Westgate
253-267 Aldington Road, Kemps Creek

Water Cycle Management Strategy
SSDA

ICON OCEANIA

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21-860

Commercial in Confidence

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1. Introduction

This report has been prepared by AT&L on behalf of ICON Oceania in support of a State Significant Development Application (SSDA) for the proposed development of the site located at 253-267 Aldington Road, Kemps Creek (the Site).

1.1. Site Description

The site is located in the suburb of Kemps Creek, within the Penrith Local Government Area (LGA), and approximately 13 km south-east of the Penrith CBD and 6 km north-east of the under-construction Western Sydney Airport. The site is located at 253-267 Aldington Road, Kemps Creek (Lot 9 DP253503) with total area of the site is approximately 10.145 hectares. The extent of the site is presented in **Figure 1**.

Figure 1: Site Extent (Nearmap image, April 2021)

The site is currently characterised as rural land and comprises residential dwelling, agricultural areas, sheds, greenhouses and several farm dams.

In June 2020, the site was rezoned IN1 – General Industrial under the *State Environmental Planning Policy (Western Sydney Employment Area) 2009*. The site is also located in the Mamre Road Precinct and is therefore subject to controls outlined in the Mamre Road Development Control Plan.

1.2. Supporting Documentation

The following documentation is referred to throughout and should be read in conjunction with this report:

a) Civil Design Report (AT&L) – "REP001-05-21-860-SSDA Civil Design Report.pdf"
b) Civil Drawings (AT&L) – "21-860-INFRASTRUCTURE AND ONLOT-SSDA_CIVIL WORKS PACKAGE.pdf"

2. Compliance with SEARs

This report responds to the NSW Planning Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning, Industry and Environment (DPIE) on 12 May 2021. **Table 1** below summarises key issues relating to soil and water management that are listed in the SEARs, and where they are addressed in this report.

Table 1: Planning Secretary's Environmental Assessment Requirements addressed in this report

Key issues listed in the SEARs	Response
Waterway health and Water Sensitive Urban Design	
1) Development applications must demonstrate compliance with the stormwater quality targets in Table 4 (DCP) and the stormwater flow targets during construction and operation phases in Table 5 (DCP) and Table 6 (DCP) at the lot or estate scale to ensure the NSW Government's waterway objectives (flow and water quality) for the Wianamatta-South Creek catchment are achieved (see Appendix D). Where the strategy for waterway management is assessed at an estate level, the approval should include for individual buildings within the estate, which may be the subject of future applications.	Performance of the proposed water management strategy against the stormwater quality targets is presented in **Table 12**. Performance against the construction phase stormwater flow targets is presented in **Section 5**. Performance of the proposed water management strategy against the operational stormwater flow targets is presented in **Table 13**.
2) The stormwater flow targets during operation phase (Table 5) include criteria for a mean annual runoff volume (MARV) flow-related option and a flow duration-related option. Applicants must demonstrate compliance with either option.	Performance of the proposed water management strategy against the operational stormwater flow targets is presented in **Table 13**.
3) Development applications must include a Water Management Strategy (WMS) detailing the proposed Water Sensitive Urban Design (WSUD) approach, how the WMS complies with stormwater targets (i.e., MUSIC modelling), and how these measures will be implemented, including ongoing management and maintenance responsibilities. Conceptual designs of the stormwater drainage and WSUD system must be provided to illustrate the functional layout and levels of the WSUD systems to ensure the operation has been considered in site levels and layout.	The Water Management Strategy for the site is outlined in **Section 7.2**, and includes the approach to WSUD for the site, performance of the proposed stormwater management measures against the DCP targets, and description of delivery, ongoing management and maintenance of each proposed measure. Design drawings showing the layout and levels of the proposed stormwater management elements are included in the AT&L civil package.
4) The design and mix of WSUD infrastructure shall consider ongoing operation and maintenance. Development applications must include a detailed lifecycle cost assessment (including capital, operation/maintenance, and renewal costs over 30 years) and Maintenance Plan for WSUD measures.	Ongoing management and maintenance considerations are addressed in **Section 7.11**. All costs associated with the delivery, operation and maintenance of the estate-based water management measures will be borne by the proponent.
6) Development must not adversely impact soil salinity or sodic soils and shall balance the needs of groundwater dependent ecosystems.	Refer to Geotechnical Investigation Report prepared by PSM for details of soil salinity, sodicity and groundwater.

Key issues listed in the SEARs	Response
7) Infiltration of collected stormwater is generally not supported due to anticipated soil conditions in the catchment. All WSUD systems must incorporate an impervious liner unless a detailed Salinity and Sodicity Assessment demonstrates infiltration of stormwater will not adversely impact the water table and soil salinity (or other soil conditions).	The proposed water management strategy does not incorporate infiltration of collected stormwater.
8) Where development is not serviced by a recycled water scheme, at least 80% of its non-potable demand is to be supplied through allotment rainwater tanks.	Refer to **Section 7.6.1** for details of proposed rainwater tanks to meet at least 80% of non-potable water demand.
9) Where a recycled water scheme (supplied by stormwater harvesting and/or recycled wastewater) is in place, development shall: ■ *Be designed in a manner that does not compromise waterway objectives, with stormwater harvesting prioritised over reticulated recycled water;* ■ *Bring a purple pipe for recycled water to the boundary of the site, as required under Clause 33G of the WSEA SEPP. Not top up rainwater tanks with recycled water unless approved by Sydney Water; and* ■ *Design recycled water reticulation to standards required by the operator of the recycled water scheme.*	Stormwater harvesting in the form of rainwater tanks on proposed lot 9 will form one of the components of the Interim Arrangement, and its supply to non-potable uses within the development will be prioritised over reticulated recycled water. It is envisaged that reticulated recycled water would supply the shortfall in supply from the rainwater tank and would not top up rainwater tanks unless approved by Sydney Water.
Soil and Water	
– *an assessment of the development's potential impacts on soil and water resources, topography, hydrology, groundwater, groundwater dependent ecosystem(s), drainage lines, watercourses and riparian lands on or nearby to the site, including mapping and descriptions of existing background conditions and cumulative impacts and measures proposed to reduce and mitigate impacts*	**Section 3**
– *a detailed site water balance including identification of water requirements for the life of the development, measures that would be implemented to ensure an adequate and secure water supply is available for the development and a detailed description of the measures to minimise water consumption at the site*	**Section 8**
– *demonstration satisfactory arrangements for drinking water, wastewater and, if required, recycled water services have been made*	refer to Service Infrastructure Assessment prepared by LandPartners (March 2021)
– *characterisation of water quality at the point of discharge to surface and/or groundwater against the relevant water quality criteria (including the Mamre Road Precinct Development Control Plan) and proposed mitigation measures, monitoring activities and methodologies*	**Section 7.5**
– *a site-specific integrated water management strategy with details of stormwater/wastewater management system including how it will be designed, operated and maintained, including the capacity of on-site detention system(s), on-site sewage management and measures to treat, reuse (including indicative quantities) or dispose of water*	**Section 7.2**

Key issues listed in the SEARs	Response
– *demonstration of how stormwater discharge will comply with the trunk drainage infrastructure identified in the Mamre Road Precinct Development Control Plan, including concept stormwater plans for both the proposed development and the ultimate developed estate*	**Section 0**
– *description of the proposed erosion and sediment controls during construction*	**Section 5**

Additional SEARS Items (25/03/2023)	**Response**
– You are reminded that the Department strongly encourages you to consult with Environment, Energy and Science Group and Sydney Water with regards to waterway health targets and trunk drainage requirements for the precinct and include evidence of this consultation as part of the EIS.	After consultation with Sydney Water and their design team, Sydney Water have provided a letter (**Appendix A**) giving in principle endorsement to lodge this SSDA.

DPIE Comments on the EIS (21/10/2021)	**Response**
– No additional comments for stormwater and waterway health.	-

3. Site Characteristics

3.1. Existing Topography and Catchments

The site in its existing condition is characterised by undulating topography. The ground slope across most of the site is between 3% and 6%. The northern part of the site (253-276 Aldington Road) is steeper than the majority of the site, with slopes of up to 10%.

Most of the site in its existing condition is pervious, other than some residential dwelling, sheds and access driveways.

