Drainage Technical Note

Redbank NT02 Development

for

Far East Consortium International Ltd



18 / 11 / 2024

CIVIL | STRUCTURAL | GEOTECHNICAL | GEO-ENVIRONMENTAL ENGINEERING SERVICES

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Issue No. 01	**DRAFT**		
Report Reference	RDB-ROC-2B-XX-RP-C-83-0500		
REVISION	**DESCRIPTION**	**SIGNATURE**	**DATE**
Issue No REV02			
Issue No REV03			
Issue No REV04.			

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1.0 INTRODUCTION

1.1 Purpose of the Report

This drainage technical note has been prepared to present the principles of the proposed drainage design for the Redbank NT02 Development at Dantzic Street, Greater Manchester. It describes the strategy for the disposal of surface water run-off and foul flows associated with the new residential led mixed-use scheme.

Plot NT02 forms the first phase of the wider development which also comprises plots NT03 and NT04 and will provide circa 1,551 new homes alongside a clubhouse, commercial uses, S278 highway improvements, public realm and landscaping. The scheme was granted planning permission in August 2023 (Ref: 136814/FO/2023).

The document should be read in conjunction with the following reports and drawings.

79268-VICN-WSP-FRA-001	Flood Risk Assessment & Drainage Strategy Report
RDB-WSP-00-XX-DR-CV-00101	Application 5 Detailed Drainage Strategy
RDB-ROC-2B-XX-DR-C-83-0500	FW & SW Drainage General Arrangement Block 2B
RDB-ROC-2B-XX-DR-C-83-0501	FW & SW Drainage Construction Details Sheet 1
RDB-ROC-2B-XX-DR-C-83-0502	FW & SW Drainage Construction Details Sheet 2
RDB-ROC-2B-XX-DR-C-83-0503	FW & SW Drainage Construction Details Sheet 3
RDB-ROC-2B-XX-DR-C-83-0504	FW & SW Drainage Construction Details Sheet 4
RDB-ROC-2B-XX-DR-C-83-0505	FW & SW Drainage Construction Details Sheet 5
RDB-ROC-00-XX-SK-C-83-0500	SW Drainage Catchment Plan

1.2 Proposed Development

This Drainage Technical Note has been produced by RoC on behalf of the Far East Consortium International Ltd in respect of a proposed residential led mixed-use development off Dantzic Street, Greater Manchester.

The scheme comprises new build residential apartments and townhouses, in a number of mid-rise and high-rise buildings ranging in height from 8 to 34 storeys, plus associated amenity and commercial space, external communal terrace, plant space and undercroft parking at ground floor.

The first phase of development, to which this report primarily relates, is defined as Plot NT02 and is located to the west of the overall site, adjacent to the ongoing Victoria Riverside scheme.

The overall site area, excluding S278 works, extends to around 2.1ha with the NT02 plot comprising approximately 0.32ha.

The site can be accessed from both Dantzic Street to the north and Dalton Street to the east.

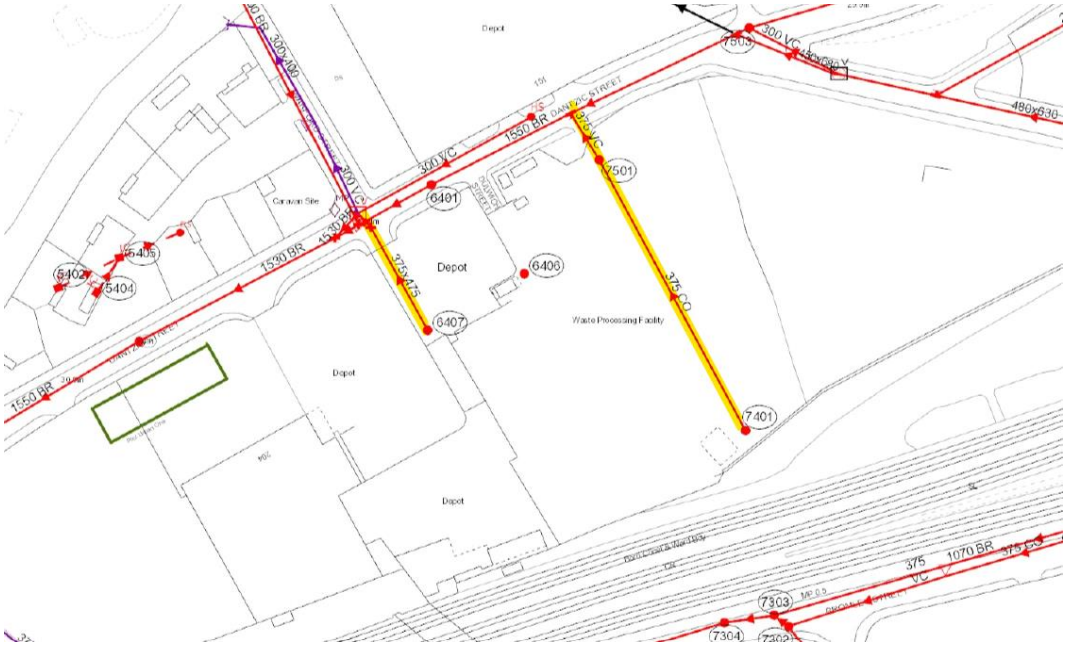
The table below provides key site information.

Site Name	Plot NT02-04 Redbank
Location	Dantzic Street, Greater Manchester, M4 4DD
Grid Ref	389565E, 264612N
Site Area	2.1ha
Lead Local Flood Authority	Manchester City Council
Local Planning Authority	Manchester City Council
Environment Agency Area	Greater Manchester, Merseyside, Cheshire
Sewerage Undertaker	United Utilities

2.0 DRAINAGE STRATEGY

2.1 Existing Drainage

United Utilities records indicate a number of sewers within and in the vicinity if the site.



Two separate 375mm combined sewers, both flowing from south to north, are located within the development boundary. These have been subject to a S116 abandonment application with United Utilities under an Enabling Works phase and will be removed prior to commencement of the main development phase.

A 1550 brick sewer runs along Dantzic Street which forms the northern boundary. A CSO shown at the junction with Warford Street which flows northward via a 300mm connection and discharges to the River Irk.

2.2 Private Drainage

Limited information pertaining to the existing drainage within the site boundary is available. However, any existing private drainage present is to be grubbed out under the Enabling Works phase to facilitate the proposed development.

2.3 Watercourses & Other Features

The River Irk runs broadly parallel to Dantzic Street to the north of the site and is classed as a main river by the EA. There are no known ordinary watercourses within the immediate vicinity of the site. The Rochdale Canal is located over 950m to the south of the site.

2.4 Geology & Hydrogeology

The following information has been extracted from the ARUP Ground Investigation Interpretative Report (Ref: VNIF-ARP-ZZ-YYY-RP-CG-0009, January 2022).

With specific reference to the geology, the report states: *'The solid geology varies from east to west across the site, with the Chester Pebble Beds Formation in the west, Manchester Marls Formation in the centre of the site and the Collyhurst Sandstone Formation in the north-east.'*

RoC undertook a Phase 2 Site Investigation for the development site, the findings of which are presented in report 4328-ROC-ZZ-XX-RP-ES-P2-101. A summary of the findings is provided below:

- Plot NT02: Made ground of thickness 0.2m to 1.7m characterised as 'demolition fill' overlying Devensian (Glacial) Till upon solid geology of Chester Formation layered upon the Manchester Marls Formation.
- Plot NT03: Made ground of thickness 0.6m to 2.0m described as a 'demolition fill' overlying Devensian Till up to 7.65mbgl which in turn is upon the Chester Formation and Manchester Marls Formation.
- Plot NT04: Made ground across the site of thickness 1.0m to 3.0m overlying Devensian Till that exists up to 10mbgl and sits upon the Manchester Marls Formation

The ARUP report indicates the following aquifer designations:

- The superficial deposits are classed as a Secondary A Aquifer
- The Manchester Marls Formation is classed as a Secondary B Aquifer
- Chester Pebble Beds Formation and Collyhurst Sandstone Formation are classed as Principal Aquifers

There are three registered groundwater abstractions within 500m of the site.

- Packaging Products Ltd, Collyhurst; 270m north-east; For General Cooling
- Derby Brewery, Cheetham; 400m north-west; For General Cooling
- Derby Brewery, Cheetham; 400m north-west; For Process Water

Groundwater was encountered at various depths across the proposed site at a depth of around 4.65mbgl at RBH201 which is located at the intersection of Dantzic Street and Dulwich Street.

Groundwater was also observed at 12.52mbgl at RBH210, located at Dulwich Street's interface with Dalton Street.

2.5 Surface Water Drainage

2.5.1. Surface Water Discharge Rate

Discharge rates for the development site are based on consultation between ARUP and the LLFA as part of the Victoria North Housing Infrastructure Fund (HIF) Outline Consent (133143/VO/2022).

This HIF drainage strategy proposed a new surface water drainage system which ultimately discharges into the River Irk via a new outfall at a rate not exceeding 22l/s/ha. A copy of these indicative proposals, with specific reference to the Redbank development site, can be found in Appendix D.

This discharge rate was subsequently used by WSP when preparing the drainage strategy which accompanied application 136814/FO/2023. A copy of the WSP strategy for the NT02-04 site is provided in Appendix E.

It should be noted that the discharge figures quoted on the above drawings are indicative only and based on assumed impermeable drained areas. The notable figure for setting discharge rates for the development is the agreed 22 l/s/ha restriction for storms events up to an including the 100 year return period with an allowance for climate change in line with the NPPF.

Based on the above, the following discharge rates are proposed across the NT02-04 development.

Plot	Gross Area (ha)	Drained Area (ha)	Discharge (l/s)
NT02	0.32	0.32	7.04
NT03	0.81	0.73	16.06
NT04	1.04	0.94	20.68

It is intended that both NT02 and NT03 will utilise the same outfall and flow control device, therefore the total flow restriction serving this part of the development would be **23.1 l/s**.

The NT04 would have a separate outfall and flow control.

2.6 Methods of Surface Water Management

There are three methods that have been reviewed for the management and discharge of surface water which are detailed below; these may be applied individually or collectively to form a complete strategy. They should be applied in the order of priority as listed.

- Discharge via infiltration;
- Discharge to watercourse;
- Discharge to public sewerage system.

Discharge via Infiltration
Based on the previous site investigations, including the Phase 1 and Phase 2 Geo-Environmental work undertaken by RoC, the encountered ground conditions (as described in Section 2.4 above) at the site are considered to preclude the use of infiltration-based drainage solutions.

In particular, Plot NT02 has strong evidence of contamination that was observed across numerous exploratory boreholes and the site generally is underlain by significant depths of clay down to 7.5mbgl.

Taking the above into consideration, the disposal of surface water from the development by soakaway or other infiltration best SuDS proposal has been discounted.

Discharge to Watercourse or other Water Feature
The nearest available water feature to the site is the River Irk. Both the drainage strategy developed by ARUP under consent 133143/VO/2022 and that developed by WSP under 136814/FO/2023, propose a new adoptable surface water carrier drain along Dalton Street and Dantzic Street which discharges to the River Irk. It is understood that the proposal for this new adoptable carrier drain has been discussed and agreed in principle with United Utilities, the Environment Agency and the LLFA.

A S104 application is to be submitted to United Utilities for approval as part of the Stage 4 design process along with the Flood Risk Consent application to the EA for the River Outfall.

Discharge to Public Sewer
As noted in Section 2., all public sewers within and in the vicinity of the site are combined. On the basis that a direct connection to the River Irk is feasible, and no existing surface water sewer is available for discharge, this option has not been considered further.

2.7 SuDs Measures

Current policy and best practice encourage the use of Sustainable Drainage Systems (SuDS) and in particular, infiltration systems.

The Environment Agency recommends that surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management.

This approach involves using a range of techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands to reduce flood risk by attenuating the rate and quantity of surface water run-off from a site.

This can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements.

An assessment of potential SuDS measures has been undertaken based on the site investigation data and the constraints of the proposed development site; this is presented below.

SUDS MATRIX		
SUDS Technique	**Description**	**Commentary**
Wetlands	As ponds, but the runoff flows slowly but continuously through aquatic vegetation that attenuates and filters the flow. Shallower than ponds.	Considered not viable due to urban nature of site
Ponds	Depressions used for storing and treating water. They have a permanent pool and bankside emergent and aquatic vegetation.	Considered not viable due to urban nature of site
Bioretention Areas	Vegetated areas for collecting and treating water before discharge downstream, or to the ground via infiltration.	Considered not viable due to landscaping surrounding the site containing existing trees with root protection zones.
Green Roofs	Vegetation roofs that reduce run off volume and rate.	Considered not viable due to siphonic roof drainage
Permeable Pavements	Allow inflow of rainwater into underlying construction / soil.	Ground conditions preclude infiltration. However, permeable pavements to be utilised across the site to drain podium areas, pedestrian areas and Dulwich Street with conveyance to the below ground attenuation systems.
Swales Shallow	Vegetated channels that conduct and / or retain water (and can permit infiltration when un-lined). The vegetation filters particulates.	Considered not viable due to urban nature of site and constraints imposed by existing landscaping
Infiltration Basins	Depressions that store and dispose of water via infiltration.	Considered not viable due to urban nature of site and anticipated ground conditions
Filter Strips	Vegetated steps of gently sloping ground designed to drain water evenly from impermeable areas and filter out silt and other particulates.	Considered not viable due to urban nature of site and constraints imposed by existing landscaping
Detention Basin	Dry depressions designed to store water for a specified retention time.	Considered not viable due to urban nature of site and constraints imposed by existing landscaping
Infiltration Trenches	As filters drain, but allowing infiltration through trench base and sides.	Considered not viable due to anticipated ground conditions and constraints imposed by existing landscaping
Filter Drain	Linear drains / trenches filled with a permeable material, often with a perforated pipe in the base of the trench.	Considered not viable due to anticipated ground conditions and constraints imposed by existing landscaping
Sand Filters	Treatment devices using sand beds as filter media.	Considered not viable due to urban nature of site
Soakaways	Sub-surface structures that store and dispose of water via infiltration.	Considered not viable due to anticipated ground conditions
Pipes, Subsurface Storage	Conduits and their accessories as conveyance measures and / or storage. Water quality can be targeted using sedimentation and filter media.	Incorporated as part of drainage design for conveyance and volumetric storage of attenuation volumes
Silt Removal Devices	Manhole and / or proprietary devices to remove silt.	Incorporated to help meet Water Quality requirements prior to discharge
Based on 'The SUDS Manual' CIRIA Guidance		

2.8 Surface Water Treatment

The table below indicates the pollution hazard indices for each of the three distinct areas within the site which is based on Table 26.2 from the SuDS Manual.

Pollution Hazard Indices				
Land Use	**Pollution Hazard Level**	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Residential Roofs	Low	0.2	0.2	0.05
Access Roads	Low	0.5	0.4	0.4
Footways	Low	0.5	0.4	0.4

The use of permeable pavements alongside catchpits and a hydrodynamic separator are considered sufficient to mitigate the above prior to discharge to the River Irk.

2.9 Performance Criteria

The surface water drainage network has been designed to satisfy the following performance criteria.

- No surcharging for the critical 2-year return period storm event;
- No flooding of the network for the critical 30-year return period storm event;
- No significant surface flooding for the critical 100-year plus climate change return period due to potential difficulties in retaining any flood water within the site.

2.10 Hydraulic design

Microdrainage software by Innovyze has been used to design the proposed piped network and attenuation storage.

The system has been designed to ensure the performance criteria identified above are satisfied and that all surface water is retained below ground for storm events up to and including the 100-year return period plus climate change.

Whilst it is considered acceptable in planning terms to permit some surface flooding for events beyond the 30-year return period, it was considered impracticable to allow significant areas of flooding due to the proposed finished levels and difficulty in retaining it on site.

A copy of the calculations are provided in Appendix F.

This demonstrates that the surface water drainage system is able to operate satisfactorily for all return periods up to the 100 year + climate change return period without any surface flooding.

2.11 Surcharged Outfall

In addition to the above, the drainage system has been designed to ensure it operates satisfactorily when the outfall is surcharged

United Utilities requirements for new outfalls into watercourses is that they should be set at a level of 300mm above the 30 year river level however, this is not feasible due to the level of the river in relation to the site.

The 30-year river level, taken from the FEC Baseline plus NT02 to NT04 model and is 30.40mAOD and 100-year +35% level around 30.88m (see extract below). The currently proposed outfall level

is 27.35mAOD which is a similar level as the outfall which has been installed to serve the adjacent Victoria Riverside development.

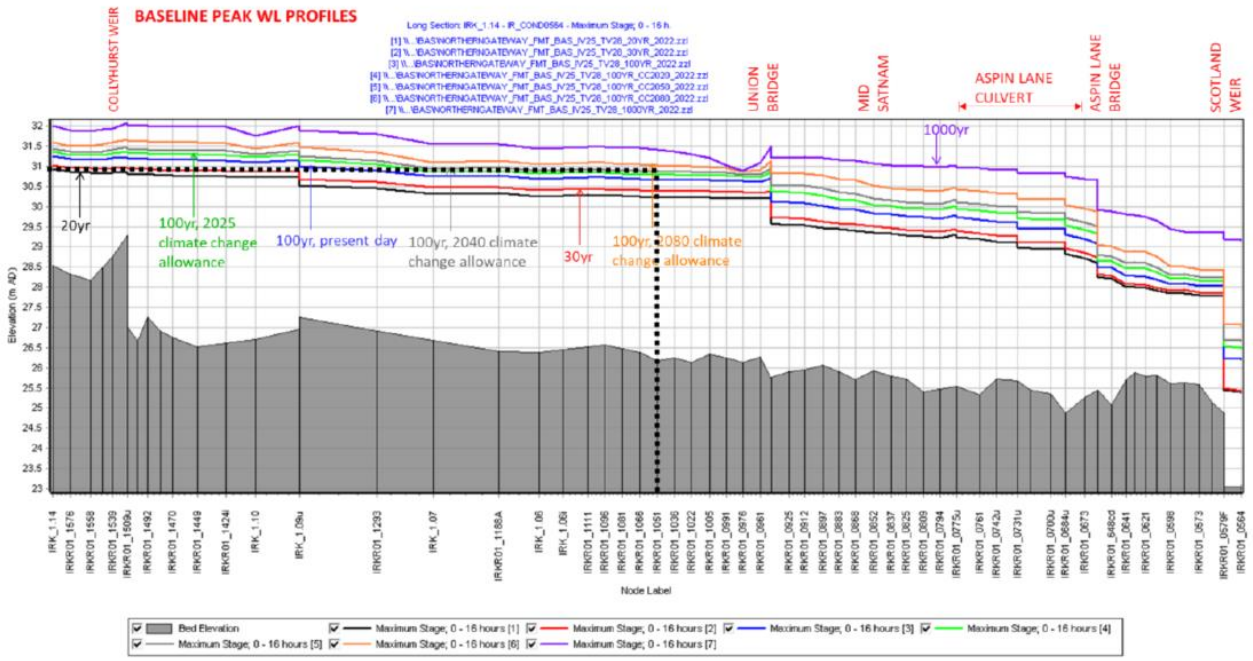


Figure 38: Long section from the 2022 Baseline model, illustrating maximum water level for a range of return periods, run using the 2022 hydrology

Based on the above, the proposed outfall is below the 30-year river level and therefore the drainage system has been checked to ensure that this impact is recognised within the design through additional attenuation where necessary.

A check has also been made against the 100year +35% level to ensure that no flooding to buildings or property occur.

Calculations for these scenarios are provided in Appendix G & H.

Flooding is shown at the outfall with the River Irk, due to the surcharge level being higher than the proposed cover levels however, the drainage system on-site is shown to still operate satisfactorily without any flooding occurring.

3.0 FOUL WATER DRAINAGE

It is proposed to install a new foul drainage system to serve the proposed development.

The foul water system has been designed in accordance with the current Building Regulations, BS EN:752 ‘Drainage and Sewer Systems Outside Buildings’, the Local Authority Building Control specifications and requirements, Sewerage Sector Guidance (Appendix C) and the Civil Engineering Specification for the Water Industry

3.1 Foul Water Capacity

WSP consulted with United Utilities regarding foul water capacity as part of the drainage strategy developed under consent 136814/FO/2023.It is understood that they did not raise any concerns with the discharge of foul water from the development to the existing combined sewer network.

3.2 Point of Connection

The existing combined sewer within Dantzic street is of brick construction and sited at a depth of around 5.85m. To avoid installing a new connection to this sewer, the drainage system will utilise the existing 375x475 combined sewer which is located within the site and is being partially abandoned under the enabling works contract.

This connection will be subject to a S106 application with United Utilities at the appropriate time.

4.0 MANGEMENT PLAN

The proposed drainage system for the development adopts a series or SuDS measures alongside traditional drainage techniques. It is important that these are maintained to ensure that all elements operate effectively for their lifetime.

Like any drainage system maintenance is a necessary and important consideration of Sustainable Drainage System (SUDS) design. If systems are properly monitored and maintained, any deterioration in performance can often be managed out.

Effective maintenance will help to ensure that the SUDS features continue to function as they were intended and keep hydraulic capacity and pollutant removal efficiency of the systems at design levels.

Pipework, Manholes, Inspection Chambers & General Maintenance

The following maintenance schedules are recommended.

- Local repair or local replacement of damaged pipes or other structures in order to maintain the functionality of the drainage system.
- Cleaning and removal of sediments, obstructions etc. to restore / maintain hydraulic capacity.
- Jetting / vacuum of sewers to be undertaken as often as necessary to remove silts and/or ordinary debris.
- In the event that any extraordinary issues are encountered during an inspection, further investigation in the form of a CCTV survey may be required.
- Maintenance to be undertaken on a six-monthly schedule.
- All manhole covers should be lifted and the manholes visually inspected for silt, debris and signs of blockages within the drainage system. Check manhole covers and frames for damage and ensure correctly bolted together. This should be undertaken on a six-monthly basis.
- Should any debris or blockages be detected, the manholes should be cleaned along with associated pipe runs using high pressure jetting equipment. On completion a CCTV survey should be undertaken to verify / identify that no further remedial works are required.
- To avoid damaging the pipe, PSI pressures should be verified before jetting of any plastic twin wall drainage. Cleaning of drainage systems may require the temporary sealing of the system and careful collection of the effluent for disposal off site.

Control Manhole Maintenance

The proposed drainage system incorporates the use of a flow control to restrict pass forward flows from the main site drainage system. This takes the form of a Hydrobrake Vortex device the location of which are identified on the drainage general arrangement drawing in Appendix J.

The controls do not have any moving parts and therefore require very little in the way of maintenance other than an inspection for debris / blockage. In particular, the orifice control devices used across the permeable pavement systems are potentially prone to blockage due to the orifice size being less than 75mm in places.

Attenuation Tank Maintenance

Regular inspection and maintenance are required to ensure the effective long-term operation of below-ground attenuation systems. The attenuation tank will be maintained in accordance with advice provided by the manufacturer, while the responsibility for this maintenance will be placed with the sites facilities management team and/or appointed maintenance company.

The maintenance tasks of the attenuation tank generally include the inspection of the inlets, outlets, air vents and overflows to identify silt build-up and/or structural damage to determine if remedial actions are required. If allowed to develop, these issues can severely reduce the effectiveness of the tank.

Permeable Paving Maintenance

Permeable pavements provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. In this instance, the water is temporarily stored before passed forward to the site wide drainage system.

Regular inspection and maintenance are important for the effective operation of permeable pavements. They should be inspected for clogging, litter, weeds and water ponding and all failures should be rectified. Inspections should be undertaken regularly, preferably after heavy rainfall to check effective operation and to identify any areas of ponding.

Permeable surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability.

The areas of permeable paving are either provided with a number of permavoid geocellular units or a perforated underdrain pipe. These help with the onward transmission of surface water flows to the wider drainage system. Both the upstream and downstream access chambers should be inspected for siltation and cleaned as necessary.

APPENDIX A – Location Plan



JOB NO	4328	SKETCH NO	SK-100	DRAWN BY
PROJECT TITLE	NT02-04 Redbank Development	SKETCH TITLE	Location Plan	ARJ. 18/12/24

COMPLEX CHALLENGES ... MADE SIMPLE

APPENDIX B - Masterplan



LEGEND

P01 - STONE FLAGS
PRODUCT: Whitworth
SUPPLIER: Hardscape or equal & approved
MATERIALS: Sandstone
SIZE: 600mm (W), 400mm (L) x 63mm (D)
FINISH: Diamond sawn all sides
COLOUR: Greyish Buff
BOND: Stretcher
DETAIL: Refer to detail 47-0001

P02 - STONE PAVERS (vehicular)
PRODUCT: Whitworth
SUPPLIER: Hardscape or equal & approved
MATERIALS: Yorkstone
SIZE: 150mm (W), 300mm (L) x 80mm (D)
FINISH: Diamond sawn all sides
COLOUR: Greyish Buff
BOND: Stretcher
DETAIL: Refer to detail 47-0001

P03 - STONE SETTS (vehicular)
PRODUCT: Whitworth
SUPPLIER: Hardscape or equal & approved
MATERIALS: Sandstone
SIZE: 95mm (W), 95mm (L) 95mm (D)
FINISH: Diamond sawn all sides
COLOUR: Greyish Buff
DETAIL: Refer to detail 47-0001

P04: BLISTER HAZARD WARNING PAVING
SUPPLIER: Hardscape or equal & approved
MATERIAL: Granite
SIZE: W400mm x L400mm x D80mm
FINISH: Flamed
COLOUR: Mist
DETAIL: Refer to detail 47-0001

P05 - BITUMINOUS MACADAM (vehicular)
SPECIFICATION: To engineer's detail and specification
NOTES: Road to include thermoplastic markings to highway's specification and design
COLOUR: Black
DETAIL: Refer to detail 47-0002

P06 - BITUMINOUS MACADAM (pedestrian)
SPECIFICATION: To engineer's detail and specification
NOTES: Road to include thermoplastic markings to highway's specification and design
COLOUR: Black
DETAIL: Refer to detail 47-0002

P07 - BITUMINOUS MACADAM: CYCLEWAY
SPECIFICATION: To engineer's detail and specification
NOTES: To include thermoplastic markings to highway's specification and design. Colour green to designate carriageway level cycle route as per Manchester City Council requirements.
COLOUR: Green
DETAIL: Refer to detail 47-0002

P08 - CRUSHED STONE
PRODUCT: Granite dust and stone
SUPPLIER: Hardscape or equal & approved
MATERIALS: Decomposed crushed granite
SIZE: Dust to 10mm
COLOUR: Buff
SUB BASE: To Engineers specification and detail
DETAIL: Refer to detail 47-0002

P09 - POROUS RESIN BOUND GRAVEL
PRODUCT: Flexistone
SUPPLIER: KBI or equal & approved
MATERIALS: Dry stone aggregate
COLOUR: Light grey
SUB BASE: To Engineers specification and detail
NOTES: Material to match Planit-ie design for Victoria Riverside
DETAIL: Refer to detail 47-0002

P11 - CONCRETE SETTS (vehicular)
PRODUCT: Kellen Breccia
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precast concrete
SIZE: 150mm (W), 130mm (L) 95mm (D)
FINISH: 80/20% mix of Grigio Nero / Anthracite 618 Breccia To Dulwich Street Carriage way
DETAIL: Refer to detail 47-0003

P12 - PAVING : CONCRETE PAVERS
PRODUCT: Kellen Breccia & Kellen Liscio mix
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precast Concrete
SIZE: 600 x 400 x 80mm
FINISH: 20/80% mix of Giallo Liscio (ground finish) / Giallo Breccia (etched finish).
To Dulwich Street Pavement
DETAIL: Refer to detail 47-0003

P16 - TEAR - CONCRETE PAVERS & STONE MIX
PRODUCT: Kellen Breccia, Kellen Liscio & Granite mix
SUPPLIER: Hardscape or equal & approved
MATERIALS: P12 & Magma flamed, Shiraz flamed, Darton flamed
SIZE: Random Mix
DETAIL: Refer to detail 47-0004 & Refer to RDB-OPN-ZZ-L00-DR-L-47-0501

P17 - PAVING : CONCRETE PAVERS
PRODUCT: Kellen Breccia & Kellen Liscio mix
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precast Concrete
SIZE: 200 x 200 x 80mm
FINISH: 20 / 80% mix of Gialpi Liscio (ground finish) / Antracite 618 Breccia (etched finish).
DETAIL: Refer to detail 47-0004

P19- CONCRETE SETTS (Building Threshold)
PRODUCT: Kellen Breccia
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precaste Concrete
SIZE: 95mm (W), 95mm (L) 95mm (D)
FINISH: Magma Flamed
To building thresholds.
DETAIL: Refer to detail 47-0004 TO BE UPDATED AT STAGE 4

P20 - ENTRANCE AREA PAVING
PRODUCT: Kellen Breccia & Kellen Liscio mix
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precast concrete
SIZE: 300mm (W), 150mm (L) 80mm (D)
20 /80% mix of Giallo Liscio (ground finish) / Giallo Breccia (etched finish).
To building entrance areas
DETAIL: Refer to detail 47-0005

P21 - CORDUROY HAZARD WARNING PAVING
SUPPLIER: Hardscape or equal & approved
MATERIAL: Granite
SIZE: W400mm x L400mm x D80mm
FINISH: Flamed
COLOUR: Mist
SUB BASE: To Engineers specification and detail
To top and bottom of steps
DETAIL: Refer to detail 47-0005

S02 - STEPS (150mm risers)
SUPPLIER: Hardscape or equal & approved
MATERIAL: Granite
DETAIL: Refer to detail 47-0016

NOTES

1. This drawing is to be read in conjunction with all other drawings and specifications.
2. Do not scale off this drawing. Written dimensions to be taken only.
3. Any discrepancies found between this drawing and other drawings and specifications in the construction documents must be referred to the Landscape Architect prior to work commencing.
4. This drawing must not be copied in whole or in part without prior written consent of Optimised Environments Ltd.

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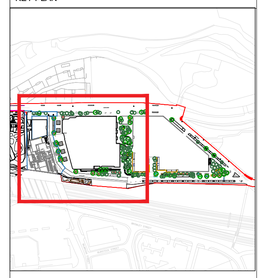
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Topographical Survey: Please reference surveyor's survey.

