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Manchester City Council

Project no.
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 Lendlease	
Document Review Lendlease document received on:	
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Accepted documents are considered to conform to the design intent, but does not mean acceptance of dimensions, details, size or weights; nor does it relieve the designer from responsibilities for errors, omissions and/or compliance with obligations and/or responsibilities of the contract.	

OUR TOWN HALL, MANCHESTER

Below Ground Drainage Operations and Maintenance Public Realm

Document ref: OTH-RAM-XX-XX-RPT-C-0018

Revision History

Revision	Date	Purpose / Status	Comments
P01	02/08/2019	Planning Submission / S3	For comment
P02	04/09/2019	Planning Submission / S3	Final Issue
P03	19/12/2019	Planning Submission / S3	Appendix 1 amended due to change in landscape plan Drainage channels and slots added

Prepared By		Reviewed By		Approved By
				
Lisa Sawyer		Gary Willis		Greig Kirker
Director		Director		Director

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MANUFACTURERS LITERATURE

1. INTRODUCTION

Ramboll UK Ltd have been appointed by Manchester City Council to produce a Below Ground Drainage Operations and Maintenance document as supplementary to the Flood Risk Assessment and Drainage Strategy Report to support a planning application for the construction of public realm areas external to the Town Hall building including Albert Square redevelopment.

The Our Town Hall Project (OTH Project) is based upon eight core principles:

- To secure the long-term future of Manchester Town Hall, its civic role and its external setting
- To retain and enhance as a functioning and efficient Town Hall
- To restore and celebrate this significant heritage asset for Manchester
- To enhance the use of the building, as a visitor destination and increase access to Mancunians
- To transform users' and visitors' experiences
- To reduce carbon footprint and energy costs
- To maximise the commercial opportunities and offset costs to the public purse
- To deliver economic and social value for Manchester

The Application Site includes the redevelopment of Albert Square and public realm/highway works, external to the Town Hall building and courtyard, included within the redline boundary. This Operations and Maintenance document covers all below ground drainage works related to the Application Site.

2. SCOPE AND OBJECTIVES

This manual detail the inspection and maintenance of below ground drainage features within the redevelopment of Albert Square and public realm/highway works external to the Town Hall building and courtyard.

This has been written in order to demonstrate to the Flood Risk Management Team in Manchester City Council who are acting as the Lead Local Flood Authority (LLFA) the effectiveness and longevity of the features designed for within the scheme as opposed to the standard Building Regulations local and domestic drainage and/or the main discharge drainage connections to 'Sewers for Adoption' standards.

This report is based on current best practice guidance and therefore may change in time.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the next stage of design for this project. Where such adjustments are undertaken as part of the detailed design, and are deemed a material derivation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

This manual is intended to give an overview of the operation and maintenance for the range of below ground drainage features included with the associated drainage strategy. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.

The recommended operations and frequencies are typical only and based on the information provided at the time of writing by the manufacturers proposed.

3. LIMITATIONS

This report has been prepared for Manchester City Council in support of a planning application for the redevelopment of Albert Square and public realm/highway works external to the Town Hall building and courtyards for the OTH Project and shall not be relied upon by any third party unless that party has been granted a contractual right to rely on this report for the purpose for which it was prepared.

The findings and opinions in the report are based upon information derived from a variety of information sources. Ramboll believe these information sources to be reliable and, where possible, have tried to verify the information.

This report has been prepared on the basis of the proposed end use defined by the Client. If this proposed end use is altered or changed then it will be necessary to review the findings of this report.

It should be noted that some of the aspects considered in this study are subject to change with time. Therefore, if the development is delayed or postponed for a significant period, then it should be reviewed to confirm that no changes have taken place, either at the site or within relevant legislation.

4. PIPEWORK AND MANHOLES

4.1 Location and Description

Pipes are the main conveyance across the site with the network as shown on drainage drawing OTH-RAM-EE-XX-DWG-C-1101.

Pipes are proprietary products and the materials used are industry standard. It is proposed to utilise plastic pipework.

The manufacturer's recommendations should be followed. Regardless of the product used the pipes will be fully compliant with Ramboll drainage specification.

4.2 Operation

Pipes are intended to be the main conveyance. They are intended to be dry except for during rainfall events. All new pipework has been designed to be self-cleansing.

Access for maintenance is provided through access chambers, manholes and rodding eyes to all new drainage in accordance with British Standards.

4.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be draining correctly thus exposing the surrounding buildings potentially to greater flood risk.

Sediment\material removal off site should be undertaken in consultation with the environmental regulator to confirm appropriate protocols. Flushing of the system into the public sewer networks downstream is prohibited.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided as post construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly and directly after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs and manholes.	6 monthly
	Jet all below ground drainage pipework to remove any build up within the pipework	Annually
Remedial actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

4.4 Maintenance Responsibility

Maintenance responsibility for the pipework and manholes is the responsibility of Manchester City Council Highways Department through an agreed commuted sum.

5. ATTENUATION TANK (GEOCELLULAR UNITS)

5.1 Location and Description

The attenuation tanks located beneath Albert Square are indicated on drawing OTH-RAM-EE-XX-DWG-C-1101.

The tanks have been designed in accordance with Lead Local Flood Authority, CIRIA C697 and the product specific requirements. The geocellular units specified are proprietary products and therefore manufacturer's recommendations should also be taken into consideration.

The current design is to utilise the Polystorm geocellular attenuation tank by Polypipe.

Different manufacturers may have different connection details, access details and arrangements which will need to be taken in to consideration if changed.

5.2 Operation

The attenuation tanks are intended to be the surface water storage feature to attenuate the discharge from the majority of Albert Square up to and including the 1 in 100 year plus 40% climate change event. As such, during rainfall events the tank will fill completely. The tank is intended to be empty between rainfall events.

An inspection unit along the length of the tanks have been provided for ease of jetting. Access for maintenance has been provided at catch pit manholes upstream of the tank. These are indicated on the general arrangement layout. The units are effectively sealed laterally preventing the ingress of deleterious material.

5.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the attenuation tank as designed. As the feature is buried, a regular inspection regime is very important to ensure the correct functionality of the surface water drainage network.

Sediment\material removal off site should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken monthly within the first year of operation and adjusted as required)	Inspect inlets and outlets for blockages from the catch pit manholes provided, and clear if required.	Half yearly and after large storm events.
	Check mechanical devices (flow control until) in downstream manhole	Half yearly.
	Inspect ventilation pipework	Half yearly and after large storm event.
Regular maintenance\inspection	Inspect and identify any areas that are not operating correctly. If required, take	6 Monthly

Maintenance Schedule	Required Action	Frequency
	remedial action.	
	Debris removal from courtyard surface (as this may cause risks to performance)	Monthly
	Remove sediment from pre-treatment structures such as catch pits and silt trap gullies	Annually (or as required after heavy rainfall events)
	Jetting of inspection unit and removal of debris from catch pits	Annually (or as required after heavy rainfall events)
Remedial actions	Repair/rehabilitation of inlets, outlets and vents.	As required.

5.4 Maintenance Responsibility

Maintenance responsibility for the attenuation tank is the responsibility of Manchester City Council Highways Department through an agreed commuted sum.

6. TREE PIT ATTENUATION

6.1 Location and Description

A number of the tree pits in Albert Square are being utilised as surface water attenuation tanks and are indicated on drawing OTH-RAM-EE-XX-DWG-C-1101 before outfall to the downstream pipework (due to lack of infiltration characteristics).

The current tree pit design is to utilise Root Cell Modules, Stratcell by GreenBlue Urban with 20 void ratio within the soil and cell system for surface water attenuation.

