BODDINGTONS BREWERY, MANCHESTER

SITEWIDE DRAINAGE STRATEGY

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1. INTRODUCTION

1.1 Purpose of this Report

This Drainage strategy report has been prepared to support planning application 118831/FO/2018 – *"Erection of two buildings (a part 17, part 12 storey building and a part 26, part 23 storey building) to form 556 residential units (Use Class C3a) together with the creation of 3490 sqm of commercial floor space (Use Classes A1, A2, A3, B1 and D1) with associated landscaping, access and other associated works."*

This report includes the information required in respect to Condition 6 of planning application 118831/FO/2018:

"Notwithstanding the water resources section of the ES stamped as received by the City Council, as Local Planning Authority on the 19 January 2018, (a) Prior to the commencement of a phase of development, a scheme for the drainage of surface water from the new development shall be submitted for approval in writing by the City Council as the Local Planning Authority. For the avoidance of doubt this shall include:

- *Runoff volume in the 1 in 100 year, 6 hours rainfall shall be constrained to a value as close as is reasonable practicable to the greenfield runoff volume for the same event, but never to exceed the runoff volume from the development site prior to redevelopment;*

  Due to the nature of the development it is not feasible to constrain the run-off volume to the greenfield run-off volume and instead the discharge from site will be limited to Qbar. Microdrainage calculations of each of the 3 proposed surface water networks indicates the total run-off volume to be 568m^3 for the 1 in 100 year 6 hour rainfall event (Refer to Appendix K for calculations) and this is less than the existing run-off volume of 599m^3 (Refer to Section 3.1.2 for details)

- *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;*

  The drainage networks have been designed to accommodate the 1 in 100 year +40% climate change rainfall event with no flooding, refer to Appendix L for Microdrainage run-off 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. The flood water should be routed away from the buildings and towards the less vulnerable areas i.e. open spaces, car parks and roads. 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.*

  Refer to Appendix M for Overland Flood Flow Routes. External Levels have been designed to fall away from buildings and towards highways and landscaping areas.

- *Hydraulic calculation of the proposed drainage system;*

  Refer to Appendix L for Proposed Surface Water Microdrainage Calculations for the 1, 2, 30 and 100 Year + 40% CC rainfall events.

- *Construction details of flow control and SuDS elements"*

Refer to Appendix N for Flow Control details, bio-retention detail and typical attenuation tank detail - supplier to produce site specific details for each tank which are to be included within the development O&M Manual.

The report should be read in conjunction with the Flood Risk Assessment & Drainage Strategy submitted as part of the original planning application.

- Flood Risk Assessment & Drainage Strategy – LO10517/R005.0 – December 2017 – Wardell Armstong

2. THE SITE

2.1 Site Location

The site situated on the Northern outskirts of Manchester city centre, approx. 200m northwest of Manchester Victoria railway station and opposite the MEN Arena. Site address is Dutton Street, Cheetham Hill, Greater Manchester, M3 1LE and is centred at National Grid Reference 383870E, 399260N. The site forms part of the former Boddingtons Brewery site.



Figure 2.1: Site Location

2.2 Site Description

The site boundaries are formed by highways on 2 sides: Dutton Street to the East and New Bridge Street to the south. The western side of the site abuts The Manchester City College - City Campus. Julia Street is located approximately 80m to south of the site.

Currently the site is occupied by a residential building and concrete hardstanding used as a private car park. The building is 2 storey structure that is scheduled to be demolished as part of the enabling works for the scheme.

The elevation of the site increases from approximately 29m AOD in the north-east corner to approximately 40m AOD in the south-west side.

Refer to Appendix A for the topographical survey.

2.3 Existing Site Drainage

A review of the topographical and utilities survey suggests that there are existing below ground drainage systems on site that drain the surface level car park that has been created since the demolition of the brewery buildings. There are areas of vegetation that slope to form the level differences across the site and other areas of overgrown vegetation that are underlay by redundant concrete slabs. As such it is appropriate to consider the site as 100% impermeable.

Refer to Appendix B for the Utility Survey.

Refer to Appendix C for United Utilities Sewer Maps.

2.4 Geology

Instructive site investigations have been undertaken by Brownfield Solutions Ltd (BSL). The following reports have been reviewed:

- Phase II Geo-Environmental Assessment Report – JEM/C5313/12029
- Piling Risk Assessment – JEM-C5313/12036
- Addendum Ground Gas Risk Assessment – AJS/C5313/12125

Within the BSL reports the site has been split into 3 areas which are indicated by the figure below.



Figure 2.2: Site Investigation Areas

2.4.1 Made Ground

Made ground is present across all areas of the site. This is comprised of asphalt concrete, gravely sand and sandy gravelly clay. The depth of made ground varies between 0.45m to 4.60m.

2.4.2 Superficial Deposits

The composition and depth of superficial soils is shown to vary substantially with respect to the different areas of site.

Area A has natural superficial deposits comprising interbedded granular and cohesive stratum to depths between 0.50m and 22.00m. Area B natural superficial deposits comprising slightly gravelly slightly sandy clay to depths between 0.95m and 5.38m. Area C has natural superficial deposits comprising sand and gravel to depths between 3.00m and 11.50m

2.4.3 Solid Geology

The underlying bedrock is indicated to be part of the Chester Formation which typically comprises sandstone. Bedrock level varies substantially across the site. The bedrock slopes down by 10m from the North to the South of the site. The change in bedrock level is further intensified by the

drop in topographic level across the site. No faults are shown on or within an influencing distance of the site.

2.5 Hydrogeology & Hydrology

The following sections are based on the following reports:

- Phase 1 Desktop Study – Contaminated Land Assessment – LO10517/R006.01 – December 2017 – Wardell Armstrong
- Phase II Geo-Environmental Assessment Report – JEM/C5313/12029 – Brownfield Solutions Ltd

2.5.1 Hydrogeology

The superficial deposits underlying the site are classified as a Secondary Undifferentiated Aquifer. Secondary undifferentiated aquifers typically have variable characteristics and may be identified as Secondary A or B aquifers (minor or non-aquifers).

The underlying solid strata is classified as a Principal Aquifer. Principal aquifers are highly permeable formations usually with a known or probable presence of significant fracturing. They are usually highly productive, strategic reserves able to support large abstractions, public water supply and river base flow.

There is an active groundwater abstraction license onsite, operated by Interbrew UK Ltd for drinking, cooking, sanitary and washing purposes as well as brewery processes. Although the closure and demolition of the brewery suggests that groundwater abstraction no longer occurs although the license is still active. There are also a number of additional ground water abstraction licenses within 2km of the site.

The site does not lie within a source protection zone.

The site is considered to have a high leaching potential (HU) due to the site's urban location.

During the recent BSL site investigation, groundwater levels have ranged between 0.30m and 20.0m below ground level.

2.5.2 Hydrology

The nearest graded watercourse is the River Irk which is approximately 171m east of the site.

2.6 Proposed Development

Erection of two buildings (a part 17, part 12 storey building and a part 26, part 23 storey building) to form 556 residential units (Use Class C3a) together with the creation of 3490 sqm of commercial floor space (Use Classes A1, A2, A3, B1 and D1) with associated landscaping, access and other associated works.

Refer to Appendix D for proposed development plans.

3. EXISTING & PROPOSED SURFACE WATER DISCHARGE RATES

3.1 Pre-Development Surface Water Run-Off Rates

A review of the topographical survey and aerial images indicated that the existing site area is circa 1.2 ha and consists of approximately 76% (0.91ha) hard standing and 24% (0.29ha) vegetation. The areas of vegetation are either steep slopes between the level differences across the site or overgrown vegetation situated above redundant concrete slabs. As such it is appropriate to consider the existing site as 100% impermeable.

The existing site run-off rates and volume have been calculated as brownfield and greenfield to provide a comparison that will inform the proposed design.

3.1.1 Existing Brownfield Run-Off Rates

The brownfield run off rates have been calculated using the Modified Rational Method using the rainfall profile provided in Appendix E.

Modified Rational Method: $\boldsymbol{Q = 2.78Ci_{(peak)}A}$

$$\boldsymbol{C = C_V C_R}$$

$$\boldsymbol{C = 0.84 \times 1.3}$$

Return Period	$I_{(peak)}$ (mm/hr)	Area (ha)	Peak Runoff (l/s)
1 in 1 Year	13.427	1.20	48.9
1 in 2 Year	16.383	1.20	59.7
1 in 30 Year	29.886	1.20	108.9
1 in 100 Year	38.870	1.20	141.6

Table 3.1: Brownfield Run-Off Rates

3.1.2 Existing Brownfield Run-Off Volume

The existing brownfield run off volume expected for a site of this size for a 100-year 6-hour storm has been calculated using the modified rational method.

$$\boldsymbol{Runoff\ Volume = 10C \times i_{(average)} \times A \times storm\ duration}$$

$$\boldsymbol{Runoff\ Volume = 10 \times 0.84 \times 9.916 \times 1.2 \times 6}$$

$$\boldsymbol{Runoff\ Volume = 599.720m^3}$$

3.1.3 Existing Greenfield Run-Off Rates

The greenfield run-off for the site has been calculated using the MicroDrainage ICP SUDS method. This method utilises the IH124 method and linearly interpolates for sites less 50 hectares. Due to the urban environment that the site is situated in and given that a large proportion of site is urbanised (76% hard standing) it is considered appropriate to apply an urban factor to Qbar. A bar has a return period of approximately 2.3 years. Refer to Appendix F for Microdrainage Greenfield Run-Off Rates.

Return Period	Q (l/s)
1 in 1 Year	15.2
1 in 2 Year	17.8
1 in 30 Year	25.3
1 in 100 Year	27.5
$Q_{bar\ (Rural)}$	7.1
$Q_{bar\ (Urban)}$	17.5

Table 3.2: Greenfield Run-Off Rates

3.1.4 Existing Greenfield Run-Off Volume

The existing greenfield run off volume expected for a site of this size for a 100-year 6-hour storm has been calculated using the Greenfield Volume calculator within Microdrainage assuming an urbanised catchment ratio of 0.75. The Greenfield Runoff Volume is calculated to be **385.567m³**. Refer to Appendix G for Microdrainage Drainage Greenfield Run-Off Volume calculation.

3.2 Proposed Surface Water Discharge Rates

As per the Strategic Flood Risk Assessment (SFRA), the drainage strategy submitted as part of the original planning submission proposed that discharge rates where to be reduced by at least 50% compared to the existing brownfield rates with an aim to reduce to greenfield run-off rates wherever possible.

A predevelopment enquiry has been submitted to United Utilities (UU) and as per the North West SuDS Pro-Forma they have agreed for the discharge from the development to be restricted to **$Q_{bar\ (Urban)}$, 17.5 l/s**, to control the flow and volume of runoff from the site into the public sewer. Refer to Appendix H for the predevelopment enquiry correspondence.

4. SURFACE WATER DISCHARGE & SUDS ASSESSMENT

4.1 Surface Water Discharge Assessment

In accordance with the National Planning Practice Guidance (PPG), the following hierarchy of surface water drainage options has been considered:

- Discharge into the ground (infiltration);
- Discharge to a surface water body;
- Discharge to a surface water sewer, highway drain, or another drainage system;
- Discharge to a combined sewer.

4.1.1 Discharge to Ground (Infiltration)

The Phase II completed by BSL indicates the site is underlain by made ground to depths of up to 4.60m bgl which would pose risks to the mobilisation of contaminations should infiltration be utilised. Groundwater was also encountered at shallow depths which would limit infiltration rates and conflict with soakaway detailing. The intrusive investigations also identified multiple concrete slabs circa 2m below ground associated with previous uses of the site. For the reasons set out above infiltration has been discounted.

4.1.2 Connection to a Watercourse

Opportunities to discharge to a watercourse have also been considered. The closest watercourse is the River Irk which lies 171m east of the site. All routes to the River would require passing through third party land or constructing new surface water drainage in the already extremely congested City centre highways. The Phase II works completed by BSL attempted to identify a possible historic culvert via trenching, but no such feature was located. This also correlates with the investigation works undertaken on the adjacent site. As such this option is discounted.

4.1.3 Connection to a Sewer

The UU sewer asset maps show a small section of surface drainage adjacent to the site however identifies this as ‘private drainage’. It is understood that this is redundant as it has not been encountered during the site enabling works or in to topographical / utility surveys. As such there are no surface water sewers in close proximity to the site however there are several combined sewers in the highways surrounding the site. It is therefore proposed that surface water should be discharged into the combined sewer network, and this has been agreed in principle via a predevelopment enquiry with UU. Connection to the public sewer will be subject to a S106 application with UU. Each connection would require a separate S106 application.

4.2 Sustainable Drainage Systems (SuDS) Assessment

The table below provides a summary of typical SuDS outlined within CIRIA guide C753 ‘The SuDS Manual’. It provides an assessment of the various above and below ground SuDS that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated into this development. The purpose of this assessment is to set out the options that can be considered within the final drainage network and do not mean that all suitable features need to be incorporated into the final design.

SuDS Technique	Description	Suitability for development site	
Rainwater Harvesting	Collection of rainwater run-off for use	Large impermeable area and limited usage deems this unsuitable. Running and maintenance costs would not be acceptable to the client	×
Green Roof	Vegetated roof area that reduces runoff and increases time of concentration.	Not efficient due to stepped roofs. Also, additional structure and costs due to increased loading.	×
Blue Roof	Roof area designed to store and reduce peak runoff rates during intense storms.	Not efficient due to stepped roofs. Also, additional structure and costs due to increased loading.	×
Infiltration systems	Systems that collect and storage runoff allowing it to infiltrate into the ground.	The large depths of made ground and shallow groundwater mean infiltration is not viable.	×
Proprietary treatment systems	Underground structures designed to provide treatment to runoff	The site has a low pollution hazard rating so does not require a proprietary treatment system	×
Filter Strips	Grass strips that promote sedimentation and filtration as runoff is conveyed over the surface	Urban nature of the development means there are no large grass strips	×
Filter Drains	Granular filled Linear drains / soakaway with either granular fill and perforated pipe, or dense vegetation that treat runoff from adjacent impermeable areas	Not suitable due to known ground conditions	×
Swales	Shallow landscape channels that treat and convey runoff.	Urban nature of the development means this is not a viable option.	×
Bioretention systems	Shallow landscape depressions that allow runoff to pond temporarily on the surface, before filtering through vegetation and underling soils. Can either infiltrate or convey via perforated pipes.	Suitable as lined system with perforated pipes	✓
Trees	Tress within soil filled pits or permeable paving that can collect, store and treat run off	Maybe suitable subject to detailing.	?
Pervious Paving	Granular build-up beneath permeable paving systems that can be used to either store runoff (lined system) and increase time of concentration or allow percolation into the ground.	Not suitable due to known ground conditions	×
Attenuation Storage tanks/ large diameter pipes	Large underground voided spaces used to storage runoff before infiltration or controlled discharge	Suitable to store and convey surface water run off	✓
Ponds and wetlands	Permanent pools of water used to treat run-off and provide attenuation above normal water level	Urban nature of the development means this is not a viable option.	×
Detention Basins	Dry basins that are designed to temporarily store runoff providing water quality treatment. Can either be positively drained or infiltrate or both.	Urban nature of the development means this is not a viable option.	×

× Not suitable ? Potentially suitable subject to further investigation ✓ Suitable

Table 4.1: SuDS Techniques & Suitability for Development Site

4.3 Water Quality Assessment

To assess the water quality consideration will be given to the guidance with the National Standard for Sustainable Urban Drainage (NSSUD) and CIRIA Guide C753. The pollution hazard levels for difference land uses are presented in table 4.2 and are based on the definitions in the NSSUD and C753.

Pollution Hazard Level	Land Use
Very Low	Residential roofs
Low	Individual property driveways, non-residential roofs, residential car parks, low traffic roads, non-residential car parking with infrequent change (e.g. Schools, offices)
Medium	Commercial yards and delivery areas, non-residential car parking with frequent change (e.g. hospital, retail), minor roads
High	Site with heavy pollution (e.g. Haulage yards, lorry parks, waste sites, sites with chemical and fuels are delivered, handled, stored etc.)

Table 4.2: Pollution Hazard Levels

The runoff from the site will be from the building roofs and external hard landscaped areas which will be predominately pedestrian areas with infrequent emergency, refuse and delivery vehicles. As such the pollution hazard level is considered to be low with the primary consideration given to the removal of gross solids and sediment.

Given surface water runoff from the development is to discharge into the combined sewers no treatment is required. However the use of silt tramps and SuDS will provide inherent treatment.

4.4 SuDS Maintenance and Management Plan

The SuDS and below ground drainage networks are to be maintained by the property owners or a maintenance company employment on their behalf. They will be required to maintain the SuDS in line with the recommendations set out within the 'The SuDS Manual C753' and the suppliers' requirements.

The following operation and maintenance requirements for the SuDS that may be incorporated into the development are to be adopted by the Building Management Company. These requirements are general and have been extracted from 'The SuDS Manual C753'.

- Table 18.3 – Operation and maintenance requirements for bioretention systems
- Table 19.3 – Operation and maintenance requirements for Trees
- Table 21.3 – Operation and maintenance requirement for Attenuation storage tanks

The contractor delivering the development is to produce a verification report of the installed SuDS which should include any product specification requirements, and this should form part of the Operation & Maintenance Manual for the development.

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess pants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular Maintenance	Remove litter, surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional Maintenance	Infill any holes or scour in the filter medium, improve erosions protection if required	As required
	Repair minor accumulation of silt by raking away surface mulch scarifying surface of medium and replacing mulch.	As required
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be >20 years

Table 4.1 - Operation and Maintenance requirements for Bio-Retention Systems (Table 18.3 'The SuDS Manual C753)

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets and outlets	Inspect monthly
Occasional Maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually, or as required
	Water	As required (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

Table 4.2 - Operation and Maintenance requirements for Trees (Table 19.3 'The SuDS Manual C753)

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/ rehabilitate inlets, outlets, overflows and vents	As required
Monitoring	Inspect/ check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tanks for sediment build-up and remove if necessary	Every 5 years or as required

Table 4.3 - Operation and Maintenance requirements for Attenuation Storage Tanks (Table 21.3 'The SuDS Manual C753)

5. DRAINAGE STRATEGY

5.1 Surface Water System

Due to the levels differences across the development it is proposed that there will be 3 separate surface water networks that are to collect run off from the building roofs and external hard landscaping. Each system will connect to the combined sewers within the surrounding highways via new connections and will be restricted to the greenfield run off rates identified in Section 3.0. One area of the development is land locked and as such drainage needs to be installed within 3rd party line in order to reach the public sewer. The route and associated easements have been discussed and agreed with the landowner, refer to Appendix P for correspondence. The surface water discharge rates from the site will be restricted by a vortex flow control within the final surface water manhole before discharging to the public sewer. Each connection to the combined sewer will require a S106 application with UU.

Surface water attenuation will be provided by oversized pipes and manholes, below ground geo-cellular tanks and bio-retention systems.

As detailed within Section 4.0 no surface water treatment is required prior to discharging into the public combined sewer however the adoption of silt traps, catchpit manholes and SuDS will provide inherent treatment.

The surface water drainage networks are to be designed and constructed in accordance with Building Regulations Part H, BS EN 752 and the Sewerage Sector Guidance (SSG). In addition the following requirements will also be adopted in accordance with the Non-Statutory Technical Standards for Sustainable Drainage, National Planning Policy Framework and Planning Practice Guidance:

- Foul and surface water are to be drained via separate systems.
- The below ground drainage system will be designed to ensure flooding does not occur on site for the 1 in 30 year events and no internal flooding for the 1 in 100 year events.
- The surface water system is to be designed to accommodate the 1, 2, 30 and 100 year events with a 40% climate change allowance for the 100 year event.
- The system will be designed for a maximum storm duration of 6 hours.

Refer to Appendix J for the Below Ground Drainage drawings.

Refer to Appendix K & L for supporting surface water microdrainage calculations.

Refer to Appendix M for Overland Flow Routes

Refer to Appendix N for Flow Control and SuDS Details

5.2 Foul Water System

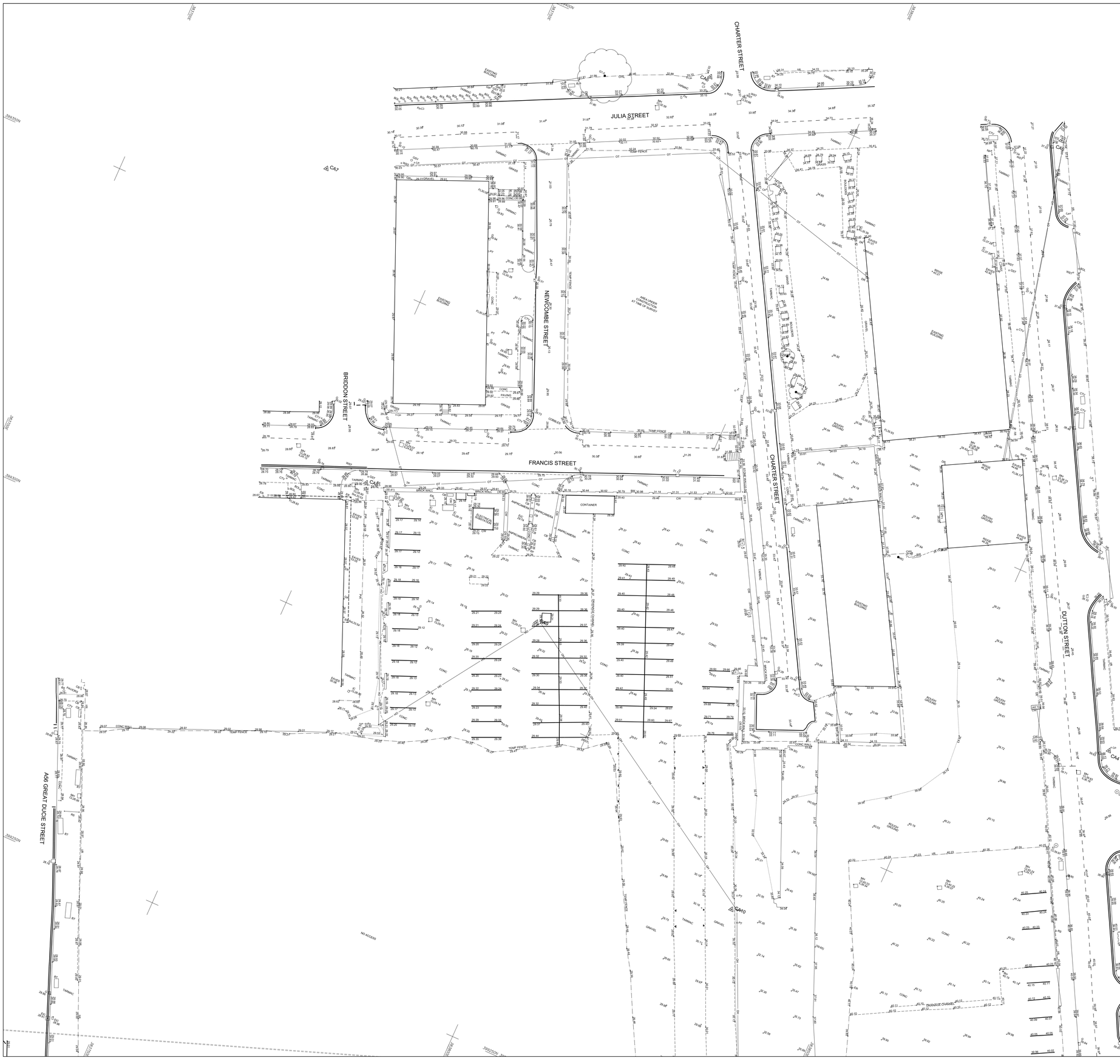
Similarly to the surface water design the site is to have 3 separate foul water networks that collect the foul water associated with the residential apartments and retail spaces. Each network will have a separate connection to the combined sewers that surround the development and require separate S106 applications with UU.

It has been confirmed by UU via a pre-development enquiry that connects to the combined sewers at unrestricted rates are acceptable.

The foul networks are to be designed and constructed in accordance with Building Regulations Part H, BS EN 752 and the Sewerage Sector Guidance (SSG).

APPENDIX A

TOPOGRAPHICAL SURVEY



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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.

Area Surveyed March 2023 as requested and added to Survey Operations Drawing 22K242 Shown within bold dashed line.

Revision - Date - Description
A - 24/05/23 - Invert levels added to survey.

SURVEY STATIONS

Name	Eastings	Northings	Height
CA1	383947.00	399187.93	36.60
CA2	383804.61	399272.47	40.00
CA3	383904.61	399272.47	40.00
CA4	383873.50	399330.34	39.79
CA5	383829.14	399412.21	37.51
CA6	383776.40	399399.32	33.34
CA7	383728.75	399302.81	29.82
CA8	383753.73	399321.58	28.90
CA9	383753.73	399321.58	28.90
CA10	383830.86	399284.91	30.31
S01	383756.45	399202.28	29.27
S02	383806.81	399236.58	29.81
LB1	383830.90	399360.32	38.30
LB2	383835.69	399347.68	38.03
LB3	383815.02	399392.18	35.38
LB4	383838.72	399321.11	33.89

STANDARD REFERENCE & ABBREVIATIONS

ANR:.....Assumed Route	IL:.....Invert Level
AB:.....Air Brick	IP:.....Inlet Pipe
AV:.....Air Valve	KO:.....Kerb Outlet
B/W:.....Barbed Wire	LB:.....Letter Box
BAR:.....Barrier	LP:.....Lamp Post
BB:.....Bellaby Beacon	MG:.....Multi-Girth
BH:.....Borehole	MH:.....Manhole
BL:.....Bed Level	MKR:.....Marker
BOL:.....Bollard	MP:.....Mooring Point
BS:.....Bus Stop	NP:.....Street Name Plate
BT Box:...British Telecom Box	O/H:.....Overhead
BT:.....British Telecom IC	O/P:.....Open Paling
BWTW:.....Brick Retaining Wall	OE:.....Overhead Electric Wire
BW:.....Brick Wall	OP:.....Outfall Pipe
C/B:.....Close Boarded	OSBM:.....Ordnance Survey Bench Mark
C/I:.....Corrugated Iron	OT:.....Overhead Telecom Wire
C/P:.....Chestnut Paling	P/C:.....Post & Chain
CB:.....Control Box	P/R:.....Post & Rail
CBW:.....Concrete Block Wall	P/W:.....Post & Wire
CCTV:.....Closed Circuit TV	PAV:.....Paving
CD:.....Cable Duct	PB:.....Pillar Box
CEL:.....Cellar Light	PC:.....Pedestrian Crossing
CHL:.....Chain Link	PP:.....Petrol Pump
CHY:.....Chimney	PT:.....Post or Pillar
CL:.....Cover Level	RE:.....Rodding Eye
CN:.....Cable Marker	RS:.....Road Sign
COL:.....Column	RTW:.....Retaining Wall
CONC:.....Concrete	RWP:.....Rain Water Pipe
CP:.....Catch Pit	SAP:.....Sapling
CRTW:.....Concrete Retaining Wall	SL:.....Sump Level
CTV:.....Cable Television	SO:.....Soffit Level
CU:.....Culvert	SP:.....Sign Post
CW:.....Concrete Block Wall	SPK:.....Sprinkling Level
DC:.....Drainage Channel	SRTW:.....Stone Retaining Wall
DPC:.....Damp Proof Course	SV:.....Stop Valve (unspecified)
DR:.....Drain	SVP:.....Soil Vent Pipe
DSW:.....Dry Stone Wall	SW:.....Stone Wall
ECP:.....Electricity Cable Pit	TAC:.....Tactile Paving
ECI:.....Electricity Inspection Cover	TB:.....Traffic Bollard
Ex:.....Expansion Joint	TBM:.....Temporary Bench Mark
EJB:.....Electricity Junction Box	TCB:.....Telephone Cable Box
EL SUB STN..Electricity Sub Station	TPR:.....Taken From Records
EL:.....Eaves Level	TIE:.....Anchor Point (Boats/Piles)
ELB:.....Electricity Box	TL:.....Traffic Light
EP:.....Electricity Pole	TLB:.....Traffic Light Control Box
ER:.....Earth Rod	TM:.....Ticket Machine
ETL:.....Electricity Transmission Line	TWC:.....Tarmac
FB:.....Flower Bed	TP:.....Telecommunications Pole
FH:.....Fire Hydrant	TPIT:.....Trial Pit
FL:.....Floor Level	TS:.....Trash Screen
FP:.....Flagpole	U/C:.....Under Construction
G:.....Earth (of tree)	U/G:.....Underground
G:.....Gulley	UTL:.....Unable to Lift (BM,IC etc)
GAR:.....Gabion	UTS:.....Unable to Survey
GIP:.....Gas Inlet Pipe	VDP:.....Vehicle Detector Pad
GMKR:.....Gas Marker	VP:.....Vent Pipe
GST:.....Gas Stop Tap (Domestic)	W/M:.....Wire Mesh
GSV:.....Gas Stop Valve (Mains)	WL:.....Water Level
HSE:.....Housing	WM:.....Water Meter
HT:.....Height	WO:.....Wash Out
HV:.....High Voltage	WP:.....Waste Pipe
I/R:.....Iron Railing	WST:.....Water Stop Tap (domestic)
IC:.....Inspection Cover	WSV:.....Water Stop Valve (mains)

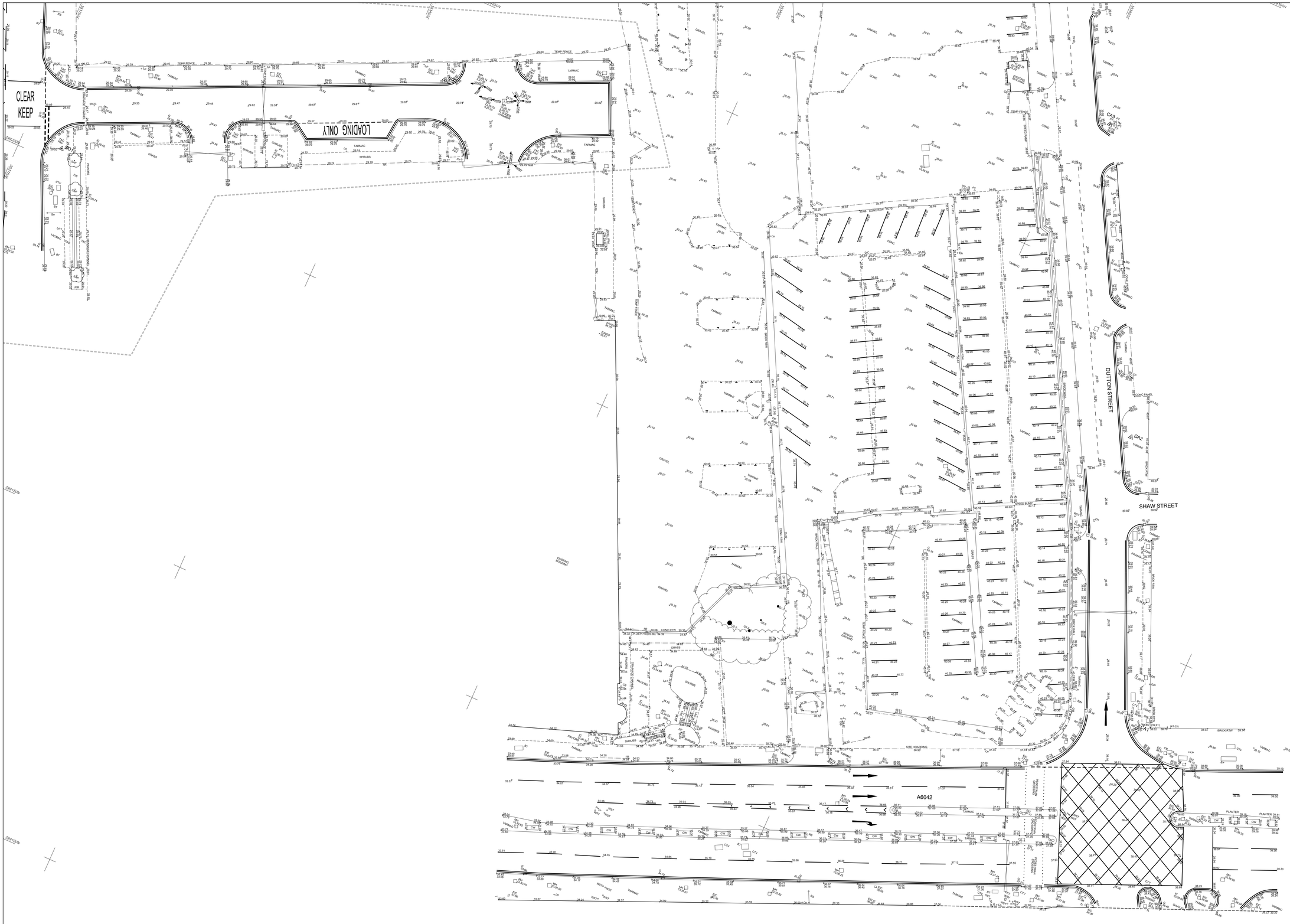
SurveY OPERATIONS
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Client
Domis Construction Ltd

Drawing Title
Topographical Survey of:
The Brwry
Manchester
Sheet 1 of 2

Scale(s) 1:200	Surveyor CA
Date Mar 23	Drawn JE/MP
Job Number 23B136	Checked TP

Sheet Size & Drg Number & Revision
A0 23B136/001/A



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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.

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Area Surveyed March 2023 as requested and added to Survey Operations Drawing 22K242 Shown within bold dashed line.

Revision - Date - Description
A - 24/05/23 - Invert levels added to survey.

SURVEY STATIONS

Name	Eastings	Northings	Height
CA1	383947.00	399187.93	38.60
CA2	383904.61	399272.47	40.03
CA3	383904.65	399272.47	40.03
CA4	383873.50	399330.34	39.79
CA5	383829.14	399412.21	37.51
CA6	383776.40	399399.32	33.34
CA7	383728.75	399302.87	29.82
CA8	383753.73	399321.58	28.90
CA9	383784.73	399263.71	30.50
CA10	383830.86	399284.91	30.31
S01	383766.45	399202.28	29.27
S02	383806.81	399236.58	29.81
LB1	383830.90	399360.32	38.30
LB2	383835.69	399347.68	38.01
LB3	383815.02	399392.18	35.38
LB4	383838.72	399321.11	33.89

STANDARD REFERENCE & ABBREVIATIONS

ANR:.....Assumed Route	IL.....Invert Level
AB.....Air Brick	IP.....Inlet Pipe
AV.....Air Valve	KO.....Kerb Outlet
B/B.....Barbed Wire	LB.....Letter Box
BAR.....Barrier	LP.....Lamp Post
BB.....Belisha Beacon	MG.....Multi Girth
BH.....Borehole	MH.....Manhole
BL.....Bed Level	MKR.....Marker
BOL.....Bollard	MP.....Mooring Point
BS.....Bus Stop	NP.....Street Name Plate
BT Box.....British Telecom Box	O/H.....Overhead
BT.....British Telecom IC	O/P.....Open Paling
BWTR.....Brick Retaining Wall	OE.....Overhead Electric Wire
BW.....Brick Wall	OP.....Outfall Pipe
C/B.....Close Boarded	OSBM.....Ordnance Survey Bench Mark
C/I.....Corrugated Iron	OT.....Overhead Telecom Wire
C/P.....Chestnut Paling	P/C.....Post & Chain
CB.....Control Box	P/R.....Post & Rail
CBW.....Concrete Block Wall	P/W.....Post & Wire
CCTV.....Closed Circuit TV	PAV.....Paving
CD.....Cable Duct	PB.....Pillar Box
CEL.....Cellar Light	PC.....Pedestrian Crossing
CHL.....Chain Link	PP.....Petrol Pump
CHY.....Chimney	PT.....Post in Pillar
CL.....Cover Level	RE.....Rodding Eye
CM.....Cable Marker	RS.....Road Sign
COL.....Colum	RTW.....Retaining Wall
CONC.....Concrete	RWP.....Rain Water Pipe
CP.....Catch Pit	SAP.....Sapling
CRTW.....Concrete Retaining Wall	SL.....Sump Level
CTV.....Cable Television	SOL.....Soffit Level
CU.....Culvert	SP.....Sign Post
CW.....Concrete Block Wall	SPL.....Springing Level
DC.....Drainage Channel	SRTW.....Stone Retaining Wall
DPC.....Damp Proof Course	SV.....Stop Valve (unspecified)
DR.....Drain	SVP.....Soil Vent Pipe
DSW.....Dry Stone Wall	SW.....Stone Wall
ESP.....Electricity Cable Pit	TAC.....Tactile Paving
ESI.....Electricity Inspection Cover	TB.....Traffic Bollard
Ex.....Expansion Joint	TBM.....Temporary Bench Mark
EJB.....Electricity Junction Box	TCB.....Telephone Call Box
EL SUB STN..Electricity Sub Station	TPR.....Taken From Records
FL.....Eaves Level	TIE.....Anchor Point (Boats/Poles)
FLB.....Electricity Box	TL.....Traffic Light
EP.....Electricity Pile	TLB.....Traffic Light Control Box
ER.....Earth Rod	TM.....Ticket Machine
ETL.....Electricity Transmission Line	TWC.....Tarmac
FB.....Flower Bed	TP.....Telecommunications Pole
FH.....Fire Hydrant	TPIT.....Trial Pit
FL.....Floor Level	TS.....Trash Screen
FP.....Flagpole	U/C.....Under Construction
G/.....Girth (of tree)	U/G.....Underground
G.....Gulley	UTL.....Unable to Lift (BH,IC etc)
GAB.....Gabion	UTS.....Unable to Survey
GIP.....Gas Inlet Pipe	VDP.....Vehicle Detector Pad
GMKR.....Gas Marker	VP.....Vent Pipe
GOT.....Gas Stop Tap (Domestic)	W/B.....Wire Mesh
GSV.....Gas Stop Valve (Mains)	WL.....Water Level
HSE.....Housing	WM.....Water Meter
HT.....Height	WO.....Wash Out
HV.....High Voltage	WP.....Waste Pipe
I/R.....Iron Railing	WST.....Water Stop Tap (Domestic)
IC.....Inspection Cover	WSV.....Water Stop Valve (Mains)

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Client
Domis Construction Ltd

Drawing Title
Topographical Survey of:
The Brwry
Manchester
Sheet 2 of 2

Scale(s) 1:200	Surveyor CA
Date Mar 23	Drawn JE/MP
Job Number 23B136	Checked TP

Sheet Size & Drg Number & Revision
A0 23B136/002/A

APPENDIX B

UTILITY SURVEY



SW	STORM WATER SEWERS
FW	FOUL WATER SEWERS
WM	WATER MAIN
GM	GAS MAIN
EL	ELECTRIC CABLES
DUCT	CABLE DUCTING
BT	BT (UNDERGROUND)
CTV	CABLE TV
CCTV	CLOSED CIRCUIT TV
UI	UNIDENTIFIED FEATURE
UP	UNIDENTIFIED PIPE
UC	UNIDENTIFIED CABLE
UNPR	UNPROVEN FEATURE
SW	END OF TRACE
FW (C)	LATERAL CONNECTIONS
	EXTENT OF SURVEY BY SURVEY OPERATIONS LTD.
FW / SW	CONNECTIVITY BETWEEN CHAMBERS FROM CCTV REPORT
□	COVER POSITION FROM CCTV REPORT – NOT SURVEYED ON TOPOGRAPHICAL SURVEY.
⊗0.0d	BURIED FEATURE FOUND USING RADAR

UNIDENTIFIED – A buried feature or utility that has been located, but we are unable to state what it is.

UNPROVEN – The assumed location of a reported feature or utility, usually taken from records, but not found during the utility trace (due to various conditions).

CAUTION – Electric pot ended cables, even when they are live, are unable to be detected or traced.

UNDERGROUND UTILITIES SERVICES DISCLAIMER

Where indicated, no allowance has been made for sub-surface entry into manholes, other chambers or confined spaces below ground level. Therefore any details relating to depths, sizes etc, are taken from the surface and as such will be approximate.