CDM INFORMATION

CDM REGULATIONS 2015. All current drawings and specifications for the project must be read in conjunction with the Designer's Hazard and Environment Assessment Record

KEY PLAN



Issue	Revision	Initial	Date
P01	Stage 4 Initial Issue.	MY	20.12.2024

optimised environments
PART OF SLR

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Optimised Environments Ltd. Registered in Scotland SC358572
Registered address: 2nd Floor | Quartermile Two | 2 Lister Square | Edinburgh | EH3 9GL

Client
Far East Consortium

Project
NT02 - 03

Dantzic Street, Manchester

Drawing Title
General Arrangement NT02

Public Realm Hard Landscape Drawing

Scale Bar: 2.5m 5.0m 7.5m 10m 12.5m
North

Scale: **1:250@A1** Date: **23.05.23**

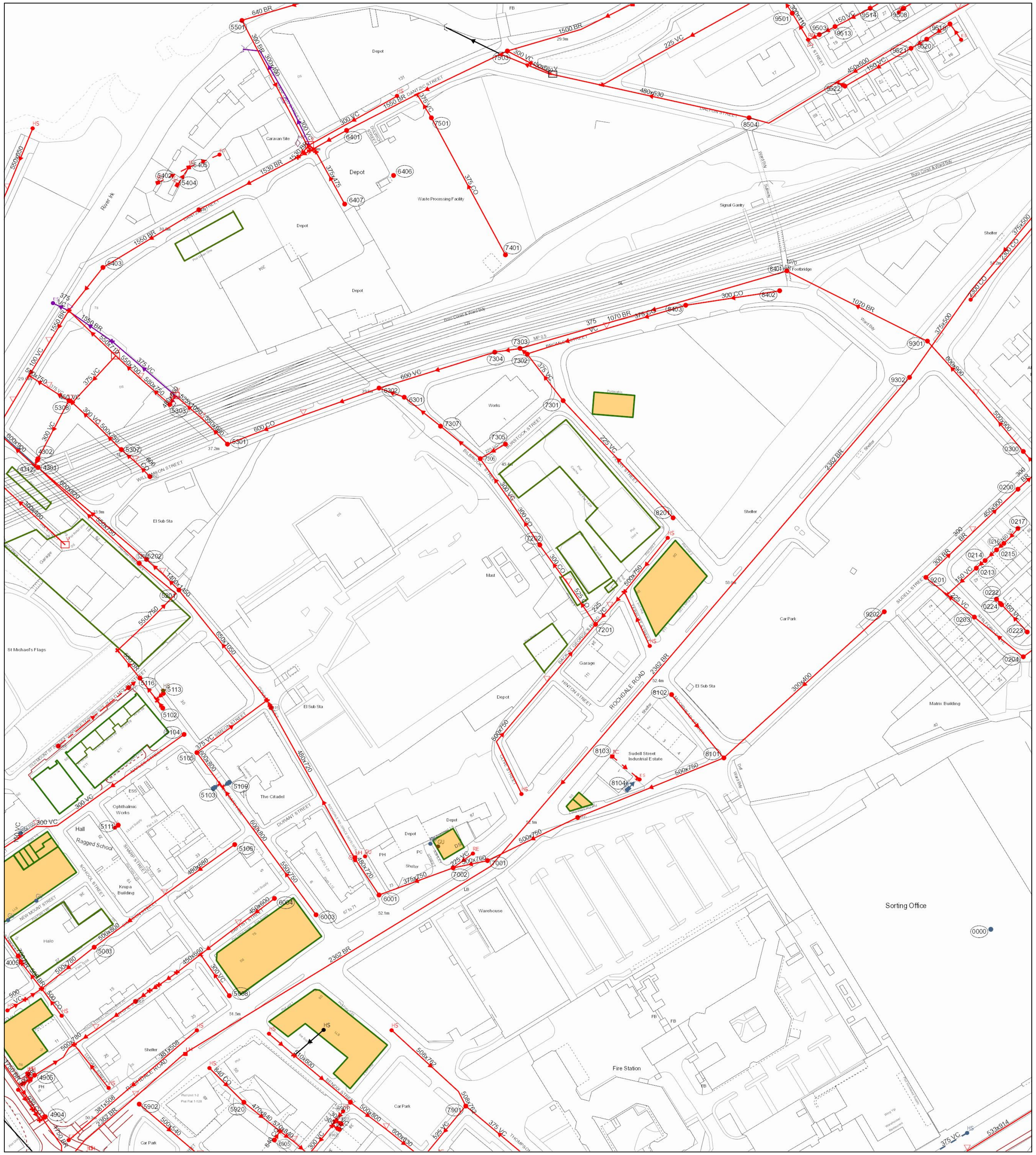
By: **MY** Status: **S1**

Checked: **AW** Approved: **AW**

Drawing Number: **RDB-OPN-2B-L00-DR-L-03-0001** Rev: **P01**

Computer File: R:\Projects\2021\M10394_NT02DantzicSt\CAD\AUTOCAD\SHEETS\Stage 4

APPENDIX C – Sewer Records



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

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
7303	46.04	CO	42.86	1070			BR	14.14214	1 in 236
0213		CO		150			VC	21.88563	
5306	34.57	CO	30.4	600			CO	11.31371	1 in 12
5920		CO	0	470			BR	25.6125	
6902	51.34	CO	48.72	300			VC	4.472136	
0203	53.35	CO	50.97	225			VC	34.82815	1 in 10
7001	52.02	CO	44.38	500			BR	19.41649	
5401	30.55	CO	24.7	1550			BR	61.91123	
5401	30.55	CO	24.7	1550			BR	61.91123	
7101	52.5	CO	46	500			BR	55.4617	1 in 35
7201	50.66	CO	45.9	525			CO	26.62705	1 in 21
5201	39.28	CO	28.45	1400			CSB	12.72792	1 in 40
9503	44.61	CO	43.24	150			VC	6.708204	
9503	44.61	CO	43.24	150			VC	6.708204	
7302	46	CO	43.23	375			VC	5	
8101	53	CO	48.5	500			BR	87.46428	
6302	39.89	CO	37.25	600			VC	44.59821	1 in 22
5403		CO	0	1550			BR	30.61046	
5403		CO	0	1550			BR	30.61046	
4005	47.34	CO	0	450			BR	33.01515	
4005	47.34	CO	0	450			BR	33.01515	
7305	46.61	CO	43.77	225			VC	16.12452	1 in 10
7002	51.92	CO	0	375			BR	43.65776	
5501		CO		300			BR	81.51928	
5501		CO		300			BR	81.51928	
0215		CO		150			VC	8.758789	
6905	51.09	CO	0	840			CO	5.830952	
8403	49.01	CO	46.64	375			CO	45.88028	1 in 27
9508		CO		150			VC	3.465536	
9508		CO		150			VC	3.465536	
5307	32.1	CO	28.44	500			BR	18.38478	
5307	32.1	CO	28.44	500			BR	18.38478	
5007	49.99	CO	46.28	450			BR	27.20294	
5308	30.08	CO	27.5	375			VC	13.0384	
5308	30.08	CO	27.5	375			VC	13.0384	
0300	53.4	CO	45.92	500			BR	40.45986	
6301	41.01	CO	38.13	300			VC	14.86607	1 in 26
0216		CO		150			VC	5.270839	
7401		CO	0	375			CO	86.35392	
6903	51.34	CO	0	300			VC	3.605551	
9301	53.6	CO	44.64	1070			BR	87.20665	
8102	52.4	CO	49.28	500			CO	45.45327	1 in 253
6101	45.7	CO	38.65	480			BR	4.472136	
8201		CO	0	225			VC	89.14034	
8401		CO	0	1070			BR	154.1201	
7301	48.08	CO	43.43	375			VC	32.80244	1 in 182
9509		CO		150			VC	18.71178	
9514		CO		150			VC	22.10397	
9514		CO		150			VC	22.10397	
5303	33.27	CO	28.83	580			BR	21.26029	1 in 44
4904	49.62	CO	0	939			CO	3.605551	
4904	49.62	CO	0	939			CO	3.605551	
5301	36.74	CO	32.93	550			BR	19.79899	1 in 13
6401	31.29	CO	24.77	1530			BR	23.22471	
6401	31.29	CO	24.77	1530			BR	23.22471	
7306	45.48	CO	42.07	300			VC	28.42534	1 in 47
6004	50.54	CO	48.03	450			BR	25	
4905	49.07	CO	0	500			BR	28.30447	
4905	49.07	CO	0	500			BR	28.30447	
0214		CO		150			VC	6.519656	
5902	50.46	CO	46.96	500			BR	44.68781	1 in 73
7307	43.35	CO	41.46	300			VC	25.6125	1 in 12
9201	53.13	CO	47.48	300			BR	36.06938	1 in 82
7202	48.7	CO	43.3	300			CO	28.84441	1 in 48
9302		CO	0	2362			BR	592.1557	
5001	48.51	CO	45.07	500			BR	37.01351	
5001	48.51	CO	45.07	500			BR	37.01351	
9513		CO		150			VC	9.752625	
9513		CO		150			VC	9.752625	
6901	51.35	CO	46.31	500			BR	25	
7304	45.38	CO	42.78	600			VC	67.05222	1 in 12
9202	53	CO	49.62	300			CO	120.3412	1 in 167
0217		CO		150			VC	11.55683	
5308	30.08	CO	27.3	300			VC	36.23534	
5308	30.08	CO	27.3	300			VC	36.23534	
8402	50.89	CO	47.93	300			CO	52.61179	
0200	53.43	CO	46.59	300			BR	17.14061	
5106	49	CO	46.25	480			BR	48.01041	1 in 83
5111		CO		150			VC	2.231356	
5111		CO		150			VC	2.231356	
6001	51.68	CO	42.44	480			BR	120.1335	1 in 32
7901	51.21	CO	44.19	525			VC	36.31802	
6003	51.36	CO	48.22	550			BR	55.80323	1 in 21
5104	44.8	CO	42.51	300			VC	98.22868	
9519		CO		150			VC	15.5569	
9519		CO		150			VC	15.5569	
0501	48.85	CO	0	450			VC	27.29469	
9501	42.64	CO	38.9	300			CO	10.81665	1 in 7
9501	42.64	CO	38.9	300			CO	10.81665	1 in 7
9522		CO		150			VC	4.785507	
9522		CO		150			VC	4.785507	
4301	31.14	CO	26.64	600			CO	30.55567	
4301	31.14	CO	26.64	600			CO	30.55567	
5203	36.71	CO	31.7	550			BR	77.10383	1 in 15
9521		CO		150			VC	42.23491	
9521		CO		150			VC	42.23491	
8504	41.79	CO	37.42	480			BR	111.4201	1 in 13
8504	41.79	CO	37.42	480			BR	111.4201	1 in 13
9520		CO		150			VC	9.927451	
9520		CO		150			VC	9.927451	
0204	53.35	CO	51.43	225			VC	34.82815	1 in 76
5116	42.35	CO	40.25	550			BR	19.69717	
4302	30.81	CO	28.25	300			VC	4.472136	
4302	30.81	CO	28.25	300			VC	4.472136	
4312	31.02	SW	26.48	600			BR	31.14482	
4312	31.02	SW	26.48	600			BR	31.14482	
5202	36.82	CO	27.75	600			CO	78.74643	1 in 72
5101	42.45	CO	40.75	225			VC	8.314363	1 in 139
5101	42.45	CO	40.75	225			VC	8.314363	1 in 139
7501	31.57	CO	29.36	375			VC	15.26434	
7501	31.57	CO	29.36	375			VC	15.26434	
0224		CO		150			VC	4.226566	
7503	30.16	CO	25	1550			BR	99.29091	1 in 473
7503	30.16	CO	25	1550			BR	99.29091	1 in 473
5008	51.32	CO	48.13	300			VC	28.01785	
5102	43.81	CO	40.27	550			BR	5.096149	
5105	45.55	CO	39.3	375			VC	48.60041	
6407	32	CO	28.2	375			CO	33.12099	
6407	32	CO	28.2	375			CO	33.12099	
0223		CO		150			VC	20.76079	
4109	42.86	CO	41.14	225			VC	50.51596	1 in 130
4109	42.86	CO	41.14	225			VC	50.51596	1 in 130
8503	40.57	CO	38.15	225			VC	114.0305	

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

LEGEND

	Abandoned	Foul	Surface Water	Combined
Public Sewer				
Private Sewer				
Section 104				
Rising Main				
Sludge Main				
Overflow				
Water Course				
Highway Drain				

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

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

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

Address or Site Reference:

97079 - A1,

OS sheet Number: SJ8499SE
Scale: 1:1250   **Date:** 01/07/2021
Nodes: 123
Sheet: 1 of 4

Printed by: Property Searches

SEWER RECORDS

United Utilities
Water for the North West

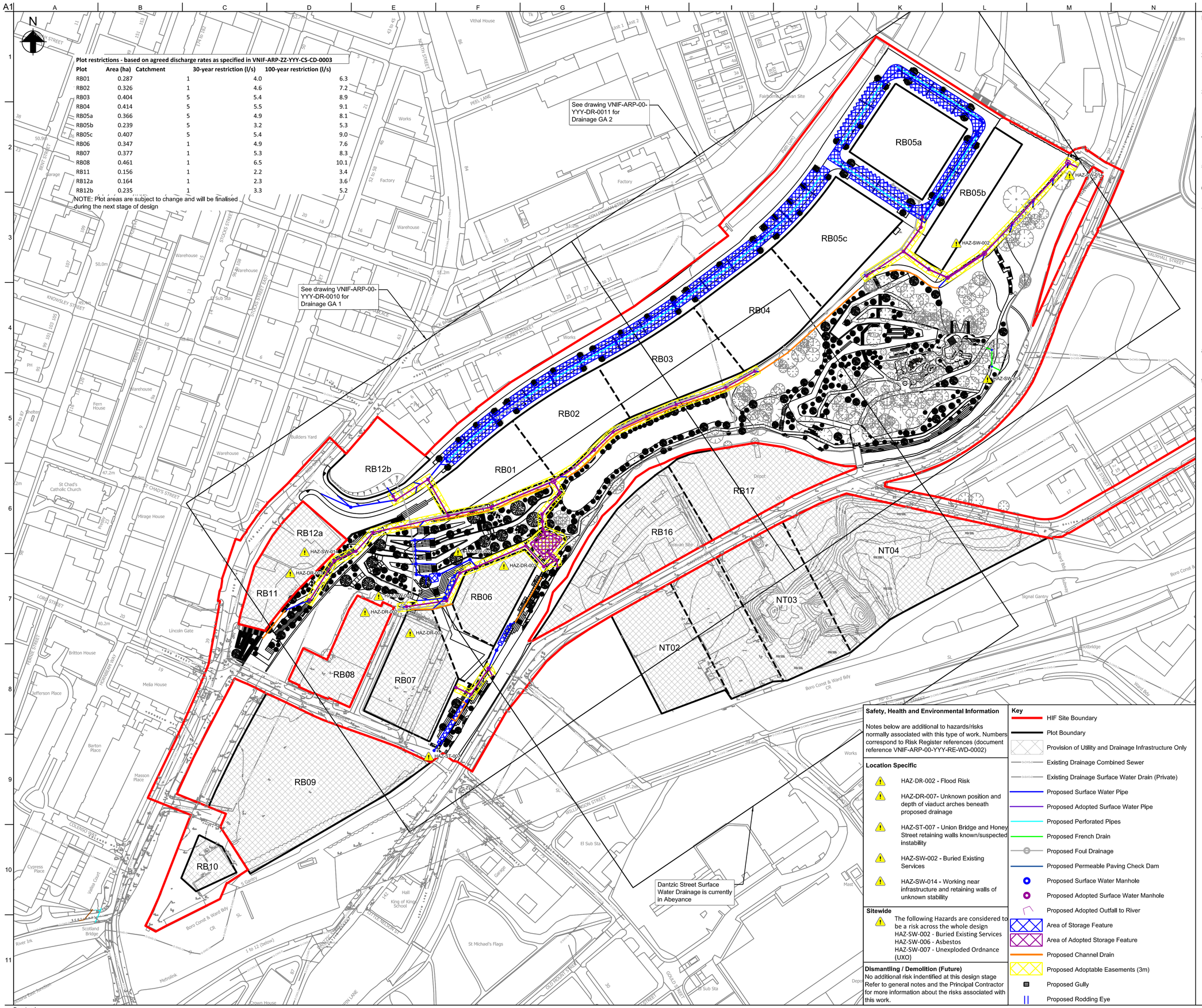
APPENDIX D – ARUP Drainage Strategy

A1

Plot restrictions - based on agreed discharge rates as specified in VNIF-ARP-ZZ-YYY-CS-CD-0003

Plot	Area (ha)	Catchment	30-year restriction (l/s)	100-year restriction (l/s)
RB01	0.287	1	4.0	6.3
RB02	0.326	1	4.6	7.2
RB03	0.404	5	5.4	8.9
RB04	0.414	5	5.5	9.1
RB05a	0.366	5	4.9	8.1
RB05b	0.239	5	3.2	5.3
RB05c	0.407	5	5.4	9.0
RB06	0.347	1	4.9	7.6
RB07	0.377	1	5.3	8.3
RB08	0.461	1	6.5	10.1
RB11	0.156	1	2.2	3.4
RB12a	0.164	1	2.3	3.6
RB12b	0.235	1	3.3	5.2

NOTE: Plot areas are subject to change and will be finalised during the next stage of design



Safety, Health and Environmental Information

Notes below are additional to hazards/risks normally associated with this type of work. Numbers correspond to Risk Register references (document reference VNIF-ARP-00-YYY-RE-WD-0002)

Location Specific

- HAZ-DR-002 - Flood Risk
- HAZ-DR-007- Unknown position and depth of viaduct arches beneath proposed drainage
- HAZ-ST-007 - Union Bridge and Honey Street retaining walls known/suspected instability
- HAZ-SW-002 - Buried Existing Services
- HAZ-SW-014 - Working near infrastructure and retaining walls of unknown stability

Sitewide

The following Hazards are considered to be a risk across the whole design
HAZ-SW-002 - Buried Existing Services
HAZ-SW-006 - Asbestos
HAZ-SW-007 - Unexploded Ordnance (UXO)

Dismantling / Demolition (Future)

No additional risk indentified at this design stage
Refer to general notes and the Principal Contractor for more information about the risks associated with this work.

Key

- HIF Site Boundary
- Plot Boundary
- Provision of Utility and Drainage Infrastructure Only
- Existing Drainage Combined Sewer
- Existing Drainage Surface Water Drain (Private)
- Proposed Surface Water Pipe
- Proposed Adopted Surface Water Pipe
- Proposed Perforated Pipes
- Proposed French Drain
- Proposed Foul Drainage
- Proposed Permeable Paving Check Dam
- Proposed Surface Water Manhole
- Proposed Adopted Surface Water Manhole
- Proposed Adopted Outfall to River
- Area of Storage Feature
- Area of Adopted Storage Feature
- Proposed Channel Drain
- Proposed Adoptable Easements (3m)
- Proposed Gully
- Proposed Rodding Eye

Notes

1. All dimensions are in m, all levels in mAOD, unless specified otherwise.
2. This map is reproduced from Ordnance Survey Material with the permission of the Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown Copyright. License Number 100019568 (2021).
3. Layout is based on:
   - Landscape Architect masterplan drawing VNIF-PLA-ZZ-YYY-DR-L-1011 Rev P06 received 04/08/2022 by Planit.
   - Topographical Survey drawing PS-2158-TS by Paragon Surveys dated September 2021.
4. Existing Drainage layout based on the following information:
   - Utility Search Map drawing 97079 undertaken by Atkins dated 24/06/2021.
5. For the Infrastructure Specification refer to VNIF-ARP-ZZ-YYY-SP-C-0001.
6. This drawing should be read with reference to Arup's full WS4 drawings and specifications.
7. Utilities have been drawn to PAS128 standard. The Located Service Classification table below gives a brief overview. For further details refer to document 'PAS 128:2014 Specification for underground utility detection, verification and location'.

Located Service Classification	Certainty/Risk
Type A Verification + Visual Identification	A
Type B Detection + Typically GPR and EML techniques are used	B
Type C Site reconnaissance + Physical surface features identified	C
Type D Desktop utility records search	D

Despite Arup's best efforts to accurately display all information, the information is provided for general guidance only and, prior to any construction works being undertaken, site investigation works shall be carried out.

8. A connection point has been provided for each plot within the HIF Boundary at a minimum depth of 2.0m to plot level (assuming FFL will be 0.5m above plot levels) as agreed with WSP.
9. Drainage construction materials:
   - Drainage pipes - Polypropylene and PVC in accordance with BS 13476
   - Manholes - Precast Concrete
   - Inspection Chambers - Polypropylene in accordance with BS 7158
10. As RB09/10 are outside the HIF Red Line Boundary, it has been agreed that a connection to the River Irk will be provided/constructed as part of the Plot construction. Discharge rates have been agreed as part of the HIF delivery.
11. For all schedules, refer to drawings VNIF-ARP-00-YYY-DR-CD-0009 and VNIF-ARP-00-YYY-DR-CD-0054.
12. For pipe abandonments and diversions, refer to drawing VNIF-ARP-00-YYY-DR-CU-1010 - 12 and schedule VNIF-ARP-ZZ-YYY-SH-CU-0001.

Rev	Date	Description	By	Chkd	Appd	Auth
P03	01/02/22		DH	RG	RG	---
P04	17/02/22	Amended for Planning Comments	DH	DH	RG	---
P05	28/02/22		DH	DH	RG	---
P06	21/03/22	Updated for Costing	ES	RG	RG	---
P07	04/04/22	Updated for Costing	DH	DH	RG	---
P08	14/07/22	WS4 Issue to BAM	DH	DH	RG	---
P09	08/08/22	Issued for Technical Approval	ES	DH	RG	---
P10	10/10/22	Full WS4 Issue	ES	DH	RG	---
P11	20/10/22	Issued for Full WS4	ES	DH	RG	---
C01	31/10/22	Issued for Full WS4	ES	DH	RG	HG

ARUP

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Manchester M1 3BN
Tel +44 161 228 2331 Fax +44 161 228 6879
www.arup.com

Client

MANCHESTER CITY COUNCIL

bam nuttall

Project Title

Victoria North HIF Infrastructure & Enabling Works

Drawing Title

Proposed Site Wide Surface Water Drainage General Arrangement

Scale at A1	1:1250	Arup Job No	282022-00
Role	Civil - Drainage		
Suitability	A - Fit for Construction		

Rev	By	Chkd	Appd	
C01	ES	DH	RG	HG
	Date 19/10/22	Date 20/10/22	Date 20/10/22	31/10/22

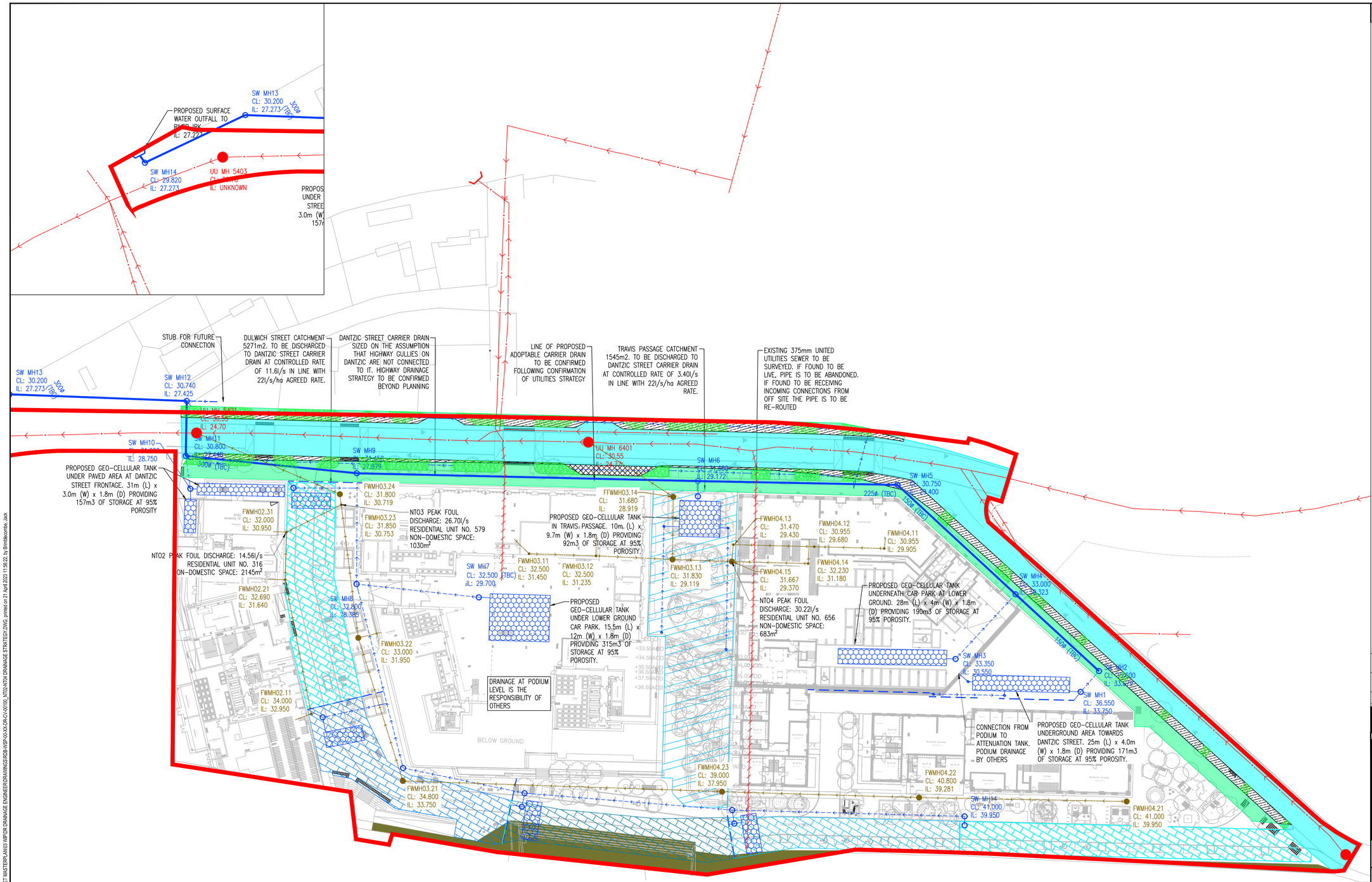
Name

VNIF	- ARP -	00	- YYY -	DR	- CD -	0002
Project	Originator	Volume	Location	Type	Role	Number

Do not scale

© Arup

APPENDIX E – WSP Drainage Strategy



Plot		Area (Assumed 100% Impermeable)	Permitted Discharge (l/s)	Storage (m^3)
NT02	2B	0.23	5.06	156
NT03	2C	0.54	11.88	315
NT04	2D	0.63	13.86	360

DO NOT SCALE

NOTES:

1. THIS DRAINAGE STRATEGY HAS BEEN PRODUCED USING THE FLOOD STUDIES REPORT RAINFALL DATA.

KEY:

- PRIVATE SURFACE WATER DRAIN
- ADOPTABLE SURFACE WATER CARRIER DRAIN
- CHANNEL DRAIN
- EXISTING UNITED UTILITIES COMBINED SEWER
- EXISTING UU COMBINED SEWER TO BE ABANDONED
- SURFACE WATER MANHOLE
- FOUL WATER MANHOLE
- SURFACE WATER HEADWALL
- COMBINED SEWER OVERFLOW HEADWALL
- SURFACE WATER ATTENUATION
- DULWICH STREET PERMEABLE PAVEMENT
- TRAVIS PASSAGE CATCHMENT AREA
- EXISTING HIGHWAY LAND TO REMAIN UNATTENUATED (2880m^2)
- EXISTING HIGHWAY LAND TO BE ATTENUATED (800m^2)
- PROPOSED NEW HIGHWAY LAND TO BE ATTENUATED (1535m^2)
- PROPOSED NEW HIGHWAY LAND TO BE UNATTENUATED (50m^2)

UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES OR STATUTORY BODIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR AND / OR EMPLOYER COMMENCE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT THEIR OWN RISK

REV	DATE	BY	DESCRIPTION	CHK	APP
P02	21/04/2023	JEB	UPDATED FOR PLANNING	SM	SM
P01	31/03/2023	JEB	FIRST ISSUE	SM	SM

DRAWING STATUS: S2 - FOR INFORMATION

wsp
8 First Street, Manchester, M15 4GU, UK
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FAR EAST CONSORTIUM

ARCHITECT: HAWKINS BROWN / MACREANOR LAVINGTON

SITE/PROJECT: REDBANK & DANTZIC STREET

TITLE: APPLICATION 5
DETAILED DRAINAGE STRATEGY

SCALE @ A1:	CHECKED:	APPROVED:
1:500	SM	S

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	JEB	JEB	April 23

DRAWING No: RDB-WSP-00-XX-DR-CV-00101 REV: P02

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File name: \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70079XXX\70079268 - REDBANK & DANTZIC STREET MASTERPLAN\03 WIP\DR DRAINAGE ENGINEER\DRAWINGS\RDB-WSP-00-XX-DR-CV-00100_NT02#2D4 DRAINAGE STRATEGY.DWG, printed on 21 April 2023 11:49:22, by Brendacombe, Jack

APPENDIX F – SW Calcs No Surcharged Outfall

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	9.969	0.125	80.0	0.038	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	13.294	0.166	80.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.002	30.138	0.502	60.0	0.019	0.00	0.0	0.600		o	150	Pipe/Conduit	
S2.000	4.914	0.680	7.2	0.007	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	22.601	1.076	21.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.004	5.733	0.201	28.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.000	13.082	0.327	40.0	0.029	4.00	0.0	0.600		o	150	Pipe/Conduit	
S3.001	7.053	0.498	14.2	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S3.002	10.873	0.272	40.0	0.042	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.003	12.149	1.058	11.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S4.000	2.174	0.036	60.4	0.000	4.00	0.0	0.600		o	225	Pipe/Conduit	
S4.001	4.197	0.064	65.6	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.004	31.350	1.280	24.5	0.011	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.005	28.271	0.471	60.0	0.098	0.00	0.0	0.600		o	450	Pipe/Conduit	
S5.000	6.978	0.047	148.5	0.016	4.00	0.0	0.600		o	450	Pipe/Conduit	
S6.000	44.701	2.190	20.4	0.076	4.00	0.0		0.030	→|↓|→		Porous Car Park	
S7.000	7.001	0.070	100.0	0.011	4.00	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)
S1.000	64.23	4.15	32.300	0.038	0.0	0.0	0.0	1.12	19.9	6.6
S1.001	63.12	4.34	32.175	0.038	0.0	0.0	0.0	1.12	19.9	6.6
S1.002	61.06	4.73	32.009	0.057	0.0	0.0	0.0	1.30	23.0	9.4
S2.000	64.96	4.02	32.187	0.007	0.0	0.0	0.0	3.77	66.7	1.2
S1.003	60.20	4.90	31.507	0.064	0.0	0.0	0.0	2.21	39.0	10.4
S1.004	60.01	4.94	28.550	0.064	0.0	0.0	0.0	2.46	97.8	10.4
S3.000	64.29	4.14	33.130	0.029	0.0	0.0	0.0	1.60	28.2	5.0
S3.001	64.04	4.18	32.803	0.029	0.0	0.0	0.0	2.69	47.6	5.0
S3.002	63.55	4.27	32.230	0.071	0.0	0.0	0.0	2.08	82.5	12.2
S3.003	63.25	4.32	31.958	0.071	0.0	0.0	0.0	3.88	154.4	12.2
S4.000	64.97	4.02	31.000	0.000	0.0	0.0	0.0	1.69	67.0	0.0
S4.001	64.71	4.06	30.964	0.000	0.0	0.0	0.0	1.62	64.3	0.0
S3.004	62.18	4.52	30.900	0.082	0.0	0.0	0.0	2.65	105.6	13.8
S3.005	61.24	4.70	28.820	0.180	0.0	0.0	0.0	2.63	418.0	29.9
S5.000	64.68	4.07	28.396	0.016	0.0	0.0	0.0	1.67	265.0	2.8
S6.000	61.64	4.62	36.985	0.076	0.0	0.0	0.0	1.21	790.1	12.7
S7.000	64.41	4.12	35.015	0.011	0.0	0.0	0.0	1.00	17.8	1.9

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.001	20.393	0.690	29.6	0.032	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.002	12.387	0.220	56.3	0.013	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.003	13.882	0.650	21.4	0.023	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.004	36.129	1.300	27.8	0.050	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.005	27.655	1.250	22.1	0.047	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S8.000	6.994	0.451	15.5	0.000	4.00	0.0		0.030	o	450	Pipe/Conduit	
S1.005	11.186	0.592	18.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.006	43.052	0.172	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.007	44.900	0.180	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.008	13.385	0.054	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.009	4.402	0.018	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S6.001	59.93	4.96	34.945	0.119	0.0	0.0	0.0	1.00	656.6	19.3
S6.002	58.57	5.24	34.255	0.132	0.0	0.0	0.0	0.73	475.7	20.9
S6.003	57.68	5.44	33.935	0.155	0.0	0.0	0.0	1.18	772.4	24.2
S6.004	55.20	6.02	33.385	0.205	0.0	0.0	0.0	1.03	677.1	30.6
S6.005	53.65	6.42	32.085	0.252	0.0	0.0	0.0	1.16	758.9	36.6
S8.000	64.74	4.06	28.800	0.000	0.0	0.0	0.0	1.97	313.7	0.0
S1.005	64.73	4.06	28.349	0.000	24.5	0.0	0.0	3.02	120.3	24.5
S1.006	60.04	4.93	27.757	0.000	24.5	0.0	0.0	0.82	32.7	24.5
S1.007	55.93	5.84	27.585	0.000	24.5	0.0	0.0	0.82	32.7	24.5
S1.008	54.83	6.12	27.405	0.000	24.5	0.0	0.0	0.82	32.7	24.5
S1.009	54.48	6.20	27.352	0.000	24.5	0.0	0.0	0.82	32.7	24.5

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Manhole Schedules for SW Net01