Different manufacturers may have different connection details, access details and arrangements which will need to be taken in to consideration if changed.

6.2 Operation

The soil retention system stores up to and including the 1 in 100 year plus 40% climate change event for the area of Albert Square only draining to the Aco linear drainage channel. As such, during rainfall events the tank will fill 300mm from the base of the tree pit. The tank is intended to be empty between rainfall events. An overall pipe is to be installed to prevent the tree sitting in water.

A perforated pipe is located beneath the tree root cell system diagonal where possible across the base. A polypropylene inspection chamber is located upstream and downstream for rodding purposes.

6.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important of the outflow from the tree pits for the effective operation of the attenuation system within the tree pit as designed and to prevent flooding of the tree pit base.

As the feature is buried, a regular inspection regime is very important to ensure the correct functionality of the surface water drainage network.

Maintenance Schedule	Required Action	Frequency
Monitoring	Inspect inspection chambers upstream and downstream of tree pit and clear if required.	To be undertaken monthly within the first year of operation and adjusted as required
Regular maintenance\inspection	Check inspection chambers upstream and downstream of tree pit to review level of sedimentation and remove if required.	6 monthly (or as required after heavy rainfall events)
	Review water outlet from overflow system	6 monthly
Remedial actions	Repair/rehabilitation	As required by manufacturer

6.4 Maintenance Responsibility

Maintenance responsibility for the tree pits are the responsibility of Manchester City Council Highways Department through an agreed commuted sum.

7. WATER TREATMENT

7.1 Location and Description

An oil separation unit is fitted between manhole S2-39 and manhole S2-40 as indicated on drainage drawing OTH-RAM-EE-XX-DWG-C-1101.

The oil separation unit is a Hydrobrake Downstream Defender system and is proprietary product.

The manufacturer's recommendations should be followed.

7.2 Operation

The Downstream Defender is a vortex separator which is used to treat stormwater runoff. Polluted stormwater is introduced tangentially into the side of the precast vortex chamber to establish rotational flow. A cylindrical baffle with an inner centre shaft creates an outer and inner spiralling column of flow and ensures maximum residence time for pollutant travel between the inlet and outlet. Oil and debris are captured and stored on the surface of the outer spiralling column. Low energy vortex motion directs sediment (if any left) into the protected sump region.

7.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify the separation is working correctly. The unit is not obstructed/clogged therefore exposing the surrounding to a greater level of flood risk.

Maintenance ports at the surface are to provide access for easy inspection and clean-out therefore no need to enter space.

Sediment\material removal from inside of the manhole off site should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided as post construction CCTV survey.	N/A
	Inspect for evidence of poor operation. If required, take remedial action.	3-monthly, 48 hours after large storms.
Occasional maintenance	Check and remove debris build up from within manholes upstream to prevent large amounts of debris into the Downstream Defender. Remove oil and debris from the floatable capture zones within the unit.	3 monthly initial, likely to be yearly following first year inspections
Remedial actions		
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

7.4 Maintenance Responsibility

Maintenance responsibility for the Downstream Defender System (oil and debris separator) is the responsibility of Manchester City Council Highways Department through an agreed commuted sum.

8. NON-RETURN VALVES

8.1 Location and Description

Non-return valves are fitted in the incoming pipes within manholes C2-1 and F2-4 shown on drainage drawing OTH-RAM-EE-XX-DWG-C-1101.

The non-return valve is a proprietary product and the materials used are standard.

The current design specifies an Althon Wastop inline pipe product. The manufacturer's recommendations should be followed for installation and maintenance.

8.2 Operation

The non-return valve is located as close to the outfall into the public sewer as possible and prevents the public sewer surcharging back into the private systems, especially into the geocellular tanks.

Access for maintenance is provided at manhole chambers C2-1 and F2-4.

8.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify the non-return valve is working correctly, it is not obstructed/clogged therefore exposing the surrounding area to a greater risk of flooding.

Sediment\material removal off site should be undertaken in consultation with the environmental regulator to confirm appropriate protocols.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided as post construction CCTV survey to show correct installation	N/A
	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms. Likely to be yearly following first year of installation.
Remedial actions	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

8.4 Maintenance Responsibility

Maintenance responsibility for the non-return valves are the responsibility of Manchester City Council Highways Department through an agreed commuted sum.

9. DRAINAGE CHANNELS AND SLOT DRAINAGE

9.1 Location and Description

Linear drainage channels with gratings and slot drainage are shown on drainage drawing OTH-RAM-EE-XX-DWG-C-1101.

The channels proposed are proprietary products and the materials used are standard.

The current design specifies Marshalls Drexus Duo Slot and Aco Multidrain Channels with Freestyle Gratings. The manufacturer's recommendations should be followed for installation and maintenance.

9.2 Operation

The drainage channels and slot drainage are located at low spots in the surfacing to take all water off the surface of the Albert Square.

Access for maintenance is provided in access points along the channel or slot.

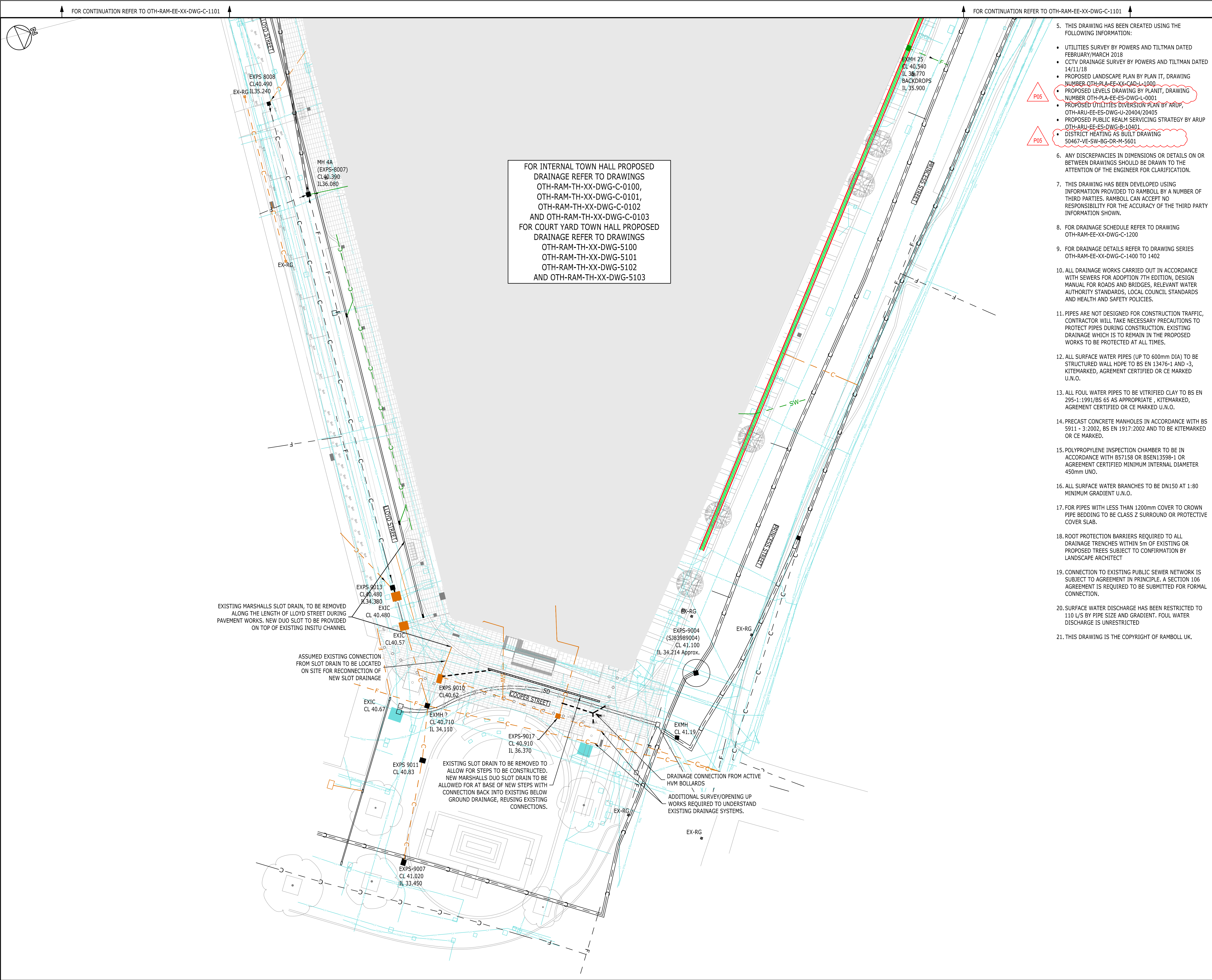
9.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the slot drainage and linear drainage channels with gratings. A regular inspection and maintenance regime is very important to ensure the correct functionality of the surface water drainage network which the slot drainage and linear drainage channels are a part of. The following maintenance schedule has been proposed at this stage of the design. Maintenance will be the responsibility of Manchester City Council Highways Department via an agreed commuted sum.