Delineation of the internal drainage catchments and external catchment that drain through the site is presented in **Figure 2**.

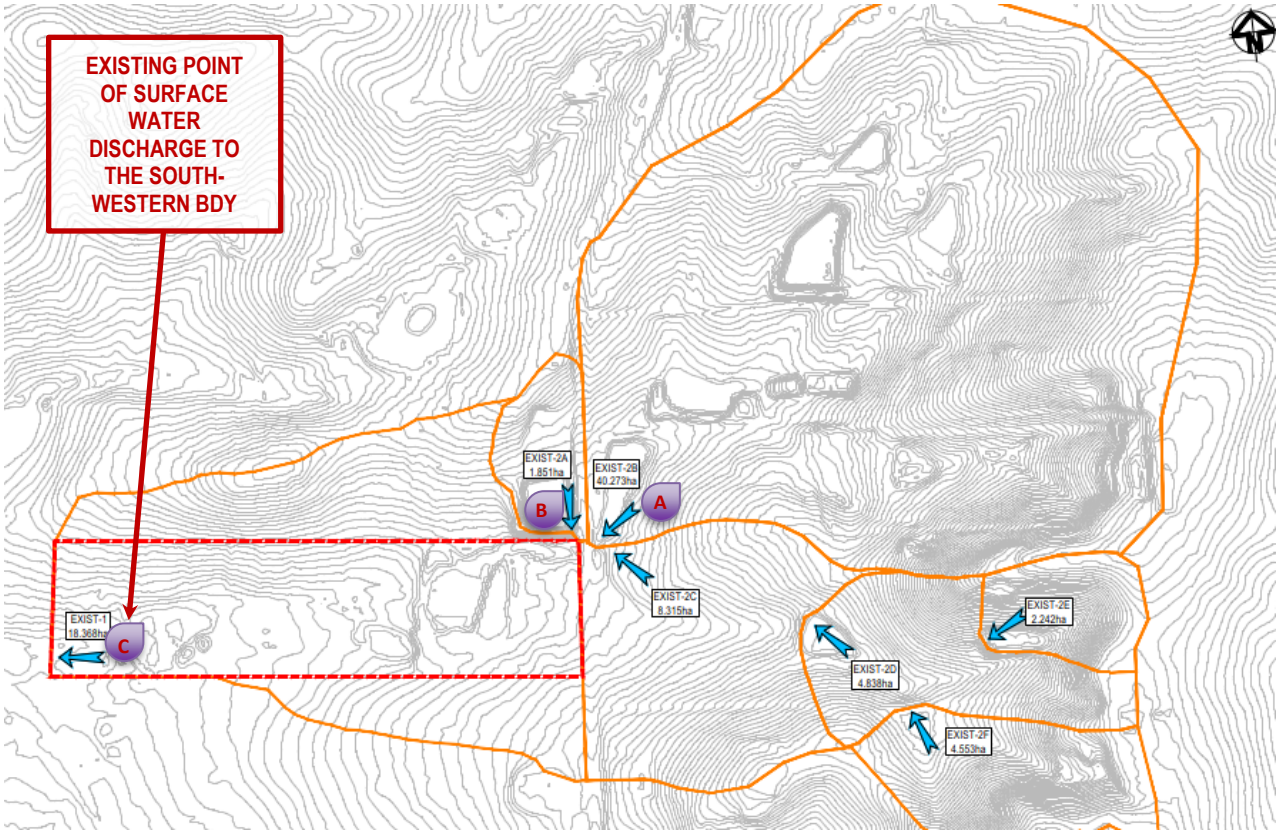

Figure 2: Catchment extents under existing conditions

A summary of the internal catchments under existing conditions is as follows:

- Existing Entry Point A (Total Catchment 60.221 ha) – discharges towards the north-eastern boundary.
- Existing Entry Point B (Total Catchment 1.851 ha) – discharges from eastern portion of 235-251 Aldington Rd.
- Existing Local Catchment Point (18.368 ha, including 10.145ha internal to the site) – discharges from the Site and local adjacent boundary flows at 235-261 (northern neighbour) and 269 Aldington Rd (southern neighbour).

There is currently no formal trunk stormwater infrastructure within the site.

3.2. Existing Drainage Lines

Based on large-scale topographic mapping (1:25,000 from NSW Six Maps), there is a minor series of dams and overflow paths within the site, refer to **Figure 3**.

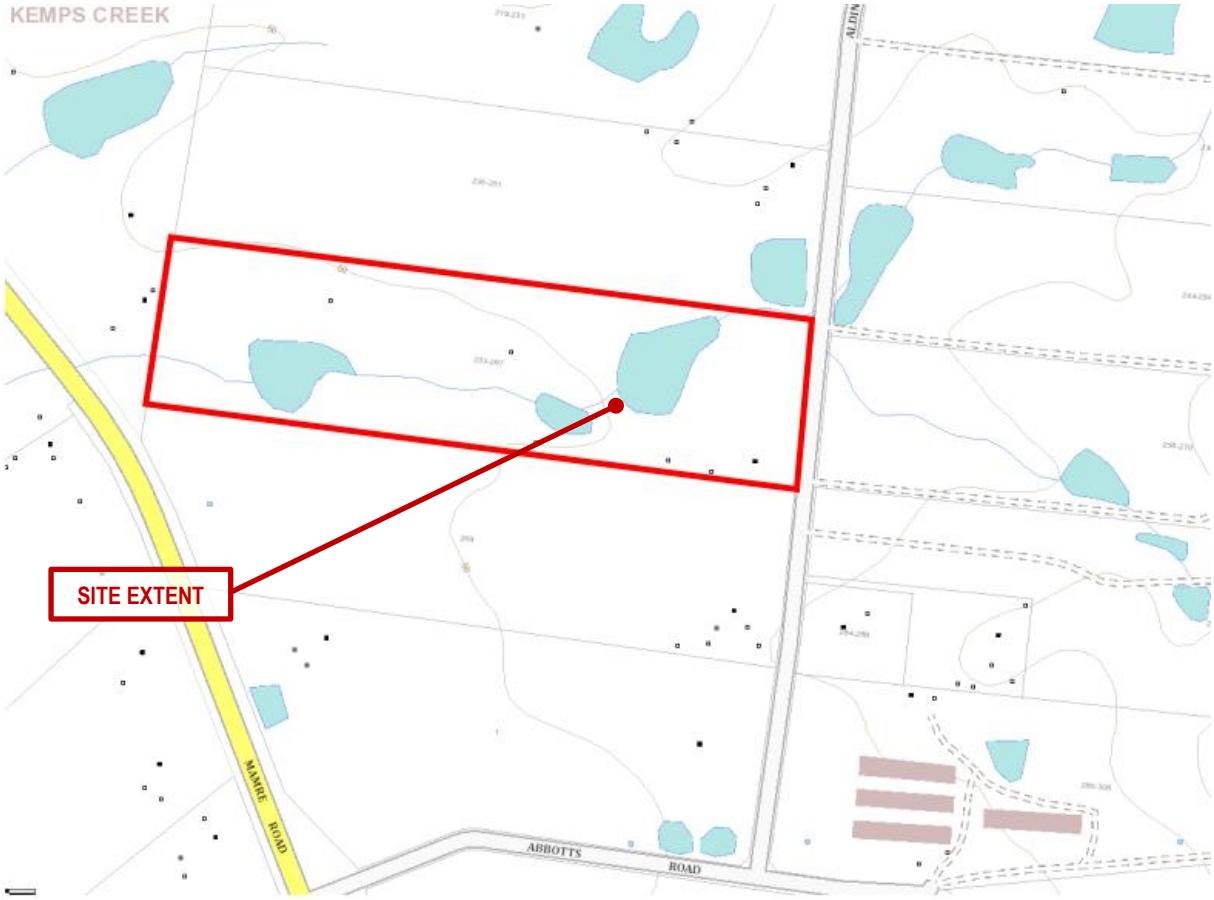

Figure 3: Topographic mapping showing drainage lines in the vicinity of the site (Source: NSW SIX Maps)

The *Mamre Road Precinct Waterway Assessment* (CTEnvironmental, April 2020), contained in the *Mamre Road Flood, Riparian Corridor, and Integrated Water Cycle Management Strategy* (Sydney Water, October 2020) presents the extents of waterways in the Mamre Road Precinct that have been the subject of a desktop review and field assessment to confirm the presence of mapped and unmapped waterways. An extract of mapping showing the extents of waterways in the Mamre Road Precinct is presented as **Figure 4**. This shows that there are no waterways within the site.