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S2.00	34.150	1.850	Open Manhole	450	S1.000	32.300	150				
S2.01	34.170	1.995	Open Manhole	1200	S1.001	32.175	150	S1.000	32.175	150	
S2.02	33.760	1.751	Open Manhole	450	S1.002	32.009	150	S1.001	32.009	150	
S2.03	33.187	1.000	Open Manhole	450	S2.000	32.187	150				
S2.04	32.680	1.173	Open Manhole	1200	S1.003	31.507	150	S1.002	31.507	150	
								S2.000	31.507	150	
S2.05	31.630	3.080	Open Manhole	1200	S1.004	28.550	225	S1.003	30.431	150	1806
S2.06	34.130	1.000	Open Manhole	600	S3.000	33.130	150				
S2.07	34.110	1.307	Open Manhole	600	S3.001	32.803	150	S3.000	32.803	150	
S2.08	33.750	1.520	Open Manhole	600	S3.002	32.230	225	S3.001	32.305	150	
S2.09	33.750	1.792	Open Manhole	600	S3.003	31.958	225	S3.002	31.958	225	
S2.10	32.190	1.190	Open Manhole	600	S4.000	31.000	225				
S2.11	32.190	1.226	Open Manhole	600	S4.001	30.964	225	S4.000	30.964	225	
S2.12	32.160	1.260	Open Manhole	600	S3.004	30.900	225	S3.003	30.900	225	
								S4.001	30.900	225	
S2.13	30.875	2.055	Open Manhole	1800	S3.005	28.820	450	S3.004	29.620	225	575
S2.14	31.630	3.234	Open Manhole	1800	S5.000	28.396	450				
S3.00	37.600	0.615	Open Manhole	600	S6.000	36.985					
S3.01	35.535	0.520	Open Manhole	450	S7.000	35.015	150				
S3.02	35.560	0.765	Open Manhole	600	S6.001	34.945		S6.000	34.795		
								S7.000	34.945	150	
S3.03	34.870	0.615	Open Manhole	600	S6.002	34.255		S6.001	34.255		
S2.15	34.550	0.615	Open Manhole	600	S6.003	33.935		S6.002	34.035		100
S2.16	34.000	0.715	Open Manhole	600	S6.004	33.385		S6.003	33.285		
S2.17	32.700	0.615	Open Manhole	600	S6.005	32.085		S6.004	32.085		
STANK	31.754	2.954	Sealed Manhole	1800	S8.000	28.800	450				
S2.18	31.470	3.121	Open Manhole	2100	S1.005	28.349	225	S1.004	28.349	225	
								S3.005	28.349	450	
								S5.000	28.349	450	
								S6.005	30.835		2726
								S8.000	28.349	450	
S5.05	31.250	3.493	Open Manhole	1350	S1.006	27.757	225	S1.005	27.757	225	
S5.06	30.350	2.765	Open Manhole	1350	S1.007	27.585	225	S1.006	27.585	225	
S5.07	29.750	2.345	Open Manhole	1200	S1.008	27.405	225	S1.007	27.405	225	
S5.08	29.700	2.348	Open Manhole	1350	S1.009	27.352	225	S1.008	27.352	225	
S	30.200	2.866	Open Manhole	0		OUTFALL		S1.009	27.334	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.00	384628.547	399391.096	384628.547	399391.096	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.01	384635.818	399397.917	384635.818	399397.917	Required	
S2.02	384626.734	399407.623	384626.734	399407.623	Required	
S2.03	384604.255	399425.092	384604.255	399425.092	Required	
S2.04	384606.142	399429.629	384606.142	399429.629	Required	
S2.05	384595.496	399449.566	384595.496	399449.566	Required	
S2.06	384607.456	399377.956	384607.456	399377.956	Required	
S2.07	384598.517	399387.508	384598.517	399387.508	Required	
S2.08	384597.387	399394.470	384597.387	399394.470	Required	
S2.09	384589.955	399402.407	384589.955	399402.407	Required	
S2.10	384591.681	399412.496	384591.681	399412.496	Required	
S2.11	384589.804	399411.400	384589.804	399411.400	Required	
S2.12	384586.568	399414.074	384586.568	399414.074	Required	
S2.13	384571.730	399441.690	384571.730	399441.690	Required	
S2.14	384602.695	399458.532	384602.695	399458.532	Required	
S3.00	384719.304	399422.990	384719.304	399422.990	Required	
S3.01	384681.034	399398.869	384681.034	399398.869	Required	
S3.02	384678.255	399405.294	384678.255	399405.294	Required	
S3.03	384659.530	399397.214	384659.530	399397.214	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.15	384647.251	399398.840	384647.251	399398.840	Required	
S2.16	384634.684	399404.738	384634.684	399404.738	Required	
S2.17	384609.764	399430.897	384609.764	399430.897	Required	
STANK	384601.360	399450.106			No Entry	
S2.18	384596.565	399455.198	384596.565	399455.198	Required	
S5.05	384591.210	399465.019	384591.210	399465.019	Required	
S5.06	384553.441	399444.356	384553.441	399444.356	Required	
S5.07	384514.464	399422.066	384514.464	399422.066	Required	
S5.08	384506.391	399411.390	384506.391	399411.390	Required	
S	384502.691	399413.776			No Entry	

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Area Summary for SW Net01

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.038	0.038	0.038
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.019	0.019	0.019
2.000	-	-	100	0.007	0.007	0.007
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.029	0.029	0.029
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.042	0.042	0.042
3.003	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.000	0.000	0.000
4.001	-	-	100	0.000	0.000	0.000
3.004	-	-	100	0.011	0.011	0.011
3.005	-	-	100	0.098	0.098	0.098
5.000	-	-	100	0.016	0.016	0.016
6.000	-	-	100	0.076	0.076	0.076
7.000	-	-	100	0.011	0.011	0.011
6.001	-	-	100	0.032	0.032	0.032
6.002	-	-	100	0.013	0.013	0.013
6.003	-	-	100	0.023	0.023	0.023
6.004	-	-	100	0.050	0.050	0.050
6.005	-	-	100	0.047	0.047	0.047
8.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.512	0.512	0.512

Free Flowing Outfall Details for SW Net01

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	30.200	27.334	0.000	0	0

Simulation Criteria for SW Net01

Volumetric Runoff Coeff	0.750	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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.358
Return Period (years)	2	Profile Type	Summer
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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Synthetic Rainfall Details

Storm Duration (mins) 30

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Online Controls for SW Net01

Hydro-Brake® Optimum Manhole: S2.18, DS/PN: S1.005, Volume (m³): 34.0

Unit Reference	MD-SHE-0193-2310-2300-2310
Design Head (m)	2.300
Design Flow (l/s)	23.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	193
Invert Level (m)	28.349
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	23.1	Kick-Flo®	1.404	18.2
Flush-Flo™	0.671	23.1	Mean Flow over Head Range	-	20.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	0.800	22.9	2.000	21.6	4.000	30.1	7.000	39.4
0.200	17.8	1.000	22.3	2.200	22.6	4.500	31.9	7.500	40.8
0.300	20.7	1.200	21.0	2.400	23.6	5.000	33.5	8.000	42.0
0.400	22.0	1.400	18.4	2.600	24.5	5.500	35.1	8.500	43.3
0.500	22.7	1.600	19.4	3.000	26.2	6.000	36.6	9.000	44.5
0.600	23.0	1.800	20.5	3.500	28.2	6.500	38.0	9.500	45.7

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Storage Structures for SW Net01

Porous Car Park Pipe: S6.000

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	44.7
Membrane Percolation (mm/hr)	10000	Slope (1:X)	20.4
Max Percolation (l/s)	558.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	36.985		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.001

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	20.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	29.6
Max Percolation (l/s)	254.9	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.945		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.002

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	12.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	56.3
Max Percolation (l/s)	154.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.255		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.003

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	13.9
Membrane Percolation (mm/hr)	10000	Slope (1:X)	21.4
Max Percolation (l/s)	173.5	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.935		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

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Porous Car Park Pipe: S6.004

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	36.1
Membrane Percolation (mm/hr)	10000	Slope (1:X)	27.8
Max Percolation (l/s)	451.6	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.385		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.005

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	27.7
Membrane Percolation (mm/hr)	10000	Slope (1:X)	22.1
Max Percolation (l/s)	345.7	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	32.085		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Cellular Storage Manhole: STANK, DS/PN: S8.000

Invert Level (m)	28.800	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)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	91.3	91.3	1.840	91.3	171.5	1.841	0.0	171.5

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 18.000	Cv (Summer) 0.750
Region England and Wales	Ratio R	0.358	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	2	+0%	100/15 Summer				32.362	-0.088
S1.001	S2.01	15 Summer	2	+0%	100/15 Summer				32.237	-0.089
S1.002	S2.02	15 Winter	2	+0%	100/15 Summer				32.075	-0.084
S2.000	S2.03	15 Winter	2	+0%					32.202	-0.135
S1.003	S2.04	15 Winter	2	+0%					31.560	-0.097
S1.004	S2.05	30 Winter	2	+0%	2/15 Summer				29.158	0.383
S3.000	S2.06	15 Winter	2	+0%					33.174	-0.106
S3.001	S2.07	15 Summer	2	+0%					32.837	-0.116
S3.002	S2.08	15 Winter	2	+0%					32.288	-0.167
S3.003	S2.09	15 Winter	2	+0%					32.000	-0.183
S4.000	S2.10	15 Summer	2	+0%					31.000	-0.225
S4.001	S2.11	15 Summer	2	+0%					30.964	-0.225
S3.004	S2.12	15 Winter	2	+0%					30.952	-0.173
S3.005	S2.13	30 Winter	2	+0%	30/15 Summer				29.160	-0.110
S5.000	S2.14	30 Winter	2	+0%	2/15 Summer				29.154	0.308
S6.000	S3.00	15 Winter	2	+0%					37.013	-0.437
S7.000	S3.01	15 Winter	2	+0%					35.050	-0.115
S6.001	S3.02	15 Winter	2	+0%					34.985	-0.425
S6.002	S3.03	15 Winter	2	+0%					34.306	-0.414
S6.003	S2.15	15 Winter	2	+0%					33.976	-0.424
S6.004	S2.16	15 Winter	2	+0%					33.436	-0.414
S6.005	S2.17	15 Winter	2	+0%					32.137	-0.413
S8.000	STANK	30 Winter	2	+0%	30/30 Winter				28.913	-0.337
S1.005	S2.18	30 Winter	2	+0%	2/15 Summer				29.154	0.580
S1.006	S5.05	120 Summer	2	+0%					27.901	-0.081
S1.007	S5.06	120 Summer	2	+0%					27.729	-0.081
S1.008	S5.07	120 Summer	2	+0%					27.563	-0.067
S1.009	S5.08	120 Summer	2	+0%					27.522	-0.055

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.36			6.3	OK	
S1.001	S2.01	0.000	0.35			6.4	OK	
S1.002	S2.02	0.000	0.40			8.7	OK	
S2.000	S2.03	0.000	0.02			1.2	OK	
S1.003	S2.04	0.000	0.27			9.8	OK	
S1.004	S2.05	0.000	0.09			5.9	SURCHARGED	
S3.000	S2.06	0.000	0.19			4.8	OK	
S3.001	S2.07	0.000	0.12			4.8	OK	
S3.002	S2.08	0.000	0.15			10.4	OK	
S3.003	S2.09	0.000	0.08			10.3	OK	
S4.000	S2.10	0.000	0.00			0.0	OK	
S4.001	S2.11	0.000	0.00			0.0	OK	
S3.004	S2.12	0.000	0.12			11.7	OK	
S3.005	S2.13	0.000	0.06			19.7	OK	
S5.000	S2.14	0.000	0.02			2.6	SURCHARGED	
S6.000	S3.00	0.000	0.02		5	12.7	OK	
S7.000	S3.01	0.000	0.12			1.8	OK	
S6.001	S3.02	0.000	0.03		10	18.4	OK	
S6.002	S3.03	0.000	0.04		6	20.1	OK	
S6.003	S2.15	0.000	0.03		6	22.9	OK	
S6.004	S2.16	0.000	0.04		10	28.8	OK	
S6.005	S2.17	0.000	0.04		7	33.5	OK	
S8.000	STANK	0.000	0.05		9	13.5	OK	
S1.005	S2.18	0.000	0.23			22.9	SURCHARGED	
S1.006	S5.05	0.000	0.74			22.9	OK	
S1.007	S5.06	0.000	0.73			22.9	OK	
S1.008	S5.07	0.000	0.81			22.9	OK	
S1.009	S5.08	0.000	0.93			22.9	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.000
Region	England and Wales	Ratio R	0.358
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	30	+0%	100/15 Summer				32.391	-0.059
S1.001	S2.01	15 Summer	30	+0%	100/15 Summer				32.265	-0.060
S1.002	S2.02	15 Summer	30	+0%	100/15 Summer				32.113	-0.046
S2.000	S2.03	15 Winter	30	+0%					32.207	-0.130
S1.003	S2.04	15 Winter	30	+0%					31.586	-0.071
S1.004	S2.05	15 Winter	30	+0%	2/15 Summer				29.359	0.584
S3.000	S2.06	15 Winter	30	+0%					33.192	-0.088
S3.001	S2.07	15 Winter	30	+0%					32.851	-0.102
S3.002	S2.08	15 Summer	30	+0%					32.318	-0.137
S3.003	S2.09	15 Summer	30	+0%					32.020	-0.163
S4.000	S2.10	15 Summer	30	+0%					31.000	-0.225
S4.001	S2.11	15 Winter	30	+0%					30.973	-0.216
S3.004	S2.12	15 Summer	30	+0%					30.978	-0.147
S3.005	S2.13	15 Winter	30	+0%	30/15 Summer				29.367	0.097
S5.000	S2.14	15 Winter	30	+0%	2/15 Summer				29.343	0.497
S6.000	S3.00	15 Winter	30	+0%					37.026	-0.424
S7.000	S3.01	15 Winter	30	+0%					35.063	-0.102
S6.001	S3.02	15 Summer	30	+0%					35.005	-0.405
S6.002	S3.03	15 Winter	30	+0%					34.330	-0.390
S6.003	S2.15	15 Winter	30	+0%					33.997	-0.403
S6.004	S2.16	15 Winter	30	+0%					33.463	-0.387
S6.005	S2.17	15 Winter	30	+0%					32.166	-0.384
S8.000	STANK	60 Winter	30	+0%	30/30 Winter				29.311	0.061
S1.005	S2.18	15 Winter	30	+0%	2/15 Summer				29.342	0.768
S1.006	S5.05	240 Winter	30	+0%					27.901	-0.081
S1.007	S5.06	240 Winter	30	+0%					27.729	-0.081
S1.008	S5.07	240 Winter	30	+0%					27.563	-0.067
S1.009	S5.08	240 Winter	30	+0%					27.522	-0.055

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.68			12.0	OK	
S1.001	S2.01	0.000	0.66			12.0	OK	
S1.002	S2.02	0.000	0.81			17.8	OK	
S2.000	S2.03	0.000	0.04			2.2	OK	
S1.003	S2.04	0.000	0.54			19.8	OK	
S1.004	S2.05	0.000	0.31			19.9	SURCHARGED	
S3.000	S2.06	0.000	0.36			9.1	OK	
S3.001	S2.07	0.000	0.23			9.1	OK	
S3.002	S2.08	0.000	0.32			22.4	OK	
S3.003	S2.09	0.000	0.17			22.4	OK	
S4.000	S2.10	0.000	0.00			0.0	OK	
S4.001	S2.11	0.000	0.00			0.0	OK	
S3.004	S2.12	0.000	0.26			25.8	OK	
S3.005	S2.13	0.000	0.15			52.5	SURCHARGED	
S5.000	S2.14	0.000	0.03			4.8	SURCHARGED	
S6.000	S3.00	0.000	0.03		5	24.0	OK	
S7.000	S3.01	0.000	0.23			3.5	OK	
S6.001	S3.02	0.000	0.06		8	36.2	OK	
S6.002	S3.03	0.000	0.09		6	39.5	OK	
S6.003	S2.15	0.000	0.06		6	45.1	OK	
S6.004	S2.16	0.000	0.09		8	58.4	OK	
S6.005	S2.17	0.000	0.09		6	67.8	OK	
S8.000	STANK	0.000	0.07		32	19.0	SURCHARGED*	
S1.005	S2.18	0.000	0.23			22.9	SURCHARGED	
S1.006	S5.05	0.000	0.74			22.9	OK	
S1.007	S5.06	0.000	0.73			22.9	OK	
S1.008	S5.07	0.000	0.81			22.9	OK	
S1.009	S5.08	0.000	0.93			22.9	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 18.000	Cv (Summer) 0.750
Region England and Wales	Ratio R	0.358	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	100	+45%	100/15 Summer				32.837	0.387
S1.001	S2.01	15 Winter	100	+45%	100/15 Summer				32.683	0.357
S1.002	S2.02	15 Winter	100	+45%	100/15 Summer				32.500	0.341
S2.000	S2.03	15 Winter	100	+45%					32.215	-0.122
S1.003	S2.04	15 Winter	100	+45%					31.615	-0.042
S1.004	S2.05	60 Winter	100	+45%	2/15 Summer				30.263	1.488
S3.000	S2.06	15 Winter	100	+45%					33.219	-0.061
S3.001	S2.07	15 Winter	100	+45%					32.871	-0.082
S3.002	S2.08	15 Summer	100	+45%					32.356	-0.099
S3.003	S2.09	15 Summer	100	+45%					32.045	-0.138
S4.000	S2.10	15 Winter	100	+45%					31.005	-0.220
S4.001	S2.11	15 Summer	100	+45%					31.011	-0.178
S3.004	S2.12	15 Summer	100	+45%					31.011	-0.114
S3.005	S2.13	60 Winter	100	+45%	30/15 Summer				30.264	0.994
S5.000	S2.14	60 Winter	100	+45%	2/15 Summer				30.260	1.414
S6.000	S3.00	15 Winter	100	+45%					37.045	-0.405
S7.000	S3.01	15 Winter	100	+45%					35.083	-0.082
S6.001	S3.02	15 Summer	100	+45%					35.033	-0.377
S6.002	S3.03	15 Winter	100	+45%					34.365	-0.355
S6.003	S2.15	15 Winter	100	+45%					34.026	-0.374
S6.004	S2.16	15 Winter	100	+45%					33.499	-0.351
S6.005	S2.17	15 Winter	100	+45%					32.203	-0.347
S8.000	STANK	60 Winter	100	+45%	30/30 Winter				30.259	1.009
S1.005	S2.18	60 Winter	100	+45%	2/15 Summer				30.260	1.686
S1.006	S5.05	720 Winter	100	+45%					27.901	-0.081
S1.007	S5.06	720 Winter	100	+45%					27.729	-0.081
S1.008	S5.07	720 Winter	100	+45%					27.564	-0.067

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	1.16			20.4	SURCHARGED	
S1.001	S2.01	0.000	1.07			19.5	SURCHARGED	
S1.002	S2.02	0.000	1.28			28.3	SURCHARGED	
S2.000	S2.03	0.000	0.08			4.1	OK	
S1.003	S2.04	0.000	0.86			31.9	OK	
S1.004	S2.05	0.000	0.28			17.9	SURCHARGED	
S3.000	S2.06	0.000	0.66			17.1	OK	
S3.001	S2.07	0.000	0.42			17.1	OK	
S3.002	S2.08	0.000	0.60			41.9	OK	
S3.003	S2.09	0.000	0.32			41.9	OK	
S4.000	S2.10	0.000	0.00			0.0	OK	
S4.001	S2.11	0.000	0.01			0.2	OK	
S3.004	S2.12	0.000	0.49			48.2	OK	
S3.005	S2.13	0.000	0.14			50.6	SURCHARGED	
S5.000	S2.14	0.000	0.02			4.0	SURCHARGED	
S6.000	S3.00	0.000	0.06		5	44.8	OK	
S7.000	S3.01	0.000	0.43			6.5	OK	
S6.001	S3.02	0.000	0.11		6	68.1	OK	
S6.002	S3.03	0.000	0.16		6	74.1	OK	
S6.003	S2.15	0.000	0.11		5	84.6	OK	
S6.004	S2.16	0.000	0.16		7	109.6	OK	
S6.005	S2.17	0.000	0.17		6	126.7	OK	
S8.000	STANK	0.000	0.06			18.3	SURCHARGED*	
S1.005	S2.18	0.000	0.22			22.8	SURCHARGED	
S1.006	S5.05	0.000	0.74			22.9	OK	
S1.007	S5.06	0.000	0.73			22.9	OK	
S1.008	S5.07	0.000	0.81			22.9	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.009	S5.08	720 Winter	100	+45%					27.522	-0.054	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.009	S5.08	0.93			22.9	OK	

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APPENDIX G – SW Calcs 30year Surcharged Outfall

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	9.969	0.125	80.0	0.038	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	13.294	0.166	80.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.002	30.138	0.502	60.0	0.019	0.00	0.0	0.600		o	150	Pipe/Conduit	
S2.000	4.914	0.680	7.2	0.007	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	22.601	1.076	21.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.004	5.733	0.201	28.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.000	13.082	0.327	40.0	0.029	4.00	0.0	0.600		o	150	Pipe/Conduit	
S3.001	7.053	0.498	14.2	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S3.002	10.873	0.272	40.0	0.042	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.003	12.149	1.058	11.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S4.000	2.174	0.036	60.4	0.000	4.00	0.0	0.600		o	225	Pipe/Conduit	
S4.001	4.197	0.064	65.6	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.004	31.350	1.280	24.5	0.011	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.005	28.271	0.471	60.0	0.098	0.00	0.0	0.600		o	450	Pipe/Conduit	
S5.000	6.978	0.047	148.5	0.016	4.00	0.0	0.600		o	450	Pipe/Conduit	
S6.000	44.701	2.190	20.4	0.076	4.00	0.0		0.030	→|↓|→		Porous Car Park	
S7.000	7.001	0.070	100.0	0.011	4.00	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)
S1.000	64.23	4.15	32.300	0.038	0.0	0.0	0.0	1.12	19.9	6.6
S1.001	63.12	4.34	32.175	0.038	0.0	0.0	0.0	1.12	19.9	6.6
S1.002	61.06	4.73	32.009	0.057	0.0	0.0	0.0	1.30	23.0	9.4
S2.000	64.96	4.02	32.187	0.007	0.0	0.0	0.0	3.77	66.7	1.2
S1.003	60.20	4.90	31.507	0.064	0.0	0.0	0.0	2.21	39.0	10.4
S1.004	60.01	4.94	28.550	0.064	0.0	0.0	0.0	2.46	97.8	10.4
S3.000	64.29	4.14	33.130	0.029	0.0	0.0	0.0	1.60	28.2	5.0
S3.001	64.04	4.18	32.803	0.029	0.0	0.0	0.0	2.69	47.6	5.0
S3.002	63.55	4.27	32.230	0.071	0.0	0.0	0.0	2.08	82.5	12.2
S3.003	63.25	4.32	31.958	0.071	0.0	0.0	0.0	3.88	154.4	12.2
S4.000	64.97	4.02	31.000	0.000	0.0	0.0	0.0	1.69	67.0	0.0
S4.001	64.71	4.06	30.964	0.000	0.0	0.0	0.0	1.62	64.3	0.0
S3.004	62.18	4.52	30.900	0.082	0.0	0.0	0.0	2.65	105.6	13.8
S3.005	61.24	4.70	28.820	0.180	0.0	0.0	0.0	2.63	418.0	29.9
S5.000	64.68	4.07	28.396	0.016	0.0	0.0	0.0	1.67	265.0	2.8
S6.000	61.64	4.62	36.985	0.076	0.0	0.0	0.0	1.21	790.1	12.7
S7.000	64.41	4.12	35.015	0.011	0.0	0.0	0.0	1.00	17.8	1.9

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.001	20.393	0.690	29.6	0.032	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.002	12.387	0.220	56.3	0.013	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.003	13.882	0.650	21.4	0.023	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.004	36.129	1.300	27.8	0.050	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.005	27.655	1.250	22.1	0.047	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S8.000	6.994	0.451	15.5	0.000	4.00	0.0		0.030	o	450	Pipe/Conduit	
S1.005	11.186	0.592	18.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.006	43.052	0.172	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.007	44.900	0.180	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.008	13.385	0.054	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.009	4.402	0.018	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S6.001	59.93	4.96	34.945	0.119	0.0	0.0	0.0	1.00	656.6	19.3
S6.002	58.57	5.24	34.255	0.132	0.0	0.0	0.0	0.73	475.7	20.9
S6.003	57.68	5.44	33.935	0.155	0.0	0.0	0.0	1.18	772.4	24.2
S6.004	55.20	6.02	33.385	0.205	0.0	0.0	0.0	1.03	677.1	30.6
S6.005	53.65	6.42	32.085	0.252	0.0	0.0	0.0	1.16	758.9	36.6
S8.000	64.74	4.06	28.800	0.000	0.0	0.0	0.0	1.97	313.7	0.0
S1.005	64.73	4.06	28.349	0.000	24.5	0.0	0.0	3.02	120.3	24.5
S1.006	60.04	4.93	27.757	0.000	24.5	0.0	0.0	0.82	32.7	24.5
S1.007	55.93	5.84	27.585	0.000	24.5	0.0	0.0	0.82	32.7	24.5
S1.008	54.83	6.12	27.405	0.000	24.5	0.0	0.0	0.82	32.7	24.5
S1.009	54.48	6.20	27.352	0.000	24.5	0.0	0.0	0.82	32.7	24.5

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Manhole Schedules for SW Net01

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S2.00	34.150	1.850	Open Manhole	450	S1.000	32.300	150				
S2.01	34.170	1.995	Open Manhole	1200	S1.001	32.175	150	S1.000	32.175	150	
S2.02	33.760	1.751	Open Manhole	450	S1.002	32.009	150	S1.001	32.009	150	
S2.03	33.187	1.000	Open Manhole	450	S2.000	32.187	150				
S2.04	32.680	1.173	Open Manhole	1200	S1.003	31.507	150	S1.002	31.507	150	
								S2.000	31.507	150	
S2.05	31.630	3.080	Open Manhole	1200	S1.004	28.550	225	S1.003	30.431	150	1806
S2.06	34.130	1.000	Open Manhole	600	S3.000	33.130	150				
S2.07	34.110	1.307	Open Manhole	600	S3.001	32.803	150	S3.000	32.803	150	
S2.08	33.750	1.520	Open Manhole	600	S3.002	32.230	225	S3.001	32.305	150	
S2.09	33.750	1.792	Open Manhole	600	S3.003	31.958	225	S3.002	31.958	225	
S2.10	32.190	1.190	Open Manhole	600	S4.000	31.000	225				
S2.11	32.190	1.226	Open Manhole	600	S4.001	30.964	225	S4.000	30.964	225	
S2.12	32.160	1.260	Open Manhole	600	S3.004	30.900	225	S3.003	30.900	225	
								S4.001	30.900	225	
S2.13	30.875	2.055	Open Manhole	1800	S3.005	28.820	450	S3.004	29.620	225	575
S2.14	31.630	3.234	Open Manhole	1800	S5.000	28.396	450				
S3.00	37.600	0.615	Open Manhole	600	S6.000	36.985					
S3.01	35.535	0.520	Open Manhole	450	S7.000	35.015	150				
S3.02	35.560	0.765	Open Manhole	600	S6.001	34.945		S6.000	34.795		
								S7.000	34.945	150	
S3.03	34.870	0.615	Open Manhole	600	S6.002	34.255		S6.001	34.255		
S2.15	34.550	0.615	Open Manhole	600	S6.003	33.935		S6.002	34.035		100
S2.16	34.000	0.715	Open Manhole	600	S6.004	33.385		S6.003	33.285		
S2.17	32.700	0.615	Open Manhole	600	S6.005	32.085		S6.004	32.085		
STANK	31.754	2.954	Sealed Manhole	1800	S8.000	28.800	450				
S2.18	31.470	3.121	Open Manhole	2100	S1.005	28.349	225	S1.004	28.349	225	
								S3.005	28.349	450	
								S5.000	28.349	450	
								S6.005	30.835		2726
								S8.000	28.349	450	
S5.05	31.250	3.493	Open Manhole	1350	S1.006	27.757	225	S1.005	27.757	225	
S5.06	30.350	2.765	Open Manhole	1350	S1.007	27.585	225	S1.006	27.585	225	
S5.07	29.750	2.345	Open Manhole	1200	S1.008	27.405	225	S1.007	27.405	225	
S5.08	29.700	2.348	Open Manhole	1350	S1.009	27.352	225	S1.008	27.352	225	
S	30.200	2.866	Open Manhole	0		OUTFALL		S1.009	27.334	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.00	384628.547	399391.096	384628.547	399391.096	Required	

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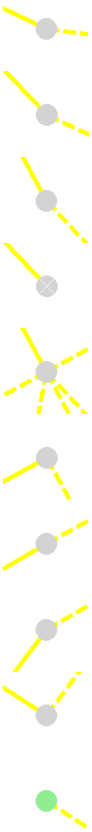
Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.01	384635.818	399397.917	384635.818	399397.917	Required	
S2.02	384626.734	399407.623	384626.734	399407.623	Required	
S2.03	384604.255	399425.092	384604.255	399425.092	Required	
S2.04	384606.142	399429.629	384606.142	399429.629	Required	
S2.05	384595.496	399449.566	384595.496	399449.566	Required	
S2.06	384607.456	399377.956	384607.456	399377.956	Required	
S2.07	384598.517	399387.508	384598.517	399387.508	Required	
S2.08	384597.387	399394.470	384597.387	399394.470	Required	
S2.09	384589.955	399402.407	384589.955	399402.407	Required	
S2.10	384591.681	399412.496	384591.681	399412.496	Required	
S2.11	384589.804	399411.400	384589.804	399411.400	Required	
S2.12	384586.568	399414.074	384586.568	399414.074	Required	
S2.13	384571.730	399441.690	384571.730	399441.690	Required	
S2.14	384602.695	399458.532	384602.695	399458.532	Required	
S3.00	384719.304	399422.990	384719.304	399422.990	Required	
S3.01	384681.034	399398.869	384681.034	399398.869	Required	
S3.02	384678.255	399405.294	384678.255	399405.294	Required	
S3.03	384659.530	399397.214	384659.530	399397.214	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.15	384647.251	399398.840	384647.251	399398.840	Required	
S2.16	384634.684	399404.738	384634.684	399404.738	Required	
S2.17	384609.764	399430.897	384609.764	399430.897	Required	
STANK	384601.360	399450.106			No Entry	
S2.18	384596.565	399455.198	384596.565	399455.198	Required	
S5.05	384591.210	399465.019	384591.210	399465.019	Required	
S5.06	384553.441	399444.356	384553.441	399444.356	Required	
S5.07	384514.464	399422.066	384514.464	399422.066	Required	
S5.08	384506.391	399411.390	384506.391	399411.390	Required	
S	384502.691	399413.776			No Entry	



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Area Summary for SW Net01

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.038	0.038	0.038
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.019	0.019	0.019
2.000	-	-	100	0.007	0.007	0.007
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.029	0.029	0.029
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.042	0.042	0.042
3.003	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.000	0.000	0.000
4.001	-	-	100	0.000	0.000	0.000
3.004	-	-	100	0.011	0.011	0.011
3.005	-	-	100	0.098	0.098	0.098
5.000	-	-	100	0.016	0.016	0.016
6.000	-	-	100	0.076	0.076	0.076
7.000	-	-	100	0.011	0.011	0.011
6.001	-	-	100	0.032	0.032	0.032
6.002	-	-	100	0.013	0.013	0.013
6.003	-	-	100	0.023	0.023	0.023
6.004	-	-	100	0.050	0.050	0.050
6.005	-	-	100	0.047	0.047	0.047
8.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.512	0.512	0.512

Surcharged Outfall Details for SW Net01

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	30.200	27.334	0.000	0	0

Datum (m) 27.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	3.400	14	3.400	27	3.400	40	3.400	53	3.400	66	3.400	79	3.400	92	3.400
2	3.400	15	3.400	28	3.400	41	3.400	54	3.400	67	3.400	80	3.400	93	3.400
3	3.400	16	3.400	29	3.400	42	3.400	55	3.400	68	3.400	81	3.400	94	3.400
4	3.400	17	3.400	30	3.400	43	3.400	56	3.400	69	3.400	82	3.400	95	3.400
5	3.400	18	3.400	31	3.400	44	3.400	57	3.400	70	3.400	83	3.400	96	3.400
6	3.400	19	3.400	32	3.400	45	3.400	58	3.400	71	3.400	84	3.400	97	3.400
7	3.400	20	3.400	33	3.400	46	3.400	59	3.400	72	3.400	85	3.400	98	3.400
8	3.400	21	3.400	34	3.400	47	3.400	60	3.400	73	3.400	86	3.400	99	3.400
9	3.400	22	3.400	35	3.400	48	3.400	61	3.400	74	3.400	87	3.400	100	3.400
10	3.400	23	3.400	36	3.400	49	3.400	62	3.400	75	3.400	88	3.400	101	3.400
11	3.400	24	3.400	37	3.400	50	3.400	63	3.400	76	3.400	89	3.400	102	3.400
12	3.400	25	3.400	38	3.400	51	3.400	64	3.400	77	3.400	90	3.400	103	3.400
13	3.400	26	3.400	39	3.400	52	3.400	65	3.400	78	3.400	91	3.400	104	3.400