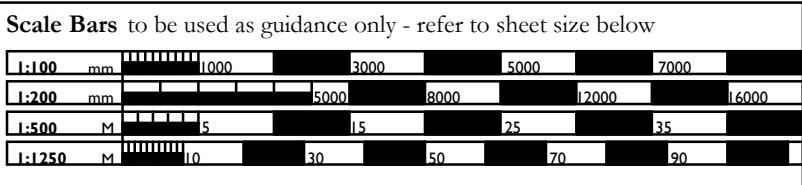
Maintenance Schedule	Required Action	Frequency
Monitoring To be undertaken within the first year of operation and after every large storm event	Inspect all channel inlets (slot or grating) and outlets at access point locations for blockages, and clear if required. Check channel gratings and locking system is working as designed.	Monthly and after large storm events.
Regular maintenance\inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	3 Monthly (or as required after heavy rainfall events) (Timing to be reviewed following monitoring exercise in first year of operation)
	Remove sediment from silt traps and debris from surface of square and slot drain aperture	3 Monthly (or as required after heavy rainfall events)
	Jetting of drainage channels	Annually (or as required after heavy

Maintenance Schedule	Required Action	Frequency
		rainfall events)
	Check channel gratings and locking systems are still in place and working	3 Monthly
Remedial actions	Repair of gratings or channel deformation	As required. Further deterioration could occur if damaged section of channel or grating is not remediated

APPENDIX 1 DRAINAGE DRAWINGS

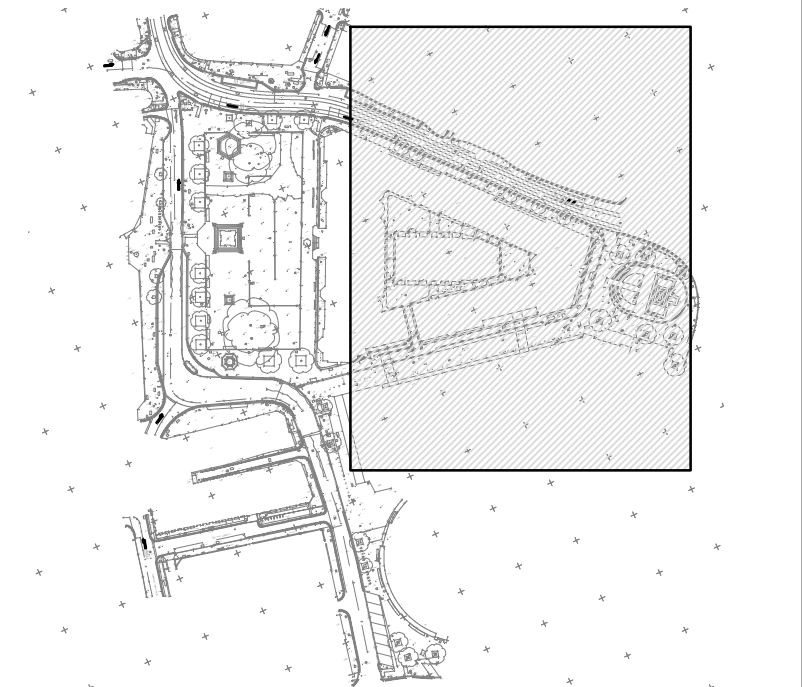


5. THIS DRAWING HAS BEEN CREATED USING THE FOLLOWING INFORMATION:
- UTILITIES SURVEY BY POWERS AND TILTMAN DATED FEBRUARY/MARCH 2018
 - CCTV DRAINAGE SURVEY BY POWERS AND TILTMAN DATED 14/11/18
 - PROPOSED LANDSCAPE PLAN BY PLAN IT, DRAWING NUMBER OTH-PLA-EE-XX-CAD-L-1000
 - PROPOSED LEVELS DRAWING BY PLANIT, DRAWING NUMBER OTH-PLA-EE-ES-DWG-L-0001
 - PROPOSED UTILITIES DIVERSION PLAN BY ARUP, OTH-ARU-EE-ES-DWG-U-20404/20405
 - PROPOSED PUBLIC REALM SERVICING STRATEGY BY ARUP OTH-ARU-EE-ES-DWG-B-10401
 - DISTRICT HEATING AS BUILT DRAWING 50467-VE-SW-BG-DR-M-5601
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9. FOR DRAINAGE DETAILS REFER TO DRAWING SERIES OTH-RAM-EE-XX-DWG-C-1400 TO 1402
10. ALL DRAINAGE WORKS CARRIED OUT IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION, DESIGN MANUAL FOR ROADS AND BRIDGES, RELEVANT WATER AUTHORITY STANDARDS, LOCAL COUNCIL STANDARDS AND HEALTH AND SAFETY POLICIES.
11. PIPES ARE NOT DESIGNED FOR CONSTRUCTION TRAFFIC. CONTRACTOR WILL TAKE NECESSARY PRECAUTIONS TO PROTECT PIPES DURING CONSTRUCTION. EXISTING DRAINAGE WHICH IS TO REMAIN IN THE PROPOSED WORKS TO BE PROTECTED AT ALL TIMES.
12. ALL SURFACE WATER PIPES (UP TO 600mm DIA) TO BE STRUCTURED WALL HDPE TO BS EN 13476-1 AND -3, KITEMARKED, AGREEMENT CERTIFIED OR CE MARKED U.N.O.
13. ALL FOUL WATER PIPES TO BE VITRIFIED CLAY TO BS EN 295-1:1991/BS 65 AS APPROPRIATE, KITEMARKED, AGREEMENT CERTIFIED OR CE MARKED U.N.O.
14. PRECAST CONCRETE MANHOLES IN ACCORDANCE WITH BS 5911 - 3:2002, BS EN 1917:2002 AND TO BE KITEMARKED OR CE MARKED.
15. POLYPROPYLENE INSPECTION CHAMBER TO BE IN ACCORDANCE WITH BS7158 OR BSEN13598-1 OR AGREEMENT CERTIFIED MINIMUM INTERNAL DIAMETER 450mm UNO.
16. ALL SURFACE WATER BRANCHES TO BE DN150 AT 1:80 MINIMUM GRADIENT U.N.O.
17. FOR PIPES WITH LESS THAN 1200mm COVER TO CROWN PIPE BEDDING TO BE CLASS 2 SURROUND OR PROTECTIVE COVER SLAB.
18. ROOT PROTECTION BARRIERS REQUIRED TO ALL DRAINAGE TRENCHES WITHIN 5m OF EXISTING OR PROPOSED TREES SUBJECT TO CONFIRMATION BY LANDSCAPE ARCHITECT
19. CONNECTION TO EXISTING PUBLIC SEWER NETWORK IS SUBJECT TO AGREEMENT IN PRINCIPLE. A SECTION 106 AGREEMENT IS REQUIRED TO BE SUBMITTED FOR FORMAL CONNECTION.
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KEY	
EXISTING PUBLIC COMBINED DRAIN/ MANHOLE	C
EXISTING PUBLIC FOUL DRAIN/ MANHOLE	F
EXISTING PUBLIC SURFACE WATER DRAIN/MANHOLE	SW
EXISTING PRIVATE FOUL DRAIN/ MANHOLE	F
EXISTING ROAD GULLY	EX-RG
PROPOSED DRAW PIT LOCATION REF C AND D, REQUIRING DRAINAGE	DP
PROPOSED FOUL WATER DRAIN/CONCRETE MANHOLE	
PROPOSED SURFACE WATER DRAIN/CONCRETE MANHOLE	
PROPOSED SURFACE WATER POLY PROPYLENE INSPECTION CHAMBER	
PERFORATED PIPES TO BASE OF TREE PITS	
PROPOSED ROAD GULLY	RG
PROPOSED DRAINAGE CHANNEL / SLOT DRAIN WITH SUMP AND ACCESS UNIT	DC / SD
PROPOSED ATTENUATION	
PROPOSED TREE PIT	



