



SUSTAINABLE DRAINAGE STRATEGY REPORT

Martin Harris Music Block, Bridgeford Street, Manchester

**Report prepared on behalf of University of
Manchester**

23/03/2023

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SUDS STRATEGY

Revision List

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P01	Initial Issue For Planning	17.03.2023
P02	Removed Flood Emergency Plan	24.03.2023

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1.0 Introduction

1.1 General

- 1.1.1** This report relates to a planning application for the development of a brownfield site off Bridgeford Street, Manchester for the proposed development of a new music teaching block.
- 1.1.2** This report should be read in conjunction with all other planning documentation submitted under reference number 135026/FO/2022, including, but not limited to; previously submitted flood risk assessment information and geotechnical reporting.
- 1.1.3** This report is prepared solely for the benefit of The University of Manchester. This report may not be assigned without prior written permission from Clancy Consulting Ltd.

2.0 Existing Drainage

- 2.1 For information regarding the existing drainage around the proposed development, please refer to section 6.0 of the Flood Risk Assessment report submitted by Clancy Consulting as part of application 135026/FO/2022.
- 2.2 The following calculations have been undertaken based on a proposed site areas analysis. A copy of the proposed site areas can be found in Appendix A (Clancy Consulting Drawing 4000 T1) and are based on a total area of 802m². Table 1 summarises this information.

	Impermeable area (m ²)	Impermeable area (%)
Existing Site	798	99.5%
Proposed Development	735	91.6%

Table 1 - Proposed Site Areas

- 2.3 The proposed development site is situated in the Irwell management catchment. Using the Environment Agency peak rainfall intensity mapping tool to establish suitable climate change allowances for the development, a +45% upper end allowance is identified for a development with a lifespan to the 2070's epoch (1% AEP) and +40% rainfall intensity for the (3.3% AEP event). Refer to Appendix B for a copy of the environment agency peak rainfall intensity data.
- 2.4 In accordance with the Wallingford procedure a review of the existing unattenuated discharge from the existing site has been undertaken. Table 2 summarises discharge rates from the existing site based on a 15 minute storm event. The calculations are presented in Appendix C.

Rainfall Event	Brownfield Run-off Rate (l/s)
100% AEP event	8.6
33.3% AEP event	21.1
1% AEP event	28.5

Table 2 - Existing development brownfield discharge rates

- 2.5 Utilities surveys have been undertaken at the proposed development site and can be found in Appendix E. It is understood that the current system is a combined drainage system discharging north to Bridgeford Street.

3.0 Local Policy and Guidance

3.1 Level 2 Strategic Flood Risk Assessment (Dated 2011)

3.1.1 Section 9.3.1 of the Strategic Flood Risk Assessment (SFRA) states the following:

For all sites, development proposals should look at opportunities to incorporate SUDS to reduce the risk of surface water flooding (Sustainability Appraisal indicator). Surface water run-off from these sites should not increase as a result of development (reduced run-off should be sought if possible in some areas)

Implications for the design are as follows; the drainage hierarchy should be followed, where possible a reduced discharge rate from the site should be incorporated. Discharge to combined sewers should not be used unless necessary.

3.2 Local Flood Risk Management Strategy (LFRMS - Not dated, accessed March 2023)

3.2.1 LFRM policy 6 states the following:

...developers should aim to minimise surface water runoff from developments, and achieve at least the following runoff rates:

- *Greenfield runoff on Greenfield sites up to a 1 in 100 year storm event, including consideration of climate change*
- *A 50% runoff rate reduction for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1 in 100 year storm event, including consideration of climate change...*

The proposed site is brownfield. Therefore, the proposed drainage strategy should seek to provide at minimum a 50% runoff rate reduction from the existing development.

4.0 Proposed Development

4.1 Description

- 4.1.1** The proposed development comprises a single new two storey modular construction music teaching block with approximately 120m² footprint. The Proposed development is serviced by an access road off Bridgeford Street. Please refer to documentation submitted as part of application 135026/FO/2022 for proposed general arrangement plans.

5.0 Drainage Proposals

5.1 Drainage Hierarchy/Pillars of SUDS

- 5.1.1** The following section of this report will discuss drainage best practices and the application to the proposed development. The contents of this section are derived from national planning policy and best practice guidance, namely CIRIA C753 (The SUDS Manual).

5.2 Drainage Hierarchy

- 5.2.1** The drainage hierarchy is outlined in the National Planning Policy Framework (NPPF – paragraph 080), This outlines the following surface water disposal hierarchy:

1. Into the ground (infiltration)
2. To surface water body
3. To surface water sewer
4. To a combined sewer

Infiltration

As part of geotechnical investigation work undertaken at the site (document reference 10/2084/002), preliminary falling head tests were undertaken in 2no. trial pits to inform the proposed drainage strategy. The rates obtained were as follows:

Trial Pit	Calculated Permeability
WS3	4.19 x10 ⁻⁶ m/s
WS4	7.86 x10 ⁻⁶ m/s

Table 3 - Calculated Permeability Rates

The obtained rates suggest that whilst infiltration is feasible (generally rates greater than 5x10⁻⁶ m/s are considered suitable for potential infiltration features). However, as demonstrated in Figure 1 there is very limited physical space to construct infiltration features. The area shown in Figure 1 indicates 5m away from the building facades. The actual foundations will likely extend beyond the building façade further reducing the area available. Therefore, in accordance with paragraph 3.25 of the Approved Document H, infiltration features will not be practical for the proposed development site.

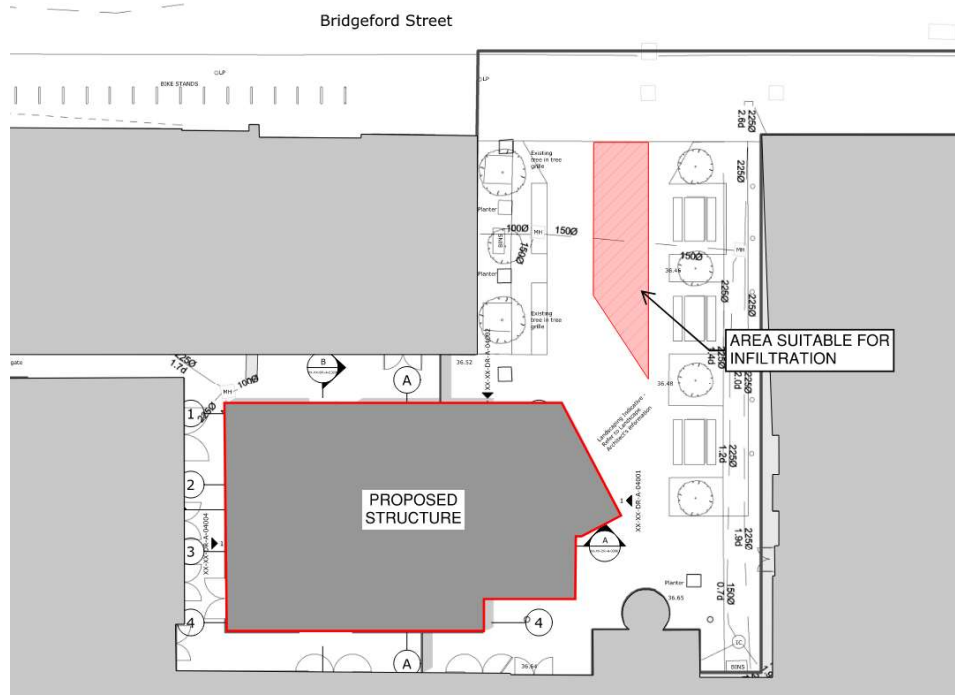


Figure 1 - Area of site suitable for infiltration features

Discharge to surface water body

Figure 2, presented below, shows the proposed development in the local context. There are no known surface water bodies in close proximity to the development site. Therefore no attempt to approach third-party land owners to secure access for drainage has been submitted. Discharge to a surface water body has therefore not been considered appropriate for the development. .

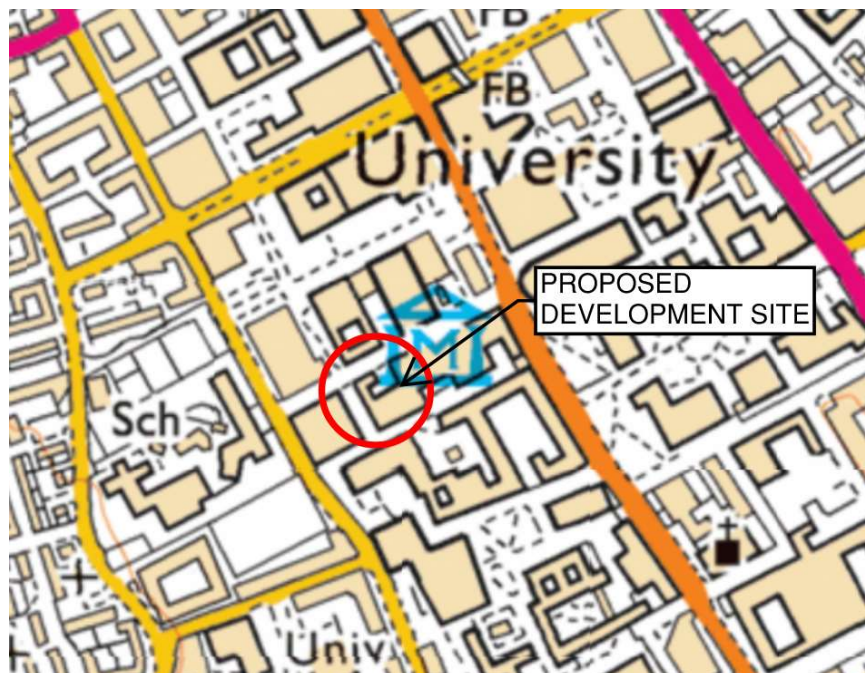


Figure 2 - Proposed Development location shown on Ordnance Survey Mapping

Discharge to a surface water sewer

Public sewer asset mapping has been obtained from united utilities and is presented in Figure 3 below. A complete copy of the asset plans obtained can be found in Appendix D.



Figure 3 - United Utilities Sewer Asset Mapping

As seen in Figure 3, there are no surface water sewers located in close proximity to the proposed development. A 600x820mm combined sewer runs west to east along Bridgeford street to the north of the proposed development site. Following the drainage hierarchy this is the most suitable discharge location for both surface and foul drainage.

5.3 The four pillars of SUDS

5.3.1 Effective SUDS design should be undertaken in the context of the four pillars of SUDS. The four pillars of SUDS are presented in Figure 4.

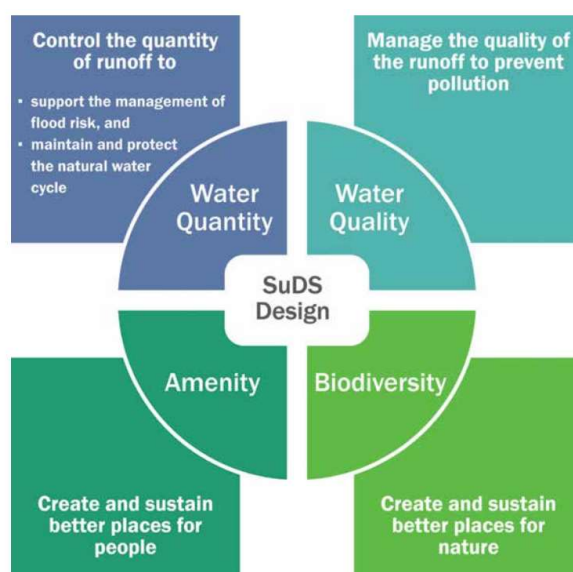


Figure 4 - Four Pillars of SUDS (CIRIA C753)

Water Quantity

The proposed development will result in a reduction of impermeable areas within the bounds of the proposed development site and therefore will result in a reduction of surface water discharge relative to the existing development.

Whilst water quantity will only be reduced due to a reduction in impermeable area, the development provides the potential to reduce the discharge rate off site. In accordance with LFRM policy 6 the discharge rate from the development will target 4l/s. This is shown to be greater than a 50% betterment, and in line with local standards.

Water Quality

Development introduces the potential for pollution into drainage systems. Potential pollution is categorised into three main areas: Total suspended solids (TSS), Metals and Hydrocarbons

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

Notes

- 1 Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).
- 2 These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

Where a site land use falls outside the defined categories, the indices should be adapted (and agreed with the drainage approving body) or else the more detailed risk assessment method should be adopted.

Where nutrient or bacteria and pathogen removal is important for a particular receiving water, equivalent indices should be developed for these pollutants (if acceptable to the drainage approving body) or the risk assessment method adopted.