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
105	3.400	164	3.400	223	3.400	282	3.400	341	3.400	400	3.400	459	3.400	518	3.400
106	3.400	165	3.400	224	3.400	283	3.400	342	3.400	401	3.400	460	3.400	519	3.400
107	3.400	166	3.400	225	3.400	284	3.400	343	3.400	402	3.400	461	3.400	520	3.400
108	3.400	167	3.400	226	3.400	285	3.400	344	3.400	403	3.400	462	3.400	521	3.400
109	3.400	168	3.400	227	3.400	286	3.400	345	3.400	404	3.400	463	3.400	522	3.400
110	3.400	169	3.400	228	3.400	287	3.400	346	3.400	405	3.400	464	3.400	523	3.400
111	3.400	170	3.400	229	3.400	288	3.400	347	3.400	406	3.400	465	3.400	524	3.400
112	3.400	171	3.400	230	3.400	289	3.400	348	3.400	407	3.400	466	3.400	525	3.400
113	3.400	172	3.400	231	3.400	290	3.400	349	3.400	408	3.400	467	3.400	526	3.400
114	3.400	173	3.400	232	3.400	291	3.400	350	3.400	409	3.400	468	3.400	527	3.400
115	3.400	174	3.400	233	3.400	292	3.400	351	3.400	410	3.400	469	3.400	528	3.400
116	3.400	175	3.400	234	3.400	293	3.400	352	3.400	411	3.400	470	3.400	529	3.400
117	3.400	176	3.400	235	3.400	294	3.400	353	3.400	412	3.400	471	3.400	530	3.400
118	3.400	177	3.400	236	3.400	295	3.400	354	3.400	413	3.400	472	3.400	531	3.400
119	3.400	178	3.400	237	3.400	296	3.400	355	3.400	414	3.400	473	3.400	532	3.400
120	3.400	179	3.400	238	3.400	297	3.400	356	3.400	415	3.400	474	3.400	533	3.400
121	3.400	180	3.400	239	3.400	298	3.400	357	3.400	416	3.400	475	3.400	534	3.400
122	3.400	181	3.400	240	3.400	299	3.400	358	3.400	417	3.400	476	3.400	535	3.400
123	3.400	182	3.400	241	3.400	300	3.400	359	3.400	418	3.400	477	3.400	536	3.400
124	3.400	183	3.400	242	3.400	301	3.400	360	3.400	419	3.400	478	3.400	537	3.400
125	3.400	184	3.400	243	3.400	302	3.400	361	3.400	420	3.400	479	3.400	538	3.400
126	3.400	185	3.400	244	3.400	303	3.400	362	3.400	421	3.400	480	3.400	539	3.400
127	3.400	186	3.400	245	3.400	304	3.400	363	3.400	422	3.400	481	3.400	540	3.400
128	3.400	187	3.400	246	3.400	305	3.400	364	3.400	423	3.400	482	3.400	541	3.400
129	3.400	188	3.400	247	3.400	306	3.400	365	3.400	424	3.400	483	3.400	542	3.400
130	3.400	189	3.400	248	3.400	307	3.400	366	3.400	425	3.400	484	3.400	543	3.400
131	3.400	190	3.400	249	3.400	308	3.400	367	3.400	426	3.400	485	3.400	544	3.400
132	3.400	191	3.400	250	3.400	309	3.400	368	3.400	427	3.400	486	3.400	545	3.400
133	3.400	192	3.400	251	3.400	310	3.400	369	3.400	428	3.400	487	3.400	546	3.400
134	3.400	193	3.400	252	3.400	311	3.400	370	3.400	429	3.400	488	3.400	547	3.400
135	3.400	194	3.400	253	3.400	312	3.400	371	3.400	430	3.400	489	3.400	548	3.400
136	3.400	195	3.400	254	3.400	313	3.400	372	3.400	431	3.400	490	3.400	549	3.400
137	3.400	196	3.400	255	3.400	314	3.400	373	3.400	432	3.400	491	3.400	550	3.400
138	3.400	197	3.400	256	3.400	315	3.400	374	3.400	433	3.400	492	3.400	551	3.400
139	3.400	198	3.400	257	3.400	316	3.400	375	3.400	434	3.400	493	3.400	552	3.400
140	3.400	199	3.400	258	3.400	317	3.400	376	3.400	435	3.400	494	3.400	553	3.400
141	3.400	200	3.400	259	3.400	318	3.400	377	3.400	436	3.400	495	3.400	554	3.400
142	3.400	201	3.400	260	3.400	319	3.400	378	3.400	437	3.400	496	3.400	555	3.400
143	3.400	202	3.400	261	3.400	320	3.400	379	3.400	438	3.400	497	3.400	556	3.400
144	3.400	203	3.400	262	3.400	321	3.400	380	3.400	439	3.400	498	3.400	557	3.400
145	3.400	204	3.400	263	3.400	322	3.400	381	3.400	440	3.400	499	3.400	558	3.400
146	3.400	205	3.400	264	3.400	323	3.400	382	3.400	441	3.400	500	3.400	559	3.400
147	3.400	206	3.400	265	3.400	324	3.400	383	3.400	442	3.400	501	3.400	560	3.400
148	3.400	207	3.400	266	3.400	325	3.400	384	3.400	443	3.400	502	3.400	561	3.400
149	3.400	208	3.400	267	3.400	326	3.400	385	3.400	444	3.400	503	3.400	562	3.400
150	3.400	209	3.400	268	3.400	327	3.400	386	3.400	445	3.400	504	3.400	563	3.400
151	3.400	210	3.400	269	3.400	328	3.400	387	3.400	446	3.400	505	3.400	564	3.400
152	3.400	211	3.400	270	3.400	329	3.400	388	3.400	447	3.400	506	3.400	565	3.400
153	3.400	212	3.400	271	3.400	330	3.400	389	3.400	448	3.400	507	3.400	566	3.400
154	3.400	213	3.400	272	3.400	331	3.400	390	3.400	449	3.400	508	3.400	567	3.400
155	3.400	214	3.400	273	3.400	332	3.400	391	3.400	450	3.400	509	3.400	568	3.400
156	3.400	215	3.400	274	3.400	333	3.400	392	3.400	451	3.400	510	3.400	569	3.400
157	3.400	216	3.400	275	3.400	334	3.400	393	3.400	452	3.400	511	3.400	570	3.400
158	3.400	217	3.400	276	3.400	335	3.400	394	3.400	453	3.400	512	3.400	571	3.400
159	3.400	218	3.400	277	3.400	336	3.400	395	3.400	454	3.400	513	3.400	572	3.400
160	3.400	219	3.400	278	3.400	337	3.400	396	3.400	455	3.400	514	3.400	573	3.400
161	3.400	220	3.400	279	3.400	338	3.400	397	3.400	456	3.400	515	3.400	574	3.400
162	3.400	221	3.400	280	3.400	339	3.400	398	3.400	457	3.400	516	3.400	575	3.400
163	3.400	222	3.400	281	3.400	340	3.400	399	3.400	458	3.400	517	3.400	576	3.400

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
577	3.400	636	3.400	695	3.400	754	3.400	813	3.400	872	3.400	931	3.400	990	3.400
578	3.400	637	3.400	696	3.400	755	3.400	814	3.400	873	3.400	932	3.400	991	3.400
579	3.400	638	3.400	697	3.400	756	3.400	815	3.400	874	3.400	933	3.400	992	3.400
580	3.400	639	3.400	698	3.400	757	3.400	816	3.400	875	3.400	934	3.400	993	3.400
581	3.400	640	3.400	699	3.400	758	3.400	817	3.400	876	3.400	935	3.400	994	3.400
582	3.400	641	3.400	700	3.400	759	3.400	818	3.400	877	3.400	936	3.400	995	3.400
583	3.400	642	3.400	701	3.400	760	3.400	819	3.400	878	3.400	937	3.400	996	3.400
584	3.400	643	3.400	702	3.400	761	3.400	820	3.400	879	3.400	938	3.400	997	3.400
585	3.400	644	3.400	703	3.400	762	3.400	821	3.400	880	3.400	939	3.400	998	3.400
586	3.400	645	3.400	704	3.400	763	3.400	822	3.400	881	3.400	940	3.400	999	3.400
587	3.400	646	3.400	705	3.400	764	3.400	823	3.400	882	3.400	941	3.400	1000	3.400
588	3.400	647	3.400	706	3.400	765	3.400	824	3.400	883	3.400	942	3.400	1001	3.400
589	3.400	648	3.400	707	3.400	766	3.400	825	3.400	884	3.400	943	3.400	1002	3.400
590	3.400	649	3.400	708	3.400	767	3.400	826	3.400	885	3.400	944	3.400	1003	3.400
591	3.400	650	3.400	709	3.400	768	3.400	827	3.400	886	3.400	945	3.400	1004	3.400
592	3.400	651	3.400	710	3.400	769	3.400	828	3.400	887	3.400	946	3.400	1005	3.400
593	3.400	652	3.400	711	3.400	770	3.400	829	3.400	888	3.400	947	3.400	1006	3.400
594	3.400	653	3.400	712	3.400	771	3.400	830	3.400	889	3.400	948	3.400	1007	3.400
595	3.400	654	3.400	713	3.400	772	3.400	831	3.400	890	3.400	949	3.400	1008	3.400
596	3.400	655	3.400	714	3.400	773	3.400	832	3.400	891	3.400	950	3.400	1009	3.400
597	3.400	656	3.400	715	3.400	774	3.400	833	3.400	892	3.400	951	3.400	1010	3.400
598	3.400	657	3.400	716	3.400	775	3.400	834	3.400	893	3.400	952	3.400	1011	3.400
599	3.400	658	3.400	717	3.400	776	3.400	835	3.400	894	3.400	953	3.400	1012	3.400
600	3.400	659	3.400	718	3.400	777	3.400	836	3.400	895	3.400	954	3.400	1013	3.400
601	3.400	660	3.400	719	3.400	778	3.400	837	3.400	896	3.400	955	3.400	1014	3.400
602	3.400	661	3.400	720	3.400	779	3.400	838	3.400	897	3.400	956	3.400	1015	3.400
603	3.400	662	3.400	721	3.400	780	3.400	839	3.400	898	3.400	957	3.400	1016	3.400
604	3.400	663	3.400	722	3.400	781	3.400	840	3.400	899	3.400	958	3.400	1017	3.400
605	3.400	664	3.400	723	3.400	782	3.400	841	3.400	900	3.400	959	3.400	1018	3.400
606	3.400	665	3.400	724	3.400	783	3.400	842	3.400	901	3.400	960	3.400	1019	3.400
607	3.400	666	3.400	725	3.400	784	3.400	843	3.400	902	3.400	961	3.400	1020	3.400
608	3.400	667	3.400	726	3.400	785	3.400	844	3.400	903	3.400	962	3.400	1021	3.400
609	3.400	668	3.400	727	3.400	786	3.400	845	3.400	904	3.400	963	3.400	1022	3.400
610	3.400	669	3.400	728	3.400	787	3.400	846	3.400	905	3.400	964	3.400	1023	3.400
611	3.400	670	3.400	729	3.400	788	3.400	847	3.400	906	3.400	965	3.400	1024	3.400
612	3.400	671	3.400	730	3.400	789	3.400	848	3.400	907	3.400	966	3.400	1025	3.400
613	3.400	672	3.400	731	3.400	790	3.400	849	3.400	908	3.400	967	3.400	1026	3.400
614	3.400	673	3.400	732	3.400	791	3.400	850	3.400	909	3.400	968	3.400	1027	3.400
615	3.400	674	3.400	733	3.400	792	3.400	851	3.400	910	3.400	969	3.400	1028	3.400
616	3.400	675	3.400	734	3.400	793	3.400	852	3.400	911	3.400	970	3.400	1029	3.400
617	3.400	676	3.400	735	3.400	794	3.400	853	3.400	912	3.400	971	3.400	1030	3.400
618	3.400	677	3.400	736	3.400	795	3.400	854	3.400	913	3.400	972	3.400	1031	3.400
619	3.400	678	3.400	737	3.400	796	3.400	855	3.400	914	3.400	973	3.400	1032	3.400
620	3.400	679	3.400	738	3.400	797	3.400	856	3.400	915	3.400	974	3.400	1033	3.400
621	3.400	680	3.400	739	3.400	798	3.400	857	3.400	916	3.400	975	3.400	1034	3.400
622	3.400	681	3.400	740	3.400	799	3.400	858	3.400	917	3.400	976	3.400	1035	3.400
623	3.400	682	3.400	741	3.400	800	3.400	859	3.400	918	3.400	977	3.400	1036	3.400
624	3.400	683	3.400	742	3.400	801	3.400	860	3.400	919	3.400	978	3.400	1037	3.400
625	3.400	684	3.400	743	3.400	802	3.400	861	3.400	920	3.400	979	3.400	1038	3.400
626	3.400	685	3.400	744	3.400	803	3.400	862	3.400	921	3.400	980	3.400	1039	3.400
627	3.400	686	3.400	745	3.400	804	3.400	863	3.400	922	3.400	981	3.400	1040	3.400
628	3.400	687	3.400	746	3.400	805	3.400	864	3.400	923	3.400	982	3.400	1041	3.400
629	3.400	688	3.400	747	3.400	806	3.400	865	3.400	924	3.400	983	3.400	1042	3.400
630	3.400	689	3.400	748	3.400	807	3.400	866	3.400	925	3.400	984	3.400	1043	3.400
631	3.400	690	3.400	749	3.400	808	3.400	867	3.400	926	3.400	985	3.400	1044	3.400
632	3.400	691	3.400	750	3.400	809	3.400	868	3.400	927	3.400	986	3.400	1045	3.400
633	3.400	692	3.400	751	3.400	810	3.400	869	3.400	928	3.400	987	3.400	1046	3.400
634	3.400	693	3.400	752	3.400	811	3.400	870	3.400	929	3.400	988	3.400	1047	3.400
635	3.400	694	3.400	753	3.400	812	3.400	871	3.400	930	3.400	989	3.400	1048	3.400

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1049	3.400	1098	3.400	1147	3.400	1196	3.400	1245	3.400	1294	3.400	1343	3.400	1392	3.400
1050	3.400	1099	3.400	1148	3.400	1197	3.400	1246	3.400	1295	3.400	1344	3.400	1393	3.400
1051	3.400	1100	3.400	1149	3.400	1198	3.400	1247	3.400	1296	3.400	1345	3.400	1394	3.400
1052	3.400	1101	3.400	1150	3.400	1199	3.400	1248	3.400	1297	3.400	1346	3.400	1395	3.400
1053	3.400	1102	3.400	1151	3.400	1200	3.400	1249	3.400	1298	3.400	1347	3.400	1396	3.400
1054	3.400	1103	3.400	1152	3.400	1201	3.400	1250	3.400	1299	3.400	1348	3.400	1397	3.400
1055	3.400	1104	3.400	1153	3.400	1202	3.400	1251	3.400	1300	3.400	1349	3.400	1398	3.400
1056	3.400	1105	3.400	1154	3.400	1203	3.400	1252	3.400	1301	3.400	1350	3.400	1399	3.400
1057	3.400	1106	3.400	1155	3.400	1204	3.400	1253	3.400	1302	3.400	1351	3.400	1400	3.400
1058	3.400	1107	3.400	1156	3.400	1205	3.400	1254	3.400	1303	3.400	1352	3.400	1401	3.400
1059	3.400	1108	3.400	1157	3.400	1206	3.400	1255	3.400	1304	3.400	1353	3.400	1402	3.400
1060	3.400	1109	3.400	1158	3.400	1207	3.400	1256	3.400	1305	3.400	1354	3.400	1403	3.400
1061	3.400	1110	3.400	1159	3.400	1208	3.400	1257	3.400	1306	3.400	1355	3.400	1404	3.400
1062	3.400	1111	3.400	1160	3.400	1209	3.400	1258	3.400	1307	3.400	1356	3.400	1405	3.400
1063	3.400	1112	3.400	1161	3.400	1210	3.400	1259	3.400	1308	3.400	1357	3.400	1406	3.400
1064	3.400	1113	3.400	1162	3.400	1211	3.400	1260	3.400	1309	3.400	1358	3.400	1407	3.400
1065	3.400	1114	3.400	1163	3.400	1212	3.400	1261	3.400	1310	3.400	1359	3.400	1408	3.400
1066	3.400	1115	3.400	1164	3.400	1213	3.400	1262	3.400	1311	3.400	1360	3.400	1409	3.400
1067	3.400	1116	3.400	1165	3.400	1214	3.400	1263	3.400	1312	3.400	1361	3.400	1410	3.400
1068	3.400	1117	3.400	1166	3.400	1215	3.400	1264	3.400	1313	3.400	1362	3.400	1411	3.400
1069	3.400	1118	3.400	1167	3.400	1216	3.400	1265	3.400	1314	3.400	1363	3.400	1412	3.400
1070	3.400	1119	3.400	1168	3.400	1217	3.400	1266	3.400	1315	3.400	1364	3.400	1413	3.400
1071	3.400	1120	3.400	1169	3.400	1218	3.400	1267	3.400	1316	3.400	1365	3.400	1414	3.400
1072	3.400	1121	3.400	1170	3.400	1219	3.400	1268	3.400	1317	3.400	1366	3.400	1415	3.400
1073	3.400	1122	3.400	1171	3.400	1220	3.400	1269	3.400	1318	3.400	1367	3.400	1416	3.400
1074	3.400	1123	3.400	1172	3.400	1221	3.400	1270	3.400	1319	3.400	1368	3.400	1417	3.400
1075	3.400	1124	3.400	1173	3.400	1222	3.400	1271	3.400	1320	3.400	1369	3.400	1418	3.400
1076	3.400	1125	3.400	1174	3.400	1223	3.400	1272	3.400	1321	3.400	1370	3.400	1419	3.400
1077	3.400	1126	3.400	1175	3.400	1224	3.400	1273	3.400	1322	3.400	1371	3.400	1420	3.400
1078	3.400	1127	3.400	1176	3.400	1225	3.400	1274	3.400	1323	3.400	1372	3.400	1421	3.400
1079	3.400	1128	3.400	1177	3.400	1226	3.400	1275	3.400	1324	3.400	1373	3.400	1422	3.400
1080	3.400	1129	3.400	1178	3.400	1227	3.400	1276	3.400	1325	3.400	1374	3.400	1423	3.400
1081	3.400	1130	3.400	1179	3.400	1228	3.400	1277	3.400	1326	3.400	1375	3.400	1424	3.400
1082	3.400	1131	3.400	1180	3.400	1229	3.400	1278	3.400	1327	3.400	1376	3.400	1425	3.400
1083	3.400	1132	3.400	1181	3.400	1230	3.400	1279	3.400	1328	3.400	1377	3.400	1426	3.400
1084	3.400	1133	3.400	1182	3.400	1231	3.400	1280	3.400	1329	3.400	1378	3.400	1427	3.400
1085	3.400	1134	3.400	1183	3.400	1232	3.400	1281	3.400	1330	3.400	1379	3.400	1428	3.400
1086	3.400	1135	3.400	1184	3.400	1233	3.400	1282	3.400	1331	3.400	1380	3.400	1429	3.400
1087	3.400	1136	3.400	1185	3.400	1234	3.400	1283	3.400	1332	3.400	1381	3.400	1430	3.400
1088	3.400	1137	3.400	1186	3.400	1235	3.400	1284	3.400	1333	3.400	1382	3.400	1431	3.400
1089	3.400	1138	3.400	1187	3.400	1236	3.400	1285	3.400	1334	3.400	1383	3.400	1432	3.400
1090	3.400	1139	3.400	1188	3.400	1237	3.400	1286	3.400	1335	3.400	1384	3.400	1433	3.400
1091	3.400	1140	3.400	1189	3.400	1238	3.400	1287	3.400	1336	3.400	1385	3.400	1434	3.400
1092	3.400	1141	3.400	1190	3.400	1239	3.400	1288	3.400	1337	3.400	1386	3.400	1435	3.400
1093	3.400	1142	3.400	1191	3.400	1240	3.400	1289	3.400	1338	3.400	1387	3.400	1436	3.400
1094	3.400	1143	3.400	1192	3.400	1241	3.400	1290	3.400	1339	3.400	1388	3.400	1437	3.400
1095	3.400	1144	3.400	1193	3.400	1242	3.400	1291	3.400	1340	3.400	1389	3.400	1438	3.400
1096	3.400	1145	3.400	1194	3.400	1243	3.400	1292	3.400	1341	3.400	1390	3.400	1439	3.400
1097	3.400	1146	3.400	1195	3.400	1244	3.400	1293	3.400	1342	3.400	1391	3.400	1440	3.400

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Simulation Criteria for SW Net01

Volumetric Runoff Coeff	0.750	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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

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Online Controls for SW Net01

Hydro-Brake® Optimum Manhole: S2.18, DS/PN: S1.005, Volume (m³): 34.0

Unit Reference	MD-SHE-0193-2310-2300-2310
Design Head (m)	2.300
Design Flow (l/s)	23.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	193
Invert Level (m)	28.349
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	23.1	Kick-Flo®	1.404	18.2
Flush-Flo™	0.671	23.1	Mean Flow over Head Range	-	20.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	0.800	22.9	2.000	21.6	4.000	30.1	7.000	39.4
0.200	17.8	1.000	22.3	2.200	22.6	4.500	31.9	7.500	40.8
0.300	20.7	1.200	21.0	2.400	23.6	5.000	33.5	8.000	42.0
0.400	22.0	1.400	18.4	2.600	24.5	5.500	35.1	8.500	43.3
0.500	22.7	1.600	19.4	3.000	26.2	6.000	36.6	9.000	44.5
0.600	23.0	1.800	20.5	3.500	28.2	6.500	38.0	9.500	45.7

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Storage Structures for SW Net01

Porous Car Park Pipe: S6.000

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	44.7
Membrane Percolation (mm/hr)	10000	Slope (1:X)	20.4
Max Percolation (l/s)	558.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	36.985		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.001

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	20.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	29.6
Max Percolation (l/s)	254.9	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.945		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.002

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	12.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	56.3
Max Percolation (l/s)	154.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.255		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.003

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	13.9
Membrane Percolation (mm/hr)	10000	Slope (1:X)	21.4
Max Percolation (l/s)	173.5	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.935		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

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Porous Car Park Pipe: S6.004

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	36.1
Membrane Percolation (mm/hr)	10000	Slope (1:X)	27.8
Max Percolation (l/s)	451.6	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.385		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.005

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	27.7
Membrane Percolation (mm/hr)	10000	Slope (1:X)	22.1
Max Percolation (l/s)	345.7	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	32.085		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Cellular Storage Manhole: STANK, DS/PN: S8.000

Invert Level (m)	28.800	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)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	91.3	91.3	1.840	91.3	171.5	1.841	0.0	171.5

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 18.000	Cv (Summer) 0.750
Region	England and Wales	Ratio R 0.358	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	2	+0%	100/15 Summer				32.362	-0.088
S1.001	S2.01	15 Summer	2	+0%	100/15 Summer				32.237	-0.089
S1.002	S2.02	15 Winter	2	+0%	100/15 Summer				32.075	-0.084
S2.000	S2.03	15 Winter	2	+0%					32.202	-0.135
S1.003	S2.04	15 Winter	2	+0%					31.560	-0.097
S1.004	S2.05	2160 Winter	2	+0%	2/15 Summer				29.764	0.989
S3.000	S2.06	15 Winter	2	+0%					33.174	-0.106
S3.001	S2.07	15 Summer	2	+0%					32.837	-0.116
S3.002	S2.08	15 Winter	2	+0%					32.288	-0.167
S3.003	S2.09	15 Winter	2	+0%					32.000	-0.183
S4.000	S2.10	15 Summer	2	+0%					31.000	-0.225
S4.001	S2.11	15 Summer	2	+0%					30.964	-0.225
S3.004	S2.12	15 Winter	2	+0%					30.952	-0.173
S3.005	S2.13	2160 Winter	2	+0%	2/30 Winter				29.764	0.494
S5.000	S2.14	2160 Winter	2	+0%	2/15 Summer				29.764	0.918
S6.000	S3.00	15 Winter	2	+0%					37.013	-0.437
S7.000	S3.01	15 Winter	2	+0%					35.050	-0.115
S6.001	S3.02	15 Winter	2	+0%					34.985	-0.425
S6.002	S3.03	15 Winter	2	+0%					34.306	-0.414
S6.003	S2.15	15 Winter	2	+0%					33.976	-0.424
S6.004	S2.16	15 Winter	2	+0%					33.436	-0.414
S6.005	S2.17	15 Winter	2	+0%					32.137	-0.413
S8.000	STANK	2160 Winter	2	+0%	2/120 Summer				29.764	0.514
S1.005	S2.18	2160 Winter	2	+0%	2/15 Summer				29.764	1.190
S1.006	S5.05	1440 Winter	2	+0%	2/15 Summer				29.742	1.760
S1.007	S5.06	1440 Winter	2	+0%	2/15 Summer				29.741	1.931
S1.008	S5.07	1440 Winter	2	+0%	2/15 Summer	30/240 Winter			29.739	2.109
S1.009	S5.08	1440 Winter	2	+0%	2/15 Summer	2/480 Winter			29.739	2.162

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.36			6.3	OK	
S1.001	S2.01	0.000	0.35			6.4	OK	
S1.002	S2.02	0.000	0.40			8.7	OK	
S2.000	S2.03	0.000	0.02			1.2	OK	
S1.003	S2.04	0.000	0.27			9.8	OK	
S1.004	S2.05	0.000	0.02			1.1	SURCHARGED	
S3.000	S2.06	0.000	0.19			4.8	OK	
S3.001	S2.07	0.000	0.12			4.8	OK	
S3.002	S2.08	0.000	0.15			10.4	OK	
S3.003	S2.09	0.000	0.08			10.3	OK	
S4.000	S2.10	0.000	0.00			0.0	OK	
S4.001	S2.11	0.000	0.00			0.0	OK	
S3.004	S2.12	0.000	0.12			11.7	OK	
S3.005	S2.13	0.000	0.00			1.5	SURCHARGED	
S5.000	S2.14	0.000	0.01			2.4	SURCHARGED	
S6.000	S3.00	0.000	0.02		5	12.7	OK	
S7.000	S3.01	0.000	0.12			1.8	OK	
S6.001	S3.02	0.000	0.03		10	18.4	OK	
S6.002	S3.03	0.000	0.04		6	20.1	OK	
S6.003	S2.15	0.000	0.03		6	22.9	OK	
S6.004	S2.16	0.000	0.04		10	28.8	OK	
S6.005	S2.17	0.000	0.04		7	33.5	OK	
S8.000	STANK	0.000	0.06		101	17.8	SURCHARGED*	
S1.005	S2.18	0.000	0.23			22.9	SURCHARGED	
S1.006	S5.05	0.000	1.09			34.0	SURCHARGED	
S1.007	S5.06	0.000	1.20			37.4	SURCHARGED	
S1.008	S5.07	0.000	1.48			42.1	FLOOD RISK	40
S1.009	S5.08	38.917	8.41			207.3	FLOOD	61

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	30	+0%	100/15 Summer				32.391	-0.059
S1.001	S2.01	15 Summer	30	+0%	100/15 Summer				32.265	-0.060
S1.002	S2.02	15 Summer	30	+0%	100/15 Summer				32.113	-0.046
S2.000	S2.03	15 Winter	30	+0%					32.207	-0.130
S1.003	S2.04	15 Winter	30	+0%					31.586	-0.071
S1.004	S2.05	480 Winter	30	+0%	2/15 Summer				29.940	1.165
S3.000	S2.06	15 Winter	30	+0%					33.192	-0.088
S3.001	S2.07	15 Winter	30	+0%					32.851	-0.102
S3.002	S2.08	15 Summer	30	+0%					32.318	-0.137
S3.003	S2.09	15 Summer	30	+0%					32.020	-0.163
S4.000	S2.10	15 Summer	30	+0%					31.000	-0.225
S4.001	S2.11	15 Winter	30	+0%					30.973	-0.216
S3.004	S2.12	15 Summer	30	+0%					30.978	-0.147
S3.005	S2.13	480 Winter	30	+0%	2/30 Winter				29.940	0.670
S5.000	S2.14	480 Winter	30	+0%	2/15 Summer				29.939	1.093
S6.000	S3.00	15 Winter	30	+0%					37.026	-0.424
S7.000	S3.01	15 Winter	30	+0%					35.063	-0.102
S6.001	S3.02	15 Summer	30	+0%					35.005	-0.405
S6.002	S3.03	15 Winter	30	+0%					34.330	-0.390
S6.003	S2.15	15 Winter	30	+0%					33.997	-0.403
S6.004	S2.16	15 Winter	30	+0%					33.463	-0.387
S6.005	S2.17	15 Winter	30	+0%					32.166	-0.384
S8.000	STANK	480 Winter	30	+0%	2/120 Summer				29.939	0.689
S1.005	S2.18	480 Winter	30	+0%	2/15 Summer				29.939	1.365
S1.006	S5.05	480 Winter	30	+0%	2/15 Summer				29.807	1.825
S1.007	S5.06	1440 Winter	30	+0%	2/15 Summer				29.802	1.992
S1.008	S5.07	1440 Winter	30	+0%	2/15 Summer	30/240 Winter			29.800	2.170

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.68			12.0	OK	
S1.001	S2.01	0.000	0.66			12.0	OK	
S1.002	S2.02	0.000	0.81			17.8	OK	
S2.000	S2.03	0.000	0.04			2.2	OK	
S1.003	S2.04	0.000	0.54			19.8	OK	
S1.004	S2.05	0.000	0.03			2.1	SURCHARGED	
S3.000	S2.06	0.000	0.36			9.1	OK	
S3.001	S2.07	0.000	0.23			9.1	OK	
S3.002	S2.08	0.000	0.32			22.4	OK	
S3.003	S2.09	0.000	0.17			22.4	OK	
S4.000	S2.10	0.000	0.00			0.0	OK	
S4.001	S2.11	0.000	0.00			0.0	OK	
S3.004	S2.12	0.000	0.26			25.8	OK	
S3.005	S2.13	0.000	0.02			5.9	SURCHARGED	
S5.000	S2.14	0.000	0.00			0.4	SURCHARGED	
S6.000	S3.00	0.000	0.03		5	24.0	OK	
S7.000	S3.01	0.000	0.23			3.5	OK	
S6.001	S3.02	0.000	0.06		8	36.2	OK	
S6.002	S3.03	0.000	0.09		6	39.5	OK	
S6.003	S2.15	0.000	0.06		6	45.1	OK	
S6.004	S2.16	0.000	0.09		8	58.4	OK	
S6.005	S2.17	0.000	0.09		6	67.8	OK	
S8.000	STANK	0.000	0.01			1.8	SURCHARGED*	
S1.005	S2.18	0.000	0.10			10.4	SURCHARGED	
S1.006	S5.05	0.000	0.33			10.3	SURCHARGED	
S1.007	S5.06	0.000	1.24			38.7	SURCHARGED	
S1.008	S5.07	49.876	4.88			138.4	FLOOD	40

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.009	S5.08	1440 Winter	30	+0%	2/15 Summer	2/480 Winter			29.799	2.223

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.009	S5.08	99.225	8.53			210.2	FLOOD	61