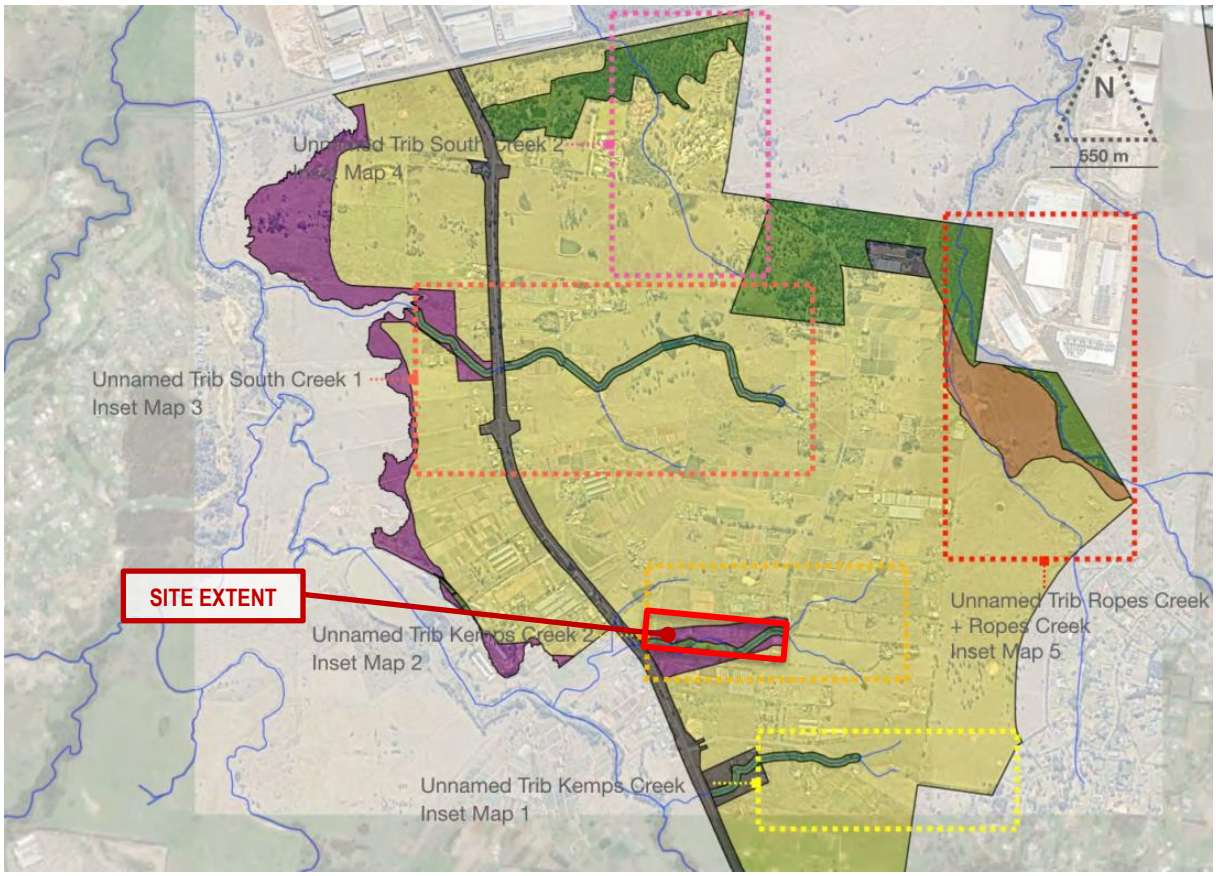

Figure 4: Extract of waterway mapping (CTEnvironmental, April 2020)

3.3. Proposed Master Plan

The proposed masterplan for the site is shown below as **Figure 5**. It consists of three warehouse building areas within two lots. A Transgrid easement runs north/south along the front third of the site dividing Lot 1 into two distinct areas.

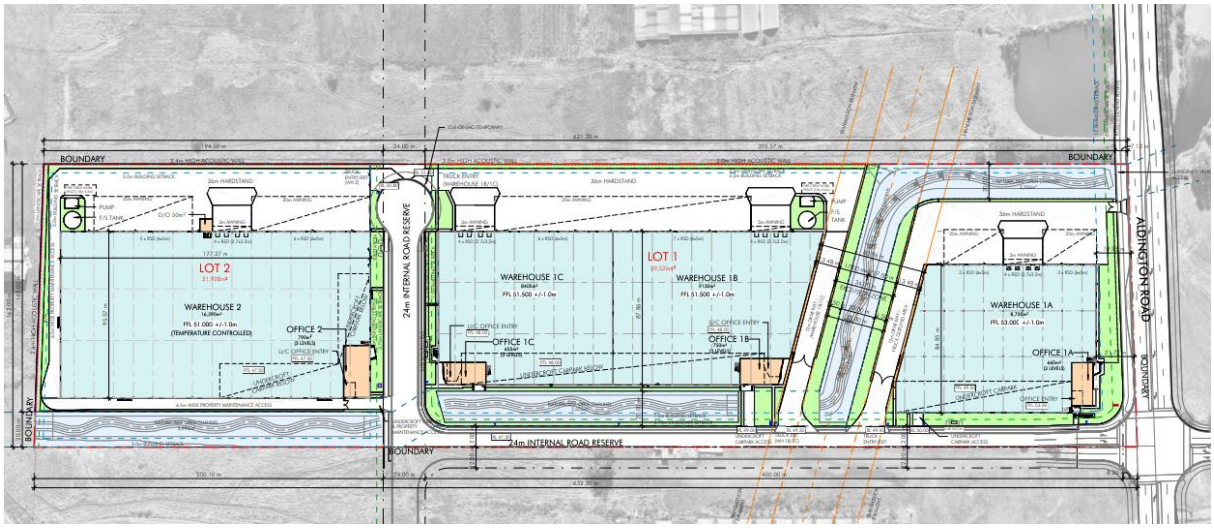

Figure 5: Proposed Estate Masterplan - Nettleton Tribe May 2023

3.4. Post-Development Catchment Extents

A post-development catchment plan based on the proposed site grading is presented as **Figure 6**.

There are four points of inflow to the site from external catchments:

A At the north eastern boundary at start of the trunk drainage channel. The discharge here is conveyed through an existing culvert and headwall as part of the Aldington Road upgrade. 58.52ha of flow is conveyed through the culvert, and 15.07ha through the pipe.

B At the Northern boundary where the electrical easement is present, there is a future trunk drain discharging 39.297ha of flow into the site, currently proposed via pipe connection.

C Along the southern boundary there will be 2.959ha of existing catchment discharging into the site over the half-road interface. This will only be present in the interim until the southern development is constructed.

D At the north of Road 2, there is 0.357ha of ultimate road catchment discharging into the site via drainage pipes.

Based on the proposed site grading, there will be two main points of surface water discharge from the site:

1 At the southern boundary at the Road 2 partially constructed intersection. The majority of flows concentrating at this point will be captured by the minor drainage system, however overland flows may drain south into the adjacent land until the ultimate development is constructed.

2 At the western boundary and towards the proposed Altis development site. Discharge to the Altis site will be subject to further design coordination via the proposed open trunk drainage channel.