Figure 5 - Sources of Pollution (CIRIA C753)

Whilst the area will primarily be used for pedestrian traffic only, there is the potential for vehicles to enter for disability access. Therefore the following pollution indices will be assumed.

Pollution Level	TSS	Metals	Hydrocarbons
Low level pollution potential	0.5	0.4	0.4

Table 4 - Proposed pollution levels at the development site

Due to the nature of the site, there is limited above ground space for pollution mitigation. Therefore a proprietary treatment product will be utilised. It is proposed to use an 'SDS Aqua-swirl' or similar approved product. From the SDS technical guidance the following pollution mitigation indices are achievable:

Product	TSS	Metals	Hydrocarbons
SDS Aqua-swirl	0.8	0.5	0.7

Table 5 - Proposed Pollution Mitigation Indices

Therefore, in accordance with guidance set out in CIRIA C753, simple indices approach, the proposed treatment will provide suitable water quality cleaning measures.

Amenity

Due to the limited above ground space available, the surface water drainage system offers limited potential for beneficial amenity value.

Biodiversity

Due to the limited above ground space available, the surface water drainage system offers limited potential for beneficial biodiversity improvements

5.4 Exceedance Routes

- 5.4.1** In extreme storm events, or due to poor maintenance of drainage systems, there may be instances where the drainage system becomes blocked. In such instances surface water may discharge from the network onto the ground levels adjacent to the development.
- 5.4.2** With reference to Clancy Consulting drawing 4450, found in Appendix F, the exceedance route of excess surface water would generally fall north east of the proposed development to Bridgeford Street. This is considered acceptable as properties on Bridgeford street adjacent the site are noted to have raised access and as such should not be at risk of immediate flooding.

5.5 Foul drainage

- 5.5.1** Foul flow rate for the proposed development have been calculated as 1.33l/s. Full copies of the calculations can be found in Appendix G.
- 5.5.2** Foul drainage around the structure should be developed and constructed in accordance with Approved Document H.
- 5.5.3** It is understood from utilities surveys undertaken (Appendix E) that the existing drainage is currently a combined system discharging to the combined United Utilities sewer in Bridgeford street. The new proposals will seek to separate the new foul and surface water drainage systems prior to a combined discharge.

5.6 Connection to United Utilities Sewer

- 5.6.1** As part of the drainage design process a pre-development application has been made to United utilities for a pre-development sewer assessment.

6.0 Drainage and SUDS Maintenance

6.1 General Considerations

- 6.1.1** The maintenance and management of the proposed drainage system will be undertaken by the University of Manchester department of estates and services.
- 6.1.1.1** All of the measures described in this document will form part of the building O&M manual. All of the measures and designs will need to be adhered to in order to maintain the design life and design capacity of the surface and foul water drainage systems. Health and Safety risks have been communicated on design drawings. All responsibility for the on-site surface, foul water drainage and maintenance will lie with the site owner.
- 6.1.1.2** The below ground drainage network is to be designed in accordance with Building Regulations Part H 2015, BSEN 752-2008, LASOO Non-Statutory Technical Standards for Sustainable Drainage 2015 and Chapter 32 of CIRIA C753 – The SUDS Manual.
- 6.1.1.3 General Maintenance**
Inspection chambers and access points are to be provided at regular intervals which can be jetted / cleaned. General checking of the below ground drainage systems should be every three (3) months. General maintenance / cleaning of the below ground systems should be after each major storm event and on an annual basis. This applies to all pipes, inspection chambers, manholes, rodding eyes, gullies, channels etc.
- 6.1.1.4 Foul Systems**
To be maintained in accordance with the “General” Section above.

SUDS Maintenance Plan

Manholes and Inspection Chambers

Description

Manholes providing rodding and jetting access to pipe work.

Normally manholes, in similarity to inspection chambers, are designed for access by operatives. Manholes must only be accessed after a risk assessment, and the implementation of a safe system of work, which identifies the specific risk to confined space.

Maintenance Issues

It is not likely that Manholes will present maintenance issues. However, they allow both the access to the drainage infrastructure and allow visual inspection from the surface of any key maintenance issues.

Schedule	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Remove covers and ensure that there are no blockages. Inspect and ascertain any parts that are not operating correctly and resolve.	For 3 months after installation
	Check covers do not need repairing.	Monthly
	Check drainage is running freely by inspecting manholes and inspection chambers.	Every 6 months and following the leaf fall in autumn.
Occasional maintenance	Suction sweeping and cleansing (to Water Jetting Association standards) and CCTV where appropriate.	2 – 4 Years
Remedial maintenance	Silt removal Inlet/outlet repair Erosion repairs System recovery following a pollution event Manhole Cover replacement Repairs to brickwork or concrete Chanel repair	When required (tasks to repair problems due to wear, damage or vandalism)

Gullies

Description

Surface Water is drained over impermeable areas towards grated gullies at low points and water is carried to below ground pipework.

Maintenance Issues

Gullies can become blocked by silt or debris, causing flooding.

Gullies include integral silt traps which can cause siltation of downstream drainage infrastructure if the appropriate maintenance is not undertaken.

Gullies frequently include a trapped outlet which prevents liquids lighter than water (ie oil and fuel) departing the gully. If silt and light liquids do not get removed regularly silt and oil will move downstream to other areas of the drainage network, some of which may be difficult to access, or totally inaccessible.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Inspect to ensure that there are no blockages at surface level, and that the outfall is operating efficiently.	For 3 months after installation
	Inspect and identify any parts that are not operating correctly and resolve.	
	Check that there are no blockages at surface level.	Monthly
	Remove covers to check for blockages or siltation.	Every 6 months and following the leaf fall in autumn.
Occasional maintenance	Remove oil and silt using specialist vacuum extraction plant.	1 – 2 Years
Remedial maintenance	- Silt removal - Inlet/outlet repair - Erosion repairs - System rehabilitation following a pollution event - Cover replacement - Structural failure of gully pot - Ensure that impermeable surfaces surrounding linear	When required (tasks to repair problems due to wear, damage or vandalism)

	drains have not settled below top of gully cover level, causing ponding	
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Pipework Description

Below ground drainage pipework connects drainage inlets (gullies, linear drains etc) to manholes as well as providing connections between manholes.

Maintenance Issues

Pipes could become blocked by silt, debris fat, grease, or collapse. In addition, it's possible for pipe joints to become displaced or for roots to grow from the surrounding ground into the pipes.

These factors can cause a reduction in, or loss of, the hydraulic capability of the pipes which could cause flooding to land and buildings.

Defects in pipes could cause a reduction in stability to ground underlying foundations, thus, causing settlement and damage to buildings and external surfaces.

The material of pipes and associated couplings can be damaged if aggressive liquids are passed through the pipes.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Inspect and identify any parts that are not operating correctly and resolve.	For 3 months after installation.
	Monitor working of drainage at ground level. The indications damaged pipework's may include localised flooding or emission of smells.	Monthly
	Remove manholes covers to check for blockages.	Every 6 months
Occasional maintenance	CCTV pipework, clean to WRC Sewer Jetting Code of Practice. Resolve issues as appropriate.	1 – 2 Years
Remedial maintenance	- Silt removal. - Fat and Grease removal. - Erosion repairs. - Joint displacement. - Structural failure, cracking or collapse. - System rehabilitation following a pollution event.	When required (tasks to repair problems due to wear, damage or vandalism)

It is recommended that trees are not planted within 3m of pipes to reduce the risk of root ingress.

Vortex Controls

Description

Vortex controls, often called Hydrobrakes, are installed in some manholes to limit the rate of flow. Vortex controls are normally constructed in steel and installed in a manhole with a sump.

Maintenance Issues

Vortex controls could become blocked by debris, plastic bags or other sheet material. If silt is allowed to build up in the sump the operation of the device could be impeded causing flooding upstream.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Check manufacturer's specification. Inspect and identify any parts that are not operating, consult supplier and remediate as required.	For 3 months after installation
	Monitor working of drainage at ground level. Where localised flooding occurs, check the condition of all system elements.	Monthly
	Remove manholes covers to check for blockages. Remove sediment from pre-treatment structures, gullies, catchpits etc.	Every 6 months and following the leaf fall in autumn.
Occasional maintenance	Clean to WRC Sewer Jetting Code of Practice. Resolve issues as appropriate.	1 – 2 Years
Remedial maintenance	Inspect, and remedy to ensure that the features are in fully working order.	As required (tasks to repair problems due to wear, damage or vandalism).

Geocellular Attenuation Storage

Description

Attenuation storage tanks are used to create a below-ground space for the temporary storage of surface water before infiltration, controlled release or use. Geocellular storage crates are advantageous as they allow for spatial versatility as opposed to in situ concrete tanks.

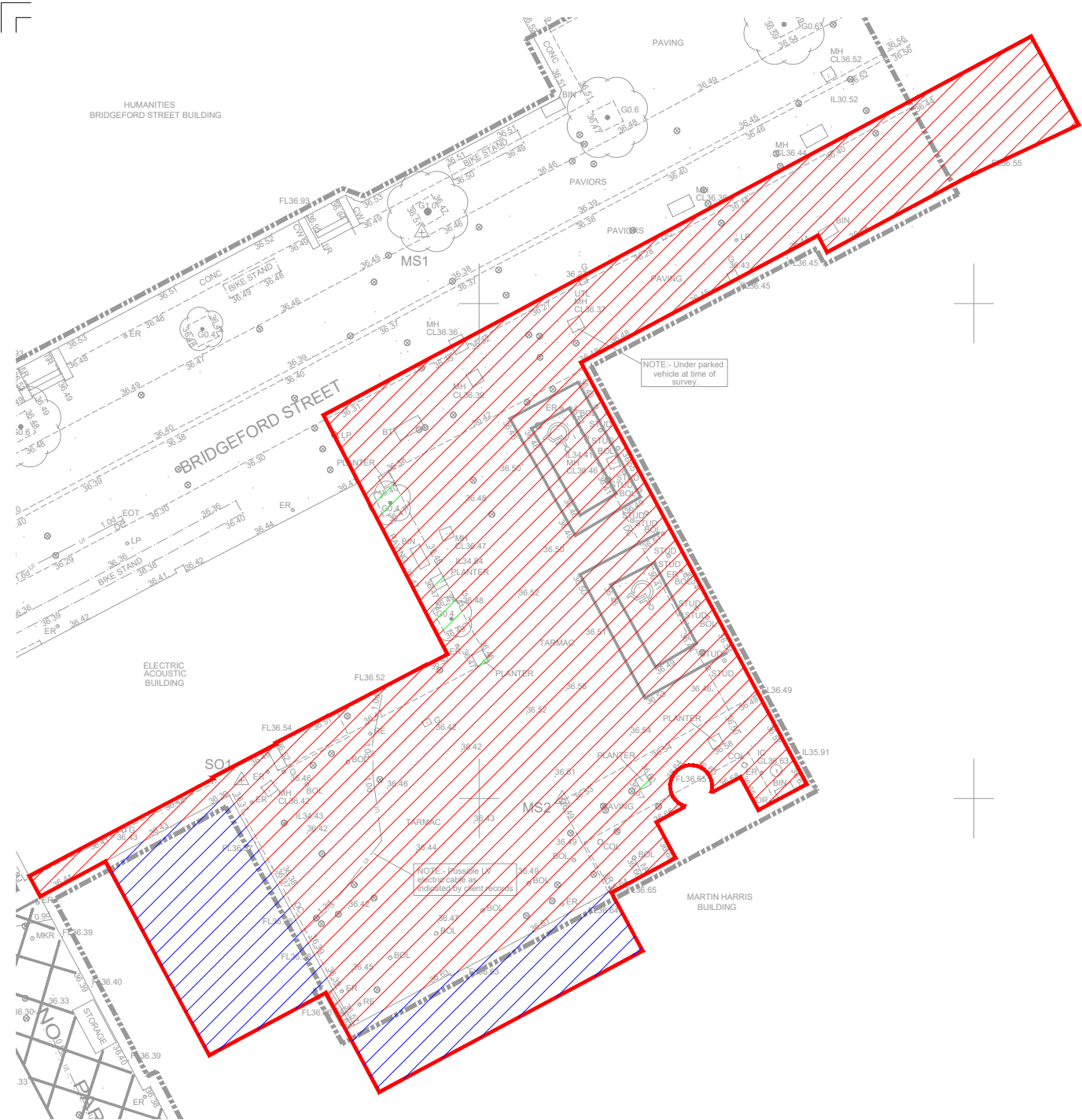
Maintenance Issues

For Geocellular attenuation tanks typical issues relate to the build-up of silt within the tank, causing a decrease in capacity over time.