We have endeavoured to supply you with the most accurate data possible by using methods and equipment that are at the forefront of our industry. We have taken great care in the detection of pipework and buried features, but as with all methods of detecting underground or buried utilities the information provided is based on results obtained from electromagnetic techniques, and as such may be liable to distortion or errors beyond the reasonable control of the operator or his instruments.

It is the responsibility of the user under Health & Safety (HSG47) Guidelines to satisfy himself of the suspected location of any services prior to excavation of the services shown.

NOTE 1

This utility survey has been undertaken using:
A: Radiodetection RD4000 + RD4000 TIO
B: Mala Geoscience Ground Probing Radar

NOTE 2

Power carrying features shown on this drawing are shown as an individual service line. This does not necessarily represent the number of cables actually present and it is possible that there could be multi numbers of cables including HV, LV and communications transmission cables following the same trace line. These could be at different depths, the trace signal from the deeper cables being masked by signal emitted from the shallower service above. Cable runs could also be present running parallel to the single line shown.

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.

UI — Line of possible Sub-Surface feature determined from GPR contacts.

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N

Note:
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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.

Drainage information must be verified with local authority records before use

Revision - Date - Description
A - 24/05/23 - Additional information added from CCTV report.

SURVEY STATIONS

Name	Easting	Northing	Height
CA1	383947.00	399187.93	38.60
CA2	383927.55	399229.12	40.02
CA3	383904.61	399272.47	40.00
CA4	383873.50	399330.34	39.79
CA5	383829.14	399412.21	37.51
CA6	383776.40	399399.32	33.34
CA7	383728.75	399362.81	29.82
CA8	383753.73	399321.58	28.90
CA9	383786.00	399312.75	29.29
CA10	383830.86	399284.91	30.31
SO1	383756.45	399202.28	29.27
SO2	383806.81	399236.58	29.81
LB1	383830.90	399360.32	38.30
LB2	383835.69	399347.68	38.03
LB3	383815.02	399392.18	35.38
LB4	383838.72	399321.11	33.89

1

2

STANDARD REFERENCE & ABBREVIATIONS

(AR)........Assumed Route	IL..........Invert Level
AB..........Air Brick	IP..........Inlet Pipe
AV..........Air Valve	KO..........Kerb Outlet
B/W.........Barbed Wire	LB..........Letter Box
BAR.........Barrier	LP..........Lamp Post
BB..........Belisha Beacon	MG..........Multi-Girth
BH..........Borehole	MH..........Manhole
BL..........Bed Level	MKR.........Marker
BOL.........Bollard	MP..........Mooring Point
BS..........Bus Stop	NP..........Street Name Plate
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CH/L........Chain Link	PP..........Petrol Pump
CHY.........Chimney	PT..........Post or Pillar
CL..........Cover Level	RE..........Rodding Eye
CM..........Cable Marker	RS..........Road Sign
COL.........Column	RTW.........Retaining Wall
CONC........Concrete	RWP.........Rain Water Pipe
CP..........Catch Pit	SAP.........Sapling
CRTW........Concrete Retaining Wall	SL..........Sump Level
CTV.........Cable Television	SoL.........Soffit Level
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CW..........Concrete Block Wall	SPL.........Springing Level
DC..........Drainage Channel	SRTW........Stone Retaining Wall
DPC.........Damp Proof Course	SV..........Stop Valve (unspecified)
DR..........Drain	SVP.........Soil Vent Pipe
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FL..........Floor Level	TS..........Trash Screen
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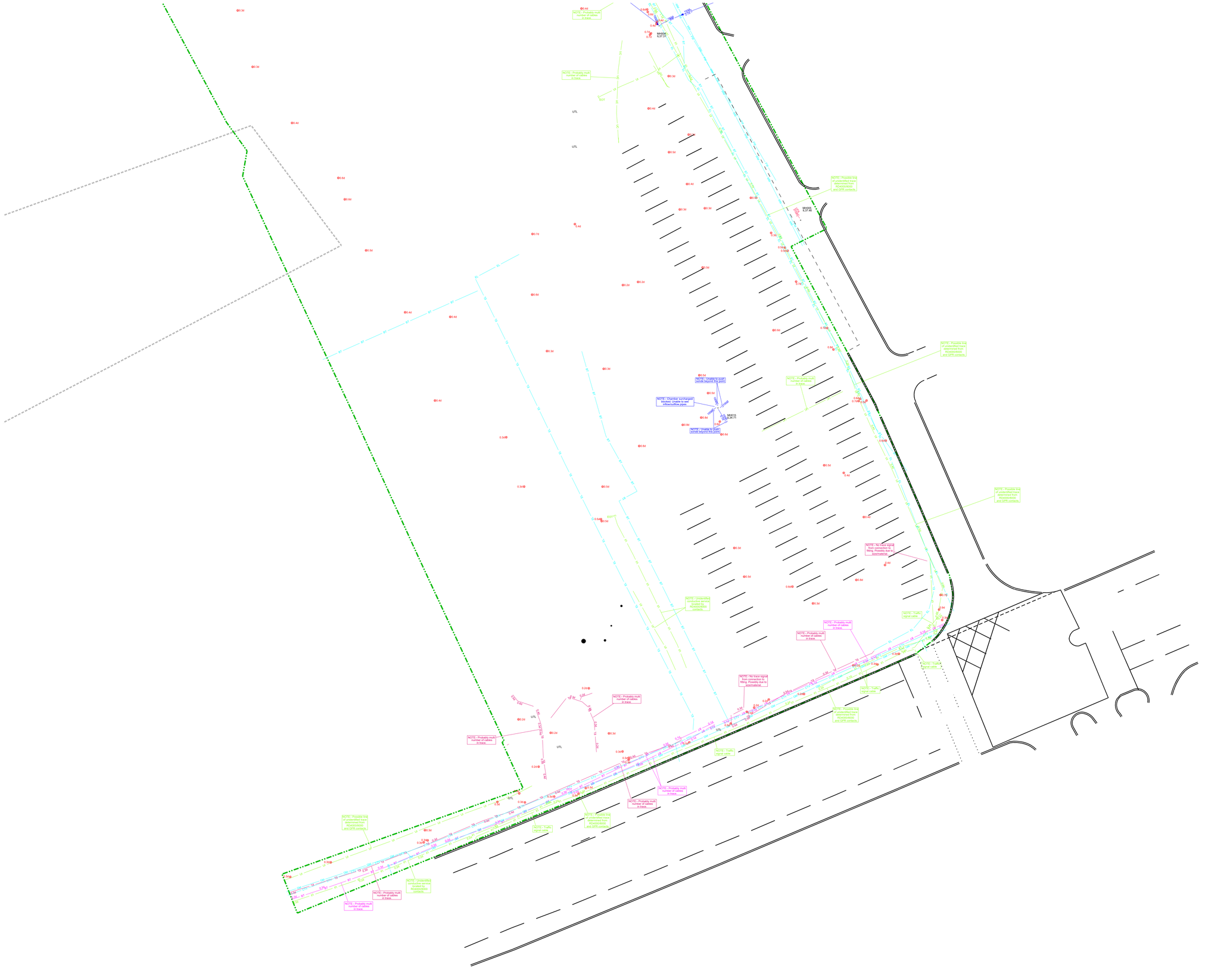
Survey Operations
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Client
Domis Construction Ltd

Drawing Title
Utility Survey of:
The Brwry
Manchester
Sheet 1 of 2

Scale(s)	1:200	Surveyor	OS
Date	Apr 23	Drawn	DS/MP
Job Number	23B137	Checked	SO

Sheet Size & Drg Number & Revision
A0 23B137/001/A



SW — STORM WATER SEWERS
FW — FOUL WATER SEWERS
WM — WATER MAIN
GM — GAS MAIN
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DUCT — CABLE DUCTING
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UP — UNIDENTIFIED PIPE
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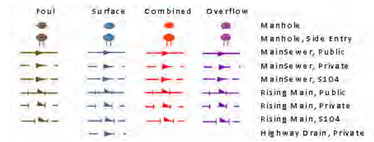
APPENDIX C

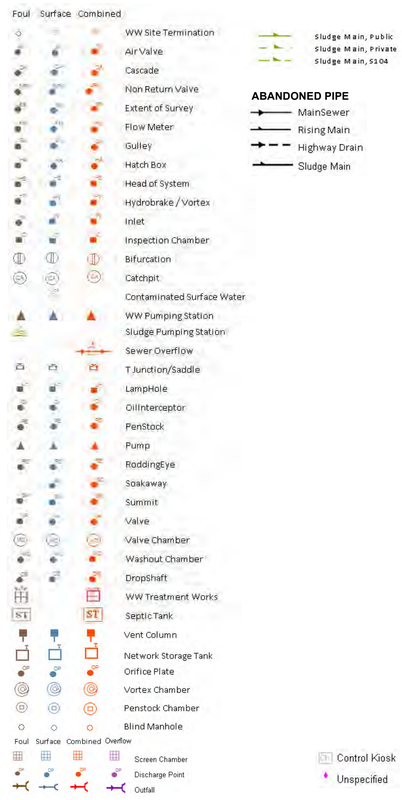
UNITED UTILITES SEWER MAP



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
5002	31.59	CO							
5201	26.9	CO							
5202	26.87	CO	23.34	525		CI	VC	55.23	789
5301		CO		150		CI	VC	5.86	
5302	27.62	CO	23.8	525		CI	VC	97.06	211
5303	27.59	CO	23.87	450		CI	VC	2.24	
5304	27.7	CO	26.64	150		CI	VC	5	
5305	27.33	CO	23.67	450		CI	VC	29.15	
5308		CO							
5401	27.66	CO	25.98	150		CI	VC	6	
5402	27.25	CO							
5404	27.26	CO							
5420		CO							
6002	30.34	CO							
6003	29.99	CO							
6004	28.5	CO							
6103	27.24	CO							
6302	27.23	SW	23.66	640	880	HO	BR	95.58	
6305	28.31	CO	23.57	700		CI	BR	9.43	
6401	28.13	CO	23.73	900		CI	BR	52.15	745
6402	27.69	CO							
6406		CO							
6407		CO							
7010	29.2	CO							
7102	29.47	CO	23.17	300		CI	BR	15.23	1523
7103	29.15	CO	23.25	1000		CI	BR	27.73	924
7104	29.11	CO	23.37	600	600	SQ	BR	86.2	
7105	29.35	CO							
7201	28.68	CO	23.34	1000		CI	BR	1	
7202		SW							
7301	29.86	CO	25.86	640	920	HO	BR	32.2	
7302	32.46	CO	26.82	660	940	HO	BR	44.28	46
7303	33.51	CO	28.37	610	970	HO	BR	12.53	8
7402	32.78	CO	29.37	650	920	HO	BR	32.2	66
8001	28.17	CO							
8302	39.71	CO							
8303	40.11	CO	36.29	300		CI	VC	20.88	
8304	38.58	CO	35.2	375		CI	VC	55.15	42
8401	37.49	CO	33.91	300		CI	VC	1.41	71
9101	36.07	CO							
9301	40.6	CO							
9401	42.71	CO	39.38	300		CI	VC	137.88	
9402	41.75	CO	38.81	300		CI	VC	118.6	47
5004		CO							
5205		SW	0	600	900	EG	BR	15.65	
5403		CO	0	304	406	UN	VC	13.42	
5407		SW	0	300		CI	VC	13.42	
5408		CO	0	304	406	UN	VC	29.07	
5409		CO	0	525		CI	VC	56.82	
5412		CO	0	525		CI	VC	8.25	
5413		CO	0	304	406	UN	BR	6.32	
5414		SW							
5416		SW							
5423		SW							
6006		CO	0	525		CI	CO	5	
6301		CO							
6307		CO	0	650	900	EG	BR	6.71	
6308		CO	23.66	700		CI	BR	52.48	750
6392		CO	0	650	840	HO	BR	38.85	
6403		CO	0	300		CI	BR	136.19	
6404		CO	0	750		SQ	BR	30.02	
6405		CO	0	300	500	UN	BR	83.24	
6408		SW							
7001		CO	0	381	508	UN	VC	105.35	
7003		CO	0	939		CI	CO	60.35	
7004		CO	0	939		CI	CO	63.45	
7008		OV	0	650	1000	EG	BR	7.33	
7107		CO	23.16	700	800	UN	BR	15.27	1527
7109		CO	23.22	300		CI	BR	27.73	924
7205		CO	0	600	600	SQ	BR	51.62	
7306		CO	0	304	406	UN	VC	45.71	
7307		CO	0	304	406	UN	VC	42.55	
7308		CO	0	304	406	UN	VC	40.31	
7313		CO	0	750		CI	CO	30	
7401		CO	0	304	406	UN	VC	47.54	
7403		CO	0	304	406	UN	VC	62.39	
7404		CO	0	304	406	UN	VC	107.63	
7405		CO	28.88	610	930	HO	BR	32.2	66
7408		CO	0	550	950	EG	BR	9.49	
8101		CO	27.86	650	650	SQ	BR	65.7	14
8301		CO	0	304	406	UN	VC	10.77	
8305		SW		300		CI	VC	22.85	
8308		CO	0	304	406	UN	VC	42.06	
8402		CO	0	300		CI	VC	56.61	
8404		CO	0	375		CI	VC	4.47	
8405		CO	0	375		CI	VC	19.7	
9105		CO	0	375		CI	VC	9.49	
9205		CO	0	300		CI	VC	6.32	
9207		CO	0	300		CI	VC	11.66	
9214		CO	0	300		CI	VC	7.29	
9302		CO	0	300		CI	VC	60.41	
9403		CO	0	300		CI	VC	50.08	
9404		CO	0	100		CI	VC	29.73	
9406		CO	0	304	406	UN	VC	48.1	
9407		CO	0	300		CI	VC	20.25	
9408		CO	0	300		CI	VC	17.72	
5001		CO							
5290		CO							
5306		CO							
5307		CO							
5405		CO							
5406		CO							
5410		CO							
5411		CO	0	525		CI	VC	47.73	
6005		CO							
6306		CO							
6390		CO							
6391		CO							
7007		CO							
7013		CO							
7191		CO	0	700	800	EG	BR	161.61	
7203		CO	0	1000		CI	BR	52.92	
7304		CO							
7305		CO							
7309		CO							
7310		CO							
7311		CO	0	304	406	UN	VC	26	
7406		CO	0	650	940	UN	BR	14.14	
7407		CO	0	375		CI	VC	10.77	
7409		CO	0	650	940	UN	BR	17.69	
7410		CO	0	650	940	UN	BR	16.28	
8002		CO							
8201		CO							
8306		CO	0	300		CI	VC	10.3	
8307		CO	0	300		CI	VC	11.18	
8309		CO							
8403		CO							
8490		CO							
9104		CO	0	375		CI	VC	86.58	
9190		CO							
9202		CO	0	300		CI	VC	15.23	
9208		CO							
9211		CO	0	300		CI	VC	33.12	
9212		CO	0	300		CI	VC	16.55	
9213		CO							
9290		CO	0	300		CI	VC	34.33	
9303		CO							
9405		CO							
6303		CO	23.59	375		CI	VC	69.75	279
6304		CO	23.81	375		CI	VC	15.4	
7009		CO	0	650	1000	EG	BR	56.4	
7101		CO	0	650	1000	UN	BR	62.6	

WASTE WATER SYMBOLOGY





LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

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. Crown copyright and database rights [2016] Ordnance Survey 100022432.

OS Sheet No: SJ8399SE
Scale: 1:1250 Date: 04/08/2017
142 Nodes
Sheet 1 of 1

United Utilities
helping life flow smoothly

SEWER RECORDS

Printed By: Property Searches

OS Sheet No: SJ8399SE

Scale: 1:1250 Date: 04/08/2017

APPENDIX D

PROPOSED DEVELOPMENT PLANS



No dimensions are to be scaled from this drawing. All dimensions are to be checked on site.
Area measurements for indicative purposes only.

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All Wright Landscapes drawings to read in conjuction with architectual / engineers plans & details.

Revision	Date	Description	Drawn	Approved
S4-P01	07-03-24	First Issue	NW	CB

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W: www.wrightlandscapes.co.uk
T: 01244 347699

HEAD OFFICE
Pickmere Lane, Pickmere, Knutsford,
WA16 0JL

CLIENT Domis Construction

PROJECT Waterhouse Gardens

DRAWING TITLE General Arrangement

DATE	SCALE
06/02/2024	1:350
DRAWN	SIZE
NW	A1
APPROVED	WORKSTAGE
CB	

DRAWING NUMBER 1174-WRI-XX-XX-DR-L-0001

SUITABILITY S4

REVISION P01

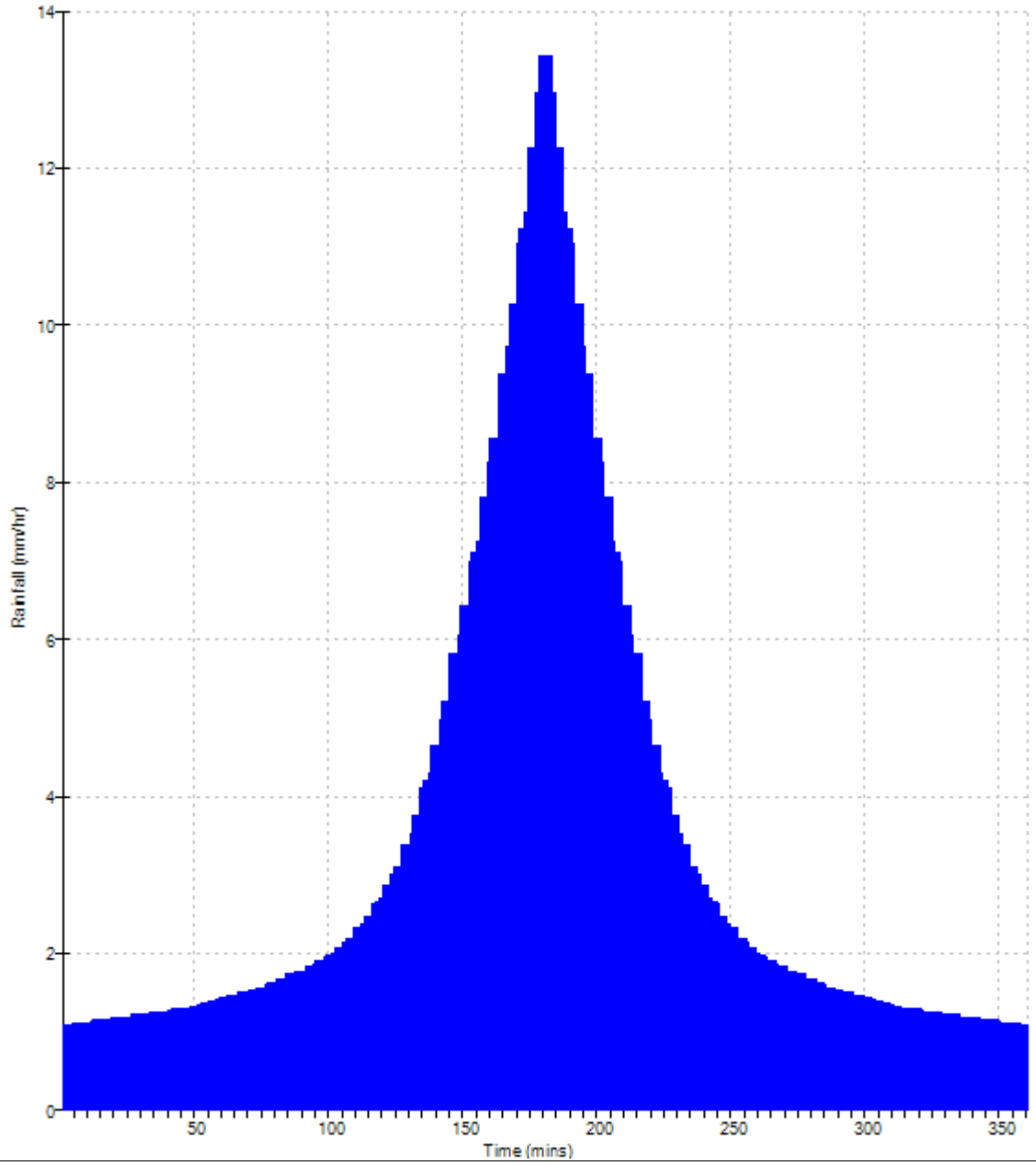
APPENDIX E

RAINFALL PROFILES

Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.000
Ratio R	0.360
Peak Intensity (mm/hr)	13.427
Ave. Intensity (mm/hr)	3.425
Return Period (years)	1.0

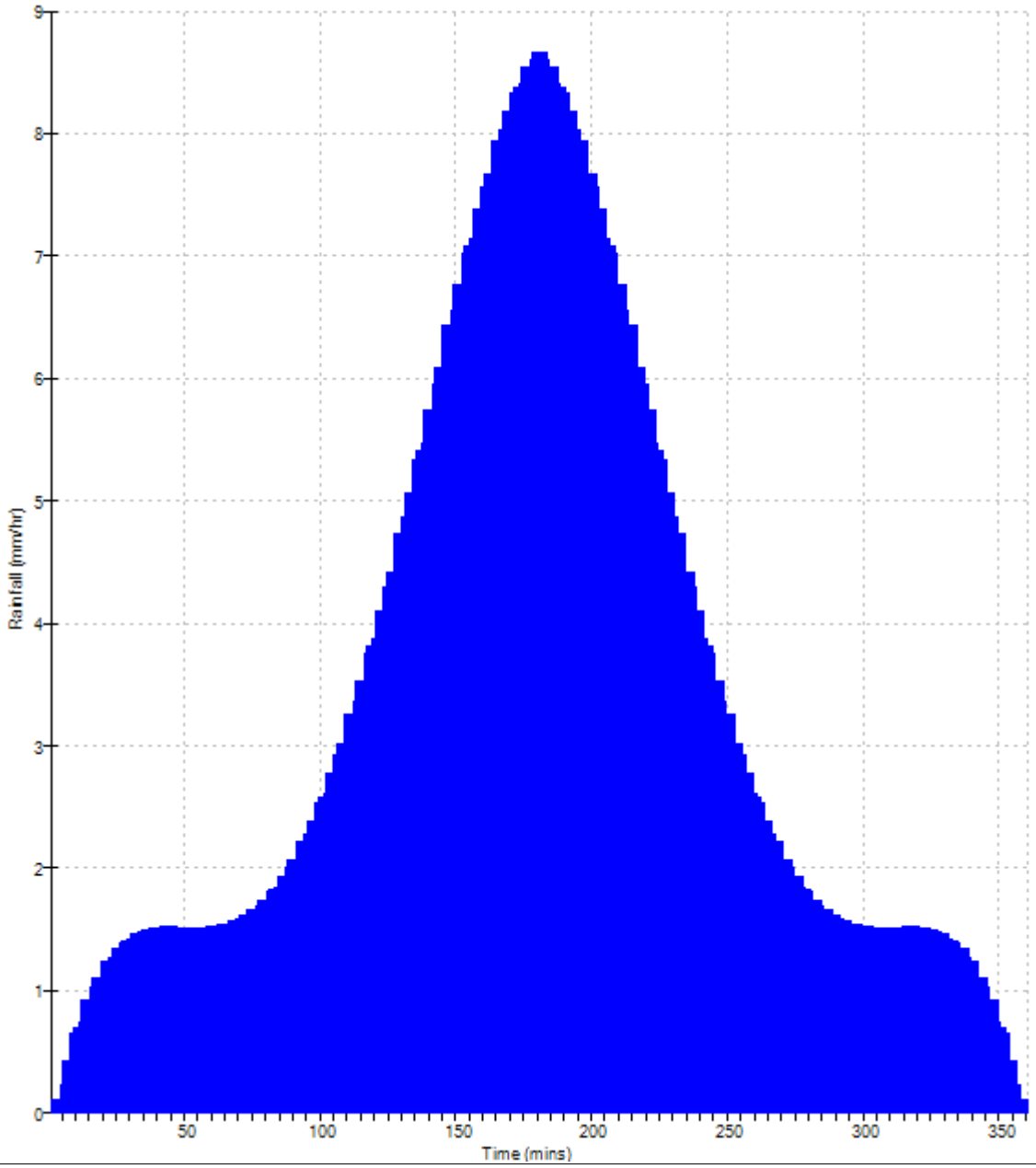


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Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.000
Ratio R	0.360
Peak Intensity (mm/hr)	8.663
Ave. Intensity (mm/hr)	3.425
Return Period (years)	1.0

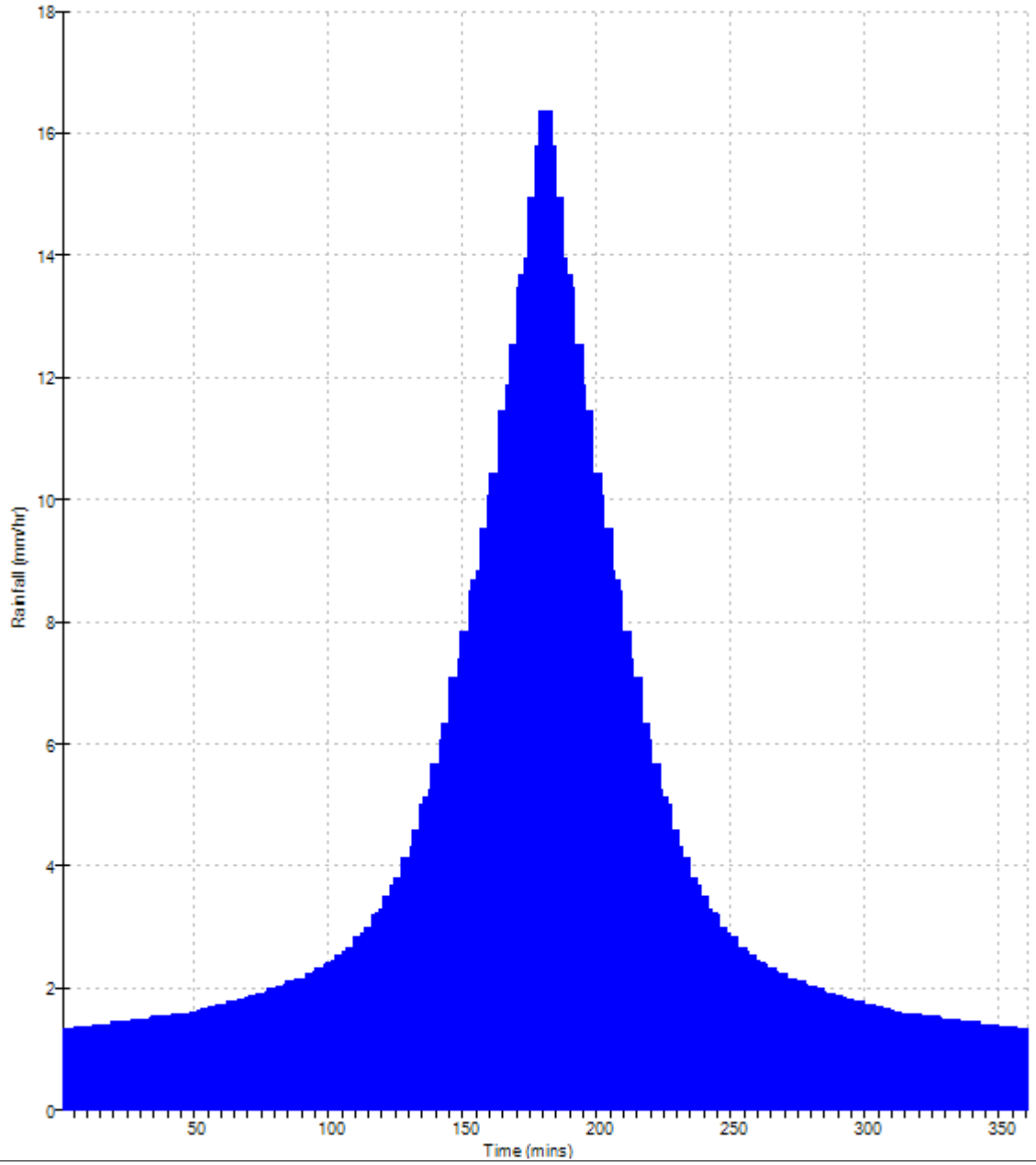


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Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.000
Ratio R	0.360
Peak Intensity (mm/hr)	16.383
Ave. Intensity (mm/hr)	4.179
Return Period (years)	2.0

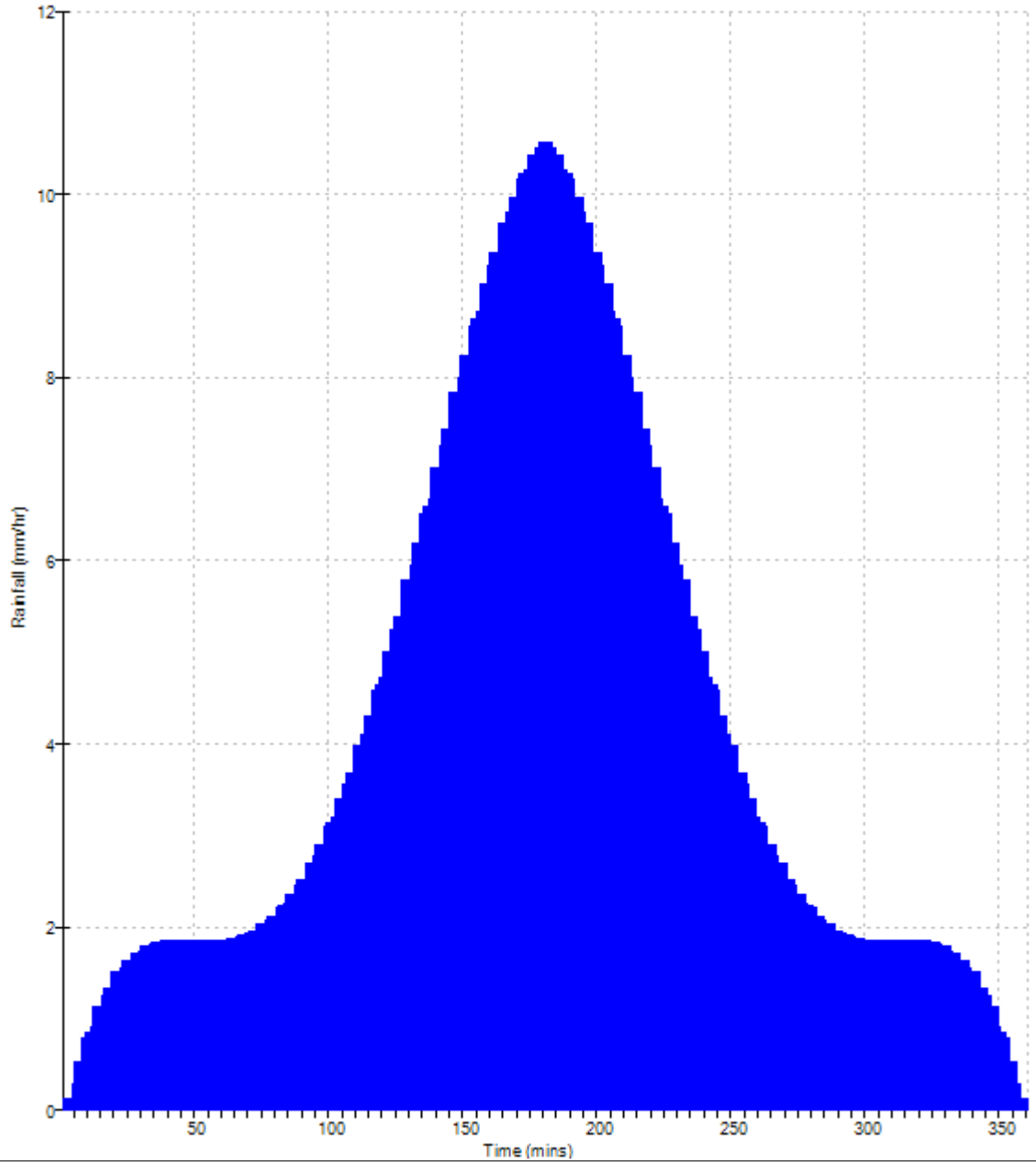


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Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.000
Ratio R	0.360
Peak Intensity (mm/hr)	10.570
Ave. Intensity (mm/hr)	4.179
Return Period (years)	2.0

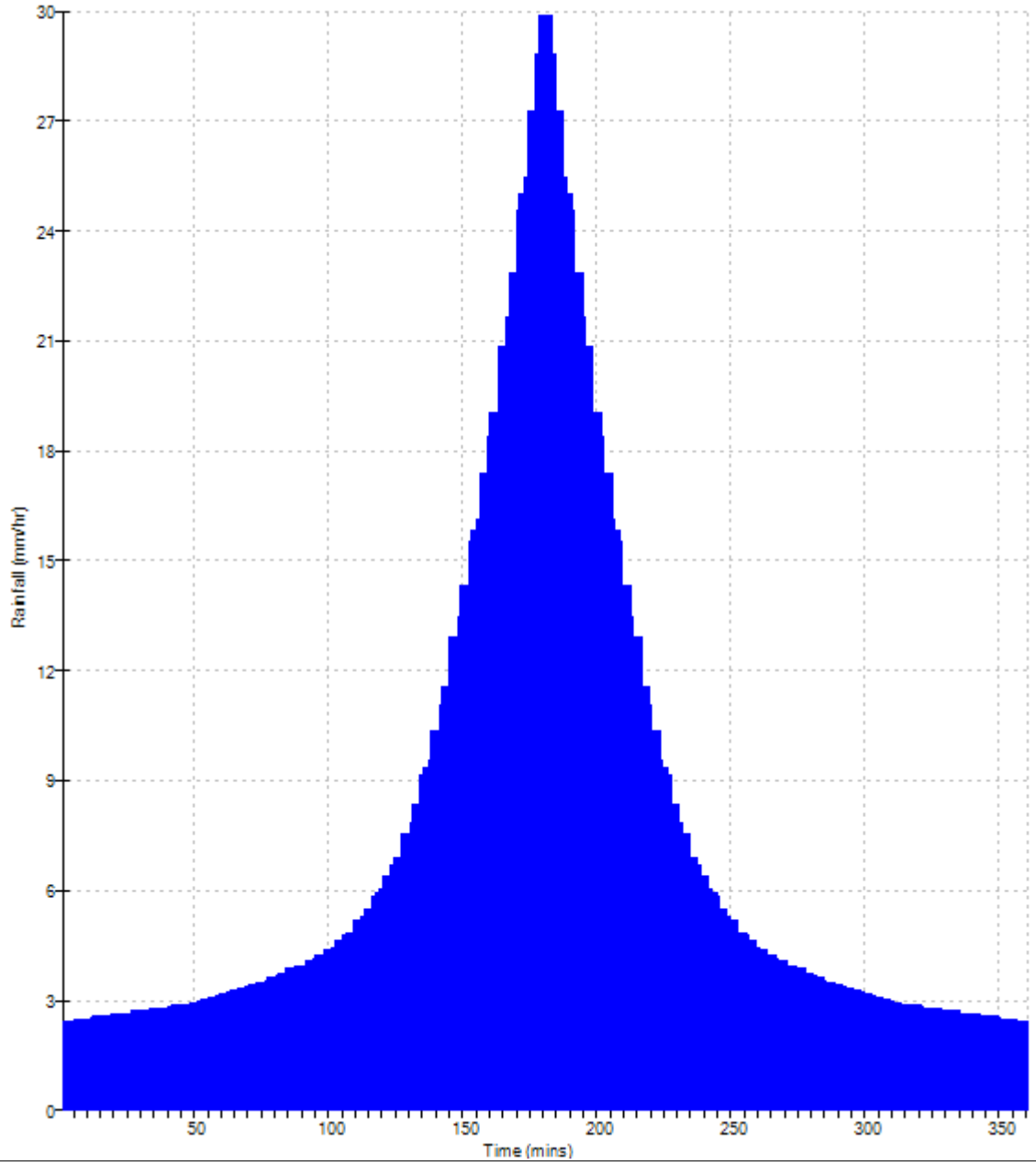


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Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.000
Ratio R	0.360
Peak Intensity (mm/hr)	29.886
Ave. Intensity (mm/hr)	7.624
Return Period (years)	30.0

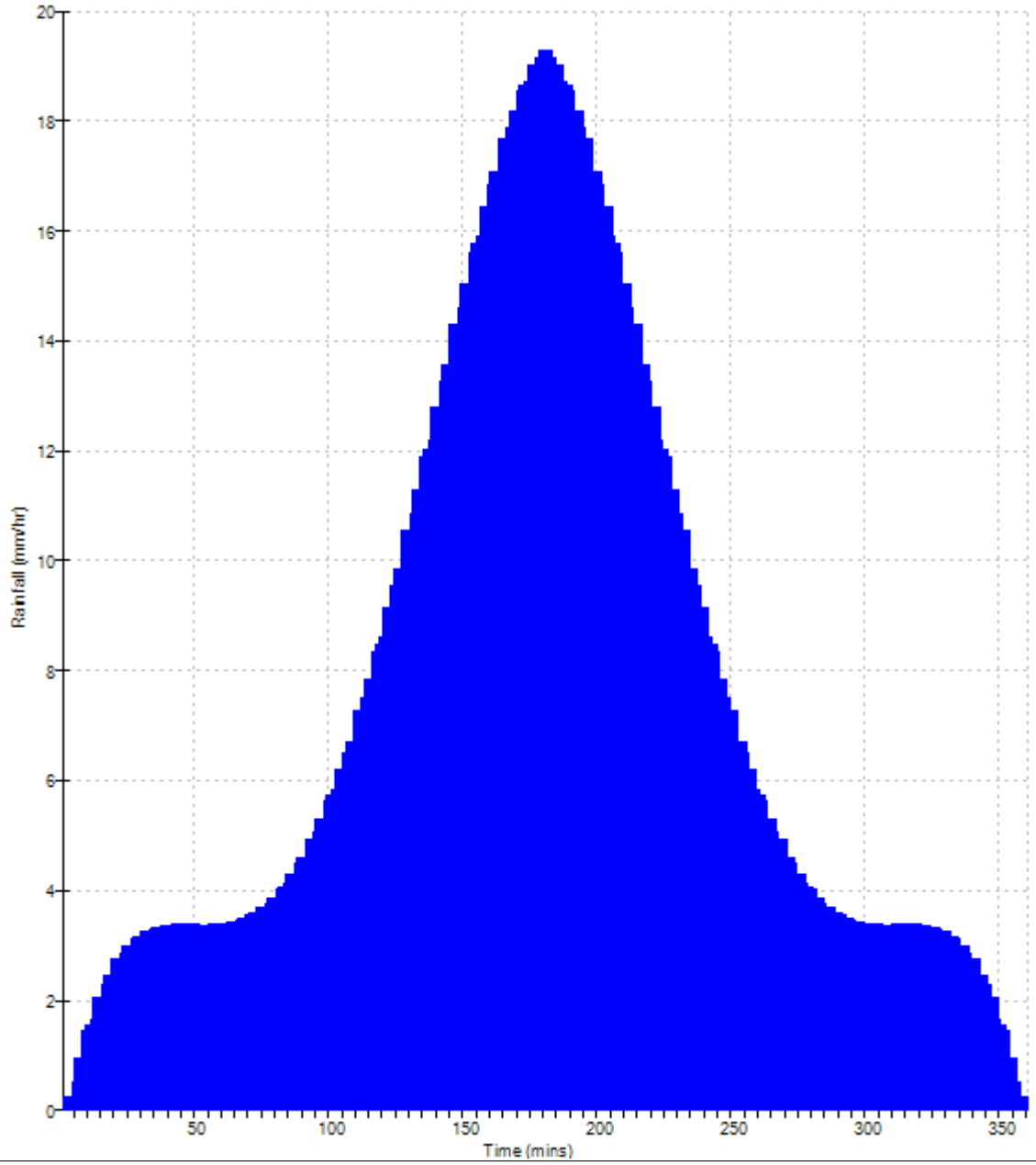


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Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.000
Ratio R	0.360
Peak Intensity (mm/hr)	19.282
Ave. Intensity (mm/hr)	7.624
Return Period (years)	30.0