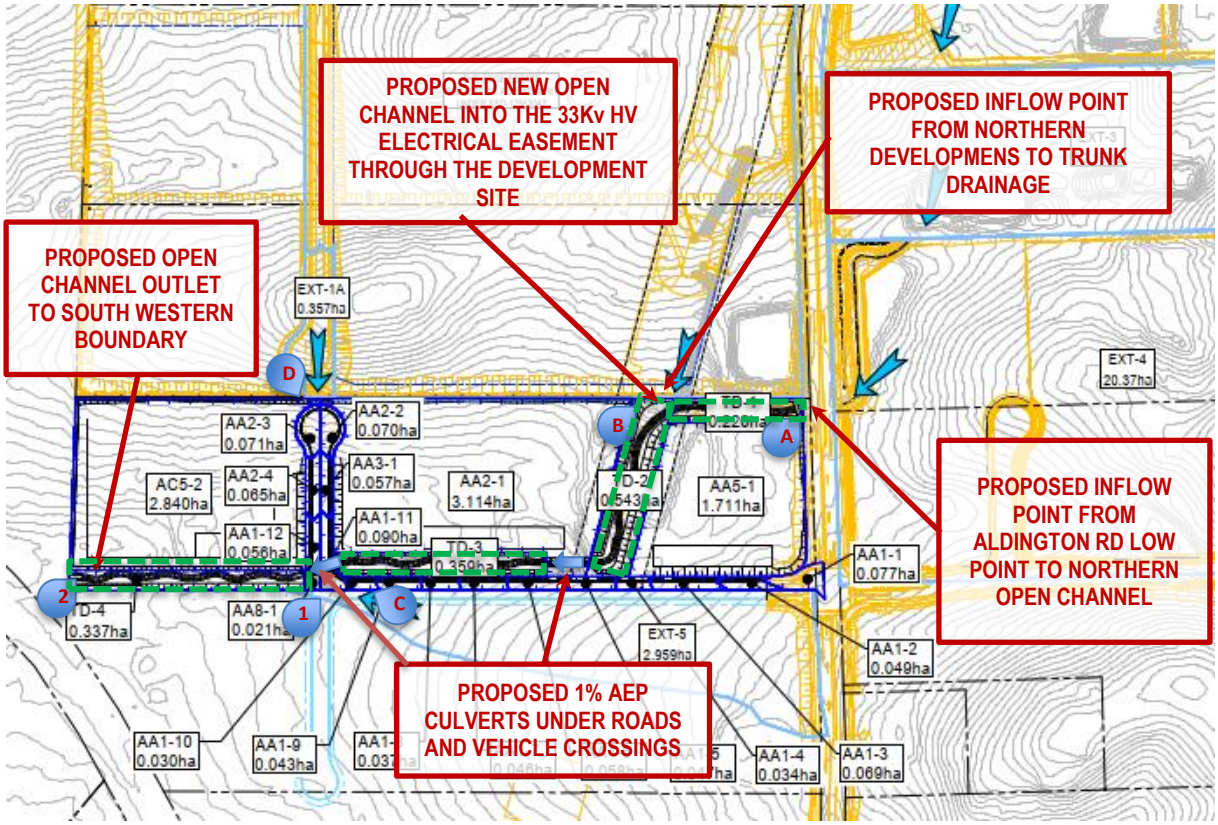

Figure 6: Catchment extents under proposed conditions

4. Project Staging

The project currently requires two stages of construction due to the stormwater management requirements of the Mamre Rd DCP.

Stage 1 will include warehouse Buildings 1A – 1C as well as all roadworks, infrastructure, stormwater, electrical, sewer, water, gas, telecommunications to service the Lot 1, including the downstream 6500m^2 evaporation pond in the future Lot 2. Stage 2 will include the removal of the evaporation pond and remediation, and construction of Lot 2 warehouse building works.

Upon completion of Stage 1, the evaporation basin will act as a stormwater basin for discharge into the existing channel to the western rear of the site, while also providing stormwater quality and quantity management to the Waterway Health objectives. Refer to section 7 Water Management Strategy and section 8 Site Water Balance for further details.

Stage 2 will be able to commence once the Sydney Water Regional scheme is operating (or otherwise agreed by Sydney Water), as the development will no longer be required to address most of the waterway health objectives internally to the site.

See **Figure 7** below for a depiction of the Staging Plan.

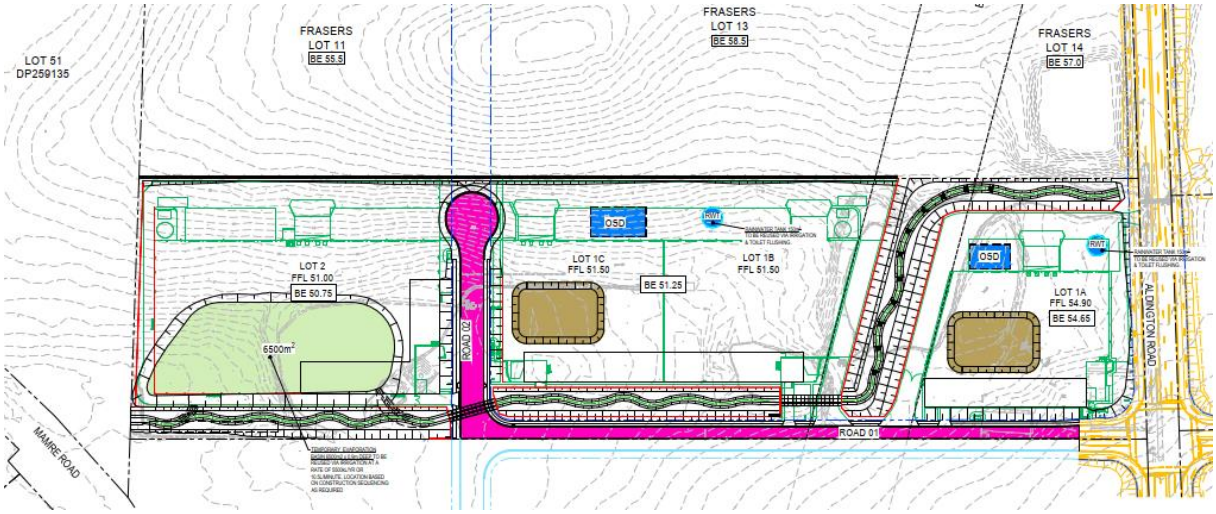

Figure 7: Staging Plan

5. Soil and Water Management

This section documents the potential impacts of the development on soil and water resources, and measures proposed to reduce and mitigate impacts during and after construction.

5.1. Erosion and Sediment Control

A Soil and Water Management Plan (SWMP) has been prepared in accordance with the NSW Department of Housing Publication titled: Managing Urban Stormwater – Soils and Construction (2004) for the whole site.

The key objectives of the SWMP are:

- Acknowledging the activities on a construction site which may contribute to erosion, sedimentation and water quality impacts.
- The implementation of industry best management practices to minimise adverse water quality and sedimentation impacts brought about through construction activities on waterbodies surrounding the work.
- Establishment of processes that effectively manage erosion, sedimentation and water quality practices during the life of the project.

5.1.1. Sources of Pollution

The activities and aspects of the works that have potential to lead to erosion, sediment transport, siltation and contamination of natural waters include:

- Earthworks undertaken immediately prior to rainfall periods.
- Work areas that have not been stabilised.
- Extraction of construction water from waterways during low rainfall periods.
- Clearing of vegetation and the methods adopted, particularly in advance of construction works.
- Stripping of topsoil, particularly in advance of construction works.
- Bulk earthworks and construction of pavements.
- Works within drainage paths, including depressions and waterways.
- Stockpiling of excavated materials.
- Storage and transfer of oils, fuels, fertilisers and chemicals.
- Maintenance of plant and equipment.
- Ineffective implementation of erosion and sediment control measures.
- Inadequate maintenance of environmental control measures; and
- Time taken for the rehabilitation / revegetation of disturbed areas.

5.1.2. Potential Impacts

The major potential impacts on the riparian environment relate to erosion of distributed areas or stockpiles and sediment transportation. Potential adverse impacts from erosion and sediment transportation can include:

- Loss of topsoil.
- Increased water turbidity.
- Decreased levels of dissolved oxygen.
- Changed salinity levels.
- Changed pH levels.
- Smothering of stream beds and aquatic vegetation.
- Reduction in aquatic habitat diversity.
- Increased maintenance costs.
- Decrease in waterway capacity leading to increased flood levels and durations.

5.1.3. RUSLE Analysis

Prior to the design of the SWMP, a Revised Universal Soil Loss Equation (RUSLE) has been undertaken in accordance with the "Blue Book". This analysis has been undertaken to predict the long term, average and annual soil loss from sheet and rill flow from the site under specified management conditions.