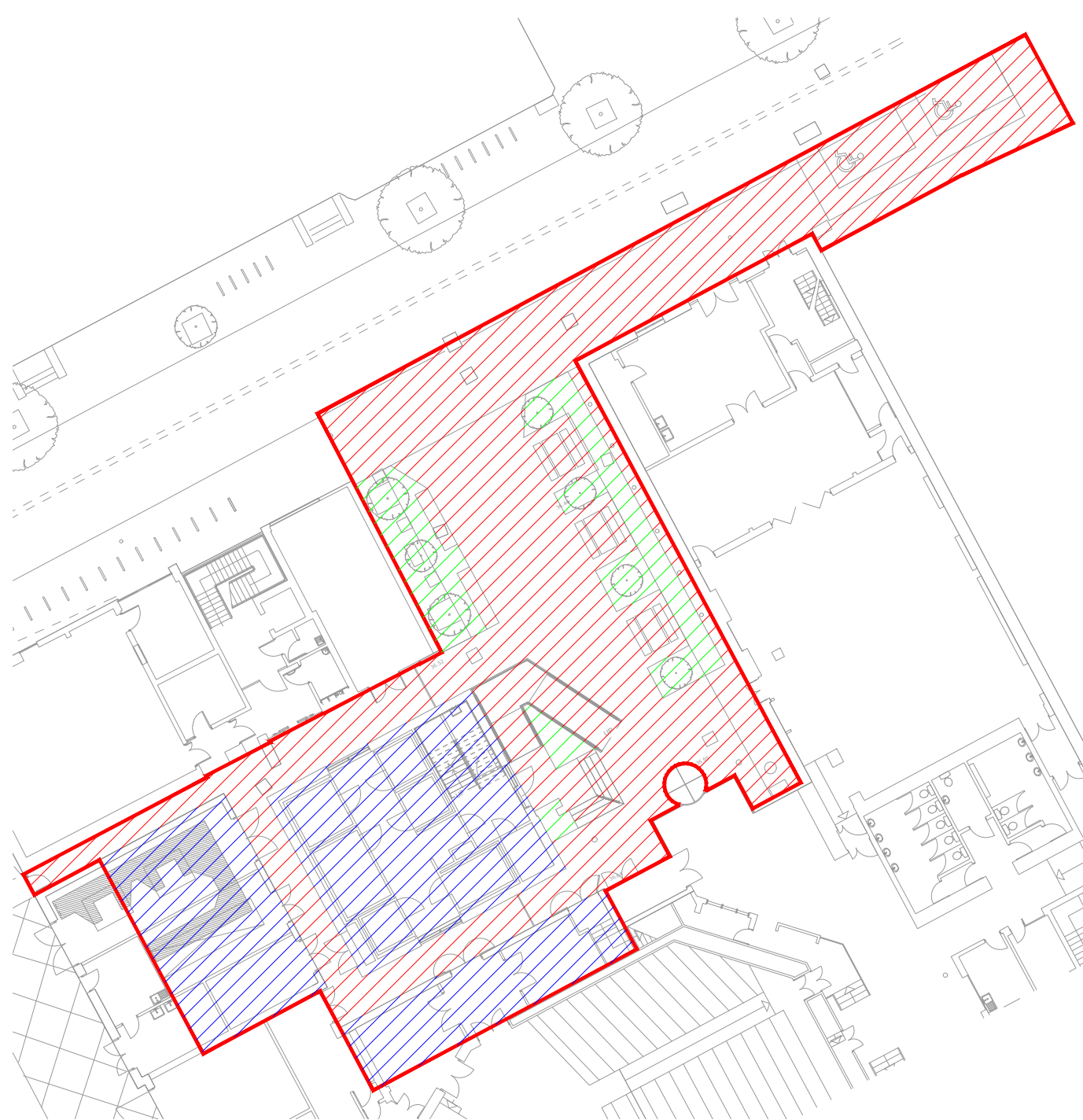
Maintenance Regime

Schedule	Action Required	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. Take remedial action as appropriate	For 3 months after installation, then annually.
	Remove debris from the catchment surface (where it may cause a risk to performance)	Monthly
	For systems where rainfall infiltrate into the tank from above, check surface of filter for blockage by sediment, algae or other matter. Remove blockage and replace surface infiltration medium as appropriate.	Annually
	Remove Sediment from pre-treatment structures and/or internal forebays.	Annual, or as needed
Remedial Actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As needed
Monitoring	Check all inlets, outlets, vents and overflows to ensure that they are working as designed.	Annually
	Survey inside of tank for sediment build-up and remove as appropriate.	Every 5 years or as needed.

Appendix A – Site Areas



LEGEND:	
	HARDSTANDING AREAS = 666m ²
	SOFT LANDSCAPING AREAS = 4m ²
	ROOF AREAS = 132m ²
	TOTAL AREAS = 802m ²



LEGEND:	
	HARDSTANDING AREAS = 484m ²
	SOFT LANDSCAPING AREAS = 67m ²
	ROOF AREAS = 251m ²
	TOTAL AREAS = 802m ²

PRELIMINARY DRAWING
THIS DRAWING IS FOR PRELIMINARY INFORMATION PURPOSES ONLY AND MUST NOT BE READ AS A CONSTRUCTION ISSUE. IT INDICATES DESIGN INTENT ONLY AND IS SUBJECT TO AMENDMENT DURING FINAL DESIGN DEVELOPMENT

SCALE 1:150m
0m 2m 4m 6m 8m 10m 12m 14m

P1	09.08.22	PRELIMINARY ISSUE	CN	LP	LP
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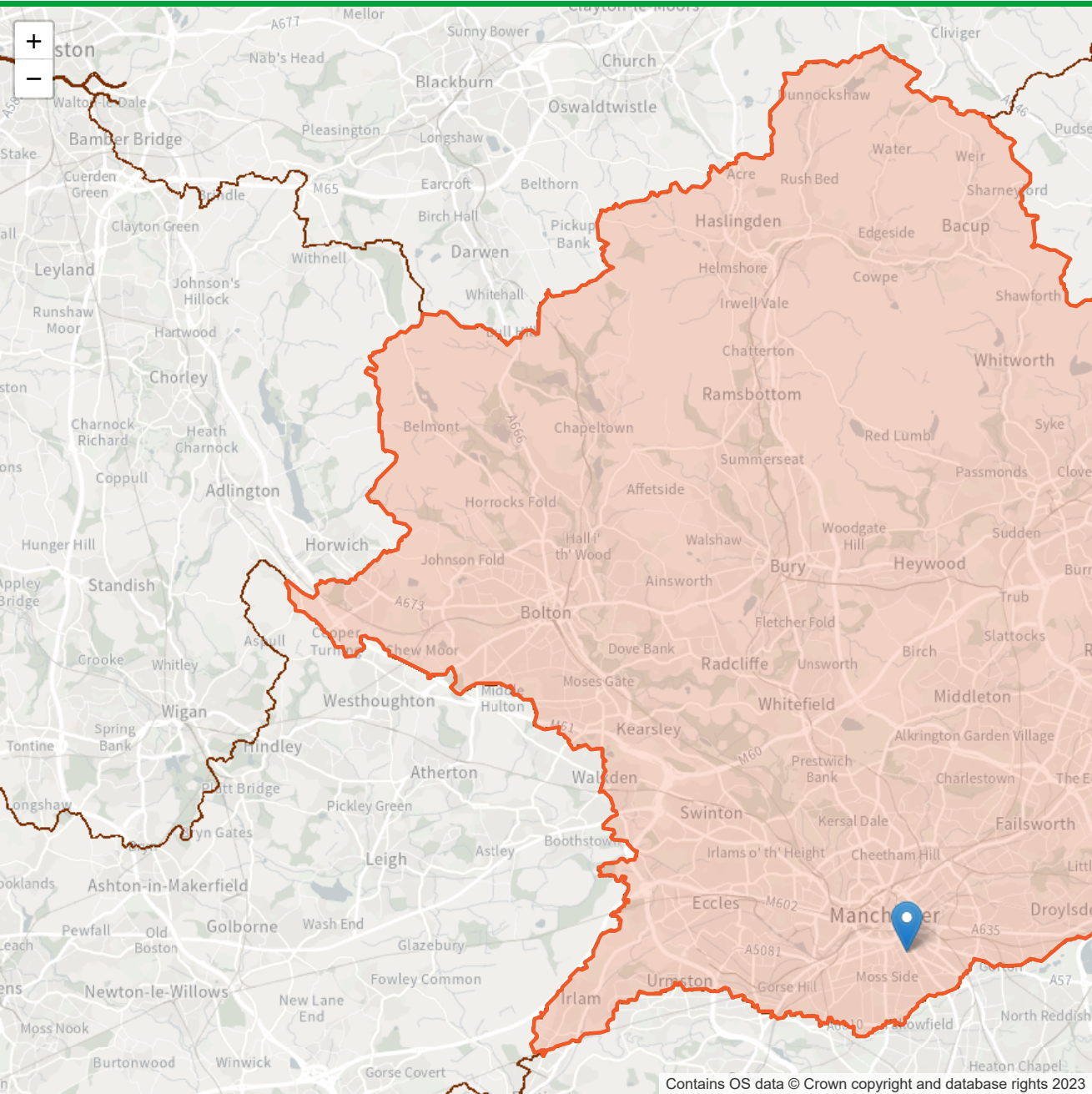
Client	UNIVERSITY OF MANCHESTER				
Project	MARTIN HARRIS MUSIC BLOCK UNIVERSITY OF MANCHESTER BRIDGEFORD STREET, M15 6FH				
Office	NORWICH 01603 305190				
Discipline	CIVIL ENGINEERING				
Title	AREAS PLAN GENERAL ARRANGEMENT				
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Originator	Job Number	Discipline	Building/Zone
CCL	8/2756	C	MHM
Type	Level	Drawing No.	Revision
GA	EXT	4000	P1

Appendix B – Environment Agency Rainfall Intensity Map



Irwell Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch		
	Central allowance	Upper end allowance
2050s	25%	35%
2070s	30%	40%

1% annual exceedance rainfall event

Epoch		
	Central allowance	Upper end allowance
2050s	25%	40%
2070s	30%	45%

*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

This map contains information generated by Met Office Hadley Centre (2019): UKCP Local Projections on a 5km grid over the UK for 1980-2080. Centre for Environmental Data Analysis, 2022

Appendix C – Run-off Calculations



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Calcs for

Existing Run-Off - 1 in 1 Year

Start page no./Revision

1

Calcs by

CN

Calcs date

17/03/2023

Checked by

Checked date

Approved by

Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Manchester
Storm duration	D = 15 min
Return period	Period = 1 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 40 %
Factor Z1 (Wallingford procedure)	Z1 = 0.62
Rainfall for 15min storm with 5 year return period	M5_15min _i = Z1 × M5_60min × (1 + p _{climate}) = 15.6 mm
Factor Z2 (Wallingford procedure)	Z2 = 0.62
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × M5_15min _i = 9.7 mm
Design rainfall intensity	I _{max} = M1_15min / D = 38.9 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 802 m ²
Percentage of area that is impermeable	p = 99 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 8.6 l/s



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Calcs for

Existing Run-Off - 1 in 30 Year

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1

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17/03/2023

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DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area

Manchester

Storm duration

D = **15** min

Return period

Period = **30** yr

Ratio 60 min to 2 day rainfall of 5 yr return period

r = **0.360**

5-year return period rainfall of 60 minutes duration

M5_60min = **18.0** mm

Increase of rainfall intensity due to global warming

p_{climate} = **40** %

Factor Z1 (Wallingford procedure)

Z1 = **0.62**

Rainfall for 15min storm with 5 year return period

M5_15min_i = Z1 × M5_60min × (1 + p_{climate}) = **15.6** mm

Factor Z2 (Wallingford procedure)

Z2 = **1.53**

Rainfall for 15min storm with 30 year return period

M30_15min = Z2 × M5_15min_i = **23.9** mm

Design rainfall intensity

I_{max} = M30_15min / D = **95.5** mm/hr

Maximum surface water runoff

Catchment area

A_{catch} = **802** m²

Percentage of area that is impermeable

p = **99** %

Maximum surface water runoff

Q_{max} = A_{catch} × p × I_{max} = **21.1** l/s



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8/2756

Calcs for

Existing Run-Off - 1 in 100 Year

Start page no./Revision

1

Calcs by

CN

Calcs date

17/03/2023

Checked by

Checked date

Approved by

Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area

Manchester

Storm duration

D = **15** min

Return period

Period = **100** yr

Ratio 60 min to 2 day rainfall of 5 yr return period

r = **0.360**

5-year return period rainfall of 60 minutes duration

M5_60min = **18.0** mm

Increase of rainfall intensity due to global warming

p_{climate} = **45** %

Factor Z1 (Wallingford procedure)

