



TETRA TECH

Argosy Drive

Drainage Strategy Addendum

PRESENTED TO

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1 INTRODUCTION

The following report is an addendum to the previous Aecom Drainage Strategy for Argosy Drive submitted as part of planning application 134103/FO/2022.

The original scheme brought forward for planning consisted of 3 blocks of terraced logistics units outlined in Figure 1 below consisting of the following units:

Unit 1 – 8 individual units

Unit 2 – 3 individual units

Unit 3 – 3 individual units



Figure 1 – Original Argosy Drive scheme

Following market testing and a period of value engineering Columbia Threadneedle Investments have decided to reduce the number of Units in the Unit 1 terrace from 8 to 6 whilst maintaining the overall footprint of the Unit. Units 2 + 3 remain the same. The new masterplan is presented in Figure 2 below:



Figure 2 – Original Argosy Drive scheme

The purpose of this addendum report is to highlight that the key principles of the original strategy are being maintained and to confirm where amendments are being made to suit the change in masterplan. It is also the intention to phase the development by delivering Unit 1 ahead of Units 2+3. Further amendments to the original strategy are proposed to reflect the requirements of the phasing.

The design changes of the redevelopment of Argosy Drive require the drainage to be adjusted to suit the new phasing of the scheme. The initial phase of the construction of Unit 1 is still to be constructed, Units 2 & 3 will follow on at a future stage rather than as one scheme. The first building to be constructed, unit 1, has also been altered from 8No. terrace units to 6No. terrace units to provide units with a larger usable space while maintaining the same overall building footprint.

The following report outlines the amendments to the original strategy and verifies where the critical elements of the strategy such as principles of the discharge rate remain the same.

The original Aecom drainage strategy is provided in Appendix A for reference.

2 SURFACE WATER

Existing Drainage

As outlined in the original Aecom report the existing site currently drains via two different surface water networks.

Existing Network 1 flows to the airfield containment network that passes through the Airside drainage system. Existing network 2 passes to the non-Containment network and discharges to the Bolin Outfall sewer via the existing MAG owned surface water in Avro Way.

The original Aecom proposal was to separate the flows from the development area and discharge all surface water from the proposed development into the non-Containment system in Avro Way. This principle has been maintained and adopted into the current design proposals.

Proposed surface water drainage

The original strategy document prepared by Aecom calculated discharge rates based on the existing catchment contributing to the Avro Way network being classified as Brownfield with a 50% reduction applied ensuring betterment is offered to the network. The discharge rate for the remainder of the site was calculated at the Greenfield run-off rate as this is a new area of contributing catchment to the system. This principle was accepted by MAG as the asset owner of the drainage network and has been maintained in the current design and strategy.

It is now proposed that the development will be delivered in two phases summarised as follows:

Phase 1 – This will include the construction of Unit 1 alongside the external yard areas for Unit 1 and upgrades to Argosy Drive. The existing buildings on the Unit 2 and 3 site will be maintained alongside their dedicated parking.

Phase 2- This will include the demolition of the existing buildings 303, 304 and 311, the construction of Units 2 & 3 along with the collection of severed surface and foul flow from the MAG site.

Drainage works will need to be phased accordingly to meet the development requirements. The phased drainage works are summarised as follows:

Phase 1 Drainage Works

The existing surface water flows from the building 303 and 304 will be diverted within the Phase 1 scheme to avoid Unit 1 and will be allowed to flow unrestricted to its previous outfall as per the current scenario.

Flows will be diverted in a new sewer running along Viscount Drive connecting back into the same outfall drain as per the current scenario in Avro Way.

The proposed drainage for Phase 1 will pick up the flows from Unit 1, associated yard & roads and will discharge at the restricted rate as per the Aecom strategy with a pro rata split between Phase 1 and 2 applied to the Phase 1 area. A bypass interceptor will treat this flow prior to the attenuation tank.

The overall discharge rate proposed has been adjusted following further investigations of the existing catchment areas and increased slightly.

The existing catchment area contributing to existing Network 1 which flows north to the airfield drainage will now be captured within the development drainage and will therefore drain south to Network 2 via the proposed site network. On the basis that this is a new contributing area to Network 2 flows have been restricted to the Greenfield run-off rate for this portion of the catchment.

The existing flows from network 2 (flows to the south) will be reduced to a 50% betterment of the existing brownfield flows.

The collective flows will be the total allowable discharge for all phases and will outfall via the existing network 2 connection to the south. The total Allowable flow rate is 116.4 l/s summarised below as follows:

<i>Catchment Areas</i>	<i>Calculation method</i>	<i>Area</i>	<i>Flow Rate</i>
<i>Catchment 1</i>	Greenfield	9752m ²	16.4 l/s
<i>Catchment 2</i>	Brownfield (with 50% reduction)	14400 m ²	100 l/s
<i>Total:</i>			116.4 l/s

The allowable flow rate for Phase 1 will be a pro-rata proportion of the total allowable rate at 47% of the total development area.

Phase 1 rate has been calculated at 54.7 l/s. Attenuation will be provided within the Phase 1 area as required.

The Phase 2 rate will be the remaining allowable rate 61.7 l/s. Attenuation will be provided within the Phase 1 area as required.

The diverted flows from Building 303 & 304 will pass through a full retention interceptor as treatment for the flows. The interceptor could be reused for the treatment of the attenuated flows from the

future Phase 2 scheme. Building 311 drainage will not be altered during this Phase 1 works and continue to drain to the containment system, Network 1.

A syphonic drainage system is to be used for Unit 1 roof drainage to reduce the number of pipe runs. It is anticipated that Units 2 & 3 also use a syphonic system in the Phase 2 scheme. The syphonic drainage will be captured by a gravity surface water network also serving the external yard areas.

Trapped gullies and linear drainage with sumped outlets will be used to capture external drainage areas to provide silt capture. The gravity network will convey flows to the outfall where restriction will be provided by a hydrobrake.

Attenuation will be provided in the form of below ground tanks in line with the original Aecom strategy as open SUDS features cannot be provided due to airport safeguarding requirements for bird mitigation.

3 FOUL DRAINAGE

A new pumping station will be constructed in Phase 1 of the work and include allowances for the future flows from Phase 2 (units 2 & 3) within the calculated pumping rate and pump failure storage volumes.

The flows will be controlled by duty and assist pumps and discharged via rising main to the existing airport owned private foul network. The pumping rate for this Phase 1 will be reduced to duty flows only respective of the discharge rate required for Phase 1. The total summation of the flows will be accommodated by the assist pump.

The foul pump station will cater for the anticipated flows from the proposed units 1, 2 & 3. The foul flows are based on the gross floor areas for the warehousing at 30m² per person and office spaces at 6m² per person summarised as follows:

Anticipated occupancy rates

	Warehousing (m2)	Office (m2)
Unit 1 (Phase 1)	5798	294
Unit 2 (Phase 2)	3084	570
Unit 3 (Phase 2)	3152	592
Total	12034	1456
Occupancy	401	242

The total anticipated occupancy is 643 persons.

The anticipated flow rates based on the British Water standard is 50 litres per head per day for industrial office/ Factory without a canteen.

The total foul flow rate has been calculated as 32150 litres per day which equates to an average 0.37 l/s dry weather base flow with a total of 2.22 l/s peak flows. Given that the downstream network is privately owned the owner (MAG) have imposed a maximum discharge rate of 1.96 l/s based on capacity restriction in their network.