Estimating soil loss for a proposed development has four important applications to soil and water management. These are to:

1. Assess the erosion risk at a site.
2. Identify suitable measures to overcome the erosion risk.
3. Estimate the required capacity of sediment retarding basins.
4. Compare the effectiveness of various erosion control measured.

Refer to **Table 2** below for estimates of soil loss on the site.

Table 2: RUSLE Analysis

Parameter	Item (Blue Book Reference)
Rainfall Erosivity Factor (R)	1893
Soil Erodibility Factor (K) (Table C20, Blue Book)	0.05 (for South Creek soil landscape)
Slope Length / Gradient Factor (LS)	3.25 (assuming average 6% slope and 300m length)
Erosion Control Practice Factor (P)	1.2 (assuming track-walked along the contour)
Ground Cover and Management Factor (C)	1
Computed Soil Loss (tonnes per hectare per year)	369
Soil Loss Class	4

The erosion hazard potential of the site is considered very low, due to the calculated soil loss lying in the range of 0 to 150 tonnes/ha/year as per Table 4.2 of the Blue Book.

5.1.4. Construction Phase Soil and Water Management Strategy

The following construction methodology will be adopted to minimise the impact of sedimentation due to construction works:

- Diversion of surface runoff from undisturbed areas away from disturbed areas and discharge via suitable scour protection.
- Provision of hay bale type flow diverters to catch drainage and divert to "clean" water drains.
- Diversion of sediment-laden water into temporary sediment control basins to capture the design storm volume and undertake flocculation (if required).
- Provision of construction traffic shaker grids and wash-down to prevent vehicles carrying soils beyond the site.
- Provision of catch drains to carry sediment-laden water to sediment basins.
- Provision of silt fences to filter and retain sediments at source.
- Rapid stabilisation of disturbed and exposed ground surfaces with hydro-seeding areas where future construction and building works are not currently proposed.
- All temporary sediment basins will be located clear of the 1% AEP flood extents from local overland flow within the site.

Refer to AT&L Drawings 21-860-301, C302, C310 for Erosion and Sediment Control Plans, for all proposed control and protection measures across the site until completion of on lot works.

Suitable temporary erosion and sediment controls shall be designed by a suitably qualified Engineer. Erosion and sediment controls shall be installed and maintained by the Contractor throughout all stages of works. Such controls shall be in accordance with the relevant requirements in the latest version of *Managing Urban Stormwater: Soils and Construction* (Landcom).

5.1.5. Design of Erosion and Sediment Control Measures

Suitable erosion and sediment controls shall be provided by the Contractor and maintained throughout all stages of works, including at completion of the bulk earthworks.

All design, documentation, installation and maintenance of sediment and erosion controls will be in accordance with the requirements of:

- *Protection of the Environment Operations Act*
- Penrith City Council's guidelines and specifications
- *Managing Urban Stormwater: Soils and Construction*, Landcom, (4th Edition) (The "Blue Book") Volume 1 and Volume 2

With the proposed site being larger than 2,500m^2 in disturbed area, sediment basins will be required. The proposed stormwater detention basins are proposed to be used temporarily as sitewide sediment basin during the bulk earthworks construction. For this approval it has been assumed that the on-lot works will be completed simultaneously, negating the need for individual sediment basins. Ultimately, the final temporary sediment basin locations and sizes will be provided to suit development staging requirements and will be sized and maintained in accordance with the requirements of the above-mentioned authority documents.

5.1.6. Site Inspection and Maintenance

The inspection and maintenance requirements outlined in this section must be carried out while earthworks are being conducted, and all areas re-established.

The Contractor will be required to inspect the site after every rainfall event and at least weekly, and will:

- Inspect and assess the effectiveness of the SWMP and identify any inadequacies that may arise during normal work activities or from a revised construction methodology.
- Construct additional erosion and sediment control works as necessary to ensure the desired protection is given to downstream lands and waterways.
- Ensure that drains operate properly and to affect any repairs.
- Remove spilled sand or other materials from hazard areas, including lands closer than 5 metres from areas of likely concentrated or high velocity flows especially waterways and paved areas.
- Remove trapped sediment whenever less than design capacity remains within the structure.
- Ensure rehabilitated lands have affectively reduced the erosion hazard and to initiate upgrading or repair as appropriate.
- Maintain erosion and sediment control measures in a fully functioning condition until all construction activity is completed and the site has been rehabilitated.
- Remove temporary soil conservation structures as the last activity in the rehabilitation.
- Inspect the sediment basin during the following periods:
  - During construction to determine whether machinery, falling trees, or construction activity has damaged and components of the sediment basin. If damage has occurred, repair it.
  - After each runoff event, inspect the erosion damage at flow entry and exit points. If damage has occurred, make the necessary repairs.
  - At least weekly during the nominated wet season (if any), otherwise at least fortnightly; and
  - Prior to, and immediately after, periods of 'stop work' or site shutdown.

- Clean out accumulated sediment when it reaches the marker board/post and restore the original volume. Place sediment in a disposal area or, if appropriate, mix with dry soil on the site.
- Do not dispose of sediment in a manner that will create an erosion or pollution hazard.
- Check all visible pipe connections for leaks, and repair as necessary.
- Check all embankments for excessive settlement, slumping of the slopes or piping between the conduit and the embankment, make all necessary repairs.
- Remove the trash and other debris from the basin and riser; and
- Submerged inflow pipes must be inspected and de-silted (as required) after each inflow event.

5.1.7. Sediment Basin Maintenance

The proposed development site contains 'Type F' soils, or soils that contain a significant proportion of fine grained (33% or more of finer than 0.02mm) and require a much longer residence time to settle.

Stormwater within the settling zone should be drained or pumped out within 5 days (design time), if the nominated water quality targets can be met, to the satisfaction of the superintendent. Flocculation should be employed where extended settling is likely to fail to meet the objectives within the 5-day period.

Flocculation is when flocculating agents are applied to the sediment basins causing the colloidal particles to clump into larger units or 'floc' that can either settle in a reasonable time or be filtered.

Refer to Appendix E4 of the Blue Book for flocculation methodologies and manufacturer's instructions for application rates, regarding the proposed sediment basins.

5.1.8. Conclusion

The erosion control measures proposed for the site will comply with the requirements of Penrith City Council Engineering Guidelines and the Department of Planning, Industry and Environment (DPIE).

The proposed SWMP will ensure that the best management practice is applied to the development site in controlling and minimising the negative impacts of soil erosion.

6. Stormwater Drainage

6.1. Stormwater Drainage Design Criteria

Design criteria and requirements for the proposed site stormwater management and stormwater drainage are outlined in the following documents:

- AS 3500.3 – Plumbing and drainage – Stormwater drainage
- Commonwealth of Australia (Geoscience Australia), Australian Rainfall and Runoff: A guide to flood estimation, 2019.
- NSW Department of Planning, Industry and Environment (DPIE), *Mamre Road Precinct, Development Control Plan*, November 2021.
- Penrith City Council, *Design Guidelines for Engineering Works for Subdivisions and Developments*, as amended 20 November 2013.
- Penrith City Council, *Penrith Development Control Plan 2014, Part C3 Water Management*.
- Penrith City Council, *Water Sensitive Urban Design (WSUD) Policy*, December 2013.
- Penrith City Council, *WSUD Technical Guidelines*, Version 4 – October 2020.

6.2. Proposed Site Stormwater Drainage

The proposed drainage network within the estate has been designed to safely convey major and minor flows prior to discharging to the neighbouring property (930-966 Mamre Rd) to the west. The following criteria have been adopted for the proposed drainage system:

- Major system (pit and pipe network, overland flow paths and channels): 1% AEP
- Minor system (pit and pipe network): minimum 5% AEP and increased where required to address major system design requirements.

The site catchments are all overall draining to the south west of the site. They can be split into 3 sub catchments, Lot 1A discharging into the downstream of the channel adjacent to road 1, Lot 1C & 1B discharging into the upstream of the southwest section of the channel, and Lot 2 discharging to the channel at the south west corner of the development.

The site is divided into two broad catchments (refer to Figure 5): one receiving flow from the new Road 1 (east/west) and the other from the Northeast corner of the site taking flow through the Electrical HV easement 10m wide channel both meeting in a trunk drainage main 2 x 1500 dia main discharging towards the south-eastern corner of the site via another open channel discharging towards the western boundary via a level spreader and outlet scour protection to minimise potential impacts associated with scour beyond the site. The proposed Road 2 (north/south) will also discharge through road drainage pipes towards the southern boundary channel.