Z1 = **0.62**

Rainfall for 15min storm with 5 year return period

M5_15min_i = Z1 × M5_60min × (1 + p_{climate}) = **16.2** mm

Factor Z2 (Wallingford procedure)

Z2 = **2.00**

Rainfall for 15min storm with 100 year return period

M100_15min = Z2 × M5_15min_i = **32.4** mm

Design rainfall intensity

I_{max} = M100_15min / D = **129.4** mm/hr

Maximum surface water runoff

Catchment area

A_{catch} = **802** m²

Percentage of area that is impermeable

p = **99** %

Maximum surface water runoff

Q_{max} = A_{catch} × p × I_{max} = **28.5** l/s

Appendix D – United Utilities Asset Plans

Clancy Consulting Ltd

19
Upper King Street,
Norwich, Norfolk
NR3 1RB

FAO:

How to contact us:

**United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP**

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

**Your Ref: Martin Harris Music Block
Our Ref: UUPS-ORD-400763
Date: 20/06/2022**

Dear Sirs

Location: Martin Harris Music Block

I acknowledge with thanks your request dated 01/06/2022 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

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

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



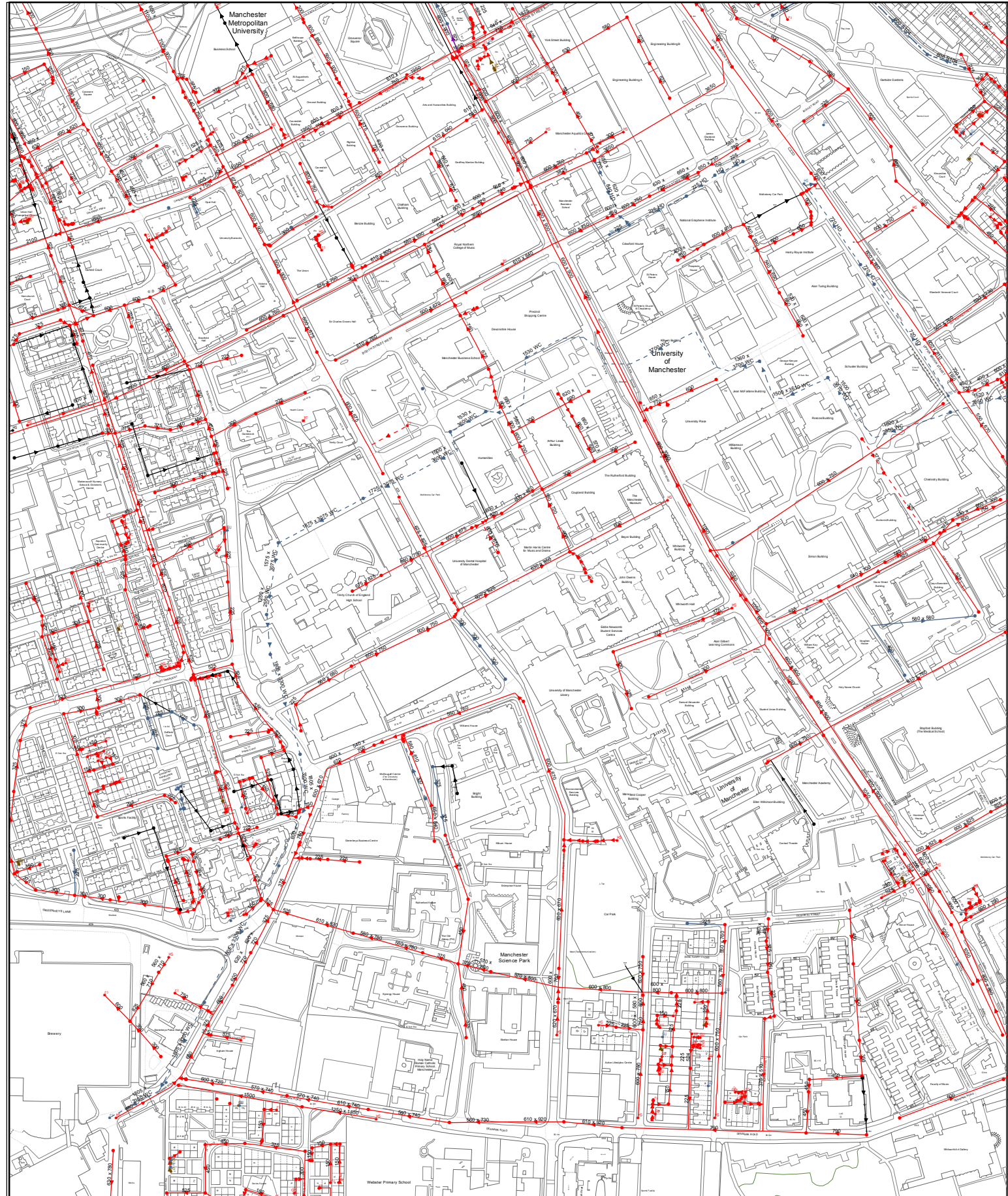
Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This 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.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this 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 Map have been made subsequent to issue and prior to any works being carried out.
- This 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) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the 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 UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



Date: 20/06/2022

Printed By:
Property Searches

Extract from Map of Public Sewers

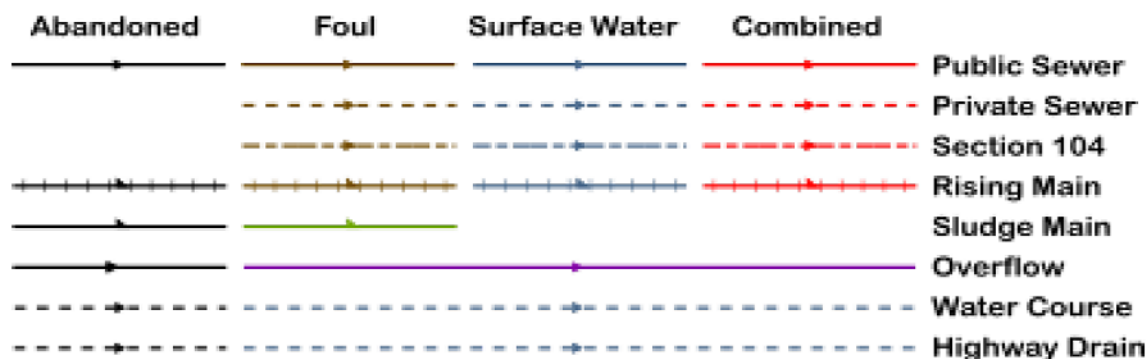
Martin Harris Music Block



The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. United Utilities Water PLC will not accept any liability for any damage caused by the actual positions being different from those shown.

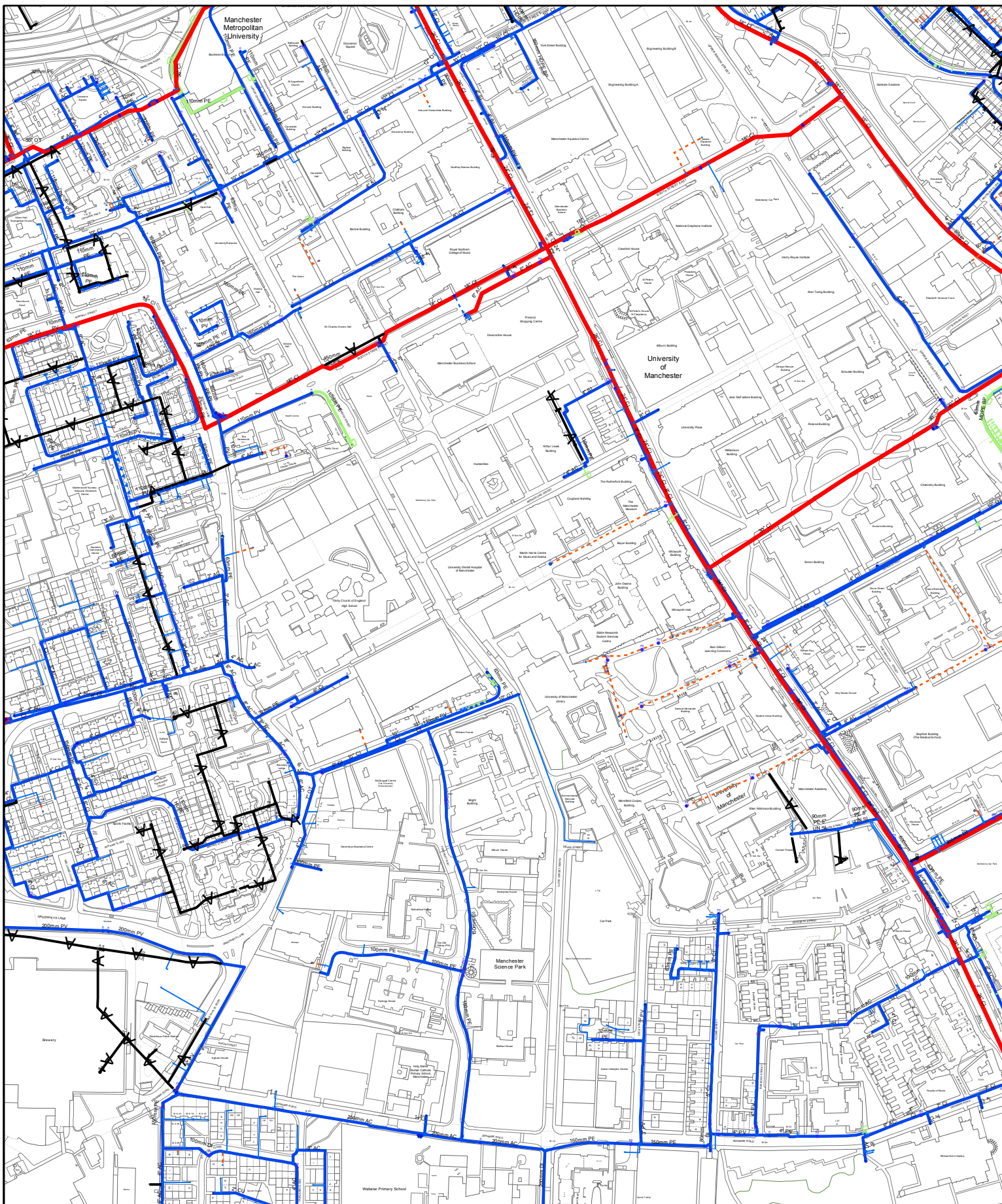
© United Utilities Water PLC 2022. The plan is based upon the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office, Crown copyright 100022432 and United Utilities Water PLC copyrights are reserved. Unauthorised reproduction will infringe these copyrights.