P05	18/12/2019	LS	SG	PLANNING ISSUE SEE REVISION CLOUDS
P04	05/09/2019	LS	SG	STAGE 4 ISSUE SEE REVISION CLOUDS

ISSUE	DATE	APPROVED	DRAWN	DESCRIPTION
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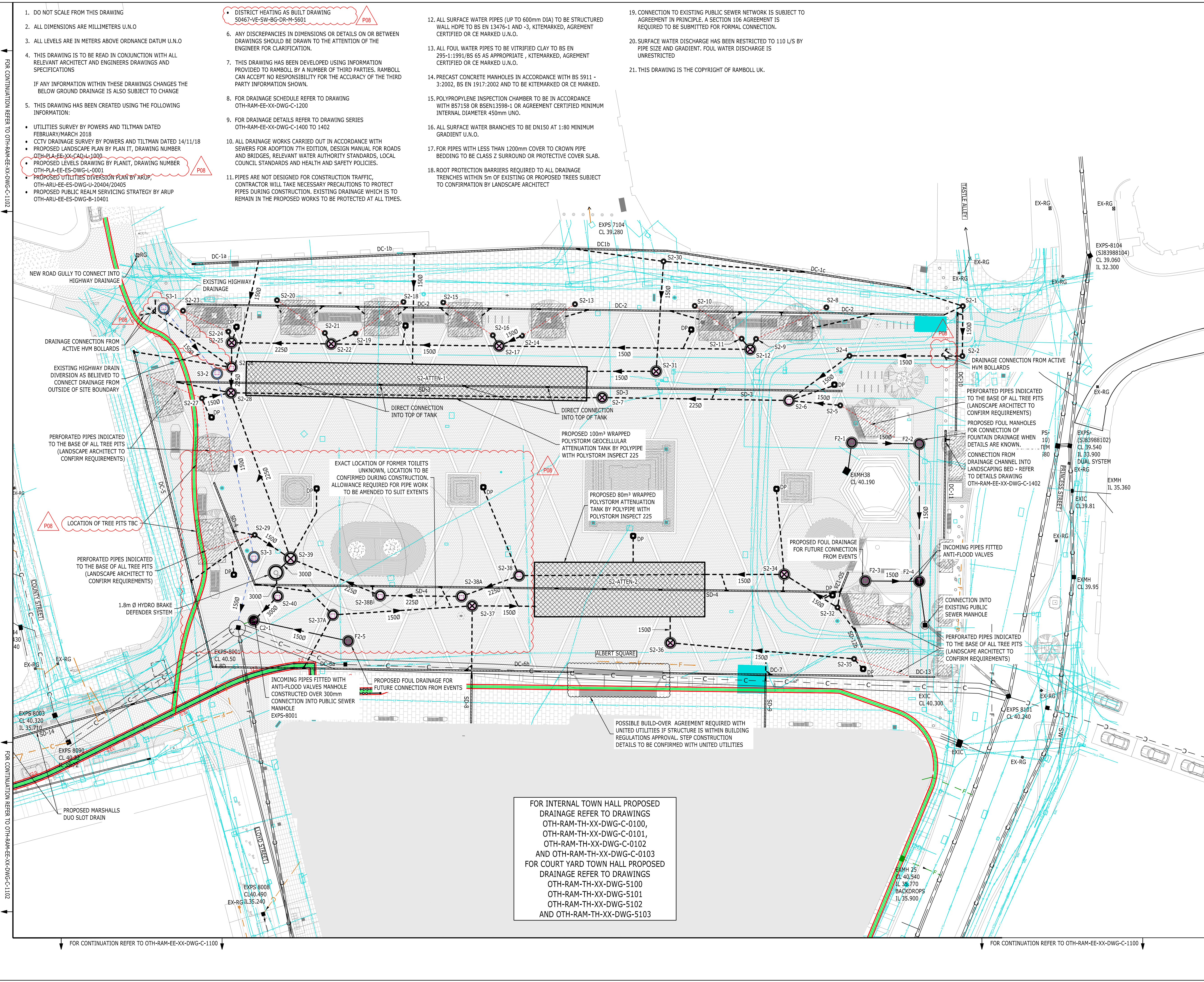
OUR TOWN HALL PROJECT

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www.ramboll.co.uk

Arkwright House, Parsonage, Manchester, M3 2LF
+44 (0) 161 827 1890
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PROJECT STATUS	STAGE 4
CLIENT	MANCHESTER CITY COUNCIL
PROJECT	OUR TOWN HALL PROJECT
DRAWING TITLE	TOWN HALL EXTERNALS PROPOSED DRAINAGE SHEET 1 OF 3
SIZE & SCALE	A1: 1:250
DRAWING STATUS	D2 - FOR TENDER
JOB NUMBER	1620003165
DRAWING NO.	OTH-RAM-EE-XX-DWG-C-1100
REV	P05



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KEY

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- EXISTING PUBLIC FOUL DRAIN/ MANHOLE
- EXISTING PUBLIC SURFACE WATER DRAIN/MANHOLE
- EXISTING PRIVATE FOUL DRAIN/ MANHOLE
- EXISTING ROAD GULLY
- PROPOSED DRAW PIT LOCATION REF C AND D, REQUIRING DRAINAGE
- PROPOSED FOUL WATER DRAIN/CONCRETE MANHOLE
- PROPOSED SURFACE WATER DRAIN/CONCRETE MANHOLE
- PROPOSED SURFACE WATER POLY PROPYLENE INSPECTION CHAMBER
- PERFORATED PIPES TO BASE OF TREE PITS
- PROPOSED ROAD GULLY
- PROPOSED DRAINAGE CHANNEL / SLOT DRAIN WITH SUMP AND ACCESS UNIT
- PROPOSED ATTENUATION
- PROPOSED TREE PIT