The proposed estate-wide drainage system will incorporate three below ground on-site detention tanks. Key parameters relating to these proposed basins are described in **Table 3**. Further specific design criteria relating to stormwater quantity management is presented in **Section 7.6.4**.

Table 3: Key detention tank parameters

Basin/Tank ID	Location	Collects stormwater from:	Discharges to:
A	Lot 1A, within the internal northern Hardstand/Loading Dock area to the north of the proposed warehouse	Proposed lot 1 warehouse 1A	Road drainage along Road 1, and ultimately to a level spreader and outlet scour protection adjacent to the southern boundary via a new overland flow channel.
B	Lot 1B/1C, within the internal northern Hardstand/Loading Dock area to the north of the proposed warehouse	Proposed lot 1 warehouse 1B/1C	Road drainage along Road 1, and ultimately to a level spreader and outlet scour protection adjacent to the southern boundary via a new overland flow channel.
C	Lot 2, below the southern fire access roadway of Warehouse 2	Proposed lot 2 warehouse	Open Channel and ultimately to a level spreader and outlet scour protection adjacent to the southern boundary via a new overland flow channel.

6.3. Trunk Drainage Infrastructure

The *Mamre Road Precinct DCP* includes indicative locations of trunk drainage infrastructure across the precinct, refer to **Figure 8**. The trunk drainage shown on the scheme plan relating to this site involves two incoming 30m open trunk channels consolidating into a 40m trunk channel through the Icon site, the northern one being a diverted catchment that does not run through the Icon catchment in existing conditions. The incoming northern channel alignment has been rejected by Transgrid for being incompatible with its future pylon footings in their easement (60x60m footing required every 400m). The current assumption is that the catchment from the north will discharge via a pipe into the site trunk channel.

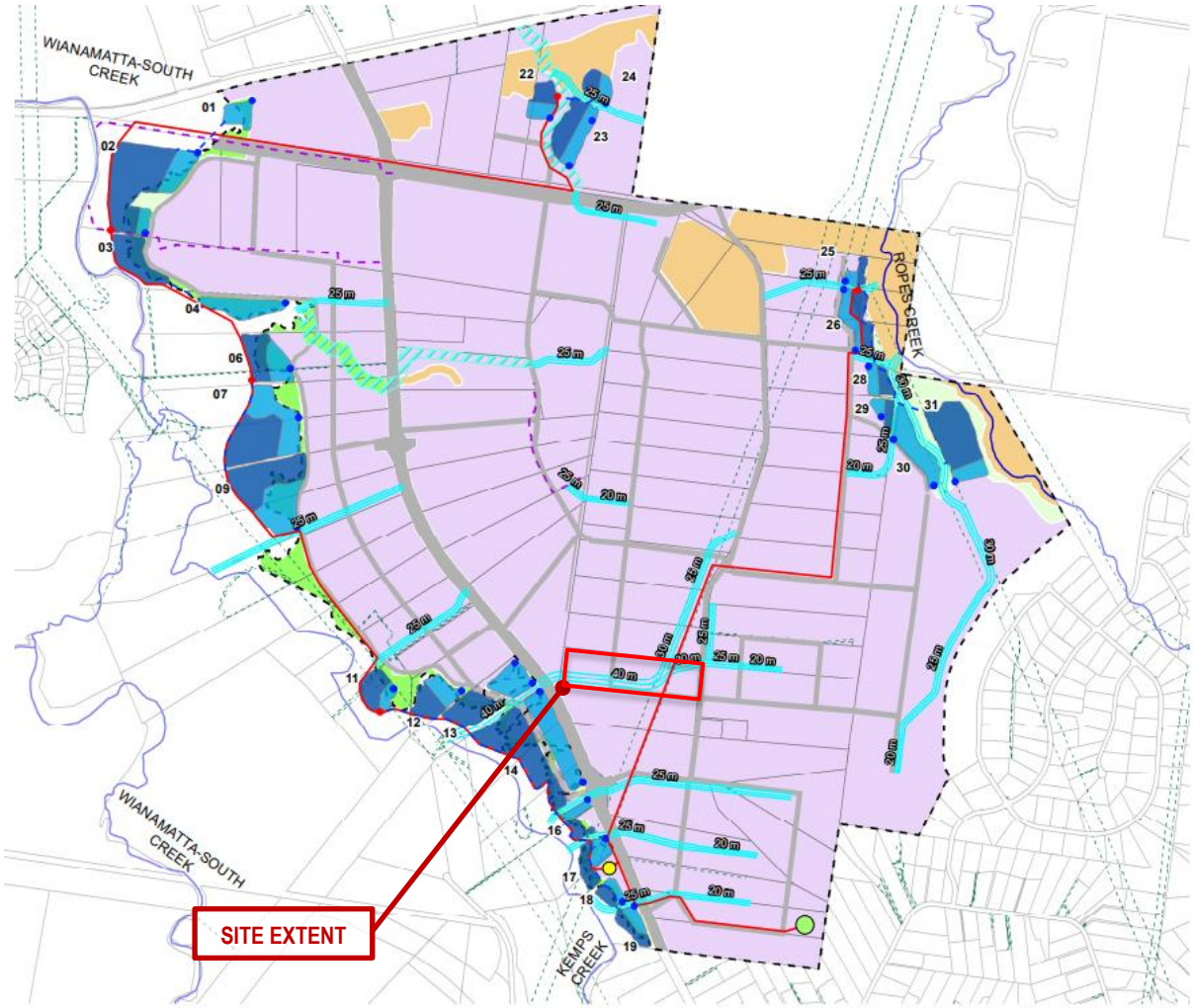

Figure 8: Mamre Road Precinct Stormwater Scheme Plan (Dec 2022, Sydney Water)

The proposed subdivision infrastructure works will incorporate the naturalised trunk drainage channel alignment as shown on the scheme plan, however with the removal of the northern incoming channel, we believe flows can be contained within a 20m channel instead of the proposed 40m channel. The naturalised trunk drainage channel with discharge in a westerly direction at the south west boundary of the site. The geometry of the channel will be generally consistent with the indicative trunk drainage path cross-section documented in the Mamre Road Precinct DCP (reproduced below as **Figure 9**).

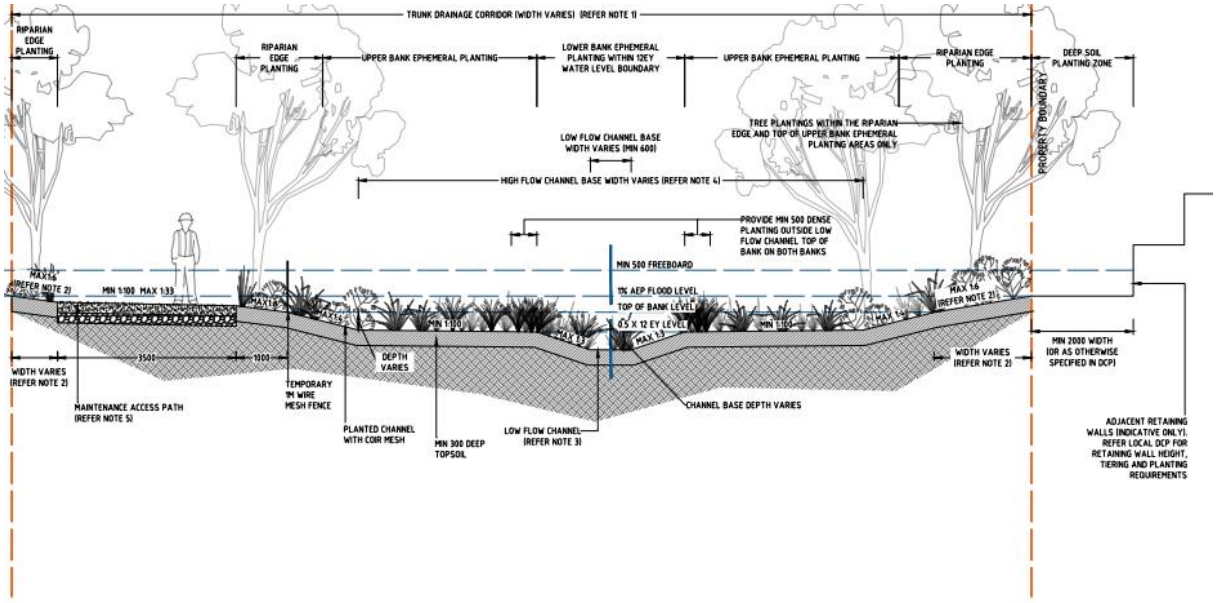

Figure 9: Draft Typical Trunk Drainage Channel type 1 (Sydney Water 2023)

A longitudinal section and spatial plans of the channel are included in the civil plan set, further details are included in the flood impact assessment *REP004-01-21-860-20-776 FIRA (AT&L 2023*), including 2D modelling of the channels. The flood impact assessment shows that there are no significant negative impacts to upstream or downstream developments due to the Westgate development, flooding is managed sufficiently in the trunk drainage channels.