The 24-hour foul storage volume required for pump failure is 32m³, with 29m³ contained within the wet well and holding tank and the remainder within the upstream foul network. The pump failure volume is based upon the dry weather flow rate.

Pumping rates have been amended from the original Aecom strategy to allow unit 1 (Phase1) to pump at half the allowable discharge rate for the 3No. proposed buildings. The pumping station will operate

at 0.96 l/s for the unit 1, at duty flow, and then when the other 2 units are constructed and connected the rate will be increased to 1.96 l/s with the assist pumps.

The connection will be made to the gravity system downstream of the existing airport owned pumping station No 9

During the future Phase 2 works the existing airport pumping station No.6 will be demolished, and a new pumping station will be required for the diversion of the foul flows from building 307/308. As there is a future requirement for building 307, 308, 309 to be removed, the pump station would be a temporary solution and therefore the pump failure volume could be omitted pending agreement with MAG. The rising main for this future phase will utilise part of the existing raising main route from PS 6 to PS 9.

APPENDIX A

Aecom Drainage Strategy 21 April 2022

Argosy Drive Development

Drainage Strategy

Threadneedle Curtis Ltd

Project number: 60663052
60663052-ACM-ArA-XX-RP-C-00001

21 April 2022

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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 Argosy Drive Development site at Manchester Airport on behalf of Threadneedle Curtis Ltd, also known as Columbia Threadneedle Investments (CTI).
- 1.2 AECOM are appointed by CTI to provide a number of pre-planning services including flood risk and drainage strategy.
- 1.3 The following document outlines the proposals for the management of foul and surface water drainage from the development site.
- 1.4 The MAG drainage network is under a full review by Jacobs who are undertaking detailed modelling. This Drainage Strategy is based on the most current information at the time of submission however there may be changes required to the overall strategy depending on the contents of the model.

2. Site

Existing Site

- 2.1 The Site is made up of 4 Buildings and a carpark; Building 303,304, 311 to the north of Argosy Drive and Building 305 on the south of Argosy Drive. The carpark is located on the south of Argosy Drive adjacent to Building 305. The buildings to the north of Argosy Drive are currently occupied and Building 305 is vacant and to be demolished.

Proposed Site

- 2.2 Argosy Drive Development will be delivered in three phases and consist of 3 units; Unit 1, delivered in phase 1, to the south west of Argosy Drive, Units 2 and 3 to the north east of Argosy Drive with Unit 2 being constructed in Phase 2 and Unit 3 constructed in Phase 3.
- 2.3 The proposed surface water attenuation tanks, detailed later in this report, will be sufficient for the whole development area.
- 2.4 The foul water network for each unit will be able to work independently of each other due to the phased construction of the units and the suggested outfall rates have been calculated on a unit by unit basis.

3. Surface Water Drainage Assessment

- 3.1 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

- 3.2 The site is currently served via separate privately owned surface water and foul networks.
- 3.3 The network is represented with an Existing Catchment area plan (60663052-ACM-ArA-XX-DR-C-001) found within Appendix A.
- 3.4 The MAG surface water network is split into a Containment and None-Containment system, the existing network outfalls to both. The Containment network water is treated prior to outfalling to the United Utilities main sewer, offsite within the wider MAG network because of potential contamination, for the None-Containment system there is no treatment necessary.

- 3.5 The Containment network outfalls to the north of Argosy Drive which is in the direction of Airside shall be referred to as Existing Network 1.
- 3.6 The None-Containment system outfalls is to the south, away from Airside shall be referred to as Existing Network 2.
- 3.7 Both surface water networks are gravity networks which ultimately convey flows south and ultimately discharges into the United Utilities owned Bolin River outfall sewer.
- 3.8 The exact catchment areas for the existing network will be confirmed by a further drainage survey as a Drainage CCTV and Asset Surveys are being commissioned in accordance with CS551 DMRB Drainage Survey standards. These will provide further information on the catchment areas, surface and foul water network connectivity, foul flow rates and the Pumping Station capacities to understand the detailed requirements of the proposed network.
- 3.9 Due to the age of the existing drainage, the network capacity has been assumed to be based on a 1 in 10 year storm event with an intensity of 50mm/hr.
- 3.10 The existing impermeable areas considered for this project extend beyond the planning boundary to the north of the site to the buildings north of York Drive, B307 and B309. This considers the current drainage network to the north of Buildings 311, 304 and 303 which be made redundant and need re-designing.
- 3.11 The area within the planning boundary is approximately 27,160m². The total impermeable catchment area for the Existing Network 1 within the planning boundary is 17,695m² and external to the planning boundary is 14,323m², totalling 32,018m². The total impermeable catchment area for the Existing Network 2 within the planning boundary is 3,768m² and external to the planning boundary is 9,856m², totalling 13,624m².

Existing Discharge Rates

- 3.12 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.
- 3.13 The brownfield rate has not been considered for the Existing Network 1 as this area is reducing in size and the greenfield rate will be achieved for the new outfall.
- 3.14 The impermeable area for the Existing Network 2 that discharges southwards to the None-Containment system is 13,624m². The brownfield rate for this discharge has been calculated at 189l/s.

Existing Surface Water Discharge Rates and Volumes

- 3.15 This analysis assumes the existing network has been designed for a 1 in 10 year, 50mm/hr intensity storm event.
- 3.16 The existing impermeable area which the surface water discharge into the Existing Network, to the south of the site, is 13,624m². Using the brownfield run off rate the expected surface water discharge rate is 189 l/s.
- 3.17 Using MicroDrainage Source Control Storage Estimation, the approximate required attenuation volume for the whole site it has been calculated to be 777.4m³.

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")

Infiltration

- 3.18 No infiltration testing has been undertaken to date however some SI across Viscount Drive to the east and a full SI for DNATA catering, south west of the Site at the end of Avro Way indicate underlying soils that are not suitable for infiltration due to the presence of cohesive soil layers. Testing will be undertaken to confirm this as part of the Phase 2 ground investigation.

Impermeable Area

- 3.19 The existing site comprises a building and a car park. The gross application site area is approximately 27,160m², with 20,400m² being impermeable.

Sustainable Drainage Hierarchy

- 3.20 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:

Table 1 - SuDS Hierarchy

Order of Priority	Sustainable Drainage Measures	Suitability (Y/N)	Comments
1	Store rainwater for later use	N	Discounted - Rainwater harvesting via collection into an external below ground tank is suitable for watering large green areas, of which this site has very little. For the soft landscaped areas the local weather conditions will provide enough water.
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 - proximity to the airfield and safeguarding restrictions to prevent the attraction of bird's presenting a strike risk to aircrafts.
4	Implement green roofs for water retention.	N	Discounted - Pitch roof design of proposed warehouse will not permit green roof and airport safeguarding restrictions to prevent the attraction of bird's presenting a strike risk to aircrafts.
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	Discounted - Discharge to the local surface water sewer is considered preferential.

4. Proposed Surface Water Drainage

Climate Change

- 4.1 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.
- 4.2 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

- 4.3 The development will outfall to both the Containment and None-Containment MAG networks. Permission for discharge is granted to the landowner by MAG under the terms of the land sale agreement.
- 4.4 The flows are ultimately conveyed south to the United Utilities owned Bolin River outfall sewer.
- 4.5 In summary approximately half of the existing site flows north into the Containment network and the other half flows south into the None-Containment network.
- 4.6 Due to the inaccuracies of the existing records the network outfalling to the north, into the Containment network has the potential to be outfalling to a foul system. Further surveys are required to understand the levels and connectivity to validate the current assumptions.
- 4.7 Surveys undertaken to date have captured the proposed outfall location for the None-Containment network and it is understood that this proposal is deemed suitable.
- 4.8 Depending on the quality of the existing assets the intention is to retain existing pipes.

