

Building 402

Drainage Strategy

Threadneedle Curtis Ltd

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1. Introduction

- 1.1 The following drainage strategy is written in support of the Flood Risk Assessment being provided as part of the planning submission for the proposed redevelopment of Building 402 site at Manchester Airport on behalf of Threadneedle Curtis Ltd.
- 1.2 AECOM are appointed by Threadneedle Curtis Ltd to provide a number of pre-planning services including flood risk and drainage.
- 1.3 The following document outlines the proposals for the discharge of foul and surface water drainage from the development site.

2. Surface Water Drainage Assessment

- 2.1 The following section outlines the proposals for disposal of surface water drainage in line with the National Planning Practice Guidance and the Stockport Council Developer Guidance.

Existing Site Drainage

- 2.2 The site is currently served via separate privately owned surface water and foul networks.
- 2.3 The surface water network is a gravity network which discharges at the north east corner into the Manchester Airport Group (MAG) network in Avro Way. The MAG networks conveys flows east and ultimately discharges into the United Utilities owned Bolin River outfall sewer.
- 2.4 The existing building and site are served by a gravity foul network which discharges to a MAG owned pumping station. There is a pumping station located within the southern extension of the warehouse which discharges into the Skycheff Pumping Station south of the site. The pumping station to the south of the site pumps flows across Pinfold Lane into MAG Pumping Station 2 where flows are then conveyed to the wider MAG network.

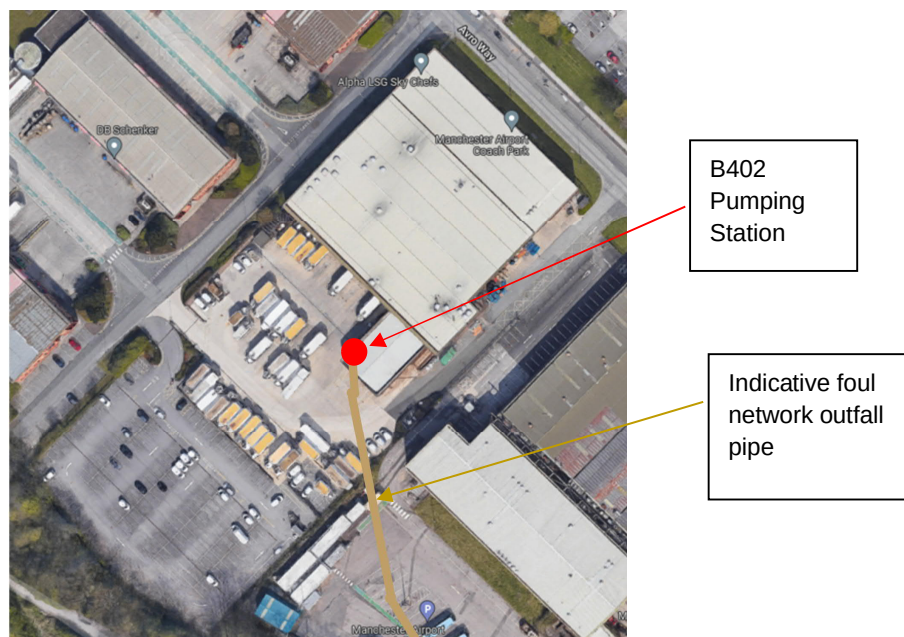


Figure 1: B402 pumping station and indicative foul network pipes

- 2.5 Subject to site levels and confirmation of drainage invert levels the pumping station shown in Figure 1 will be made redundant and new connections made to the offsite outfall drain which will remain in situ under

the ownership of MAG of which connections have been permitted by MAG to Threadneedle Curtis Ltd under the terms of the land sale agreement.

- 2.6 The existing drainage serving the existing buildings and infrastructure on site will be abandoned or removed in line with the demolition and earthworks strategy.
- 2.7 The gross application site has an area of approximately 1.9ha with an existing impermeable area of approximately 1.54ha.

Existing Discharge Rates

- 2.8 In addition to the NPPG guidance, the industry standards along with the Environment Agency and Design and Construction Guidance for foul and surface water sewers¹ dictates for below ground surface water drainage such that:

- There will be no surcharging of the drainage system for a 1 in 1-year storm.
- The drainage can be surcharged with no flooding for a 1 in 30-year storm.
- The drainage can flood on-site for a 1 in a 100-year storm with a 40% Climate Change allowance provided the flood water remains on site and does not affect safe ingress and egress to the site for occupiers, vehicles and pedestrians. Given the nature of the development and the proximity to buildings overland flooding will not be acceptable so in this instance all flows for the 1 in 100-year event plus 40% climate change will be attenuated below ground.