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	100	+45%	100/15 Summer				32.837	0.387
S1.001	S2.01	15 Winter	100	+45%	100/15 Summer				32.683	0.357
S1.002	S2.02	15 Winter	100	+45%	100/15 Summer				32.500	0.341
S2.000	S2.03	15 Winter	100	+45%					32.215	-0.122
S1.003	S2.04	15 Winter	100	+45%					31.615	-0.042
S1.004	S2.05	180 Winter	100	+45%	2/15 Summer				30.863	2.088
S3.000	S2.06	15 Winter	100	+45%					33.219	-0.061
S3.001	S2.07	15 Winter	100	+45%					32.871	-0.082
S3.002	S2.08	15 Summer	100	+45%					32.356	-0.099
S3.003	S2.09	15 Summer	100	+45%					32.045	-0.138
S4.000	S2.10	15 Winter	100	+45%					31.005	-0.220
S4.001	S2.11	15 Summer	100	+45%					31.011	-0.178
S3.004	S2.12	15 Summer	100	+45%					31.011	-0.114
S3.005	S2.13	180 Winter	100	+45%	2/30 Winter				30.864	1.594
S5.000	S2.14	180 Winter	100	+45%	2/15 Summer				30.860	2.014
S6.000	S3.00	15 Winter	100	+45%					37.045	-0.405
S7.000	S3.01	15 Winter	100	+45%					35.083	-0.082
S6.001	S3.02	15 Summer	100	+45%					35.033	-0.377
S6.002	S3.03	15 Winter	100	+45%					34.365	-0.355
S6.003	S2.15	15 Winter	100	+45%					34.026	-0.374
S6.004	S2.16	15 Winter	100	+45%					33.499	-0.351
S6.005	S2.17	15 Winter	100	+45%					32.203	-0.347
S8.000	STANK	180 Winter	100	+45%	2/120 Summer				30.860	1.610
S1.005	S2.18	180 Winter	100	+45%	2/15 Summer				30.860	2.286
S1.006	S5.05	360 Winter	100	+45%	2/15 Summer				29.983	2.001
S1.007	S5.06	1440 Winter	100	+45%	2/15 Summer				29.915	2.105
S1.008	S5.07	1440 Winter	100	+45%	2/15 Summer	30/240 Winter			29.911	2.281

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	1.16			20.4	SURCHARGED	
S1.001	S2.01	0.000	1.07			19.5	SURCHARGED	
S1.002	S2.02	0.000	1.28			28.3	SURCHARGED	
S2.000	S2.03	0.000	0.08			4.1	OK	
S1.003	S2.04	0.000	0.86			31.9	OK	
S1.004	S2.05	0.000	0.14			8.6	SURCHARGED	
S3.000	S2.06	0.000	0.66			17.1	OK	
S3.001	S2.07	0.000	0.42			17.1	OK	
S3.002	S2.08	0.000	0.60			41.9	OK	
S3.003	S2.09	0.000	0.32			41.9	OK	
S4.000	S2.10	0.000	0.00			0.0	OK	
S4.001	S2.11	0.000	0.01			0.2	OK	
S3.004	S2.12	0.000	0.49			48.2	OK	
S3.005	S2.13	0.000	0.07			23.3	FLOOD RISK	
S5.000	S2.14	0.000	0.01			1.9	SURCHARGED	
S6.000	S3.00	0.000	0.06		5	44.8	OK	
S7.000	S3.01	0.000	0.43			6.5	OK	
S6.001	S3.02	0.000	0.11		6	68.1	OK	
S6.002	S3.03	0.000	0.16		6	74.1	OK	
S6.003	S2.15	0.000	0.11		5	84.6	OK	
S6.004	S2.16	0.000	0.16		7	109.6	OK	
S6.005	S2.17	0.000	0.17		6	126.7	OK	
S8.000	STANK	0.000	0.07			18.8	SURCHARGED*	
S1.005	S2.18	0.000	0.23			23.0	SURCHARGED	
S1.006	S5.05	0.000	0.74			22.9	SURCHARGED	
S1.007	S5.06	0.000	1.31			40.8	SURCHARGED	
S1.008	S5.07	160.721	4.95			140.4	FLOOD	40

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.009	S5.08	1440 Winter	100	+45%	2/15 Summer	2/480 Winter			29.910	2.333

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.009	S5.08	209.520	8.74			215.3	FLOOD	61

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APPENDIX H – SW Calcs 100year +35% Surcharged Outfall

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	9.969	0.125	80.0	0.038	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	13.294	0.166	80.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.002	30.138	0.502	60.0	0.019	0.00	0.0	0.600		o	150	Pipe/Conduit	
S2.000	4.914	0.680	7.2	0.007	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	22.601	1.076	21.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.004	5.733	0.201	28.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.000	13.082	0.327	40.0	0.029	4.00	0.0	0.600		o	150	Pipe/Conduit	
S3.001	7.053	0.498	14.2	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S3.002	10.873	0.272	40.0	0.042	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.003	12.149	1.058	11.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S4.000	2.174	0.036	60.4	0.000	4.00	0.0	0.600		o	225	Pipe/Conduit	
S4.001	4.197	0.064	65.6	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.004	31.350	1.280	24.5	0.011	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.005	28.271	0.471	60.0	0.098	0.00	0.0	0.600		o	450	Pipe/Conduit	
S5.000	6.978	0.047	148.5	0.016	4.00	0.0	0.600		o	450	Pipe/Conduit	
S6.000	44.701	2.190	20.4	0.076	4.00	0.0		0.030	→|↓|→		Porous Car Park	
S7.000	7.001	0.070	100.0	0.011	4.00	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)
S1.000	64.23	4.15	32.300	0.038	0.0	0.0	0.0	1.12	19.9	6.6
S1.001	63.12	4.34	32.175	0.038	0.0	0.0	0.0	1.12	19.9	6.6
S1.002	61.06	4.73	32.009	0.057	0.0	0.0	0.0	1.30	23.0	9.4
S2.000	64.96	4.02	32.187	0.007	0.0	0.0	0.0	3.77	66.7	1.2
S1.003	60.20	4.90	31.507	0.064	0.0	0.0	0.0	2.21	39.0	10.4
S1.004	60.01	4.94	28.550	0.064	0.0	0.0	0.0	2.46	97.8	10.4
S3.000	64.29	4.14	33.130	0.029	0.0	0.0	0.0	1.60	28.2	5.0
S3.001	64.04	4.18	32.803	0.029	0.0	0.0	0.0	2.69	47.6	5.0
S3.002	63.55	4.27	32.230	0.071	0.0	0.0	0.0	2.08	82.5	12.2
S3.003	63.25	4.32	31.958	0.071	0.0	0.0	0.0	3.88	154.4	12.2
S4.000	64.97	4.02	31.000	0.000	0.0	0.0	0.0	1.69	67.0	0.0
S4.001	64.71	4.06	30.964	0.000	0.0	0.0	0.0	1.62	64.3	0.0
S3.004	62.18	4.52	30.900	0.082	0.0	0.0	0.0	2.65	105.6	13.8
S3.005	61.24	4.70	28.820	0.180	0.0	0.0	0.0	2.63	418.0	29.9
S5.000	64.68	4.07	28.396	0.016	0.0	0.0	0.0	1.67	265.0	2.8
S6.000	61.64	4.62	36.985	0.076	0.0	0.0	0.0	1.21	790.1	12.7
S7.000	64.41	4.12	35.015	0.011	0.0	0.0	0.0	1.00	17.8	1.9

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.001	20.393	0.690	29.6	0.032	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.002	12.387	0.220	56.3	0.013	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.003	13.882	0.650	21.4	0.023	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.004	36.129	1.300	27.8	0.050	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.005	27.655	1.250	22.1	0.047	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S8.000	6.994	0.451	15.5	0.000	4.00	0.0		0.030	o	450	Pipe/Conduit	
S1.005	11.186	0.592	18.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.006	43.052	0.172	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.007	44.900	0.180	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.008	13.385	0.054	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.009	4.402	0.018	250.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S6.001	59.93	4.96	34.945	0.119	0.0	0.0	0.0	1.00	656.6	19.3
S6.002	58.57	5.24	34.255	0.132	0.0	0.0	0.0	0.73	475.7	20.9
S6.003	57.68	5.44	33.935	0.155	0.0	0.0	0.0	1.18	772.4	24.2
S6.004	55.20	6.02	33.385	0.205	0.0	0.0	0.0	1.03	677.1	30.6
S6.005	53.65	6.42	32.085	0.252	0.0	0.0	0.0	1.16	758.9	36.6
S8.000	64.74	4.06	28.800	0.000	0.0	0.0	0.0	1.97	313.7	0.0
S1.005	64.73	4.06	28.349	0.000	24.5	0.0	0.0	3.02	120.3	24.5
S1.006	60.04	4.93	27.757	0.000	24.5	0.0	0.0	0.82	32.7	24.5
S1.007	55.93	5.84	27.585	0.000	24.5	0.0	0.0	0.82	32.7	24.5
S1.008	54.83	6.12	27.405	0.000	24.5	0.0	0.0	0.82	32.7	24.5
S1.009	54.48	6.20	27.352	0.000	24.5	0.0	0.0	0.82	32.7	24.5

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Manhole Schedules for SW Net01

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S2.00	34.150	1.850	Open Manhole	450	S1.000	32.300	150				
S2.01	34.170	1.995	Open Manhole	1200	S1.001	32.175	150	S1.000	32.175	150	
S2.02	33.760	1.751	Open Manhole	450	S1.002	32.009	150	S1.001	32.009	150	
S2.03	33.187	1.000	Open Manhole	450	S2.000	32.187	150				
S2.04	32.680	1.173	Open Manhole	1200	S1.003	31.507	150	S1.002	31.507	150	
								S2.000	31.507	150	
S2.05	31.630	3.080	Open Manhole	1200	S1.004	28.550	225	S1.003	30.431	150	1806
S2.06	34.130	1.000	Open Manhole	600	S3.000	33.130	150				
S2.07	34.110	1.307	Open Manhole	600	S3.001	32.803	150	S3.000	32.803	150	
S2.08	33.750	1.520	Open Manhole	600	S3.002	32.230	225	S3.001	32.305	150	
S2.09	33.750	1.792	Open Manhole	600	S3.003	31.958	225	S3.002	31.958	225	
S2.10	32.190	1.190	Open Manhole	600	S4.000	31.000	225				
S2.11	32.190	1.226	Open Manhole	600	S4.001	30.964	225	S4.000	30.964	225	
S2.12	32.160	1.260	Open Manhole	600	S3.004	30.900	225	S3.003	30.900	225	
								S4.001	30.900	225	
S2.13	30.875	2.055	Open Manhole	1800	S3.005	28.820	450	S3.004	29.620	225	575
S2.14	31.630	3.234	Open Manhole	1800	S5.000	28.396	450				
S3.00	37.600	0.615	Open Manhole	600	S6.000	36.985					
S3.01	35.535	0.520	Open Manhole	450	S7.000	35.015	150				
S3.02	35.560	0.765	Open Manhole	600	S6.001	34.945		S6.000	34.795		
								S7.000	34.945	150	
S3.03	34.870	0.615	Open Manhole	600	S6.002	34.255		S6.001	34.255		
S2.15	34.550	0.615	Open Manhole	600	S6.003	33.935		S6.002	34.035		100
S2.16	34.000	0.715	Open Manhole	600	S6.004	33.385		S6.003	33.285		
S2.17	32.700	0.615	Open Manhole	600	S6.005	32.085		S6.004	32.085		
STANK	31.754	2.954	Sealed Manhole	1800	S8.000	28.800	450				
S2.18	31.470	3.121	Open Manhole	2100	S1.005	28.349	225	S1.004	28.349	225	
								S3.005	28.349	450	
								S5.000	28.349	450	
								S6.005	30.835		2726
								S8.000	28.349	450	
S5.05	31.250	3.493	Open Manhole	1350	S1.006	27.757	225	S1.005	27.757	225	
S5.06	30.350	2.765	Open Manhole	1350	S1.007	27.585	225	S1.006	27.585	225	
S5.07	29.750	2.345	Open Manhole	1200	S1.008	27.405	225	S1.007	27.405	225	
S5.08	29.700	2.348	Open Manhole	1350	S1.009	27.352	225	S1.008	27.352	225	
S	30.200	2.866	Open Manhole	0		OUTFALL		S1.009	27.334	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.00	384628.547	399391.096	384628.547	399391.096	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.01	384635.818	399397.917	384635.818	399397.917	Required	
S2.02	384626.734	399407.623	384626.734	399407.623	Required	
S2.03	384604.255	399425.092	384604.255	399425.092	Required	
S2.04	384606.142	399429.629	384606.142	399429.629	Required	
S2.05	384595.496	399449.566	384595.496	399449.566	Required	
S2.06	384607.456	399377.956	384607.456	399377.956	Required	
S2.07	384598.517	399387.508	384598.517	399387.508	Required	
S2.08	384597.387	399394.470	384597.387	399394.470	Required	
S2.09	384589.955	399402.407	384589.955	399402.407	Required	
S2.10	384591.681	399412.496	384591.681	399412.496	Required	
S2.11	384589.804	399411.400	384589.804	399411.400	Required	
S2.12	384586.568	399414.074	384586.568	399414.074	Required	
S2.13	384571.730	399441.690	384571.730	399441.690	Required	
S2.14	384602.695	399458.532	384602.695	399458.532	Required	
S3.00	384719.304	399422.990	384719.304	399422.990	Required	
S3.01	384681.034	399398.869	384681.034	399398.869	Required	
S3.02	384678.255	399405.294	384678.255	399405.294	Required	
S3.03	384659.530	399397.214	384659.530	399397.214	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.15	384647.251	399398.840	384647.251	399398.840	Required	
S2.16	384634.684	399404.738	384634.684	399404.738	Required	
S2.17	384609.764	399430.897	384609.764	399430.897	Required	
STANK	384601.360	399450.106			No Entry	
S2.18	384596.565	399455.198	384596.565	399455.198	Required	
S5.05	384591.210	399465.019	384591.210	399465.019	Required	
S5.06	384553.441	399444.356	384553.441	399444.356	Required	
S5.07	384514.464	399422.066	384514.464	399422.066	Required	
S5.08	384506.391	399411.390	384506.391	399411.390	Required	
S	384502.691	399413.776			No Entry	

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Area Summary for SW Net01

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.038	0.038	0.038
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.019	0.019	0.019
2.000	-	-	100	0.007	0.007	0.007
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.029	0.029	0.029
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.042	0.042	0.042
3.003	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.000	0.000	0.000
4.001	-	-	100	0.000	0.000	0.000
3.004	-	-	100	0.011	0.011	0.011
3.005	-	-	100	0.098	0.098	0.098
5.000	-	-	100	0.016	0.016	0.016
6.000	-	-	100	0.076	0.076	0.076
7.000	-	-	100	0.011	0.011	0.011
6.001	-	-	100	0.032	0.032	0.032
6.002	-	-	100	0.013	0.013	0.013
6.003	-	-	100	0.023	0.023	0.023
6.004	-	-	100	0.050	0.050	0.050
6.005	-	-	100	0.047	0.047	0.047
8.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.512	0.512	0.512

Surcharged Outfall Details for SW Net01

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	30.200	27.334	0.000	0	0

Datum (m) 27.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	3.880	14	3.880	27	3.880	40	3.880	53	3.880	66	3.880	79	3.880	92	3.880
2	3.880	15	3.880	28	3.880	41	3.880	54	3.880	67	3.880	80	3.880	93	3.880
3	3.880	16	3.880	29	3.880	42	3.880	55	3.880	68	3.880	81	3.880	94	3.880
4	3.880	17	3.880	30	3.880	43	3.880	56	3.880	69	3.880	82	3.880	95	3.880
5	3.880	18	3.880	31	3.880	44	3.880	57	3.880	70	3.880	83	3.880	96	3.880
6	3.880	19	3.880	32	3.880	45	3.880	58	3.880	71	3.880	84	3.880	97	3.880
7	3.880	20	3.880	33	3.880	46	3.880	59	3.880	72	3.880	85	3.880	98	3.880
8	3.880	21	3.880	34	3.880	47	3.880	60	3.880	73	3.880	86	3.880	99	3.880
9	3.880	22	3.880	35	3.880	48	3.880	61	3.880	74	3.880	87	3.880	100	3.880
10	3.880	23	3.880	36	3.880	49	3.880	62	3.880	75	3.880	88	3.880	101	3.880
11	3.880	24	3.880	37	3.880	50	3.880	63	3.880	76	3.880	89	3.880	102	3.880
12	3.880	25	3.880	38	3.880	51	3.880	64	3.880	77	3.880	90	3.880	103	3.880
13	3.880	26	3.880	39	3.880	52	3.880	65	3.880	78	3.880	91	3.880	104	3.880

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
105	3.880	164	3.880	223	3.880	282	3.880	341	3.880	400	3.880	459	3.880	518	3.880
106	3.880	165	3.880	224	3.880	283	3.880	342	3.880	401	3.880	460	3.880	519	3.880
107	3.880	166	3.880	225	3.880	284	3.880	343	3.880	402	3.880	461	3.880	520	3.880
108	3.880	167	3.880	226	3.880	285	3.880	344	3.880	403	3.880	462	3.880	521	3.880
109	3.880	168	3.880	227	3.880	286	3.880	345	3.880	404	3.880	463	3.880	522	3.880
110	3.880	169	3.880	228	3.880	287	3.880	346	3.880	405	3.880	464	3.880	523	3.880
111	3.880	170	3.880	229	3.880	288	3.880	347	3.880	406	3.880	465	3.880	524	3.880
112	3.880	171	3.880	230	3.880	289	3.880	348	3.880	407	3.880	466	3.880	525	3.880
113	3.880	172	3.880	231	3.880	290	3.880	349	3.880	408	3.880	467	3.880	526	3.880
114	3.880	173	3.880	232	3.880	291	3.880	350	3.880	409	3.880	468	3.880	527	3.880
115	3.880	174	3.880	233	3.880	292	3.880	351	3.880	410	3.880	469	3.880	528	3.880
116	3.880	175	3.880	234	3.880	293	3.880	352	3.880	411	3.880	470	3.880	529	3.880
117	3.880	176	3.880	235	3.880	294	3.880	353	3.880	412	3.880	471	3.880	530	3.880
118	3.880	177	3.880	236	3.880	295	3.880	354	3.880	413	3.880	472	3.880	531	3.880
119	3.880	178	3.880	237	3.880	296	3.880	355	3.880	414	3.880	473	3.880	532	3.880
120	3.880	179	3.880	238	3.880	297	3.880	356	3.880	415	3.880	474	3.880	533	3.880
121	3.880	180	3.880	239	3.880	298	3.880	357	3.880	416	3.880	475	3.880	534	3.880
122	3.880	181	3.880	240	3.880	299	3.880	358	3.880	417	3.880	476	3.880	535	3.880
123	3.880	182	3.880	241	3.880	300	3.880	359	3.880	418	3.880	477	3.880	536	3.880
124	3.880	183	3.880	242	3.880	301	3.880	360	3.880	419	3.880	478	3.880	537	3.880
125	3.880	184	3.880	243	3.880	302	3.880	361	3.880	420	3.880	479	3.880	538	3.880
126	3.880	185	3.880	244	3.880	303	3.880	362	3.880	421	3.880	480	3.880	539	3.880
127	3.880	186	3.880	245	3.880	304	3.880	363	3.880	422	3.880	481	3.880	540	3.880
128	3.880	187	3.880	246	3.880	305	3.880	364	3.880	423	3.880	482	3.880	541	3.880
129	3.880	188	3.880	247	3.880	306	3.880	365	3.880	424	3.880	483	3.880	542	3.880
130	3.880	189	3.880	248	3.880	307	3.880	366	3.880	425	3.880	484	3.880	543	3.880
131	3.880	190	3.880	249	3.880	308	3.880	367	3.880	426	3.880	485	3.880	544	3.880
132	3.880	191	3.880	250	3.880	309	3.880	368	3.880	427	3.880	486	3.880	545	3.880
133	3.880	192	3.880	251	3.880	310	3.880	369	3.880	428	3.880	487	3.880	546	3.880
134	3.880	193	3.880	252	3.880	311	3.880	370	3.880	429	3.880	488	3.880	547	3.880
135	3.880	194	3.880	253	3.880	312	3.880	371	3.880	430	3.880	489	3.880	548	3.880
136	3.880	195	3.880	254	3.880	313	3.880	372	3.880	431	3.880	490	3.880	549	3.880
137	3.880	196	3.880	255	3.880	314	3.880	373	3.880	432	3.880	491	3.880	550	3.880
138	3.880	197	3.880	256	3.880	315	3.880	374	3.880	433	3.880	492	3.880	551	3.880
139	3.880	198	3.880	257	3.880	316	3.880	375	3.880	434	3.880	493	3.880	552	3.880
140	3.880	199	3.880	258	3.880	317	3.880	376	3.880	435	3.880	494	3.880	553	3.880
141	3.880	200	3.880	259	3.880	318	3.880	377	3.880	436	3.880	495	3.880	554	3.880
142	3.880	201	3.880	260	3.880	319	3.880	378	3.880	437	3.880	496	3.880	555	3.880
143	3.880	202	3.880	261	3.880	320	3.880	379	3.880	438	3.880	497	3.880	556	3.880
144	3.880	203	3.880	262	3.880	321	3.880	380	3.880	439	3.880	498	3.880	557	3.880
145	3.880	204	3.880	263	3.880	322	3.880	381	3.880	440	3.880	499	3.880	558	3.880
146	3.880	205	3.880	264	3.880	323	3.880	382	3.880	441	3.880	500	3.880	559	3.880
147	3.880	206	3.880	265	3.880	324	3.880	383	3.880	442	3.880	501	3.880	560	3.880
148	3.880	207	3.880	266	3.880	325	3.880	384	3.880	443	3.880	502	3.880	561	3.880
149	3.880	208	3.880	267	3.880	326	3.880	385	3.880	444	3.880	503	3.880	562	3.880
150	3.880	209	3.880	268	3.880	327	3.880	386	3.880	445	3.880	504	3.880	563	3.880
151	3.880	210	3.880	269	3.880	328	3.880	387	3.880	446	3.880	505	3.880	564	3.880
152	3.880	211	3.880	270	3.880	329	3.880	388	3.880	447	3.880	506	3.880	565	3.880
153	3.880	212	3.880	271	3.880	330	3.880	389	3.880	448	3.880	507	3.880	566	3.880
154	3.880	213	3.880	272	3.880	331	3.880	390	3.880	449	3.880	508	3.880	567	3.880
155	3.880	214	3.880	273	3.880	332	3.880	391	3.880	450	3.880	509	3.880	568	3.880
156	3.880	215	3.880	274	3.880	333	3.880	392	3.880	451	3.880	510	3.880	569	3.880
157	3.880	216	3.880	275	3.880	334	3.880	393	3.880	452	3.880	511	3.880	570	3.880
158	3.880	217	3.880	276	3.880	335	3.880	394	3.880	453	3.880	512	3.880	571	3.880
159	3.880	218	3.880	277	3.880	336	3.880	395	3.880	454	3.880	513	3.880	572	3.880
160	3.880	219	3.880	278	3.880	337	3.880	396	3.880	455	3.880	514	3.880	573	3.880
161	3.880	220	3.880	279	3.880	338	3.880	397	3.880	456	3.880	515	3.880	574	3.880
162	3.880	221	3.880	280	3.880	339	3.880	398	3.880	457	3.880	516	3.880	575	3.880
163	3.880	222	3.880	281	3.880	340	3.880	399	3.880	458	3.880	517	3.880	576	3.880

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
577	3.880	636	3.880	695	3.880	754	3.880	813	3.880	872	3.880	931	3.880	990	3.880
578	3.880	637	3.880	696	3.880	755	3.880	814	3.880	873	3.880	932	3.880	991	3.880
579	3.880	638	3.880	697	3.880	756	3.880	815	3.880	874	3.880	933	3.880	992	3.880
580	3.880	639	3.880	698	3.880	757	3.880	816	3.880	875	3.880	934	3.880	993	3.880
581	3.880	640	3.880	699	3.880	758	3.880	817	3.880	876	3.880	935	3.880	994	3.880
582	3.880	641	3.880	700	3.880	759	3.880	818	3.880	877	3.880	936	3.880	995	3.880
583	3.880	642	3.880	701	3.880	760	3.880	819	3.880	878	3.880	937	3.880	996	3.880
584	3.880	643	3.880	702	3.880	761	3.880	820	3.880	879	3.880	938	3.880	997	3.880
585	3.880	644	3.880	703	3.880	762	3.880	821	3.880	880	3.880	939	3.880	998	3.880
586	3.880	645	3.880	704	3.880	763	3.880	822	3.880	881	3.880	940	3.880	999	3.880
587	3.880	646	3.880	705	3.880	764	3.880	823	3.880	882	3.880	941	3.880	1000	3.880
588	3.880	647	3.880	706	3.880	765	3.880	824	3.880	883	3.880	942	3.880	1001	3.880
589	3.880	648	3.880	707	3.880	766	3.880	825	3.880	884	3.880	943	3.880	1002	3.880
590	3.880	649	3.880	708	3.880	767	3.880	826	3.880	885	3.880	944	3.880	1003	3.880
591	3.880	650	3.880	709	3.880	768	3.880	827	3.880	886	3.880	945	3.880	1004	3.880
592	3.880	651	3.880	710	3.880	769	3.880	828	3.880	887	3.880	946	3.880	1005	3.880
593	3.880	652	3.880	711	3.880	770	3.880	829	3.880	888	3.880	947	3.880	1006	3.880
594	3.880	653	3.880	712	3.880	771	3.880	830	3.880	889	3.880	948	3.880	1007	3.880
595	3.880	654	3.880	713	3.880	772	3.880	831	3.880	890	3.880	949	3.880	1008	3.880
596	3.880	655	3.880	714	3.880	773	3.880	832	3.880	891	3.880	950	3.880	1009	3.880
597	3.880	656	3.880	715	3.880	774	3.880	833	3.880	892	3.880	951	3.880	1010	3.880
598	3.880	657	3.880	716	3.880	775	3.880	834	3.880	893	3.880	952	3.880	1011	3.880
599	3.880	658	3.880	717	3.880	776	3.880	835	3.880	894	3.880	953	3.880	1012	3.880
600	3.880	659	3.880	718	3.880	777	3.880	836	3.880	895	3.880	954	3.880	1013	3.880
601	3.880	660	3.880	719	3.880	778	3.880	837	3.880	896	3.880	955	3.880	1014	3.880
602	3.880	661	3.880	720	3.880	779	3.880	838	3.880	897	3.880	956	3.880	1015	3.880
603	3.880	662	3.880	721	3.880	780	3.880	839	3.880	898	3.880	957	3.880	1016	3.880
604	3.880	663	3.880	722	3.880	781	3.880	840	3.880	899	3.880	958	3.880	1017	3.880
605	3.880	664	3.880	723	3.880	782	3.880	841	3.880	900	3.880	959	3.880	1018	3.880
606	3.880	665	3.880	724	3.880	783	3.880	842	3.880	901	3.880	960	3.880	1019	3.880
607	3.880	666	3.880	725	3.880	784	3.880	843	3.880	902	3.880	961	3.880	1020	3.880
608	3.880	667	3.880	726	3.880	785	3.880	844	3.880	903	3.880	962	3.880	1021	3.880
609	3.880	668	3.880	727	3.880	786	3.880	845	3.880	904	3.880	963	3.880	1022	3.880
610	3.880	669	3.880	728	3.880	787	3.880	846	3.880	905	3.880	964	3.880	1023	3.880
611	3.880	670	3.880	729	3.880	788	3.880	847	3.880	906	3.880	965	3.880	1024	3.880
612	3.880	671	3.880	730	3.880	789	3.880	848	3.880	907	3.880	966	3.880	1025	3.880
613	3.880	672	3.880	731	3.880	790	3.880	849	3.880	908	3.880	967	3.880	1026	3.880
614	3.880	673	3.880	732	3.880	791	3.880	850	3.880	909	3.880	968	3.880	1027	3.880
615	3.880	674	3.880	733	3.880	792	3.880	851	3.880	910	3.880	969	3.880	1028	3.880
616	3.880	675	3.880	734	3.880	793	3.880	852	3.880	911	3.880	970	3.880	1029	3.880
617	3.880	676	3.880	735	3.880	794	3.880	853	3.880	912	3.880	971	3.880	1030	3.880
618	3.880	677	3.880	736	3.880	795	3.880	854	3.880	913	3.880	972	3.880	1031	3.880
619	3.880	678	3.880	737	3.880	796	3.880	855	3.880	914	3.880	973	3.880	1032	3.880
620	3.880	679	3.880	738	3.880	797	3.880	856	3.880	915	3.880	974	3.880	1033	3.880
621	3.880	680	3.880	739	3.880	798	3.880	857	3.880	916	3.880	975	3.880	1034	3.880
622	3.880	681	3.880	740	3.880	799	3.880	858	3.880	917	3.880	976	3.880	1035	3.880
623	3.880	682	3.880	741	3.880	800	3.880	859	3.880	918	3.880	977	3.880	1036	3.880
624	3.880	683	3.880	742	3.880	801	3.880	860	3.880	919	3.880	978	3.880	1037	3.880
625	3.880	684	3.880	743	3.880	802	3.880	861	3.880	920	3.880	979	3.880	1038	3.880
626	3.880	685	3.880	744	3.880	803	3.880	862	3.880	921	3.880	980	3.880	1039	3.880
627	3.880	686	3.880	745	3.880	804	3.880	863	3.880	922	3.880	981	3.880	1040	3.880
628	3.880	687	3.880	746	3.880	805	3.880	864	3.880	923	3.880	982	3.880	1041	3.880
629	3.880	688	3.880	747	3.880	806	3.880	865	3.880	924	3.880	983	3.880	1042	3.880
630	3.880	689	3.880	748	3.880	807	3.880	866	3.880	925	3.880	984	3.880	1043	3.880
631	3.880	690	3.880	749	3.880	808	3.880	867	3.880	926	3.880	985	3.880	1044	3.880
632	3.880	691	3.880	750	3.880	809	3.880	868	3.880	927	3.880	986	3.880	1045	3.880
633	3.880	692	3.880	751	3.880	810	3.880	869	3.880	928	3.880	987	3.880	1046	3.880
634	3.880	693	3.880	752	3.880	811	3.880	870	3.880	929	3.880	988	3.880	1047	3.880
635	3.880	694	3.880	753	3.880	812	3.880	871	3.880	930	3.880	989	3.880	1048	3.880