Wastewater Symbolology



All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

Manhole	Side Entry Manhole
Head of System	Outfall
Extent of Survey	Screen Chamber
Rodding Eye	Inspection Chamber
Inlet	Bifurcation Chamber
Discharge Point	Lamp Hole
Vortex	T Junction / Saddle
Penstock	Catchpit
Washout Chamber	Valve Chamber
Valve	Vent Column
Air Valve	Vortex Chamber
Non Return Valve	Penstock Chamber
Soakaway	Network Storage Tank
Gully	Sewer Overflow
Cascade	Ww Treatment Works
Flow Meter	Ww Pumping Station
Hatch Box	Septic Tank
Oil Interceptor	Control Kiosk
Summit	
Drop Shaft	Change of Characteristic
Orifice Plate	



Date: 20/06/2022

Extract from Map Of Water Mains

Printed By:
Property Searches

Martin Harris Music Block



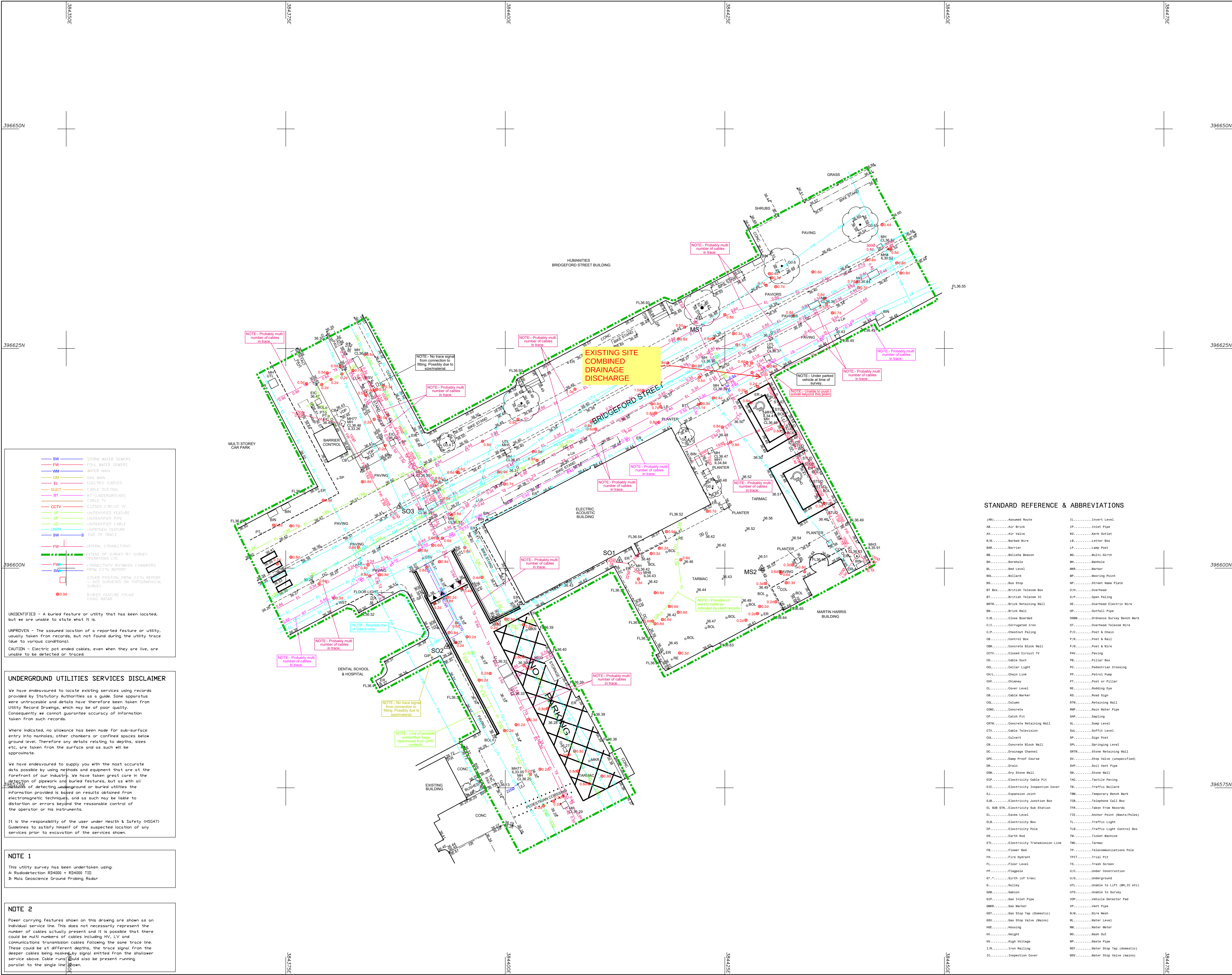
The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. United Utilities Water PLC will not accept any liability for any damage caused by the actual positions being different from those shown.

Clean Water Symbolology

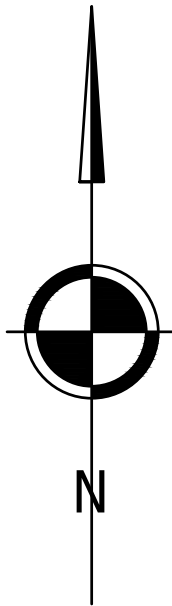
Proposed	Abandoned	Live	
			Distribution Main
			Trunk Main
			Comms Pipe
			Private Pipe
			Concessionary Service
			Raw Water
			LDTM Raw Water
			LDTM Treated Water
			Air Valve
			AC Valve, open
			AC Valve, closed
			CC Valve, open
			CC Valve, closed
			Non Return Valve
			Pressure Management Valve
			OMS Valve
			Stop Tap
			Flow Meter
			Domestic Meter
			Commercial Meter
			Pump
			Hydrant
			Fire Hydrant
			Anode
			Chlorination Point
			De-chlorination Point
			Strainer Point
			Access Point
			Hatch Box
			IP Point
			Sampling Station
			Logger Box
			Bore Hole
			Inlet Point
			Bulk Supply Point
			End Cap
			Site Termination
			Change of Characteristic
			Condition Report
			<u>Property Types</u>
			Water Tower
			Valve House
			Booster Pumping Station
			Intake Pumping Station
			Water Treatment Works
			Supply Reservoir
			Service Reservoir
			Impounding Reservoir
			Pipe Bridge

Symbology for proposed assets is the same as above, but shown in **green**
 Symbology for abandoned assets is the same as above, but shown in **black**

Appendix E – Utilities Survey



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is prohibited without the prior permission of
Survey Operations Limited.



Note:
The survey is plotted on a plane local
Grid. Orientation to National Grid.
All levels relate to Ordnance Datum,
achieved using the
OS National GPS Network.

Survey Control Markers established for
Mapping purposes only and should not be
used for Construction without the written
approval of Survey Operations Ltd.

SURVEY STATIONS			
Name	Easting	Northing	Height
S01	384413.00	396600.91	36.42
S02	384393.37	396591.09	36.34
S03	384387.99	396607.04	36.40
MS1	384422.10	396628.58	36.46
MS2	384429.20	396599.97	36.51

Utilities surveyed April 2022 and added
to Survey Operations drawing no. 21L118

EL	UNPROVEN ELEC
BT	UNPROVEN BT
GM	UNPROVEN GAS
WM	UNPROVEN WATER
SW	UNPROVEN SURFACE
FW	UNPROVEN FOUL

All unproven lines without additional notes on
drawing show the approximate location of a
reported utility or feature as indicated on
available stat records.

Revision - Date - Description
A - 03/05/22 - Drawing notes updated.

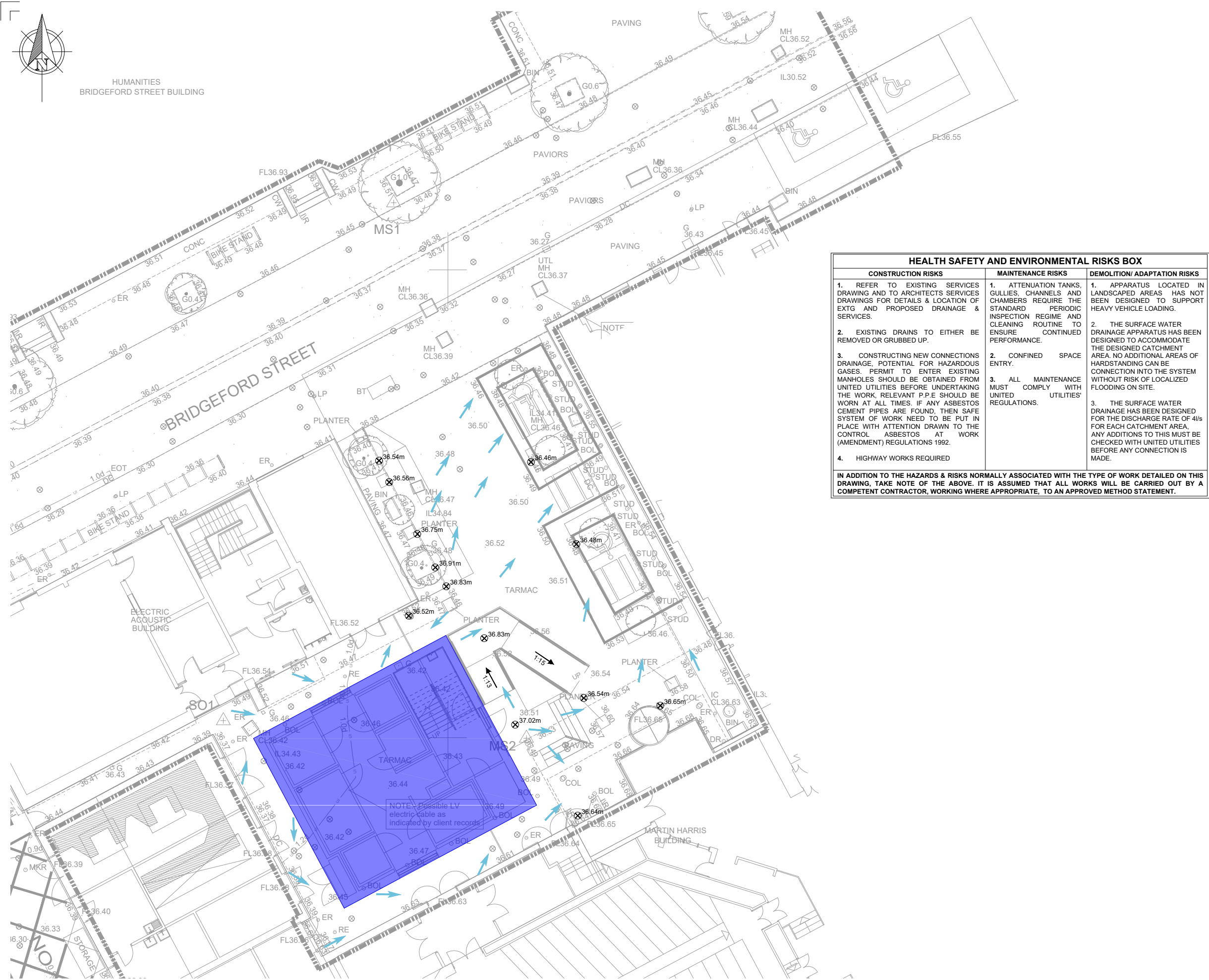


Smith Street, Skelmersdale, Lancs. WN8 8LN
Tel: 01695 725662 Fax: 01695 51816
Email: mail@survops.co.uk - www.survops.co.uk

Client University of Manchester	
Drawing Title Utilities Survey of: New Music Practice Building Manchester	
Scale(s) 1:200	Surveyor ES
Date Apr 22	Drawn DS
Job Number 22C200	Checked SO

Sheet Size & Drg Number & Revision
A1 22C200/001 A

Appendix F – Exceedance Plans



- NOTES:**
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEER'S AND ARCHITECT'S DRAWINGS, DETAILS & SPECIFICATIONS.
 - THE EXTERNAL WORKS DESIGN IS BASED UPON JEFFERSON SHEARD ARCHITECTS' PLAN 2080-JSA-XX-00-DR-A-01000 REV P5 DATED 01.08.22.
 - TOPOGRAPHICAL SURVEY DRAWING 22C200/001 DATED APRIL 2022 BY SURVEY OPERATIONS HAS ALSO BEEN USED IN THE DESIGN.
 - REFER TO THE ARCHITECT FOR SETTING OUT OF ALL BUILDINGS & INTERNAL DOWN PIPES & RWP'S
 - REFER TO SERVICE ENGINEERS DRAWINGS FOR FINAL SETTING OUT OF RWP AND SVP'S (BASED ON GUTTER SYSTEM).
 - REFER TO SERVICE ENGINEERS DRAWINGS FOR ABOVE GROUND PLUMBING ROUTES FROM APPLIANCES TO STUB STACKS ETC.
 - ALL EXISTING DRAINAGE THAT IS TO BE ABANDONED TO BE 'PLUGGED' IN WITH MASS CONCRETE (150mm MIN) OR REMOVED ENTIRELY.
 - ANY EXISTING SERVICES TO BE LOCATED AND CLEARLY MARKED PRIOR TO EXCAVATIONS BY CONTRACTOR.
 - ALL LEVELS ARE TO BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO CONSTRUCTION.
 - IT IS ASSUMED THAT ALL SINK AND TOILET DRAINAGE POINTS WILL HAVE RODDING ACCESS AT THE APPLIANCE BASE.
 - CONTRACTOR TO AVOID UNDERMINING ANY EXISTING FOOTPATHS/ BUILDINGS DURING WORKS BY ALLOWING ADEQUATE PROTECTION ADJACENT TO THESE AREAS.
 - ALL RAINWATER DOWN PIPES TO HAVE RODDABLE ACCESS AT THE BASE OF THE VERTICAL SECTION.
 - ALL BELOW GROUND DRAINAGE PIPES WITH LESS THAN 900mm COVER TO SOFFIT LEVEL IN TRAFFICKED AREAS I.E. CAR PARK AND SERVICE YARD AREA TO HAVE CLASS Z BEDDING SURROUND. REFER TO THE MANHOLE SCHEDULE AND DETAIL SHEETS FOR FURTHER DETAILS.
 - ALL BELOW GROUND DRAINAGE WITHIN THE SITE BOUNDARY HAS BEEN DESIGNED TO BSEN 752:2008 AND BUILDING REGULATIONS - PART H:2015.