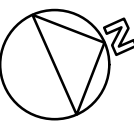
NO	DATE	APPROVED	DRAWN	DESCRIPTION
P08	18/12/2019	LS	SG	PLANNING ISSUE SEE REVISION CLOUDS
P07	11/10/2019	LS	SG	STAGE 4 ISSUE - VIC SOC CHANGES SEE REVISION CLOUDS
P06	05/09/2019	LS	SG	STAGE 4 ISSUE SEE REVISION CLOUDS
P05	26/07/2019	LS	SG	STAGE 4 ISSUE SEE REVISION CLOUDS

OUR TOWN HALL PROJECT

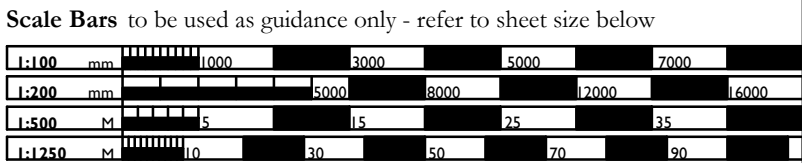
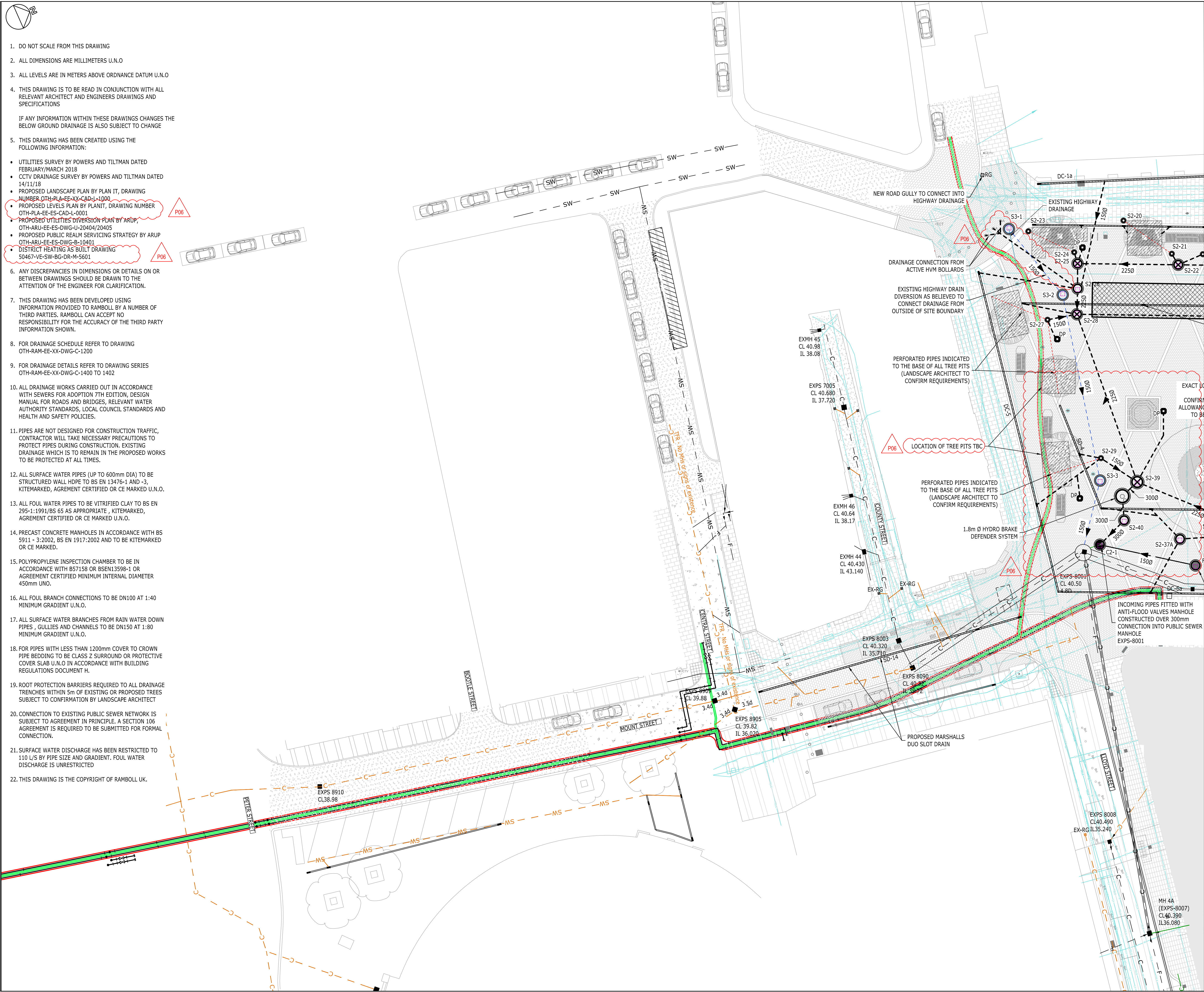
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Arkwright House, Parsonage, Manchester, M3 2LF
+44 (0) 161 827 1800
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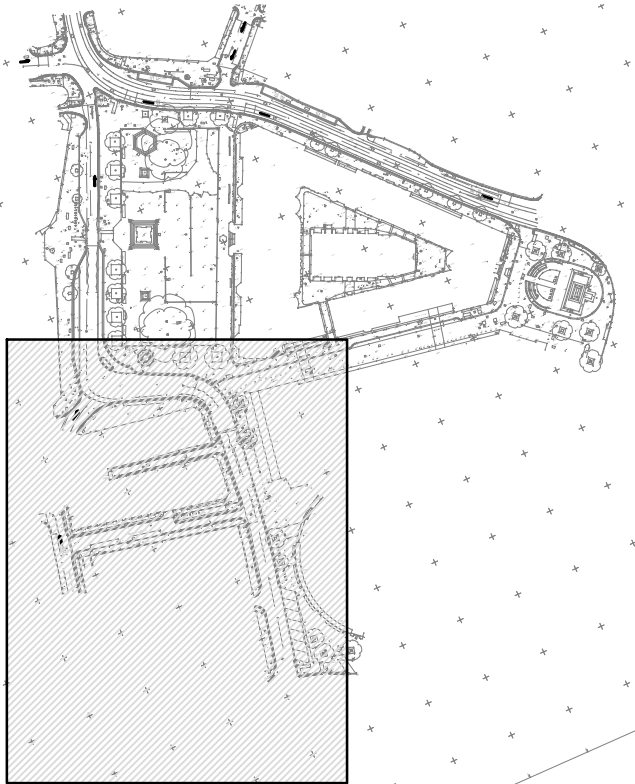
PROJECT STATUS	STAGE 4
CLIENT	MANCHESTER CITY COUNCIL
PROJECT	OUR TOWN HALL PROJECT
DRAWING TITLE	TOWN HALL EXTERNALS PROPOSED DRAINAGE SHEET 2 OF 3
SIZE & SCALE	A1: 1:250
DRAWING STATUS	D2 - TENDER
JOB NUMBER	1620003165
DRAWING NO.	OTH-RAM-EE-XX-DWG-C-1101
REV	P08