7. Water Management Strategy

This section summarises the proposed stormwater quality management strategy for the site, including details of the proposed stormwater treatment train and characterisation of water quality at the points of discharge at the site boundary against relevant water quality criteria (including the *Mamre Road Precinct Development Control Plan*).

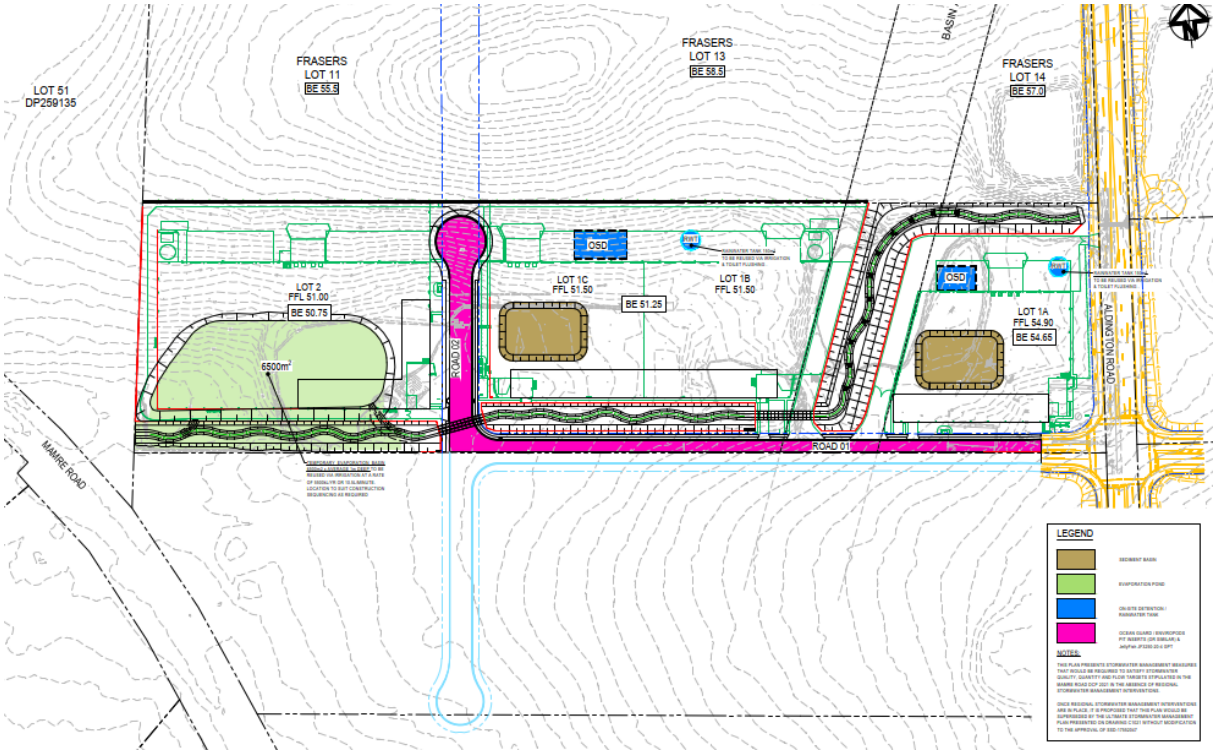

Figure 10: Stormwater Staging

As mentioned in **Section 4** above, the Staging of the development will be able to be split into two stages, Stage 1 (Lot 1) plus roadworks/infrastructure and Stage 2 Lot 2 building works.

As shown in Figure 8 above, the majority of the stormwater drainage infrastructure will be constructed in Stage 1. The existing rear dam which is located within the existing low point in Lot 2 will be able to remain (with modification) during the construction works of Stage 1 and act as a temporary sediment basin and then be extended to a 6500m2 evaporation basin after the completion of Stage 1 works. The evaporation basin is proposed to receive diverted flows from the southern trunk drainage channel, to reduce overall runoff volumes from the site through evapotranspiration.

We have designed the on-site detention and water quality treatment of the development to be completed separately in Stages or to be completed together in one complete project. This means the net flow rates in the proposed staged construction will be compliant and less than the existing Greenfields flow rates. The water quality removal rates are in compliant with Penrith City Council and Mamre Precinct development controls in regard to staging with the inclusion of the rear basin in Lot 2.

While the Sydney Water regional scheme is not operational, or otherwise agreed with DPIE and Sydney Water, only stage 1 can be constructed to achieve the interim targets of the Waterway Health objectives. If the regional scheme is then subsequently completed, stage 2 can be constructed and the evaporation/sediment pond may be decommissioned.

As is shown in the Flood Impact Assessment *REP004-01-21-860-20-776 FIRA (AT&L 2023*), including the fully developed Westgate development providing the proposed OSD basins and 20m width naturalised trunk drainage channels, there are no significant negative flood impacts to the upstream and downstream areas of the development.

7.1. Water Management Strategy Objectives

The main objectives pertaining to the management of stormwater within the proposed development site are outlined in Section 2.4 of the Mamre Road Precinct DCP. Controls relating to stormwater quantity management and the requirement to attenuate peak flow rates are outlined in Section 2.5 of the DCP.

Specific controls relating to water management, as well as a response to these controls, are summarised below in **Table 4**.

Table 4: Response to DCP controls relating to water management

DCP Controls	Response
Waterway health and Water Sensitive Urban Design	
1) Development applications must demonstrate compliance with the stormwater quality targets in Table 4 (DCP) and the stormwater flow targets during construction and operation phases in Table 5 (DCP) and Table 6 (DCP) at the lot or estate scale to ensure the NSW Government's waterway objectives (flow and water quality) for the Wianamatta-South Creek catchment are achieved (see Appendix D). Where the strategy for waterway management is assessed at an estate level, the approval should include for individual buildings within the estate, which may be the subject of future applications.	Performance of the proposed water management strategy against the stormwater quality targets is presented in **Table 11.** Performance against the construction phase stormwater flow targets is presented in **Section 5**. Performance of the proposed water management strategy against the operational stormwater flow targets is presented in **Table 13.**
2) The stormwater flow targets during operation phase (Table 5) include criteria for a mean annual runoff volume (MARV) flow-related option and a flow duration-related option. Applicants must demonstrate compliance with either option.	Performance of the proposed water management strategy against the operational stormwater flow targets is presented in **Table 13.**
3) Development applications must include a Water Management Strategy (WMS) detailing the proposed Water Sensitive Urban Design (WSUD) approach, how the WMS complies with stormwater targets (i.e., MUSIC modelling), and how these measures will be implemented, including ongoing management and maintenance responsibilities. Conceptual designs of the stormwater drainage and WSUD system must be provided to illustrate the functional layout and levels of the WSUD systems to ensure the operation has been considered in site levels and layout.	The Water Management Strategy for the site is outlined in **Section 7.2**, and includes the approach to WSUD for the site, performance of the proposed stormwater management measures against the DCP targets, and description of delivery, ongoing management and maintenance of each proposed measure. Design drawings showing the layout and levels of the proposed stormwater management elements are included in the AT&L civil package.
4) The design and mix of WSUD infrastructure shall consider ongoing operation and maintenance. Development applications must include a detailed lifecycle cost assessment (including capital, operation/maintenance, and renewal costs over 30 years) and Maintenance Plan for WSUD measures.	Ongoing management and maintenance considerations are addressed in **Section 7.11**. All costs associated with the delivery, operation and maintenance of the estate-based water management measures will be borne by the proponent.
5) WSUD infrastructure may be adopted at a range of scales (i.e., allotment, street, estate, or sub-precinct scale) to treat stormwater, integrate with the landscape and maximise evaporative losses to reduce development flow runoff. Vegetated WSUD measures, naturalised trunk drainage and rainwater/stormwater reuse are preferred.	A summary of the proposed WSUD infrastructure adopted in the water management strategy is presented in **Table 5**.