LEGEND:

	PROPOSED LEVELS
	PROPOSED SURFACE GRADIENTS
	SURFACE WATER EXCEEDANCE ARROWS

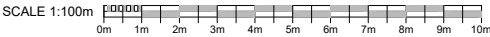
HEALTH SAFETY AND ENVIRONMENTAL RISKS BOX		
CONSTRUCTION RISKS	MAINTENANCE RISKS	DEMOLITION/ ADAPTATION RISKS
1. REFER TO EXISTING SERVICES DRAWING AND TO ARCHITECTS SERVICES DRAWINGS FOR DETAILS & LOCATION OF EXTG AND PROPOSED DRAINAGE & SERVICES. 2. EXISTING DRAINS TO EITHER BE REMOVED OR GRUBBED UP. 3. CONSTRUCTING NEW CONNECTIONS DRAINAGE. POTENTIAL FOR HAZARDOUS GASES. PERMIT TO ENTER EXISTING MANHOLES SHOULD BE OBTAINED FROM UNITED UTILITIES BEFORE UNDERTAKING THE WORK. RELEVANT P.P.E SHOULD BE WORN AT ALL TIMES. IF ANY ASBESTOS CEMENT PIPES ARE FOUND, THEN SAFE SYSTEM OF WORK NEED TO BE PUT IN PLACE WITH ATTENTION DRAWN TO THE CONTROL ASBESTOS AT WORK (AMENDMENT) REGULATIONS 1992. 4. HIGHWAY WORKS REQUIRED	1. ATTENUATION TANKS, GULLIES, CHANNELS AND CHAMBERS REQUIRE THE STANDARD PERIODIC INSPECTION REGIME AND CLEANING ROUTINE TO ENSURE CONTINUED PERFORMANCE. 2. CONFINED SPACE ENTRY. 3. ALL MAINTENANCE MUST COMPLY WITH UNITED UTILITIES' REGULATIONS.	1. APPARATUS LOCATED IN LANDSCAPED AREAS HAS NOT BEEN DESIGNED TO SUPPORT HEAVY VEHICLE LOADING. 2. THE SURFACE WATER DRAINAGE APPARATUS HAS BEEN DESIGNED TO ACCOMMODATE THE DESIGNED CATCHMENT AREA. NO ADDITIONAL AREAS OF HARDSTANDING CAN BE CONNECTION INTO THE SYSTEM WITHOUT RISK OF LOCALIZED FLOODING ON SITE. 3. THE SURFACE WATER DRAINAGE HAS BEEN DESIGNED FOR THE DISCHARGE RATE OF 4l/s FOR EACH CATCHMENT AREA, ANY ADDITIONS TO THIS MUST BE CHECKED WITH UNITED UTILITIES BEFORE ANY CONNECTION IS MADE.
IN ADDITION TO THE HAZARDS & RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, TAKE NOTE OF THE ABOVE. IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WORKING WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.		

T1	26.09.22	TENDER ISSUE	CN	LP	LP
Rev	Date	Description	By	Check	App.
Client					
UNIVERSITY OF MANCHESTER					
Project					
MARTIN HARRIS MUSIC BLOCK UNIVERSITY OF MANCHESTER BRIDGEFORD STREET, M15 6FH					
Office					
NORWICH 01603 305190					
Discipline					
CIVIL ENGINEERING					
Title					
EXCEEDANCE & LEVELS PLAN GENERAL ARRANGEMENT					
Scale @ A1			Status		
1:100			TENDER		

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Originator	Job Number	Discipline	Building/Zone
CCL	8/2756	C	MHM
Type	Level	Drawing No.	Revision
GA	DRN	4450	T1

TENDER DRAWING
THIS DRAWING IS FOR TENDER PURPOSES ONLY AND MUST NOT BE READ AS A CONSTRUCTION ISSUE. IT INDICATES DESIGN INTENT ONLY AND IS SUBJECT TO AMENDMENT DURING FINAL DESIGN DEVELOPMENT



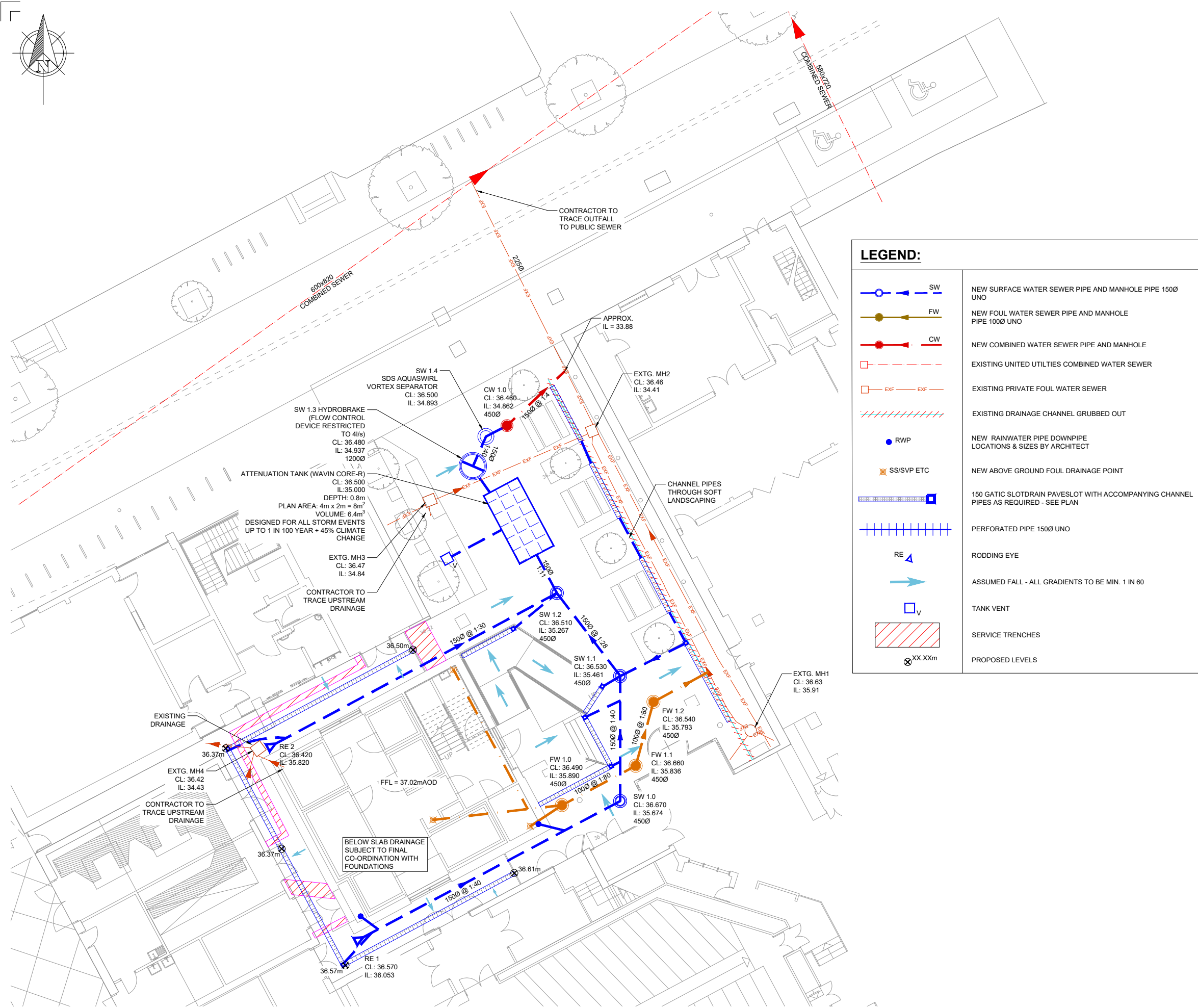
Appendix G – Foul Flow Rate

Foul Flow Impact Calculation

foul water discharge rate

[illegible]

Appendix H – Proposed Drainage Strategy



LEGEND:

SW

FW

CW

EXF

EXF

RWP

SS/SVP ETC

RE

V

XX.XXm

NEW SURFACE WATER SEWER PIPE AND MANHOLE PIPE 1500 UNO

NEW FOUL WATER SEWER PIPE AND MANHOLE PIPE 1000 UNO

NEW COMBINED WATER SEWER PIPE AND MANHOLE

EXISTING UNITED UTILITIES COMBINED WATER SEWER

EXISTING PRIVATE FOUL WATER SEWER

EXISTING DRAINAGE CHANNEL GRUBBED OUT

NEW RAINWATER PIPE DOWNPIPE LOCATIONS & SIZES BY ARCHITECT

NEW ABOVE GROUND FOUL DRAINAGE POINT

150 GATIC SLOTDRAIN PAVESLOT WITH ACCOMPANYING CHANNEL PIPES AS REQUIRED - SEE PLAN

PERFORATED PIPE 1500 UNO

RODDING EYE

ASSUMED FALL - ALL GRADIENTS TO BE MIN. 1 IN 60

TANK VENT

SERVICE TRENCHES

PROPOSED LEVELS

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEER'S AND ARCHITECT'S DRAWINGS, DETAILS & SPECIFICATIONS.

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6. REFER TO SERVICE ENGINEERS DRAWINGS FOR ABOVE GROUND PLUMBING ROUTES FROM APPLIANCES TO STUB STACKS ETC.

7. ALL EXISTING DRAINAGE THAT IS TO BE ABANDONED TO BE 'PLUGGED' IN WITH MASS CONCRETE (150mm MIN) OR REMOVED ENTIRELY.

8. ANY EXISTING SERVICES TO BE LOCATED AND CLEARLY MARKED PRIOR TO EXCAVATIONS BY CONTRACTOR.

9. ALL LEVELS ARE TO BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO CONSTRUCTION.

10. IT IS ASSUMED THAT ALL SINK AND TOILET DRAINAGE POINTS WILL HAVE RODDING ACCESS AT THE APPLIANCE BASE.

11. CONTRACTOR TO AVOID UNDERMINING ANY EXISTING FOOTPATHS/ BUILDINGS DURING WORKS BY ALLOWING ADEQUATE PROTECTION ADJACENT TO THESE AREAS.

12. ALL RAINWATER DOWN PIPES TO HAVE RODDABLE ACCESS AT THE BASE OF THE VERTICAL SECTION.

13. ALL BELOW GROUND DRAINAGE PIPES WITH LESS THAN 900mm COVER TO SOFFIT LEVEL IN TRAFFICKED AREAS I.E. CAR PARK AND SERVICE YARD AREA TO HAVE CLASS Z BEDDING SURROUND. REFER TO THE MANHOLE SCHEDULE AND DETAIL SHEETS FOR FURTHER DETAILS.

14. ALL BELOW GROUND DRAINAGE WITHIN THE SITE BOUNDARY HAS BEEN DESIGNED TO BSEN 752:2008 AND BUILDING REGULATIONS - PART H:2015.

HEALTH SAFETY AND ENVIRONMENTAL RISKS BOX

CONSTRUCTION RISKS	MAINTENANCE RISKS	DEMOLITION/ ADAPTATION RISKS
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IN ADDITION TO THE HAZARDS & RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, TAKE NOTE OF THE ABOVE. IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WORKING WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

DRAINAGE STRATEGY:

THE SURFACE WATER DRAINAGE STRATEGY IS TO COLLECT ALL SURFACE WATER RUN-OFF FROM THE PAVED AREAS ON SITE INTO A NUMBER OF CHANNEL DRAINS WHICH ARE POSITIONED AT LOW POINTS ON SITE, WITH ROOF RUN-OFF BEING COLLECTED VIA RAINWATER PIPES. THE RUN-OFF IS THEN TRANSFERRED TO AN ON-SITE ATTENUATION TANK VIA A NETWORK OF PIPES, WHICH IS FOLLOWED BY A FLOW CONTROL CHAMBER TO REGULATE THE DISCHARGE RATE TO 4l/s. THIS IS A 50% BETTERMENT OF THE EXISTING 1 IN 1 YEAR RUNOFF RATE. THIS WATER IS THEN RUN THROUGH A VORTEX SEPARATOR TO PROVIDE AN APPROPRIATE LEVEL OF WATER TREATMENT BEFORE IT IS DISCHARGED TO THE PUBLIC COMBINED SYSTEM PRESENT WITHIN BRIDGEFORD STREET.

FOR THE FOUL DISCHARGE ON SITE, THE WASTE WATER IS COLLECTED VIA SOIL VENT PIPES WITHIN THE BUILDING WHICH IS THEN TRANSFERRED INTO A NETWORK OF PIPES THAT CARRIES THE WATER TO THE DISCHARGE POINT WITHIN BRIDGEFORD STREET.