Proposed Impermeable Area

- 4.9 The network is represented with a Proposed Catchment area plan (60663052-ACM-ArA-XX-DR-C-002) found within Appendix B.
- 4.10 The area that is outfalling to the Containment system, north of the site, is being reduced from 32,018m² to 23,139m², the total reduction will be 8,879m² and will be diverted to the none-containment system to the south.
- 4.11 Due to the proposed development including an additional row of industrial units, there will be a 4,717m² net increase in impermeable area.
- 4.12 The summation of the additional areas mentioned above is 13,596m² and the existing hardstanding area that drains to the southern outfall is 13,624m². Therefore, the new total hardstanding area draining to the none-containment system, south of the site will be 27,220m². As indicated on the proposed catchment plan, this captures the whole area within the planning site boundary as well the area north of the proposed Units 3b, 3c and 3d.

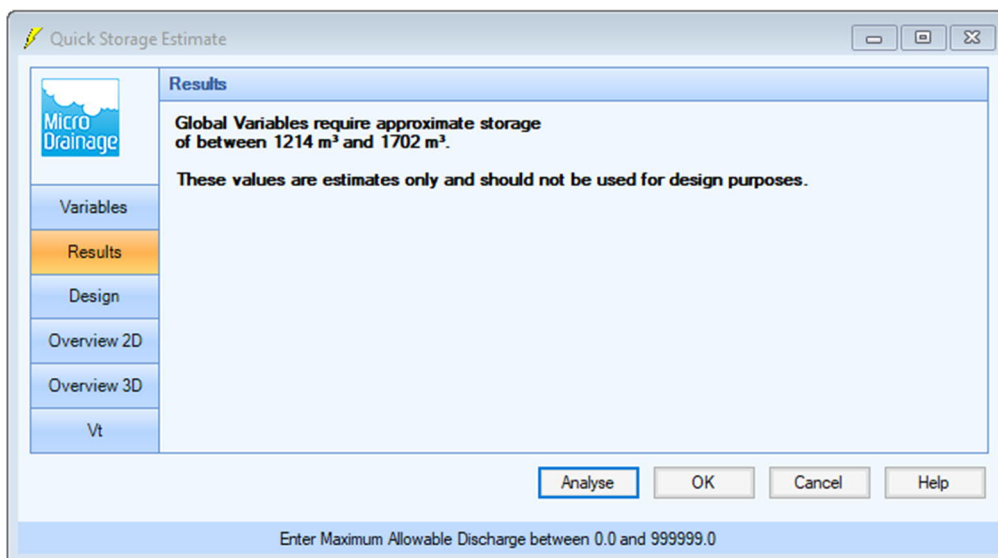
Proposed Discharge Rate

- 4.13 The outfall arrangement for the containment system that drains to the northern outfall will not be amended as part of this development. As previously discussed, the catchment area for this system has been reduced by approx. 28%. It is assumed that this system does not have a flow control and so the discharge rates will likely decrease proportionally.
- 4.14 With regards to the none-containment drainage network which drains southwards, the new discharge arrangement will be based on the summation of:

- a. The brownfield rate with 50% betterment applied to the existing catchment area (13,624m²); and
 - b. The greenfield rate for the additional areas of the site (13,596m²).
- 4.15 Assuming a rainfall intensity of 50 mm/hr, the estimated existing brownfield rate for the 13,624m² area is approx. 189.2 l/s. Providing a 50% betterment gives an allowable discharge rate of 94.6 l/s.
- 4.16 The greenfield rates for the additional area (13,596m²) are as shown below, taken from the HR Wallingford UK SuDS Online Greenfield Runoff Tool:
- | | |
|----------------|-----------|
| 1 in 1 year | 6.88 l/s |
| 1 in 30 years | 13.45 l/s |
| 1 in 100 years | 16.45 l/s |
- 4.17 Therefore, the proposed total max discharge rate during a 1 in 100 year +40% climate change allowance event is 111.0 l/s. Additionally, 1107.2m³ of long-term storage will be provided and discharged at a max rate of 5.4 l/s (2 l/s/ha).

Proposed Drainage Design

- 4.18 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.
- 4.19 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 for the None-Containment network.
- 4.20 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 will be attenuated below ground. This will ensure safe ingress and egress to the site for occupiers, vehicles and pedestrians is maintained throughout intense periods of rainfall.
- 4.21 The proposed containment drainage network that drains northwards will be removed and diverted to south network as necessary to facilitate the new development. As the system will not be taking any of the proposed development works and will have a net decrease in catchment area, it is proposed to retain the existing pipework or provide like-for-like where diversions are necessary.
- 4.22 The proposed none-containment network that drains southwards will comprise below-ground drainage pipework and an online attenuation tank that will be sized to ensure flooding does not occur during the 1 in 100 year storm events plus 40% climate change allowance.
- 4.23 As discussed previously, long-term storage of 1107.2m³ will be provided and discharged at no more than 5.4 l/s while the combined 100-year discharge rate plus 40% climate change allowance will be limited to 111.0 l/s. This will be achieved by utilising a single attenuation tank and complex flow control manhole.
- 4.24 The complex flow control manhole will house an internal weir wall with a vortex flow control to restrict the long-term storage discharge to 5.4 l/s and an orifice outlet located above the 1107.2 m³ storage volume line to help achieve a total combined discharge that is no more than 111.0 l/s during the 1 in 100 year +40% climate change allowance critical event.
- 4.25 The attenuation tank will be designed to provide 1107.2m³ of long-term storage in the lower part of the tank while a further volume will be provided above to attenuate the flows from the 1 in 100 year +40% climate change allowance events. The additional attenuation tank volume for the short-term storage has been estimated to be between 1200-1700m³. This volume range has been estimated using Source Control and is subject to change as the detailed design is progressed.
- 4.26 The design of both the proposed foul and surface water drainage networks are subject to further investigation to determine the full connectivity of the foul and surface water drainage networks and confirmation of the existing catchment areas.
- 4.27 The site team will be responsible to ensure that the drainage remains operational for all buildings that are occupied, especially when existing drainage runs are made redundant.