- DO NOT SCALE FROM THIS DRAWING
- ALL DIMENSIONS ARE MILLIMETERS U.N.O
- ALL LEVELS ARE IN METERS ABOVE ORDNANCE DATUM U.N.O
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT AND ENGINEERS DRAWINGS AND SPECIFICATIONS
IF ANY INFORMATION WITHIN THESE DRAWINGS CHANGES THE BELOW GROUND DRAINAGE IS ALSO SUBJECT TO CHANGE
- THIS DRAWING HAS BEEN CREATED USING THE FOLLOWING INFORMATION:
 - UTILITIES SURVEY BY POWERS AND TILTMAN DATED FEBRUARY/MARCH 2018
 - CCTV DRAINAGE SURVEY BY POWERS AND TILTMAN DATED 14/11/18
 - PROPOSED LANDSCAPE PLAN BY PLAN IT, DRAWING NUMBER OTH-PLA-EE-XX-CAD-L-1000
 - PROPOSED LEVELS PLAN BY PLANIT, DRAWING NUMBER OTH-PLA-EE-ES-CAD-L-0001
 - PROPOSED UTILITIES DIVERSION PLAN BY ARUP, OTH-ARU-EE-ES-DWG-U-20404/20405
 - PROPOSED PUBLIC REALM SERVICING STRATEGY BY ARUP OTH-ARU-EE-ES-DWG-B-10401
 - DISTRICT HEATING AS BUILT DRAWING 50467-VE-SW-BG-DR-M-5601
- ANY DISCREPANCIES IN DIMENSIONS OR DETAILS ON OR BETWEEN DRAWINGS SHOULD BE DRAWN TO THE ATTENTION OF THE ENGINEER FOR CLARIFICATION.
- THIS DRAWING HAS BEEN DEVELOPED USING INFORMATION PROVIDED TO RAMBOLL BY A NUMBER OF THIRD PARTIES. RAMBOLL CAN ACCEPT NO RESPONSIBILITY FOR THE ACCURACY OF THE THIRD PARTY INFORMATION SHOWN.
- FOR DRAINAGE SCHEDULE REFER TO DRAWING OTH-RAM-EE-XX-DWG-C-1200
- FOR DRAINAGE DETAILS REFER TO DRAWING SERIES OTH-RAM-EE-XX-DWG-C-1400 TO 1402
- ALL DRAINAGE WORKS CARRIED OUT IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION, DESIGN MANUAL FOR ROADS AND BRIDGES, RELEVANT WATER AUTHORITY STANDARDS, LOCAL COUNCIL STANDARDS AND HEALTH AND SAFETY POLICIES.
- PIPES ARE NOT DESIGNED FOR CONSTRUCTION TRAFFIC, CONTRACTOR WILL TAKE NECESSARY PRECAUTIONS TO PROTECT PIPES DURING CONSTRUCTION. EXISTING DRAINAGE WHICH IS TO REMAIN IN THE PROPOSED WORKS TO BE PROTECTED AT ALL TIMES.
- ALL SURFACE WATER PIPES (UP TO 600mm DIA) TO BE STRUCTURED WALL HDPE TO BS EN 13476-1 AND -3, KITEMARKED, AGREEMENT CERTIFIED OR CE MARKED U.N.O.
- ALL FOUL WATER PIPES TO BE VITRIFIED CLAY TO BS EN 295-1:1991/BS 65 AS APPROPRIATE , KITEMARKED, AGREEMENT CERTIFIED OR CE MARKED U.N.O.
- PRECAST CONCRETE MANHOLES IN ACCORDANCE WITH BS 5911 - 3:2002, BS EN 1917:2002 AND TO BE KITEMARKED OR CE MARKED.
- POLYPROPYLENE INSPECTION CHAMBER TO BE IN ACCORDANCE WITH B57158 OR BSEN13598-1 OR AGREEMENT CERTIFIED MINIMUM INTERNAL DIAMETER 450mm UNO.
- ALL FOUL BRANCH CONNECTIONS TO BE DN100 AT 1:40 MINIMUM GRADIENT U.N.O.
- ALL SURFACE WATER BRANCHES FROM RAIN WATER DOWN PIPES , GULLIES AND CHANNELS TO BE DN150 AT 1:80 MINIMUM GRADIENT U.N.O.
- FOR PIPES WITH LESS THAN 1200mm COVER TO CROWN PIPE BEDDING TO BE CLASS Z SURROUND OR PROTECTIVE COVER SLAB U.N.O IN ACCORDANCE WITH BUILDING REGULATIONS DOCUMENT H.
- ROOT PROTECTION BARRIERS REQUIRED TO ALL DRAINAGE TRENCHES WITHIN 5m OF EXISTING OR PROPOSED TREES SUBJECT TO CONFIRMATION BY LANDSCAPE ARCHITECT
- CONNECTION TO EXISTING PUBLIC SEWER NETWORK IS SUBJECT TO AGREEMENT IN PRINCIPLE. A SECTION 106 AGREEMENT IS REQUIRED TO BE SUBMITTED FOR FORMAL CONNECTION.
- SURFACE WATER DISCHARGE HAS BEEN RESTRICTED TO 110 L/S BY PIPE SIZE AND GRADIENT. FOUL WATER DISCHARGE IS UNRESTRICTED
- THIS DRAWING IS THE COPYRIGHT OF RAMBOLL UK.



- KEY
- EXISTING PUBLIC COMBINED DRAIN/ MANHOLE — C —
 - EXISTING PUBLIC FOUL DRAIN/ MANHOLE — F —
 - EXISTING PUBLIC SURFACE WATER DRAIN/MANHOLE — SW —
 - EXISTING PRIVATE FOUL DRAIN/ MANHOLE — F —
 - EXISTING ROAD GULLY — EX-RG
 - PROPOSED DRAW PIT LOCATION REF C AND D, REQUIRING DRAINAGE — DP
 - PROPOSED FOUL WATER DRAIN/CONCRETE MANHOLE — —
 - PROPOSED SURFACE WATER DRAIN/CONCRETE MANHOLE — —
 - PROPOSED SURFACE WATER POLY PROPYLENE INSPECTION CHAMBER — —
 - PERFORATED PIPES TO BASE OF TREE PITS — —
 - PROPOSED ROAD GULLY — RG
 - PROPOSED DRAINAGE CHANNEL / SLOT DRAIN WITH SUMP AND ACCESS UNIT — DC / SD
 - PROPOSED ATTENUATION — —
 - PROPOSED TREE PIT — —



P06	18/12/2019	LS	SG	PLANNING ISSUE SEE REVISION CLOUDS
P05	11/10/2019	LS	SG	STAGE 4 ISSUE - VIC SOC CHANGES SEE REVISION CLOUDS
P04	05/09/2019	LS	SG	STAGE 4 ISSUE SEE REVISION CLOUDS

ISSUE	DATE	APPROVED	DRAWN	DESCRIPTION
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OUR
TOWN
HALL
PROJECT



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PROJECT STATUS	STAGE 4
CLIENT	MANCHESTER CITY COUNCIL
PROJECT	OUR TOWN HALL PROJECT
DRAWING TITLE	TOWN HALL EXTERNALS PROPOSED DRAINAGE SHEET 3 OF 3
SIZE & SCALE	A1: 1:250
DRAWING STATUS	D2 - FOR TENDER
JOB NUMBER	1620003165
DRAWING NO.	OTH-RAM-EE-XX-DWG-C-1102
REV	P06

APPENDIX 2

MANUFACTURERS LITERATURE

Downstream Defender®

High-Level Treatment in a Small Footprint

Product Profile

The Downstream Defender® is an advanced vortex separator used to treat stormwater runoff in pretreatment or stand-alone applications. Its unique flow-modifying internal components distinguish the Downstream Defender® from conventional and simple swirl separators that typically bypass untreated peak flows to prevent washout of captured pollutants. Its wide treatment flow range, low headloss, small footprint and low-profile make it a compact and economical solution for capturing nonpoint source pollution.