CONTRACTOR NOTE:

EXISTING MANHOLE CHAMBERS TO BE REPLACED TO SUIT NEW LANDSCAPE DESIGN. COVER LEVELS MAY ALSO NEED ADJUSTMENT

T1	26.09.22	TENDER ISSUE	CN	LP	LP
Rev	Date	Description	By	Check	App.
Client					
UNIVERSITY OF MANCHESTER					
Project					
MARTIN HARRIS MUSIC BLOCK UNIVERSITY OF MANCHESTER BRIDGEFORD STREET, M15 6FH					
Office					
NORWICH 01603 305190					
Discipline					
CIVIL ENGINEERING					
Title					
DRAINAGE STRATEGY GENERAL ARRANGEMENT					
Scale @ A1			Status		
1:100			TENDER		

TENDER DRAWING

THIS DRAWING IS FOR TENDER PURPOSES ONLY AND MUST NOT BE READ AS A CONSTRUCTION ISSUE. IT INDICATES DESIGN INTENT ONLY AND IS SUBJECT TO AMENDMENT DURING FINAL DESIGN DEVELOPMENT

SCALE 1:100m

0m

1m

2m

3m

4m

5m

6m

7m

8m

9m

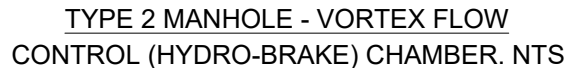
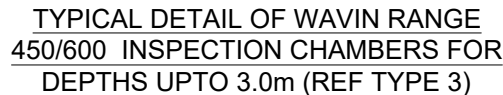
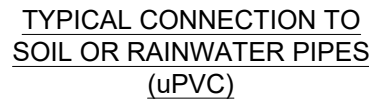
10m

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Originator	Job Number	Discipline	Building/Zone
CCL	8/2756	C	MHM
Type	Level	Drawing No.	Revision
GA	DRN	4400	T1

L



NOTE 1
Bd. = TRENCH WIDTH AT CROWN OF PIPE - (NARROW TRENCH WIDTH CONDITIONS)
Bc = OUTSIDE DIAMETER OF PIPE

CLASS 'Z' & CLASS 'S' FOR PIPE DIAMETERS 100 TO 525. GENERAL CASE CLASS 'S':
CLASS 'Z' FOR USE WHERE CROWN OF PIPE IS WITHIN 0.9m OF U/S OF PAVING IN TRAFFICKED AREAS AND 0.6m IN NON TRAFFICKED AREAS.

1. BACK FILL TO TRENCHES TO BE SELECTED GRANULAR MATERIAL. MAX. PARTICLE SIZE NOT EXCEEDING 75mm, AND NOT MORE THAN 10% PASSING 75mm SIEVE. MATERIAL SHALL NOT CONTAIN ANY CLAY LUMPS OR ANY OTHER FOREIGN MATTER.

2. PIPES TO BE VITRIFIED CLAY TO BSEN 295 OR PVC-U TO BSEN 1404-1:1998 TO CONTRACTOR CHOICE



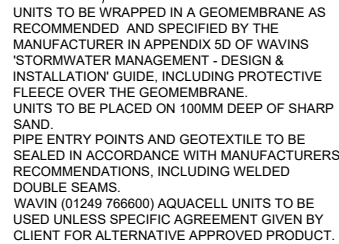
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IT SHALL NOT BE USED WITHOUT PERMISSION BY ANYONE FOR ANY PURPOSE.
DO NOT SCALE THIS DRAWING ELECTRONICALLY OR MANUALLY.
DO NOT TO TRIM OR REDUCE DIMENSIONS ONLY.
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
DO NOT TURN OVER LAYERS THAT HAVE BEEN TURNED OFF.
DO NOT TRIM LAYERS THAT HAVE BEEN FROZEN.

Client	UNIVERSITY OF MANCHESTER		
Project	MARTIN HARRIS MUSIC BLOCK UNIVERSITY OF MANCHESTER BRIDGEFORD, M15 6FH		
Office	NORWICH - 01603 305 190		
Discipline	CIVIL ENGINEERING		
Title	DRAINAGE CONNECTION DETAILS SHEET		
Scale @ A1	1:20	Status	TENDER



Originator	Job Number	Discipline	Building/Zone
CCL	8/2756	C	MHM
Type	Level	Drawing No.	Revision
DET	DRN	4410	T1

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DEVELOPMENT

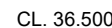
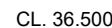


PIPEWORK SHOWN INDICATIVELY ONLY.
SEE GENERAL ARRANGEMENT FOR
LOCATIONS AND LEVELS OF PIPEWORK.

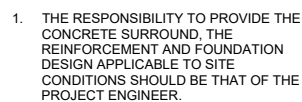
AQUACELL NOTES
AQUACELLS TO HAVE TYPE 1 OR TYPE 2 SUB-BASE
BACKFILL TO THE SIDES AND OVER THE CELLS ONLY.
MATERIAL TO BE COMPACTED IN ACCORDANCE WITH
TABLE 6/1 OR 8/1 OF THE SPECIFICATION FOR
HIGHWAY WORKS AND TAKING INTO ACCOUNT
MAXIMUM ROLLER WEIGHTS AS ADVISED BY WAVIN.

CONSTRUCTION PLANT **NOT** TO TRAFFIC NEAR OR OVER AQUACELL LOCATIONS UNLESS SPECIFICALLY AUTHORISED BY THE ENGINEER.

AQUACELL SURFACE WATER STORAGE DETAILS



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CHANNEL PIPE	
CHANNEL PIPE	PART NUMBER
150	SPA00182

CONTRACTOR NOTE:
DRAINAGE CHANNELS TO BE INSTALLED
IN ACCORDANCE WITH MANUFACTURERS
REQUIREMENTS AND RECOMMENDATIONS



THE RESPONSIBILITY TO PROVIDE THE FOUNDATION DESIGN SHOULD BE THAT OF THE PROJECT ENGINEER. THE FOUNDATION SHOULD BE STRONG ENOUGH TO TAKE THE ANTICIPATED LOADS FROM THE LARGEST AIRCRAFT/ VEHICLES THAT WILL TRAFFIC THE CHANNEL.

BLOCK PAVING INSTALLATION
NOT TO SCALE

T1	26.09.22	TENDER ISSUE	CN	LP	LP
Rev	Date	Description	By	Check	App.

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DO NOT THAW LAYERS THAT HAVE BEEN FROZEN.

Client

UNIVERSITY OF MANCHESTER

UNIVERSITY OF MANCHESTER

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Project

MARTIN HARRIS MUSIC BLOCK
UNIVERSITY OF MANCHESTER
BRIDGEFORD, M15 6FH

Office NORWICH - 01603 305 190

Discipline **CIVIL ENGINEERING**

Title DRAINAGE CONSTRUCTION
DETAILS SHEET 2

Scale @ A1

Status	TENDER
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Originator	Job Number	Discipline	Building/Zone
CCL	8/2756	C	MHM
Type	Level	Drawing No.	Revision
DET	DRN	4411	T1

Manhole Schedule - Surface Water											
MH Ref	MH Type	MH Internal Diameter (mm)	Cover Type	No. of Inlets & Outlets	Cover Level (m)	Invert Level (m)	Outgoing Pipe Size (mm)	Depth to Outgoing Pipe Invert (m)	Depth to Outgoing Pipe Soffit (m)	Bedding & Backfill Type	Comments
RE 1	N/A	N/A	C250	1	36.570	36.053	150	0.517	0.367		
SW 1.0	PPIC	450	C250	3	36.670	35.674	150	0.996	0.846		
SW 1.1	PPIC	450	C250	4	36.530	35.461	150	1.069	0.919		
SW 1.2	PPIC	450	C250	4	36.510	35.267	150	1.243	1.093		
RE 2	N/A	N/A	C250	1	36.420	35.820	150	0.600	0.450		
SW 1.3	PCC	1200	C250	2	36.480	34.937	150	1.543	1.393		HYDROBRAKE FLOW CONTROL MANHOLE
SW 1.4	SUPPLIER	SUPPLIER	C250	2	36.500	34.893	150	1.607	1.457		SDS AQUASWIRL - VORTEX SEPARATOR

Manhole Schedule - Foul Water											
MH Ref	MH Type	MH Internal Diameter (mm)	Cover Type	No. of Inlets & Outlets	Cover Level (m)	Invert Level (m)	Outgoing Pipe Size (mm)	Depth to Outgoing Pipe Invert (m)	Depth to Outgoing Pipe Soffit (m)	Bedding & Backfill Type	Comments
FW 1.0	PPIC	450	C250	3	36.490	35.890	100	0.600	0.500		
FW 1.1	PPIC	450	C250	2	36.660	35.836	100	0.824	0.724		
FW 1.2	PPIC	450	C250	2	36.540	35.793	100	0.747	0.647		

Manhole Schedule - Combined Water											
MH Ref	MH Type	MH Internal Diameter (mm)	Cover Type	No. of Inlets & Outlets	Cover Level (m)	Invert Level (m)	Outgoing Pipe Size (mm)	Depth to Outgoing Pipe Invert (m)	Depth to Outgoing Pipe Soffit (m)	Bedding & Backfill Type	Comments
CW 1.0	PPIC	450	C250	3	36.460	34.862	150	1.598	1.448		DEMARCATIION CHAMBER

T1	26.09.22	TENDER ISSUE	CN	LP	LP
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Discipline	CIVIL ENGINEERING		
Title	DRAINAGE CONSTRUCTION MANHOLE SCHEDULE		
Scale @ A1	1:20	Status	TENDER



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SCH	DRN	4415	T1

Birmingham 0121 207 7800 · Glasgow 0141 222 2700 · Liverpool 0151 222 2200 · London 020 3077 0970 · Manchester 0161 616 0000 · Newcastle 0191 221 2272 0932 · Norwich 01603 305 190 · Plymouth 01752 478171 · Reading 0118 941 1788

SDS Aqua-Swirl™

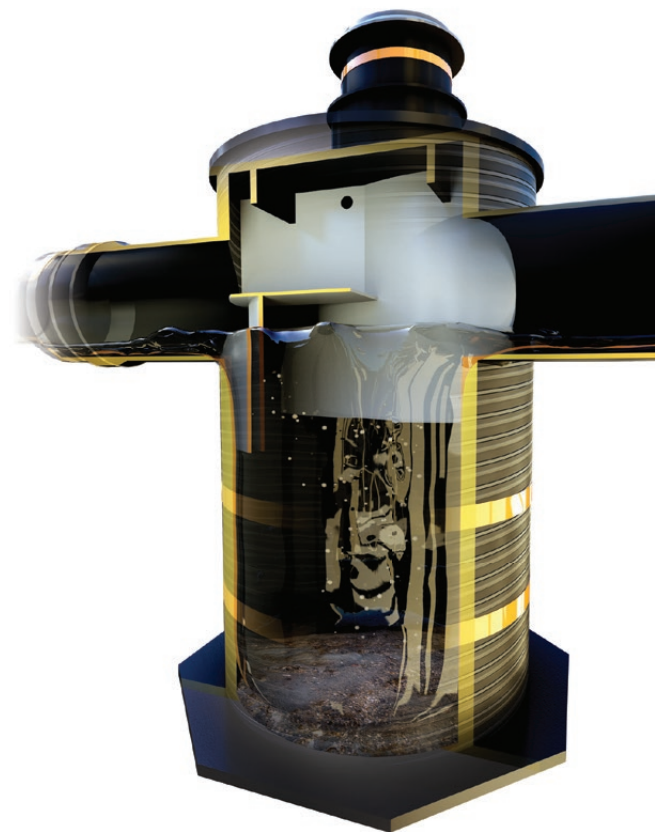
Hydrodynamic Vortex Separator

SDS Aqua-Swirl™ is a custom engineered, flow through water quality device that utilises hydrodynamic separation technology to maximise the removal of sediment, debris and free floating oil within surface water runoff.

SYMBiotic™

When connected to a SDS SYMBiotIC™ system, SDS Aqua-Swirl™ provides real time data on a broad range of key operating factors such as pollutant loads and silt capture level.

- *BBA HAPAS approved*
- *HDPE plastic construction*
- *No moving parts*
- *Sealed baffle*
- *Large debris storage chamber*
- *Lifting supports*
- *Compact dimensions*
- *Available in 9 different sizes*
- *Bespoke sizing available*



SDS Aqua-Swirl™ is sized according to water quality treatment flow rates which are based on the initial movement of pollutants into the storm drainage system. This flow rate typically represents approximately 90% to 95% of the total pollutants in the runoff volume.