Quick Storage Estimate

Micro Drainage

Variables

Results

Design

Overview 2D

Overview 3D

Vt

Results

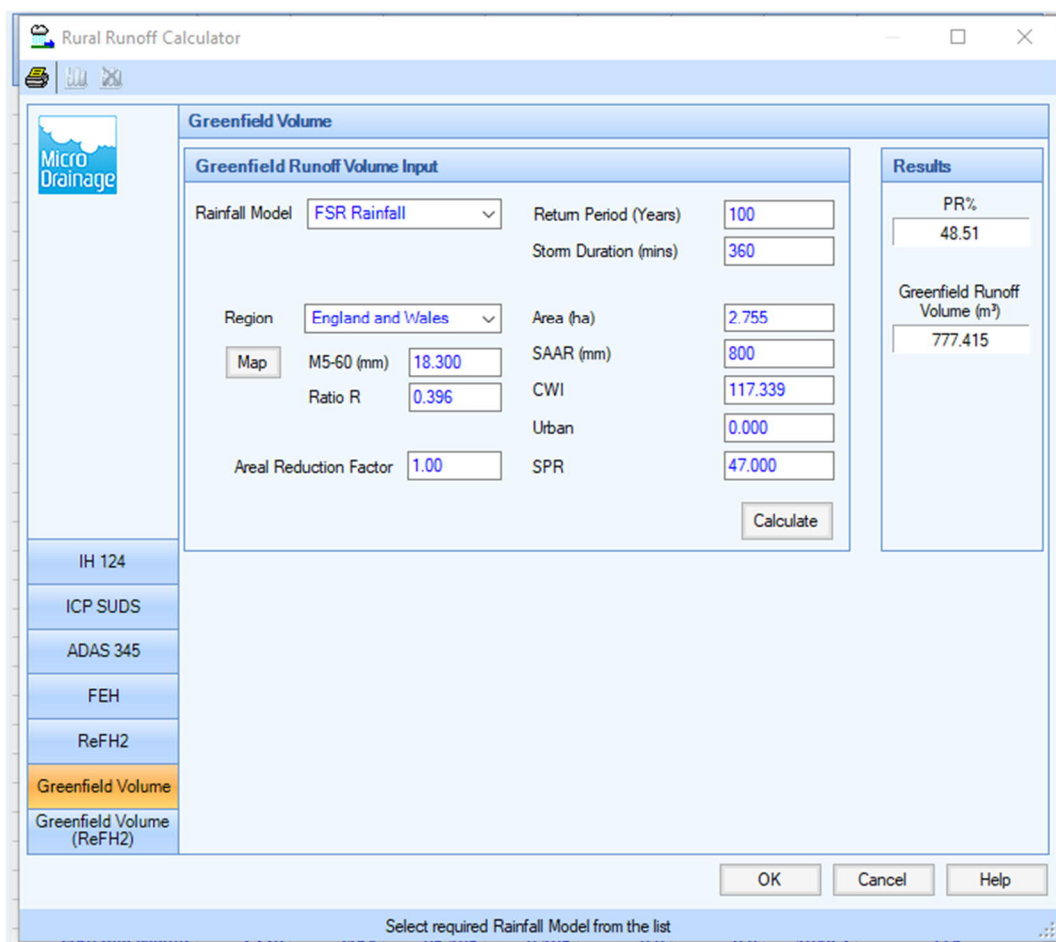
Global Variables require approximate storage of between 1214 m³ and 1702 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

Figure 1: MicroDrainage Quick Storage Estimate calculator



Rural Runoff Calculator

Micro Drainage

Greenfield Volume

Greenfield Runoff Volume Input

Rainfall Model: FSR Rainfall

Return Period (Years): 100

Storm Duration (mins): 360

Region: England and Wales

Area (ha): 2.755

Map: M5-60 (mm): 18.300

SAAR (mm): 800

Ratio R: 0.396

CWI: 117.339

Urban: 0.000

Areal Reduction Factor: 1.00

SPR: 47.000

Calculate

Results

PR%: 48.51

Greenfield Runoff Volume (m³): 777.415

IH 124

ICP SUDS

ADAS 345

FEH

ReFH2

Greenfield Volume

Greenfield Volume (ReFH2)

OK Cancel Help

Select required Rainfall Model from the list

Figure 2: MicroDrainage Rural Runoff Calculator

Soft Landscaping, Tree Pits and Rain Garden's

- 4.28 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 Figure 3)
- 4.29 Storage options are limited to below ground storage however consideration will be given during the detailed design to creating soft landscaped areas between the south of the site and Avro Way and between the east of the site and Viscount Drive 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	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	✓		
	Least Sustainable			

Figure 3: SUDs Manual C753 storage option hierarchy

5. Maintenance Strategy

Introduction

- 5.1 The maintenance of SuDS, attenuation and separation features are vital in ensuring that they work as efficiently as intended.
- 5.2 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.
- 5.3 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

- 5.4 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

5.5 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 at every six months.
Before Start	Removal of any inappropriate material from within the chambers and dispose off-site	At Start
Regular Maintenance (as per manufacturer's requirements) Remedial Actions	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

6. Foul Drainage

- 6.1 The existing buildings are served by a gravity foul network which discharges to two MAG owned pumping stations, Pumping Station (PS) 6 and PS9 on either side of York Drive. Buildings 304 and 311 convey flows to PS6 and Buildings 305 and 303 convey flows to PS9. Once the flows are conveyed across York Drive they enter the wider MAG network.