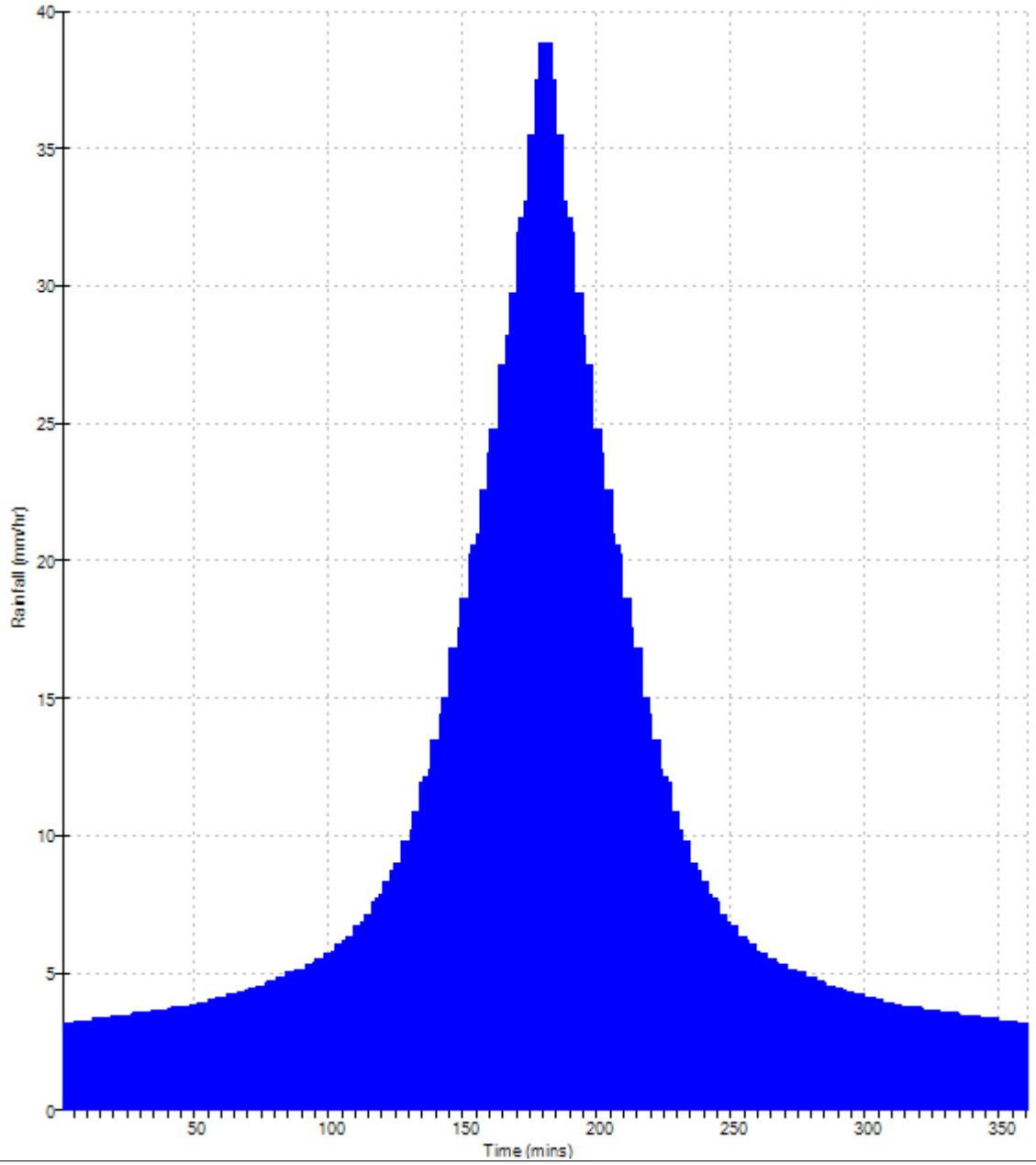


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Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.000
Ratio R	0.360
Peak Intensity (mm/hr)	38.870
Ave. Intensity (mm/hr)	9.916
Return Period (years)	100.0

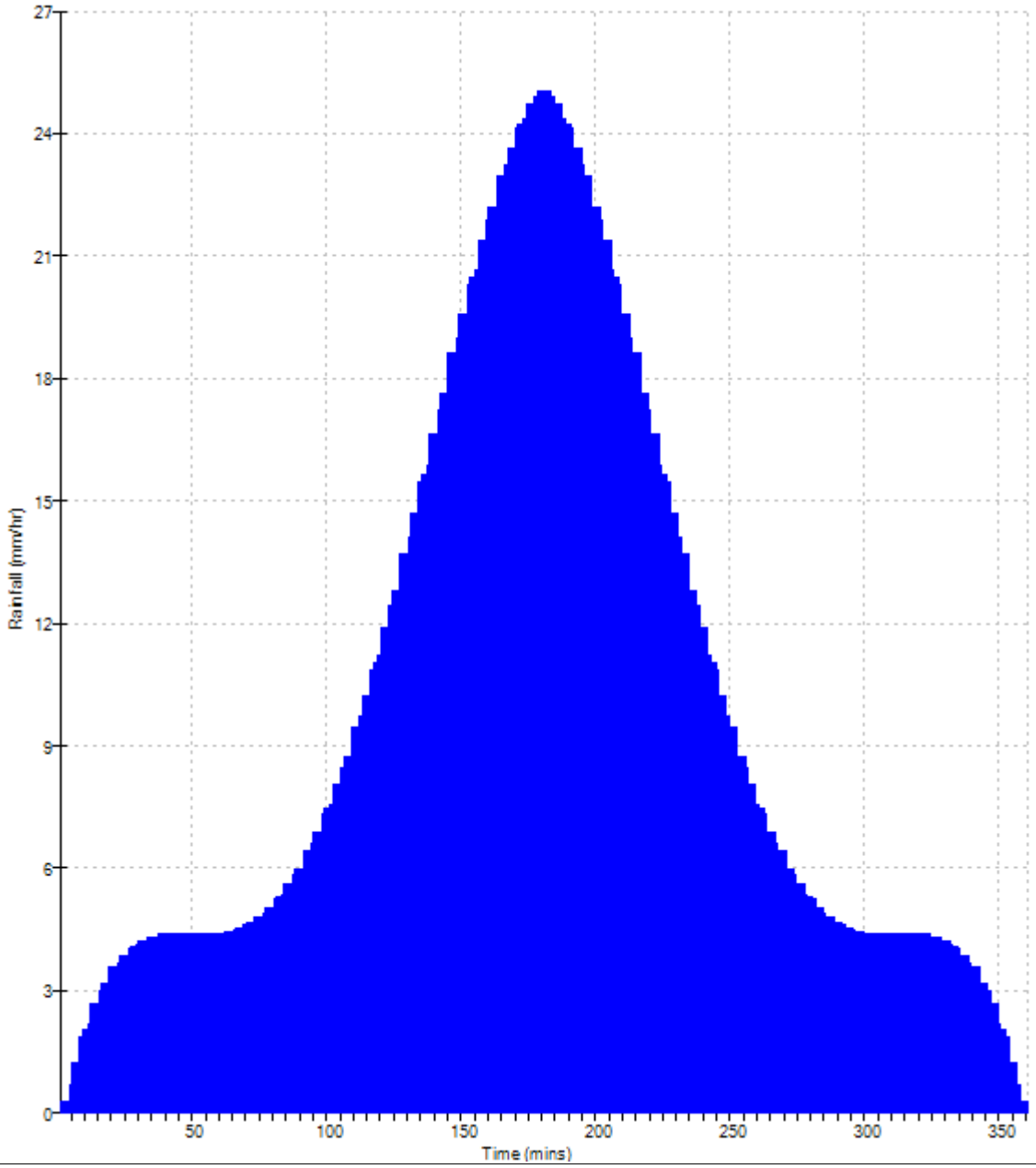


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Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.000
Ratio R	0.360
Peak Intensity (mm/hr)	25.078
Ave. Intensity (mm/hr)	9.916
Return Period (years)	100.0



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APPENDIX F

MICRODRAINAGE GREENFIELD RUN-OFF RATES

ICP SUDS Mean Annual Flood

Input

Return Period (years) 2 SAAR (mm) 899 Urban 0.750
Area (ha) 1.200 Soil 0.450 Region Number Region 10

Results l/s

QBAR Rural 7.1
QBAR Urban 17.5

Q2 years 17.8

Q1 year 15.2
Q30 years 25.3
Q100 years 27.5

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APPENDIX G

MICRODRAINAGE GREENFIELD RUN-OFF VOLUME

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	18.000
Ratio R	0.360
Areal Reduction Factor	1.00
Area (ha)	1.200
SAAR (mm)	899
CWI	120.055
Urban	0.750
SPR	47.000

Results

Percentage Runoff (%)	54.01
Greenfield Runoff Volume (m³)	385.567

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APPENDIX H

UNITED UTILITIES PRE-DEVELOPMENT ENQUIRY CORRESPONDENCE

JoeBullough

From: seweradoptions@uuplc.co.uk
Sent: 02 June 2023 13:48
To: JoeBullough
Cc: Patrick Clayton
Subject: RE: Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

You don't often get email from seweradoptions@uuplc.co.uk. Learn why this is important

Good afternoon Joe,

Apologies, it appears we were given different response dates. Due to the bank holiday the system unfortunately edited certain dates causing some delays. Please do accept my apologies for this.

I am happy with the proposed 17.5 l/s, thank you for sending over further information.

Please note this is subject to section 106 approval.

I have linked below the application form.

https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/

If I can be of any further assistance please do get in touch.

Kind regards

United Utilities
Water for the North West

Ashleigh Bellerby
Assistant Developer Engineer
Developer Services & Metering
Customer Services
T: 07826891650
unitedutilities.com

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Visit: unitedutilities.com/wow

---------- Original Message ----------
From: JoeBullough [joebullough@renaissance-ltd.com]
Sent: 31/05/2023 10:14
To: seweradoptions@uuplc.co.uk
Cc: patrickclayton@renaissance-ltd.com
Subject: RE: Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

Good Morning,

Please can an update be provided on the below given that we have now passed advised response date (30th May)?

Kind Regards,

Joe Bullough | Engineer

MEng

Carvers Warehouse, 77 Dale Street

Manchester, M1 2HG

e: joebullough@renaissance-ltd.com

t: 0161 393 6509

dd: 0161 552 1912

w: www.renaissance-ltd.com

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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: Saturday, May 20, 2023 9:08 PM
To: JoeBullough <JoeBullough@renaissance-ltd.com>
Cc: Patrick Clayton <patrickclayton@renaissance-ltd.com>
Subject: RE: Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

Hello Joe,

I have asked the engineer Ashleigh Bellerby to review your file again.

Please note the response will be due before 30th May

Regards

Samantha
0345 026 8989 - Option 4

---------- Original Message ----------
From: JoeBullough [joebullough@renaissance-ltd.com]
Sent: 18/05/2023 15:22
To: seweradoptions@uuplc.co.uk
Cc: patrickclayton@renaissance-ltd.com
Subject: RE: Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

Ashleigh,

We can confirm that your understanding is incorrect and the modified rational method has **not** been used.

The modified rational method would result in far greater run off rate – 126.5/s assuming a rainfall intensity of 50mm/hr and an impermeable area of 0.91 ha and is normally used to approximate the existing site run off.

As explained in our previous email we have used the ICP SuDs Method within Microdrainage.

As you will be aware the IH124 method is to be used for catchments <50 ha and therefore the ICP SuDs Method follows the IH124 method using a catchment area of 50ha and the resulting run off is linearly interpolated for the actual area.

We have set out below the hand calculations that prove that the Microdrainage Calculations follow the IH 124 method.

Section 24.3.2 of The SuDs Manual indicates the IH124 Equation for Q Bar (rural) to be as follows:

EQ. 24.3 **IH124: Catchment descriptor equation**

$$Q_{BAR(rural)} = 0.00108\ AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$$

where:

$Q_{BAR(rural)}$	=	mean annual flood (a return period in the region of 2.3 years)
AREA	=	area of the catchment in km^2
SAAR	=	Standard Average Annual Rainfall for the period 1941–1970 in mm
SOIL	=	soil index, which is a value found from the FSR soil maps or the WRAP the Wallingford procedure, and represents an estimate of the proportion from the catchment surface*

Where the site is less than 50 ha, the formula should be applied for 50 ha and the result fa based on the ratio of the actual site area and the applied area (50 ha).

* If a reliable surface soils class map of the site is available, then IH126 Table 2.12 (Boor *al*, 1995), can be used to allocate a HOST category to the site soils. IH126 Table 4.16 c be used to obtain a corresponding value for SPR (note this is stated as a percentage, r a proportion so will need to be divided by 100). The extra detail provided by HOST is ge likely to provide an improved estimate of SPR than using the coarse categorisation of t SOIL categories, although it should be recognised that SPRHOST was not originally de use in the IH124 equation, and Appendix 5 of Kellagher (2013) should be referenced fo guidance on this issue.

HOST/SOIL CLASS	SPR Value % (HOST)[3]	SPR Value SOIL *
1	0.02[2]	0.15 (0.10)
2	0.02[2]	0.30 (0.30)
3	0.12	0.40 (0.37)
4	0.02[2]	0.45 (0.47)
5	0.12	0.50 (0.53)
6	0.34	
7	0.21	
8	0.30	
9	0.25	
10	0.35	
11	0.02[2]	
12	0.60[2]	
13	0.02[2]	
14	0.40	
15	0.48	
16	0.22	
17	0.29	
18	0.47	
19	0.45	
20	0.47	
21	0.47	
22	0.600[2]	
23	0.600[2]	
24	0.40	
25	0.50	
26	0.59[2]	
27	0.60[2]	
28	-	
29	0.60[2]	

** Values of SPR for SOIL have been used for deriving Figure A10.1. These SPR values are based on the SOIL coefficients used in the Wallingford Procedure runoff model. The value in brackets is the SPR value for SOIL from the Flood Studies Report. The Wallingford Procedure analysis was carried out by the Institute of Hydrology and resulted in modified SPR values to obtain the best correlation for the percentage runoff equation for urban drainage.*

Note 1: There is no relationship between the HOST index class and the index for SOIL
Note 2: Where SPRHOST values are less than 0.1 then 0.1 shall be used. Where SPRHOST values are greater than 0.53 then 0.53 shall be used.
Note 3: SPRHOST values are from the predominant soils rather than FEH based values

Figure A12.1 SPR Values for SOIL and HOST

Using the following parameters

Area = 50 ha = 0.5km^2

SAAR = 899mm

SOIL = Soil Type 4 = 0.45

Q_{BAR}(RURAL) = 294.4 l/s (for 50ha)

Linearly interpolating for the actual site area gives the following:

Q_{BAR}(RURAL) = 294.4 x (1.2/50) = **7.1 l/s** – note this is the same as the MicroDrainage calculation previously supplied – attached again for ease of reference.

Due to the urban environment the site is situated in and given a large proportion of the site (0.91/1.2ha i.e. 76%) is urbanised it is appropriate to apply an urban factor to the Q_{BAR} (rural) run off rate as set out below.

QBAR urban, Adjustment for urbanisation - From IH report 124 equations 7.2 to 7.4. CIRIA Book

The ratio of $QRAR_{urban}$ to $QBAR_{rural}$ = $(1+URBAN)^{2NC}$ $(1+URBAN\ ((21/CIND)-0.3))$

where

CIND = 102.4 x SOIL + 0.28 x (CWI - 125)

NC = 0.92 - 0.00024 x SAAR (for 500 <= SAAR <= 1100mm)

NC = 0.74 – 0.000082 x SAAR (for 1100 <= SAAR <= 3000mm)

CWI	Catchment wetness index is a function of the Average annual rainfall and is described in FSR figure I. 6.62
CIND	The catchment index
NC	Rainfall continentality factor which is a function of SAAR
URBAN	The fraction of the catchment area coloured orange on a 1:50000 Ordinance Map, or the fraction of the catchment to be urbanised.

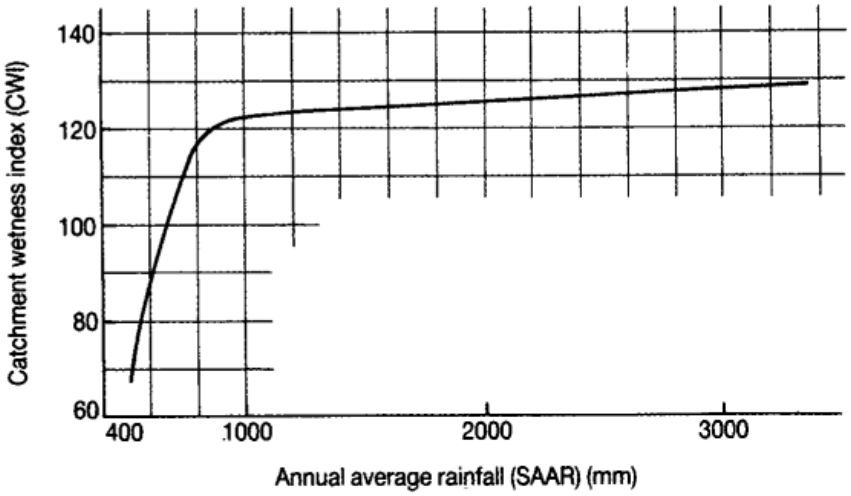


Figure 3.6 ***Plot of catchment wetness index, CWI, against mean annual rainfall, SAAR (based on FSR Figure I.6.62)***

Using the above equations and site characteristics gives the following:

CWI = 122 (based on SAAR = 899mm)

NC= 0.70424

CIND = 45.24

URBAN = 0.75

$QBAR_{URBAN}$: $QBAR_{RURAL}$ = 2.470

$QBAR_{URBAN}$ = $QBAR_{RURAL}$ x 2.470

$QBAR_{URBAN}$ = 17.5 l/s – note this is the same as the MicroDrainage calculation previously supplied – attached again for ease of reference.

To put this into perspective the approximate run off currently discharging from the site into the public sewer based upon the modified rational method is 126.5 l/s - assuming a rainfall intensity of 50mm/hr and an impermeable area of 0.91 ha.

Therefore a proposed run-off rate of 17.5 l/s provides a 86% reduction on the existing discharge rate.

We would also like to note that the above method has been applied and approved as part of other developments in the area – for example Salford Zone Youth UU Reference Number : 02466246.

As such we would be grateful if you could review the above and attached and confirm that the proposed total discharge rate of 17.5 l/s is indeed acceptable.

Kind Regards,

Joe Bullough | Engineer

MEng

Carvers Warehouse, 77 Dale Street

Manchester, M1 2HG

e: joebullough@renaissance-ltd.com

t: 0161 393 6509

dd: 0161 552 1912

w: www.renaissance-ltd.com

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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: Tuesday, May 2, 2023 3:16 PM
To: JoeBullough <JoeBullough@renaissance-ltd.com>
Subject: Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

Good afternoon Joe,

Thank you for your email.

I imputed the new site area (ha) into HR Wallingford IH124 and the below information was received. Please note United Utilities do not accept the modified rational method which, as far as I am aware has been used on the Microdrainage submitted. Please clarify if I am incorrect.

HR Wallingford

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	ashleigh bellerby
Site name:	BRWRY DUTTON STREET
Site location:	M3 1RR

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.49003° N
Longitude:	2.24454° W
Reference:	3723894960
Date:	May 02 2023 15:11

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1.20

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.53

Hydrological characteristics	Default	Edited
SAAR (mm):	899	899
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	7.76	10.08
1 in 1 year (l/s):	6.75	8.77
1 in 30 years (l/s):	13.2	17.13
1 in 100 year (l/s):	16.15	20.96
1 in 200 years (l/s):	18.4	23.88

In line with the Qbar calculation edited to soil type 5 United Utilities would accept a surface water discharge rate of 10.08 l/s, however this is to be determined by the LLFA.

If I can be of any further assistance please do get in touch.

Kind regards

Ashleigh Bellerby
Assistant Developer Engineer
Developer Services & Metering
Customer Services
T: 07826891650
unitedutilities.com

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---------- Original Message ----------
From: JoeBullough [joebullough@renaissance-ltd.com]
Sent: 17/04/2023 14:42
To: seweradoptions@uuplc.co.uk
Subject: RE: Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

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Hi Ashleigh,

Thanks for getting back to me.

I note you have specified the area as 0.93ha which relates to the hard paved areas only. From my understanding the site area should be taken as the whole site area. I have attached an updated existing drained areas plan which provides a breakdown of the areas and shows the whole site area to be **1.20 ha.**

Our Qbar rates have been calculated within Microdrainage using the ICP SuDS method. The ICP SuDS method simply uses the IH124 method with an area of 50 ha and then linearly interpolates the results for the specified site area.

Update results of the Qbar calcs are attached which show Qbar (urban) to be **17.5 l/s.**

The following parameter have been used with the calculations:

1. SAAR(mm) = 899
2. Soil = 0.450 (Soil Type 4)
3. Area (ha) = 1.20
4. Region Number = 10
5. Urban Proportion = 0.75 - given a large proportion of the site (0.91/1.2ha i.e. 76%) is urbanised and also given the urban setting which the development is set in it is appropriate to apply to the maximum urban proportion of 0.75

We would be grateful if you could review the above and attached and confirm that the proposed total discharge rate of 17.5 l/s is acceptable.

Kind Regards,

Joe Bullough | Engineer

MEng

Carvers Warehouse, 77 Dale Street

Manchester, M1 2HG

e: joebullough@renaissance-ltd.com

t: 0161 393 6509

dd: 0161 552 1912

w: www.renaissance-ltd.com

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Renaissance Associates Ltd trading as Renaissance, a company incorporated in England and Wales under Company Number: 08149019, Registered Office: Carvers Warehouse, 77 Dale Street, Manchester, M1 2HG, UK

From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: Wednesday, April 12, 2023 1:26 PM
To: JoeBullough <JoeBullough@renaissance-ltd.com>
Subject: RE: Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

Good afternoon Joe,

Thank you for your email.

The discharge rate was from HR Wallingford IH124 Method using 0.93 as the total site area in ha unedited soil type (type 4), we would not object to soil type 5 being used which would be a discharge rate of 7.81 l/s.

Prior to consideration of your proposed 16.9 l/s please could you advise on your Qbar rates.

I would not object to the proposed points of discharge for surface water, subject to a section 106.

If I can be of any further assistance please do get in touch.

Kind regards

United Utilities
Water for the North West

Ashleigh Bellerby
Assistant Developer Engineer
Developer Services & Metering
Customer Services
T: 07826891650
unitedutilities.com

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---------- Original Message ----------
From: JoeBullough [joebullough@renaissance-ltd.com]
Sent: 29/03/2023 10:34
To: seweradoptions@uuplc.co.uk
Subject: RE: Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

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Ashleigh,

Thank you for your response.

I note you have requested that a pass forward rate be limited to 6.7 l/s. Please could you provide the clarification of how this rate was derived?

Based on our calculations Qbar for the development gives a rate of 16.9 l/s. And it is our understanding that limiting the discharge to Qbar is deemed accepted in accordance with the North West SuDS Proforma.

I also note from your response that you would consider a surface water connection to the 600 dia sewer within Great Ducie Street. As the site does not lie adjacent to Great Ducie Street this would require third party agreements with the adjacent land owner to install the outlet pipe beneath their land. This would also limit the future development of this land which the owner

The topographical survey indicates the presence of existing drainage that heads towards Dutton Street.

On this basis and due to the nature of the development and large level difference across the proposed site (refer to BRW-REN-ZZ-FN-DR-C-00050 and BRW-REN-XX-XX-SK-C-00011) we have proposed 3 separate connections to the United Utilities Network. Please can you confirm that these are acceptable in principle?

Kind Regards,

Joe Bullough | Engineer

MEng

Carvers Warehouse, 77 Dale Street

Manchester, M1 2HG

e: joebullough@renaissance-ltd.com

t: 0161 393 6509

dd: 0161 552 1912

w: www.renaissance-ltd.com

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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: Friday, March 24, 2023 2:43 PM
To: Selvana Ahmad <SelvanaAhmad@renaissance-ltd.com>
Subject: Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

Good afternoon Selvana,

Pre Development Enquiry for: BRWRY DUTTON STREET Manchester M3 1RR UU Reference Number : 03758802

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 6723 723 or refer to the link below:

https://www.unitedutilities.com/builders-developers/working-near-our-assets/

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

United Utilities would not object to your foul proposals to the public combined sewer at an unrestricted rate.

In accordance with our infrastructure plans we may ask you to change your point of connection. Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**
2. **to a surface waterbody;**
3. **to a surface water sewer or highway drain;**
4. **to a combined sewer.**

For guidance, The **North West SuDS Pro-Forma** provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.
The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).
The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration
Thank you for providing evidence that infiltration is not possible onsite.

Highway Drainage
If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

Public Sewer
In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.
United Utilities will consider a connection the proposed connection to the 600mm diameter public combined sewer within Great Ducie Street located West of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 6.7l/s.
Please note the given discharge rate is based on the full site area as the specifics of the area being developed are not yet clear. If there are significant areas of the site that will not be developed, the discharge rate should be reduced accordingly.
As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels
For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Land drainage / Overland flows / track drainage
United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the pubic sewerage network under any circumstances

Existing Wastewater Assets Crossing the Site
We have reviewed our records and can confirm that there does not appear to be any charted public sewers located within the boundary of proposed development. However, due to the accuracy of the records and the public sewer transfer legislation in 2011, not all public sewers are shown on our records so we would ask that you proceed with caution and carry out your own site investigation works. If any uncharted sewers are identified while carrying out your works we would ask that you contact United Utilities at the earliest opportunity so that we can offer guidance and update our records.

Existing Water Assets Crossing the Site
It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:
https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/

Connection Application
Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:
https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/
We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.
If we can be of any further assistance please don't hesitate to contact us further.

Many thanks and kind regards,

United Utilities
Water for the North West

Ashleigh Bellerby
Assistant Developer Engineer
Developer Services & Metering
Customer Services
T: 07826891650
unitedutilities.com

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---------- Original Message ----------
From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]
Sent: 15/03/2023 09:56
To: selvanaahmad@renaissance-ltd.com
Subject: BRWRY DUTTON STREET Manchester M3 1RR

PRE DEVELOPMENT APPLICATION AT: BRWRY DUTTON STREET Manchester M3 1RR – UU Ref 03758802

Please accept this email as receipt of your application received on 14.03.2023 for the above development. This has now been logged on our system and the job reference is 03758802we would ask that you quote this reference in all future correspondence.

I have reviewed your application (and attachments) and can confirm this is suitable to be passed to Ashleigh Bellerby for technical assessment. You will receive their response within 8 working days.

Kind regards

Lucie Gaskell
Customer Advisor Advanced
Developer Services & Metering
Customer Services
Direct Tel: 01925 233050
Tel: 0345 072 6067
unitedutilities.com

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APPENDIX J


BELOW GROUND DRAINAGE DRAWINGS

DRAWING LEGEND

- PLANNING BOUNDARY
- PROPOSED SURFACE WATER DRAINAGE (150mm DIAMETER UNO)
- PROPOSED FOUL WATER DRAINAGE (150mm DIAMETER UNO)
- PROPOSED COMBINED SEWER
- EXISTING UNITED UTILITIES COMBINED SEWER
- GULLY
- CHANNEL DRAIN TO LANDSCAPE ARCHITECTS SPECIFICATION UNO
- RAINWATER PIPE/ SOIL VENT PIPE
- PROPOSED BACKDROP MANHOLE
- PROPOSED INLINE NO-RETURN VALVE
- POLYPIPE ATTENUATION TANK TO CONTRACTORS DESIGN
- BIO RETENTION AREA REFER TO DRAWING BRW-REN-ZZ-FN-DR-C-03105 FOR DETAILS
- INDICATES EASEMENT ON DRAINAGE PASSING THROUGH ADJACENT PRIVATE LAND AS AGREED WITH LAND OWNER - EMAIL DATED 03/07/2023

FLOOR LEVELS

- INDICATES GROUND FLOOR LEVEL
- INDICATES BASEMENT LEVEL 01
- INDICATES BASEMENT LEVEL 02



NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RENAISSANCE, ARCHITECTS, LANDSCAPE ARCHITECTS AND BUILDING SERVICES ENGINEERS DRAWINGS.
2. REFER TO DRAWING BRW-REN-ZZ-FN-DR-C-01101 FOR BELOW GROUND FOUL WATER DRAINAGE DETAILS.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE BELOW GROUND DRAINAGE SPECIFICATION SP-C-00050 AND DETAILS SHOWN ON DRAWINGS C-03101, C-03102, C-03103, C-03104 & C-03105.
4. FOR ALL ABOVE GROUND DRAINAGE AND ASSOCIATED PUMPS REFER TO BUILDING SERVICES AND ARCHITECT'S DRAWINGS.
5. ALL BELOW GROUND DRAINAGE WORKS TO BE IN ACCORDANCE WITH RELEVANT BUILDING REGULATIONS AND SEWER SECTOR GUIDANCE APPENDIX C- DESIGN AND CONSTRUCTION GUIDANCE. IF DISCREPANCIES ARE NOTED BETWEEN SSG AND DRAWINGS THESE SHOULD BE BROUGHT TO THE ATTENTION OF RENAISSANCE FOR REVIEW.
6. RWPs, SVPs, SSs AND FLOOR GULLEYS ARE TO HAVE RODDABLE ACCESS POINTS ABOVE GROUND FLOOR TO BUILDING SERVICES DETAILS.
7. THE CONTRACTOR IS TO UNDERTAKE A FULL CCTV SURVEY AT COMPLETION OF THE PROJECT TO DEMONSTRATE THAT THE DRAINAGE IS CLEAN. ANY DEFECTS ARE TO BE CORRECTED BY THE CONTRACTOR PRIOR TO HANDOVER OF THE SYSTEM TO THE CLIENT.
8. THE CONTRACTOR IS TO KEEP A RECORD SET OF THE AS INSTALLED DRAINAGE ON SITE AND PROVIDE THIS TO RENAISSANCE UPON COMPLETION OF THE WORKS TO ALLOW FOR PRODUCTION OF A 'FINAL CONSTRUCTION' ISSUE DRAWING.
9. DURING THE WORKS ALTERATIONS TO THE DRAINAGE LAYOUT ARE TO BE MARKED UP BY THE CONTRACTOR AND AGREED WITH RENAISSANCE IN WRITING.
10. THE CHAMBER SIZE OF PCC MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS AND BENDS.
11. MANHOLE COVERS ARE TO BE ACCORDANCE WITH BS EN 124 FOR THE RATING INDICATED IN THE MANHOLE SCHEDULE. THE CONTRACTOR IS TO SUBMIT DETAILS FOR THE PROPOSED MANHOLE COVERS TO THE ENGINEER AND LANDSCAPE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION.
12. ALL INTERNAL COVERS TO BE RECESSED AND TRIPLE SEALED
13. COVER SLABS MUST CARRY THE BSI KITEMARK. WHERE THE CLEAR OPENING OF THE KITEMARKED PRODUCT IS DIFFERENT TO THAT OF THE COVER AND FRAME, A LOAD BEARING REDUCING SLAB SHOULD BE FITTED ABOVE THE COVER SLAB TO BRING THE SIZE DOWN TO REQUIRED SIZE.
14. ALL SEWERS TO BE BSI KITEMARK (CERTIFIED TO WIS 4-35-01)
15. ALL CONCRETE PIPES TO BE TO ES EN 1916 CLASS 120 (54kN/m).
16. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2).
17. IF PLASTIC PIPES ARE TO BE USED THEN THE FOLLOWING MUST APPLY:
    A. BSI KITEMARK (CERTIFIED TO BS EN 13476-1 AND WIS 4-35-01)
    B. PIPES LESS THAN OR EQUAL TO 500mm DIA
    C. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2)
17. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS: 100mm DIA. 40kN/m, 150mm DIA. 40kN/m, 225mm DIA. 45kN/m AND 300mm DIA. 72kN/m.
18. THE MINIMUM CRUSHING STRENGTH FOR CONCRETE PIPES SHOULD BE - (CLASS 120 TO EN 1916/BS5911-1 2002). PLASTIC PIPES SHOULD CONFORM TO WIS 4-35-01 AND BS EN13476.
19. SULPHATE RESISTANT CEMENT (C20-DC2) AND PRECAST CONCRETE PRODUCTS MUST BE USED OR A LABORATORY REPORT PROVIDED PROVIDING THAT SUCH PRECAUTIONS ARE NOT NECESSARY.
20. SEWER PIPES TO BE LAID IN MAXIMUM 3 METER LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER PIPES, AND THIS IS AGREED BY THE CONTRACTOR WITH THE PIPE MANUFACTURER.
21. ALL FOUL AND SURFACE WATER BELOW GROUND SYSTEMS ARE TO BE VENTED WITHIN THE ABOVE GROUND DRAINAGE TO THE BUILDING SERVICES ENGINEERS DETAILS.

CDM NOTES

IN ADDITION TO THE NORMAL HAZARDS AND RISK NORMALLY ASSOCIATED WITH WORKS OF THIS NATURE, NOTE THE FOLLOWING ABNORMAL RISKS:

SOIL CONTAMINATION (1)
HEAVY METAL, PAH AND ASBESTOS CONTAMINATION IDENTIFIED WITHIN THE MADE GROUND. MINOR HEAVY METAL AND NON-METAL CONTAMINATION IDENTIFIED WITHIN PERCHED GROUNDWATER.

STRIKING UXO OR BURIED SERVICES (2)
SITE ENABLING WORKS PACKAGE REQUIRED TO CLEAR LIVE SERVICES AND UXO RISK

PERCHED WATER TABLE (3)
ALLOW FOR LOCALISED DEWATERING DURING ALL SUBSTRUCTURE WORKS.

REFERENCE SHOULD BE MADE TO BROWNFIELD SOLUTIONS LTD SITE INVESTIGATION FOR GROUND CONDITIONS AND PERCHED GROUND WATER TABLES. CONTRACTOR SHOULD MAKE ALLOWANCE FOR TEMPORARY DEWATERING TRENCH SUPPORT WORKS PRIOR TO CONSTRUCTION.

RIBA STAGE 4+
THIS DRAWING IS INTENDED TO COMMUNICATE THE INTERIM PROGRESS OF THE TECHNICAL DESIGN AND IS APPROPRIATE FOR RIBA STAGE 4+

A DESIGN CONTINGENCY OF 10-15% IS RECOMMENDED TO ALLOW FOR DESIGN DEVELOPMENT DURING RIBA STAGE 5 AND TO REFLECT INPUT FROM THE CONTRACTOR DESIGNED PACKAGES. THIS DRAWING HAS BEEN DEVELOPED WITHOUT FULL STAGE 4 INFORMATION FROM THE WIDER DESIGN TEAM.

EXISTING ONSITE PRIVATE DRAINAGE
ALL EXISTING ONSITE PRIVATE DRAINAGE IS TO BE GRUBBED UP AND SUITABLY CAPPED AT THE SITE BOUNDARY. PRIOR TO DISCONNECT/ REMOVAL THE DRAINAGE SHOULD BE SURVEYED TO CONFIRMED IT IS REDUNDANT.

SVP & RWP SETTING OUT AND CALCULATIONS
SVP AND RWP LOCATIONS ARE INDICATIVE FOR DETAILED SETTING OUT REFER TO ARCHITECTS DRAWINGS. ALL UNDER SLAB DRAINAGE IS IN ABEYANCE UNTIL SETTING OUT OF ALL SVPs, STACKS AND RWPs IS CONFIRMED BY THE ARCHITECT AND M&E ENGINEERING. ALL CONNECTIONS BETWEEN ABOVE GROUND DRAINAGE TO BE SIZED TO SUIT ABOVE GROUND DRAINAGE. FOUL WATER DRAINAGE IS SUBJECT TO CHANGE UNTIL SVP DISCHARGE UNITS ARE CONFIRMED BY THE M&E ENGINEER.

ATTENUATION TANK
SUPPLIER TO UNDERTAKE DETAILED DESIGN OF ATTENUATION TANKS. ALLOW FOR VENT PIPES AND INSPECTION CHAMBERS TO SUIT SUPPLIERS DETAILS AND REQUIREMENTS.

COVER LEVELS
LANDSCAPE ARCHITECT TO VALIDATE COVER LEVELS IN ALL EXTERNAL AREAS. ARCHITECT TO VALIDATE COVER LEVELS IN ALL INTERNAL AREAS.

EXTERNAL WORKS AND DRAINAGE
ALL EXTERNAL LEVELS, CHANNEL DRAINS, GULLIES ETC ARE TO BE CONFIRMED AND SET OUT BY THE LANDSCAPE ARCHITECT.

ALL CHANNELS AND GULLIES ARE TO INCLUDE A SILT TRAPS.

COMMERCIAL UNIT DRAINAGE
ANY FOOD AND BEVERAGE USE TO THE COMMERCIAL UNITS IS TO INCORPORATE GREASE TRAPS WITHIN THE ABOVE GROUND DRAINAGE NETWORK TO REDUCE THE RISKS OF BLOCKAGE WITHIN THE BELOW GROUND DRAINAGE NETWORKS.

TREES
THE DESIGN OF LANDSCAPING SHOULD BE UNDERTAKEN AT THE SAME TIME AS THE DESIGN OF THE DRAINAGE SO THAT THE IMPACT OF TREE ROOTS ON THE DRAINAGE CAN BE CONSIDERED. A SEWER OR LATERAL DRAIN SHOULD NOT BE LOCATED CLOSER TO TREES/BUSHES/SHRUBS THAN THE CANOPY WIDTH AT MATURE HEIGHT, EXCEPT WHERE SPECIAL PROTECTION MEASURES ARE PROVIDED, IN ACCORDANCE WITH B7.6 OF THE SEWER SECTOR GUIDANCE APPENDIX C. A TREE SHOULD NOT BE PLANTED DIRECTLY OVER SEWERS OR WHERE EXCAVATION ONTO THE SEWER WOULD REQUIRE REMOVAL OF THE TREE

SWIMMING POOL
POOL SPECIALIST TO CONFIRM RISING MAIN LOCATIONS, POWER SUPPLIES AND ALARMS LOCATIONS WITH THE ARCHITECT AND BUILDING SERVICES ENGINEER.

APPROVAL
DRAINAGE DESIGN AND DRAWING IS PRELIMINARY, SUBJECT TO CONFIRMATION FROM UNITED UTILITIES AND MANCHESTER CITY COUNCIL ON ACCEPTANCE OF DISCHARGE RATES, CONNECTIONS AND SUDS.

Rev:	Description:	Date:	By:	Chkd:
P04	UPDATED FOR LANDSCAPE PROPOSALS	12.02.24	JB	BH
P03	STAGE 4+ UPDATE TO SUIT FOUNDATIONS LEVELS AND BLOCK C&D AGD COORDINATION.	25.10.23	JB	PC
P02	STAGE 4 ISSUE	13.09.23	JB	PC
P01	STAGE 3 ISSUE	30.06.23	SA	PC

Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:
BODDINGTONS BREWERY, MANCHESTER

Drawing Title:
BELOW GROUND SURFACE WATER DRAINAGE PLAN

Status: STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A0	JUN 23	SA	HW	PC

Scale: 1:200 | Project No: 2211-11

Project – Originator – Volume – Level – Type – Role – Number: BRW-REN-ZZ-FN-DR-C-01100 | Revision: P04

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DRAWING LEGEND

- PLANNING BOUNDARY
- PROPOSED SURFACE WATER DRAINAGE (150mm DIAMETER UNO)
- PROPOSED FOUL WATER DRAINAGE (150mm DIAMETER UNO)
- PROPOSED COMBINED SEWER
- EXISTING UNITED UTILITIES COMBINED SEWER
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FLOOR LEVELS

- INDICATES GROUND FLOOR LEVEL
- INDICATES BASEMENT LEVEL 01
- INDICATES BASEMENT LEVEL 02

DUTTON ST

CHARTER ST

FRANCIS ST

TRINITY WAY

UU MH008 CL: 39.730 IL: 35.370

UU MH 8302 CL: 39.830 IL: 36.180

SADDLE CONNECTION INTO UNITED UTILITIES SEWER DUTTON STREET. INVERT LEVEL TBC ON SITE MIN IL: 37.031

CD1.00 1200 DIA CL: 39.842 IL: 37.071

UU MH 005 CL: 39.90 IL: 37.460

APPROXIMATE TOWER CRANE FOUNDATION

BELOW GROUND DRAINAGE TO CONNECT TO ABOVE GROUND DRAINAGE

AGD CONNECTION CL: 39.380 IL: 38.030

ABG CONNECTION THROUGH WALL

WHERE PIPE BARREL IS WITHIN 300mm OF THE UNDERSIDE OF SLAB DRAINAGE IS TO BE CONCRETE ENCASED. REFER TO TYPICAL DETAILS

BLOCK C & D PODIUM RWPs/ OUTLETS TO BE CONFIRMED BY ARCHITECT/ BUILDING SERVICES ENGINEER.