The treatment flow rate of the SDS Aqua-Swirl™ system is engineered to meet or exceed the local water quality treatment criteria and form an intrinsic part of the SuDS solution train.

Features	Benefits
Available with performance monitoring via SDS SYMBiotIC™.	Provides bespoke suite of operating data, such as silt levels and pollutants, viewable via a secure web portal dashboard with live notifications via email and text.
BBA HAPAS certified.	Approved for installation under roads and pavements; adoptable by the Highways Agency.
Manufactured from HDPE high strength plastic Weholite.	Offers a durable, light weight and low cost alternative to concrete. Easy and quick to install resulting in substantial cost savings.
Specialised sealed baffle.	Delivers the most effective performance of any vortex separator.
Internal bypass with pollution retention.	Able to treat localised rain and larger storm events while retaining captured pollutants.
NJDEP verified performance.	Verification accepted by UK Government environmental regulators (as cited in the CIRIA C753 SuDS Manual).
Single swirl chamber.	Simplifies inspection and maintenance facilities with no special equipment required.
Compact dimensions.	Reduces ground excavation and product installation costs.
Small footprint design.	Can be retro-fitted with minimal disruption to existing infrastructure utilities or surface features, extending the ability to meet new regulations.
Certified installation lifting supports.	Easy installation without the need for large, expensive cranes.
Suitable for use during site construction programme.	Can be put into operation prior to completion of the site build, with the inclusion of a planned maintenance schedule.
Available in 9 different standard sizes and also bespoke.	Provides greater design flexibility and assists the removal of sediments at a greater rate than comparable systems.

SPECIFICATIONS

SDS Aqua-Swirl™ Model No.	Maximum ID pipe connection (mm) BYP ¹	Chamber Internal Diameter (mm)	Water Quality Treatment Flow Rate NJDEP (L/s) Fine	Water Quality Treatment Flow Rate (L/s) OK110 Coarse	Oil/debris storage capacity litres	Sediment storage capacity m ³	Aqua-Swirl™ Weight kg
AS-2	375	750	16	30	136	0.3	300
AS-3	500	1050	31	53	416	0.6	700
AS-4	600	1200	40	77	644	0.8	1000
AS-5	750	1500	63	120	1382	1.3	1100
AS-6	900	1800	91	173	1439	1.8	1400
AS-7	1050	2100	123	235	1987	2.5	1700
AS-8	1200	2400	161	307	2612	3.3	2200
AS-9	1350	2800	220	418	3596	4.4	2600
AS-10	1500	3000	252	480	4164	5.1	3100

¹BYP (Internal Bypass) provides full treatment of the first flush of water while the peak design storm is diverted and channelled through the main conveyance pipe.

Notes:

Details of pollution mitigation indices, head loss and CAD details, standard drawings and Installation Guides available upon request.

The sediment storage capacity has been calculated in accordance with the relevant test protocol and is not a physical maximum; any additional sediment capacity required is achieved with bespoke deeper units.

For assistance in design and specific sizing using historical rainfall data, please contact SDS.

A-S DS/0819

Appendix I – Network Calculations

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.450
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1.0	0.009	4.00	36.570	450	384419.935	396590.730	0.600
1.1	0.006	4.00	36.560	450	384430.402	396596.272	0.886
1.2	0.021	4.00	36.530	450	384433.298	396604.298	1.069
2.0	0.004	4.00	36.420	450	384415.382	396600.785	0.600
1.3	0.001	4.00	36.510	450	384430.005	396608.607	1.243
1.4			36.500	450	384427.336	396613.644	1.500
1.5			36.420	1200	384424.002	396617.398	1.483

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1.0	1.1	11.844	0.600	35.970	35.674	0.296	40.0	150	4.12	53.1
1.001	1.1	1.2	8.532	0.600	35.674	35.461	0.213	40.0	150	4.21	53.1
1.002	1.2	1.3	5.423	0.600	35.461	35.267	0.194	28.0	150	4.26	53.1
2.000	2.0	1.3	16.584	0.600	35.820	35.267	0.553	30.0	150	4.15	53.1
1.003	1.3	1.4	3.000	0.600	35.267	35.000	0.267	11.2	150	4.28	53.1
1.004	1.4	1.5	5.021	0.600	35.000	34.937	0.063	80.0	150	4.35	53.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.596	28.2	1.3	0.450	0.736	0.009	0.0	22	0.813
1.001	1.596	28.2	2.2	0.736	0.919	0.015	0.0	28	0.942
1.002	1.911	33.8	5.2	0.919	1.093	0.036	0.0	40	1.387
2.000	1.845	32.6	0.6	0.450	1.093	0.004	0.0	14	0.695
1.003	3.022	53.4	5.9	1.093	1.350	0.041	0.0	34	2.002
1.004	1.125	19.9	5.9	1.350	1.333	0.041	0.0	56	0.982

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	11.844	40.0	150	Circular_Default Sewer Type	36.570	35.970	0.450	36.560	35.674	0.736
1.001	8.532	40.0	150	Circular_Default Sewer Type	36.560	35.674	0.736	36.530	35.461	0.919
1.002	5.423	28.0	150	Circular_Default Sewer Type	36.530	35.461	0.919	36.510	35.267	1.093
2.000	16.584	30.0	150	Circular_Default Sewer Type	36.420	35.820	0.450	36.510	35.267	1.093
1.003	3.000	11.2	150	Circular_Default Sewer Type	36.510	35.267	1.093	36.500	35.000	1.350
1.004	5.021	80.0	150	Circular_Default Sewer Type	36.500	35.000	1.350	36.420	34.937	1.333

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1.0	450	Manhole	Adoptable	1.1	450	Manhole	Adoptable
1.001	1.1	450	Manhole	Adoptable	1.2	450	Manhole	Adoptable
1.002	1.2	450	Manhole	Adoptable	1.3	450	Manhole	Adoptable
2.000	2.0	450	Manhole	Adoptable	1.3	450	Manhole	Adoptable
1.003	1.3	450	Manhole	Adoptable	1.4	450	Manhole	Adoptable
1.004	1.4	450	Manhole	Adoptable	1.5	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1.0	384419.935	396590.730	36.570	0.600	450				
						0	1.000	35.970	150
1.1	384430.402	396596.272	36.560	0.886	450		1	1.000	35.674
						0	1.001	35.674	150
1.2	384433.298	396604.298	36.530	1.069	450		1	1.001	35.461
						0	1.002	35.461	150
2.0	384415.382	396600.785	36.420	0.600	450				
						0	2.000	35.820	150
1.3	384430.005	396608.607	36.510	1.243	450		1	2.000	35.267
						2	1.002	35.267	150
						0	1.003	35.267	150
1.4	384427.336	396613.644	36.500	1.500	450		1	1.003	35.000
						0	1.004	35.000	150
1.5	384424.002	396617.398	36.420	1.483	1200		1	1.004	34.937

Simulation Settings

Rainfall Methodology	FEH-13	Skip Steady State	✓	Check Discharge Volume	✓
Summer CV	0.750	Drain Down Time (mins)	240	100 year 360 minute (m³)	
Winter CV	0.840	Additional Storage (m³/ha)	20.0		
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 1.5 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	34.937	Product Number	CTL-SHE-0086-4000-1600-4000
Design Depth (m)	1.600	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	4.0	Min Node Diameter (mm)	1200

Node 1.4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	35.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	66

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	8.0	0.0	0.800	8.0	0.0	0.801	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 97.14%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1.0	10	35.992	0.022	1.3	0.0101	0.0000	OK
15 minute winter	1.1	10	35.702	0.028	2.2	0.0083	0.0000	OK
15 minute winter	1.2	10	35.505	0.044	5.2	0.0242	0.0000	OK
15 minute winter	2.0	10	35.834	0.014	0.6	0.0041	0.0000	OK
15 minute summer	1.3	10	35.301	0.034	5.9	0.0059	0.0000	OK
15 minute winter	1.4	13	35.100	0.100	5.9	0.7724	0.0000	OK
15 minute winter	1.5	14	35.097	0.160	5.5	0.1814	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1.0	1.000	1.1	1.3	0.669	0.046	0.0231	
15 minute winter	1.1	1.001	1.2	2.2	0.675	0.078	0.0281	
15 minute winter	1.2	1.002	1.3	5.2	1.443	0.154	0.0196	
15 minute winter	2.0	2.000	1.3	0.6	0.331	0.018	0.0314	
15 minute summer	1.3	1.003	1.4	5.9	1.498	0.110	0.0198	
15 minute winter	1.4	1.004	1.5	5.5	0.561	0.277	0.0754	
15 minute winter	1.5	Hydro-Brake®		3.2				2.5

Results for 30 year Critical Storm Duration. Lowest mass balance: 97.14%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1.0	10	36.005	0.035	3.3	0.0159	0.0000	OK
15 minute winter	1.1	10	35.719	0.045	5.5	0.0132	0.0000	OK
15 minute summer	1.2	10	35.535	0.074	13.3	0.0408	0.0000	OK
15 minute winter	2.0	10	35.842	0.022	1.5	0.0064	0.0000	OK
30 minute winter	1.3	24	35.428	0.161	11.5	0.0282	0.0000	SURCHARGED
30 minute winter	1.4	25	35.426	0.426	11.4	3.3054	0.0000	SURCHARGED
30 minute winter	1.5	25	35.423	0.486	5.6	0.5497	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1.0	1.000	1.1	3.3	0.883	0.117	0.0444	
15 minute winter	1.1	1.001	1.2	5.5	0.851	0.195	0.0555	
15 minute summer	1.2	1.002	1.3	13.3	1.723	0.395	0.0437	
15 minute winter	2.0	2.000	1.3	1.5	0.381	0.046	0.1496	
30 minute winter	1.3	1.003	1.4	11.4	1.668	0.213	0.0528	
30 minute winter	1.4	1.004	1.5	5.6	0.574	0.280	0.0884	
30 minute winter	1.5	Hydro-Brake®		3.6				8.7

Results for 100 year Critical Storm Duration. Lowest mass balance: 97.14%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1.0	10	36.011	0.041	4.6	0.0188	0.0000	OK
15 minute summer	1.1	10	35.728	0.054	7.7	0.0158	0.0000	OK
30 minute winter	1.2	28	35.688	0.227	14.3	0.1251	0.0000	SURCHARGED
15 minute winter	2.0	10	35.846	0.026	2.1	0.0076	0.0000	OK
30 minute winter	1.3	29	35.686	0.419	16.1	0.0733	0.0000	SURCHARGED
30 minute winter	1.4	29	35.684	0.684	14.3	5.3073	0.0000	SURCHARGED
30 minute winter	1.5	29	35.682	0.745	5.3	0.8423	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1.0	1.000	1.1	4.6	0.964	0.163	0.0568	
15 minute summer	1.1	1.001	1.2	7.7	0.916	0.273	0.0719	
30 minute winter	1.2	1.002	1.3	14.1	1.713	0.419	0.0955	
15 minute winter	2.0	2.000	1.3	2.1	0.386	0.064	0.1613	
30 minute winter	1.3	1.003	1.4	14.3	1.773	0.267	0.0528	
30 minute winter	1.4	1.004	1.5	5.3	0.608	0.266	0.0884	
30 minute winter	1.5	Hydro-Brake®		3.6				12.2

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 97.14%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1.0	48	36.271	0.301	3.4	0.1383	0.0000	FLOOD RISK
60 minute winter	1.1	48	36.271	0.597	5.7	0.1755	0.0000	FLOOD RISK
60 minute winter	1.2	48	36.270	0.809	13.7	0.4468	0.0000	FLOOD RISK
60 minute winter	2.0	48	36.268	0.448	2.9	0.1308	0.0000	FLOOD RISK
60 minute winter	1.3	48	36.268	1.001	14.2	0.1751	0.0000	FLOOD RISK
60 minute winter	1.4	48	36.265	1.265	12.6	6.2849	0.0000	FLOOD RISK
60 minute winter	1.5	48	36.262	1.325	6.4	1.4981	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	1.0	1.000	1.1	3.4	0.888	0.121	0.2085	
60 minute winter	1.1	1.001	1.2	5.7	0.919	0.202	0.1502	
60 minute winter	1.2	1.002	1.3	12.4	1.666	0.366	0.0955	
60 minute winter	2.0	2.000	1.3	-1.7	0.369	-0.051	0.2920	
60 minute winter	1.3	1.003	1.4	12.6	1.608	0.235	0.0528	
60 minute winter	1.4	1.004	1.5	6.4	0.543	0.320	0.0884	
60 minute winter	1.5	Hydro-Brake®		3.7				22.6

Appendix I – Network Calculations