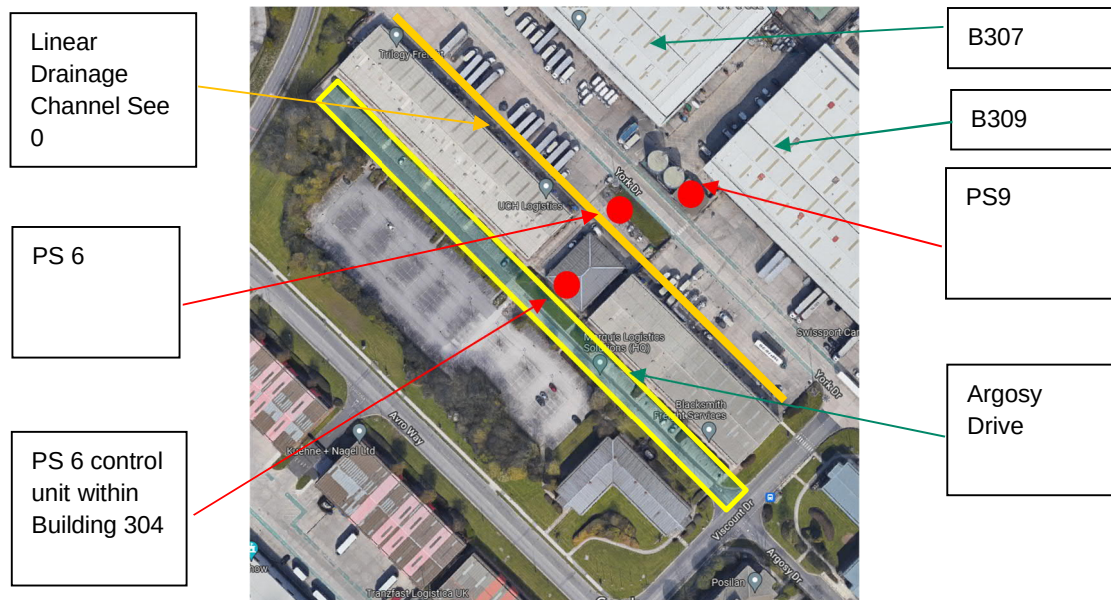


Figure 4: PS6 and PS9 off York Drive, north of Argosy Drive Development

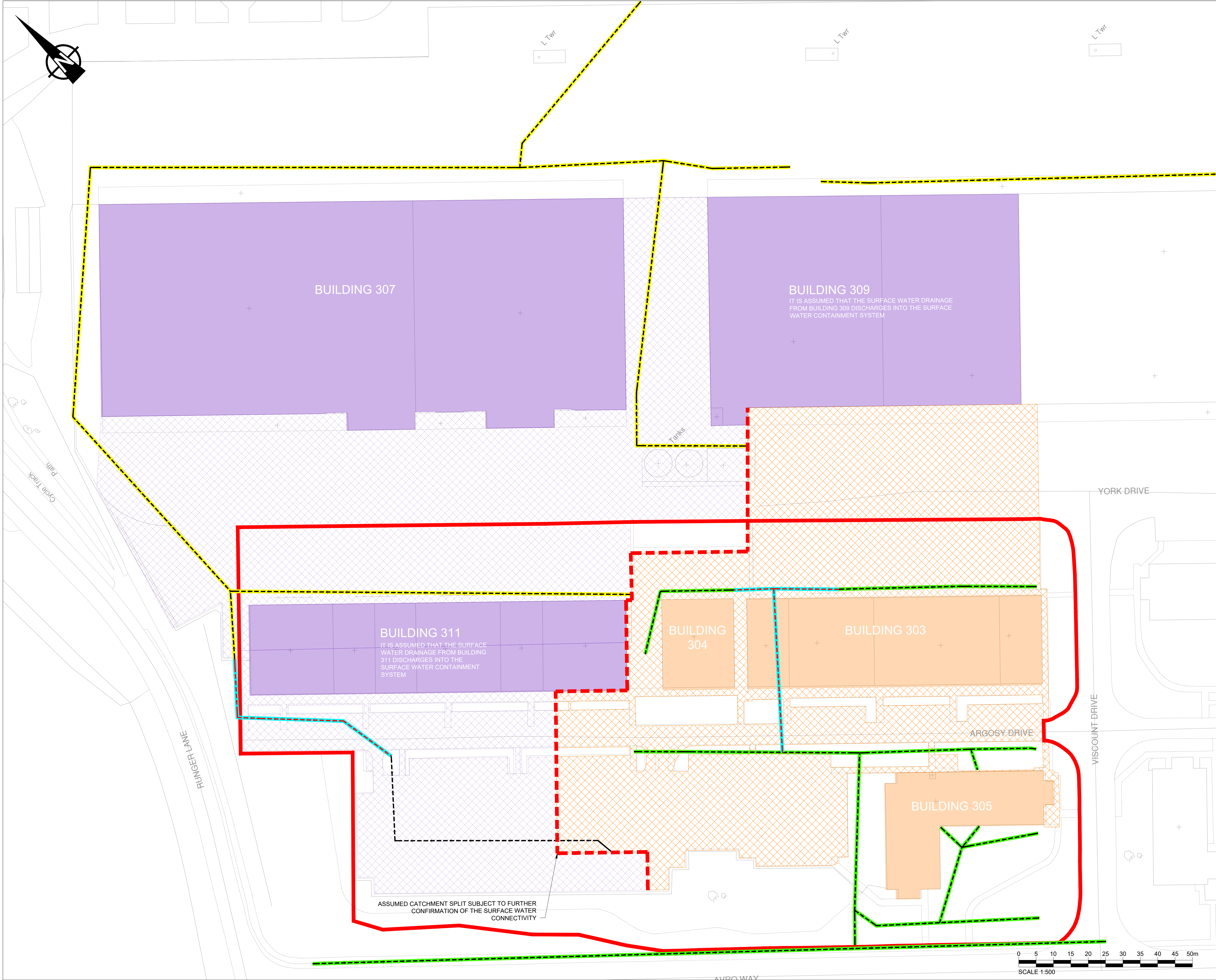
- 6.2 For each delivery phase the drainage serving the existing buildings and infrastructure on site will be abandoned or removed in line with the demolition and earthworks strategy, for the legacy buildings in the latter phases there may be a requirement for temporary pumping or diversion of the foul network however those affected buildings will remain operational. Due to the phased delivery, each building's foul network will work independently of each other.
- 6.3 Subject to site levels and confirmation of drainage invert levels there may be a requirement for an additional pumping station at the north west of Argosy Drive to facilitate the addition of Unit 1. The capacity of PS6 and PS9 are to be reviewed and if required, subject to agreement with MAG, capacity increased. The new connections made to the offsite outfall drain will remain in situ under the ownership of MAG, of which connections have been permitted by MAG to CTI under the terms of the land sale agreement.
- 6.4 Phase 2 of the Argosy Drive Development will require the demolition of Building 304 which houses the control unit for PS6. Since this is essential infrastructure for the operation of the foul MAG network this will need to be rehoused offsite without the Pumping Station losing functionality unless an agreed period of downtime is agreed with MAG utilities.
- 6.5 The capacity of the existing pumping 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.
- 6.6 Unlike the surface water due to the phased delivery approach the foul water network for each unit will be designed able to work independently of each other and the suggested outfall rates have been calculated on a unit by unit basis.
- 6.7 Depending on the capacity of PS6 and PS9 will confirm whether an additional PS at the north of the site, near Unit 1a is required. The proposed foul network will convey flows across York Drive to the existing MAG owned pumping station.

- 6.8 For Unit 1; a maximum discharge of 0.852l/s is envisaged and the new development is anticipated to have a lower discharge than existing due to the change in use from a two storey office building to Logistics and distribution.
- 6.9 For Unit 2; a maximum discharge of 0.546l/s is envisaged and the new development is anticipated to have a lower discharge than existing due to the change in use from a two storey office building, which backs on to a logistics and distribution warehouse for the entity of Building 311 and a small distribution unit, B304 changing purpose to a Logistics and distribution.
- 6.10 For Unit 3; a maximum discharge of 0.565l/s is envisaged and the new development is anticipated to have a lower discharge than existing due to the change in use from a two storey office building, which backs on to a logistics and distribution warehouse for the entity of Building 303 changing purpose to a Logistics and distribution.
- 6.11 The proposed foul drainage network will need to discharge into the MAG foul gravity network downstream of PS6 and PS9 across York Drive, see Drainage Strategy drawing (60663052-ACM-ArA-XX-DR-C-003) in Appendix C.
- 6.12 The design of both the proposed foul and surface water drainage networks are subject to further investigation to determine the full connectivity of the foul and surface water drainage networks and confirmation of the existing catchment areas.
- 6.13 The site team will be responsible to ensure that the drainage remains operational for all buildings that are occupied, especially when existing drainage runs are made redundant.

7. Summary

- 7.1 The proposed development outfalls to both the MAG Containment (Proposed Network 1) and None-Containment (Proposed Network 2) networks. The design is expected to net increase the impermeable area by 4,717m².
- 7.2 Proposed Network 1, flowing northwards to the Containment system will be attenuated using oversized pipes which will be installed at the extent of where the pipes are being made redundant and will restrict the maximum discharge rate to 18.4l/s, this results in a 50% betterment to the greenfield run off rate for a 1 in 100 year storm event with a 50mm/hr intensity. No attenuation tank is provided at this outfall, oversized pipes provide adequate attenuation.
- 7.3 This underground attenuation 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.
- 7.4 Proposed Network 2, flowing southwards, will provide a complex flow control device downstream of the attenuation tank to restrict the maximum discharge rate to 111l/s, which 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 1400m³ is required.
- 7.5 The attenuation tank for the whole development will be constructed under the Unit 1 yard which is within construction phase 1. Oversized pipes for Proposed Network 2 provide attenuation for the greenfield runoff volume calculated for the catchment north of the planning boundary.
- 7.6 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.
- 7.7 The foul network will be limited per Unit to 0.852l/s (Unit 1), 0.546l/s (Unit 2) and 0.565l/s (Unit3).
- 7.8 The design of both the proposed foul and surface water drainage networks are subject to further investigation to determine the full connectivity of the foul and surface water drainage networks and confirmation of the existing catchment areas.
- 7.9 The site team will be responsible to ensure that the drainage remains operational for all buildings that are occupied, specifically when existing drainage runs are made redundant.