B1 LEVEL EXTERNAL GARDEN DRAINAGE OUTLET TO BE CONFIRMED BY ARCHITECT/ BUILDING SERVICES ENGINEER

POOL DRAINAGE REQUIREMENTS TO BE CONFIRMED BY SPECIALIST

LOADING

UU MH 009 CL: 29.070 IL: 24.830

APPROX IL:24.830 TBC ON SITE

225 DIA

OF1.00 1200 DIA CL: 26.580 IL: 26.530

SADDLE CONNECTION POINT INTO UNITED UTILITIES SEWER FRANCIS STREET

LU MH REF CL: 36.240 IL: 32.540

CT1.00 1200 DIA CL: 35.553 IL: 32.931

2250 1:60 @ MIN

PROPOSED SADDLE CONNECTION INTO UNITED UTILITIES SEWER WITHIN TRINITY WAY. INVERT LEVEL TBC ON SITE. MIN IL: 32.845

EXISTING DRAINAGE AND LANDSCAPING TO COLLEGE ENTRANCE BY OTHERS TO REMAIN

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RENAISSANCE, ARCHITECTS, LANDSCAPE ARCHITECTS AND BUILDING SERVICES ENGINEERS DRAWINGS.
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11. MANHOLE COVERS ARE TO BE ACCORDANCE WITH BS EN 124 FOR THE RATING INDICATED IN THE MANHOLE SCHEDULE. THE CONTRACTOR IS TO SUBMIT DETAILS FOR THE PROPOSED MANHOLE COVERS TO THE ENGINEER AND LANDSCAPE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION.
12. ALL INTERNAL COVERS TO BE RECESSED AND TRIPLE SEALED
13. COVER SLABS MUST CARRY THE BSI KITEMARK. WHERE THE CLEAR OPENING OF THE KITEMARKED PRODUCT IS DIFFERENT TO THAT OF THE COVER AND FRAME, A LOAD BEARING REDUCING SLAB SHOULD BE FITTED ABOVE THE COVER SLAB TO BRING THE SIZE DOWN TO REQUIRED SIZE.
14. ALL SEWERS TO BE BSI KITEMARK (CERTIFIED TO WIS 4-35-01)
15. ALL CONCRETE PIPES TO BE TO ES EN 1916 CLASS 120 (54kN/m).
16. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2).
17. IF PLASTIC PIPES ARE TO BE USED THEN THE FOLLOWING MUST APPLY:
    A. BSI KITEMARK (CERTIFIED TO BS EN 13476-1 AND WIS 4-35-01)
    B. PIPES LESS THAN OR EQUAL TO 500mm DIA
    C. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2)
17. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS: 100mm DIA. 40kN/m, 150mm DIA. 40kN/m, 225mm DIA. 45kN/m AND 300mm DIA. 72kN/m.
18. THE MINIMUM CRUSHING STRENGTH FOR CONCRETE PIPES SHOULD BE - (CLASS 120 TO EN 1916/BS5911-1 2002). PLASTIC PIPES SHOULD CONFORM TO WIS 4-35-01 AND BS EN13476.
19. SULPHATE RESISTANT CEMENT (C20-DC2) AND PRECAST CONCRETE PRODUCTS MUST BE USED OR A LABORATORY REPORT PROVIDED PROVIDING THAT SUCH PRECAUTIONS ARE NOT NECESSARY.
20. SEWER PIPES TO BE LAID IN MAXIMUM 3 METER LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER PIPES, AND THIS IS AGREED BY THE CONTRACTOR WITH THE PIPE MANUFACTURER.
21. ALL FOUL AND SURFACE WATER BELOW GROUND SYSTEMS ARE TO BE VENTED WITHIN THE ABOVE GROUND DRAINAGE TO THE BUILDING SERVICES ENGINEERS DETAILS.

CDM NOTES

IN ADDITION TO THE NORMAL HAZARDS AND RISK NORMALLY ASSOCIATED WITH WORKS OF THIS NATURE, NOTE THE FOLLOWING ABNORMAL RISKS:

SOIL CONTAMINATION
HEAVY METAL, PAH AND ASBESTOS CONTAMINATION IDENTIFIED WITHIN THE MADE GROUND. MINOR HEAVY METAL AND NON-MIETAL CONTAMINATION IDENTIFIED WITHIN PERCHED GROUNDWATER.

STRIKING UXO OR BURIED SERVICES
SITE ENABLING WORKS PACKAGE REQUIRED TO CLEAR LIVE SERVICES AND UXO RISK

PERCHED WATER TABLE
ALLOW FOR LOCALISED DEWATERING DURING ALL SUBSTRUCTURE WORKS.

REFERENCE SHOULD BE MADE TO BROWNFIELD SOLUTIONS LTD SITE INVESTIGATION FOR GROUND CONDITIONS AND PERCHED GROUND WATER TABLES. CONTRACTOR SHOULD MAKE ALLOWANCE FOR TEMPORARY DEWATERING TRENCH SUPPORT WORKS PRIOR TO CONSTRUCTION.

RIBA STAGE 4+
THIS DRAWING IS INTENDED TO COMMUNICATE THE INTERIM PROGRESS OF THE TECHNICAL DESIGN AND IS APPROPRIATE FOR RIBA STAGE 4+

A DESIGN CONTINGENCY OF 10-15% IS RECOMMENDED TO ALLOW FOR DESIGN DEVELOPMENT DURING RIBA STAGE 5 AND TO REFLECT INPUT FROM THE CONTRACTOR DESIGNED PACKAGES. THIS DRAWING HAS BEEN DEVELOPED WITHOUT FULL STAGE 4 INFORMATION FROM THE WIDER DESIGN TEAM.

EXISTING ONSITE PRIVATE DRAINAGE
ALL EXISTING ONSITE PRIVATE DRAINAGE IS TO BE GRUBBED UP AND SUITABLY CAPPED AT THE SITE BOUNDARY. PRIOR TO DISCONNECT/ REMOVAL THE DRAINAGE SHOULD BE SURVEYED TO CONFIRMED IT IS REDUNDANT.

SVP & RWP SETTING OUT AND CALCULATIONS
SVP AND RWP LOCATIONS ARE INDICATIVE FOR DETAILED SETTING OUT REFER TO ARCHITECTS DRAWINGS. ALL UNDER SLAB DRAINAGE IS IN ABEYANCE UNTIL SETTING OUT OF ALL SVPs, STACKS AND RWPs IS CONFIRMED BY THE ARCHITECT AND M&E ENGINEERING. ALL CONNECTIONS BETWEEN ABOVE GROUND DRAINAGE TO BE SIZED TO SUIT ABOVE GROUND DRAINAGE. FOUL WATER DRAINAGE IS SUBJECT TO CHANGE UNTIL SVP DISCHARGE UNITS ARE CONFIRMED BY THE M&E ENGINEER.

ATTENUATION TANK
SUPPLIER TO UNDERTAKE DETAILED DESIGN OF ATTENUATION TANKS. ALLOW FOR VENT PIPES AND INSPECTION CHAMBERS TO SUIT SUPPLIERS DETAILS AND REQUIREMENTS.

COVER LEVELS
LANDSCAPE ARCHITECT TO VALIDATE COVER LEVELS IN ALL EXTERNAL AREAS. ARCHITECT TO VALIDATE COVER LEVELS IN ALL INTERNAL AREAS.

EXTERNAL WORKS AND DRAINAGE
ALL EXTERNAL LEVELS, CHANNEL DRAINS, GULLIES ETC ARE TO BE CONFIRMED AND SET OUT BY THE LANDSCAPE ARCHITECT.

ALL CHANNELS AND GULLIES ARE TO INCLUDE A SILT TRAPS.

COMMERCIAL UNIT DRAINAGE
ANY FOOD AND BEVERAGE USE TO THE COMMERCIAL UNITS IS TO INCORPORATE GREASE TRAPS WITHIN THE ABOVE GROUND DRAINAGE NETWORK TO REDUCE THE RISKS OF BLOCKAGE WITHIN THE BELOW GROUND DRAINAGE NETWORKS.

TREES
THE DESIGN OF LANDSCAPING SHOULD BE UNDERTAKEN AT THE SAME TIME AS THE DESIGN OF THE DRAINAGE SO THAT THE IMPACT OF TREE ROOTS ON THE DRAINAGE CAN BE CONSIDERED. A SEWER OR LATERAL DRAIN SHOULD NOT BE LOCATED CLOSER TO TREES/BUSHES/SHRUBS THAN THE CANOPY WIDTH AT MATURE HEIGHT, EXCEPT WHERE SPECIAL PROTECTION MEASURES ARE PROVIDED, IN ACCORDANCE WITH B7.6 OF THE SEWER SECTOR GUIDANCE APPENDIX C. A TREE SHOULD NOT BE PLANTED DIRECTLY OVER SEWERS OR WHERE EXCAVATION ONTO THE SEWER WOULD REQUIRE REMOVAL OF THE TREE

SWIMMING POOL
POOL SPECIALIST TO CONFIRM RISING MAIN LOCATIONS, POWER SUPPLIES AND ALARMS LOCATIONS WITH THE ARCHITECT AND BUILDING SERVICES ENGINEER.

APPROVAL
DRAINAGE DESIGN AND DRAWING IS PRELIMINARY, SUBJECT TO CONFIRMATION FROM UNITED UTILITIES AND MANCHESTER CITY COUNCIL ON ACCEPTANCE OF DISCHARGE RATES, CONNECTIONS AND SUDS.

Rev:	Description:	Date:	By:	Chkd:
P03	UPDATED LANDSCAPE ARCHITECT BACKGROUND	12.02.24	JB	BH
P02	STAGE 4+ UPDATE TO SUIT FOUNDATION LEVELS AND BLOCK C&D AGD COORDINATION	25.10.23	JB	PC
P01	STAGE 4 ISSUE	13.09.23	JB	PC

Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:
BODDINGTONS BREWERY, MANCHESTER

Drawing Title:
BELOW GROUND FOUL WATER DRAINAGE PLAN

Status:
STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A0	SEP 23	JB	JB	PC

Scale: 1:200 Project No: 2211-11

Project – Originator – Volume – Level – Type – Role – Number: Revision:

BRW-REN-ZZ-FN-DR-C-01101 P03

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APPENDIX K

PROPOSED SURFACE WATER RUN-OFF VOLUME CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Trinity Way

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm - Trinity Way

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.261	4-8	0.089

Total Area Contributing (ha) = 0.350

Total Pipe Volume (m³) = 8.318

Network Design Table for Storm - Trinity Way

« - Indicates pipe capacity < flow

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
ST1.000	15.946	0.106	150.0	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.001	18.054	0.120	150.0	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.002	8.989	0.608	14.8	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.003	13.773	0.092	150.0	0.114	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.004	4.171	0.213	19.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST2.000	10.641	0.071	150.0	0.038	5.00	0.0	0.600	o	150	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)
ST1.000	50.00	5.25	38.660	0.044	0.0	0.0	0.0	1.07	42.4	6.0
ST1.001	50.00	5.53	38.554	0.050	0.0	0.0	0.0	1.07	42.4	6.8
ST1.002	50.00	5.58	38.433	0.056	0.0	0.0	0.0	3.42	136.0	7.6
ST1.003	50.00	5.79	37.825	0.170	0.0	0.0	0.0	1.07	42.4	23.0
ST1.004	50.00	5.81	37.734	0.170	0.0	0.0	0.0	2.97	118.1	23.0
ST2.000	50.00	5.22	38.650	0.038	0.0	0.0	0.0	0.82	14.5	5.1

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Network Design Table for Storm - Trinity Way

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
ST3.000	2.553	0.017	150.0	0.076	5.00	0.0	0.600	o	225	Pipe/Conduit	
ST3.001	10.807	0.229	47.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST2.001	20.084	0.134	150.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST2.002	6.064	0.606	10.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
ST1.005	12.368	1.237	10.0	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST4.000	9.166	0.061	150.0	0.004	5.00	0.0	0.600	o	150	Pipe/Conduit	
ST1.006	5.512	0.501	11.0	0.004	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.007	9.389	0.854	11.0	0.004	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.008	7.084	0.381	18.6	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
ST5.000	21.981	0.147	150.0	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit	
ST1.009	7.203	0.048	150.0	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
ST1.010	5.176	0.035	150.0	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
ST6.000	2.175	0.014	150.0	0.004	5.00	0.0	0.600	o	150	Pipe/Conduit	
ST1.011	3.174	0.021	150.0	0.000	0.00	0.0	0.600	o	150	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)
ST3.000	50.00	5.04	38.750	0.076	0.0	0.0	0.0	1.07	42.4	10.3
ST3.001	50.00	5.13	38.733	0.076	0.0	0.0	0.0	1.91	75.9	10.3
ST2.001	50.00	5.53	38.504	0.114	0.0	0.0	0.0	1.07	42.4	15.4
ST2.002	50.00	5.56	38.370	0.114	0.0	0.0	0.0	3.20	56.6	15.4
ST1.005	50.00	5.86	36.200	0.322	0.0	0.0	0.0	4.16	165.5	43.6
ST4.000	50.00	5.19	36.526	0.004	0.0	0.0	0.0	0.82	14.5	0.5
ST1.006	50.00	5.89	34.963	0.330	0.0	0.0	0.0	3.97	157.8	44.7
ST1.007	50.00	5.93	34.462	0.334	0.0	0.0	0.0	3.97	157.8	45.2
ST1.008	50.00	5.96	33.534	0.338	0.0	0.0	0.0	3.66	258.9	45.8
ST5.000	50.00	5.29	33.300	0.000	0.0	0.0	0.0	1.28	90.6	0.0
ST1.009	50.00	6.05	33.153	0.342	0.0	0.0	0.0	1.28	90.6	46.3
ST1.010	50.00	6.12	33.105	0.346	0.0	0.0	0.0	1.28	90.6	46.9
ST6.000	50.00	5.04	34.358	0.004	0.0	0.0	0.0	0.82	14.5	0.5
ST1.011	50.00	6.18	33.070	0.350	0.0	0.0	0.0	0.82	14.5«	47.4

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Area Summary for Storm - Trinity Way

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.044	0.044	0.044
1.001	-	-	100	0.006	0.006	0.006
1.002	-	-	100	0.006	0.006	0.006
1.003	-	-	100	0.114	0.114	0.114
1.004	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.038	0.038	0.038
3.000	-	-	100	0.076	0.076	0.076
3.001	-	-	100	0.000	0.000	0.000
2.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.038	0.038	0.038
4.000	-	-	100	0.004	0.004	0.004
1.006	-	-	100	0.004	0.004	0.004
1.007	-	-	100	0.004	0.004	0.004
1.008	-	-	100	0.004	0.004	0.004
5.000	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.004	0.004	0.004
1.010	-	-	100	0.004	0.004	0.004
6.000	-	-	100	0.004	0.004	0.004
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.350	0.350	0.350

Free Flowing Outfall Details for Storm - Trinity Way

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
ST1.011	ST	35.553	33.049	0.000	0	0

Simulation Criteria for Storm - Trinity Way

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/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 1	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR	Profile Type Summer
Return Period (years)		100	Cv (Summer) 1.000
Region	England and Wales		Cv (Winter) 0.840
M5-60 (mm)		18.000	Storm Duration (mins) 30
Ratio R		0.360	

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Online Controls for Storm - Trinity Way

Hydro-Brake® Optimum Manhole: ST1.11-FC, DS/PN: ST1.011, Volume (m³): 3.3

Unit Reference	MD-SCL-0094-5400-1800-5400
Design Head (m)	1.800
Design Flow (l/s)	5.4
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	94
Invert Level (m)	33.070
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)	1.800	5.4	Kick-Flo®	0.836	3.8
Flush-Flo™	0.375	5.0	Mean Flow over Head Range	-	4.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.5	3.000	6.8	7.000	10.2
0.200	4.7	1.400	4.8	3.500	7.3	7.500	10.5
0.300	5.0	1.600	5.1	4.000	7.8	8.000	10.9
0.400	5.0	1.800	5.4	4.500	8.3	8.500	11.2
0.500	4.9	2.000	5.7	5.000	8.7	9.000	11.5
0.600	4.8	2.200	5.9	5.500	9.1	9.500	11.8
0.800	4.0	2.400	6.2	6.000	9.5		
1.000	4.1	2.600	6.4	6.500	9.8		

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Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm - Trinity Way

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
ST1.000	ST1.00	360 minute 100 year Winter I+0%	360	40.051	38.698	-0.187	0.000
ST1.001	ST1.01	360 minute 100 year Winter I+0%	360	40.039	38.595	-0.184	0.000
ST1.002	ST1.02	360 minute 100 year Winter I+0%	360	39.992	38.459	-0.200	0.000
ST1.003	ST1.03	360 minute 100 year Winter I+0%	360	40.100	37.904	-0.146	0.000
ST1.004	ST1.04	360 minute 100 year Winter I+0%	360	39.060	37.792	-0.167	0.000
ST2.000	ST2.00	360 minute 100 year Winter I+0%	360	40.100	38.691	-0.109	0.000
ST3.000	ST3.00	360 minute 100 year Winter I+0%	360	40.100	38.810	-0.165	0.000
ST3.001	ST3.01	360 minute 100 year Winter I+0%	360	40.100	38.772	-0.186	0.000
ST2.001	ST2.01	360 minute 100 year Winter I+0%	360	40.100	38.567	-0.162	0.000
ST2.002	ST2.02	360 minute 100 year Winter I+0%	360	40.100	38.407	-0.113	0.000
ST1.005	ST1.05	360 minute 100 year Winter I+0%	360	39.060	36.254	-0.171	0.000
ST4.000	ST4.00	360 minute 100 year Winter I+0%	360	37.876	36.539	-0.137	0.000
ST1.006	ST1.06	360 minute 100 year Winter I+0%	360	37.501	35.030	-0.158	0.000
ST1.007	ST1.07	360 minute 100 year Winter I+0%	360	36.836	34.520	-0.167	0.000
ST1.008	ST1.08	360 minute 100 year Winter I+0%	360	36.677	34.241	0.407	0.000
ST5.000	ST5.00-TANK	360 minute 100 year Summer I+0%	360	35.600	34.075	0.475	0.000
ST1.009	ST1.09	360 minute 100 year Winter I+0%	360	36.390	34.234	0.781	0.000
ST1.010	ST1.10	360 minute 100 year Winter I+0%	360	35.931	34.244	0.840	0.000
ST6.000	ST6.00	360 minute 100 year Winter I+0%	360	35.708	34.373	-0.135	0.000
ST1.011	ST1.11-FC	360 minute 100 year Winter I+0%	360	35.697	34.245	1.025	0.000

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Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm - Trinity Way

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
ST1.000	ST1.00	0.07		0.009	21.989	0.6		2.6	OK
ST1.001	ST1.01	0.08		0.048	24.988	0.6		2.9	OK
ST1.002	ST1.02	0.03		0.027	27.986	1.4		3.3	OK
ST1.003	ST1.03	0.27		0.028	84.958	0.8		9.9	OK
ST1.004	ST1.04	0.15		0.070	84.958	1.2		9.9	OK
ST2.000	ST2.00	0.17		0.006	18.991	0.6		2.2	OK
ST3.000	ST3.00	0.16		0.016	37.981	0.5		4.4	OK
ST3.001	ST3.01	0.07		0.018	37.981	1.0		4.4	OK
ST2.001	ST2.01	0.17		0.036	56.972	0.7		6.7	OK
ST2.002	ST2.02	0.14		0.043	56.972	1.9		6.7	OK
ST1.005	ST1.05	0.13		0.056	160.920	2.6		18.8	OK
ST4.000	ST4.00	0.02		0.001	1.999	0.4		0.2	OK
ST1.006	ST1.06	0.19		0.022	164.917	2.0		19.3	OK
ST1.007	ST1.07	0.15		0.019	166.916	2.4		19.5	OK
ST1.008	ST1.08	0.13		0.998	168.915	1.4		19.5	SURCHARGED
ST5.000	ST5.00-TANK	0.12		71.528	0.010	0.6	221	9.8	SURCHARGED
ST1.009	ST1.09	0.13		3.102	170.895	0.5		8.1	SURCHARGED
ST1.010	ST1.10	0.11		1.708	172.893	0.4		6.5	SURCHARGED
ST6.000	ST6.00	0.02		0.002	1.999	0.3		0.2	OK
ST1.011	ST1.11-FC	0.47		1.604	174.891	0.7		5.0	SURCHARGED

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Francis Street

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm - Francis Street

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.177	4-8	0.181

Total Area Contributing (ha) = 0.358

Total Pipe Volume (m³) = 115.947

Network Design Table for Storm - Francis Street

« - Indicates pipe capacity < flow

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
SF1.000	4.741	0.032	150.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.001	5.264	0.856	6.1	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.002	3.766	1.220	3.1	0.002	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.003	3.325	1.213	2.7	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.004	5.814	1.170	5.0	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.005	3.994	0.517	7.7	0.003	0.00	0.0	0.600	o	150	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)
SF1.000	50.00	5.10	33.688	0.010	0.0	0.0	0.0	0.82	14.5	1.4
SF1.001	50.00	5.12	33.656	0.016	0.0	0.0	0.0	4.09	72.3	2.2
SF1.002	50.00	5.13	32.800	0.018	0.0	0.0	0.0	5.78	102.1	2.4
SF1.003	50.00	5.14	31.580	0.021	0.0	0.0	0.0	6.13	108.4	2.8
SF1.004	50.00	5.16	30.367	0.024	0.0	0.0	0.0	4.55	80.4	3.2
SF1.005	50.00	5.18	29.197	0.027	0.0	0.0	0.0	3.65	64.5	3.7

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Network Design Table for Storm - Francis Street

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
SF2.000	11.505	0.170	67.7	0.016	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.006	7.455	0.019	400.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF3.000	5.398	0.239	22.6	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.007	11.489	0.029	396.2	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF4.000	5.276	0.268	19.7	0.007	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.008	3.421	0.009	380.1	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF5.000	12.477	0.083	150.0	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF5.001	11.064	0.143	77.2	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.009	8.478	0.021	403.7	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF6.000	6.055	0.298	20.3	0.005	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF7.000	3.628	0.098	37.0	0.053	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.010	13.838	0.035	400.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF8.000	7.412	0.333	22.3	0.000	5.00	0.0	0.600	o	150	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)
SF2.000	50.00	5.16	28.850	0.016	0.0	0.0	0.0	1.22	21.6	2.2
SF1.006	50.00	5.25	27.780	0.043	0.0	0.0	0.0	1.72	1486.6	5.8
SF3.000	50.00	5.04	28.900	0.008	0.0	0.0	0.0	2.13	37.6	1.1
SF1.007	50.00	5.36	27.761	0.051	0.0	0.0	0.0	1.73	1493.8	6.9
SF4.000	50.00	5.04	28.900	0.007	0.0	0.0	0.0	2.28	40.3	0.9
SF1.008	50.00	5.39	27.732	0.058	0.0	0.0	0.0	1.76	1525.3	7.9
SF5.000	50.00	5.25	28.850	0.013	0.0	0.0	0.0	0.82	14.5	1.8
SF5.001	50.00	5.42	28.767	0.026	0.0	0.0	0.0	1.15	20.2	3.5
SF1.009	50.00	5.50	27.723	0.084	0.0	0.0	0.0	1.71	1479.7	11.4
SF6.000	50.00	5.04	28.900	0.005	0.0	0.0	0.0	2.24	39.7	0.7
SF7.000	50.00	5.04	28.700	0.053	0.0	0.0	0.0	1.66	29.3	7.2
SF1.010	50.00	5.63	27.702	0.142	0.0	0.0	0.0	1.72	1486.6	19.2
SF8.000	50.00	5.06	28.900	0.000	0.0	0.0	0.0	2.14	37.9	0.0

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Network Design Table for Storm - Francis Street

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
SF9.000	9.190	0.061	150.0	0.007	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF9.001	11.091	0.222	50.0	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.011	10.480	0.026	400.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF10.000	5.809	0.359	16.2	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.012	3.459	0.009	384.3	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF11.000	4.870	0.268	18.2	0.029	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.013	1.519	0.004	379.8	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF12.000	8.487	0.084	100.9	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF12.001	10.735	0.238	45.2	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.014	17.254	0.043	401.3	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF13.000	3.982	0.265	15.0	0.018	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.015	0.946	0.002	473.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF14.000	9.694	0.065	150.0	0.013	5.00	0.0	0.600	o	150	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)
SF9.000	50.00	5.19	28.850	0.007	0.0	0.0	0.0	0.82	14.5	0.9
SF9.001	50.00	5.32	28.789	0.020	0.0	0.0	0.0	1.43	25.2	2.7
SF1.011	50.00	5.73	27.667	0.162	0.0	0.0	0.0	1.72	1486.6	21.9
SF10.000	50.00	5.04	28.900	0.012	0.0	0.0	0.0	2.52	44.5	1.6
SF1.012	50.00	5.77	27.641	0.174	0.0	0.0	0.0	1.75	1516.8	23.6
SF11.000	50.00	5.03	28.800	0.029	0.0	0.0	0.0	2.37	42.0	3.9
SF1.013	50.00	5.78	27.632	0.203	0.0	0.0	0.0	1.76	1526.0	27.5
SF12.000	50.00	5.14	28.850	0.013	0.0	0.0	0.0	1.00	17.7	1.8
SF12.001	50.00	5.26	28.766	0.020	0.0	0.0	0.0	1.50	26.5	2.7
SF1.014	50.00	5.95	27.628	0.223	0.0	0.0	0.0	1.71	1484.3	30.2
SF13.000	50.00	5.03	28.750	0.018	0.0	0.0	0.0	2.61	46.2	2.4
SF1.015	50.00	5.96	27.585	0.241	0.0	0.0	0.0	1.58	1366.2	32.6
SF14.000	50.00	5.20	28.850	0.013	0.0	0.0	0.0	0.82	14.5	1.8

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Network Design Table for Storm - Francis Street

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
SF15.000	2.620	0.065	40.5	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF14.001	10.576	0.303	34.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.016	11.664	0.030	393.6	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF16.000	3.649	0.247	14.8	0.011	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.017	19.441	0.049	400.0	0.013	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF17.000	5.634	0.296	19.0	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.018	15.102	0.038	400.0	0.026	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF18.000	3.294	1.210	2.7	0.003	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.001	3.736	1.222	3.1	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.002	4.062	1.219	3.3	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.003	3.516	1.216	2.9	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.004	4.345	1.231	3.5	0.002	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.005	3.748	1.226	3.1	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.006	4.866	1.500	3.2	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.007	9.602	0.024	400.0	0.003	0.00	0.0	0.600	o	450	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)
SF15.000	50.00	5.03	28.850	0.010	0.0	0.0	0.0	1.59	28.0	1.4
SF14.001	50.00	5.30	28.785	0.023	0.0	0.0	0.0	1.71	30.2	3.1
SF1.016	50.00	6.07	27.583	0.264	0.0	0.0	0.0	1.73	1498.8	35.7
SF16.000	50.00	5.02	28.700	0.011	0.0	0.0	0.0	2.63	46.6	1.5
SF1.017	50.00	6.26	27.553	0.288	0.0	0.0	0.0	1.72	1486.6	39.0
SF17.000	50.00	5.04	28.700	0.014	0.0	0.0	0.0	2.32	41.0	1.9
SF1.018	50.00	6.41	27.504	0.328	0.0	0.0	0.0	1.72	1486.6	44.4
SF18.000	50.00	5.01	37.371	0.003	0.0	0.0	0.0	6.15	108.8	0.4
SF18.001	50.00	5.02	36.161	0.006	0.0	0.0	0.0	5.81	102.6	0.8
SF18.002	50.00	5.03	34.939	0.009	0.0	0.0	0.0	5.56	98.3	1.2
SF18.003	50.00	5.04	33.720	0.012	0.0	0.0	0.0	5.97	105.5	1.6
SF18.004	50.00	5.06	32.504	0.014	0.0	0.0	0.0	5.40	95.5	1.9
SF18.005	50.00	5.07	31.273	0.017	0.0	0.0	0.0	5.81	102.6	2.3
SF18.006	50.00	5.08	30.047	0.020	0.0	0.0	0.0	5.64	99.6	2.7
SF18.007	50.00	5.24	27.490	0.023	0.0	0.0	0.0	1.01	160.7	3.1

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Network Design Table for Storm - Francis Street

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
SF1.019	5.400	0.054	100.0	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.020	38.898	0.389	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SF1.021	28.953	0.290	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SF1.022	4.607	0.795	5.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
SF1.019	50.00	6.50	27.466	0.358	0.0	0.0	0.0	1.00	17.8«	48.5
SF1.020	50.00	6.99	27.337	0.358	0.0	0.0	0.0	1.31	52.0	48.5
SF1.021	50.00	7.36	26.948	0.358	0.0	0.0	0.0	1.31	52.0	48.5
SF1.022	50.00	7.38	26.659	0.358	0.0	0.0	0.0	5.47	217.6	48.5

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Area Summary for Storm - Francis Street

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.010	0.010	0.010
1.001	-	-	100	0.006	0.006	0.006
1.002	-	-	100	0.002	0.002	0.002
1.003	-	-	100	0.003	0.003	0.003
1.004	-	-	100	0.003	0.003	0.003
1.005	-	-	100	0.003	0.003	0.003
2.000	-	-	100	0.016	0.016	0.016
1.006	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.008	0.008	0.008
1.007	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.007	0.007	0.007
1.008	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.013	0.013	0.013
5.001	-	-	100	0.013	0.013	0.013
1.009	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.005	0.005	0.005
7.000	-	-	100	0.053	0.053	0.053
1.010	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.007	0.007	0.007
9.001	-	-	100	0.013	0.013	0.013
1.011	-	-	100	0.000	0.000	0.000
10.000	-	-	100	0.012	0.012	0.012
1.012	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.029	0.029	0.029
1.013	-	-	100	0.000	0.000	0.000
12.000	-	-	100	0.013	0.013	0.013
12.001	-	-	100	0.007	0.007	0.007
1.014	-	-	100	0.000	0.000	0.000
13.000	-	-	100	0.018	0.018	0.018
1.015	-	-	100	0.000	0.000	0.000
14.000	-	-	100	0.013	0.013	0.013
15.000	-	-	100	0.010	0.010	0.010
14.001	-	-	100	0.000	0.000	0.000
1.016	-	-	100	0.000	0.000	0.000
16.000	-	-	100	0.011	0.011	0.011
1.017	-	-	100	0.013	0.013	0.013
17.000	-	-	100	0.014	0.014	0.014
1.018	-	-	100	0.026	0.026	0.026
18.000	-	-	100	0.003	0.003	0.003
18.001	-	-	100	0.003	0.003	0.003
18.002	-	-	100	0.003	0.003	0.003
18.003	-	-	100	0.003	0.003	0.003
18.004	-	-	100	0.002	0.002	0.002
18.005	-	-	100	0.003	0.003	0.003
18.006	-	-	100	0.003	0.003	0.003
18.007	-	-	100	0.003	0.003	0.003
1.019	-	-	100	0.007	0.007	0.007
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000
1.022	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.358	0.358	0.358

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Free Flowing Outfall Details for Storm - Francis Street

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SF1.022	SF	28.580	25.864	0.000	0	0

Simulation Criteria for Storm - Francis Street

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/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	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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Online Controls for Storm - Francis Street

Hydro-Brake® Optimum Manhole: SF1.19-FC, DS/PN: SF1.019, Volume (m³): 19.9

Unit Reference	MD-SCL-0094-5500-1856-5500
Design Head (m)	1.856
Design Flow (l/s)	5.5
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	94
Invert Level (m)	27.466
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)	1.856	5.5	Kick-Flo®	0.836	3.8
Flush-Flo™	0.377	5.0	Mean Flow over Head Range	-	4.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.5	3.000	6.9	7.000	10.2
0.200	4.7	1.400	4.8	3.500	7.4	7.500	10.6
0.300	5.0	1.600	5.1	4.000	7.9	8.000	10.9
0.400	5.0	1.800	5.4	4.500	8.3	8.500	11.2
0.500	4.9	2.000	5.7	5.000	8.7	9.000	11.5
0.600	4.8	2.200	5.9	5.500	9.1	9.500	11.8
0.800	4.1	2.400	6.2	6.000	9.5		
1.000	4.1	2.600	6.4	6.500	9.9		

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Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm - Francis Street

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 Coeffiecient	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 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.000	SF1.00	360 minute 100 year Winter I+0%	360	34.738	33.710	-0.128	0.000
SF1.001	SF1.01	360 minute 100 year Winter I+0%	360	34.574	33.668	-0.139	0.000
SF1.002	SF1.02	360 minute 100 year Winter I+0%	360	33.850	32.811	-0.139	0.000
SF1.003	SF1.03	360 minute 100 year Winter I+0%	360	32.630	31.593	-0.137	0.000
SF1.004	SF1.04	360 minute 100 year Winter I+0%	360	31.417	30.382	-0.135	0.000
SF1.005	SF1.05	360 minute 100 year Winter I+0%	360	30.247	29.215	-0.132	0.000
SF2.000	SF2.00	360 minute 100 year Winter I+0%	360	30.042	28.871	-0.129	0.000
SF1.006	SF1.06	360 minute 100 year Winter I+0%	360	29.953	28.418	-0.412	0.000
SF3.000	SF3.00	360 minute 100 year Winter I+0%	360	29.913	28.911	-0.139	0.000
SF1.007	SF1.07-JCT	360 minute 100 year Winter I+0%	360	29.813	28.418	-0.393	0.000
SF4.000	SF4.00	360 minute 100 year Winter I+0%	360	30.036	28.909	-0.141	0.000
SF1.008	SF1.08-JCT	360 minute 100 year Winter I+0%	360	29.992	28.418	-0.364	0.000
SF5.000	SF5.00	360 minute 100 year Winter I+0%	360	30.037	28.873	-0.127	0.000
SF5.001	SF5.01	360 minute 100 year Winter I+0%	360	30.049	28.796	-0.121	0.000
SF1.009	SF1.09-JCT	360 minute 100 year Winter I+0%	360	29.853	28.418	-0.355	0.000
SF6.000	SF6.00	360 minute 100 year Winter I+0%	360	29.938	28.906	-0.144	0.000
SF7.000	SF7.00	360 minute 100 year Winter I+0%	360	29.753	28.740	-0.110	0.000
SF1.010	SF1.10	360 minute 100 year Winter I+0%	360	29.817	28.418	-0.334	0.000
SF8.000	SF8.00	360 minute 100 year Summer I+0%	360	29.927	28.900	-0.150	0.000
SF9.000	SF9.00	360 minute 100 year Winter I+0%	360	30.037	28.867	-0.133	0.000
SF9.001	SF9.01	360 minute 100 year Winter I+0%	360	30.037	28.811	-0.128	0.000
SF1.011	SF1.11	360 minute 100 year Winter I+0%	360	29.820	28.418	-0.299	0.000
SF10.000	SF10.00	360 minute 100 year Winter I+0%	360	29.938	28.914	-0.136	0.000
SF1.012	SF1.12-JCT	360 minute 100 year Winter I+0%	360	29.845	28.418	-0.272	0.000
SF11.000	SF11.00	360 minute 100 year Winter I+0%	360	29.822	28.822	-0.128	0.000

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Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.000	SF1.00	0.05		0.003	4.997	0.4		0.6	OK
SF1.001	SF1.01	0.02		0.004	7.995	1.7		0.9	OK
SF1.002	SF1.02	0.02		0.001	8.995	2.0		1.1	OK
SF1.003	SF1.03	0.02		0.001	10.494	2.0		1.2	OK
SF1.004	SF1.04	0.02		0.002	11.992	1.9		1.4	OK
SF1.005	SF1.05	0.04		0.002	13.491	1.3		1.6	OK
SF2.000	SF2.00	0.05		0.003	7.996	0.6		0.9	OK
SF1.006	SF1.06	0.00		2.194	21.487	0.1		2.1	OK
SF3.000	SF3.00	0.02		0.001	3.998	0.9		0.5	OK
SF1.007	SF1.07-JCT	0.00		3.572	25.483	0.1		2.0	OK*
SF4.000	SF4.00	0.01		0.001	3.498	0.9		0.4	OK
SF1.008	SF1.08-JCT	0.00		6.270	28.981	0.1		1.7	OK*
SF5.000	SF5.00	0.06		0.003	6.497	0.4		0.8	OK
SF5.001	SF5.01	0.08		0.023	12.994	0.6		1.5	OK
SF1.009	SF1.09-JCT	0.00		2.386	41.973	0.1		2.6	OK*
SF6.000	SF6.00	0.01		0.000	2.498	0.7		0.3	OK
SF7.000	SF7.00	0.16		0.006	26.487	0.8		3.1	OK
SF1.010	SF1.10	0.01		6.308	70.957	0.2		4.7	OK
SF8.000	SF8.00	0.00		0.000	0.000	0.0		0.0	OK
SF9.000	SF9.00	0.03		0.002	3.498	0.4		0.4	OK
SF9.001	SF9.01	0.05		0.014	9.995	0.7		1.2	OK
SF1.011	SF1.11	0.01		9.069	80.952	0.2		4.5	OK
SF10.000	SF10.00	0.02		0.001	5.997	1.1		0.7	OK
SF1.012	SF1.12-JCT	0.00		6.236	86.948	0.2		4.5	OK*
SF11.000	SF11.00	0.05		0.003	14.493	1.1		1.7	OK

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Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm - Francis Street