Components

- | | |
|------------------------------------|--------------------------|
| 1. Inlet to Precast Vortex Chamber | 4. Outlet Pipe |
| 2. Cylindrical Baffle | 5. Sediment Storage Sump |
| 3. Center Shaft | 6. Access Lid |

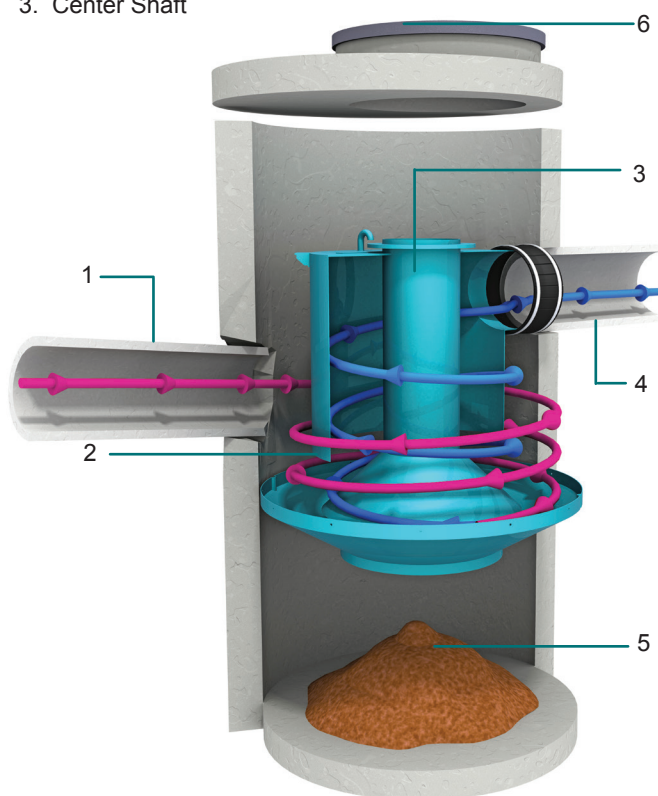


Fig.1 The Downstream Defender® has internal components designed to maximize pollutant capture and minimize pollutant washout.

Applications

- Removal of total suspended solids (TSS), floatable trash and petroleum products from stormwater runoff
- New construction or redevelopment of commercial and residential sites
- Pollutant hotspots such as maintenance yards, parking lots, gas stations, streets, highways, airports and transportation hubs
- Site constrained LID or green infrastructure based developments
- LEED® development projects

Advantages

- Special internal components maximize pollutant capture and minimize footprint, headloss and washout
- Captures and retains a wide range of TSS particles
- High peak treatment flow rates
- Treats the entire storm with no washout or untreated bypass flows
- Low maintenance requirements - no dredging required, and no screens or media to block
- Variable inlet/outlet angles for ease of site layout

How it Works

Advanced hydrodynamic vortex separation is a complex hydraulic process that augments gravity separation with low-energy rotary forces. The flow modifying internal components used in the Downstream Defender® harness the energy from vortex flow and maximize the time for separation to occur while deflecting high scour velocities (**Fig.1**).

Polluted stormwater is introduced tangentially into the side of the precast vortex chamber to establish rotational flow. A cylindrical baffle with an inner center shaft creates an outer (**magenta arrow**) and inner (**blue arrow**) spiraling column of flow and ensures maximum residence time for pollutant travel between the inlet and outlet.

Oil, trash and other floating pollutants are captured and stored on the surface of the outer spiraling column. Low energy vortex motion directs sediment into the protected sump region. Only after following a long three-dimensional flow path is the treated stormwater discharged from the outlet pipe. Maintenance ports at ground level provide access for easy inspection and clean-out.

Downstream Defender®

Downstream Defender® Design

Drainage Profile

The Downstream Defender® is designed with a submerged tangential inlet to minimize turbulence within the device. Turbulence increases system headlosses and reduces performance by keeping pollutant particles in suspension.

The inlet elevation of the Downstream Defender® is located one inlet pipe diameter lower than the elevation of the outlet invert (**Fig.2**). This arrangement ensures that influent flows are introduced to the treatment chamber quiescently below the water surface elevation, minimizing turbulence.

The unique flow-modifying internal components also minimize hydraulic losses. There are no internal weirs or orifices; large clear openings ensure low headloss at peak flow rates with little risk of blockages that cause upstream flooding.

Sizing & Design

The Downstream Defender® can be used to meet a wide range of stormwater treatment objectives. It is available in 5 precast models that fit easily into the drainage network (**Table 1**). Selection and layout of the appropriate Downstream Defender® model depends on site hydraulics, site constraints and local regulations. Both online (**Fig.3a**) and offline (**Fig.3b**) configurations are common.

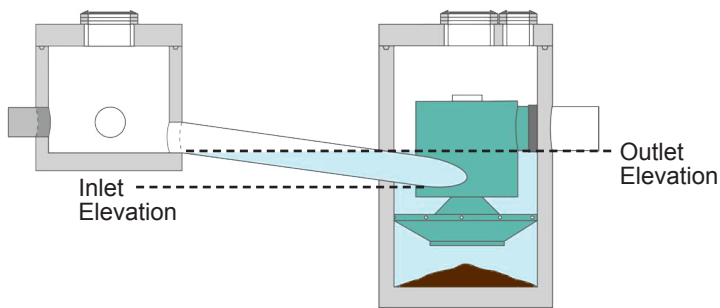


Fig.2 The Downstream Defender® has a submerged inlet that reduces headloss and improves efficiency of pollutant capture.

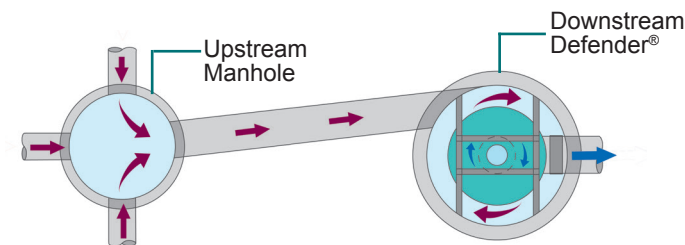


Fig.3a The Downstream Defender® in an online configuration.

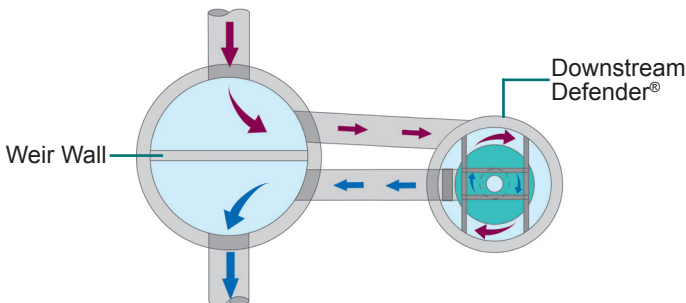


Fig.3b The Downstream Defender® in an offline configuration.



Free Stormwater Separator Sizing Calculator for Engineers

This simple online tool will recommend the best separator, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Table 1. Downstream Defender® Design Chart.

Model Number and Diameter		Peak Treatment Flow Rate		Maximum Pipe Diameter		Oil Storage Capacity		Sediment Storage Capacity		Minimum Distance from Outlet Invert to Top of Rim		Standard Height from Outlet Invert to Sump Floor	
(ft)	(m)	(cfs)	(L/s)	(in)	(mm)	(gal)	(L)	(yd³)	(m³)	(ft)	(m)	(ft)	(m)
4	1.2	3.0	85	12	300	70	265	0.70	0.53	2.8	0.85	4.1	1.25
6	1.8	8.0	227	18	450	216	818	2.10	1.61	3.2	0.98	5.9	1.80
8	2.4	15.0	425	24	600	540	2,044	4.65	3.56	4.2	1.28	7.7	2.35
10	3.0	25.0	708	30	750	1,050	3,975	8.70	6.65	5.0	1.52	9.4	2.85
12*	3.7	38.0	1,076	36	900	1,770	6,700	14.70	11.24	5.6	1.71	11.2	3.41

*Not available in all areas. Contact Hydro International for details.