Appendix A Existing catchment plan



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PROJECT

ARGOSY DRIVE
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CLIENT



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NOTES

1. FURTHER INVESTIGATION IS REQUIRED TO CONFIRM THE SURFACE WATER DRAINAGE CONNECTIVITY AND CATCHMENT AREAS.

CATCHMENT AREA SUMMARY

SURFACE WATER NON CONTAINMENT SYSTEM:
EXISTING BUILDING IMPERMEABLE CATCHMENT AREA = 3,768m²
EXISTING EXTERNAL IMPERMEABLE CATCHMENT AREA = 9,856m²
TOTAL IMPERMEABLE CATCHMENT AREA = 13,624m²

SURFACE WATER CONTAINMENT SYSTEM:
EXISTING BUILDING IMPERMEABLE CATCHMENT AREA = 17,695m²
EXISTING EXTERNAL IMPERMEABLE CATCHMENT AREA = 14,323m²
TOTAL IMPERMEABLE CATCHMENT AREA = 32,018m²

KEY

- PLANNING BOUNDARY
- EXISTING BUILDING IMPERMEABLE CATCHMENT AREA THAT DISCHARGES INTO THE SURFACE WATER NON CONTAINMENT SYSTEM
- EXISTING EXTERNAL IMPERMEABLE CATCHMENT AREA THAT DISCHARGES INTO THE SURFACE WATER NON CONTAINMENT SYSTEM
- EXISTING BUILDING IMPERMEABLE AREA THAT DISCHARGES INTO THE SURFACE WATER CONTAINMENT SYSTEM
- EXISTING EXTERNAL IMPERMEABLE CATCHMENT AREA THAT DISCHARGES INTO THE SURFACE WATER CONTAINMENT SYSTEM
- EXISTING CONTAINMENT SURFACE WATER SEWER
- EXISTING NON CONTAINMENT SURFACE WATER SYSTEM
- ASSUMED DRAINAGE CONNECTIVITY ROUTE TBC
- ASSUMED CATCHMENT DIVIDE
- UNDEFINED DRAINAGE CONNECTIVITY ROUTE TBC

ISSUE/REVISION

P01	22/04/2022	FOR PLANNING
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PROJECT NUMBER

60663052

SHEET TITLE

ARGOSY DRIVE DEVELOPMENT
EXISTING SURFACE WATER
CATCHMENT PLAN

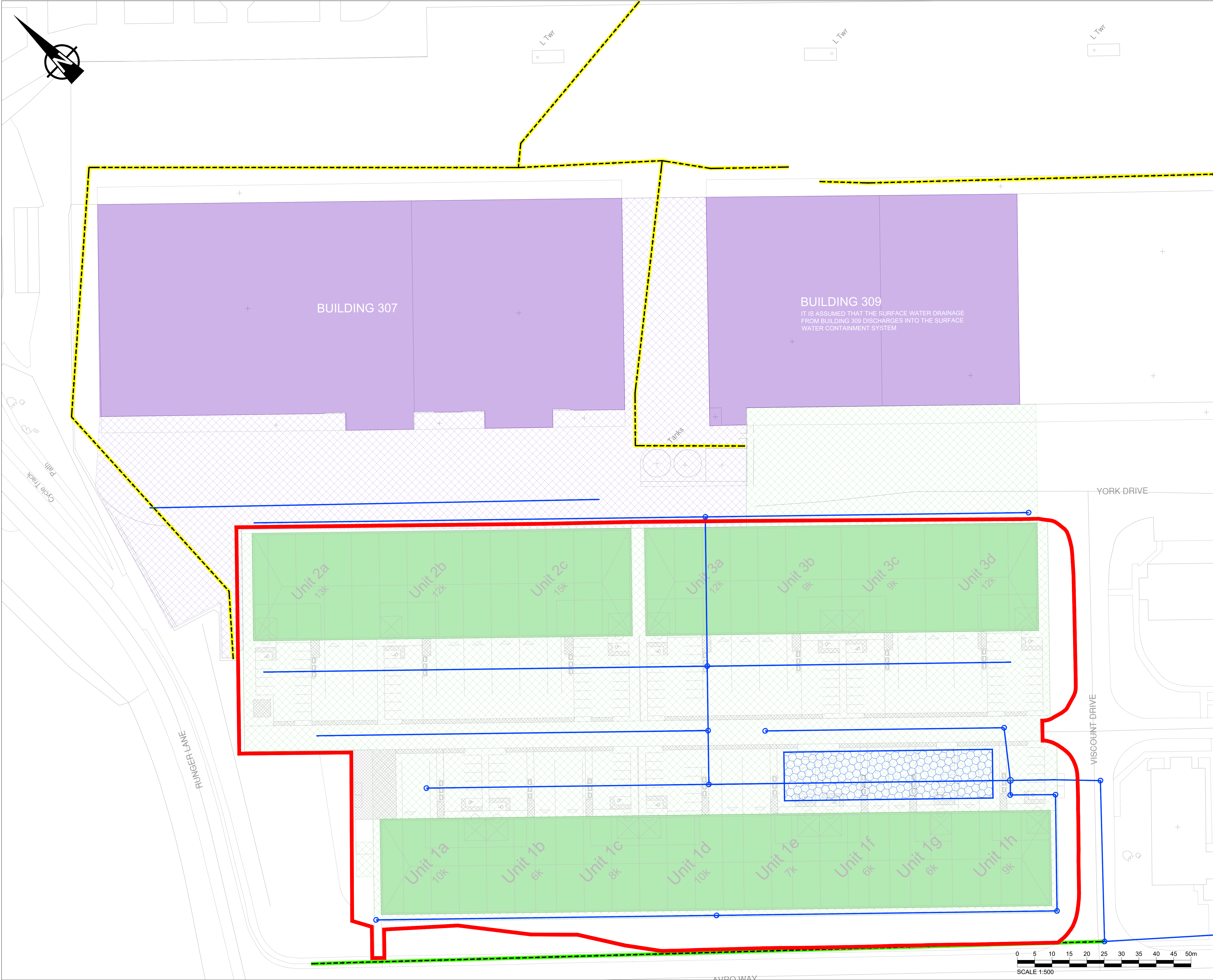
SHEET NUMBER

60663052-ACM-ArA-XX-DR-C-001

Appendix B Proposed Catchment Plan

ISO A1 594mm x 841mm
Approved:VB
Checked:JG
Drawn:NM
Project Management Initials: Revision:PO1
Last saved by: BASIM.HAFIZ(2022-04-21) Last Plotted: 2022-04-21
Filename:

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NOTES

1. FURTHER INVESTIGATION IS REQUIRED TO CONFIRM THE SURFACE WATER DRAINAGE CONNECTIVITY AND CATCHMENT AREAS.

CATCHMENT AREA SUMMARY

SURFACE WATER NON CONTAINMENT SYSTEM:
PREDEVELOPMENT IMPERMEABLE CATCHMENT AREA = 13,624m²
POST DEVELOPMENT CATCHMENT AREA = 27,220m²
CATCHMENT AREA CHANGE = 13,596m² INCREASE

SURFACE WATER CONTAINMENT SYSTEM:
PREDEVELOPMENT IMPERMEABLE CATCHMENT AREA = 32,018m²
POST DEVELOPMENT IMPERMEABLE CATCHMENT AREA = 23,139m²
CATCHMENT AREA CHANGE = 8,879m² REDUCTION