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.013	SF1.13-JCT	360 minute 100 year Winter I+0%	360	29.891	28.418	-0.263	0.000
SF12.000	SF12.00	360 minute 100 year Winter I+0%	360	30.037	28.871	-0.129	0.000
SF12.001	SF12.01	360 minute 100 year Winter I+0%	360	30.041	28.787	-0.129	0.000
SF1.014	SF1.14-JCT	360 minute 100 year Winter I+0%	360	29.899	28.418	-0.259	0.000
SF13.000	SF13.00	360 minute 100 year Winter I+0%	360	29.788	28.768	-0.132	0.000
SF1.015	SF1.15-JCT	360 minute 100 year Winter I+0%	360	29.644	28.418	-0.216	0.000
SF14.000	SF14.00	360 minute 100 year Winter I+0%	360	30.033	28.873	-0.127	0.000
SF15.000	SF15.00	360 minute 100 year Winter I+0%	360	30.027	28.868	-0.132	0.000
SF14.001	SF14.01	360 minute 100 year Winter I+0%	360	30.027	28.807	-0.129	0.000
SF1.016	SF1.16-JCT	360 minute 100 year Winter I+0%	360	29.644	28.418	-0.214	0.000
SF16.000	SF16.00	360 minute 100 year Winter I+0%	360	29.728	28.715	-0.135	0.000
SF1.017	SF1.17	360 minute 100 year Winter I+0%	360	29.573	28.418	-0.185	0.000
SF17.000	SF17.00	360 minute 100 year Winter I+0%	360	29.846	28.716	-0.134	0.000
SF1.018	SF1.18	360 minute 100 year Winter I+0%	360	29.726	28.418	-0.136	0.000
SF18.000	SF18.00	360 minute 100 year Winter I+0%	360	38.521	37.373	-0.148	0.000
SF18.001	SF18.01	360 minute 100 year Winter I+0%	360	37.311	36.165	-0.146	0.000
SF18.002	SF18.02	360 minute 100 year Winter I+0%	360	36.089	34.944	-0.145	0.000
SF18.003	SF18.03	360 minute 100 year Winter I+0%	360	34.870	33.727	-0.143	0.000
SF18.004	SF18.04	360 minute 100 year Winter I+0%	360	33.654	32.512	-0.142	0.000
SF18.005	SF18.05	360 minute 100 year Winter I+0%	360	32.423	31.283	-0.140	0.000
SF18.006	SF18.06	360 minute 100 year Winter I+0%	360	31.197	30.058	-0.139	0.000
SF18.007	SF18.07	360 minute 100 year Winter I+0%	360	29.928	28.417	0.477	0.000
SF1.019	SF1.19-FC	360 minute 100 year Winter I+0%	360	29.623	28.417	0.801	0.000
SF1.020	SF1.20	360 minute 100 year Winter I+0%	360	29.460	27.385	-0.177	0.000
SF1.021	SF1.21	360 minute 100 year Winter I+0%	360	29.080	26.996	-0.177	0.000
SF1.022	SF1.22	360 minute 100 year Winter I+0%	360	28.570	26.688	-0.196	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.013	SF1.13-JCT	0.00		2.817	101.441	0.2		5.4	OK*
SF12.000	SF12.00	0.05		0.003	6.497	0.5		0.8	OK
SF12.001	SF12.01	0.05		0.011	9.995	0.8		1.2	OK
SF1.014	SF1.14-JCT	0.00		1.686	111.435	0.2		6.1	OK*
SF13.000	SF13.00	0.03		0.002	8.995	0.9		1.1	OK
SF1.015	SF1.15-JCT	0.00		11.766	120.432	0.2		5.6	OK*
SF14.000	SF14.00	0.06		0.003	6.497	0.4		0.8	OK
SF15.000	SF15.00	0.04		0.002	4.997	0.5		0.6	OK
SF14.001	SF14.01	0.05		0.017	11.494	0.9		1.3	OK
SF1.016	SF1.16-JCT	0.00		1.432	131.926	0.2		6.3	OK*
SF16.000	SF16.00	0.02		0.002	5.497	0.9		0.6	OK
SF1.017	SF1.17	0.01		10.025	143.922	0.2		6.2	OK
SF17.000	SF17.00	0.02		0.002	6.996	1.0		0.8	OK
SF1.018	SF1.18	0.01		15.426	163.911	0.1		6.0	OK
SF18.000	SF18.00	0.00		0.000	1.498	0.4		0.2	OK
SF18.001	SF18.01	0.01		0.000	2.996	0.8		0.4	OK
SF18.002	SF18.02	0.01		0.000	4.493	1.2		0.5	OK
SF18.003	SF18.03	0.01		0.000	5.991	1.6		0.7	OK
SF18.004	SF18.04	0.01		0.001	6.990	1.8		0.8	OK
SF18.005	SF18.05	0.01		0.001	8.487	2.0		1.0	OK
SF18.006	SF18.06	0.02		0.001	9.985	2.2		1.2	OK

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Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF18.007	SF18.07	0.01		3.194	11.484	0.1		1.0	SURCHARGED
SF1.019	SF1.19-FC	0.34		14.073	178.893	0.9		5.0	SURCHARGED
SF1.020	SF1.20	0.10		0.049	178.893	0.8		5.0	OK
SF1.021	SF1.21	0.10		0.079	178.893	0.8		5.0	OK
SF1.022	SF1.22	0.04		0.043	178.892	1.7		5.0	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Dutton Street

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm - Dutton Street

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.338	4-8	0.091

Total Area Contributing (ha) = 0.429

Total Pipe Volume (m³) = 3.574

Network Design Table for Storm - Dutton Street

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

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
SD1.000	2.913	0.138	21.1	0.103	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD1.001	1.708#	0.012	142.3	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
SD2.000	3.845	0.384	10.0	0.097	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD2.001	1.562#	0.010	150.0	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
SD1.000	50.00	5.02	37.900	0.103	0.0	0.0	0.0	2.20	38.9	13.9
SD1.001	50.00	5.05	37.687	0.128	0.0	0.0	0.0	1.09	43.5	17.3
SD2.000	50.00	5.02	38.700	0.097	0.0	0.0	0.0	3.20	56.6	13.1
SD2.001	50.00	5.04	38.241	0.139	0.0	0.0	0.0	1.07	42.4	18.8

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Network Design Table for Storm - Dutton Street

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
SD3.000	13.667	0.091	150.0	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD4.000	4.728	0.032	150.0	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD4.001	9.828	0.085	116.2	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD3.001	6.237	0.357	17.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD5.000	32.416	0.216	150.0	0.024	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD5.001	9.853	0.066	150.0	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD5.002	9.883	0.066	150.0	0.038	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD3.002	16.790	0.187	89.8	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
SD3.003	6.195	0.357	17.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SD3.004	1.191#	0.008	150.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SD6.000	8.798	0.059	150.0	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD6.001	1.176#	0.008	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD1.002	3.025	0.020	150.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SD1.003	4.865	0.032	150.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SD7.000	1.921	0.013	150.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD1.004	3.650	0.116	31.5	0.000	0.00	0.0	0.600	o	150	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)
SD3.000	50.00	5.28	38.750	0.019	0.0	0.0	0.0	0.82	14.5	2.6
SD4.000	50.00	5.10	38.775	0.019	0.0	0.0	0.0	0.82	14.5	2.6
SD4.001	50.00	5.27	38.743	0.038	0.0	0.0	0.0	0.93	16.5	5.1
SD3.001	50.00	5.32	38.659	0.057	0.0	0.0	0.0	2.42	42.8	7.7
SD5.000	50.00	5.66	38.650	0.024	0.0	0.0	0.0	0.82	14.5	3.2
SD5.001	50.00	5.86	38.434	0.029	0.0	0.0	0.0	0.82	14.5	3.9
SD5.002	50.00	6.06	38.368	0.067	0.0	0.0	0.0	0.82	14.5	9.1
SD3.002	50.00	6.27	38.227	0.143	0.0	0.0	0.0	1.38	54.9	19.4
SD3.003	50.00	6.30	38.040	0.143	0.0	0.0	0.0	3.16	125.5	19.4
SD3.004	50.00	6.32	37.683	0.143	0.0	0.0	0.0	1.07	42.4	19.4
SD6.000	50.00	5.18	38.900	0.019	0.0	0.0	0.0	0.82	14.5	2.6
SD6.001	50.00	5.20	38.841	0.019	0.0	0.0	0.0	0.82	14.5	2.6
SD1.002	50.00	6.36	37.600	0.429	0.0	0.0	0.0	1.28	90.6	58.1
SD1.003	50.00	6.42	37.580	0.429	0.0	0.0	0.0	1.28	90.6	58.1
SD7.000	50.00	5.04	38.000	0.000	0.0	0.0	0.0	0.82	14.5	0.0
SD1.004	50.00	6.45	37.547	0.429	0.0	0.0	0.0	1.80	31.8«	58.1

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Area Summary for Storm - Dutton Street

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.103	0.103	0.103
1.001	-	-	100	0.025	0.025	0.025
2.000	-	-	100	0.097	0.097	0.097
2.001	-	-	100	0.042	0.042	0.042
3.000	-	-	100	0.019	0.019	0.019
4.000	-	-	100	0.019	0.019	0.019
4.001	-	-	100	0.019	0.019	0.019
3.001	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.024	0.024	0.024
5.001	-	-	100	0.005	0.005	0.005
5.002	-	-	100	0.038	0.038	0.038
3.002	-	-	100	0.019	0.019	0.019
3.003	-	-	100	0.000	0.000	0.000
3.004	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.019	0.019	0.019
6.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.429	0.429	0.429

Free Flowing Outfall Details for Storm - Dutton Street

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SD1.004	SD	39.842	37.431	0.000	0	0

Simulation Criteria for Storm - Dutton Street

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/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 1	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR	Profile Type Summer
Return Period (years)		100	Cv (Summer) 1.000
Region	England and Wales		Cv (Winter) 0.840
M5-60 (mm)		18.000	Storm Duration (mins) 30
Ratio R		0.360	

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Online Controls for Storm - Dutton Street

Hydro-Brake® Optimum Manhole: SD1.04-FC, DS/PN: SD1.004, Volume (m³): 4.5

Unit Reference	MD-SCL-0106-6600-1600-6600
Design Head (m)	1.600
Design Flow (l/s)	6.6
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	106
Invert Level (m)	37.547
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)	1.600	6.6	Kick-Flo®	0.864	5.0
Flush-Flo™	0.381	6.6	Mean Flow over Head Range	-	5.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.0	1.200	5.8	3.000	8.8	7.000	13.2
0.200	6.1	1.400	6.2	3.500	9.5	7.500	13.6
0.300	6.5	1.600	6.6	4.000	10.1	8.000	14.1
0.400	6.6	1.800	7.0	4.500	10.7	8.500	14.5
0.500	6.5	2.000	7.3	5.000	11.3	9.000	14.9
0.600	6.3	2.200	7.7	5.500	11.8	9.500	15.3
0.800	5.5	2.400	8.0	6.000	12.3		
1.000	5.3	2.600	8.3	6.500	12.7		

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Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm - Dutton Street

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SD1.000	SD-RWP	360 minute 100 year Winter I+0%	360	39.323	38.050	0.000	0.000
SD1.001	SD1.01	360 minute 100 year Winter I+0%	360	39.461	38.571	0.659	0.000
SD2.000	SD-RWP	360 minute 100 year Winter I+0%	360	39.997	38.738	-0.112	0.000
SD2.001	SD2.01	360 minute 100 year Winter I+0%	360	39.943	38.572	0.106	0.000
SD3.000	SD3.00	360 minute 100 year Winter I+0%	360	40.100	38.779	-0.121	0.000
SD4.000	SD4.00	360 minute 100 year Winter I+0%	360	40.100	38.807	-0.118	0.000
SD4.001	SD4.01	360 minute 100 year Winter I+0%	360	40.100	38.782	-0.111	0.000
SD3.001	SD3.01	360 minute 100 year Winter I+0%	360	40.100	38.689	-0.119	0.000
SD5.000	SD5.00	360 minute 100 year Winter I+0%	360	40.035	38.682	-0.118	0.000
SD5.001	SD5.01	360 minute 100 year Winter I+0%	360	40.025	38.581	-0.003	0.000
SD5.002	SD5.02	360 minute 100 year Winter I+0%	360	40.100	38.580	0.061	0.000
SD3.002	SD3.02	360 minute 100 year Winter I+0%	360	40.100	38.577	0.125	0.000
SD3.003	SD3.03	360 minute 100 year Winter I+0%	360	40.100	38.573	0.308	0.000
SD3.004	SD3.04	360 minute 100 year Winter I+0%	360	39.955	38.572	0.664	0.000
SD6.000	SD6.00	360 minute 100 year Winter I+0%	360	40.100	38.930	-0.120	0.000
SD6.001	SD6.01	360 minute 100 year Winter I+0%	360	39.962	38.873	-0.118	0.000
SD1.002	SD1.02-TANK	360 minute 100 year Winter I+0%	360	39.938	38.571	0.671	0.000
SD1.003	SD1.03	360 minute 100 year Winter I+0%	360	39.944	38.587	0.707	0.000
SD7.000	SD7.00	360 minute 100 year Summer I+0%	360	39.961	38.464	0.314	0.000
SD1.004	SD1.04-FC	360 minute 100 year Winter I+0%	360	39.942	38.591	0.894	0.000

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Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm - Dutton Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SD1.000	SD-RWP	0.24		0.668	51.475	1.1		5.6	SURCHARGED*
SD1.001	SD1.01	0.23		1.036	63.969	0.5		6.8	SURCHARGED
SD2.000	SD-RWP	0.15		0.033	48.476	1.6		5.7	OK*
SD2.001	SD2.01	0.27		0.395	69.466	0.6		8.1	SURCHARGED
SD3.000	SD3.00	0.08		0.004	9.495	0.5		1.1	OK
SD4.000	SD4.00	0.10		0.004	9.495	0.4		1.1	OK
SD4.001	SD4.01	0.15		0.020	18.991	0.6		2.2	OK
SD3.001	SD3.01	0.09		0.040	28.486	1.3		3.3	OK
SD5.000	SD5.00	0.10		0.004	11.994	0.5		1.4	OK
SD5.001	SD5.01	0.13		0.208	14.493	0.5		1.7	OK
SD5.002	SD5.02	0.30		0.198	33.484	0.6		3.9	SURCHARGED
SD3.002	SD3.02	0.17		0.318	71.465	0.9		8.4	SURCHARGED
SD3.003	SD3.03	0.10		0.793	71.464	1.4		8.2	SURCHARGED
SD3.004	SD3.04	0.27		0.472	71.464	0.5		8.1	SURCHARGED
SD6.000	SD6.00	0.09		0.004	9.495	0.4		1.1	OK
SD6.001	SD6.01	0.10		0.023	9.495	0.4		1.1	OK
SD1.002	SD1.02-TANK	0.14		107.177	214.395	0.5	246	8.4	SURCHARGED*
SD1.003	SD1.03	0.13		1.932	214.395	0.4		7.6	SURCHARGED
SD7.000	SD7.00	0.00		0.073	0.006	0.1		0.0	SURCHARGED
SD1.004	SD1.04-FC	0.31		2.091	214.400	1.4		6.6	SURCHARGED

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APPENDIX L

PROPOSED SURFACE WATER MICRODRAINAGE CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Trinity Way

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm - Trinity Way

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.261	4-8	0.089

Total Area Contributing (ha) = 0.350

Total Pipe Volume (m³) = 8.318

Network Design Table for Storm - Trinity Way

« - Indicates pipe capacity < flow

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
ST1.000	15.946	0.106	150.0	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.001	18.054	0.120	150.0	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.002	8.989	0.608	14.8	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.003	13.773	0.092	150.0	0.114	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.004	4.171	0.213	19.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST2.000	10.641	0.071	150.0	0.038	5.00	0.0	0.600	o	150	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)
ST1.000	50.00	5.25	38.660	0.044	0.0	0.0	0.0	1.07	42.4	6.0
ST1.001	50.00	5.53	38.554	0.050	0.0	0.0	0.0	1.07	42.4	6.8
ST1.002	50.00	5.58	38.433	0.056	0.0	0.0	0.0	3.42	136.0	7.6
ST1.003	50.00	5.79	37.825	0.170	0.0	0.0	0.0	1.07	42.4	23.0
ST1.004	50.00	5.81	37.734	0.170	0.0	0.0	0.0	2.97	118.1	23.0
ST2.000	50.00	5.22	38.650	0.038	0.0	0.0	0.0	0.82	14.5	5.1

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Network Design Table for Storm - Trinity Way

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
ST3.000	2.553	0.017	150.0	0.076	5.00	0.0	0.600	o	225	Pipe/Conduit	
ST3.001	10.807	0.229	47.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST2.001	20.084	0.134	150.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST2.002	6.064	0.606	10.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
ST1.005	12.368	1.237	10.0	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST4.000	9.166	0.061	150.0	0.004	5.00	0.0	0.600	o	150	Pipe/Conduit	
ST1.006	5.512	0.501	11.0	0.004	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.007	9.389	0.854	11.0	0.004	0.00	0.0	0.600	o	225	Pipe/Conduit	
ST1.008	7.084	0.381	18.6	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
ST5.000	21.981	0.147	150.0	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit	
ST1.009	7.203	0.048	150.0	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
ST1.010	5.176	0.035	150.0	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
ST6.000	2.175	0.014	150.0	0.004	5.00	0.0	0.600	o	150	Pipe/Conduit	
ST1.011	3.174	0.021	150.0	0.000	0.00	0.0	0.600	o	150	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)
ST3.000	50.00	5.04	38.750	0.076	0.0	0.0	0.0	1.07	42.4	10.3
ST3.001	50.00	5.13	38.733	0.076	0.0	0.0	0.0	1.91	75.9	10.3
ST2.001	50.00	5.53	38.504	0.114	0.0	0.0	0.0	1.07	42.4	15.4
ST2.002	50.00	5.56	38.370	0.114	0.0	0.0	0.0	3.20	56.6	15.4
ST1.005	50.00	5.86	36.200	0.322	0.0	0.0	0.0	4.16	165.5	43.6
ST4.000	50.00	5.19	36.526	0.004	0.0	0.0	0.0	0.82	14.5	0.5
ST1.006	50.00	5.89	34.963	0.330	0.0	0.0	0.0	3.97	157.8	44.7
ST1.007	50.00	5.93	34.462	0.334	0.0	0.0	0.0	3.97	157.8	45.2
ST1.008	50.00	5.96	33.534	0.338	0.0	0.0	0.0	3.66	258.9	45.8
ST5.000	50.00	5.29	33.300	0.000	0.0	0.0	0.0	1.28	90.6	0.0
ST1.009	50.00	6.05	33.153	0.342	0.0	0.0	0.0	1.28	90.6	46.3
ST1.010	50.00	6.12	33.105	0.346	0.0	0.0	0.0	1.28	90.6	46.9
ST6.000	50.00	5.04	34.358	0.004	0.0	0.0	0.0	0.82	14.5	0.5
ST1.011	50.00	6.18	33.070	0.350	0.0	0.0	0.0	0.82	14.5«	47.4

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Area Summary for Storm - Trinity Way

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.044	0.044	0.044
1.001	-	-	100	0.006	0.006	0.006
1.002	-	-	100	0.006	0.006	0.006
1.003	-	-	100	0.114	0.114	0.114
1.004	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.038	0.038	0.038
3.000	-	-	100	0.076	0.076	0.076
3.001	-	-	100	0.000	0.000	0.000
2.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.038	0.038	0.038
4.000	-	-	100	0.004	0.004	0.004
1.006	-	-	100	0.004	0.004	0.004
1.007	-	-	100	0.004	0.004	0.004
1.008	-	-	100	0.004	0.004	0.004
5.000	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.004	0.004	0.004
1.010	-	-	100	0.004	0.004	0.004
6.000	-	-	100	0.004	0.004	0.004
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.350	0.350	0.350

Free Flowing Outfall Details for Storm - Trinity Way

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
ST1.011	ST	35.553	33.049	0.000	0	0

Simulation Criteria for Storm - Trinity Way

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/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 1	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR	Profile Type Summer
Return Period (years)		100	Cv (Summer) 1.000
Region	England and Wales		Cv (Winter) 0.840
M5-60 (mm)		18.000	Storm Duration (mins) 30
Ratio R		0.360	

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Online Controls for Storm - Trinity Way

Hydro-Brake® Optimum Manhole: ST1.11-FC, DS/PN: ST1.011, Volume (m³): 3.3

Unit Reference	MD-SCL-0094-5400-1800-5400
Design Head (m)	1.800
Design Flow (l/s)	5.4
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	94
Invert Level (m)	33.070
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)	1.800	5.4	Kick-Flo®	0.836	3.8
Flush-Flo™	0.375	5.0	Mean Flow over Head Range	-	4.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.5	3.000	6.8	7.000	10.2
0.200	4.7	1.400	4.8	3.500	7.3	7.500	10.5
0.300	5.0	1.600	5.1	4.000	7.8	8.000	10.9
0.400	5.0	1.800	5.4	4.500	8.3	8.500	11.2
0.500	4.9	2.000	5.7	5.000	8.7	9.000	11.5
0.600	4.8	2.200	5.9	5.500	9.1	9.500	11.8
0.800	4.0	2.400	6.2	6.000	9.5		
1.000	4.1	2.600	6.4	6.500	9.8		

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Storage Structures for Storm - Trinity Way

Cellular Storage Manhole: ST5.00-TANK, DS/PN: ST5.000

Invert Level (m) 33.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	96.0	0.0	1.601	0.0	0.0
1.600	96.0	0.0			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Trinity Way

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
ST1.000	ST1.00	15 minute 1 year Winter I+0%	15	40.051	38.716	-0.169	0.000
ST1.001	ST1.01	15 minute 1 year Winter I+0%	15	40.039	38.613	-0.166	0.000
ST1.002	ST1.02	15 minute 1 year Winter I+0%	15	39.992	38.469	-0.190	0.000
ST1.003	ST1.03	15 minute 1 year Winter I+0%	15	40.100	37.937	-0.113	0.000
ST1.004	ST1.04	15 minute 1 year Winter I+0%	15	39.060	37.814	-0.144	0.000
ST2.000	ST2.00	15 minute 1 year Winter I+0%	15	40.100	38.712	-0.088	0.000
ST3.000	ST3.00	15 minute 1 year Winter I+0%	15	40.100	38.839	-0.136	0.000
ST3.001	ST3.01	15 minute 1 year Winter I+0%	15	40.100	38.790	-0.168	0.000
ST2.001	ST2.01	15 minute 1 year Winter I+0%	15	40.100	38.598	-0.132	0.000
ST2.002	ST2.02	15 minute 1 year Winter I+0%	15	40.100	38.425	-0.095	0.000
ST1.005	ST1.05	15 minute 1 year Winter I+0%	15	39.060	36.276	-0.149	0.000
ST4.000	ST4.00	15 minute 1 year Winter I+0%	15	37.876	36.545	-0.131	0.000
ST1.006	ST1.06	15 minute 1 year Winter I+0%	15	37.501	35.057	-0.131	0.000
ST1.007	ST1.07	15 minute 1 year Winter I+0%	15	36.836	34.543	-0.144	0.000
ST1.008	ST1.08	15 minute 1 year Winter I+0%	15	36.677	33.690	-0.143	0.000
ST5.000	ST5.00-TANK	60 minute 1 year Winter I+0%	60	35.600	33.465	-0.135	0.000
ST1.009	ST1.09	15 minute 1 year Winter I+0%	15	36.390	33.671	0.218	0.000
ST1.010	ST1.10	15 minute 1 year Winter I+0%	15	35.931	33.676	0.272	0.000
ST6.000	ST6.00	15 minute 1 year Winter I+0%	15	35.708	34.378	-0.130	0.000
ST1.011	ST1.11-FC	15 minute 1 year Summer I+0%	15	35.697	33.677	0.457	0.000

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Trinity Way

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
ST1.000	ST1.00	0.14		0.015	2.479	0.7		5.2	OK
ST1.001	ST1.01	0.15		0.072	2.817	0.7		5.9	OK
ST1.002	ST1.02	0.06		0.040	3.155	1.6		6.5	OK
ST1.003	ST1.03	0.49		0.043	9.577	0.9		18.0	OK
ST1.004	ST1.04	0.28		0.099	9.577	1.4		18.0	OK
ST2.000	ST2.00	0.35		0.009	2.141	0.7		4.6	OK
ST3.000	ST3.00	0.33		0.024	4.282	0.6		9.1	OK
ST3.001	ST3.01	0.14		0.027	4.282	1.2		9.0	OK
ST2.001	ST2.01	0.36		0.056	6.422	0.9		13.6	OK
ST2.002	ST2.02	0.29		0.067	6.422	2.3		13.7	OK
ST1.005	ST1.05	0.25		0.081	18.140	3.0		35.6	OK
ST4.000	ST4.00	0.04		0.002	0.225	0.4		0.5	OK
ST1.006	ST1.06	0.36		0.031	18.591	2.3		36.4	OK
ST1.007	ST1.07	0.28		0.027	18.816	2.8		36.6	OK
ST1.008	ST1.08	0.24		0.178	19.042	1.7		36.6	OK
ST5.000	ST5.00-TANK	0.06		15.259	-2.147	0.6	40	4.6	OK
ST1.009	ST1.09	0.19		2.417	16.157	0.6		11.6	SURCHARGED
ST1.010	ST1.10	0.13		1.065	16.109	0.5		7.9	SURCHARGED
ST6.000	ST6.00	0.04		0.002	0.225	0.3		0.5	OK
ST1.011	ST1.11-FC	0.47		0.962	15.108	0.7		5.0	SURCHARGED

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Trinity Way

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
ST1.000	ST1.00	15 minute 2 year Winter I+0%	15	40.051	38.725	-0.160	0.000
ST1.001	ST1.01	15 minute 2 year Winter I+0%	15	40.039	38.622	-0.156	0.000
ST1.002	ST1.02	15 minute 2 year Winter I+0%	15	39.992	38.475	-0.184	0.000
ST1.003	ST1.03	15 minute 2 year Winter I+0%	15	40.100	37.956	-0.094	0.000
ST1.004	ST1.04	15 minute 2 year Winter I+0%	15	39.060	37.827	-0.132	0.000
ST2.000	ST2.00	15 minute 2 year Winter I+0%	15	40.100	38.722	-0.078	0.000
ST3.000	ST3.00	15 minute 2 year Winter I+0%	15	40.100	38.853	-0.122	0.000
ST3.001	ST3.01	15 minute 2 year Winter I+0%	15	40.100	38.799	-0.159	0.000
ST2.001	ST2.01	15 minute 2 year Winter I+0%	15	40.100	38.612	-0.117	0.000
ST2.002	ST2.02	15 minute 2 year Winter I+0%	15	40.100	38.434	-0.086	0.000
ST1.005	ST1.05	15 minute 2 year Winter I+0%	15	39.060	36.288	-0.137	0.000
ST4.000	ST4.00	15 minute 2 year Winter I+0%	15	37.876	36.547	-0.129	0.000
ST1.006	ST1.06	15 minute 2 year Winter I+0%	15	37.501	35.072	-0.116	0.000
ST1.007	ST1.07	15 minute 2 year Winter I+0%	15	36.836	34.556	-0.131	0.000
ST1.008	ST1.08	15 minute 2 year Summer I+0%	15	36.677	33.743	-0.090	0.000
ST5.000	ST5.00-TANK	60 minute 2 year Winter I+0%	60	35.600	33.548	-0.052	0.000
ST1.009	ST1.09	15 minute 2 year Summer I+0%	15	36.390	33.715	0.263	0.000
ST1.010	ST1.10	15 minute 2 year Summer I+0%	15	35.931	33.734	0.330	0.000
ST6.000	ST6.00	15 minute 2 year Winter I+0%	15	35.708	34.381	-0.127	0.000
ST1.011	ST1.11-FC	15 minute 2 year Summer I+0%	15	35.697	33.737	0.517	0.000

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Trinity Way

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
ST1.000	ST1.00	0.18		0.017	3.208	0.7		6.8	OK
ST1.001	ST1.01	0.20		0.084	3.646	0.7		7.6	OK
ST1.002	ST1.02	0.08		0.048	4.083	1.7		8.4	OK
ST1.003	ST1.03	0.63		0.056	12.394	1.0		23.3	OK
ST1.004	ST1.04	0.36		0.116	12.394	1.5		23.4	OK
ST2.000	ST2.00	0.46		0.011	2.771	0.7		5.9	OK
ST3.000	ST3.00	0.43		0.028	5.541	0.7		11.8	OK
ST3.001	ST3.01	0.18		0.032	5.541	1.2		11.7	OK
ST2.001	ST2.01	0.46		0.072	8.311	0.9		17.7	OK
ST2.002	ST2.02	0.38		0.078	8.311	2.5		17.7	OK
ST1.005	ST1.05	0.32		0.094	23.476	3.2		46.0	OK
ST4.000	ST4.00	0.05		0.003	0.292	0.4		0.6	OK
ST1.006	ST1.06	0.47		0.037	24.060	2.5		47.1	OK
ST1.007	ST1.07	0.36		0.031	24.351	3.0		47.4	OK
ST1.008	ST1.08	0.30		0.245	22.002	1.8		47.1	OK
ST5.000	ST5.00-TANK	0.08		22.852	-7.393	0.3	48	6.2	OK
ST1.009	ST1.09	0.20		2.488	16.829	0.6		12.2	SURCHARGED
ST1.010	ST1.10	0.15		1.131	16.543	0.5		8.9	SURCHARGED
ST6.000	ST6.00	0.06		0.003	0.292	0.4		0.6	OK
ST1.011	ST1.11-FC	0.47		1.029	16.282	0.7		5.0	SURCHARGED

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Trinity Way

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
ST1.000	ST1.00	15 minute 30 year Winter I+0%	15	40.051	38.752	-0.133	0.000
ST1.001	ST1.01	15 minute 30 year Winter I+0%	15	40.039	38.652	-0.127	0.000
ST1.002	ST1.02	15 minute 30 year Winter I+0%	15	39.992	38.492	-0.167	0.000
ST1.003	ST1.03	15 minute 30 year Winter I+0%	15	40.100	38.134	0.084	0.000
ST1.004	ST1.04	15 minute 30 year Winter I+0%	15	39.060	37.887	-0.072	0.000
ST2.000	ST2.00	15 minute 30 year Winter I+0%	15	40.100	38.759	-0.041	0.000
ST3.000	ST3.00	15 minute 30 year Winter I+0%	15	40.100	38.905	-0.070	0.000
ST3.001	ST3.01	15 minute 30 year Winter I+0%	15	40.100	38.825	-0.133	0.000
ST2.001	ST2.01	15 minute 30 year Winter I+0%	15	40.100	38.669	-0.060	0.000
ST2.002	ST2.02	15 minute 30 year Winter I+0%	15	40.100	38.464	-0.056	0.000
ST1.005	ST1.05	15 minute 30 year Winter I+0%	15	39.060	36.337	-0.088	0.000
ST4.000	ST4.00	15 minute 30 year Winter I+0%	15	37.876	36.557	-0.119	0.000
ST1.006	ST1.06	15 minute 30 year Winter I+0%	15	37.501	35.143	-0.046	0.000
ST1.007	ST1.07	15 minute 30 year Winter I+0%	15	36.836	34.611	-0.076	0.000
ST1.008	ST1.08	15 minute 30 year Summer I+0%	15	36.677	34.039	0.206	0.000
ST5.000	ST5.00-TANK	120 minute 30 year Winter I+0%	120	35.600	33.994	0.394	0.000
ST1.009	ST1.09	120 minute 30 year Winter I+0%	120	36.390	33.997	0.544	0.000
ST1.010	ST1.10	120 minute 30 year Winter I+0%	120	35.931	34.005	0.601	0.000
ST6.000	ST6.00	15 minute 30 year Winter I+0%	15	35.708	34.391	-0.117	0.000
ST1.011	ST1.11-FC	120 minute 30 year Winter I+0%	120	35.697	34.006	0.786	0.000

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Trinity Way

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
ST1.000	ST1.00	0.34		0.025	6.064	0.9		12.9	OK
ST1.001	ST1.01	0.38		0.123	6.891	0.9		14.6	OK
ST1.002	ST1.02	0.15		0.071	7.718	2.0		16.4	OK
ST1.003	ST1.03	1.40		0.191	23.428	1.3		51.8	SURCHARGED
ST1.004	ST1.04	0.79		0.278	23.428	1.8		51.4	OK
ST2.000	ST2.00	0.86		0.017	5.237	0.8		11.2	OK
ST3.000	ST3.00	0.80		0.043	10.474	0.8		22.3	OK
ST3.001	ST3.01	0.35		0.046	10.474	1.5		22.1	OK
ST2.001	ST2.01	0.87		0.218	15.710	1.1		33.4	OK
ST2.002	ST2.02	0.71		0.118	15.710	2.9		33.5	OK
ST1.005	ST1.05	0.67		0.149	44.375	3.8		95.4	OK
ST4.000	ST4.00	0.09		0.004	0.551	0.5		1.2	OK
ST1.006	ST1.06	0.98		0.075	45.478	2.9		98.0	OK
ST1.007	ST1.07	0.76		0.060	46.029	3.6		99.3	OK
ST1.008	ST1.08	0.65		0.690	41.582	1.7		99.8	SURCHARGED
ST5.000	ST5.00-TANK	0.12		64.094	0.013	0.6	137	9.7	SURCHARGED
ST1.009	ST1.09	0.13		2.834	98.195	0.5		8.2	SURCHARGED
ST1.010	ST1.10	0.11		1.437	99.343	0.4		6.5	SURCHARGED
ST6.000	ST6.00	0.11		0.004	0.551	0.4		1.2	OK
ST1.011	ST1.11-FC	0.47		1.335	100.490	0.7		5.0	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Trinity Way

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
ST1.000	ST1.00	15 minute 100 year Winter I+40%	15	40.051	38.790	-0.095	0.000
ST1.001	ST1.01	15 minute 100 year Winter I+40%	15	40.039	38.730	-0.049	0.000
ST1.002	ST1.02	15 minute 100 year Winter I+40%	15	39.992	38.689	0.030	0.000
ST1.003	ST1.03	15 minute 100 year Winter I+40%	15	40.100	38.663	0.613	0.000
ST1.004	ST1.04	15 minute 100 year Winter I+40%	15	39.060	38.264	0.306	0.000
ST2.000	ST2.00	15 minute 100 year Winter I+40%	15	40.100	39.132	0.332	0.000
ST3.000	ST3.00	15 minute 100 year Winter I+40%	15	40.100	39.171	0.196	0.000
ST3.001	ST3.01	15 minute 100 year Winter I+40%	15	40.100	39.109	0.151	0.000
ST2.001	ST2.01	15 minute 100 year Winter I+40%	15	40.100	39.006	0.277	0.000
ST2.002	ST2.02	15 minute 100 year Winter I+40%	15	40.100	38.748	0.227	0.000
ST1.005	ST1.05	15 minute 100 year Winter I+40%	15	39.060	37.958	1.533	0.000
ST4.000	ST4.00	15 minute 100 year Winter I+40%	15	37.876	36.730	0.054	0.000
ST1.006	ST1.06	15 minute 100 year Winter I+40%	15	37.501	36.723	1.535	0.000
ST1.007	ST1.07	15 minute 100 year Winter I+40%	15	36.836	35.666	0.979	0.000
ST1.008	ST1.08	180 minute 100 year Winter I+40%	180	36.677	34.873	1.040	0.000
ST5.000	ST5.00-TANK	180 minute 100 year Winter I+40%	180	35.600	34.868	1.268	0.000
ST1.009	ST1.09	180 minute 100 year Winter I+40%	180	36.390	34.870	1.417	0.000
ST1.010	ST1.10	180 minute 100 year Winter I+40%	180	35.931	34.869	1.464	0.000
ST6.000	ST6.00	180 minute 100 year Winter I+40%	180	35.708	34.867	0.359	0.000
ST1.011	ST1.11-FC	180 minute 100 year Winter I+40%	180	35.697	34.869	1.649	0.000

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Trinity Way

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
ST1.000	ST1.00	0.62		0.035	10.960	1.0		23.3	OK
ST1.001	ST1.01	0.68		0.374	12.456	1.0		25.7	OK
ST1.002	ST1.02	0.28		0.634	13.950	2.1		30.4	SURCHARGED
ST1.003	ST1.03	2.31		0.568	42.346	2.2		85.2	SURCHARGED
ST1.004	ST1.04	1.31		0.672	42.346	2.2		84.9	SURCHARGED
ST2.000	ST2.00	1.49		0.076	9.465	1.1		19.3	SURCHARGED
ST3.000	ST3.00	1.39		0.118	18.931	1.0		38.5	SURCHARGED
ST3.001	ST3.01	0.59		0.182	18.931	1.6		37.8	SURCHARGED
ST2.001	ST2.01	1.47		0.725	28.398	1.4		56.5	SURCHARGED
ST2.002	ST2.02	1.13		0.872	28.398	3.0		53.6	SURCHARGED
ST1.005	ST1.05	1.02		2.124	80.209	3.9		144.5	SURCHARGED
ST4.000	ST4.00	0.17		0.032	0.997	0.5		2.1	SURCHARGED
ST1.006	ST1.06	1.47		1.086	82.202	3.7		146.3	SURCHARGED
ST1.007	ST1.07	1.13		0.534	83.198	3.7		147.0	SURCHARGED
ST1.008	ST1.08	0.30		1.847	199.883	1.5		47.0	SURCHARGED
ST5.000	ST5.00-TANK	0.12		144.815	0.475	0.6	277	9.5	SURCHARGED
ST1.009	ST1.09	0.14		3.821	202.723	0.5		8.4	SURCHARGED
ST1.010	ST1.10	0.11		2.414	205.088	0.4		6.9	SURCHARGED
ST6.000	ST6.00	0.06		0.080	2.379	0.4		0.6	SURCHARGED
ST1.011	ST1.11-FC	0.50		2.334	207.466	0.8		5.4	SURCHARGED

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Francis Street

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm - Francis Street

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.177	4-8	0.181

Total Area Contributing (ha) = 0.358

Total Pipe Volume (m³) = 115.947

Network Design Table for Storm - Francis Street

« - Indicates pipe capacity < flow

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
SF1.000	4.741	0.032	150.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.001	5.264	0.856	6.1	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.002	3.766	1.220	3.1	0.002	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.003	3.325	1.213	2.7	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.004	5.814	1.170	5.0	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.005	3.994	0.517	7.7	0.003	0.00	0.0	0.600	o	150	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)
SF1.000	50.00	5.10	33.688	0.010	0.0	0.0	0.0	0.82	14.5	1.4
SF1.001	50.00	5.12	33.656	0.016	0.0	0.0	0.0	4.09	72.3	2.2
SF1.002	50.00	5.13	32.800	0.018	0.0	0.0	0.0	5.78	102.1	2.4
SF1.003	50.00	5.14	31.580	0.021	0.0	0.0	0.0	6.13	108.4	2.8
SF1.004	50.00	5.16	30.367	0.024	0.0	0.0	0.0	4.55	80.4	3.2
SF1.005	50.00	5.18	29.197	0.027	0.0	0.0	0.0	3.65	64.5	3.7

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Network Design Table for Storm - Francis Street

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
SF2.000	11.505	0.170	67.7	0.016	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.006	7.455	0.019	400.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF3.000	5.398	0.239	22.6	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.007	11.489	0.029	396.2	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF4.000	5.276	0.268	19.7	0.007	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.008	3.421	0.009	380.1	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF5.000	12.477	0.083	150.0	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF5.001	11.064	0.143	77.2	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.009	8.478	0.021	403.7	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF6.000	6.055	0.298	20.3	0.005	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF7.000	3.628	0.098	37.0	0.053	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.010	13.838	0.035	400.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF8.000	7.412	0.333	22.3	0.000	5.00	0.0	0.600	o	150	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)
SF2.000	50.00	5.16	28.850	0.016	0.0	0.0	0.0	1.22	21.6	2.2
SF1.006	50.00	5.25	27.780	0.043	0.0	0.0	0.0	1.72	1486.6	5.8
SF3.000	50.00	5.04	28.900	0.008	0.0	0.0	0.0	2.13	37.6	1.1
SF1.007	50.00	5.36	27.761	0.051	0.0	0.0	0.0	1.73	1493.8	6.9
SF4.000	50.00	5.04	28.900	0.007	0.0	0.0	0.0	2.28	40.3	0.9
SF1.008	50.00	5.39	27.732	0.058	0.0	0.0	0.0	1.76	1525.3	7.9
SF5.000	50.00	5.25	28.850	0.013	0.0	0.0	0.0	0.82	14.5	1.8
SF5.001	50.00	5.42	28.767	0.026	0.0	0.0	0.0	1.15	20.2	3.5
SF1.009	50.00	5.50	27.723	0.084	0.0	0.0	0.0	1.71	1479.7	11.4
SF6.000	50.00	5.04	28.900	0.005	0.0	0.0	0.0	2.24	39.7	0.7
SF7.000	50.00	5.04	28.700	0.053	0.0	0.0	0.0	1.66	29.3	7.2
SF1.010	50.00	5.63	27.702	0.142	0.0	0.0	0.0	1.72	1486.6	19.2
SF8.000	50.00	5.06	28.900	0.000	0.0	0.0	0.0	2.14	37.9	0.0

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Network Design Table for Storm - Francis Street