2.3 Polystorm

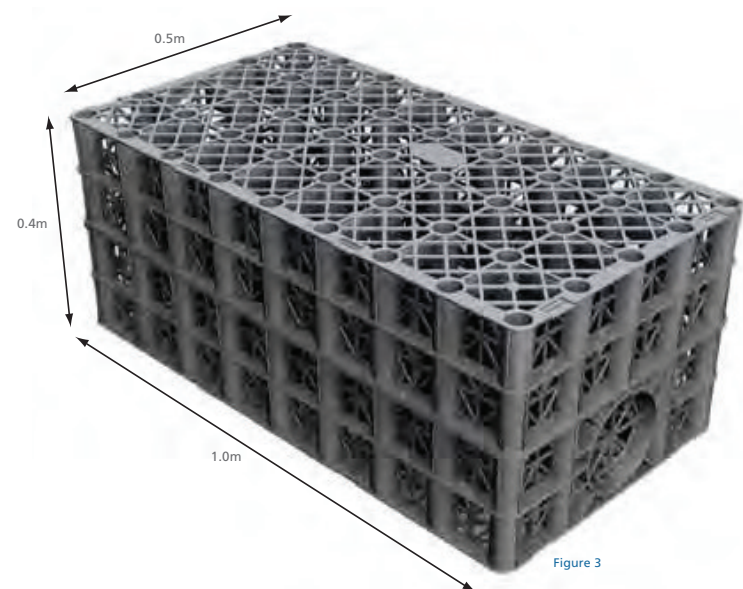


Figure 3

Designed for use in trafficked and loaded applications with a load bearing capacity of:

40 tonnes

Technical specification overview	
Unit type	Polystorm
Product code	PSM1*
Dimensions	1m x 0.5m x 0.4m high
Total volume	0.2m per cube
Unit weight	9kgs**
Cube storage volume	0.19m ³ (190 litres)
Surface area	48% perforated
Compressive strength	Maximum 40 tonnes per sq metre
Maximum burial depth	3.7 metres***

* Each unit includes 4 clips and 2 shear connectors. Please note that brick bond connector may be required at additional cost.
 ** Pallet weight dependent upon order quantity and transport type.
 *** In weak clay soil conditions the maximum burial depth is reduced, please consult Polypipe WMS Technical Team on 01509 615100.

Table 3

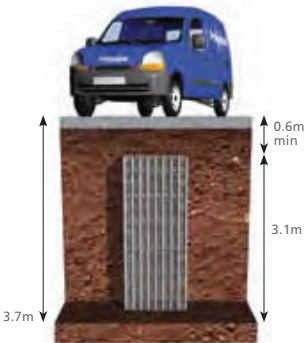


Figure 4

Polystorm features individual modular cells that can be built up to form a load-bearing tank structure of any shape or size to receive rainwater collected from the gutter system or surface drains ready to release within a set discharge limit. Polystorm has a 40 tonne per square metre compressive strength and is ideally suited for light trafficked and loaded applications. Polystorm can be used for both attenuation and soakaway applications and typically for housing developments, small car parks and light commercial developments.

Polystorm		
Description	Code	Pack quantity
Polystorm cell 1000 x 500 x 400mm	PSM1	15
Polystorm cell with 225mm connector	PSMCRD225	1
Polystorm cell with 300mm connector	PSMCRD300	1
Brick bond shear connector	PSMBBSC	30
Clips	PSMCLIP	60
Shear connector	PSMSC	30
EN1401 flange adaptor - 110mm	PSMFA110	1
Ridgidrain flange adaptor - 150mm	PSMFA150	1
EN1401 flange adaptor - 160mm	PSMFA160	1
Basic silt trap	PSMST160	1
Advanced silt trap - 15 litres/sec	PSMSTA160/15	1
Cover & frame (round)	UG501	1
Cover & frame (square)	UG502	1
450mm silt trap lid & frame	UG512	1
460mm lockable plastic cover & frame	UG511	1
Polypropylene cover & frame	ICDC1	1
Chamber riser section	ICDR1	1
Silt trap sealing ring	UG488	1

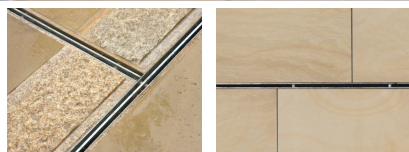
Table 4



Note: Minimum cover and burial depths may vary depending on load and ground conditions. Please contact Polypipe WMS for further information. All grades of Polystorm units may be used in situations outside of those recommended above, through the use of the appropriate protective measures designed to reduce the imposed loading on the proposed Polystorm structures.

Drexus Slot Drain

Date Created: 07/02/19



drexus slot
drain duo

drexus slot
drain mono

Marshall's Drexus Slot Drain is the ideal solution for projects requiring an effective drainage solution that doesn't compromise on the aesthetics of the overall landscape.

Particularly well suited to natural stone applications, the low-capacity Drexus Slot Drain hides the Drexus 100 channel beneath a galvanised steel slot, featuring slimline mono or duo linear aperture.

Suitable for use across a range of applications and public developments, Marshall's can also design and manufacture a bespoke Drexus Drain Slot to meet project requirements including true radius curved apertures and stainless steel finishes.

DESCRIPTION	
Manufacturing Process	Semi dry pressed & vibrated concrete
Base Raw Material	Concrete
Governing Manufacturing Standards	All data where relevant to be established in accordance with BS EN 1433 : 2002
CE Marking/DOP	https://www.marshalls.co.uk/dop
NBS Specification	Q10 170

Drexus Slot Drain

Date Created: 07/02/19

PHYSICAL PROPERTIES

Work Dimensions (mm)	1000/500 x 160 x 170
	1000/500 x 160 x 195
	1000/500 x 160 x 220
	1000/500 x 160 x 245
	1000/500 x 160 x 270
Apparent Density	2280 kg/m ³ (typically)
Water Absorption (%)	Meets the requirement for Grade 2
Water Tightness	Meets the requirements of the standard.

SPECIFICATION

Approx unit weight (kg)	37 to 70 kg (excluding grate)
Emission of Asbestos	No content
Reaction to fire	Class A1, see commission decision 2000/605/EC

APPLICATION

Application	Suitable for all locations as described in BS EN 1433 : 2002 for load classification D400
Suitability	Perfect for complementing block or pave installations and particularly suited to Natural Stone landscapes. Drexus Slot Drain is suitable for an array of applications and public realm developments
Restrictions	Not suitable for use in the main carriageway of a road or motorway cross-over
Loading Classification	D400

PERFORMANCE

Discharge of cross section	7300 mm ² - 22300 mm ²
Protection of steel	Thickness of galvanising is 70 microns
Sealing of joints	Completed by the use of M-Seal or M-Flex into rebate
Security of Grating	Installation details are available on request

SUPPLY

Units Per Pack	Pallet packed for individual contracts
Av. pack weight (kg)	Maximum 1.5 tonnes
Packaging	Banded & shrink-wrapped onto non-returnable pallets

SUSTAINABILITY

Carbon Footprint	Available on Request
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FURTHER INFORMATION

Efflorescence	Any product containing cement during its early life may exhibit a temporary white discolouration known as efflorescence. This is not a product fault and will gradually disappear with exposure to natural weathering and trafficking
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Product Evolution	The evolution of new product design is continuous and information is subject to change without notice. Customers should check with the supplier to ensure that they have the latest details. Marshalls reserve the right to amend the technical information as deemed necessary and in accordance with the relevant national and international standards without notice.
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Contact Us	For technical information on the design, specification and construction when utilising the product, contact the Technical Advisory Services Department on 0370 411 2233
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Drexus Slot Drain

Date Created: 07/02/19