TOTAL IMPERMEABLE AREA INCREASE = 4,717m²

KEY

- ARGOSY DRIVE SITE BOUNDARY
- PROPOSED BUILDING IMPERMEABLE CATCHMENT AREA THAT DISCHARGES INTO THE SURFACE WATER NON CONTAINMENT SYSTEM
- PROPOSED EXTERNAL IMPERMEABLE CATCHMENT AREA THAT DISCHARGES INTO THE SURFACE WATER NON CONTAINMENT SYSTEM
- EXISTING BUILDING IMPERMEABLE AREA THAT DISCHARGES INTO THE SURFACE WATER CONTAINMENT SYSTEM
- EXISTING EXTERNAL IMPERMEABLE CATCHMENT AREA THAT DISCHARGES INTO THE SURFACE WATER CONTAINMENT SYSTEM
- EXISTING CONTAINMENT SURFACE WATER SEWER
- EXISTING NON CONTAINMENT SURFACE WATER SEWER
- PROPOSED SW NETWORK
- PROPOSED MANHOLE
- PROPOSED GEOCELLULAR ATTENUATION TANK

ISSUE/REVISION

P01	22/04/2022	FOR PLANNING
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60663052

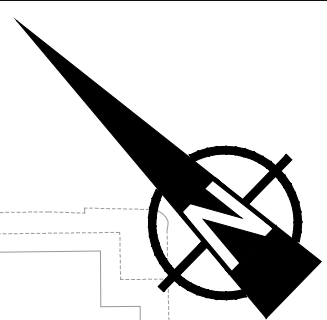
SHEET TITLE

ARGOSY DRIVE DEVELOPMENT
PROPOSED CATCHMENT
PLAN

SHEET NUMBER

60663052-ACM-ArA-XX-DR-C-002

Appendix C Drainage Strategy Drawing



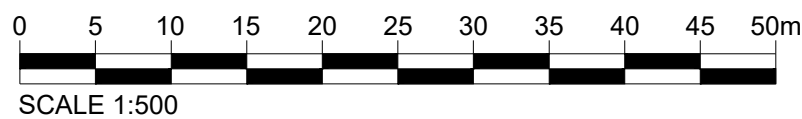
PROPOSED SURFACE WATER CONNECTIONS SUBJECT TO AGREEMENT WITH MAG AND CONFIRMATION OF THE EXISTING SURFACE WATER SEWER INVERT LEVELS

EXISTING SURFACE WATER DRAINAGE NETWORK (SWITCH NON CONTAINMENT SYSTEM) TO BE RETAINED

AVRO WAY

AVRO WAY

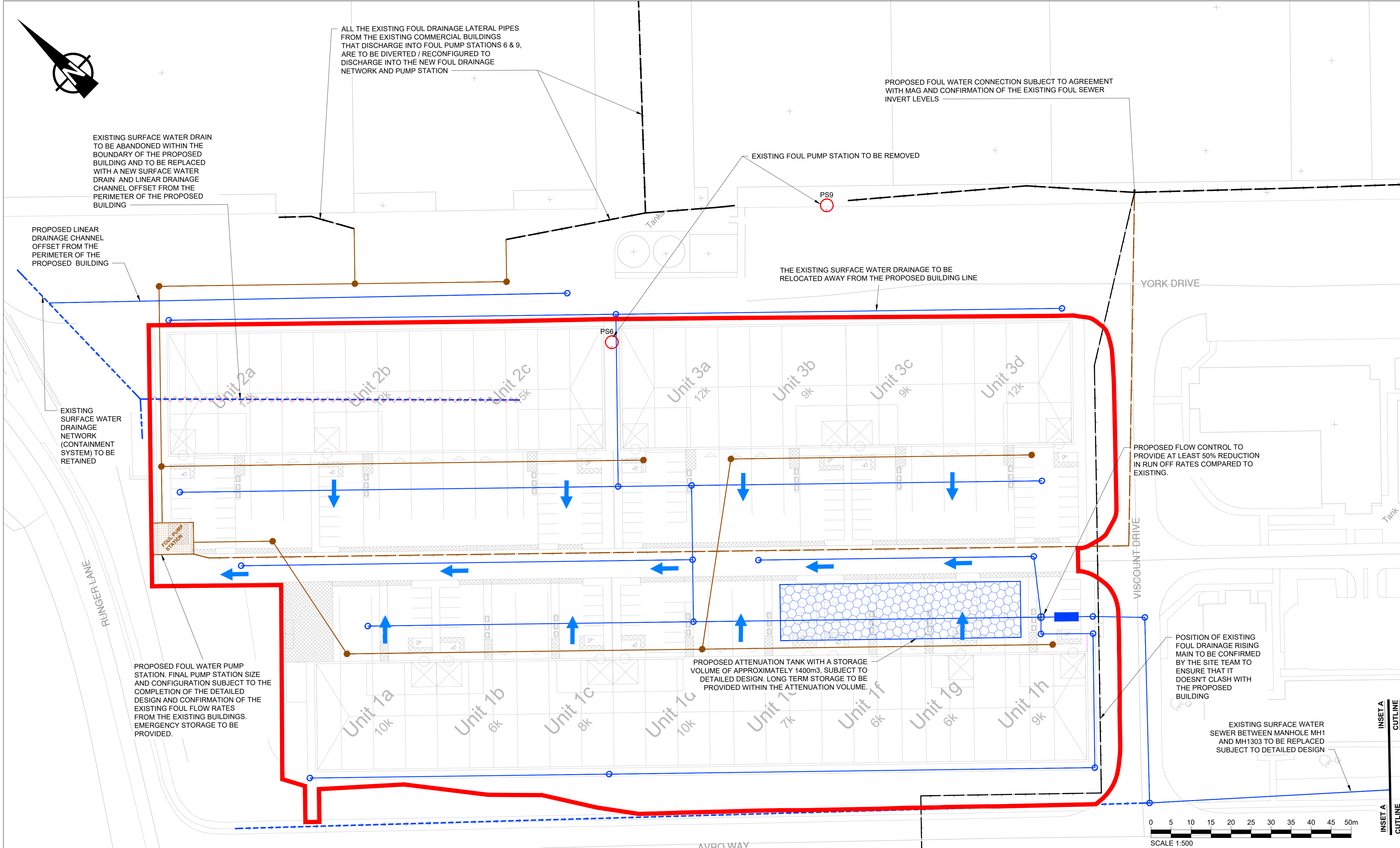
PINFOLD LANE



INSET A
CUTLINE

INSET A

INSET A CUTLINE



EXISTING SURFACE WATER DRAIN TO BE ABANDONED WITHIN THE BOUNDARY OF THE PROPOSED BUILDING AND TO BE REPLACED WITH A NEW SURFACE WATER DRAIN AND LINEAR DRAINAGE CHANNEL OFFSET FROM THE PERIMETER OF THE PROPOSED BUILDING

ALL THE EXISTING FOUL DRAINAGE LATERAL PIPES FROM THE EXISTING COMMERCIAL BUILDINGS THAT DISCHARGE INTO FOUL PUMP STATIONS 6 & 9, ARE TO BE DIVERTED / RECONFIGURED TO DISCHARGE INTO THE NEW FOUL DRAINAGE NETWORK AND PUMP STATION

PROPOSED FOUL WATER CONNECTION SUBJECT TO AGREEMENT WITH MAG AND CONFIRMATION OF THE EXISTING FOUL SEWER INVERT LEVELS

EXISTING FOUL PUMP STATION TO BE REMOVED

PS9

THE EXISTING SURFACE WATER DRAINAGE TO BE RELOCATED AWAY FROM THE PROPOSED BUILDING LINE

YORK DRIVE

PROPOSED FLOW CONTROL TO PROVIDE AT LEAST 50% REDUCTION IN RUN OFF RATES COMPARED TO EXISTING.