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
SF9.000	9.190	0.061	150.0	0.007	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF9.001	11.091	0.222	50.0	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.011	10.480	0.026	400.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF10.000	5.809	0.359	16.2	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.012	3.459	0.009	384.3	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF11.000	4.870	0.268	18.2	0.029	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.013	1.519	0.004	379.8	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF12.000	8.487	0.084	100.9	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF12.001	10.735	0.238	45.2	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.014	17.254	0.043	401.3	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF13.000	3.982	0.265	15.0	0.018	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.015	0.946	0.002	473.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF14.000	9.694	0.065	150.0	0.013	5.00	0.0	0.600	o	150	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)
SF9.000	50.00	5.19	28.850	0.007	0.0	0.0	0.0	0.82	14.5	0.9
SF9.001	50.00	5.32	28.789	0.020	0.0	0.0	0.0	1.43	25.2	2.7
SF1.011	50.00	5.73	27.667	0.162	0.0	0.0	0.0	1.72	1486.6	21.9
SF10.000	50.00	5.04	28.900	0.012	0.0	0.0	0.0	2.52	44.5	1.6
SF1.012	50.00	5.77	27.641	0.174	0.0	0.0	0.0	1.75	1516.8	23.6
SF11.000	50.00	5.03	28.800	0.029	0.0	0.0	0.0	2.37	42.0	3.9
SF1.013	50.00	5.78	27.632	0.203	0.0	0.0	0.0	1.76	1526.0	27.5
SF12.000	50.00	5.14	28.850	0.013	0.0	0.0	0.0	1.00	17.7	1.8
SF12.001	50.00	5.26	28.766	0.020	0.0	0.0	0.0	1.50	26.5	2.7
SF1.014	50.00	5.95	27.628	0.223	0.0	0.0	0.0	1.71	1484.3	30.2
SF13.000	50.00	5.03	28.750	0.018	0.0	0.0	0.0	2.61	46.2	2.4
SF1.015	50.00	5.96	27.585	0.241	0.0	0.0	0.0	1.58	1366.2	32.6
SF14.000	50.00	5.20	28.850	0.013	0.0	0.0	0.0	0.82	14.5	1.8

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Network Design Table for Storm - Francis Street

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
SF15.000	2.620	0.065	40.5	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF14.001	10.576	0.303	34.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.016	11.664	0.030	393.6	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF16.000	3.649	0.247	14.8	0.011	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.017	19.441	0.049	400.0	0.013	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF17.000	5.634	0.296	19.0	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.018	15.102	0.038	400.0	0.026	0.00	0.0	0.600	o	1050	Pipe/Conduit	
SF18.000	3.294	1.210	2.7	0.003	5.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.001	3.736	1.222	3.1	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.002	4.062	1.219	3.3	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.003	3.516	1.216	2.9	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.004	4.345	1.231	3.5	0.002	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.005	3.748	1.226	3.1	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.006	4.866	1.500	3.2	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF18.007	9.602	0.024	400.0	0.003	0.00	0.0	0.600	o	450	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)
SF15.000	50.00	5.03	28.850	0.010	0.0	0.0	0.0	1.59	28.0	1.4
SF14.001	50.00	5.30	28.785	0.023	0.0	0.0	0.0	1.71	30.2	3.1
SF1.016	50.00	6.07	27.583	0.264	0.0	0.0	0.0	1.73	1498.8	35.7
SF16.000	50.00	5.02	28.700	0.011	0.0	0.0	0.0	2.63	46.6	1.5
SF1.017	50.00	6.26	27.553	0.288	0.0	0.0	0.0	1.72	1486.6	39.0
SF17.000	50.00	5.04	28.700	0.014	0.0	0.0	0.0	2.32	41.0	1.9
SF1.018	50.00	6.41	27.504	0.328	0.0	0.0	0.0	1.72	1486.6	44.4
SF18.000	50.00	5.01	37.371	0.003	0.0	0.0	0.0	6.15	108.8	0.4
SF18.001	50.00	5.02	36.161	0.006	0.0	0.0	0.0	5.81	102.6	0.8
SF18.002	50.00	5.03	34.939	0.009	0.0	0.0	0.0	5.56	98.3	1.2
SF18.003	50.00	5.04	33.720	0.012	0.0	0.0	0.0	5.97	105.5	1.6
SF18.004	50.00	5.06	32.504	0.014	0.0	0.0	0.0	5.40	95.5	1.9
SF18.005	50.00	5.07	31.273	0.017	0.0	0.0	0.0	5.81	102.6	2.3
SF18.006	50.00	5.08	30.047	0.020	0.0	0.0	0.0	5.64	99.6	2.7
SF18.007	50.00	5.24	27.490	0.023	0.0	0.0	0.0	1.01	160.7	3.1

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Network Design Table for Storm - Francis Street

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
SF1.019	5.400	0.054	100.0	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
SF1.020	38.898	0.389	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SF1.021	28.953	0.290	100.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SF1.022	4.607	0.795	5.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
SF1.019	50.00	6.50	27.466	0.358	0.0	0.0	0.0	1.00	17.8«	48.5
SF1.020	50.00	6.99	27.337	0.358	0.0	0.0	0.0	1.31	52.0	48.5
SF1.021	50.00	7.36	26.948	0.358	0.0	0.0	0.0	1.31	52.0	48.5
SF1.022	50.00	7.38	26.659	0.358	0.0	0.0	0.0	5.47	217.6	48.5

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Area Summary for Storm - Francis Street

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.010	0.010	0.010
1.001	-	-	100	0.006	0.006	0.006
1.002	-	-	100	0.002	0.002	0.002
1.003	-	-	100	0.003	0.003	0.003
1.004	-	-	100	0.003	0.003	0.003
1.005	-	-	100	0.003	0.003	0.003
2.000	-	-	100	0.016	0.016	0.016
1.006	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.008	0.008	0.008
1.007	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.007	0.007	0.007
1.008	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.013	0.013	0.013
5.001	-	-	100	0.013	0.013	0.013
1.009	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.005	0.005	0.005
7.000	-	-	100	0.053	0.053	0.053
1.010	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.007	0.007	0.007
9.001	-	-	100	0.013	0.013	0.013
1.011	-	-	100	0.000	0.000	0.000
10.000	-	-	100	0.012	0.012	0.012
1.012	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.029	0.029	0.029
1.013	-	-	100	0.000	0.000	0.000
12.000	-	-	100	0.013	0.013	0.013
12.001	-	-	100	0.007	0.007	0.007
1.014	-	-	100	0.000	0.000	0.000
13.000	-	-	100	0.018	0.018	0.018
1.015	-	-	100	0.000	0.000	0.000
14.000	-	-	100	0.013	0.013	0.013
15.000	-	-	100	0.010	0.010	0.010
14.001	-	-	100	0.000	0.000	0.000
1.016	-	-	100	0.000	0.000	0.000
16.000	-	-	100	0.011	0.011	0.011
1.017	-	-	100	0.013	0.013	0.013
17.000	-	-	100	0.014	0.014	0.014
1.018	-	-	100	0.026	0.026	0.026
18.000	-	-	100	0.003	0.003	0.003
18.001	-	-	100	0.003	0.003	0.003
18.002	-	-	100	0.003	0.003	0.003
18.003	-	-	100	0.003	0.003	0.003
18.004	-	-	100	0.002	0.002	0.002
18.005	-	-	100	0.003	0.003	0.003
18.006	-	-	100	0.003	0.003	0.003
18.007	-	-	100	0.003	0.003	0.003
1.019	-	-	100	0.007	0.007	0.007
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000
1.022	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.358	0.358	0.358

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Free Flowing Outfall Details for Storm - Francis Street

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SF1.022	SF	28.580	25.864	0.000	0	0

Simulation Criteria for Storm - Francis Street

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/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	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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Online Controls for Storm - Francis Street

Hydro-Brake® Optimum Manhole: SF1.19-FC, DS/PN: SF1.019, Volume (m³): 19.9

Unit Reference	MD-SCL-0094-5500-1856-5500
Design Head (m)	1.856
Design Flow (l/s)	5.5
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	94
Invert Level (m)	27.466
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)	1.856	5.5	Kick-Flo®	0.836	3.8
Flush-Flo™	0.377	5.0	Mean Flow over Head Range	-	4.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.5	3.000	6.9	7.000	10.2
0.200	4.7	1.400	4.8	3.500	7.4	7.500	10.6
0.300	5.0	1.600	5.1	4.000	7.9	8.000	10.9
0.400	5.0	1.800	5.4	4.500	8.3	8.500	11.2
0.500	4.9	2.000	5.7	5.000	8.7	9.000	11.5
0.600	4.8	2.200	5.9	5.500	9.1	9.500	11.8
0.800	4.1	2.400	6.2	6.000	9.5		
1.000	4.1	2.600	6.4	6.500	9.9		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

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 Coeffiecient	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 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.000	SF1.00	15 minute 1 year Winter I+0%	15	34.738	33.721	-0.117	0.000
SF1.001	SF1.01	15 minute 1 year Winter I+0%	15	34.574	33.674	-0.133	0.000
SF1.002	SF1.02	15 minute 1 year Winter I+0%	15	33.850	32.817	-0.133	0.000
SF1.003	SF1.03	15 minute 1 year Winter I+0%	15	32.630	31.598	-0.132	0.000
SF1.004	SF1.04	15 minute 1 year Winter I+0%	15	31.417	30.387	-0.131	0.000
SF1.005	SF1.05	15 minute 1 year Winter I+0%	15	30.247	29.222	-0.125	0.000
SF2.000	SF2.00	15 minute 1 year Winter I+0%	15	30.042	28.882	-0.118	0.000
SF1.006	SF1.06	60 minute 1 year Winter I+0%	60	29.953	27.872	-0.958	0.000
SF3.000	SF3.00	15 minute 1 year Winter I+0%	15	29.913	28.917	-0.133	0.000
SF1.007	SF1.07-JCT	60 minute 1 year Winter I+0%	60	29.813	27.872	-0.939	0.000
SF4.000	SF4.00	15 minute 1 year Winter I+0%	15	30.036	28.916	-0.134	0.000
SF1.008	SF1.08-JCT	60 minute 1 year Winter I+0%	60	29.992	27.872	-0.910	0.000
SF5.000	SF5.00	15 minute 1 year Winter I+0%	15	30.037	28.884	-0.116	0.000
SF5.001	SF5.01	15 minute 1 year Winter I+0%	15	30.049	28.807	-0.110	0.000
SF1.009	SF1.09-JCT	60 minute 1 year Winter I+0%	60	29.853	27.872	-0.901	0.000
SF6.000	SF6.00	15 minute 1 year Winter I+0%	15	29.938	28.913	-0.137	0.000
SF7.000	SF7.00	15 minute 1 year Winter I+0%	15	29.753	28.759	-0.091	0.000
SF1.010	SF1.10	60 minute 1 year Winter I+0%	60	29.817	27.872	-0.880	0.000
SF8.000	SF8.00	15 minute 1 year Summer I+0%	15	29.927	28.900	-0.150	0.000
SF9.000	SF9.00	15 minute 1 year Winter I+0%	15	30.037	28.875	-0.125	0.000
SF9.001	SF9.01	15 minute 1 year Winter I+0%	15	30.037	28.820	-0.119	0.000
SF1.011	SF1.11	60 minute 1 year Winter I+0%	60	29.820	27.872	-0.845	0.000
SF10.000	SF10.00	15 minute 1 year Winter I+0%	15	29.938	28.919	-0.131	0.000
SF1.012	SF1.12-JCT	60 minute 1 year Winter I+0%	60	29.845	27.872	-0.819	0.000
SF11.000	SF11.00	15 minute 1 year Winter I+0%	15	29.822	28.833	-0.117	0.000

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.000	SF1.00	0.11		0.004	0.563	0.4		1.2	OK
SF1.001	SF1.01	0.03		0.007	0.901	1.6		1.8	OK
SF1.002	SF1.02	0.03		0.002	1.014	1.9		2.0	OK
SF1.003	SF1.03	0.03		0.002	1.183	2.0		2.3	OK
SF1.004	SF1.04	0.04		0.002	1.352	2.0		2.6	OK
SF1.005	SF1.05	0.07		0.004	1.521	1.5		2.9	OK
SF2.000	SF2.00	0.10		0.004	0.902	0.7		1.9	OK
SF1.006	SF1.06	0.00		0.300	4.108	0.1		2.6	OK
SF3.000	SF3.00	0.03		0.002	0.451	0.9		1.0	OK
SF1.007	SF1.07-JCT	0.00		0.170	4.872	0.1		2.9	OK*
SF4.000	SF4.00	0.03		0.002	0.394	0.9		0.8	OK
SF1.008	SF1.08-JCT	0.00		0.373	5.540	0.1		3.2	OK*
SF5.000	SF5.00	0.12		0.005	0.732	0.5		1.6	OK
SF5.001	SF5.01	0.16		0.033	1.465	0.8		2.9	OK
SF1.009	SF1.09-JCT	0.00		0.226	8.024	0.2		4.7	OK*
SF6.000	SF6.00	0.02		0.001	0.282	0.9		0.6	OK
SF7.000	SF7.00	0.32		0.009	2.986	1.0		6.4	OK
SF1.010	SF1.10	0.01		0.807	13.566	0.3		8.0	OK
SF8.000	SF8.00	0.00		0.000	0.000	0.0		0.0	OK
SF9.000	SF9.00	0.07		0.003	0.394	0.4		0.8	OK
SF9.001	SF9.01	0.10		0.023	1.127	0.8		2.2	OK
SF1.011	SF1.11	0.01		1.212	15.478	0.3		8.3	OK
SF10.000	SF10.00	0.04		0.002	0.676	1.1		1.4	OK
SF1.012	SF1.12-JCT	0.01		0.815	16.625	0.3		8.3	OK*
SF11.000	SF11.00	0.11		0.004	1.634	1.2		3.5	OK

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.013	SF1.13-JCT	60 minute 1 year Winter I+0%	60	29.891	27.872	-0.810	0.000
SF12.000	SF12.00	15 minute 1 year Winter I+0%	15	30.037	28.882	-0.118	0.000
SF12.001	SF12.01	15 minute 1 year Winter I+0%	15	30.041	28.797	-0.119	0.000
SF1.014	SF1.14-JCT	60 minute 1 year Winter I+0%	60	29.899	27.872	-0.806	0.000
SF13.000	SF13.00	15 minute 1 year Winter I+0%	15	29.788	28.775	-0.125	0.000
SF1.015	SF1.15-JCT	60 minute 1 year Winter I+0%	60	29.644	27.872	-0.763	0.000
SF14.000	SF14.00	15 minute 1 year Winter I+0%	15	30.033	28.885	-0.115	0.000
SF15.000	SF15.00	15 minute 1 year Winter I+0%	15	30.027	28.877	-0.123	0.000
SF14.001	SF14.01	15 minute 1 year Winter I+0%	15	30.027	28.818	-0.118	0.000
SF1.016	SF1.16-JCT	60 minute 1 year Winter I+0%	60	29.644	27.872	-0.761	0.000
SF16.000	SF16.00	15 minute 1 year Winter I+0%	15	29.728	28.720	-0.130	0.000
SF1.017	SF1.17	60 minute 1 year Winter I+0%	60	29.573	27.872	-0.731	0.000
SF17.000	SF17.00	15 minute 1 year Winter I+0%	15	29.846	28.722	-0.128	0.000
SF1.018	SF1.18	60 minute 1 year Winter I+0%	60	29.726	27.872	-0.682	0.000
SF18.000	SF18.00	15 minute 1 year Winter I+0%	15	38.521	37.375	-0.146	0.000
SF18.001	SF18.01	15 minute 1 year Winter I+0%	15	37.311	36.168	-0.143	0.000
SF18.002	SF18.02	15 minute 1 year Winter I+0%	15	36.089	34.949	-0.140	0.000
SF18.003	SF18.03	15 minute 1 year Winter I+0%	15	34.870	33.733	-0.137	0.000
SF18.004	SF18.04	15 minute 1 year Winter I+0%	15	33.654	32.519	-0.135	0.000
SF18.005	SF18.05	15 minute 1 year Winter I+0%	15	32.423	31.289	-0.134	0.000
SF18.006	SF18.06	15 minute 1 year Winter I+0%	15	31.197	30.063	-0.134	0.000
SF18.007	SF18.07	60 minute 1 year Winter I+0%	60	29.928	27.871	-0.069	0.000
SF1.019	SF1.19-FC	60 minute 1 year Winter I+0%	60	29.623	27.871	0.255	0.000
SF1.020	SF1.20	180 minute 1 year Summer I+0%	180	29.460	27.385	-0.177	0.000
SF1.021	SF1.21	180 minute 1 year Winter I+0%	180	29.080	26.996	-0.177	0.000
SF1.022	SF1.22	120 minute 1 year Summer I+0%	120	28.570	26.688	-0.196	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.013	SF1.13-JCT	0.01		0.473	19.396	0.3		9.8	OK*
SF12.000	SF12.00	0.10		0.004	0.732	0.6		1.6	OK
SF12.001	SF12.01	0.10		0.018	1.127	0.9		2.3	OK
SF1.014	SF1.14-JCT	0.01		0.348	21.308	0.4		10.6	OK*
SF13.000	SF13.00	0.07		0.003	1.014	1.1		2.2	OK
SF1.015	SF1.15-JCT	0.01		2.031	22.942	0.3		9.9	OK*
SF14.000	SF14.00	0.12		0.005	0.732	0.5		1.6	OK
SF15.000	SF15.00	0.08		0.004	0.563	0.6		1.2	OK
SF14.001	SF14.01	0.10		0.028	1.296	1.0		2.7	OK
SF1.016	SF1.16-JCT	0.01		0.382	25.096	0.3		11.0	OK*
SF16.000	SF16.00	0.04		0.002	0.620	1.0		1.3	OK
SF1.017	SF1.17	0.01		2.424	27.069	0.2		10.5	OK
SF17.000	SF17.00	0.05		0.003	0.789	1.1		1.7	OK
SF1.018	SF1.18	0.01		4.174	30.188	0.2		8.7	OK
SF18.000	SF18.00	0.01		0.000	0.169	0.8		0.4	OK
SF18.001	SF18.01	0.01		0.000	0.338	1.5		0.7	OK
SF18.002	SF18.02	0.01		0.001	0.507	1.9		1.0	OK
SF18.003	SF18.03	0.02		0.001	0.675	1.9		1.3	OK
SF18.004	SF18.04	0.02		0.002	0.788	1.9		1.5	OK
SF18.005	SF18.05	0.03		0.002	0.957	1.9		1.8	OK
SF18.006	SF18.06	0.03		0.002	1.126	2.1		2.1	OK

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF18.007	SF18.07	0.01		1.304	1.743	0.0		0.7	OK
SF1.019	SF1.19-FC	0.34		5.012	31.435	0.9		5.0	SURCHARGED
SF1.020	SF1.20	0.10		0.049	44.094	0.8		5.0	OK
SF1.021	SF1.21	0.10		0.079	49.372	0.8		5.0	OK
SF1.022	SF1.22	0.04		0.043	38.611	1.7		5.0	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

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 Coeffiecient	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 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.000	SF1.00	15 minute 2 year Winter I+0%	15	34.738	33.725	-0.113	0.000
SF1.001	SF1.01	15 minute 2 year Winter I+0%	15	34.574	33.676	-0.131	0.000
SF1.002	SF1.02	15 minute 2 year Winter I+0%	15	33.850	32.819	-0.131	0.000
SF1.003	SF1.03	15 minute 2 year Winter I+0%	15	32.630	31.601	-0.130	0.000
SF1.004	SF1.04	15 minute 2 year Winter I+0%	15	31.417	30.389	-0.128	0.000
SF1.005	SF1.05	15 minute 2 year Winter I+0%	15	30.247	29.227	-0.121	0.000
SF2.000	SF2.00	15 minute 2 year Winter I+0%	15	30.042	28.886	-0.114	0.000
SF1.006	SF1.06	60 minute 2 year Winter I+0%	60	29.953	27.943	-0.887	0.000
SF3.000	SF3.00	15 minute 2 year Winter I+0%	15	29.913	28.919	-0.131	0.000
SF1.007	SF1.07-JCT	60 minute 2 year Winter I+0%	60	29.813	27.943	-0.868	0.000
SF4.000	SF4.00	15 minute 2 year Winter I+0%	15	30.036	28.918	-0.132	0.000
SF1.008	SF1.08-JCT	60 minute 2 year Winter I+0%	60	29.992	27.943	-0.839	0.000
SF5.000	SF5.00	15 minute 2 year Winter I+0%	15	30.037	28.889	-0.111	0.000
SF5.001	SF5.01	15 minute 2 year Winter I+0%	15	30.049	28.813	-0.104	0.000
SF1.009	SF1.09-JCT	60 minute 2 year Winter I+0%	60	29.853	27.943	-0.830	0.000
SF6.000	SF6.00	15 minute 2 year Winter I+0%	15	29.938	28.916	-0.134	0.000
SF7.000	SF7.00	15 minute 2 year Winter I+0%	15	29.753	28.768	-0.082	0.000
SF1.010	SF1.10	60 minute 2 year Winter I+0%	60	29.817	27.943	-0.809	0.000
SF8.000	SF8.00	15 minute 2 year Summer I+0%	15	29.927	28.900	-0.150	0.000
SF9.000	SF9.00	15 minute 2 year Winter I+0%	15	30.037	28.880	-0.120	0.000
SF9.001	SF9.01	15 minute 2 year Winter I+0%	15	30.037	28.824	-0.115	0.000
SF1.011	SF1.11	60 minute 2 year Winter I+0%	60	29.820	27.943	-0.774	0.000
SF10.000	SF10.00	15 minute 2 year Winter I+0%	15	29.938	28.922	-0.128	0.000
SF1.012	SF1.12-JCT	60 minute 2 year Winter I+0%	60	29.845	27.943	-0.748	0.000
SF11.000	SF11.00	15 minute 2 year Winter I+0%	15	29.822	28.837	-0.113	0.000

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.000	SF1.00	0.14		0.005	0.729	0.5		1.6	OK
SF1.001	SF1.01	0.04		0.009	1.167	1.8		2.3	OK
SF1.002	SF1.02	0.04		0.003	1.312	2.1		2.6	OK
SF1.003	SF1.03	0.04		0.003	1.531	2.1		3.0	OK
SF1.004	SF1.04	0.05		0.003	1.750	2.2		3.4	OK
SF1.005	SF1.05	0.08		0.004	1.969	1.6		3.8	OK
SF2.000	SF2.00	0.13		0.005	1.167	0.8		2.5	OK
SF1.006	SF1.06	0.01		0.547	5.235	0.1		3.1	OK
SF3.000	SF3.00	0.04		0.002	0.583	0.9		1.2	OK
SF1.007	SF1.07-JCT	0.00		0.407	6.190	0.2		3.6	OK*
SF4.000	SF4.00	0.03		0.002	0.510	0.9		1.1	OK
SF1.008	SF1.08-JCT	0.00		0.765	6.962	0.2		3.8	OK*
SF5.000	SF5.00	0.15		0.005	0.948	0.6		2.0	OK
SF5.001	SF5.01	0.20		0.039	1.896	0.8		3.7	OK
SF1.009	SF1.09-JCT	0.00		0.403	10.063	0.2		5.7	OK*
SF6.000	SF6.00	0.02		0.002	0.365	0.9		0.8	OK
SF7.000	SF7.00	0.42		0.010	3.864	1.1		8.2	OK
SF1.010	SF1.10	0.01		1.334	16.838	0.3		9.6	OK
SF8.000	SF8.00	0.00		0.000	0.000	0.0		0.0	OK
SF9.000	SF9.00	0.09		0.004	0.510	0.4		1.1	OK
SF9.001	SF9.01	0.12		0.026	1.458	0.9		2.8	OK
SF1.011	SF1.11	0.01		2.037	18.781	0.3		9.3	OK
SF10.000	SF10.00	0.05		0.003	0.875	1.2		1.9	OK
SF1.012	SF1.12-JCT	0.01		1.353	19.914	0.3		9.0	OK*
SF11.000	SF11.00	0.14		0.005	2.115	1.3		4.5	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.013	SF1.13-JCT	60 minute 2 year Winter I+0%	60	29.891	27.943	-0.739	0.000
SF12.000	SF12.00	15 minute 2 year Winter I+0%	15	30.037	28.886	-0.114	0.000
SF12.001	SF12.01	15 minute 2 year Winter I+0%	15	30.041	28.801	-0.115	0.000
SF1.014	SF1.14-JCT	60 minute 2 year Winter I+0%	60	29.899	27.943	-0.735	0.000
SF13.000	SF13.00	15 minute 2 year Winter I+0%	15	29.788	28.780	-0.120	0.000
SF1.015	SF1.15-JCT	60 minute 2 year Winter I+0%	60	29.644	27.943	-0.692	0.000
SF14.000	SF14.00	15 minute 2 year Winter I+0%	15	30.033	28.890	-0.110	0.000
SF15.000	SF15.00	15 minute 2 year Winter I+0%	15	30.027	28.881	-0.119	0.000
SF14.001	SF14.01	15 minute 2 year Winter I+0%	15	30.027	28.822	-0.114	0.000
SF1.016	SF1.16-JCT	60 minute 2 year Winter I+0%	60	29.644	27.943	-0.689	0.000
SF16.000	SF16.00	15 minute 2 year Winter I+0%	15	29.728	28.723	-0.127	0.000
SF1.017	SF1.17	60 minute 2 year Winter I+0%	60	29.573	27.943	-0.660	0.000
SF17.000	SF17.00	15 minute 2 year Winter I+0%	15	29.846	28.725	-0.125	0.000
SF1.018	SF1.18	60 minute 2 year Winter I+0%	60	29.726	27.943	-0.611	0.000
SF18.000	SF18.00	15 minute 2 year Winter I+0%	15	38.521	37.376	-0.145	0.000
SF18.001	SF18.01	15 minute 2 year Winter I+0%	15	37.311	36.170	-0.141	0.000
SF18.002	SF18.02	15 minute 2 year Winter I+0%	15	36.089	34.952	-0.137	0.000
SF18.003	SF18.03	15 minute 2 year Winter I+0%	15	34.870	33.736	-0.134	0.000
SF18.004	SF18.04	15 minute 2 year Winter I+0%	15	33.654	32.521	-0.133	0.000
SF18.005	SF18.05	15 minute 2 year Winter I+0%	15	32.423	31.291	-0.132	0.000
SF18.006	SF18.06	15 minute 2 year Winter I+0%	15	31.197	30.065	-0.132	0.000
SF18.007	SF18.07	60 minute 2 year Winter I+0%	60	29.928	27.943	0.003	0.000
SF1.019	SF1.19-FC	60 minute 2 year Winter I+0%	60	29.623	27.943	0.326	0.000
SF1.020	SF1.20	360 minute 2 year Summer I+0%	360	29.460	27.385	-0.177	0.000
SF1.021	SF1.21	360 minute 2 year Winter I+0%	360	29.080	26.996	-0.177	0.000
SF1.022	SF1.22	360 minute 2 year Winter I+0%	360	28.570	26.688	-0.196	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.013	SF1.13-JCT	0.01		0.719	23.214	0.3		10.7	OK*
SF12.000	SF12.00	0.13		0.005	0.948	0.6		2.0	OK
SF12.001	SF12.01	0.12		0.020	1.458	0.9		2.9	OK
SF1.014	SF1.14-JCT	0.01		0.497	25.455	0.4		11.9	OK*
SF13.000	SF13.00	0.09		0.004	1.313	1.1		2.8	OK
SF1.015	SF1.15-JCT	0.01		3.121	26.749	0.3		11.0	OK*
SF14.000	SF14.00	0.16		0.006	0.948	0.5		2.0	OK
SF15.000	SF15.00	0.10		0.004	0.729	0.6		1.6	OK
SF14.001	SF14.01	0.13		0.033	1.677	1.1		3.5	OK
SF1.016	SF1.16-JCT	0.01		0.509	29.303	0.3		12.4	OK*
SF16.000	SF16.00	0.06		0.003	0.802	1.0		1.7	OK
SF1.017	SF1.17	0.01		3.332	30.764	0.2		11.1	OK
SF17.000	SF17.00	0.06		0.003	1.021	1.2		2.2	OK
SF1.018	SF1.18	0.01		5.560	32.971	0.2		9.1	OK
SF18.000	SF18.00	0.01		0.000	0.219	1.1		0.5	OK
SF18.001	SF18.01	0.01		0.001	0.437	1.9		0.9	OK
SF18.002	SF18.02	0.02		0.001	0.656	1.9		1.3	OK
SF18.003	SF18.03	0.02		0.002	0.875	1.9		1.6	OK
SF18.004	SF18.04	0.03		0.002	1.021	1.9		1.9	OK
SF18.005	SF18.05	0.03		0.002	1.239	2.0		2.3	OK
SF18.006	SF18.06	0.04		0.002	1.458	2.2		2.7	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF18.007	SF18.07	0.01		1.550	1.810	0.0		1.0	SURCHARGED
SF1.019	SF1.19-FC	0.34		6.290	32.231	0.9		5.0	SURCHARGED
SF1.020	SF1.20	0.10		0.049	67.294	0.8		5.0	OK
SF1.021	SF1.21	0.10		0.079	75.363	0.8		5.0	OK
SF1.022	SF1.22	0.04		0.043	75.362	1.7		5.0	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

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 Coeffiecient	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 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.000	SF1.00	15 minute 30 year Winter I+0%	15	34.738	33.741	-0.097	0.000
SF1.001	SF1.01	15 minute 30 year Winter I+0%	15	34.574	33.685	-0.121	0.000
SF1.002	SF1.02	15 minute 30 year Winter I+0%	15	33.850	32.828	-0.122	0.000
SF1.003	SF1.03	15 minute 30 year Winter I+0%	15	32.630	31.611	-0.119	0.000
SF1.004	SF1.04	15 minute 30 year Winter I+0%	15	31.417	30.401	-0.117	0.000
SF1.005	SF1.05	15 minute 30 year Winter I+0%	15	30.247	29.241	-0.107	0.000
SF2.000	SF2.00	15 minute 30 year Winter I+0%	15	30.042	28.900	-0.100	0.000
SF1.006	SF1.06	120 minute 30 year Winter I+0%	120	29.953	28.254	-0.576	0.000
SF3.000	SF3.00	15 minute 30 year Winter I+0%	15	29.913	28.928	-0.122	0.000
SF1.007	SF1.07-JCT	120 minute 30 year Winter I+0%	120	29.813	28.254	-0.557	0.000
SF4.000	SF4.00	15 minute 30 year Winter I+0%	15	30.036	28.925	-0.125	0.000
SF1.008	SF1.08-JCT	120 minute 30 year Winter I+0%	120	29.992	28.254	-0.528	0.000
SF5.000	SF5.00	15 minute 30 year Winter I+0%	15	30.037	28.905	-0.095	0.000
SF5.001	SF5.01	15 minute 30 year Winter I+0%	15	30.049	28.836	-0.081	0.000
SF1.009	SF1.09-JCT	120 minute 30 year Winter I+0%	120	29.853	28.254	-0.519	0.000
SF6.000	SF6.00	15 minute 30 year Winter I+0%	15	29.938	28.920	-0.130	0.000
SF7.000	SF7.00	15 minute 30 year Winter I+0%	15	29.753	28.803	-0.047	0.000
SF1.010	SF1.10	120 minute 30 year Winter I+0%	120	29.817	28.254	-0.498	0.000
SF8.000	SF8.00	15 minute 30 year Summer I+0%	15	29.927	28.900	-0.150	0.000
SF9.000	SF9.00	15 minute 30 year Winter I+0%	15	30.037	28.890	-0.110	0.000
SF9.001	SF9.01	15 minute 30 year Winter I+0%	15	30.037	28.842	-0.097	0.000
SF1.011	SF1.11	120 minute 30 year Winter I+0%	120	29.820	28.254	-0.463	0.000
SF10.000	SF10.00	15 minute 30 year Winter I+0%	15	29.938	28.931	-0.119	0.000
SF1.012	SF1.12-JCT	120 minute 30 year Winter I+0%	120	29.845	28.254	-0.437	0.000
SF11.000	SF11.00	15 minute 30 year Winter I+0%	15	29.822	28.852	-0.098	0.000

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.000	SF1.00	0.26		0.008	1.378	0.5		2.9	OK
SF1.001	SF1.01	0.08		0.014	2.205	2.0		4.8	OK
SF1.002	SF1.02	0.08		0.004	2.481	2.4		5.4	OK
SF1.003	SF1.03	0.09		0.004	2.894	2.5		6.3	OK
SF1.004	SF1.04	0.11		0.005	3.308	2.5		7.2	OK
SF1.005	SF1.05	0.18		0.007	3.721	2.0		8.1	OK
SF2.000	SF2.00	0.24		0.007	2.205	0.9		4.7	OK
SF1.006	SF1.06	0.01		1.624	12.344	0.1		3.5	OK
SF3.000	SF3.00	0.08		0.004	1.103	1.1		2.4	OK
SF1.007	SF1.07-JCT	0.00		2.323	14.640	0.1		3.3	OK*
SF4.000	SF4.00	0.06		0.003	0.965	1.1		2.1	OK
SF1.008	SF1.08-JCT	0.00		4.149	16.649	0.1		2.9	OK*
SF5.000	SF5.00	0.29		0.008	1.792	0.7		3.8	OK
SF5.001	SF5.01	0.43		0.061	3.583	1.0		7.9	OK
SF1.009	SF1.09-JCT	0.00		1.639	24.113	0.2		4.4	OK*
SF6.000	SF6.00	0.04		0.002	0.689	1.0		1.5	OK
SF7.000	SF7.00	0.80		0.016	7.304	1.2		15.6	OK
SF1.010	SF1.10	0.01		4.472	40.763	0.2		7.7	OK
SF8.000	SF8.00	0.00		0.000	0.000	0.0		0.0	OK
SF9.000	SF9.00	0.16		0.006	0.965	0.5		2.1	OK
SF9.001	SF9.01	0.27		0.041	2.756	1.1		6.1	OK
SF1.011	SF1.11	0.01		6.507	46.505	0.2		7.1	OK
SF10.000	SF10.00	0.10		0.004	1.654	1.3		3.5	OK
SF1.012	SF1.12-JCT	0.00		4.475	49.950	0.2		7.0	OK*
SF11.000	SF11.00	0.26		0.008	3.997	1.6		8.6	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.013	SF1.13-JCT	120 minute 30 year Winter I+0%	120	29.891	28.254	-0.428	0.000
SF12.000	SF12.00	15 minute 30 year Winter I+0%	15	30.037	28.901	-0.099	0.000
SF12.001	SF12.01	15 minute 30 year Winter I+0%	15	30.041	28.817	-0.099	0.000
SF1.014	SF1.14-JCT	120 minute 30 year Winter I+0%	120	29.899	28.254	-0.424	0.000
SF13.000	SF13.00	15 minute 30 year Winter I+0%	15	29.788	28.791	-0.109	0.000
SF1.015	SF1.15-JCT	120 minute 30 year Winter I+0%	120	29.644	28.254	-0.381	0.000
SF14.000	SF14.00	15 minute 30 year Winter I+0%	15	30.033	28.906	-0.094	0.000
SF15.000	SF15.00	15 minute 30 year Winter I+0%	15	30.027	28.894	-0.106	0.000
SF14.001	SF14.01	15 minute 30 year Winter I+0%	15	30.027	28.836	-0.099	0.000
SF1.016	SF1.16-JCT	120 minute 30 year Winter I+0%	120	29.644	28.254	-0.379	0.000
SF16.000	SF16.00	15 minute 30 year Winter I+0%	15	29.728	28.732	-0.118	0.000
SF1.017	SF1.17	120 minute 30 year Winter I+0%	120	29.573	28.254	-0.349	0.000
SF17.000	SF17.00	15 minute 30 year Winter I+0%	15	29.846	28.735	-0.115	0.000
SF1.018	SF1.18	120 minute 30 year Winter I+0%	120	29.726	28.253	-0.301	0.000
SF18.000	SF18.00	15 minute 30 year Winter I+0%	15	38.521	37.380	-0.141	0.000
SF18.001	SF18.01	15 minute 30 year Winter I+0%	15	37.311	36.177	-0.134	0.000
SF18.002	SF18.02	15 minute 30 year Winter I+0%	15	36.089	34.958	-0.131	0.000
SF18.003	SF18.03	15 minute 30 year Winter I+0%	15	34.870	33.742	-0.128	0.000
SF18.004	SF18.04	15 minute 30 year Winter I+0%	15	33.654	32.528	-0.126	0.000
SF18.005	SF18.05	15 minute 30 year Winter I+0%	15	32.423	31.300	-0.123	0.000
SF18.006	SF18.06	15 minute 30 year Winter I+0%	15	31.197	30.075	-0.122	0.000
SF18.007	SF18.07	120 minute 30 year Winter I+0%	120	29.928	28.253	0.313	0.000
SF1.019	SF1.19-FC	120 minute 30 year Winter I+0%	120	29.623	28.253	0.637	0.000
SF1.020	SF1.20	240 minute 30 year Summer I+0%	240	29.460	27.385	-0.177	0.000
SF1.021	SF1.21	360 minute 30 year Winter I+0%	360	29.080	26.996	-0.177	0.000
SF1.022	SF1.22	240 minute 30 year Winter I+0%	240	28.570	26.688	-0.196	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.013	SF1.13-JCT	0.01		2.068	58.276	0.2		8.6	OK*
SF12.000	SF12.00	0.25		0.007	1.792	0.7		3.8	OK
SF12.001	SF12.01	0.25		0.031	2.757	1.1		6.0	OK
SF1.014	SF1.14-JCT	0.01		1.265	64.018	0.2		9.6	OK*
SF13.000	SF13.00	0.16		0.006	2.481	1.4		5.3	OK
SF1.015	SF1.15-JCT	0.01		8.744	69.187	0.2		8.1	OK*
SF14.000	SF14.00	0.30		0.008	1.792	0.6		3.8	OK
SF15.000	SF15.00	0.19		0.006	1.378	0.7		3.0	OK
SF14.001	SF14.01	0.25		0.048	3.170	1.3		6.7	OK
SF1.016	SF1.16-JCT	0.01		1.111	75.791	0.2		9.3	OK*
SF16.000	SF16.00	0.10		0.004	1.516	1.2		3.3	OK
SF1.017	SF1.17	0.01		7.731	82.677	0.2		8.7	OK
SF17.000	SF17.00	0.12		0.005	1.930	1.3		4.1	OK
SF1.018	SF1.18	0.01		12.123	94.160	0.2		7.6	OK
SF18.000	SF18.00	0.01		0.001	0.414	2.0		0.9	OK
SF18.001	SF18.01	0.03		0.002	0.827	1.9		1.8	OK
SF18.002	SF18.02	0.04		0.002	1.240	2.1		2.8	OK
SF18.003	SF18.03	0.05		0.003	1.654	2.3		3.7	OK
SF18.004	SF18.04	0.06		0.003	1.929	2.3		4.3	OK
SF18.005	SF18.05	0.08		0.004	2.343	2.4		5.3	OK
SF18.006	SF18.06	0.08		0.004	2.756	2.7		6.2	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF18.007	SF18.07	0.02		2.626	6.600	0.1		1.5	SURCHARGED
SF1.019	SF1.19-FC	0.34		11.556	102.770	0.9		5.0	SURCHARGED
SF1.020	SF1.20	0.10		0.049	110.965	0.8		5.0	OK
SF1.021	SF1.21	0.10		0.079	137.531	0.8		5.0	OK
SF1.022	SF1.22	0.04		0.043	124.259	1.7		5.0	OK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