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1049	3.880	1098	3.880	1147	3.880	1196	3.880	1245	3.880	1294	3.880	1343	3.880	1392	3.880
1050	3.880	1099	3.880	1148	3.880	1197	3.880	1246	3.880	1295	3.880	1344	3.880	1393	3.880
1051	3.880	1100	3.880	1149	3.880	1198	3.880	1247	3.880	1296	3.880	1345	3.880	1394	3.880
1052	3.880	1101	3.880	1150	3.880	1199	3.880	1248	3.880	1297	3.880	1346	3.880	1395	3.880
1053	3.880	1102	3.880	1151	3.880	1200	3.880	1249	3.880	1298	3.880	1347	3.880	1396	3.880
1054	3.880	1103	3.880	1152	3.880	1201	3.880	1250	3.880	1299	3.880	1348	3.880	1397	3.880
1055	3.880	1104	3.880	1153	3.880	1202	3.880	1251	3.880	1300	3.880	1349	3.880	1398	3.880
1056	3.880	1105	3.880	1154	3.880	1203	3.880	1252	3.880	1301	3.880	1350	3.880	1399	3.880
1057	3.880	1106	3.880	1155	3.880	1204	3.880	1253	3.880	1302	3.880	1351	3.880	1400	3.880
1058	3.880	1107	3.880	1156	3.880	1205	3.880	1254	3.880	1303	3.880	1352	3.880	1401	3.880
1059	3.880	1108	3.880	1157	3.880	1206	3.880	1255	3.880	1304	3.880	1353	3.880	1402	3.880
1060	3.880	1109	3.880	1158	3.880	1207	3.880	1256	3.880	1305	3.880	1354	3.880	1403	3.880
1061	3.880	1110	3.880	1159	3.880	1208	3.880	1257	3.880	1306	3.880	1355	3.880	1404	3.880
1062	3.880	1111	3.880	1160	3.880	1209	3.880	1258	3.880	1307	3.880	1356	3.880	1405	3.880
1063	3.880	1112	3.880	1161	3.880	1210	3.880	1259	3.880	1308	3.880	1357	3.880	1406	3.880
1064	3.880	1113	3.880	1162	3.880	1211	3.880	1260	3.880	1309	3.880	1358	3.880	1407	3.880
1065	3.880	1114	3.880	1163	3.880	1212	3.880	1261	3.880	1310	3.880	1359	3.880	1408	3.880
1066	3.880	1115	3.880	1164	3.880	1213	3.880	1262	3.880	1311	3.880	1360	3.880	1409	3.880
1067	3.880	1116	3.880	1165	3.880	1214	3.880	1263	3.880	1312	3.880	1361	3.880	1410	3.880
1068	3.880	1117	3.880	1166	3.880	1215	3.880	1264	3.880	1313	3.880	1362	3.880	1411	3.880
1069	3.880	1118	3.880	1167	3.880	1216	3.880	1265	3.880	1314	3.880	1363	3.880	1412	3.880
1070	3.880	1119	3.880	1168	3.880	1217	3.880	1266	3.880	1315	3.880	1364	3.880	1413	3.880
1071	3.880	1120	3.880	1169	3.880	1218	3.880	1267	3.880	1316	3.880	1365	3.880	1414	3.880
1072	3.880	1121	3.880	1170	3.880	1219	3.880	1268	3.880	1317	3.880	1366	3.880	1415	3.880
1073	3.880	1122	3.880	1171	3.880	1220	3.880	1269	3.880	1318	3.880	1367	3.880	1416	3.880
1074	3.880	1123	3.880	1172	3.880	1221	3.880	1270	3.880	1319	3.880	1368	3.880	1417	3.880
1075	3.880	1124	3.880	1173	3.880	1222	3.880	1271	3.880	1320	3.880	1369	3.880	1418	3.880
1076	3.880	1125	3.880	1174	3.880	1223	3.880	1272	3.880	1321	3.880	1370	3.880	1419	3.880
1077	3.880	1126	3.880	1175	3.880	1224	3.880	1273	3.880	1322	3.880	1371	3.880	1420	3.880
1078	3.880	1127	3.880	1176	3.880	1225	3.880	1274	3.880	1323	3.880	1372	3.880	1421	3.880
1079	3.880	1128	3.880	1177	3.880	1226	3.880	1275	3.880	1324	3.880	1373	3.880	1422	3.880
1080	3.880	1129	3.880	1178	3.880	1227	3.880	1276	3.880	1325	3.880	1374	3.880	1423	3.880
1081	3.880	1130	3.880	1179	3.880	1228	3.880	1277	3.880	1326	3.880	1375	3.880	1424	3.880
1082	3.880	1131	3.880	1180	3.880	1229	3.880	1278	3.880	1327	3.880	1376	3.880	1425	3.880
1083	3.880	1132	3.880	1181	3.880	1230	3.880	1279	3.880	1328	3.880	1377	3.880	1426	3.880
1084	3.880	1133	3.880	1182	3.880	1231	3.880	1280	3.880	1329	3.880	1378	3.880	1427	3.880
1085	3.880	1134	3.880	1183	3.880	1232	3.880	1281	3.880	1330	3.880	1379	3.880	1428	3.880
1086	3.880	1135	3.880	1184	3.880	1233	3.880	1282	3.880	1331	3.880	1380	3.880	1429	3.880
1087	3.880	1136	3.880	1185	3.880	1234	3.880	1283	3.880	1332	3.880	1381	3.880	1430	3.880
1088	3.880	1137	3.880	1186	3.880	1235	3.880	1284	3.880	1333	3.880	1382	3.880	1431	3.880
1089	3.880	1138	3.880	1187	3.880	1236	3.880	1285	3.880	1334	3.880	1383	3.880	1432	3.880
1090	3.880	1139	3.880	1188	3.880	1237	3.880	1286	3.880	1335	3.880	1384	3.880	1433	3.880
1091	3.880	1140	3.880	1189	3.880	1238	3.880	1287	3.880	1336	3.880	1385	3.880	1434	3.880
1092	3.880	1141	3.880	1190	3.880	1239	3.880	1288	3.880	1337	3.880	1386	3.880	1435	3.880
1093	3.880	1142	3.880	1191	3.880	1240	3.880	1289	3.880	1338	3.880	1387	3.880	1436	3.880
1094	3.880	1143	3.880	1192	3.880	1241	3.880	1290	3.880	1339	3.880	1388	3.880	1437	3.880
1095	3.880	1144	3.880	1193	3.880	1242	3.880	1291	3.880	1340	3.880	1389	3.880	1438	3.880
1096	3.880	1145	3.880	1194	3.880	1243	3.880	1292	3.880	1341	3.880	1390	3.880	1439	3.880
1097	3.880	1146	3.880	1195	3.880	1244	3.880	1293	3.880	1342	3.880	1391	3.880	1440	3.880

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Simulation Criteria for SW Net01

Volumetric Runoff Coeff	0.750	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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

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Online Controls for SW Net01

Hydro-Brake® Optimum Manhole: S2.18, DS/PN: S1.005, Volume (m³): 34.0

Unit Reference	MD-SHE-0193-2310-2300-2310
Design Head (m)	2.300
Design Flow (l/s)	23.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	193
Invert Level (m)	28.349
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	23.1	Kick-Flo®	1.404	18.2
Flush-Flo™	0.671	23.1	Mean Flow over Head Range	-	20.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	0.800	22.9	2.000	21.6	4.000	30.1	7.000	39.4
0.200	17.8	1.000	22.3	2.200	22.6	4.500	31.9	7.500	40.8
0.300	20.7	1.200	21.0	2.400	23.6	5.000	33.5	8.000	42.0
0.400	22.0	1.400	18.4	2.600	24.5	5.500	35.1	8.500	43.3
0.500	22.7	1.600	19.4	3.000	26.2	6.000	36.6	9.000	44.5
0.600	23.0	1.800	20.5	3.500	28.2	6.500	38.0	9.500	45.7

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Storage Structures for SW Net01

Porous Car Park Pipe: S6.000

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	44.7
Membrane Percolation (mm/hr)	10000	Slope (1:X)	20.4
Max Percolation (l/s)	558.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	36.985		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.001

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	20.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	29.6
Max Percolation (l/s)	254.9	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.945		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.002

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	12.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	56.3
Max Percolation (l/s)	154.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.255		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.003

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	13.9
Membrane Percolation (mm/hr)	10000	Slope (1:X)	21.4
Max Percolation (l/s)	173.5	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.935		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

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Porous Car Park Pipe: S6.004

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	36.1
Membrane Percolation (mm/hr)	10000	Slope (1:X)	27.8
Max Percolation (l/s)	451.6	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.385		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.005

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	27.7
Membrane Percolation (mm/hr)	10000	Slope (1:X)	22.1
Max Percolation (l/s)	345.7	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	32.085		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Cellular Storage Manhole: STANK, DS/PN: S8.000

Invert Level (m)	28.800	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)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	91.3	91.3	1.840	91.3	171.5	1.841	0.0	171.5

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 18.000	Cv (Summer) 0.750
Region	England and Wales	Ratio R 0.358	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	2	+0%	100/15 Summer				32.362	-0.088
S1.001	S2.01	15 Summer	2	+0%	100/15 Summer				32.237	-0.089
S1.002	S2.02	15 Winter	2	+0%	100/15 Summer				32.075	-0.084
S2.000	S2.03	15 Winter	2	+0%					32.202	-0.135
S1.003	S2.04	15 Winter	2	+0%					31.560	-0.097
S1.004	S2.05	2160 Winter	2	+0%	2/15 Summer				29.764	0.989
S3.000	S2.06	15 Winter	2	+0%					33.174	-0.106
S3.001	S2.07	15 Summer	2	+0%					32.837	-0.116
S3.002	S2.08	15 Winter	2	+0%					32.288	-0.167
S3.003	S2.09	15 Winter	2	+0%					32.000	-0.183
S4.000	S2.10	15 Summer	2	+0%					31.000	-0.225
S4.001	S2.11	15 Summer	2	+0%					30.964	-0.225
S3.004	S2.12	15 Winter	2	+0%					30.952	-0.173
S3.005	S2.13	2160 Winter	2	+0%	2/30 Winter				29.764	0.494
S5.000	S2.14	2160 Winter	2	+0%	2/15 Summer				29.764	0.918
S6.000	S3.00	15 Winter	2	+0%					37.013	-0.437
S7.000	S3.01	15 Winter	2	+0%					35.050	-0.115
S6.001	S3.02	15 Winter	2	+0%					34.985	-0.425
S6.002	S3.03	15 Winter	2	+0%					34.306	-0.414
S6.003	S2.15	15 Winter	2	+0%					33.976	-0.424
S6.004	S2.16	15 Winter	2	+0%					33.436	-0.414
S6.005	S2.17	15 Winter	2	+0%					32.137	-0.413
S8.000	STANK	2160 Winter	2	+0%	2/120 Summer				29.764	0.514
S1.005	S2.18	2160 Winter	2	+0%	2/15 Summer				29.764	1.190
S1.006	S5.05	1440 Winter	2	+0%	2/15 Summer				29.742	1.760
S1.007	S5.06	1440 Winter	2	+0%	2/15 Summer				29.741	1.931
S1.008	S5.07	1440 Winter	2	+0%	2/15 Summer	30/240 Winter			29.739	2.109
S1.009	S5.08	1440 Winter	2	+0%	2/15 Summer	2/480 Winter			29.739	2.162

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.36			6.3	OK	
S1.001	S2.01	0.000	0.35			6.4	OK	
S1.002	S2.02	0.000	0.40			8.7	OK	
S2.000	S2.03	0.000	0.02			1.2	OK	
S1.003	S2.04	0.000	0.27			9.8	OK	
S1.004	S2.05	0.000	0.02			1.1	SURCHARGED	
S3.000	S2.06	0.000	0.19			4.8	OK	
S3.001	S2.07	0.000	0.12			4.8	OK	
S3.002	S2.08	0.000	0.15			10.4	OK	
S3.003	S2.09	0.000	0.08			10.3	OK	
S4.000	S2.10	0.000	0.00			0.0	OK	
S4.001	S2.11	0.000	0.00			0.0	OK	
S3.004	S2.12	0.000	0.12			11.7	OK	
S3.005	S2.13	0.000	0.00			1.5	SURCHARGED	
S5.000	S2.14	0.000	0.01			2.4	SURCHARGED	
S6.000	S3.00	0.000	0.02		5	12.7	OK	
S7.000	S3.01	0.000	0.12			1.8	OK	
S6.001	S3.02	0.000	0.03		10	18.4	OK	
S6.002	S3.03	0.000	0.04		6	20.1	OK	
S6.003	S2.15	0.000	0.03		6	22.9	OK	
S6.004	S2.16	0.000	0.04		10	28.8	OK	
S6.005	S2.17	0.000	0.04		7	33.5	OK	
S8.000	STANK	0.000	0.06		101	17.8	SURCHARGED*	
S1.005	S2.18	0.000	0.23			22.9	SURCHARGED	
S1.006	S5.05	0.000	1.09			34.0	SURCHARGED	
S1.007	S5.06	0.000	1.20			37.4	SURCHARGED	
S1.008	S5.07	0.000	1.48			42.1	FLOOD RISK	40
S1.009	S5.08	38.917	8.41			207.3	FLOOD	61

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	30	+0%	100/15 Summer				32.391	-0.059
S1.001	S2.01	15 Summer	30	+0%	100/15 Summer				32.265	-0.060
S1.002	S2.02	15 Summer	30	+0%	100/15 Summer				32.113	-0.046
S2.000	S2.03	15 Winter	30	+0%					32.207	-0.130
S1.003	S2.04	15 Winter	30	+0%					31.586	-0.071
S1.004	S2.05	480 Winter	30	+0%	2/15 Summer				29.940	1.165
S3.000	S2.06	15 Winter	30	+0%					33.192	-0.088
S3.001	S2.07	15 Winter	30	+0%					32.851	-0.102
S3.002	S2.08	15 Summer	30	+0%					32.318	-0.137
S3.003	S2.09	15 Summer	30	+0%					32.020	-0.163
S4.000	S2.10	15 Summer	30	+0%					31.000	-0.225
S4.001	S2.11	15 Winter	30	+0%					30.973	-0.216
S3.004	S2.12	15 Summer	30	+0%					30.978	-0.147
S3.005	S2.13	480 Winter	30	+0%	2/30 Winter				29.940	0.670
S5.000	S2.14	480 Winter	30	+0%	2/15 Summer				29.939	1.093
S6.000	S3.00	15 Winter	30	+0%					37.026	-0.424
S7.000	S3.01	15 Winter	30	+0%					35.063	-0.102
S6.001	S3.02	15 Summer	30	+0%					35.005	-0.405
S6.002	S3.03	15 Winter	30	+0%					34.330	-0.390
S6.003	S2.15	15 Winter	30	+0%					33.997	-0.403
S6.004	S2.16	15 Winter	30	+0%					33.463	-0.387
S6.005	S2.17	15 Winter	30	+0%					32.166	-0.384
S8.000	STANK	480 Winter	30	+0%	2/120 Summer				29.939	0.689
S1.005	S2.18	480 Winter	30	+0%	2/15 Summer				29.939	1.365
S1.006	S5.05	480 Winter	30	+0%	2/15 Summer				29.807	1.825
S1.007	S5.06	1440 Winter	30	+0%	2/15 Summer				29.802	1.992
S1.008	S5.07	1440 Winter	30	+0%	2/15 Summer	30/240 Winter			29.800	2.170

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.68			12.0	OK	
S1.001	S2.01	0.000	0.66			12.0	OK	
S1.002	S2.02	0.000	0.81			17.8	OK	
S2.000	S2.03	0.000	0.04			2.2	OK	
S1.003	S2.04	0.000	0.54			19.8	OK	
S1.004	S2.05	0.000	0.03			2.1	SURCHARGED	
S3.000	S2.06	0.000	0.36			9.1	OK	
S3.001	S2.07	0.000	0.23			9.1	OK	
S3.002	S2.08	0.000	0.32			22.4	OK	
S3.003	S2.09	0.000	0.17			22.4	OK	
S4.000	S2.10	0.000	0.00			0.0	OK	
S4.001	S2.11	0.000	0.00			0.0	OK	
S3.004	S2.12	0.000	0.26			25.8	OK	
S3.005	S2.13	0.000	0.02			5.9	SURCHARGED	
S5.000	S2.14	0.000	0.00			0.4	SURCHARGED	
S6.000	S3.00	0.000	0.03		5	24.0	OK	
S7.000	S3.01	0.000	0.23			3.5	OK	
S6.001	S3.02	0.000	0.06		8	36.2	OK	
S6.002	S3.03	0.000	0.09		6	39.5	OK	
S6.003	S2.15	0.000	0.06		6	45.1	OK	
S6.004	S2.16	0.000	0.09		8	58.4	OK	
S6.005	S2.17	0.000	0.09		6	67.8	OK	
S8.000	STANK	0.000	0.01			1.8	SURCHARGED*	
S1.005	S2.18	0.000	0.10			10.4	SURCHARGED	
S1.006	S5.05	0.000	0.33			10.3	SURCHARGED	
S1.007	S5.06	0.000	1.24			38.7	SURCHARGED	
S1.008	S5.07	49.876	4.88			138.4	FLOOD	40

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.009	S5.08	1440 Winter	30	+0%	2/15 Summer	2/480 Winter			29.799	2.223

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.009	S5.08	99.225	8.53			210.2	FLOOD	61

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 18.000	Cv (Summer) 0.750
Region England and Wales	Ratio R	0.358	Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	100	+45%	100/15 Summer				32.837	0.387
S1.001	S2.01	15 Winter	100	+45%	100/15 Summer				32.683	0.357
S1.002	S2.02	15 Winter	100	+45%	100/15 Summer				32.500	0.341
S2.000	S2.03	15 Winter	100	+45%					32.215	-0.122
S1.003	S2.04	15 Winter	100	+45%					31.615	-0.042
S1.004	S2.05	180 Winter	100	+45%	2/15 Summer				30.863	2.088
S3.000	S2.06	15 Winter	100	+45%					33.219	-0.061
S3.001	S2.07	15 Winter	100	+45%					32.871	-0.082
S3.002	S2.08	15 Summer	100	+45%					32.356	-0.099
S3.003	S2.09	15 Summer	100	+45%					32.045	-0.138
S4.000	S2.10	15 Winter	100	+45%					31.005	-0.220
S4.001	S2.11	15 Summer	100	+45%					31.011	-0.178
S3.004	S2.12	15 Summer	100	+45%					31.011	-0.114
S3.005	S2.13	180 Winter	100	+45%	2/30 Winter				30.864	1.594
S5.000	S2.14	180 Winter	100	+45%	2/15 Summer				30.860	2.014
S6.000	S3.00	15 Winter	100	+45%					37.045	-0.405
S7.000	S3.01	15 Winter	100	+45%					35.083	-0.082
S6.001	S3.02	15 Summer	100	+45%					35.033	-0.377
S6.002	S3.03	15 Winter	100	+45%					34.365	-0.355
S6.003	S2.15	15 Winter	100	+45%					34.026	-0.374
S6.004	S2.16	15 Winter	100	+45%					33.499	-0.351
S6.005	S2.17	15 Winter	100	+45%					32.203	-0.347
S8.000	STANK	180 Winter	100	+45%	2/120 Summer				30.860	1.610
S1.005	S2.18	180 Winter	100	+45%	2/15 Summer				30.860	2.286
S1.006	S5.05	360 Winter	100	+45%	2/15 Summer				29.983	2.001
S1.007	S5.06	1440 Winter	100	+45%	2/15 Summer				29.915	2.105
S1.008	S5.07	1440 Winter	100	+45%	2/15 Summer	30/240 Winter			29.911	2.281

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	1.16			20.4	SURCHARGED	
S1.001	S2.01	0.000	1.07			19.5	SURCHARGED	
S1.002	S2.02	0.000	1.28			28.3	SURCHARGED	
S2.000	S2.03	0.000	0.08			4.1	OK	
S1.003	S2.04	0.000	0.86			31.9	OK	
S1.004	S2.05	0.000	0.14			8.6	SURCHARGED	
S3.000	S2.06	0.000	0.66			17.1	OK	
S3.001	S2.07	0.000	0.42			17.1	OK	
S3.002	S2.08	0.000	0.60			41.9	OK	
S3.003	S2.09	0.000	0.32			41.9	OK	
S4.000	S2.10	0.000	0.00			0.0	OK	
S4.001	S2.11	0.000	0.01			0.2	OK	
S3.004	S2.12	0.000	0.49			48.2	OK	
S3.005	S2.13	0.000	0.07			23.3	FLOOD RISK	
S5.000	S2.14	0.000	0.01			1.9	SURCHARGED	
S6.000	S3.00	0.000	0.06		5	44.8	OK	
S7.000	S3.01	0.000	0.43			6.5	OK	
S6.001	S3.02	0.000	0.11		6	68.1	OK	
S6.002	S3.03	0.000	0.16		6	74.1	OK	
S6.003	S2.15	0.000	0.11		5	84.6	OK	
S6.004	S2.16	0.000	0.16		7	109.6	OK	
S6.005	S2.17	0.000	0.17		6	126.7	OK	
S8.000	STANK	0.000	0.07			18.8	SURCHARGED*	
S1.005	S2.18	0.000	0.23			23.0	SURCHARGED	
S1.006	S5.05	0.000	0.74			22.9	SURCHARGED	
S1.007	S5.06	0.000	1.31			40.8	SURCHARGED	
S1.008	S5.07	160.721	4.95			140.4	FLOOD	40

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.009	S5.08	1440 Winter	100	+45%	2/15 Summer	2/480 Winter			29.910	2.333

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.009	S5.08	209.520	8.74			215.3	FLOOD	61

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APPENDIX J – Drainage General Arrangement

NOTE:
REFER TO ROC S104 DRAWINGS FOR DETAILS OF OFF-SITE DRAINAGE

INDICATIVE FUTURE CONNECTION FOR PLOTS RB16 AND RB17

FLOW CONTROL CHAMBER (S2.18) WITH INTEGRAL HYDROBRAKE OPTIMUM OR EQUIVALENT APPROVED.
REF: MD-SHE-0193-2310-2300-2310
QMAX: 23.1 l/s, HEAD: 2.3m, CL: 31.47m IL: 28.34m
(22 l/s/ha) (1.05ha) (NT02 & NT03)

PROPOSED FPMCANN STORMCLEANSER HYDRODYNAMIC SEPARATOR. REF: PRE-SC1200. MAX FLOW RATE 43.0l/s

PROPOSED ACO STORMBRIXX HD GEOCELLULAR ATTENUATION TANK OR EQUIVALENT APPROVED. VOL MAX: 160m³. 16.87m x 5.42m 1.84m DEEP. IL 28.80m. POSITION OF TANK TBC PENDING FURTHER COORDINATION WITH LANDSCAPE/ SITE WIDE SERVICES

NEW MANHOLE ON EXISTING PUBLIC COMBINED SEWER. UPSTREAM LENGTH TO BE ABANDONED AND REMOVED. SUBJECT TO S116/ S106 APPLICATION TO UNITED UTILITIES

PROPOSED MANHOLE FOR FUTURE CONNECTION FROM NT03 DEVELOPMENT

DANTZIC STREET

DULWICH STREET

NT02
Amenity Club House

NT03
Tower 2

NT03 Midrise

BELOW GROUND

Pedestrian Zone

Cor Park

S1.009 300Ø 1:250
1550Ø BR CWS
S5.06
CL 30.35
IL 27.50
S1.008 300Ø 1:250
5401
CL 30.55
IL 24.70
1530Ø BR CWS
S5.05
CL 31.25
IL 27.68
S1.005 225Ø 1:9
300Ø VC CWS
375x475 CWS

S2.19
CL 31.45
IL 28.17
S2.18
CL 31.47
IL 28.34
S2.14
CL 31.63
IL 28.39
S2.13
CL 30.82
IL 28.82
3.005 450Ø 1:60
450Ø 1:150
225Ø 1:28
450Ø 1:15
225Ø 1:100
bd 29.62m
S2.05
CL 31.63
IL 28.55
F2.12
CL 31.74
IL 29.90
bd 30.43m
1.003 150Ø 1:21
1.006 225Ø 1:80
Ø225Ø
3.004 225Ø 1:24
F2.13
CL 32.00
IL 29.74
F2.14
CL 31.95
IL 29.62
225Ø 1:120
F2.15
CL 31.80
IL 29.53
bd 29.43m
F2.16
CL 31.80
IL 26.53

S2.04
CL 32.68
IL 31.50
S2.03
CL 33.18
IL 32.18
S2.17
CL 32.70
IL 31.57
F2.11
CL 32.70
IL 30.18
S2.12
CL 32.16
IL 30.90
S2.10
CL 32.19
IL 31.00
S2.11
CL 32.19
IL 30.96
3.003 225Ø 1:11
F2.09
CL 32.19
IL 30.52
F2.08
CL 32.19
IL 30.65
150Ø 1:80
F2.10
CL 32.92
IL 30.26
1.002 150Ø 1:80
BD 31.97m
225Ø
S2.09
CL 33.75
IL 31.95
F2.04
CL 33.52
IL 32.13
S2.08
CL 34.15
IL 32.23
3.002 150Ø 1:40
F2.07
CL 32.99
IL 31.47
F2.06
CL 32.99
IL 31.56
S2.02
CL 33.76
IL 32.00
S2.07
CL 34.11
IL 32.80
3.001 150Ø 1:11
F2.05
CL 32.99
IL 31.80
F2.03
CL 34.00
IL 32.35
S2.16
CL 34.00
IL 32.87
F2.02
CL 34.15
IL 32.62
3.000 150Ø 1:40
F2.01
CL 34.15
IL 32.91
S2.01
CL 34.17
IL 32.17
S2.15
CL 34.55
IL 33.42
S2.06
CL 34.13
IL 33.13
F2.00
CL 34.15
IL 33.00
S2.00
CL 34.15
IL 32.30
1.000 150Ø 1:80

PERMEABLE PAVING TO DISCHARGE VIA PERMAVOID DIFFUSER UNITS LOCATED WITHIN OPEN GRADED SUB-BASE. DETAILS TBC PENDING FURTHER CO-ORDINATION

CENTRAL 225Ø PERFORATED RIDGITREAT PIPE BY POLYPIPE LAID IN NARROW TRENCH FOR DISPERSAL/ CONVEYANCE/ TREATMENT OF SURFACE WATER RUN-OFF FROM PERMEABLE PAVEMENT ABOVE.

WORK IN PROGRESS

ALL INFORMATION ON THIS DRAWING IS SUBJECT TO CHANGE AS THE SCHEME IS DEVELOPED AS THE FOLLOWING INFORMATION IS EITHER YET TO BE FINALISED.

- SW DISCHARGE CONSENT APPLICATION
- SW S104 AGREEMENT & TECHNICAL APPROVAL
- FW S106 AGREEMENT & TECHNICAL APPROVAL
- LANDSCAPE/ EXTERNAL WORKS LEVELS
- LANDSCAPE/ EXTERNAL WORKS FINISHES

- PLANNING BOUNDARY
- NT02 BOUNDARY
- EXISTING COMBINED SEWER
- SEWER TO BE ABANDONED
- DIVERTED COMBINED SEWER
- PERMEABLE PAVEMENT WITH HARDSCAPE DRAINJOINT
- ATTENUATION TANK
- SURFACE WATER DRAIN
- SW MANHOLE/ INSPECTION CHAMBER/ CATCHPIT
- RAINWATER PIPE & 150Ø CONNECTION
- DRAINAGE CHANNEL
- ACO SLOT DRAIN & SUMP UNIT
- FILTER DRAIN WITH CATCHPIT & PERFORATED PIPE
- YARD GULLY & 110Ø CONNECTION
- FOUL WATER DRAIN
- FW MANHOLE/ INSPECTION CHAMBER
- FOUL WATER POP-UP & 110Ø UNO
- S104 SW SEWER & MANHOLE
- S104 FW SEWER & MANHOLE

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NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.
3. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
4. BEFORE STARTING ANY WORKS, CONTRACTOR TO CHECK INVERT LEVELS AND POSITIONS OF EXISTING DRAINS, SEWERS, INSPECTIONS CHAMBERS AND MANHOLES AGAINST INFORMATION SHOWN ON THIS DRAWING.
5. ROCKER PIPES ARE TO BE PROVIDED AT ALL CONCRETE CASED INTERFACES.
6. CLASS Z CONCRETE SURROUND TO BE PROVIDED FOR PIPES WITH COVER LESS THAN 1.2m ABOVE THE CROWN OF THE PIPE FOR ROADS AND 0.6m FOR SOFT AND PEDESTRIAN AREAS ONLY AND UNDER ALL FOUNDATIONS AND WHERE PIPES LAID WITHIN 1m OF FOUNDATIONS.
7. CONNECTIONS TO EXISTING PUBLIC SEWERS IN ACCORDANCE WITH UNITED UTILITIES REQUIREMENTS, TO BE APPROVED / AGREED WITH THE WATER AUTHORITY.
8. PROPOSED COVER LEVELS ARE APPROXIMATE AND SHALL BE CHECKED BY THE CONTRACTOR ON SITE TO SUIT THE EXACT FINISHED LEVEL AND GRADIENT.
9. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY AND IN CONJUNCTION WITH ALL RELEVANT BRITISH STANDARDS, CODES OF PRACTICE AND 'SEWERS FOR ADOPTION' 7th EDITION.
10. ACCESS COVERS AND FRAMES SHALL COMPLY WITH THE LOADINGS SPECIFIED AND TO BS EN 124 AND KITEMARKED OR IF RECESSED COVERS ARE SPECIFIED THEN IN ACCORDANCE WITH FACTA ASSOCIATION EQUIVALENT. ALLOW FOR RECESS MANHOLE COVERS TO ACCEPT LANDSCAPE ARCHITECT FINISHES TO ALL NON-ASPHALT EXTERNAL AREAS.
11. THE PROPOSED BUILDING LAYOUTS SHOWN ON THIS DRAWING ARE FOR INFORMATION ONLY. REFER TO ARCHITECTS PLANS FOR PRECISE LOCATION SETTING OUT INFORMATION AND DETAILS
12. FOR SETTING OUT DIMENSIONS OF SSS, SVPS, RWPS, FLOOR GULLY'S & OTHER DRAINAGE 'POP UP' LOCATIONS, REFER TO ARCHITECTS OR MECHANICAL & ELECTRICAL ENGINEERS DRAWINGS.
13. ALL DRAINAGE PIPEWORK SHOWN SHALL BE 100mm DIAMETER FOR FOUL AND 150mm FOR SURFACE WATER UNLESS NOTED OTHERWISE. ALL DRAINAGE PIPEWORK SHALL BE LAID SOFFIT TO SOFFIT UNLESS OTHERWISE STATED.
14. ALL UNDERSLAB DRAINAGE SHALL BE LAID AT GRADIENTS OF 1:80 MIN. FOR FOUL PIPEWORK AND 1:100 MIN. FOR SURFACE WATER UNLESS NOTED OTHERWISE. ALL UNDERSLAB DRAINAGE SHALL BE CLEAR OF FOUNDATIONS UNLESS SHOWN OTHERWISE. USE OF SHORT / LONG RADIUS BENDS IS ACCEPTABLE PROVIDED THEY ARE KEPT TO A MINIMUM AND USED WHERE UNAVOIDABLE.
15. AT LEAST ONE SOIL PIPE AT THE HEAD OF EACH FOUL RUN SHALL BE VENTED TO THE ATMOSPHERE. ALL RAINWATER PIPES SHALL HAVE ABOVE GROUND RODDING ACCESS.
16. ALL PRIVATE DRAINAGE PIPEWORK FOR FOUL AND SURFACE WATER SYSTEMS HAVE BEEN DESIGNED ON THE BASIS OF UPVC TO BS EN 1401-1, UNLESS NOTED OTHERWISE.
17. CONCRETE ENCASEMENT OF THE PIPEWORK SHALL BE REQUIRED WHERE THE VERTICAL CLEARANCE BETWEEN TWO PIPES CROSSING IS LESS THAN 300MM.
18. WHERE NEW DRAINAGE IS SITUATED WITHIN 5 METRES OF NEW OR EXISTING TREES THE PIPEWORK SHALL BE ENCASED IN CONCRETE TO REDUCE THE RISK OF ROOT INGRESS.
19. ALL NEW DRAINAGE INSTALLATIONS TOGETHER WITH ANY EXISTING DRAINAGE RETAINED SHALL BE JETTED AND CCTV SURVEYED UPON COMPLETION. CONTRACTOR TO ENSURE THAT THE DRAINAGE SYSTEM IS FULLY OPERATIONAL, FREE OF EXCESS DEBRIS/SILT AND ALL IDENTIFIED FAULTS RECTIFIED.
20. ATTENUATION STORAGE CALCULATIONS INCLUDE CLIMATE CHANGE ALLOWANCE OF 40% IN ACCORDANCE WITH CURRENT ENVIRONMENT AGENCY GUIDELINES.