Existing Surface Water Discharge Rates and Volumes

- 2.9 Since the site is entirely impermeable and has been developed a calculation of expected surface water discharge for the site in its current state was undertaken. Assuming the current drainage has the capacity to accept a maximum rainfall intensity of 50mm/hr (which is roughly equivalent to a 10yr storm), this gives a maximum discharge rate of $2.78 \times 1\text{ha} \times 50\text{mm/hr} = 139\text{l/s/ha}$, which equates to 214l/s based on the existing impermeable area of 1.54ha.
- 2.10 Using MicroDrainage Greenfield Runoff Volume for the site it has been calculated as 263.4m^3 .

Infiltration

- 2.11 No infiltration testing has to date been undertaken however some SI for the site and a full SI for the adjacent site indicate underlying soils that are not suitable for infiltration. Testing will be undertaken to confirm this as part of the Phase 2 ground investigation.

Impermeable Area

- 2.12 The existing site comprises a building and a car park. The gross application site area is approximately 1.9ha.

Sustainable Drainage Hierarchy

- 2.13 The surface water flow from the proposed development must drain in accordance with the SUDs hierarchy as outlined in the National Planning Practice Guidance (NPPG). Various outfall options have been assessed for the discharge of surface water drainage for the proposed development. The National planning Practice Guidance stipulates that sites should "aim to discharge surface water run-off as high up the SUDs hierarchy as reasonably practicable". Hence, discharge to the existing separate MAG/UU sewers was favoured over discharging to a combined sewer. These were assessed in the order below:

¹ Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code")

Table 1 - SuDS Hierarchy

Order of Priority	Sustainable Drainage Measures	Suitability (Y/N)	Comments
1	Store rainwater for later use	Y	Rainwater harvesting via collection into an external below ground tank is potentially viable. The building is intended to have multiple tenants so the management and implementation of this may be challenging and the viability will need to be confirmed at a later stage.
2	Use infiltration techniques, such as porous surfaces in non-clay areas	N	Discounted – the site is underlain by non-productive clay. Infiltration testing has not been undertaken but previous SI gives a reasonable picture.
3	Attenuate rainwater in ponds or open water features for gradual release	N	Discounted due to proximity to the airfield and safeguarding restrictions to prevent the attraction of bird's presenting a strike risk to aircraft.
4	Implement green roofs for water retention.	N	Pitch roof design of proposed warehouse will not permit green roof.
5	Attenuate rainwater beneath permeable surfaces such as car parks.	N	Discounted due to required volume, tanking and potential maintenance issues
6	Attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Underground attenuation storage to be provided via a sealed tank.
7	Discharge rainwater direct to a watercourse	N	Discounted – significant constraints in the form of existing structures and utilities constrain the route along with third party land issues.
8	Discharge rainwater to a surface water sewer/drain	Y	Surface water to discharge to the existing surface water drain serving the site.
9	Discharge rainwater to the combined sewer.	N	Discharge to the local surface water sewer is considered preferential.

3. Proposed Surface Water Drainage

Climate Change

- 3.1 Table 5 of the updated guidance on climate change allowances published by the Environment Agency considers that until 2069, climate change is expected to result in a 10-20% increase in rainfall intensity. Beyond this it is expected there will be up to a 20-40% increase up to 2115. In determining which factors should be applied and tested for climate change, the expected lifespan of the development should be determined.
- 3.2 It is considered that the proposed development will have a lifespan of approximately 50 years. An increase in rainfall intensity of 40% has therefore been considered in line with for the design of the surface water drainage system.

Proposed Outfall

- 3.3 The proposed surface water network will outfall to the existing outfall drain serving the site owned by the Manchester Airport Group. Permission for discharge is granted to the landowner by MAG under the terms of the land sale agreement.

Proposed Impermeable Area

- 3.4 The catchment area for the proposed drainage network is considered cognisant of the proposed adjacent 401 development which has recently had planning approval granted, Ref: 131892/FO/2021 dated 2 February 2022. Therefore the catchment for this development is 1.54ha, of which the existing and proposed impermeable area are approximately the same based on google maps.

Proposed Discharge Rate

- 3.5 The proposed discharge rate will be limited to 107 l/s which is equivalent to brownfield rate for storm events outlined in Section 2.7 with a 50% betterment.