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 Coeffiecient	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 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.000	SF1.00	15 minute 100 year Winter I+40%	15	34.738	33.762	-0.076	0.000
SF1.001	SF1.01	15 minute 100 year Winter I+40%	15	34.574	33.695	-0.111	0.000
SF1.002	SF1.02	15 minute 100 year Winter I+40%	15	33.850	32.838	-0.112	0.000
SF1.003	SF1.03	15 minute 100 year Winter I+40%	15	32.630	31.622	-0.109	0.000
SF1.004	SF1.04	15 minute 100 year Winter I+40%	15	31.417	30.413	-0.105	0.000
SF1.005	SF1.05	180 minute 100 year Winter I+40%	180	30.247	29.300	-0.048	0.000
SF2.000	SF2.00	180 minute 100 year Winter I+40%	180	30.042	29.300	0.300	0.000
SF1.006	SF1.06	180 minute 100 year Winter I+40%	180	29.953	29.299	0.469	0.000
SF3.000	SF3.00	180 minute 100 year Winter I+40%	180	29.913	29.299	0.249	0.000
SF1.007	SF1.07-JCT	180 minute 100 year Summer I+40%	180	29.813	28.811	0.000	0.000
SF4.000	SF4.00	180 minute 100 year Winter I+40%	180	30.036	29.299	0.249	0.000
SF1.008	SF1.08-JCT	180 minute 100 year Summer I+40%	180	29.992	28.782	0.000	0.000
SF5.000	SF5.00	180 minute 100 year Winter I+40%	180	30.037	29.301	0.301	0.000
SF5.001	SF5.01	180 minute 100 year Winter I+40%	180	30.049	29.301	0.384	0.000
SF1.009	SF1.09-JCT	120 minute 100 year Summer I+40%	120	29.853	28.773	0.000	0.000
SF6.000	SF6.00	180 minute 100 year Winter I+40%	180	29.938	29.299	0.249	0.000
SF7.000	SF7.00	180 minute 100 year Winter I+40%	180	29.753	29.300	0.450	0.000
SF1.010	SF1.10	180 minute 100 year Winter I+40%	180	29.817	29.299	0.547	0.000
SF8.000	SF8.00	180 minute 100 year Winter I+40%	180	29.927	29.299	0.249	0.000
SF9.000	SF9.00	180 minute 100 year Winter I+40%	180	30.037	29.301	0.301	0.000
SF9.001	SF9.01	180 minute 100 year Winter I+40%	180	30.037	29.300	0.362	0.000
SF1.011	SF1.11	180 minute 100 year Winter I+40%	180	29.820	29.299	0.582	0.000
SF10.000	SF10.00	180 minute 100 year Winter I+40%	180	29.938	29.300	0.250	0.000
SF1.012	SF1.12-JCT	120 minute 100 year Summer I+40%	120	29.845	28.691	0.000	0.000
SF11.000	SF11.00	180 minute 100 year Winter I+40%	180	29.822	29.300	0.350	0.000

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.000	SF1.00	0.48		0.011	2.491	0.6		5.3	OK
SF1.001	SF1.01	0.15		0.020	3.986	2.4		8.7	OK
SF1.002	SF1.02	0.14		0.006	4.484	2.9		9.8	OK
SF1.003	SF1.03	0.17		0.006	5.231	3.0		11.5	OK
SF1.004	SF1.04	0.20		0.007	5.978	3.0		13.1	OK
SF1.005	SF1.05	0.08		0.018	15.965	1.6		3.7	OK
SF2.000	SF2.00	0.11		0.071	9.461	0.8		2.2	SURCHARGED
SF1.006	SF1.06	0.01		5.469	25.426	0.1		4.9	SURCHARGED
SF3.000	SF3.00	0.04		0.063	4.731	0.9		1.1	SURCHARGED
SF1.007	SF1.07-JCT	0.00		6.353	26.927	0.1		5.7	SURCHARGED*
SF4.000	SF4.00	0.03		0.063	4.139	0.9		1.0	SURCHARGED
SF1.008	SF1.08-JCT	0.01		10.671	30.623	0.1		9.4	SURCHARGED*
SF5.000	SF5.00	0.14		0.071	7.688	0.5		1.8	SURCHARGED
SF5.001	SF5.01	0.20		0.297	15.375	0.8		3.6	SURCHARGED
SF1.009	SF1.09-JCT	0.00		3.884	39.650	0.1		5.1	SURCHARGED*
SF6.000	SF6.00	0.02		0.063	2.957	1.0		0.7	SURCHARGED
SF7.000	SF7.00	0.37		0.095	31.341	1.0		7.3	SURCHARGED
SF1.010	SF1.10	0.02		12.073	83.966	0.2		11.5	SURCHARGED
SF8.000	SF8.00	0.00		0.063	0.000	0.0		0.0	SURCHARGED
SF9.000	SF9.00	0.08		0.071	4.139	0.4		1.0	SURCHARGED
SF9.001	SF9.01	0.12		0.235	11.827	0.9		2.8	SURCHARGED
SF1.011	SF1.11	0.02		16.082	95.793	0.2		14.6	SURCHARGED
SF10.000	SF10.00	0.04		0.063	7.096	1.2		1.7	SURCHARGED
SF1.012	SF1.12-JCT	0.00		9.075	82.134	0.2		6.9	SURCHARGED*
SF11.000	SF11.00	0.12		0.079	17.149	1.3		4.0	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SF1.013	SF1.13-JCT	120 minute 100 year Summer I+40%	120	29.891	28.682	0.000	0.000
SF12.000	SF12.00	180 minute 100 year Winter I+40%	180	30.037	29.301	0.301	0.000
SF12.001	SF12.01	180 minute 100 year Winter I+40%	180	30.041	29.300	0.385	0.000
SF1.014	SF1.14-JCT	120 minute 100 year Summer I+40%	120	29.899	28.678	0.000	0.000
SF13.000	SF13.00	180 minute 100 year Winter I+40%	180	29.788	29.300	0.400	0.000
SF1.015	SF1.15-JCT	120 minute 100 year Summer I+40%	120	29.644	28.635	0.000	0.000
SF14.000	SF14.00	180 minute 100 year Winter I+40%	180	30.033	29.301	0.301	0.000
SF15.000	SF15.00	180 minute 100 year Winter I+40%	180	30.027	29.301	0.301	0.000
SF14.001	SF14.01	180 minute 100 year Winter I+40%	180	30.027	29.301	0.365	0.000
SF1.016	SF1.16-JCT	120 minute 100 year Summer I+40%	120	29.644	28.633	0.000	0.000
SF16.000	SF16.00	180 minute 100 year Winter I+40%	180	29.728	29.300	0.450	0.000
SF1.017	SF1.17	180 minute 100 year Winter I+40%	180	29.573	29.299	0.696	0.000
SF17.000	SF17.00	180 minute 100 year Winter I+40%	180	29.846	29.300	0.450	0.000
SF1.018	SF1.18	180 minute 100 year Winter I+40%	180	29.726	29.299	0.745	0.000
SF18.000	SF18.00	15 minute 100 year Winter I+40%	15	38.521	37.387	-0.134	0.000
SF18.001	SF18.01	15 minute 100 year Winter I+40%	15	37.311	36.182	-0.129	0.000
SF18.002	SF18.02	15 minute 100 year Winter I+40%	15	36.089	34.966	-0.123	0.000
SF18.003	SF18.03	15 minute 100 year Winter I+40%	15	34.870	33.751	-0.119	0.000
SF18.004	SF18.04	15 minute 100 year Winter I+40%	15	33.654	32.537	-0.117	0.000
SF18.005	SF18.05	15 minute 100 year Winter I+40%	15	32.423	31.310	-0.113	0.000
SF18.006	SF18.06	15 minute 100 year Winter I+40%	15	31.197	30.085	-0.112	0.000
SF18.007	SF18.07	180 minute 100 year Winter I+40%	180	29.928	29.299	1.359	0.000
SF1.019	SF1.19-FC	180 minute 100 year Winter I+40%	180	29.623	29.300	1.683	0.000
SF1.020	SF1.20	180 minute 100 year Winter I+40%	180	29.460	27.387	-0.175	0.000
SF1.021	SF1.21	180 minute 100 year Winter I+40%	180	29.080	26.998	-0.175	0.000
SF1.022	SF1.22	180 minute 100 year Winter I+40%	180	28.570	26.689	-0.195	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF1.013	SF1.13-JCT	0.01		4.104	95.823	0.2		10.7	SURCHARGED*
SF12.000	SF12.00	0.12		0.071	7.687	0.6		1.8	SURCHARGED
SF12.001	SF12.01	0.12		0.226	11.827	0.9		2.8	SURCHARGED
SF1.014	SF1.14-JCT	0.01		2.558	105.265	0.2		14.1	SURCHARGED*
SF13.000	SF13.00	0.08		0.087	10.644	1.1		2.5	SURCHARGED
SF1.015	SF1.15-JCT	0.01		16.083	113.763	0.2		8.2	SURCHARGED*
SF14.000	SF14.00	0.14		0.071	7.687	0.5		1.8	SURCHARGED
SF15.000	SF15.00	0.09		0.071	5.913	0.6		1.4	SURCHARGED
SF14.001	SF14.01	0.12		0.283	13.601	1.1		3.2	SURCHARGED
SF1.016	SF1.16-JCT	0.01		2.140	124.621	0.3		12.4	SURCHARGED*
SF16.000	SF16.00	0.05		0.095	6.505	1.0		1.5	SURCHARGED
SF1.017	SF1.17	0.01		15.264	170.312	0.2		12.0	SURCHARGED
SF17.000	SF17.00	0.06		0.095	8.279	1.1		1.9	SURCHARGED
SF1.018	SF1.18	0.01		21.294	193.970	0.2		8.9	SURCHARGED
SF18.000	SF18.00	0.02		0.002	0.748	1.9		1.6	OK
SF18.001	SF18.01	0.05		0.003	1.495	2.2		3.3	OK
SF18.002	SF18.02	0.07		0.004	2.242	2.4		5.0	OK
SF18.003	SF18.03	0.10		0.005	2.989	2.5		6.7	OK
SF18.004	SF18.04	0.11		0.005	3.487	2.7		7.8	OK
SF18.005	SF18.05	0.14		0.006	4.235	2.8		9.5	OK
SF18.006	SF18.06	0.15		0.006	4.982	3.2		11.2	OK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Francis Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SF18.007	SF18.07	0.03		6.279	13.597	0.1		2.5	SURCHARGED
SF1.019	SF1.19-FC	0.38		18.785	211.707	0.9		5.5	SURCHARGED
SF1.020	SF1.20	0.11		0.051	211.707	0.8		5.5	OK
SF1.021	SF1.21	0.11		0.082	211.707	0.8		5.5	OK
SF1.022	SF1.22	0.04		0.045	211.706	1.7		5.5	OK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Dutton Street

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm - Dutton Street

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.338	4-8	0.091

Total Area Contributing (ha) = 0.429

Total Pipe Volume (m³) = 3.574

Network Design Table for Storm - Dutton Street

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

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
SD1.000	2.913	0.138	21.1	0.103	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD1.001	1.708#	0.012	142.3	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
SD2.000	3.845	0.384	10.0	0.097	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD2.001	1.562#	0.010	150.0	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
SD1.000	50.00	5.02	37.900	0.103	0.0	0.0	0.0	2.20	38.9	13.9
SD1.001	50.00	5.05	37.687	0.128	0.0	0.0	0.0	1.09	43.5	17.3
SD2.000	50.00	5.02	38.700	0.097	0.0	0.0	0.0	3.20	56.6	13.1
SD2.001	50.00	5.04	38.241	0.139	0.0	0.0	0.0	1.07	42.4	18.8

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Network Design Table for Storm - Dutton Street

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
SD3.000	13.667	0.091	150.0	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD4.000	4.728	0.032	150.0	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD4.001	9.828	0.085	116.2	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD3.001	6.237	0.357	17.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD5.000	32.416	0.216	150.0	0.024	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD5.001	9.853	0.066	150.0	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD5.002	9.883	0.066	150.0	0.038	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD3.002	16.790	0.187	89.8	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
SD3.003	6.195	0.357	17.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SD3.004	1.191#	0.008	150.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SD6.000	8.798	0.059	150.0	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD6.001	1.176#	0.008	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
SD1.002	3.025	0.020	150.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SD1.003	4.865	0.032	150.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SD7.000	1.921	0.013	150.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
SD1.004	3.650	0.116	31.5	0.000	0.00	0.0	0.600	o	150	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)
SD3.000	50.00	5.28	38.750	0.019	0.0	0.0	0.0	0.82	14.5	2.6
SD4.000	50.00	5.10	38.775	0.019	0.0	0.0	0.0	0.82	14.5	2.6
SD4.001	50.00	5.27	38.743	0.038	0.0	0.0	0.0	0.93	16.5	5.1
SD3.001	50.00	5.32	38.659	0.057	0.0	0.0	0.0	2.42	42.8	7.7
SD5.000	50.00	5.66	38.650	0.024	0.0	0.0	0.0	0.82	14.5	3.2
SD5.001	50.00	5.86	38.434	0.029	0.0	0.0	0.0	0.82	14.5	3.9
SD5.002	50.00	6.06	38.368	0.067	0.0	0.0	0.0	0.82	14.5	9.1
SD3.002	50.00	6.27	38.227	0.143	0.0	0.0	0.0	1.38	54.9	19.4
SD3.003	50.00	6.30	38.040	0.143	0.0	0.0	0.0	3.16	125.5	19.4
SD3.004	50.00	6.32	37.683	0.143	0.0	0.0	0.0	1.07	42.4	19.4
SD6.000	50.00	5.18	38.900	0.019	0.0	0.0	0.0	0.82	14.5	2.6
SD6.001	50.00	5.20	38.841	0.019	0.0	0.0	0.0	0.82	14.5	2.6
SD1.002	50.00	6.36	37.600	0.429	0.0	0.0	0.0	1.28	90.6	58.1
SD1.003	50.00	6.42	37.580	0.429	0.0	0.0	0.0	1.28	90.6	58.1
SD7.000	50.00	5.04	38.000	0.000	0.0	0.0	0.0	0.82	14.5	0.0
SD1.004	50.00	6.45	37.547	0.429	0.0	0.0	0.0	1.80	31.8«	58.1

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Area Summary for Storm - Dutton Street

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.103	0.103	0.103
1.001	-	-	100	0.025	0.025	0.025
2.000	-	-	100	0.097	0.097	0.097
2.001	-	-	100	0.042	0.042	0.042
3.000	-	-	100	0.019	0.019	0.019
4.000	-	-	100	0.019	0.019	0.019
4.001	-	-	100	0.019	0.019	0.019
3.001	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.024	0.024	0.024
5.001	-	-	100	0.005	0.005	0.005
5.002	-	-	100	0.038	0.038	0.038
3.002	-	-	100	0.019	0.019	0.019
3.003	-	-	100	0.000	0.000	0.000
3.004	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.019	0.019	0.019
6.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.429	0.429	0.429

Free Flowing Outfall Details for Storm - Dutton Street

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SD1.004	SD	39.842	37.431	0.000	0	0

Simulation Criteria for Storm - Dutton Street

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/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 1	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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Online Controls for Storm - Dutton Street

Hydro-Brake® Optimum Manhole: SD1.04-FC, DS/PN: SD1.004, Volume (m³): 4.5

Unit Reference	MD-SCL-0106-6600-1600-6600
Design Head (m)	1.600
Design Flow (l/s)	6.6
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	106
Invert Level (m)	37.547
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)	1.600	6.6	Kick-Flo®	0.864	5.0
Flush-Flo™	0.381	6.6	Mean Flow over Head Range	-	5.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.0	1.200	5.8	3.000	8.8	7.000	13.2
0.200	6.1	1.400	6.2	3.500	9.5	7.500	13.6
0.300	6.5	1.600	6.6	4.000	10.1	8.000	14.1
0.400	6.6	1.800	7.0	4.500	10.7	8.500	14.5
0.500	6.5	2.000	7.3	5.000	11.3	9.000	14.9
0.600	6.3	2.200	7.7	5.500	11.8	9.500	15.3
0.800	5.5	2.400	8.0	6.000	12.3		
1.000	5.3	2.600	8.3	6.500	12.7		

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Storage Structures for Storm - Dutton Street

Cellular Storage Manhole: SD1.02-TANK, DS/PN: SD1.002

Invert Level (m) 37.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	115.0	0.0	1.601	0.0	0.0
1.600	115.0	0.0			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Dutton Street

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SD1.000	SD-RWP	15 minute 1 year Winter I+0%	15	39.323	37.979	-0.071	0.000
SD1.001	SD1.01	60 minute 1 year Winter I+0%	60	39.461	37.829	-0.083	0.000
SD2.000	SD-RWP	15 minute 1 year Winter I+0%	15	39.997	38.756	-0.094	0.000
SD2.001	SD2.01	15 minute 1 year Winter I+0%	15	39.943	38.359	-0.107	0.000
SD3.000	SD3.00	15 minute 1 year Winter I+0%	15	40.100	38.792	-0.108	0.000
SD4.000	SD4.00	15 minute 1 year Winter I+0%	15	40.100	38.821	-0.104	0.000
SD4.001	SD4.01	15 minute 1 year Winter I+0%	15	40.100	38.799	-0.095	0.000
SD3.001	SD3.01	15 minute 1 year Winter I+0%	15	40.100	38.702	-0.107	0.000
SD5.000	SD5.00	15 minute 1 year Winter I+0%	15	40.035	38.696	-0.104	0.000
SD5.001	SD5.01	15 minute 1 year Winter I+0%	15	40.025	38.486	-0.098	0.000
SD5.002	SD5.02	15 minute 1 year Winter I+0%	15	40.100	38.449	-0.069	0.000
SD3.002	SD3.02	15 minute 1 year Winter I+0%	15	40.100	38.315	-0.137	0.000
SD3.003	SD3.03	15 minute 1 year Winter I+0%	15	40.100	38.105	-0.160	0.000
SD3.004	SD3.04	60 minute 1 year Winter I+0%	60	39.955	37.829	-0.079	0.000
SD6.000	SD6.00	15 minute 1 year Winter I+0%	15	40.100	38.943	-0.107	0.000
SD6.001	SD6.01	15 minute 1 year Winter I+0%	15	39.962	38.888	-0.103	0.000
SD1.002	SD1.02-TANK	60 minute 1 year Winter I+0%	60	39.938	37.829	-0.071	0.000
SD1.003	SD1.03	60 minute 1 year Winter I+0%	60	39.944	37.844	-0.036	0.000
SD7.000	SD7.00	15 minute 1 year Summer I+0%	15	39.961	38.000	-0.150	0.000
SD1.004	SD1.04-FC	60 minute 1 year Winter I+0%	60	39.942	37.847	0.149	0.000

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Dutton Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SD1.000	SD-RWP	0.53		0.074	5.804	1.3		12.3	OK*
SD1.001	SD1.01	0.28		0.161	12.232	0.6		8.3	OK
SD2.000	SD-RWP	0.30		0.052	5.467	1.9		11.7	OK*
SD2.001	SD2.01	0.53		0.129	7.833	0.8		15.8	OK
SD3.000	SD3.00	0.17		0.006	1.070	0.6		2.3	OK
SD4.000	SD4.00	0.21		0.007	1.070	0.5		2.3	OK
SD4.001	SD4.01	0.29		0.030	2.141	0.7		4.2	OK
SD3.001	SD3.01	0.18		0.060	3.211	1.6		6.5	OK
SD5.000	SD5.00	0.20		0.007	1.352	0.6		2.8	OK
SD5.001	SD5.01	0.26		0.046	1.634	0.6		3.3	OK
SD5.002	SD5.02	0.56		0.067	3.775	0.7		7.2	OK
SD3.002	SD3.02	0.32		0.026	8.056	1.1		15.6	OK
SD3.003	SD3.03	0.19		0.055	8.056	1.6		15.6	OK
SD3.004	SD3.04	0.31		0.069	13.665	0.7		9.2	OK
SD6.000	SD6.00	0.18		0.006	1.070	0.6		2.3	OK
SD6.001	SD6.01	0.21		0.035	1.070	0.5		2.3	OK
SD1.002	SD1.02-TANK	0.13		25.233	35.204	0.5	48	8.1	OK*
SD1.003	SD1.03	0.12		0.586	35.046	0.4		7.1	OK
SD7.000	SD7.00	0.00		0.000	0.000	0.0		0.0	OK
SD1.004	SD1.04-FC	0.30		0.739	34.819	1.4		6.5	SURCHARGED

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Dutton Street

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SD1.000	SD-RWP	15 minute 2 year Winter I+0%	15	39.323	37.993	-0.057	0.000
SD1.001	SD1.01	60 minute 2 year Winter I+0%	60	39.461	37.912	0.000	0.000
SD2.000	SD-RWP	15 minute 2 year Winter I+0%	15	39.997	38.765	-0.085	0.000
SD2.001	SD2.01	15 minute 2 year Winter I+0%	15	39.943	38.380	-0.085	0.000
SD3.000	SD3.00	15 minute 2 year Winter I+0%	15	40.100	38.798	-0.102	0.000
SD4.000	SD4.00	15 minute 2 year Winter I+0%	15	40.100	38.828	-0.097	0.000
SD4.001	SD4.01	15 minute 2 year Winter I+0%	15	40.100	38.807	-0.086	0.000
SD3.001	SD3.01	15 minute 2 year Winter I+0%	15	40.100	38.708	-0.100	0.000
SD5.000	SD5.00	15 minute 2 year Winter I+0%	15	40.035	38.703	-0.097	0.000
SD5.001	SD5.01	15 minute 2 year Winter I+0%	15	40.025	38.494	-0.090	0.000
SD5.002	SD5.02	15 minute 2 year Winter I+0%	15	40.100	38.464	-0.054	0.000
SD3.002	SD3.02	15 minute 2 year Winter I+0%	15	40.100	38.328	-0.124	0.000
SD3.003	SD3.03	15 minute 2 year Winter I+0%	15	40.100	38.114	-0.150	0.000
SD3.004	SD3.04	60 minute 2 year Winter I+0%	60	39.955	37.911	0.004	0.000
SD6.000	SD6.00	15 minute 2 year Winter I+0%	15	40.100	38.949	-0.101	0.000
SD6.001	SD6.01	15 minute 2 year Winter I+0%	15	39.962	38.895	-0.096	0.000
SD1.002	SD1.02-TANK	60 minute 2 year Winter I+0%	60	39.938	37.911	0.011	0.000
SD1.003	SD1.03	60 minute 2 year Winter I+0%	60	39.944	37.924	0.044	0.000
SD7.000	SD7.00	15 minute 2 year Summer I+0%	15	39.961	38.000	-0.150	0.000
SD1.004	SD1.04-FC	60 minute 2 year Winter I+0%	60	39.942	37.929	0.232	0.000

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Dutton Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SD1.000	SD-RWP	0.69		0.088	7.511	1.4		16.0	OK*
SD1.001	SD1.01	0.35		0.268	15.557	0.7		10.5	OK
SD2.000	SD-RWP	0.39		0.060	7.075	2.1		15.1	OK*
SD2.001	SD2.01	0.68		0.155	10.137	0.8		20.5	OK
SD3.000	SD3.00	0.22		0.007	1.385	0.6		2.9	OK
SD4.000	SD4.00	0.27		0.008	1.385	0.5		3.0	OK
SD4.001	SD4.01	0.37		0.035	2.771	0.8		5.4	OK
SD3.001	SD3.01	0.23		0.069	4.156	1.7		8.4	OK
SD5.000	SD5.00	0.26		0.008	1.750	0.7		3.7	OK
SD5.001	SD5.01	0.34		0.054	2.114	0.7		4.3	OK
SD5.002	SD5.02	0.72		0.080	4.885	0.8		9.3	OK
SD3.002	SD3.02	0.41		0.030	10.426	1.2		20.2	OK
SD3.003	SD3.03	0.24		0.063	10.426	1.8		20.2	OK
SD3.004	SD3.04	0.39		0.133	17.414	0.7		11.6	SURCHARGED
SD6.000	SD6.00	0.23		0.007	1.385	0.6		3.0	OK
SD6.001	SD6.01	0.27		0.041	1.385	0.5		2.9	OK
SD1.002	SD1.02-TANK	0.13		34.326	38.938	0.5	54	8.0	SURCHARGED*
SD1.003	SD1.03	0.12		0.754	38.607	0.4		7.4	SURCHARGED
SD7.000	SD7.00	0.00		0.000	0.000	0.0		0.0	OK
SD1.004	SD1.04-FC	0.31		0.900	38.208	1.4		6.6	SURCHARGED

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Dutton Street

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SD1.000	SD-RWP	15 minute 30 year Summer I+0%	15	39.323	38.050	0.000	0.000
SD1.001	SD1.01	120 minute 30 year Winter I+0%	120	39.461	38.343	0.431	0.000
SD2.000	SD-RWP	15 minute 30 year Winter I+0%	15	39.997	38.797	-0.053	0.000
SD2.001	SD2.01	15 minute 30 year Winter I+0%	15	39.943	38.535	0.070	0.000
SD3.000	SD3.00	15 minute 30 year Winter I+0%	15	40.100	38.818	-0.082	0.000
SD4.000	SD4.00	15 minute 30 year Winter I+0%	15	40.100	38.857	-0.068	0.000
SD4.001	SD4.01	15 minute 30 year Winter I+0%	15	40.100	38.845	-0.048	0.000
SD3.001	SD3.01	15 minute 30 year Winter I+0%	15	40.100	38.732	-0.076	0.000
SD5.000	SD5.00	15 minute 30 year Winter I+0%	15	40.035	38.726	-0.074	0.000
SD5.001	SD5.01	15 minute 30 year Winter I+0%	15	40.025	38.627	0.043	0.000
SD5.002	SD5.02	15 minute 30 year Winter I+0%	15	40.100	38.600	0.082	0.000
SD3.002	SD3.02	15 minute 30 year Winter I+0%	15	40.100	38.390	-0.062	0.000
SD3.003	SD3.03	120 minute 30 year Winter I+0%	120	40.100	38.344	0.080	0.000
SD3.004	SD3.04	120 minute 30 year Winter I+0%	120	39.955	38.342	0.435	0.000
SD6.000	SD6.00	15 minute 30 year Winter I+0%	15	40.100	38.970	-0.080	0.000
SD6.001	SD6.01	15 minute 30 year Winter I+0%	15	39.962	38.919	-0.073	0.000
SD1.002	SD1.02-TANK	120 minute 30 year Winter I+0%	120	39.938	38.342	0.442	0.000
SD1.003	SD1.03	120 minute 30 year Winter I+0%	120	39.944	38.356	0.477	0.000
SD7.000	SD7.00	120 minute 30 year Winter I+0%	120	39.961	38.362	0.212	0.000
SD1.004	SD1.04-FC	120 minute 30 year Winter I+0%	120	39.942	38.362	0.665	0.000

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Dutton Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SD1.000	SD-RWP	1.21		0.263	12.674	1.6		28.1	SURCHARGED*
SD1.001	SD1.01	0.40		0.777	36.748	0.6		11.9	SURCHARGED
SD2.000	SD-RWP	0.73		0.092	13.370	2.4		28.5	OK*
SD2.001	SD2.01	1.39		0.348	19.158	1.1		41.4	SURCHARGED
SD3.000	SD3.00	0.42		0.010	2.619	0.7		5.6	OK
SD4.000	SD4.00	0.50		0.012	2.619	0.6		5.6	OK
SD4.001	SD4.01	0.79		0.058	5.237	0.9		11.5	OK
SD3.001	SD3.01	0.47		0.107	7.855	2.0		17.0	OK
SD5.000	SD5.00	0.50		0.011	3.308	0.8		6.9	OK
SD5.001	SD5.01	0.72		0.328	3.997	0.6		9.2	SURCHARGED
SD5.002	SD5.02	1.48		0.202	9.233	1.1		19.1	SURCHARGED
SD3.002	SD3.02	0.85		0.115	19.707	1.4		41.3	OK
SD3.003	SD3.03	0.17		0.646	41.053	1.6		14.3	SURCHARGED
SD3.004	SD3.04	0.47		0.408	41.053	0.7		14.0	SURCHARGED
SD6.000	SD6.00	0.44		0.010	2.619	0.7		5.6	OK
SD6.001	SD6.01	0.51		0.061	2.619	0.6		5.5	OK
SD1.002	SD1.02-TANK	0.17		81.875	123.161	0.5	127	10.3	SURCHARGED*
SD1.003	SD1.03	0.15		1.525	123.161	0.4		8.7	SURCHARGED
SD7.000	SD7.00	0.00		0.057	0.007	0.1		0.0	SURCHARGED
SD1.004	SD1.04-FC	0.31		1.685	123.168	1.4		6.6	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Dutton Street

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 Coeffiecient	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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
SD1.000	SD-RWP	15 minute 100 year Summer I+40%	15	39.323	38.050	0.000	0.000
SD1.001	SD1.01	180 minute 100 year Winter I+40%	180	39.461	39.177	1.265	0.000
SD2.000	SD-RWP	15 minute 100 year Summer I+40%	15	39.997	38.850	0.000	0.000
SD2.001	SD2.01	180 minute 100 year Winter I+40%	180	39.943	39.177	0.711	0.000
SD3.000	SD3.00	180 minute 100 year Winter I+40%	180	40.100	39.187	0.287	0.000
SD4.000	SD4.00	180 minute 100 year Winter I+40%	180	40.100	39.188	0.263	0.000
SD4.001	SD4.01	180 minute 100 year Winter I+40%	180	40.100	39.188	0.294	0.000
SD3.001	SD3.01	180 minute 100 year Winter I+40%	180	40.100	39.185	0.376	0.000
SD5.000	SD5.00	15 minute 100 year Winter I+40%	15	40.035	39.440	0.640	0.000
SD5.001	SD5.01	15 minute 100 year Winter I+40%	15	40.025	39.299	0.715	0.000
SD5.002	SD5.02	15 minute 100 year Winter I+40%	15	40.100	39.227	0.709	0.000
SD3.002	SD3.02	180 minute 100 year Winter I+40%	180	40.100	39.183	0.731	0.000
SD3.003	SD3.03	180 minute 100 year Winter I+40%	180	40.100	39.178	0.914	0.000
SD3.004	SD3.04	180 minute 100 year Winter I+40%	180	39.955	39.177	1.269	0.000
SD6.000	SD6.00	180 minute 100 year Winter I+40%	180	40.100	39.177	0.127	0.000
SD6.001	SD6.01	180 minute 100 year Winter I+40%	180	39.962	39.176	0.185	0.000
SD1.002	SD1.02-TANK	180 minute 100 year Winter I+40%	180	39.938	39.176	1.276	0.000
SD1.003	SD1.03	240 minute 100 year Winter I+40%	240	39.944	39.190	1.310	0.000
SD7.000	SD7.00	240 minute 100 year Winter I+40%	240	39.961	39.193	1.043	0.000
SD1.004	SD1.04-FC	240 minute 100 year Winter I+40%	240	39.942	39.192	1.495	0.000

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Dutton Street

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
SD1.000	SD-RWP	2.04		0.863	21.936	2.7		47.4	SURCHARGED*
SD1.001	SD1.01	0.53		1.720	75.691	0.6		15.8	SURCHARGED
SD2.000	SD-RWP	1.21		0.538	21.575	2.7		46.8	SURCHARGED*
SD2.001	SD2.01	0.63		1.110	82.196	0.8		18.8	SURCHARGED
SD3.000	SD3.00	0.20		0.069	11.235	0.6		2.6	SURCHARGED
SD4.000	SD4.00	0.24		0.065	11.235	0.5		2.6	SURCHARGED
SD4.001	SD4.01	0.36		0.145	22.471	0.8		5.2	SURCHARGED
SD3.001	SD3.01	0.22		0.482	33.706	1.6		7.9	SURCHARGED
SD5.000	SD5.00	0.83		0.125	5.978	0.8		11.5	SURCHARGED
SD5.001	SD5.01	1.07		0.702	7.223	0.8		13.7	SURCHARGED
SD5.002	SD5.02	2.46		0.302	16.688	1.8		31.6	SURCHARGED
SD3.002	SD3.02	0.38		0.535	84.560	1.1		18.7	SURCHARGED
SD3.003	SD3.03	0.22		0.964	84.560	1.6		18.2	SURCHARGED
SD3.004	SD3.04	0.60		0.643	84.560	0.6		18.1	SURCHARGED
SD6.000	SD6.00	0.21		0.043	11.235	0.6		2.6	SURCHARGED
SD6.001	SD6.01	0.24		0.200	11.235	0.5		2.6	SURCHARGED
SD1.002	SD1.02-TANK	0.16		173.887	253.683	0.5	294	9.6	SURCHARGED*
SD1.003	SD1.03	0.13		2.998	273.003	0.4		7.8	SURCHARGED
SD7.000	SD7.00	0.00		0.189	0.006	0.1		0.1	SURCHARGED
SD1.004	SD1.04-FC	0.31		3.153	273.009	1.4		6.6	SURCHARGED

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APPENDIX M

OVERLAND FLOOD FLOW ROUTES

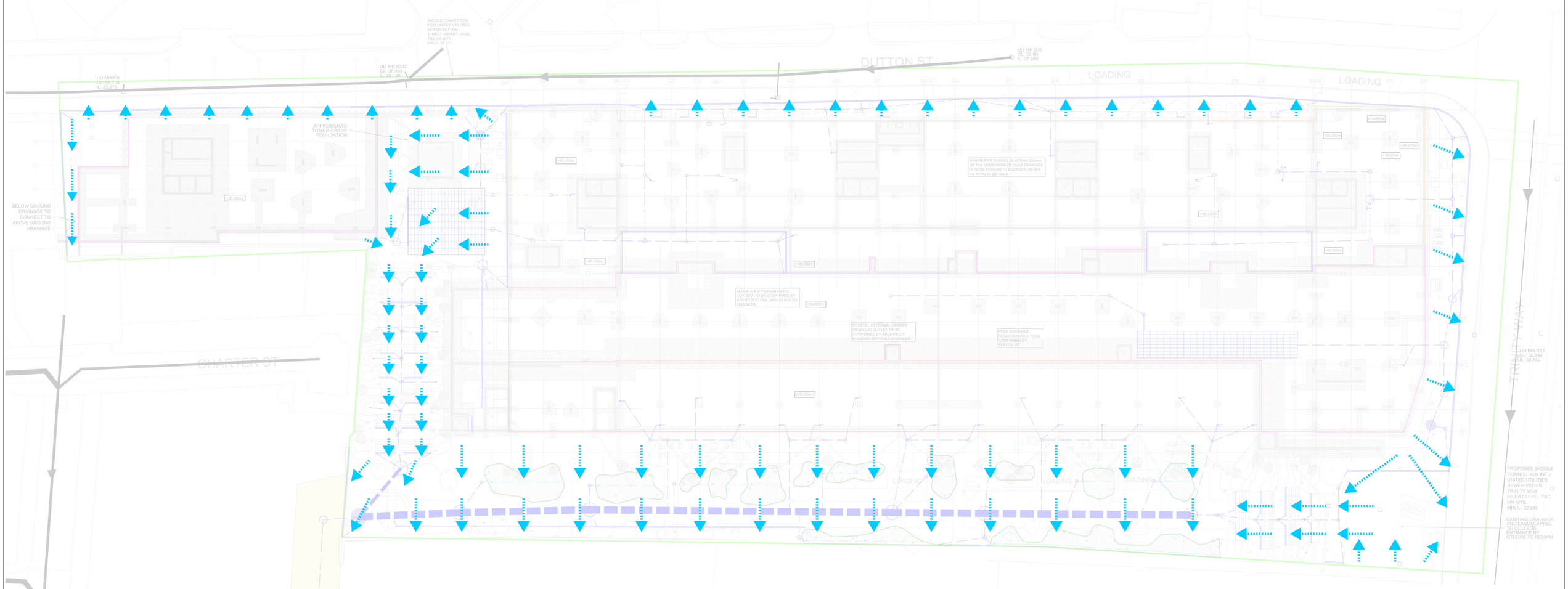
NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RENAISSANCE, ARCHITECTS, LANDSCAPE ARCHITECTS AND BUILDING SERVICES ENGINEERS DRAWINGS.
2. THE DRAINAGE SYSTEM HAS BEEN DESIGNED TO ACCOMMODATE RAINFALL EVENTS UPTO 1 IN 100 YEAR + 40% CLIMATE CHANGE AND AS SUCH THIS DRAWING INDICATES THE OVERLAND FLOW ROUTES FOR AN EXCEEDANCE EVENT OF THE DRAINAGE SYSTEM.

DRAWING LEGEND

PLANNING BOUNDARY

EXCEEDANCE FLOOD FLOW ROUTES



Rev:	Description:	Date:	By:	Chkd:
P02	LANDSCAPE BACKGROUND UPDATED	12.02.23	JB	BH
P01	STAGE 4 ISSUE	12.09.23	JB	PC

Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:

BODDINGTONS BREWERY, MANCHESTER

Drawing Title:

OVERLAND FLOOD FLOW ROUTES

Status:

STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A0	SEP 23	JB	JB	PC

Scale: 1:200 Project No: 2211-11

Project – Originator – Volume – Level – Type – Role – Number:	Revision:
BRW-REN-ZZ-FN-DR-C-01150	P02

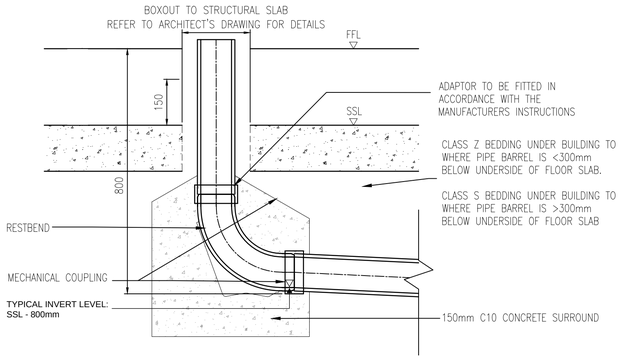
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APPENDIX N

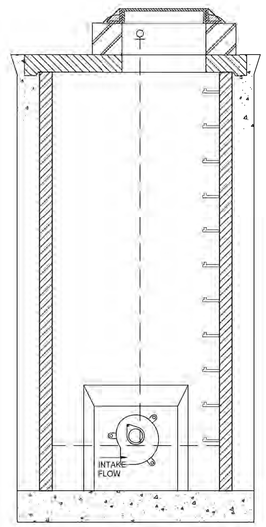
FLOW CONTROL AND SUDS DETAILS

NOTES:

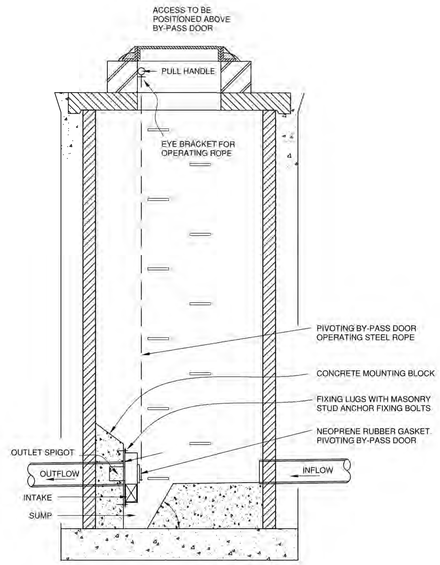
1. FOR GENERAL NOTES REFER TO RENAISSANCE DRAWING BRW-REN-ZZ-FN-DR-C-01100. FOR DRAINAGE NOTES REFER TO BRW-REN-ZZ-FN-DR-C-03101.
2. DO NOT SCALE FROM THIS DRAWING. ANY AMBIGUITIES OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS TO BE CHECKED/ VERIFIED ON SITE.