REV.	DATE	DETAILS	DRN.	CHK
P03	17/12/2024	COORDINATION	ARJ	JAS
P02	22/11/2024	COORDINATION	ARJ	JAS
P01	15/11/2024	FIRST ISSUE	ARJ	JAS

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W rocconsulting.com

DRAWN ARJ	DATE OCT 24	SCALES 1:200
CHECKED PAW	DATE OCT 24	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE –DO NOT SCALE–
APPRVD. JAS	DATE OCT 24	EMAIL FOR DRAWINGS info@rocconsulting.com

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PROJECT TITLE
REDBANK DEVELOPMENT

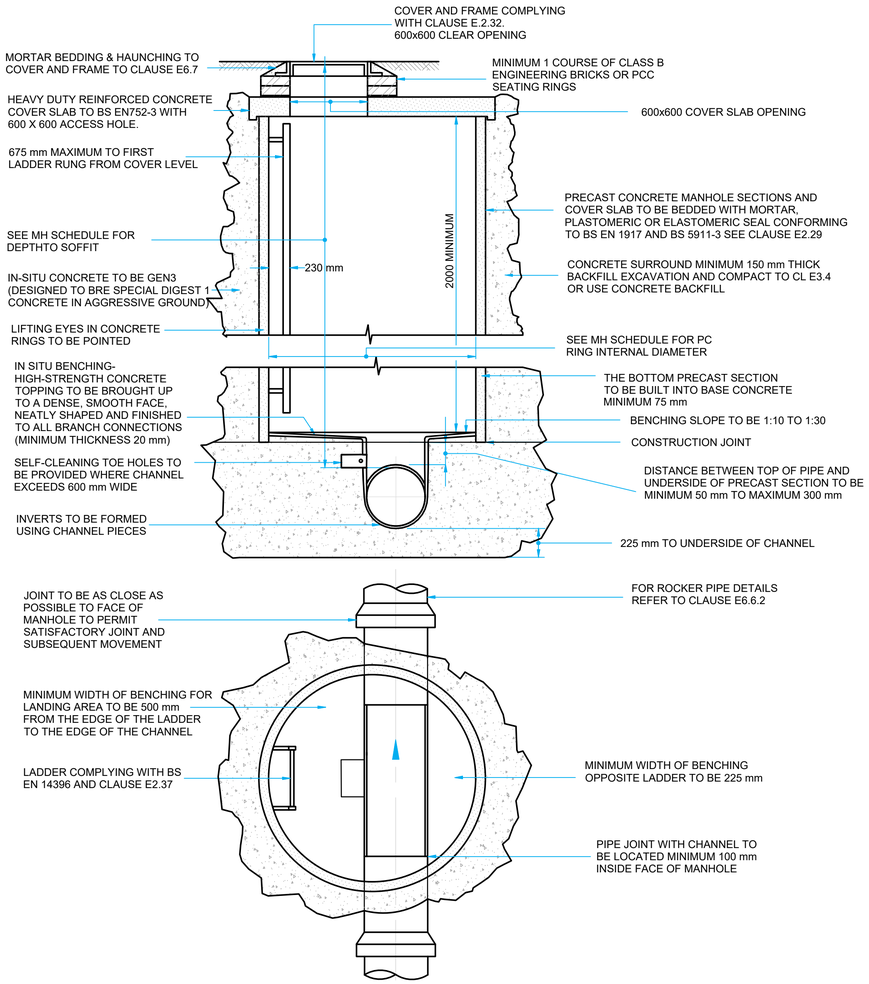
DRAWING TITLE
FW & SW DRAINAGE GENERAL ARRANGEMENT BLOCK 2B

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RDB/ROC/2B/XX/DR/C/83/0500	P03

4328

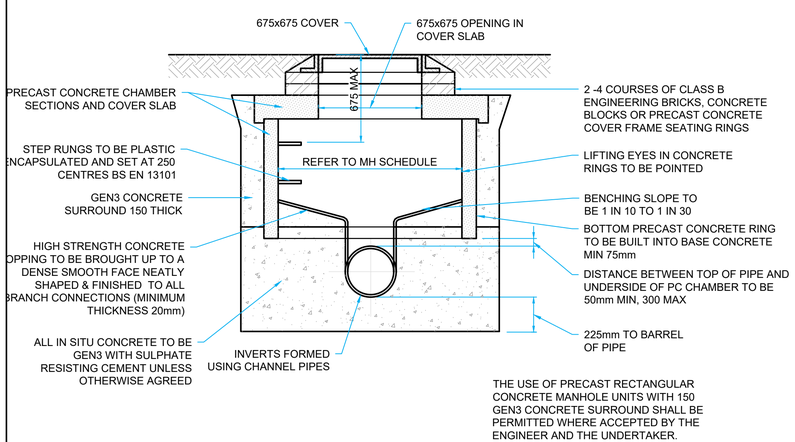
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APPENDIX K – Drainage Details



TYPICAL MANHOLE DETAIL - TYPE A
(DEPTH TO SOFFIT 3m - 6m)

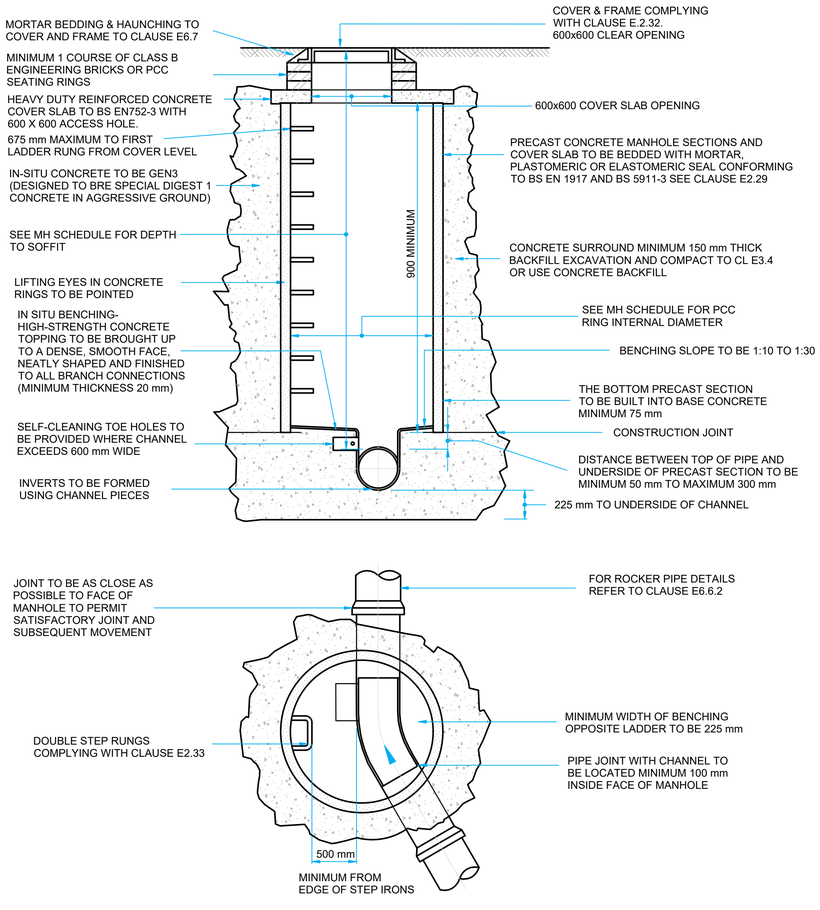
SCALE - NTS



THE USE OF PRECAST RECTANGULAR CONCRETE MANHOLE UNITS WITH 150 GEN3 CONCRETE SURROUND SHALL BE PERMITTED WHERE ACCEPTED BY THE ENGINEER AND THE UNDERTAKER.

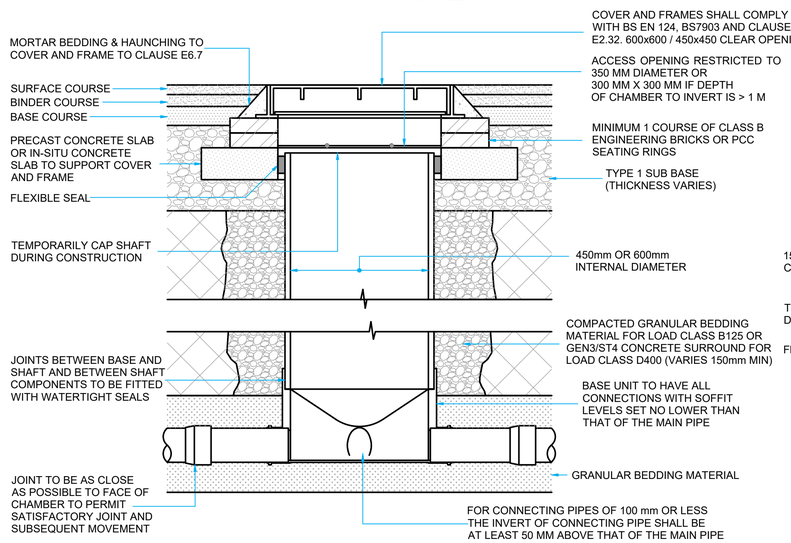
MANHOLE DETAIL - TYPE C
(DEPTH TO SOFFIT 1.0m - 1.5m)

SCALE - NTS



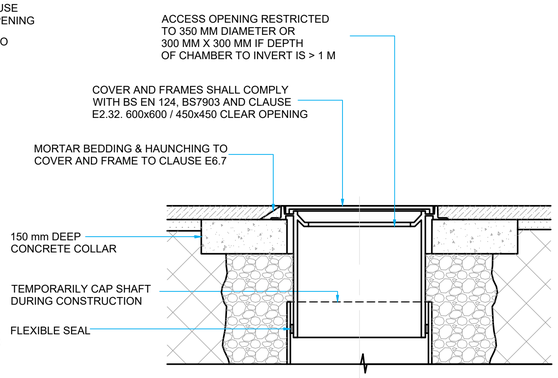
TYPICAL MANHOLE DETAIL - TYPE B
(DEPTH TO SOFFIT 1.5 - 3m)

SCALE - NTS



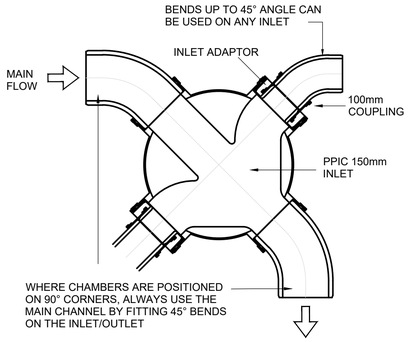
INSPECTION CHAMBER DETAIL - TYPE D
450Ø & 600Ø (DEPTH TO SOFFIT 3m)
D400 COVER

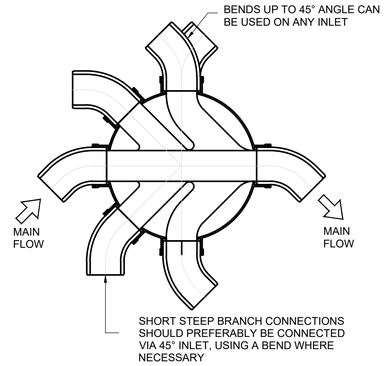
SCALE - NTS



INSPECTION CHAMBER DETAIL - TYPE D
B125 COVER

SCALE - NTS





PPIC
BASE DETAIL

SCALE - NTS

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NOTES

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2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS.
3. SHOULD THERE BE ANY DISCREPANCY BETWEEN DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS THE ENGINEER SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
4. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.

REV.	DATE	DETAILS	DRN.	CHK.
P01	22.11.24	FIRST ISSUE	ARJ	JAS

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ARJ	NOV 24	AS SHOWN
CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE --DO NOT SCALE--
PAW	NOV 24	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JAS	NOV 24	info@rocconsulting.com

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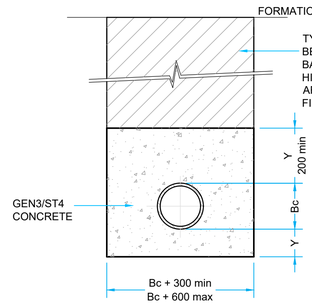
PROJECT TITLE
REDBANK DEVELOPMENT

DRAWING TITLE
FW & SW DRAINAGE CONSTRUCTION DETAILS SHEET 1

DRAWING No.	REV.
RDB/ROC/2B/XX/DR/C/83/0501	P01

4328

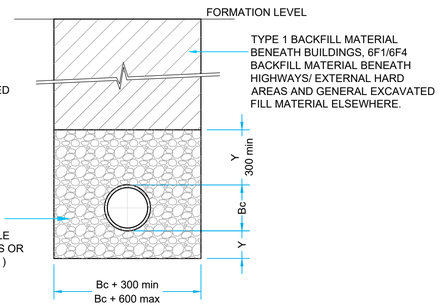
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TO BE USED WHERE COVER TO PIPE IS:
1. LESS THAN 1.2m IN TRAFFICKED AREAS
2. LESS THAN 0.90m IN FIELDS
3. LESS THAN 0.6m IN LANDSCAPED AREAS
4. LESS THAN 0.3m BENEATH BUILDING SLABS

CLASS Z BEDDING DETAIL

Y VALUE: HARD SPOTS/IRREGULAR TRENCH BOTTOM BC/4 (200mm MIN), EVEN TRENCH BOTTOM BC/6 (100mm MIN)
BC = OUTSIDE PIPE DIAMETER

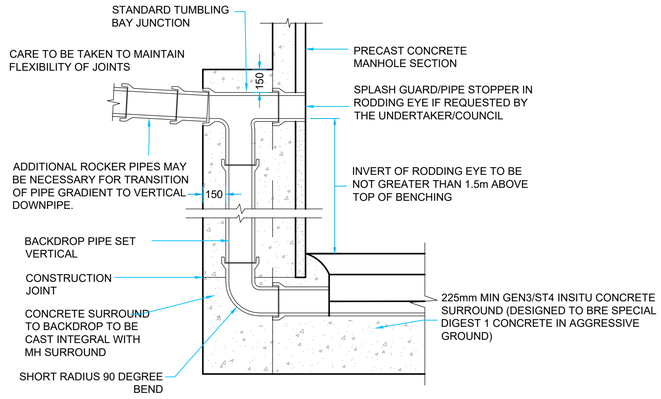


CLASS S BEDDING DETAIL

Y VALUE: HARD SPOTS/IRREGULAR TRENCH BOTTOM BC/4 (200mm MIN), EVEN TRENCH BOTTOM BC/6 (100mm MIN).
BC = OUTSIDE PIPE DIAMETER

TRENCH WIDTHS

PIPE I.D	OVERALL TRENCH WIDTH
100	550
150	600
225	700
300	850
375	1050
450	1150
525	1200
600	1350
675	1450
750	1500
825	1600
900	1900
1050	2100
1200	2300
1350	2500
1500	2700
1800	3100



TYPICAL VERTICAL BACKDROP DETAIL

NOTE : WHERE THE DROP IS NOT EXCESSIVE A 45° DROP PIPE MAY BE USED

SEWER DIAMETER (mm)	DROP SHAFT DIAMETER (mm)
225-300	225
375	300
450	375
525-600	450
675	525
750-900	600

THE CONNECTION AT THE BOTTOM OF THE BACKDROP IS TO BE MADE AT SOFFIT LEVEL IN MANHOLES MAX. PIPE SIZE 825mm AND AT SPRINGING LEVEL IN MANHOLES PIPE SIZE 900 TO 1500mm

VERTICAL RODDING EYE MAY BE REQUIRED IN SITUATIONS WHERE BLOCKAGES ARE HIGH RISK.
THE TUMBLING BAY SHALL BE BUILT INTO THE MANHOLE CHAMBER BELOW ANY REUCING SLAB

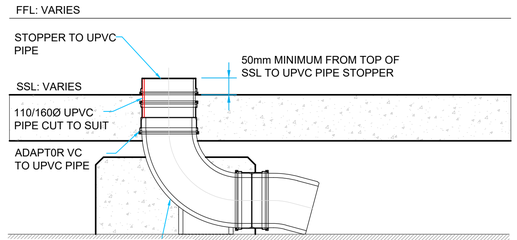
BS EN 1610:1998 ANNEX B TABLE B.15 COARSE AGGREGATE - PIPE BEDDING							
SIEVE SIZE (mm)	PERCENTAGE BY MASS PASSING BS SIEVES FOR NOMINAL SIZES						
	GRADED AGGREGATE (mm)			SINGLE-SIZED AGGREGATE (mm)			
	40 to 5	20 to 5	14 to 5	40	20	14	10
50.0	100	-----	-----	100	-----	-----	-----
37.5	90 - 100	100	-----	85 - 100	100	-----	-----
20.0	35 - 70	90 - 100	100	0 - 25	85 - 100	100	-----
14.0	-----	-----	90 - 100	-----	-----	85 - 100	100
10.0	10 - 40	30 - 60	50 - 85	0 - 5	0 - 25	0 - 50	85 - 100
5.0	0 - 5	0 - 10	0 - 10	-----	0 - 5	0 - 10	0 - 25
2.36	-----	-----	-----	-----	-----	-----	0 - 5

RIGID PIPES BEDDING GRADING

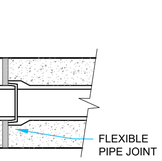
FOR RIGID PIPES THE BEDDING SHOULD BE SINGLE SIZE MATERIAL OR GRADED MATERIAL FROM 5mm UP TO A MAX SIZE OF 10mm FOR 100mm PIPES; 14mm FOR 150mm PIPES; 20mm FOR 225mm TO 600mm PIPES; 40mm FOR OVER 600mm PIPES

BS EN 13242, COARSE AGGREGATE (CLAUSE 4.3.2)		
CATEGORY FOR GENERAL GRADING REQUIREMENTS	Gc80-20	
CATEGORY FOR TOLERANCES AT MID-SIZE SIEVES	GTnr (NO REQUIREMENTS)	
CATEGORY PF MAXIMUM VALUES OF FINES CONTENTS	GRAVEL - F1.5 CRUSHED ROCK, RECYCLED AGGREGATE - F4	
NOMINAL PIPE DIAMETER, mm	AGGREGATE SIZE, mm	
	GRADED	SINGLE SIZED
NOT EXCEEDING 140	-	4/10
EXCEEDING 140 BUT NOT EXCEEDING 400	2/14 or 4/20	4/10, 6/14 or 10/20
EXCEEDING 400	2/14, 4/20 or 4/40	4/10, 6/14, 10/20 or 20/40

FLEXIBLE PIPE BEDDING, HAUNCHING AND SURROUND MATERIAL



TYPICAL BELOW GROUND WASTE PIPE CONNECTION DETAIL



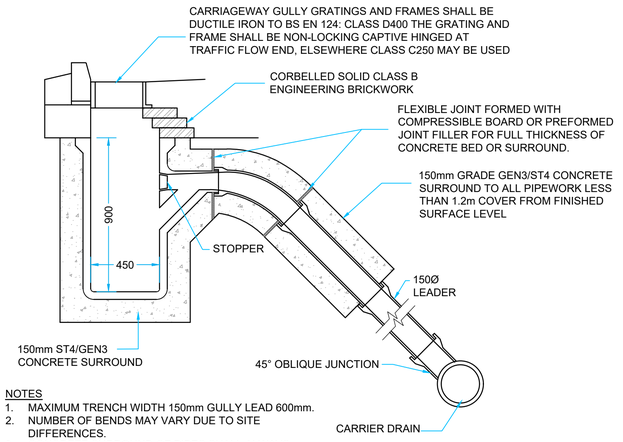
PIPE Ø	JOINT THICKNESS
< 450	18mm
450 - 1200	36mm
>1200	54mm

COMPRESSIBLE FILLER TABLE

(BITUMEN IMPREGNATED INSULATING BOARD TO BS EN 622-1 AND BS EN 622-4)

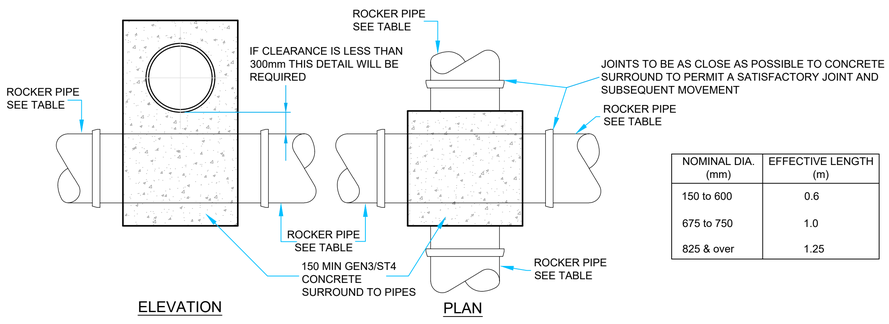
JOINTS FOR CONCRETE SURROUND TO PIPES

(AT EACH PIPE JOINT)



NOTES
1. MAXIMUM TRENCH WIDTH 150mm GULLY LEAD 600mm.
2. NUMBER OF BENDS MAY VARY DUE TO SITE DIFFERENCES.
3. CONCRETE SURROUND OF PIPES SHALL ALWAYS FINISH AT A JOINT.

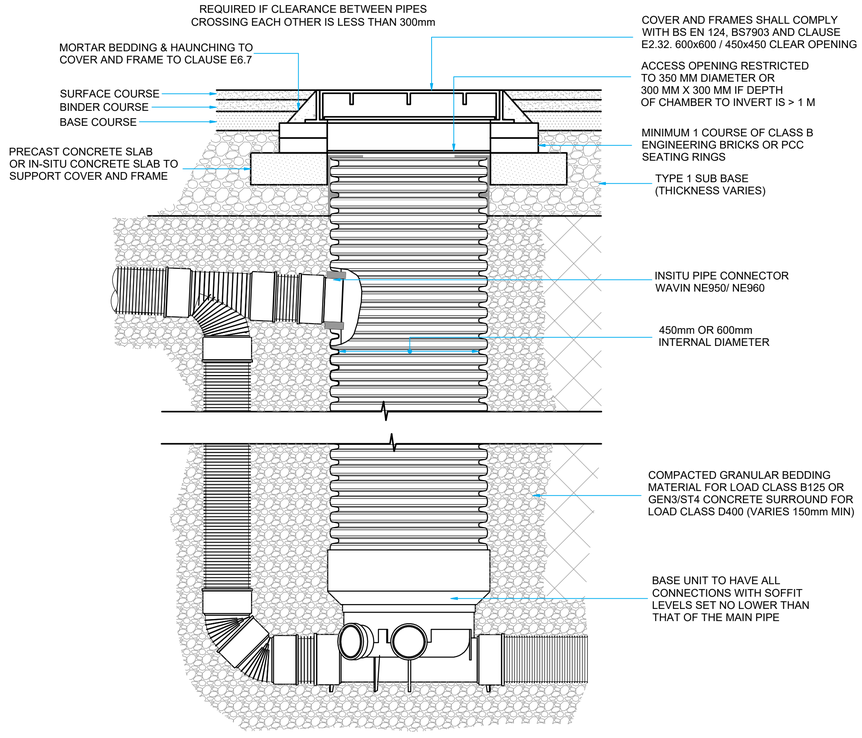
TYPICAL ROAD GULLY DETAIL



SPECIAL PIPE CROSSOVER DETAIL

REQUIRED IF CLEARANCE BETWEEN PIPES CROSSING EACH OTHER IS LESS THAN 300mm

NOMINAL DIA. (mm)	EFFECTIVE LENGTH (m)
150 to 600	0.6
675 to 750	1.0
825 & over	1.25



INSPECTION CHAMBER BACKDROP DETAIL - TYPE D 450Ø & 600Ø (DEPTH TO SOFFIT 3m) D400 COVER

SCALE - NTS

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REV.	DATE	DETAILS	DRN.	CHK.
P01	22.11.24	FIRST ISSUE	ARJ	JAS

DRAWING STATUS
PRELIMINARY

RIBA STAGE
STAGE 4

RoC CONSULTING
Commercial Wharf
6 Commercial Street
Manchester M15 4PZ
T 0161 214 5390
W rocconsulting.com

DRAWN	DATE	SCALES
ARJ	NOV 24	AS SHOWN
CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE –DO NOT SCALE–
PAW	NOV 24	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JAS	NOV 24	info@rocconsulting.com

CLIENT
FAR EAST CONSORTIUM INTERNATIONAL LTD

PROJECT TITLE
REDBANK DEVELOPMENT

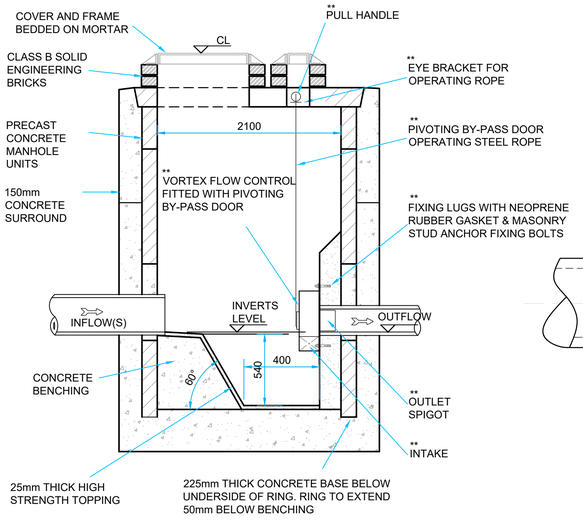
DRAWING TITLE
FW & SW DRAINAGE CONSTRUCTION DETAILS SHEET 2

DRAWING No.
RDB/ROC/2B/XX/DR/C/83/0502

REV.
P01

4328

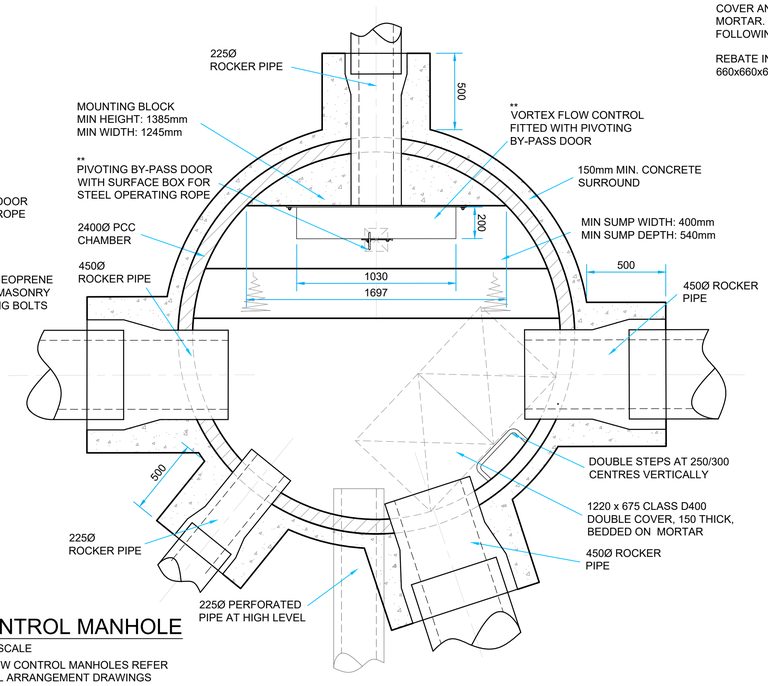
© RgCp Ltd.

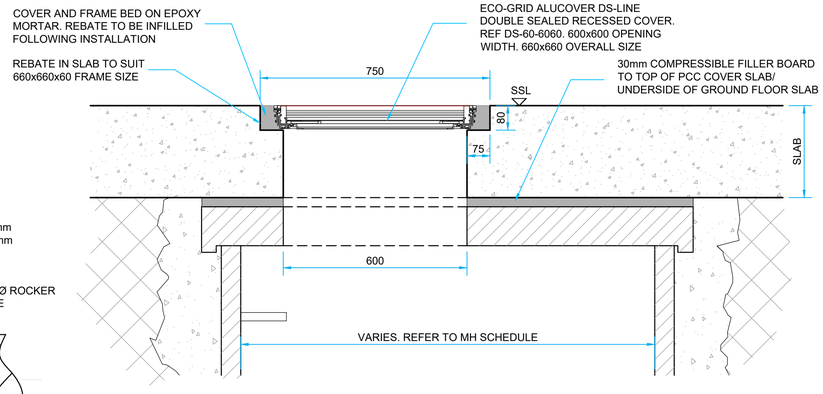


VORTEX FLOW CONTROL MANHOLE

NOT TO SCALE

FOR LOCATION OF VORTEX FLOW CONTROL MANHOLES REFER TO ROC DRAINAGE GENERAL ARRANGEMENT DRAWINGS

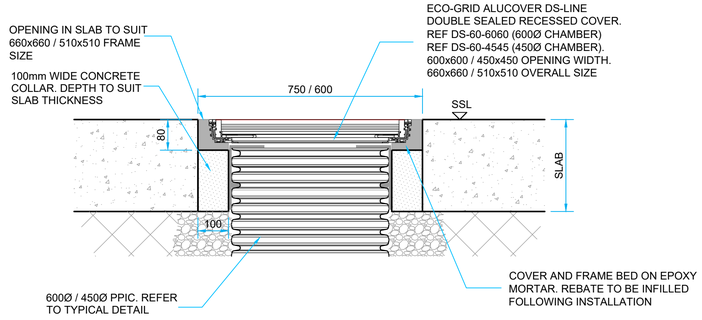




INTERNAL MANHOLE DETAIL TYPE A, B & C

NOT TO SCALE

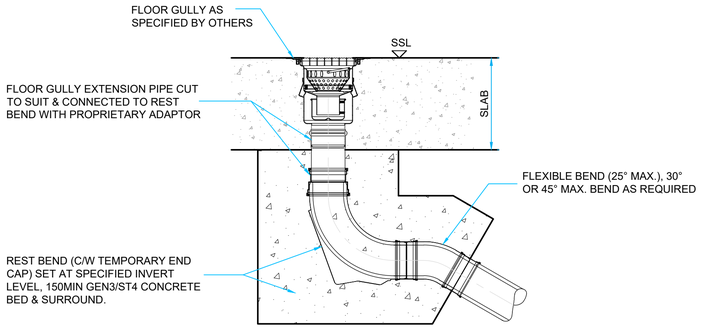
NOTE: COVER SET AT SSL. ARCHITECT TO DETAIL INTERFACE WITH PROPOSED FLOOR FINISH



INTERNAL MANHOLE DETAIL TYPE D

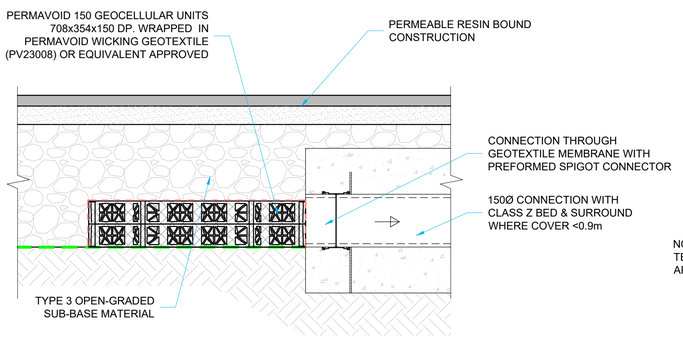
NOT TO SCALE

NOTE: COVER SET AT SSL. ARCHITECT TO DETAIL INTERFACE WITH PROPOSED FLOOR FINISH



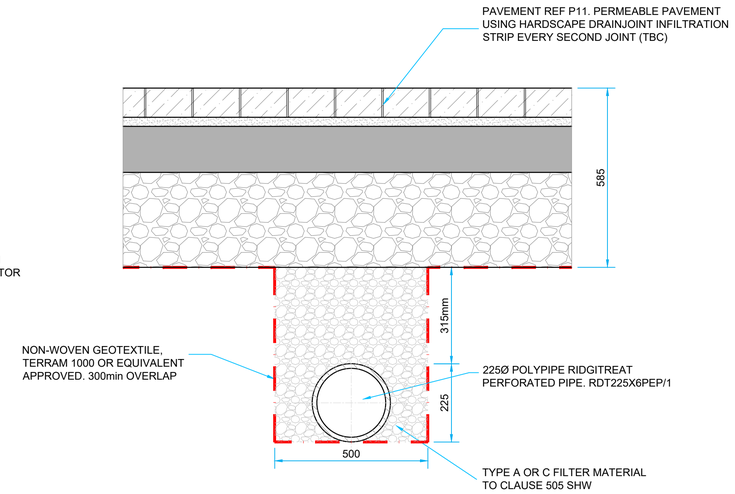
TRAPPED INTERNAL FLOOR GULLY DETAIL

NOT TO SCALE



TYPICAL PERMAVOID OUTLET DETAIL

SCALE - 1:10



DULWICH STREET PERMEABLE PAVEMENT UNDERDRAIN

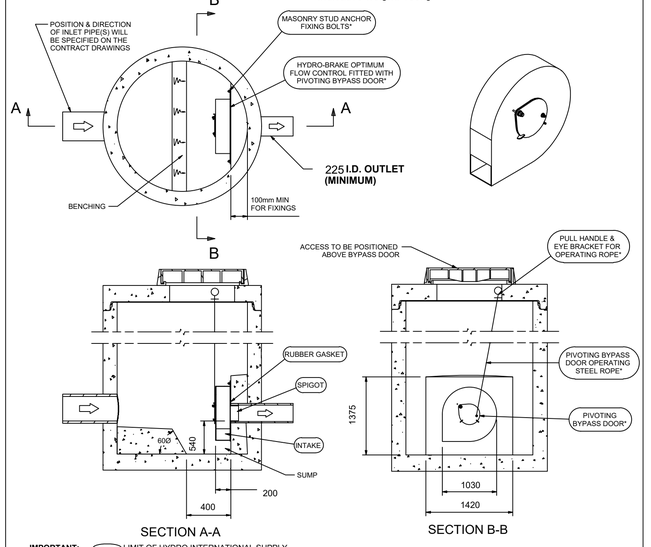
NOT TO SCALE

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.300	23.100
Flush-Flo	0.671	23.062
Kick-Flo	1.404	18.249
Mean Flow		20.146

Hydro-Brake Optimum Flow Control including:

- 5 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
- Variable flow rate post installation via adjustable inlet
- Indicative weight: 100kg



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 SHE-0193-2310-2300-2310 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.**
DATE	
SITE	NT02-03 REDBANK
DESIGNER	Andy James
REF	4328

SHE-0193-2310-2300-2310
Hydro-Brake Optimum

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REV.	DATE	DETAILS	DRN.	CHK
P02	17.12.24	FLOW CONTROL DETAIL UPDATED	ARJ	JAS
P01	22.11.24	FIRST ISSUE	ARJ	JAS

DRAWING STATUS
PRELIMINARY

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Manchester M15 4PZ
T 0161 214 5390
W rocconsulting.com

DRAWN	DATE	SCALES
ARJ	NOV 24	AS SHOWN
CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE --DO NOT SCALE--
PAW	NOV 24	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JAS	NOV 24	info@rocconsulting.com

CLIENT
FAR EAST CONSORTIUM INTERNATIONAL LTD

PROJECT TITLE
REDBANK DEVELOPMENT

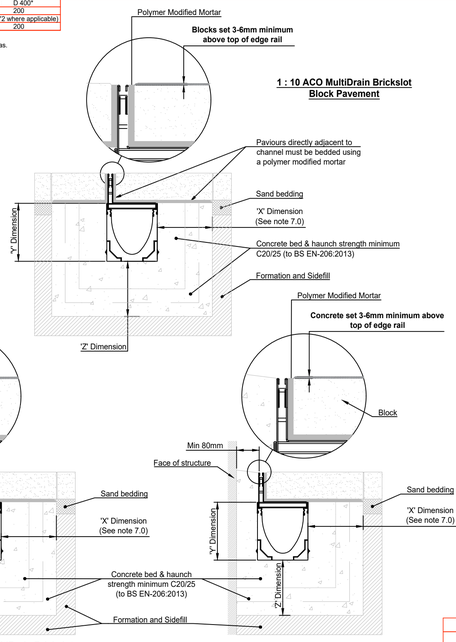
DRAWING TITLE
FW & SW DRAINAGE CONSTRUCTION DETAILS SHEET 3

DRAWING No.	REV.
RDB/ROC/2B/XX/DR/C/83/0503	P02

4328 © RgCp Ltd.