POSITION OF EXISTING FOUL DRAINAGE RISING MAIN TO BE CONFIRMED BY THE SITE TEAM TO ENSURE THAT IT DOESN'T CLASH WITH THE PROPOSED BUILDING

EXISTING SURFACE WATER SEWER BETWEEN MANHOLE MH1 AND MH1303 TO BE REPLACED SUBJECT TO DETAILED DESIGN

PROPOSED FOUL WATER PUMP STATION. FINAL PUMP STATION SIZE AND CONFIGURATION SUBJECT TO THE COMPLETION OF THE DETAILED DESIGN AND CONFIRMATION OF THE EXISTING FOUL FLOW RATES FROM THE EXISTING BUILDINGS. EMERGENCY STORAGE TO BE PROVIDED.

PROPOSED ATTENUATION TANK WITH A STORAGE VOLUME OF APPROXIMATELY 1400m3, SUBJECT TO DETAILED DESIGN. LONG TERM STORAGE TO BE PROVIDED WITHIN THE ATTENUATION VOLUME.

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PROJECT

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NOTES

1. THE DESIGN OF BOTH THE PROPOSED FOUL AND SURFACE WATER DRAINAGE NETWORKS ARE SUBJECT TO FURTHER INVESTIGATION TO DETERMINE THE FULL CONNECTIVITY OF THE SURFACE / FOUL WATER DRAINAGE NETWORKS, AND CONFIRMATION OF THE EXISTING CATCHMENT AREAS.
2. THE PROPOSED STRATEGY IS SUBJECT TO AGREEMENT WITH MAGS AND UNITED UTILITIES
3. THE SITE TEAM WILL NEED TO ENSURE THAT THE DRAINAGE REMAINS OPERATIONAL FOR ALL BUILDINGS THAT ARE OCCUPIED, ESPECIALLY WHEN EXISTING DRAINAGE RUNS ARE MADE REDUNDANT. FURTHER INVESTIGATION MAYBE REQUIRED BY THE SITE TEAM TO ENSURE THAT CONNECTIVITY REMAINS.

KEY

- ARGOSY DRIVE SITE BOUNDARY
- EXISTING MAG SW SEWER
- EXISTING MAG SW SEWER TO BE ABANDONED
- PROPOSED OVERLAND FLOOD FLOW ROUTES
- PROPOSED SW DRAIN
- PROPOSED SW MANHOLE
- PROPOSED SW ATTENUATION TANK
- PROPOSED FLOW CONTROL
- PROPOSED FUEL SEPARATOR
- EXISTING MAG FOUL PUMPING STATION
- EXISTING MAG FOUL WATER SEWER
- EXISTING MAG FOUL RISING MAIN
- PROPOSED FOUL WATER MANHOLE
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL WATER RISING MAIN
- PROPOSED FOUL WATER PUMPING STATION

ISSUE/REVISION

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PROJECT NUMBER

60663052

SHEET TITLE

**ARGOSY DRIVE DEVELOPMENT
PROPOSED SURFACE AND FOUL
WATER DRAINAGE STRATEGY**

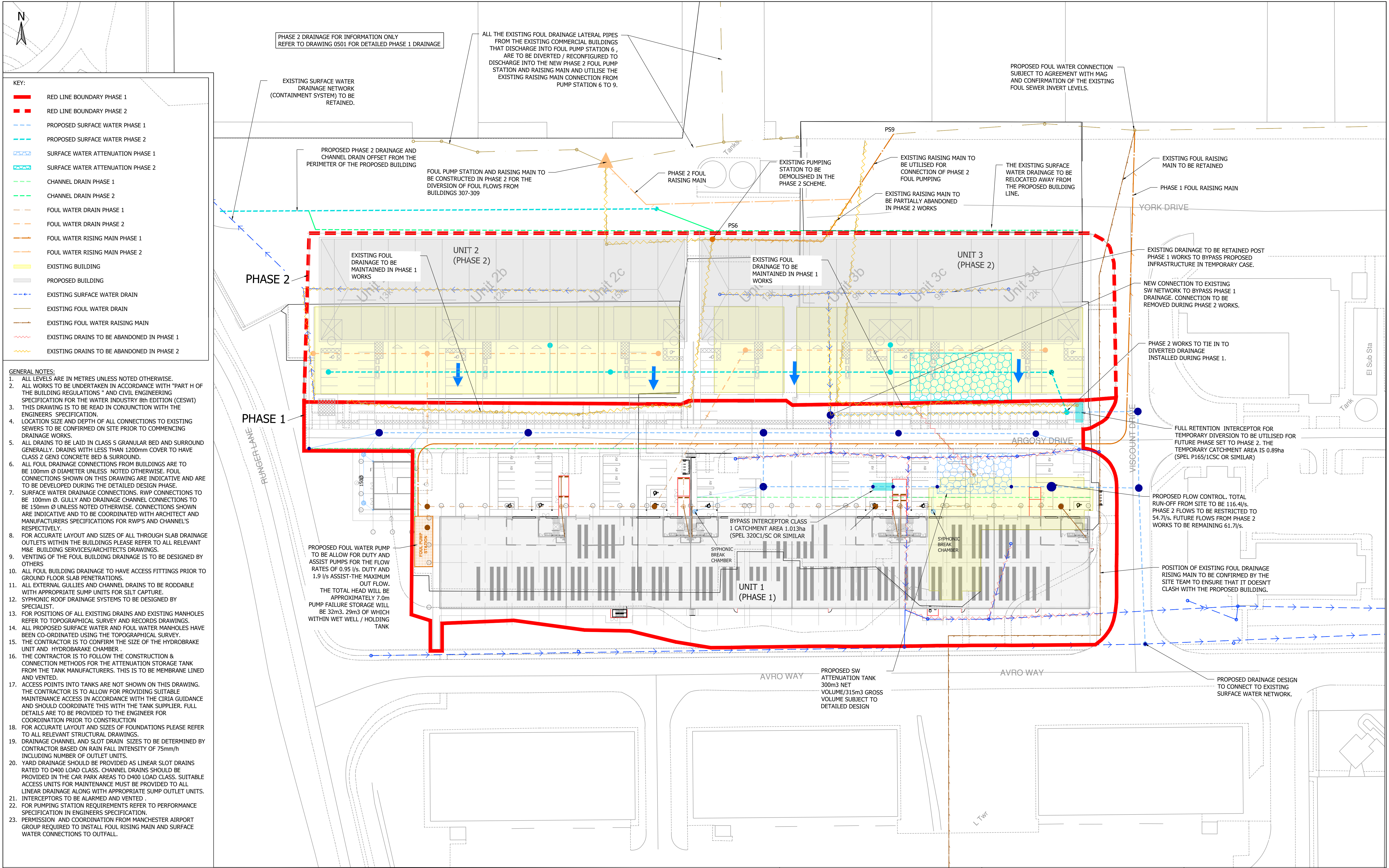
SHEET NUMBER

60663052-ACM-ArA-XX-DR-C-003

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APPENDIX B

Complete development drainage layout



05101525m
SCALE 1:500

PRELIMINARY ISSUE

Client

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Project Name

ARGOSY DRIVE

Sheet Title

DRAINAGE PHASING PLAN

TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A1	Suitability
B040536	JS	NOV 22	DH	NOV 22	NM	NOV 22	1:500	S0

Client Project Number	Originator	Volume/System	Level/Location	Type/Code	Role	Number	Revision
B040536	- TTE	- 00	- ZZ	- DR	- C	- 0505	P01

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