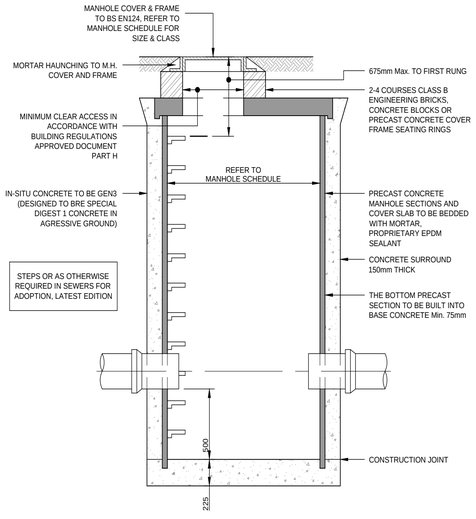
TYPICAL REST BEND DETAIL



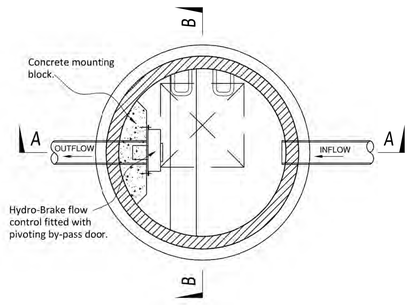
SECTION A-A



SECTION B-B



MANHOLE - SILT TRAP



TYPICAL PLAN OF HYDRO-BRAKE MANHOLE

Rev:	Description:	Date:	By:	Chkd:
P02	STAGE 4 ISSUE	12.09.23	JB	PC
P01	STAGE 3	30.06.23	SA	PC

Renaissance Associates Ltd
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Project:

BRWRY
MANCHESTER

Drawing Title:

BELOW GROUND DRAINAGE DETAILS SHEET 3

Status:

STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	JUN'23	SA	--	PC

Scale:	Project No:
NTS	2211-11

Project - Originator - Volume - Level - Type - Role - Number: BRW-REN-ZZ-FN-DR-C-03103

Revision: P02

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Technical Specification

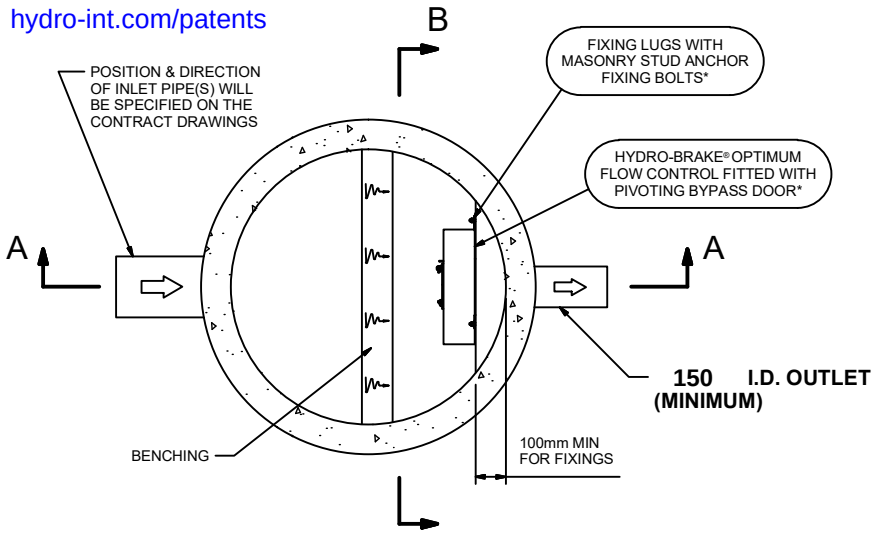
Control Point	Head (m)	Flow (l/s)
Primary Design	1.800	5.400
Flush-Flo™	0.375	5.008
Kick-Flo®	0.836	3.791
Mean Flow		4.473

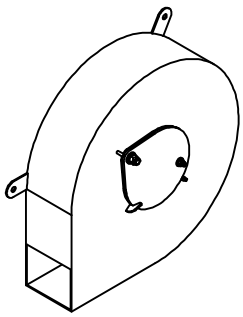
Hydro-Brake® Optimum Flow Control including:

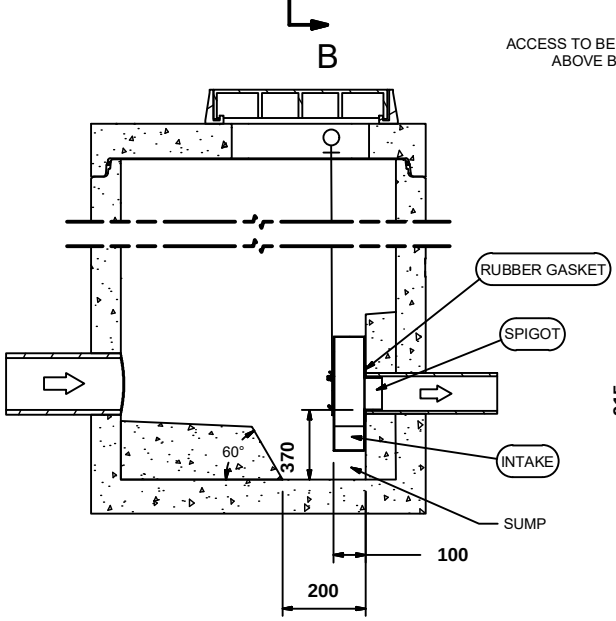
- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- Indicative Weight: 20 kg

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE 08/4596

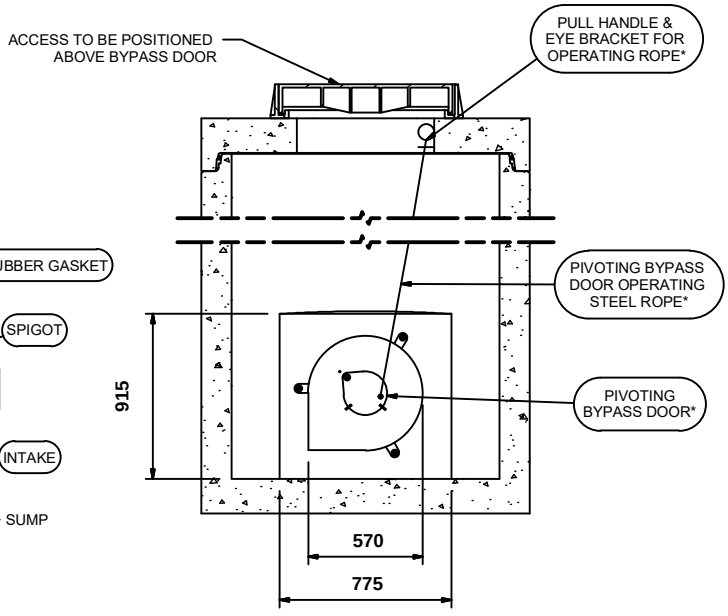
hydro-int.com/patents







SECTION A-A



SECTION B-B

IMPORTANT: (⬭) LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE

The head/flow characteristics of this SCL-0094-5400-1800-5400 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International®

DATE	12/09/2023 15:45
SITE	BRWRY
DESIGNER	Joe Bullough
REF	ST1.11-FC

SCL-0094-5400-1800-5400
Hydro-Brake® Optimum

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joebullough@renaissance-ltd.com

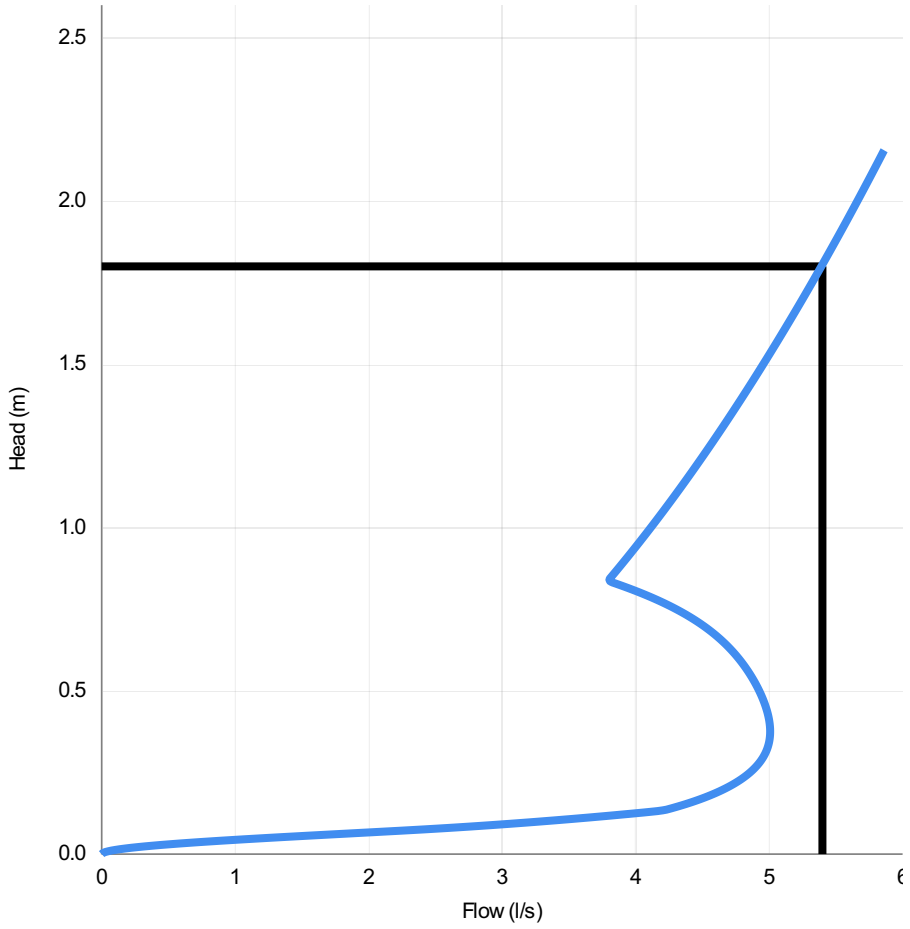
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.800	5.400
Flush-Flo	0.375	5.008
Kick-Flo®	0.836	3.791
Mean Flow		4.473



wrc approved
PT/503/0422
Valid: 01/04/2022 - 31/03/2027

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Head (m)	Flow (l/s)
0.000	0.000
0.062	1.803
0.124	3.977
0.186	4.595
0.248	4.853
0.310	4.974
0.372	5.008
0.434	4.988
0.497	4.931
0.559	4.845
0.621	4.727
0.683	4.563
0.745	4.328
0.807	3.996
0.869	3.859
0.931	3.982
0.993	4.101
1.055	4.216
1.117	4.328
1.179	4.437
1.241	4.543
1.303	4.646
1.366	4.746
1.428	4.844
1.490	4.940
1.552	5.034
1.614	5.126
1.676	5.217
1.738	5.305
1.800	5.392

DESIGN ADVICE

The head/flow characteristics of this SCL-0094-5400-1800-5400 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

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Hydro International®

DATE	12/09/2023 15:45
Site	BRWRY
DESIGNER	Joe Bullough
Ref	ST1.11-FC

SCL-0094-5400-1800-5400

Hydro-Brake Optimum®

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Technical Specification

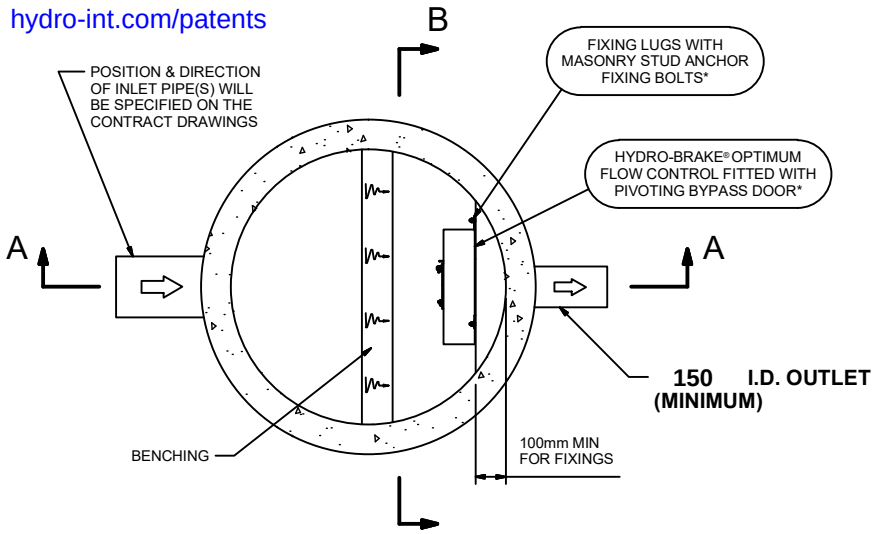
Control Point	Head (m)	Flow (l/s)
Primary Design	1.856	5.500
Flush-Flo™	0.377	5.022
Kick-Flo®	0.836	3.806
Mean Flow		4.519

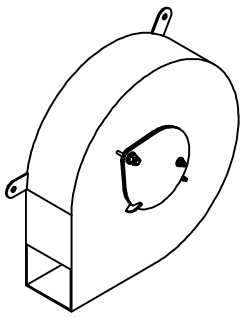
Hydro-Brake® Optimum Flow Control including:

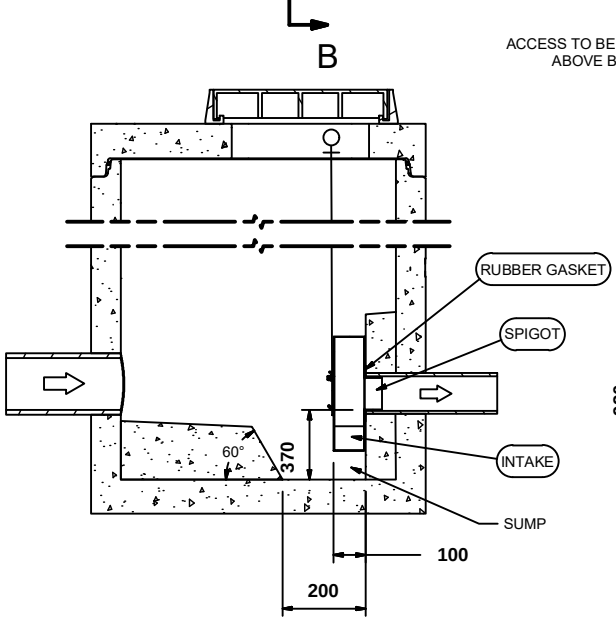
- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- Indicative Weight: 20 kg

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE 08/4596

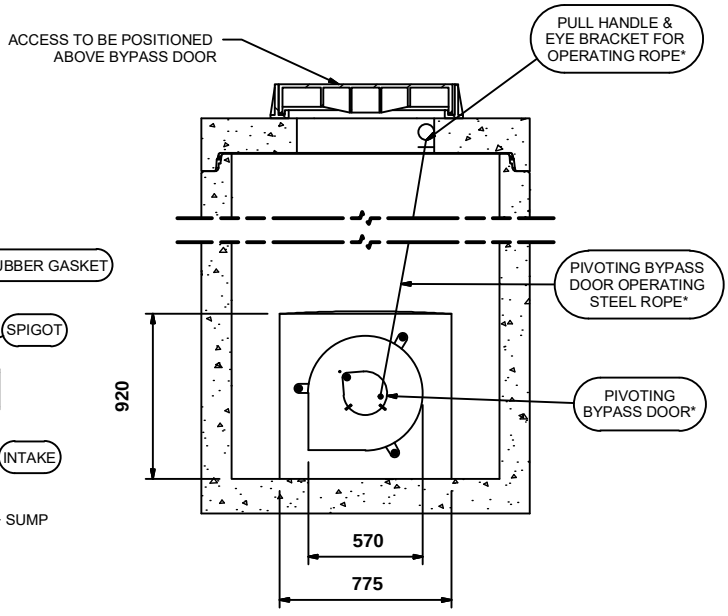
hydro-int.com/patents







SECTION A-A



SECTION B-B

IMPORTANT: (oval) LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
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* WHERE SUPPLIED
HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE

The head/flow characteristics of this SCL-0094-5500-1856-5500 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International®

DATE	12/09/2023 15:44
SITE	BRWRY
DESIGNER	Joe Bullough
REF	SF1.19-FC

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joebullough@renaissance-ltd.com

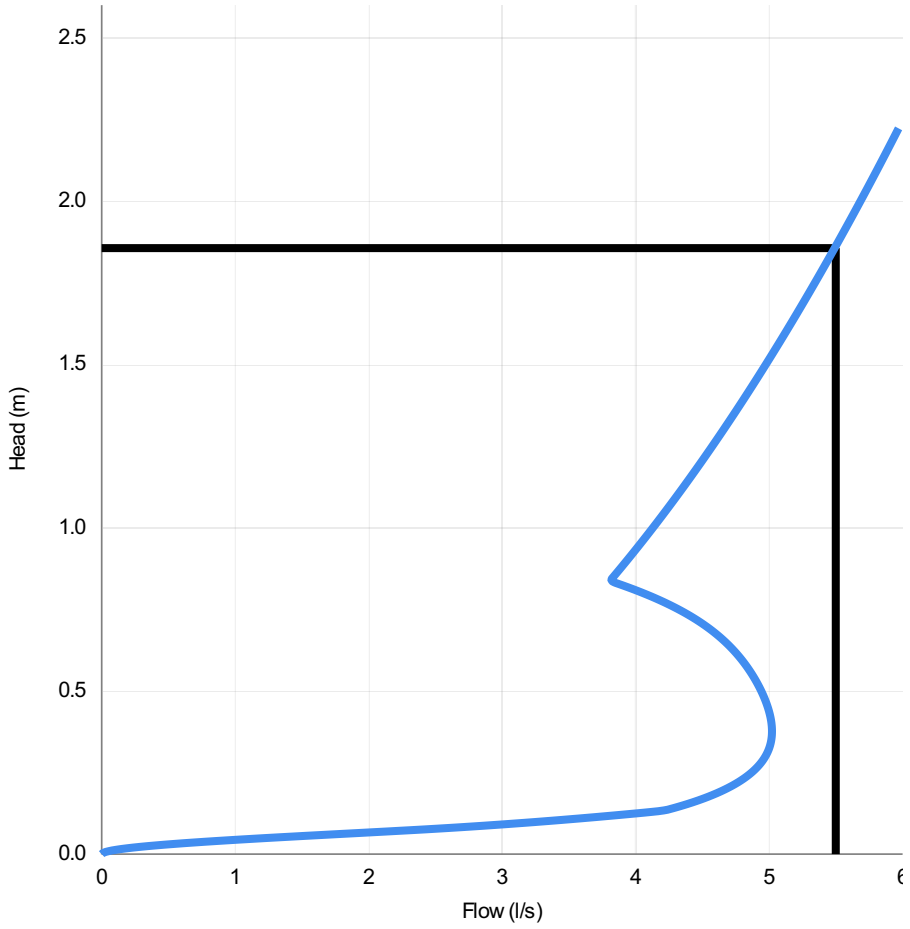
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.856	5.500
Flush-Flo	0.377	5.022
Kick-Flo®	0.836	3.806
Mean Flow		4.519



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PT/503/0422
Valid: 01/04/2022 - 31/03/2027

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Head (m)	Flow (l/s)
0.000	0.000
0.064	1.895
0.128	4.091
0.192	4.638
0.256	4.886
0.320	4.997
0.384	5.022
0.448	4.992
0.512	4.926
0.576	4.831
0.640	4.697
0.704	4.507
0.768	4.232
0.832	3.841
0.896	3.929
0.960	4.055
1.024	4.176
1.088	4.294
1.152	4.408
1.216	4.518
1.280	4.626
1.344	4.731
1.408	4.834
1.472	4.934
1.536	5.031
1.600	5.127
1.664	5.221
1.728	5.313
1.792	5.403
1.856	5.491

DESIGN ADVICE

The head/flow characteristics of this SCL-0094-5500-1856-5500 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

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Hydro International®

DATE	12/09/2023 15:44
Site	BRWRY
DESIGNER	Joe Bullough
Ref	SF1.19-FC

SCL-0094-5500-1856-5500

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Technical Specification

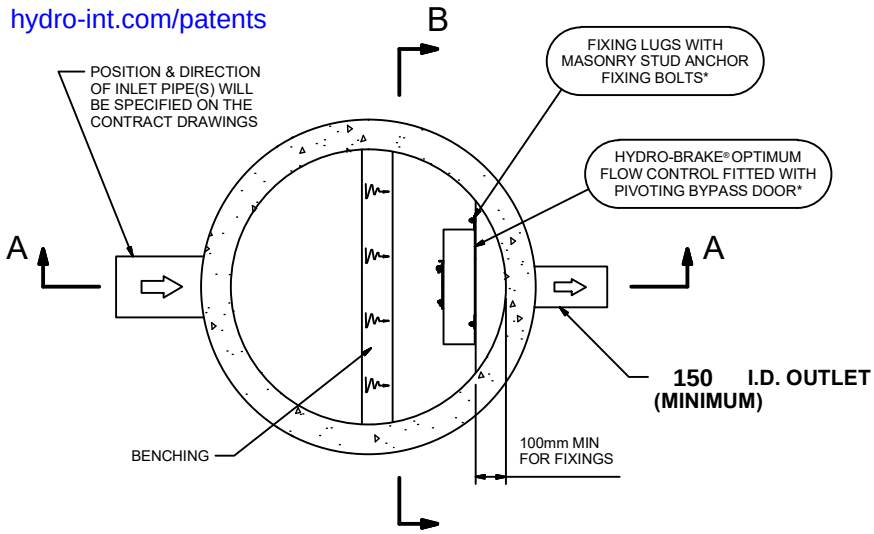
Control Point	Head (m)	Flow (l/s)
Primary Design	1.600	6.600
Flush-Flo™	0.381	6.590
Kick-Flo®	0.864	4.963
Mean Flow		5.698

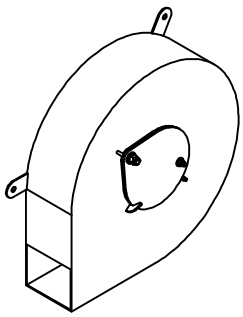
Hydro-Brake® Optimum Flow Control including:

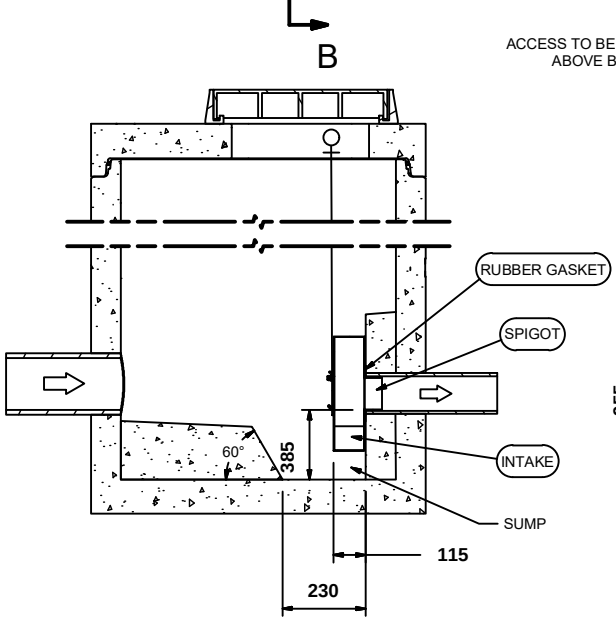
- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- Indicative Weight: 20 kg

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE 08/4596

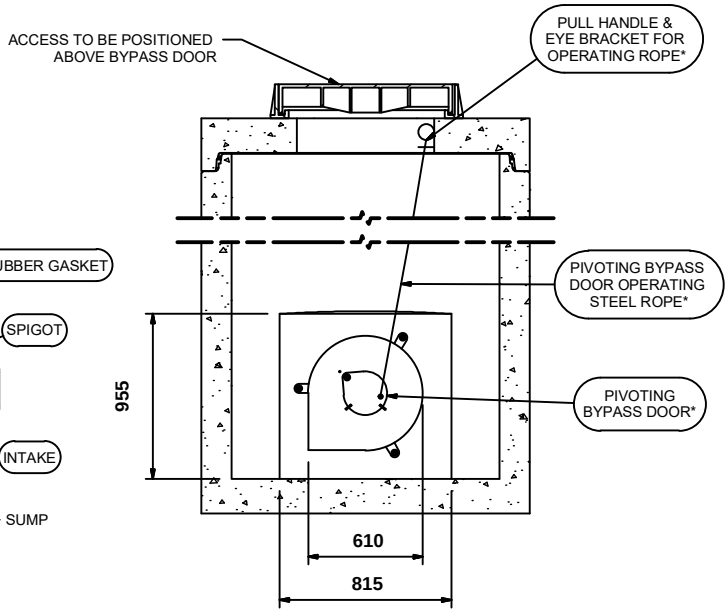
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SECTION A-A



SECTION B-B

IMPORTANT: ⬭ LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
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DESIGN ADVICE

The head/flow characteristics of this SCL-0106-6600-1600-6600 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

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DATE	12/09/2023 15:44
SITE	BRWRY
DESIGNER	Joe Bullough
REF	SD1.04-FC

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joebullough@renaissance-ltd.com

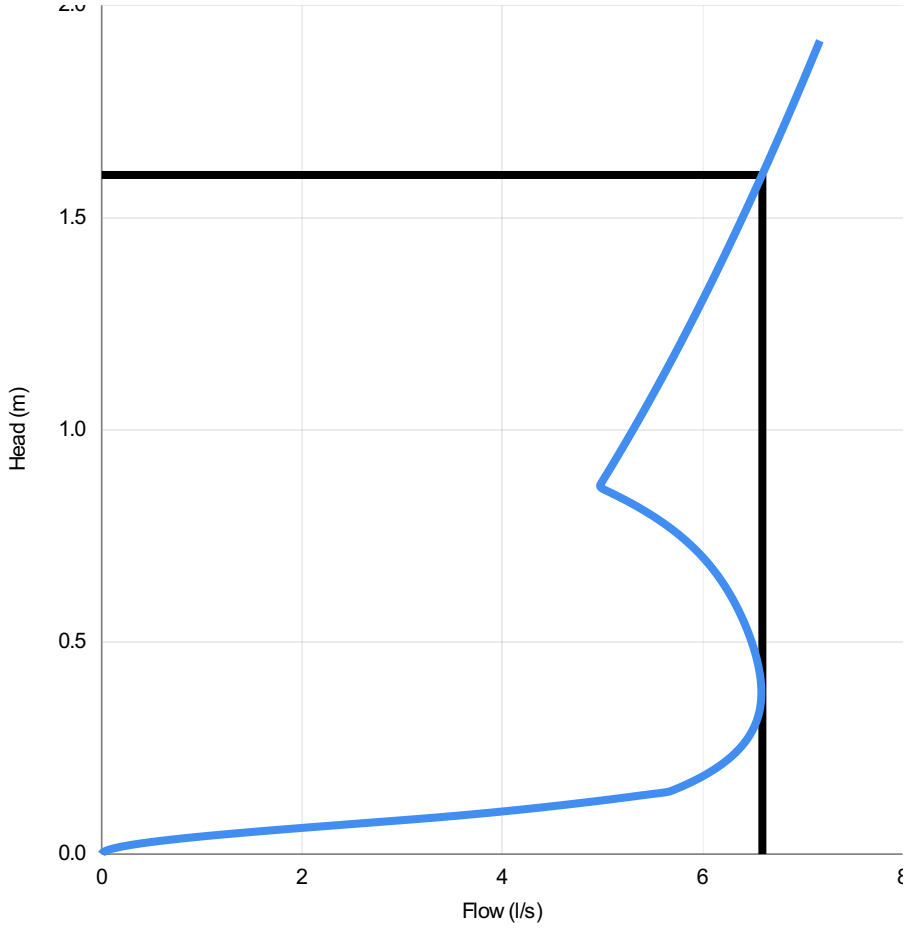
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.600	6.600
Flush-Flo	0.381	6.590
Kick-Flo®	0.864	4.963
Mean Flow		5.698



PT/503/0422
Valid: 01/04/2022 - 31/03/2027

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Head (m)	Flow (l/s)
0.000	0.000
0.055	1.654
0.110	4.409
0.166	5.855
0.221	6.244
0.276	6.462
0.331	6.565
0.386	6.590
0.441	6.562
0.497	6.498
0.552	6.407
0.607	6.289
0.662	6.136
0.717	5.932
0.772	5.656
0.828	5.282
0.883	5.013
0.938	5.155
0.993	5.292
1.048	5.425
1.103	5.555
1.159	5.682
1.214	5.805
1.269	5.925
1.324	6.043
1.379	6.158
1.434	6.271
1.490	6.382
1.545	6.491
1.600	6.597

DESIGN ADVICE

The head/flow characteristics of this SCL-0106-6600-1600-6600 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

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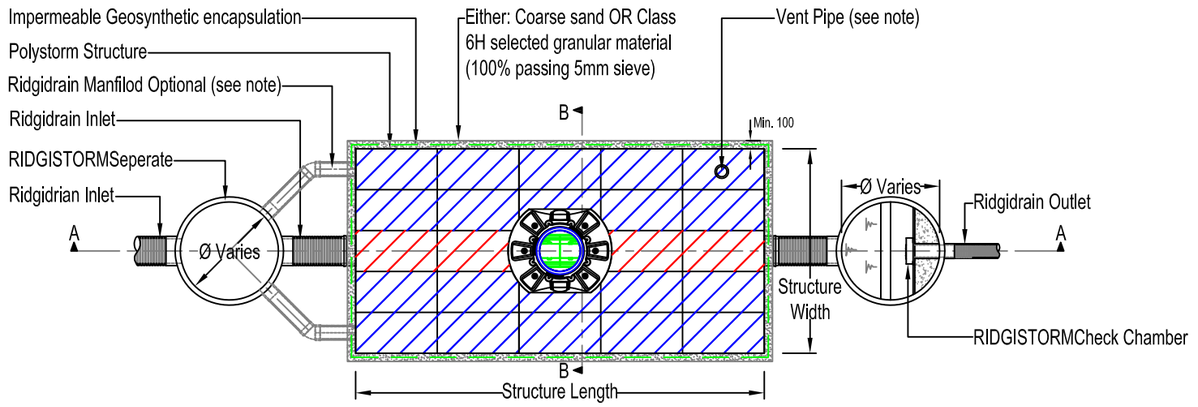
Hydro International®

DATE	12/09/2023 15:44
Site	BRWRY
DESIGNER	Joe Bullough
Ref	SD1.04-FC

SCL-0106-6600-1600-6600

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TYPICAL ATTENUATION TANK PLAN

(Scale 1:75)

KEY:

POLYSTORM (PSM1, 1A & 2 CELL)

POLYSTORM (PSM4 CELL)

POLYSTORM ACCESS NOTES

1. Refer to Polypipe drawing No. PSM_SD_PSM_004 for typical integration into Polystorm structure.

VENTILATION NOTE

For information on Ventilation Options please refer to drawing ref: PSM_SD_PSM_002

MANIFOLD NOTE

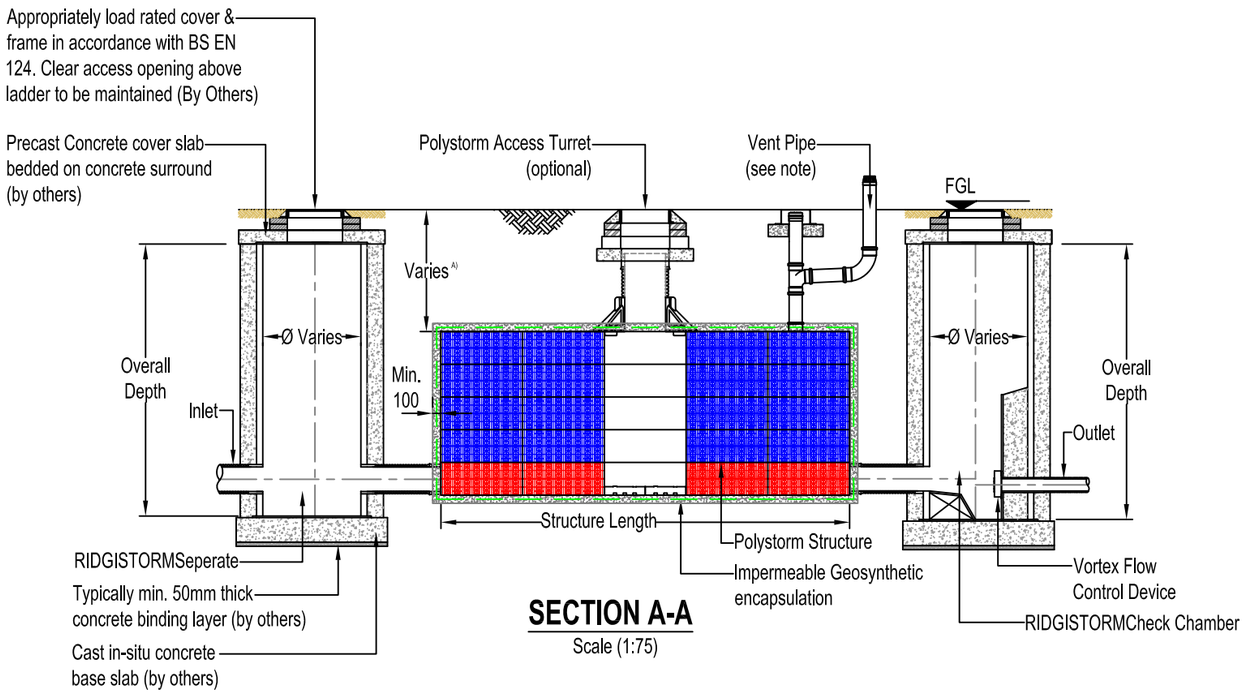
Where single pipe hydraulic capacity is exceeded manifold detail may be required. For information on Manifold connections please refer to drawing ref: PSM_SD_008

NOTE A

For information on tank cover depths please refer to drawing ref: PSM_SD_PSM_005 or alternatively contact the Technical Team:- 01509 61500

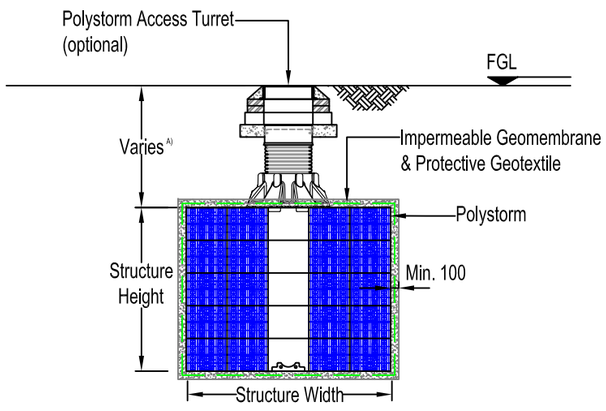
NOTES

1. All dimensions in millimetres, unless otherwise stated.
2. All dimensions are nominal and may vary within manufacturing or construction tolerances.
3. All site temporary and enabling works by others.
4. Polypipe products to be installed in accordance with Polypipe civils recommendations (refer to Polypipe technical guidance for further information), giving due consideration to the requirements of the organisation who will be taking ultimate owner ship of the installation.
5. This drawing is intended for guidance only. Confirmation of the information contained within this document should be sought from the consulting engineers before final design or construction activities commence.



SECTION A-A

Scale (1:75)



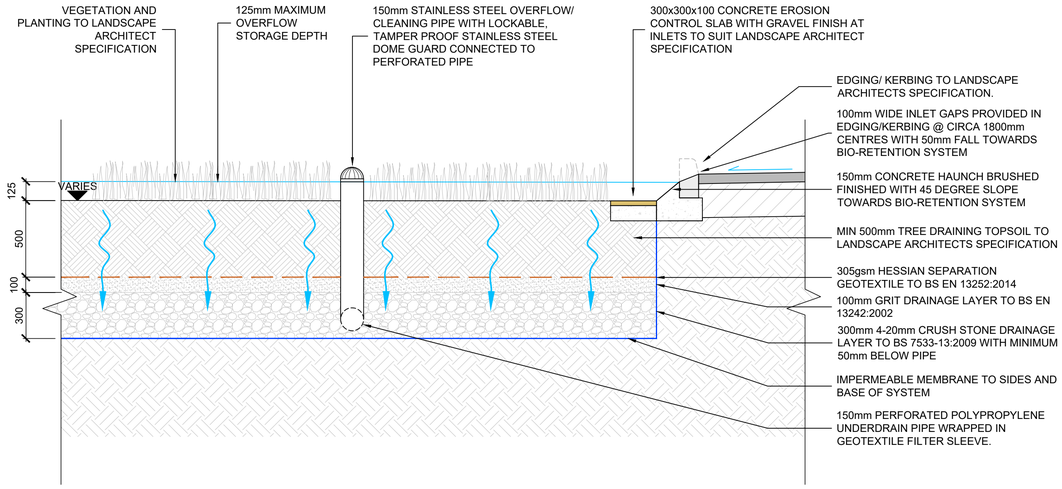
SECTION B-B

Scale (1:75)

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Polypipe Civils
Charnwood Business Park,
North Road, Loughborough,
Leicestershire. LE11 1LE
Tel: 01509 615100
Fax: 01509 615215
www.polypipe.com/civils
www.polypipe.com/wms

PROJECT	POLYSTORM STANDARD DETAILS
TITLE	POLYSTORM ATTENUATION DETAIL
STATUS	FOR INFORMATION
DATE	17/03/16
DRAWN BY	JL
ORIGINAL SIZE	A3
SCALE	AS SHOWN
DRAWING No.	PSM_SD_PSM_001
REV.	



BIO-RETENTION DETAIL

SCALE 1:20

NOTES:

1. FOR GENERAL NOTES REFER TO RENAISSANCE DRAWING BRW-REN-ZZ-FN-DR-C-01100. FOR DRAINAGE NOTES REFER TO BRW-REN-ZZ-FN-DR-C-03101.
2. DO NOT SCALE FROM THIS DRAWING. ANY AMBIGUITIES OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS TO BE CHECKED/ VERIFIED ON SITE.

Rev:	Description:	Date:	By:	Chkd:
P02	STAGE 4	13.09.23	HW	PC
P01	STAGE 3	26.06.23	SA	PC

Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:

BODDINGTONS BREWERY, MANCHESTER

Drawing Title:

BELOW GROUND DRAINAGE DETAILS SHEET 5

Status:

STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	JUN 23	SA	--	PC

Scale:	Project No:
1:20	2211-11

Project – Originator – Volume – Level – Type – Role – Number: BRW-REN-ZZ-FN-DR-C-03105

Revision: P02

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APPENDIX P

ADJACENT LANDOWNER CORRESPONDENCE

JoeBullough

From: Nick Russell <Nick.Russell@salboy.co.uk>
Sent: 03 July 2023 09:28
To: William Thorpe
Cc: Henry Wilkinson; Ben Hughes; Paul Hawkins; Stuart Taylor; Geoff Danby; Darren Hughes; Paul Strutt; Patrick Clayton; Stephen Ward; ben@novo.eu.com; Sam Power; Tom Hogan
Subject: Re: Proposed - Drainage Network route

Assuming it's adheres to the 5m easement then it's approved.

Kind regards

Nick Russell

Business Development Manager

Mobile: (+44)07592644409

Email: nick.russell@salboy.co.uk

LinkedIn: www.linkedin.com/in/nickrussell91

Website: www.salboy.co.uk

SALBOY

United Kingdom: Unit 3 | Birchwood One Business Park | Dewhurst Road| Birchwood | Warrington | WA3 7GB

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From: William Thorpe <William@artal.uk.com>
Sent: Friday, June 30, 2023 14:19
To: Nick Russell <Nick.Russell@salboy.co.uk>
Cc: Henry Wilkinson <HenryWilkinson@renaissance-ltd.com>; Ben Hughes <benhughes@renaissance-ltd.com>; Paul Hawkins <paulhawkins@domisconstruction.co.uk>; Stuart Taylor <stuart@artal.uk.com>; Geoff Danby <geoffdanby@domisconstruction.co.uk>; Darren Hughes <darrenhughes@domisconstruction.co.uk>; Paul Strutt

<paulstrutt@domisconstruction.co.uk>; Patrick Clayton <patrickclayton@renaissance-ltd.com>; Stephen Ward <stephen.ward@salboy.co.uk>; ben@novo.eu.com <ben@novo.eu.com>; Sam Power <sam@studiopower.co.uk>; Tom Hogan <Tom@artal.uk.com>
Subject: Proposed - Drainage Network route

Afternoon Nick,

Please see attached below ground drainage plan showing proposed surface / foul drainage route toward Francis Street [SW].

Note: We have previously agreed 5m easement for drainage excavation / installation with TMC in this location.

As this land is under Salboy ownership – Renaissance have requested written confirmation / acceptance of proposed drainage run ahead of MCC review of drainage strategy.

Please can you review and provide written acceptance

Regards

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