Load Class		A 15	B 125	C 250	D 400*
Minimum	X	100	150	150	200
Dimensions (mm)	Y	Full Channel Height (Less Y2 where applicable)			
	Z	100	150	150	200

* e.g. parking areas for all types of road vehicle.
Not suitable for carriageway of roads or industrial areas.



1 : 10 ACO MultiDrain Brickslot Block Pavement

1 : 10 ACO MultiDrain Brickslot Adjacent to Structure Option 1

1 : 10 ACO MultiDrain Brickslot Adjacent to Structure Option 2

NBS Specification:
ACO MultiDrain® Brickslot should be specified in section Q10:170. Assistance in completing this clause can be found in ACO Technologies product entries in NBS Plus, or a model specification can be downloaded from www.aco.co.uk. For further assistance, contact the ACO Water Management Design Services Team.

Best Practice and Workmanship:
ACO can give guidance with respect to the most suitable methods of installation for each of the products in the ACO MultiDrain® Brickslot range. ACO MultiDrain® Brickslot should be installed using levels of workmanship that accord with the National Code of Practice (UK: BS8000-0:2014) and in keeping with BS EN 1433:2002 (Drainage channels for vehicular and pedestrian areas).

Detailed installation statements and methodologies will vary for all sites as each will have different aspects deserving particular consideration, consequently the relevant approvals should be sought from the consulting engineer and/or the installer.

1.0 Load Class
Installation recommendations shown are ACO minimum recommendations for BS EN 1433:2002 load class requirements.

2.0 Ground Conditions
The long term performance of a channel installation to sustain vertical and lateral loads depends upon A) ground conditions B) stability of the adjacent pavement and C) a durable concrete bed and surround. The recommended installation detail may require the minimum dimensions to be revised to achieve site specific load class requirements (referred to in 1.0 above).

3.0 Cutting and Jointing
Mitre joints are formed by cutting the channels to the required angle and butting them together with appropriate sealant (e.g. Sikaflex 11FC or similar) or ACO Repair Kit. Where possible 90° joints and T's should be formed so that gratings do not have to be cut. Angles can be formed by connecting them using proprietary PVCu pipework attached to ACO inlet/outlet endcaps. For further details please contact ACO Design Services Team.
Note: For Load Classes higher than C 250, mitred joints are not recommended in vehicular areas. Where requested ACO can custom manufacture angled junctions to order.

4.0 Isolation Joints
The channel must be isolated from the surrounding environment. An isolation joint must be positioned up to 1500mm from the channel wall. Any dowel bars must be located no nearer than 150mm from the channel wall. Other isolation joints in surrounding slab must be continued through the channel. Additional crack control may be required to comply with specifier requirements.

5.0 Installation into in-situ Slab
Where a channel is to be installed into an existing concrete slab it is necessary to cut a suitably sized pocket in the slab. The channel will then need to be bedded in polymer modified mortar of 25mm minimum thickness (this may vary depending on the type of mortar used). Engineering advice may be necessary.

6.0 Temporary Installation
A channel installation is not complete until the final surfacing is laid. In any temporary condition, i.e. with the channel walls projecting above adjacent ground, site traffic should not cross channels. Loose boards, stone fill or cover plates will not protect the channel walls or grating. A temporary channel crossing should be formed by raising the ground level locally, to 3 - 6mm above top of edge rail, either side of a channel for a distance of 750 to 1000mm, to form ramps. Note that the channel load class should be adequate to carry the site traffic.

7.0 Block Pavements
The channel must be supported laterally. Blocks laid directly against a channel must be laid as a soldier course and restrained from movement by bedding securely on the concrete haunch e.g. by using a polymer modified mortar for bed and perpendicular joints (e.g. RONAFIX mortar mix C or similar). Blocks or slabs bedded on sand remote from the channel should be set at a higher level to compensate for possible settlement of the paving in service.

8.0 Grate Locking System
Gratings should be securely fixed to the channel, where required, using an appropriate grate lock system (where available).

9.0 Channel Protection
Avoid contact between compaction equipment and top of ACO channel edge rail. The installer must ensure that the finished surface level lies above the top of the edge rail (by at least 3-6mm). Covering or protecting the grating, before concreting the haunch or laying blocks, removes the time and cost associated with cleaning the channel and grating of cement material and embedded stones. (Please note that ACO channels must be installed with the grating in place to prevent deformation of the channel).

10.0 Watertight Installation to BS EN 1433:2002
Where ACO channel joints/fittings and channel/pavement interfaces are to be sealed, an appropriate sealant should be used (e.g. Sikaflex 11FC or similar). Guidance on the necessary surface preparation and/or priming should be sought from the sealant manufacturer.

For Guidance a typical method of application follows:
- The end faces of the channels are to be sound and free from dust, oil, and grease, with any loose material or dirt removed, e.g. by mechanical wire brush. No water drops should be evident.
- Using a standard cartridge gun, apply the sealant evenly and with no flaws. The detail on the ends of a channel varies from one product to another:
- Products with a basically flat face - apply the sealant in a layer approximately 5mm thick to one face of the joint.
- Products with a sealing groove within the end face - apply the sealant in a bead of approximately 10mm diameter into the sealing groove.
- Products with a sealing groove following the inside shape of the channel - apply the sealant to the end face of the channel and to the sealant groove, such that when the joint is completed, the sealant will both cover the end face and fill the groove.
- The channel unit should be placed on the prepared concrete bedding and pressed against the previously placed channel unit. A sealed joint of approximately 1-2mm width should be formed between adjacent channel units.
- Excess sealant should be wiped from the inside face of the channel to leave a smooth finish.
- The sealant is to be left to cure for 24 hours, during which time the sealant should be kept as dry as possible.

Note: Galvanised steel and iron products have good corrosion resistance to concrete and mortar products but may experience corrosion if high chloride and/or sulphate content is present. Use only good quality concrete and consider using corrosion inhibitors where necessary. The use of protective coatings, such as paint, can minimise the risk of corrosion.

Version	Date	Description	Name
E	28.6.2016	Updated title block	TS
D	31.5.2016	Revised to comments 12/04/16	TS
C	23.3.2016	Revised to comments 15/03/16	TS
B	2.3.2016	General revisions	TS

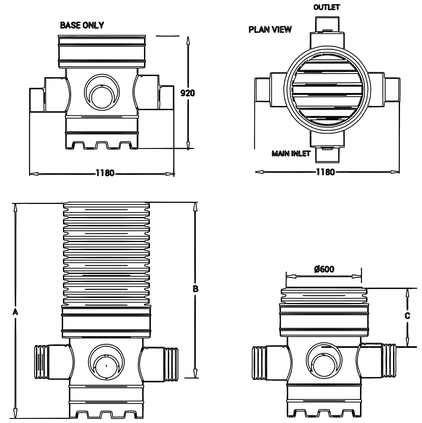
ACO Technologies plc
ACO Business Park
Hitchin Road
Shefford
Bedfordshire
SG17 5TE. UK
Tel: 01462 816666
www.aco.co.uk

Drawing Number: 22116 Revision: E

Title: ACO MULTIDRAIN M150D/DS 0.0 CHANNEL BRICKSLOT INSTALLATION DETAIL DRAWING

Created by: IM	Released by: TS	Projection: ISO-A	Format: A3
Created at: 4.2.2016	Released at: 28.6.2016	Units: mm	Scale: 1 : 10
Replacement for: E1-E01-031-3	Replaced by:		Sheet: 1 of 1

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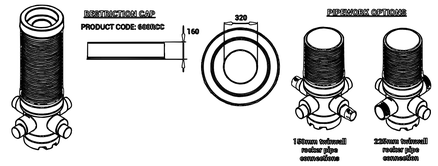
Product Code	Main pipework connections Ø (mm)	Optional Side inlets Ø (mm)	Depth A (mm)	inlet invert B (mm)	Soffit Depth C (mm)	Approx. Weight (kg)
ACCP0000361800 (Base Only)	150-225	150-225	920	580	355	16
ACCP0000361800/1	150-225	150-225	1055	715	490	28
ACCP0000361800/1.5	150-225	150-225	1450	1110	885	36
ACCP0000361800/2	150-225	150-225	1960	1620	1400	46
ACCP0000361800/2.5	150-225	150-225	2365	2015	1790	54
ACCP0000361800/3	150-225	150-225	3005	2665	2440	66

Please Note: Chambers deeper than 1000mm to soffit of pipework, (C), require a Restriction Cap 600RCC to comply with DCG

RESTRICTION CAPS

NEW DESIGN & CONSTRUCTION GUIDANCE (DCG), HAS NOW EFFECTIVELY SUPERCEDED S167 (SEWERS FOR ADOPTION 7). DCG STATES THAT ACCESS MUST BE RESTRICTED TO A MAXIMUM OF 350MM, ON ANY TYPE D OR E INSPECTION CHAMBER, DEEPER THAN 1000MM FROM COVER LEVEL TO SOFFIT OF PIPE.

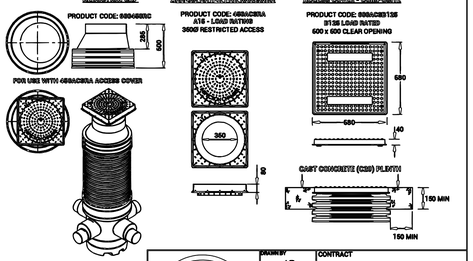
OUR 600RCC - RESTRICTION CAP IS DESIGNED TO FIT OVER THE ACCESS SHAFT AND PROVIDE A Ø320MM ACCESS.



RESTRICTION CAP & ACCESS COVERS

ALTERNATIVELY CHAMBERS CAN BE SUPPLIED WITH OUR 600RCC - REDUCTION CAP, WHICH WILL ACCOMMODATE OUR ACCESS COVER 450ACSRA, WHICH FITS DIRECTLY INTO THE CAP. THE FRAME HAS THE REQUIRED RESTRICTED ACCESS OF Ø350MM MOULDED INTEGRALLY. THE COVER LOADING IS A15 RATED.

IF REQUIRED A B125 LOADING ACCESS COVER CAN BE PROVIDED 600ACSB125. PLEASE NOTE: THIS NEEDS TO BE INSTALLED INTO A CONCRETE PLINTH (SEE DETAIL BELOW).



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TURTLE ENVRO

ACCESSO DRAINAGE SYSTEMS

DRAWN BY: A.T	CONTRACT		
CHKD DATE: 4/2/2022			
-	PRODUCT DESCRIPTION	BLUE RANGE 600 SERIES - CATCHPITS	
APPROVED BY: D.A	PRODUCT/CODE	ACCP0000361800	
APPROVED DATE: 4/2/2022	SCALE:	SHEET/SIZE: A4	REV: 1

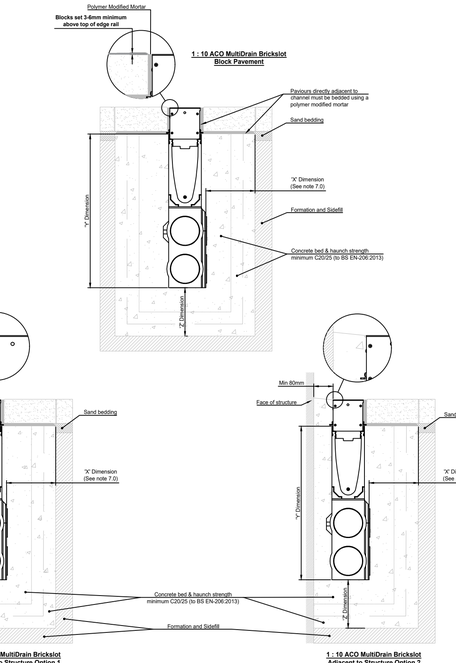
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Load Class		A 15	B 125	C 250	D 400*
Minimum	X	100	150	150	200
Dimensions (mm)	Y	Full Channel Height (Less Y2 where applicable)			
	Z	100	150	150	200

* e.g. parking areas for all types of road vehicle.
Not suitable for carriageway of roads or industrial areas.



1 : 10 ACO MultiDrain Brickslot Block Pavement

1 : 10 ACO MultiDrain Brickslot Adjacent to Structure Option 1

1 : 10 ACO MultiDrain Brickslot Adjacent to Structure Option 2

NBS Specification:
ACO MultiDrain® Brickslot should be specified in section Q10:170. Assistance in completing this clause can be found in ACO Technologies product entries in NBS Plus, or a model specification can be downloaded from www.aco.co.uk. For further assistance, contact the ACO Water Management Design Services Team.

Best Practice and Workmanship:
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Detailed installation statements and methodologies will vary for all sites as each will have different aspects deserving particular consideration, consequently the relevant approvals should be sought from the consulting engineer and/or the installer.

1.0 Load Class
Installation recommendations shown are ACO minimum recommendations for BS EN 1433:2002 load class requirements.

2.0 Ground Conditions
The long term performance of a channel installation to sustain vertical and lateral loads depends upon A) ground conditions B) stability of the adjacent pavement and C) a durable concrete bed and surround. The recommended installation detail may require the minimum dimensions to be revised to achieve site specific load class requirements (referred to in 1.0 above).

3.0 Cutting and Jointing
Mitre joints are formed by cutting the channels to the required angle and butting them together with appropriate sealant (e.g. Sikaflex 11FC or similar) or ACO Repair Kit. Where possible 90° joints and T's should be formed so that gratings do not have to be cut. Angles can be formed by connecting them using proprietary PVCu pipework attached to ACO inlet/outlet endcaps. For further details please contact ACO Design Services Team.
Note: For Load Classes higher than C 250, mitred joints are not recommended in vehicular areas. Where requested ACO can custom manufacture angled junctions to order.

4.0 Isolation Joints
The channel must be isolated from the surrounding environment. An isolation joint must be positioned up to 1500mm from the channel wall. Any dowel bars must be located no nearer than 150mm from the channel wall. Other isolation joints in surrounding slab must be continued through the channel. Additional crack control may be required to comply with specifier requirements.

5.0 Installation into in-situ Slab
Where a channel is to be installed into an existing concrete slab it is necessary to cut a suitably sized pocket in the slab. The channel will then need to be bedded in polymer modified mortar of 25mm minimum thickness (this may vary depending on the type of mortar used). Engineering advice may be necessary.

6.0 Temporary Installation
A channel installation is not complete until the final surfacing is laid. In any temporary condition, i.e. with the channel walls projecting above adjacent ground, site traffic should not cross channels. Loose boards, stone fill or cover plates will not protect the channel walls or grating. A temporary channel crossing should be formed by raising the ground level locally, to 3 - 6mm above top of edge rail, either side of a channel for a distance of 750 to 1000mm, to form ramps. Note that the channel load class should be adequate to carry the site traffic.

7.0 Block Pavements
The channel must be supported laterally. Blocks laid directly against a channel must be laid as a soldier course and restrained from movement by bedding securely on the concrete haunch e.g. by using a polymer modified mortar for bed and perpendicular joints (e.g. RONAFIX mortar mix C or similar). Blocks or slabs bedded on sand remote from the channel should be set at a higher level to compensate for possible settlement of the paving in service.

8.0 Grate Locking System
Gratings should be securely fixed to the channel, where required, using an appropriate grate lock system (where available).

9.0 Channel Protection
Avoid contact between compaction equipment and top of ACO channel edge rail. The installer must ensure that the finished surface level lies above the top of the edge rail (by at least 3-6mm). Covering or protecting the grating, before concreting the haunch or laying blocks, removes the time and cost associated with cleaning the channel and grating of cement material and embedded stones. (Please note that ACO channels must be installed with the grating in place to prevent deformation of the channel).

10.0 Watertight Installation to BS EN 1433:2002
Where ACO channel joints/fittings and channel/pavement interfaces are to be sealed, an appropriate sealant should be used (e.g. Sikaflex 11FC or similar). Guidance on the necessary surface preparation and/or priming should be sought from the sealant manufacturer.

For Guidance a typical method of application follows:
- The end faces of the channels are to be sound and free from dust, oil, and grease, with any loose material or dirt removed, e.g. by mechanical wire brush. No water drops should be evident.
- Using a standard cartridge gun, apply the sealant evenly and with no flaws. The detail on the ends of a channel varies from one product to another:
- Products with a basically flat face - apply the sealant in a layer approximately 5mm thick to one face of the joint.
- Products with a sealing groove within the end face - apply the sealant in a bead of approximately 10mm diameter into the sealing groove.
- Products with a sealing groove following the inside shape of the channel - apply the sealant to the end face of the channel and to the sealant groove, such that when the joint is completed, the sealant will both cover the end face and fill the groove.
- The channel unit should be placed on the prepared concrete bedding and pressed against the previously placed channel unit. A sealed joint of approximately 1-2mm width should be formed between adjacent channel units.
- Excess sealant should be wiped from the inside face of the channel to leave a smooth finish.
- The sealant is to be left to cure for 24 hours, during which time the sealant should be kept as dry as possible.

Note: Galvanised steel and iron products have good corrosion resistance to concrete and mortar products but may experience corrosion if high chloride and/or sulphate content is present. Use only good quality concrete and consider using corrosion inhibitors where necessary. The use of protective coatings, such as paint, can minimise the risk of corrosion.

Version	Date	Description	Name
D	28.6.2016	Updated title block	TS
C	15.6.2016	Revised to comments 15/03/16	TS
B	2.3.2016	Revised grating detail	TS

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Drawing Number: 22123 Revision: D

Title: ACO MULTIDRAIN M100D/DS UNIVERSAL SUMP BRICKSLOT INSTALLATION DETAIL DRAWING

Created by: IM	Released by: TS	Projection: ISO-A	Format: A3
Created at: 4.2.2016	Released at: 28.6.2016	Units: mm	Scale: 1 : 10
Replacement for: E1-E01-031-3	Replaced by:		Sheet: 1 of 1

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REV.	DATE	DETAILS	DRN.	CHK.
P01	22.11.24	FIRST ISSUE	ARJ	PAW

DRAWING STATUS
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DRAWN ARJ	DATE NOV 24	SCALES AS SHOWN
CHECKED PAW	DATE NOV 24	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE --DO NOT SCALE--
APPRVD. JAS	DATE NOV 24	EMAIL FOR DRAWINGS info@rocconsulting.com

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FAR EAST CONSORTIUM INTERNATIONAL LTD

PROJECT TITLE
REDBANK DEVELOPMENT

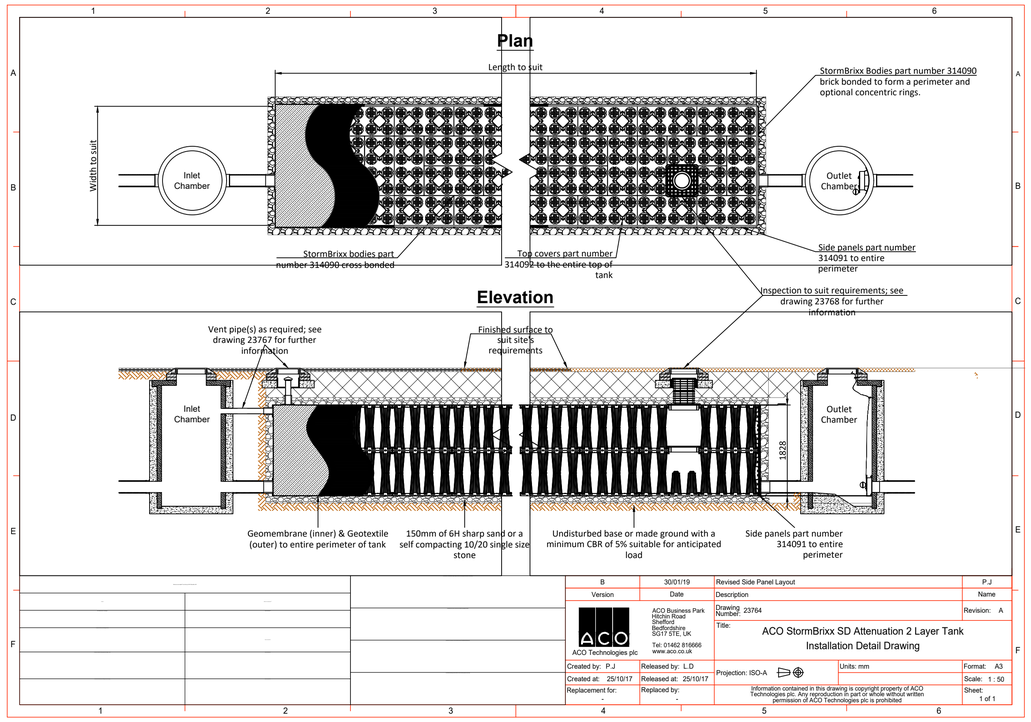
DRAWING TITLE
FW & SW DRAINAGE CONSTRUCTION DETAILS SHEET 4

DRAWING No.
RDB/ROC/2B/XX/DR/C/83/0504

REV.
P01

4328

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Version	Date	Description	Name
B	30/01/19	Revised Side Panel Layout	P.J

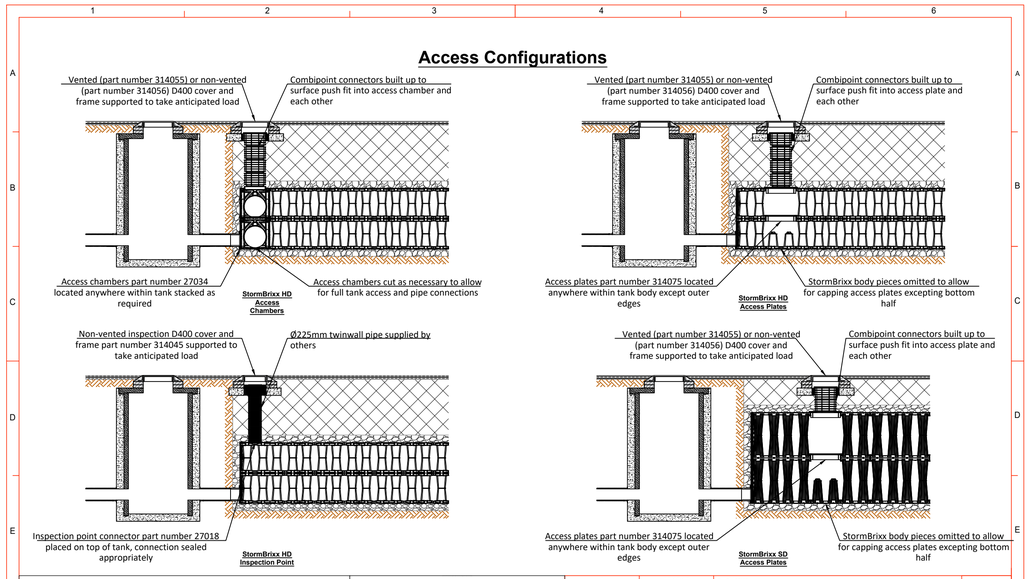
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Drawing Number: 23764 — Revision: A

Title: ACO StormBrixx SD Attenuation 2 Layer Tank Installation Detail Drawing

Created by: P.J	Released by: L.D	Projection: ISO-A	Units: mm / Format: A3
Created at: 25/10/17	Released at: 25/10/17		Scale: 1 : 50
Replacement for: -	Replaced by: -		Sheet: 1 of 1

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Version	Date	Description	Name
A	25/10/17	Initial Issue	P.J

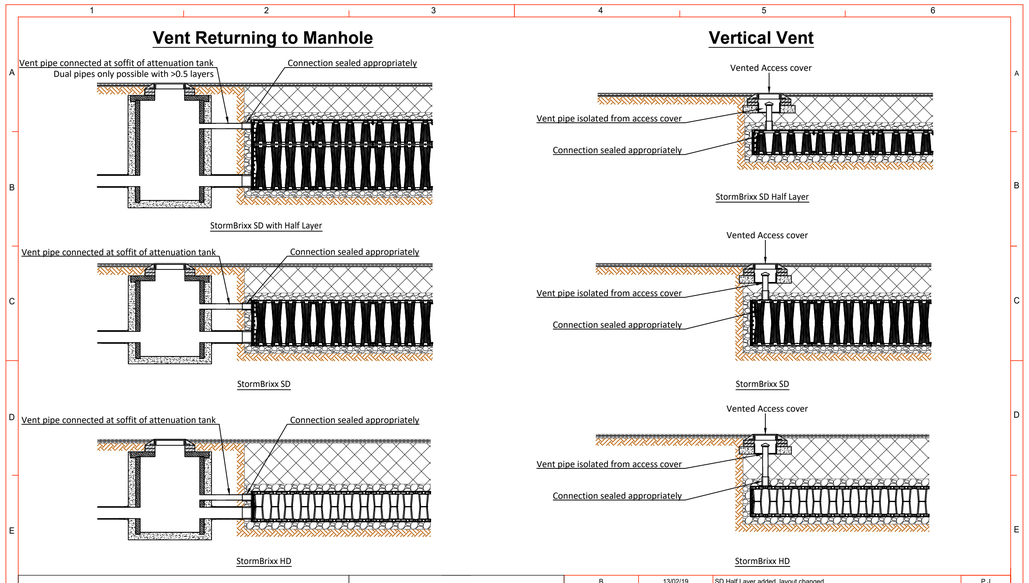
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Drawing Number: 23768 — Revision: A

Title: ACO StormBrixx Typical Access Detail Installation Detail Drawing

Created by: P.J	Released by: L.D	Projection: ISO-A	Units: mm / Format: A3
Created at: 25/10/17	Released at: 25/10/17		Scale: 1 : 5
Replacement for: -	Replaced by: -		Sheet: 1 of 1

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Version	Date	Description	Name
B	13/02/19	SD Half Layer added, layout changed	P.J

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Drawing Number: 23767 — Revision: B

Title: ACO StormBrixx Typical Vent Detail Installation Detail Drawing

Created by: P.J	Released by: L.D	Projection: ISO-A	Units: mm / Format: A3
Created at: 25/10/17	Released at: 25/10/17		Scale: 1 : 30
Replacement for: -	Replaced by: -		Sheet: 1 of 1

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3. SHOULD THERE BE ANY DISCREPANCY BETWEEN DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS THE ENGINEER SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
4. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.

REV.	DATE	DETAILS	DRN.	CHK
P01	22.11.24	FIRST ISSUE	ARJ	PAW

DRAWING STATUS
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APPRVD. JAS	DATE NOV 24	EMAIL FOR DRAWINGS info@rocconsulting.com

CLIENT
FAR EAST CONSORTIUM INTERNATIONAL LTD

PROJECT TITLE
PLOTS NT02, NT03 & NT04
NORTHERN GATEWAY

DRAWING TITLE
FW & SW DRAINAGE
CONSTRUCTION DETAILS
SHEET 5

DRAWING No.
RDB/ROC/2B/XX/DR/C/83/0505

REV.
P01

4328

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APPENDIX L – Maintenance Record

COMPLEX CHALLENGES ...
MADE SIMPLE

Pipework, Access and General Maintenance

Inspection Date:

Pipework and Manhole Access Maintenance	Frequency	Details	Action required	Date completed
Inspection of inlets and outlets. Ensure they are clear and flows are not impeded.	Bi-annually			
Inspection of manholes, gullies, sumps, and channel drains for debris and signs of blockages.	Bi-annually			
Inspection of manhole covers and frames for damage and ensure correctly bolted together.	Bi-annually			
Inspection of water quality. Ensure water quality is free of algae, oils, or odours.	Bi-annually			
Visual inspection for inefficiencies - such as surface water building up at the inlet.	Bi-annually			
Remove litter and debris from gully and channel drain surface.	Bi-annually			
Remove or control tree roots where they are encroaching the sides of the gully	Bi-annually			
Inspection of gully and channel drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage.	Bi-annually			

COMPLEX CHALLENGES ...
MADE SIMPLE

Control Chamber Maintenance

Inspection Date:

Control Chamber Maintenance	Frequency	Details	Action required	Date completed
Inspection of the Vortex Flow Control device to ensure that the outlet is clear and unit is undamaged	Monthly for 6 months after installation then Bi-annually			
Inspection of the Vortex Flow Control By-Pass Penstock to ensure it is operational	Monthly for 6 months after installation then Bi-annually			
Inspection of Orifice Control to ensure hole is clear and undamaged	Monthly for 6 months after installation then Bi-annually			
Inspection of incoming and outgoing pipework for blockages and clear if required.	Monthly for 6 months after installation then Bi-annually			
Remove sediment and debris from control chamber sump	Monthly for 6 months after installation then Bi-annually			

COMPLEX CHALLENGES ...
MADE SIMPLE

Attenuation Tank Maintenance

Inspection Date:

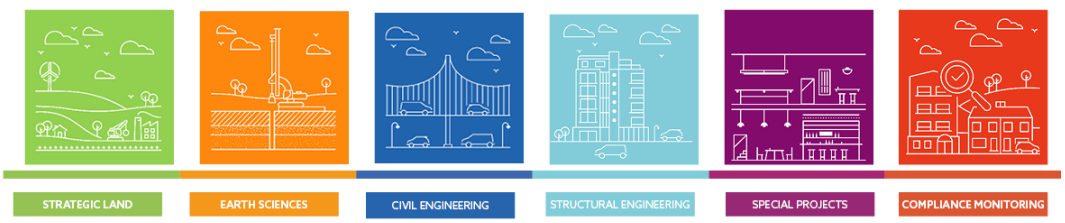
Attenuation Tank Maintenance	Frequency	Details	Action required	Date completed
Inspect and identify any areas that are not operating correctly. IF required, take remedial action	Monthly for 3 months then annually			
Remove debris from the catchment surface (where it has the potential to cause risks to performance)	Monthly			
Remove sediment from upstream/ downstream catchpits/ access points	Annually or as required			
Inspect all inlets, outlets, vents and overflows to ensure they are not blocked/ damaged and are operating as designed	Annually			
Survey inside of tank for sediment build-up and remove as necessary	Every 5 years or as required			

COMPLEX CHALLENGES ...
MADE SIMPLE

Permeable Paving Maintenance

Inspection Date:

Permeable Paving Maintenance	Frequency	Details	Action required	Date completed
Brushing and vacuuming (standard cosmetic sweep across whole surface)	3 times annually or as required			
Inspect for evidence of poor operation and/ or weed growth. If required take remedial action.	3 monthly			
Inspect filter/ under drain via upstream/ downstream inspection chambers & flow control. Remove silt as required	Annually			
Stabilise and mow adjacent landscaped areas.	As required			
Remove weeds or management using proprietary weed killer applied directly	As required			
Remedial works to any depressions, rutting and cracked or broken blocks.	As required			
Replace lost jointing materials	As required			
Rehabilitation of surface and upper sub-structure if performance is significantly reduced.	As required			



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