Proposed Drainage Design

- 3.6 The proposed surface water network will implement a number of interception methods including channel drains gullies and kerb drains which will be considered during detailed design. All of these will be provided with suitable sump outlet units for the control and capture of silt.
- 3.7 A Class 1 bypass oil separator as per EN858-1 and PPG13 guidance will be provided prior to the outfall to the existing MAG drainage.
- 3.8 The network will be designed to provide underground attenuation storage for up to the 1 in 100-year event plus 40% allowance for climate change. Allowance for long term storage will be included within the attenuation volume and will be discharge at a controlled rate of 2l/s/ha to the exiting surface water drainage network. Volume will be calculated which considers the delta in volume between the pre-development infiltration volumes compared with the reduced post development infiltration volume to provide attenuation to store the equivalent volume and outfall this at 2l/s/ha to the existing network.
- 3.9 The proposed surface water network drains via a series of below ground pipes and an online attenuation tank that will be sized to ensure flooding does not occur during the 1 in 100 year storm event plus 40 % climate change. A complex flow control device will be installed downstream of the attenuation tank and will restrict the discharge rate to a maximum of 107l/s. This will provide 50% betterment to the existing brownfield surface water discharge rate based on a rainfall intensity of 50mm/hr.

Soft Landscaping, Tree Pits and Rain Garden's

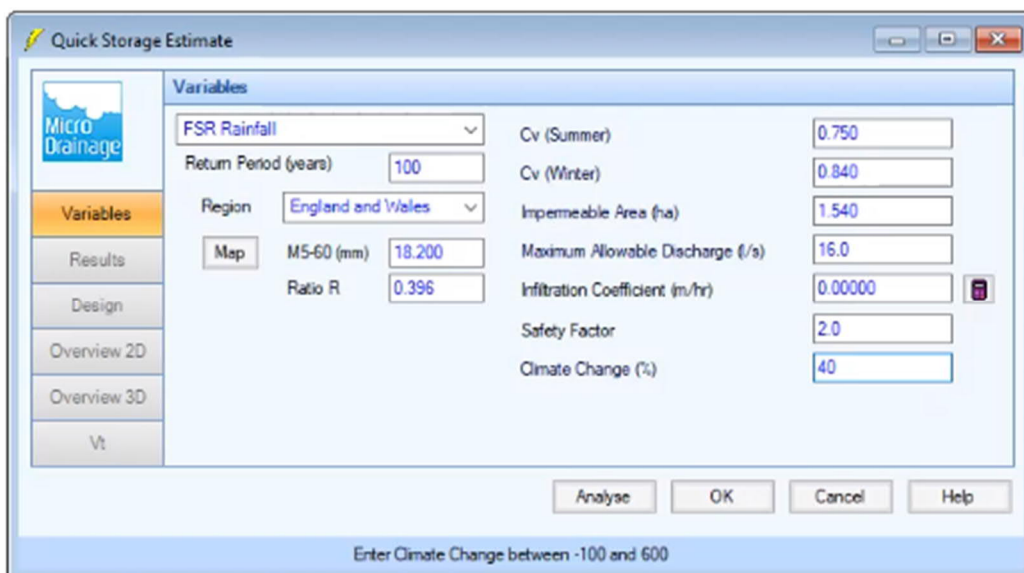
- 3.10 To reduce the site surface water discharge rate attenuation will be required. Options for proposed attenuation have been assessed in accordance with the SUDS hierarchy as per CIRIA SuDS Manual C753 (below). (refer to table 3-1)
- 3.11 Storage options are limited to below ground storage however consideration should be given during the detailed design to creating soft landscaped areas to decrease the amount of impermeable area along with the use of tree pits and rain gardens where viable in hard landscaped areas.

Most Sustainable  Least Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviers	✓	✓	
	Tanked systems - over-sized pipes/tanks - storms cells	✓		

Figure 2: SUDs Manual C753 storage option hierarchy

Attenuation

- 3.12 A quick storage calculation has been undertaken using Micro Drainage to estimate the required storage volumes.
- 3.13 A maximum storage volume of 1016m³ is estimated. This is likely to reduce during detailed design and will be provided via a below ground storage tank beneath the proposed car parks and .

