
3.000	5	0.000	0.063	0.000	0.063
2.003	6	0.162	0.419	0.000	0.581
2.004	7	4.056	2.829	0.000	6.885
1.001	8	3.967	2.827	6.134	12.928
1.002	9	4.011	2.542	0.000	6.553
4.000	10	0.000	0.175	0.000	0.175
4.001	12	0.115	0.084	0.000	0.199
1.003	13	4.050	1.897	10.701	16.648
Total		20.542	16.533	44.120	81.195

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 7588 SW01.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.356 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine Inertia Status ON
 DTS Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH		Return Period	Climate Change	First (X)		First (Y)		First (Z)		Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
	Name	Storm			Surcharge	Flood	Overflow	Overflow	Overflow	Act.		(m)	(m)	(m³)
1.000	1	60 Winter	1	+0%	30/15	Summer						61.171	-0.304	0.000
2.000	2	15 Winter	1	+0%								62.865	-0.035	0.000
2.001	3	15 Winter	1	+0%	30/15	Summer						62.450	-0.030	0.000
2.002	4	15 Winter	1	+0%	30/60	Winter						62.344	-0.081	0.000
3.000	5	15 Winter	1	+0%								62.819	-0.081	0.000
2.003	6	15 Winter	1	+0%	30/30	Winter						62.171	-0.157	0.000
2.004	7	60 Winter	1	+0%	30/15	Summer						61.171	-0.284	0.000
1.001	8	60 Winter	1	+0%	30/15	Summer						61.171	-0.259	0.000
1.002	9	60 Winter	1	+0%	30/15	Summer						61.170	-0.235	0.000
4.000	10	15 Winter	1	+0%								62.835	-0.065	0.000
4.001	12	15 Winter	1	+0%	100/15	Winter						62.547	-0.130	0.000
1.003	13	60 Winter	1	+0%	30/15	Summer						61.170	-0.213	0.000

PN	US/MH		Pipe Flow / Overflow		Pipe Flow		Level	
	Name	Cap.	(l/s)	(l/s)	Status	Exceeded		
1.000	1	0.01		2.5	OK			
2.000	2	0.72		4.3	OK*			
2.001	3	0.82		4.3	OK			
2.002	4	0.43		5.7	OK			
3.000	5	0.08		1.3	OK*			
2.003	6	0.20		6.9	OK			
2.004	7	0.03		5.5	OK			
1.001	8	0.02		4.5	OK			
1.002	9	0.02		3.5	OK			
4.000	10	0.26		1.6	OK*			
4.001	12	0.04		3.2	OK			
1.003	13	0.01		3.8	OK			

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 7588 SW01.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.356 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine Inertia Status ON
 DTS Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
	Name	Storm							(m)	(m)	(m³)
1.000	1	180 Winter	30	+0%	30/15 Summer				62.603	1.128	0.000
2.000	2	30 Winter	30	+0%					62.900	0.000	0.000
2.001	3	120 Winter	30	+0%	30/15 Summer				62.616	0.136	0.000
2.002	4	180 Winter	30	+0%	30/60 Winter				62.614	0.189	0.000
3.000	5	15 Winter	30	+0%					62.830	-0.070	0.000
2.003	6	180 Winter	30	+0%	30/30 Winter				62.637	0.308	0.000
2.004	7	180 Winter	30	+0%	30/15 Summer				62.639	1.184	0.000
1.001	8	180 Winter	30	+0%	30/15 Summer				62.636	1.206	0.000
1.002	9	180 Winter	30	+0%	30/15 Summer				62.647	1.242	0.000
4.000	10	15 Winter	30	+0%					62.858	-0.042	0.000
4.001	12	120 Winter	30	+0%	100/15 Winter				62.603	-0.074	0.000
1.003	13	180 Winter	30	+0%	30/15 Summer				62.647	1.264	0.000

				Pipe		
	US/MH	Flow /	Overflow	Flow		Level
PN	Name	Cap.	(l/s)	(l/s)	Status	Exceeded
1.000	1	0.05		11.8	SURCHARGED	
2.000	2	1.15		6.9	SURCHARGED*	
2.001	3	0.71		3.7	SURCHARGED	
2.002	4	0.30		4.0	SURCHARGED	
3.000	5	0.20		3.2	OK*	
2.003	6	0.13		4.8	SURCHARGED	
2.004	7	0.04		6.6	SURCHARGED	
1.001	8	0.07		13.4	SURCHARGED	
1.002	9	0.06		9.9	SURCHARGED	
4.000	10	0.63		3.8	OK*	
4.001	12	0.04		2.9	OK	
1.003	13	0.02		4.4	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 7588 SW01.SWS

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.356 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine Inertia Status ON
 DTS Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
	Name	Storm							(m)	(m)	(m ³)
1.000	1	120 Winter	100	+40%	30/15 Summer				62.985	1.510	0.000
2.000	2	30 Winter	100	+40%					62.900	0.000	0.000
2.001	3	120 Winter	100	+40%	30/15 Summer				63.001	0.521	0.000
2.002	4	120 Winter	100	+40%	30/60 Winter				62.993	0.568	0.000
3.000	5	60 Winter	100	+40%					62.900	0.000	0.000
2.003	6	120 Winter	100	+40%	30/30 Winter				62.987	0.659	0.000
2.004	7	120 Winter	100	+40%	30/15 Summer				62.985	1.530	0.000
1.001	8	120 Winter	100	+40%	30/15 Summer				62.984	1.554	0.000
1.002	9	120 Winter	100	+40%	30/15 Summer				62.984	1.579	0.000
4.000	10	15 Winter	100	+40%					62.900	0.000	0.000
4.001	12	120 Winter	100	+40%	100/15 Winter				62.985	0.308	0.000
1.003	13	120 Winter	100	+40%	30/15 Summer				62.983	1.600	0.000

PN	US/MH		Flow / Cap.	Pipe Flow (l/s)	Overflow (l/s)	Status	Level Exceeded
	Name						
1.000	1		0.02		4.2	FLOOD RISK	
2.000	2		1.49		8.9	SURCHARGED*	
2.001	3		1.04		5.5	FLOOD RISK	
2.002	4		0.58		7.7	FLOOD RISK	
3.000	5		0.19		3.2	SURCHARGED*	
2.003	6		0.27		9.5	FLOOD RISK	
2.004	7		0.08		14.6	FLOOD RISK	
1.001	8		0.04		7.1	FLOOD RISK	
1.002	9		0.04		7.4	FLOOD RISK	
4.000	10		1.06		6.4	SURCHARGED*	
4.001	12		0.07		5.1	FLOOD RISK	
1.003	13		0.02		4.9	FLOOD RISK	