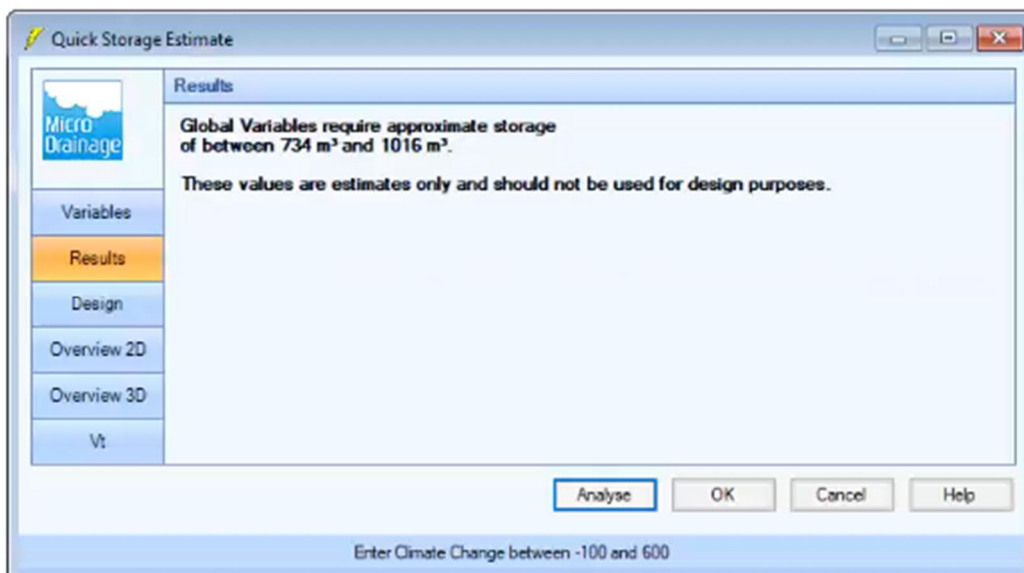


The 'Quick Storage Estimate' window shows the 'Variables' tab. The left sidebar has buttons for Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area contains input fields for various parameters:

Parameter	Value
FSR Rainfall	[Dropdown]
Return Period (years)	100
Region	England and Wales
Map	M5-60 (mm)
Ratio R	0.396
Cv (Summer)	0.750
Cv (Winter)	0.840
Impermeable Area (ha)	1.540
Maximum Allowable Discharge (l/s)	16.0
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	40

Buttons at the bottom: Analyse, OK, Cancel, Help. A footer note says: Enter Climate Change between -100 and 600.

Figure 3: Micro Drainage Quick Storage Estimate Variables



The 'Quick Storage Estimate' window shows the 'Results' tab. The left sidebar has buttons for Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area displays the following text:

Global Variables require approximate storage of between 734 m³ and 1016 m³.
These values are estimates only and should not be used for design purposes.

Buttons at the bottom: Analyse, OK, Cancel, Help. A footer note says: Enter Climate Change between -100 and 600.

Figure 4: Micro Drainage Quick Storage Estimate Results

4. Maintenance Strategy

Introduction

- 4.1 The maintenance of SuDS, attenuation and separation features are vital in ensuring that they work as efficiently as intended.
- 4.2 It is assumed that site maintenance is to be managed by Threadneedle Curtis Ltd. This responsibility may be subcontracted to a third party however this will be confirmed in the future.
- 4.3 A full maintenance strategy must be prepared by the Contractor and submitted to the Local Authority as part of the detailed submission.

Soft Landscaping, and Tree Pits

Construction

- 4.4 Heavy construction vehicles and equipment not directly involved in the construction of the proposed vegetation should be kept away from these areas. Excavations for the soft landscaping ground make-up should aim to be undertaken in times of dry weather, when possible, to prevent mobilisation of sediments from exposed surfaces. Exposed surfaces after excavations should be stabilised where required as soon as possible with grass seed and straw mulch. Perimeter controls should be installed prior to construction to protect neighbouring properties.

Maintenance Schedule

- 4.5 Table 2 below shows the operation and maintenance requirements for proposed SuDS features, adapted from the CIRIA C753 SuDS Manual.

Table 2 - Maintenance requirements for Attenuation Storage Tanks (CIRIA C753, 2015)

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

Table 3 - Maintenance requirements for flow control devices

Maintenance Schedule	Required Action	Typical Frequency
Before Start Regular Maintenance (as per manufacturer's requirements) Remedial Actions Monitoring	Removal of any inappropriate material from within the chambers and dispose off-site	At Start
	Removal of debris (which could include leaves, rubbish and branches) from areas served by the drainage (where it may cause risk to performance)	Monthly
	For blockages resulting in flooded manhole chambers, drain down manhole chamber and unblock	As required

	Inspect unit and hose down is required	Monthly at the start for three months, then six monthly
Before Start	Removal of any inappropriate material from within the chambers and dispose off-site	At Start
Regular Maintenance (as per manufacturer's requirements)	Removal of debris (which could include leaves, rubbish and branches) from areas served by the drainage (where it may cause risk to performance)	Monthly
Remedial Actions	For blockages resulting in flooded manhole chambers, drain down manhole chamber and unblock	As required

5. Foul Drainage

- 5.1 The capacity of the existing pump stations are to be investigated further at the detailed design stage which will determine if they need to be upgraded, replaced or retained. Within detail design there will be a capacity for 24hr emergency storage in case of pump failure.
- 5.2 The proposed foul network will discharge to the existing MAG owned pumping station present on site. A maximum discharge of 2.09l/s is expected and the new development is envisaged to have a lower discharge than existing due to the change in use from Catering to Logistics and distribution.
- 5.3 The existing on site pumping station will need to be relocated or made redundant to facilitate the construction of the building. The proposed foul drainage network will need to discharge into the MAG foul gravity network upstream from the Skychef pump station.

6. Summary

- 6.1 The proposed development on site is expected to retain a similar impermeable area of 1.54Ha. The network will be designed to provide underground attenuation storage for up to the 1 in 100-year event plus 40% allowance for climate change.
- 6.2 Underground attenuation will be provided that will be designed not to flood in a 1 in 100-year event, ensuring safe ingress and egress for the site occupiers, vehicles and pedestrians.
- 6.3 The complex flow control device will be installed downstream of the attenuation tank and will restrict the maximum discharge rate to 107l/s, this results in a 50% betterment to the existing brownfield surface water discharge rate based on a rainfall intensity of 50mm/hr. From a quick storage estimate undertaken using MicroDrainage it is estimated a maximum storage volume of 1016m³ is required.
- 6.4 For the foul network the capacity of the existing pump stations are to be investigated further at the detailed design stage which will determine if they need to be upgraded, replaced or retained. Within detail design there will be a capacity for 24hr emergency storage in case of pump failure

Appendix A Drainage Strategy Drawing

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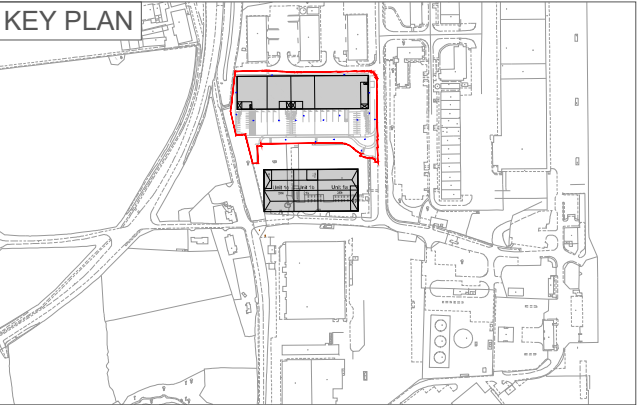
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KEY

- EXISTING UNITED UTILITIES SURFACE WATER SEWER
- EXISTING MANCHESTER AIRPORT GROUP SURFACE WATER SEWER
- EXISTING MANCHESTER AIRPORT GROUP FOUL WATER SEWER
- EXISTING PUMPING STATION

NOTES

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- ALL DIMENSIONS IN METRES UNLESS STATED OTHERWISE.
- THE DESIGN OF BOTH THE PROPOSED FOUL AND SURFACE WATER DRAINAGE NETWORKS ARE SUBJECT TO COMPLETION AND REVIEW OF THE TOPOGRAPHICAL AND EXISTING DRAINAGE NETWORK SURVEY.
- PROPOSED BUILDING 401 SITE HAS RECEIVED PLANNING APPROVAL (REF: 131892/FO/2021 DATED 2 FEBRUARY 2022)
- DISCLAIMER THAT THE FINAL DESIGN WILL BE SUBJECT TO LOCATION OF EXISTING SERVICES AND DRAINAGE.
- SURFACE WATER DRAINAGE NETWORK WILL BE DESIGNED FOR STORM EVENTS UP TO THE 100 YEAR + 40% CLIMATE CHANGE.



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