DCP Controls	Response
Acceptable WSUD measures to retain stormwater within the development footprint and subdivision are shown in Table 7 (DCP).	
6) Development must not adversely impact soil salinity or sodic soils and shall balance the needs of groundwater dependent ecosystems.	Refer to Geotechnical Investigation Report for details of soil salinity, sodicity and groundwater.
7) Infiltration of collected stormwater is generally not supported due to anticipated soil conditions in the catchment. All WSUD systems must incorporate an impervious liner unless a detailed Salinity and Sodicity Assessment demonstrates infiltration of stormwater will not adversely impact the water table and soil salinity (or other soil conditions).	The proposed water management strategy does not incorporate infiltration of collected stormwater.
8) Where development is not serviced by a recycled water scheme, at least 80% of its non-potable demand is to be supplied through allotment rainwater tanks.	Refer to **Section 7.6.1** for details of proposed rainwater tanks to meet at least 80% of non-potable water demand of each lot.
9) Where a recycled water scheme (supplied by stormwater harvesting and/or recycled wastewater) is in place, development shall: ▪ ***Be designed in a manner that does not compromise waterway objectives, with stormwater harvesting prioritised over reticulated recycled water;*** ▪ ***Bring a purple pipe for recycled water to the boundary of the site, as required under Clause 33G of the WSEA SEPP. Not top up rainwater tanks with recycled water unless approved by Sydney Water; and*** ▪ ***Design recycled water reticulation to standards required by the operator of the recycled water scheme.***	Stormwater harvesting in the form of rainwater tanks on proposed lots 1A-1C will form one of the components of the Interim Arrangement, and its supply to non-potable uses within the development will be prioritised over reticulated recycled water. It is envisaged that reticulated recycled water would supply the shortfall in supply from the rainwater tank and would not top up rainwater tanks unless approved by Sydney Water.
Trunk Drainage Infrastructure	
10) Indicative naturalised trunk drainage paths are shown in Figure 4 (DCP)	Reproduced in this report for context as **Figure 8**.
11) Naturalised trunk drainage paths are to be provided when the: ▪ ***Contributing catchment exceeds 15ha; or*** ▪ ***1% AEP overland flows cannot be safely conveyed overland as described in Australian Rainfall and Runoff – 2019;***	Details of the proposed trunk drainage infrastructure are included in **Section 0**. Further detailed modelling will be conducted during the detailed design stage.
12) The design and rehabilitation of naturalised trunk drainage paths is to be generally in accordance with NRAR requirements (refer to Section 2.3) that replicates natural Western Sydney streams. An example of a naturalised trunk drainage path is shown in Figure 3.	Details of the proposed trunk drainage infrastructure, including a typical section, are included in **Section 0**. Further details are provided in the Landscape Design package prepared by habit8.

DCP Controls	Response
13) Naturalised trunk drainage paths shall be designed to: ■ ***Contain the 50% AEP flows from the critical duration event in a low flow natural invert;*** ■ ***Convey 1% AEP flows from the critical duration event with a minimum 0.5m freeboard to applicable finished floor levels and road/driveway crossings; and*** ■ ***Provide safe conveyance of flows up to the 1% AEP flood event.***	A typical section showing indicative dimensions of the low flow (50% AEP), minor flow (5% AEP) and major flow (1% AEP) is presented in **Section 0**.
14) Where naturalised trunk drainage paths traverse development sites, they may be realigned to suit the development footprint, provided that they: ■ ***Comply with the performance requirements for flow conveyance and freeboard;*** ■ ***Are designed to integrate with the formed landscape and permit safe and effective access for maintenance;*** ■ ***Do not have adverse flood impacts on neighbouring properties; and*** ■ ***Enter and leave the development site at the existing points of flow entry and exit.***	The proposed naturalised trunk drainage channel follows an alignment that will: ■ Discharge across the western boundary at the lowest point along the boundary. ■ Will be aligned to suit the proposed development layout. ■ Has been designed to contain the 1% AEP peak flow with sufficient freeboard to finished floor levels, such that the flood prone land development controls will be satisfied. ■ Incorporate suitable points of access for maintenance.
15) Trunk drainage paths shall remain in private ownership with maintenance covenants placed over them to the satisfaction of Council (standard wording for positive covenants is available from Council). Easements will also be required to benefit upstream land.	The proposed trunk drainage channel will be incorporated into one or more of the proposed lots within the estate. Refer to the Plan of Subdivision for further details.
16) Where pipes/ culverts are implemented in lieu of naturalised trunk drainage paths, they must remain on private land and not burden public roads, unless otherwise accepted by Council.	Aside from culverts as required under proposed roads and vehicle crossovers, there are no pipes or culverts provided in lieu of open trunk drainage channels.
17) High vertical walls and steep batters shall be avoided. Batters shall be vegetated with a maximum batter slope 1V:4H. Where unavoidable, retaining walls shall not exceed 2.0m in cumulative height.	Based on the proposed site grading and drainage strategy, retaining walls will be required adjacent to the proposed trunk drainage channel to transition between the proposed lot levels and the drainage channel. The nature and extent of these walls will be subject to further design development and coordination with the project landscape designer and ecologist and will consider design issues such as maintenance access and overshadowing of the channel.
18) Raingardens and other temporary water storage facilities may be installed online in naturalised trunk drainage paths to promote runoff volume reductions.	A temporary evaporation basin in the position of the western side of Lot 2 shall be installed to also reduce runoff volumes. This basin has been sized to achieve stormwater quantity targets.
19) Subdivision and development are to consider the coordinated staging and delivery of naturalised trunk	The proposed trunk drainage channel will be staged and delivered commensurate with the

DCP Controls	Response
drainage infrastructure. Development consent will only be granted to land serviced by trunk drainage infrastructure where suitable arrangements are in place for the delivery of trunk infrastructure (to the satisfaction of the relevant Water Management Authority).	staging of earthworks and infrastructure across the estate. The trunk drainage channel will form a critical component of the site water management strategy throughout construction and will be incorporated into the Erosion and Sediment Control Plan and Construction Environmental Management Plan. The final form of the trunk drainage channel, including landscaping and any repair or remediation that may be required as a result of construction phase activities, will be undertaken at a suitable stage of development of the estate – nominally at completion of 80% of the development of the estate, and subject to further consultation with the Waterway Manager.
20) Stormwater drainage infrastructure, upstream of the trunk drainage, is to be constructed by the developer of the land considered for approval.	All stormwater drainage upstream of the proposed trunk drainage channel will be designed and delivered by the proponent, with the exception of upstream external catchments.
21) All land identified by the Water Management Authority as performing a significant drainage function and where not specifically identified in the Contributions Plan, is to be covered by an appropriate "restriction to user" and created free of cost to the Water Management Authority.	Noted – subject to further consultation with the Waterway Manager.
22) All proposed development submissions must clearly demonstrate via 2-dimensional flood modelling that: ***1) Overland flow paths are preserved and accommodated through the site;*** ***2) Runoff from upstream properties (post development flows) are accommodated in the trunk drainage system design;*** ***3) Any proposed change in site levels or drainage works are not to adversely impact and upstream or downstream, or cause a restriction to flows from upstream properties;*** ***4) There is no concentration of flows onto an adjoining property; and*** ***5) No flows have been diverted from their natural catchment to another.***	refer to the Flood Impact Risk Assessment report by AT&L
Overland Flow Flooding	
23) Development should not obstruct overland flow paths. Development is required to demonstrate that any overland flow is maintained for the 1% AEP overland flow with consideration for failsafe of flows up to the PMF.	The proposed major and minor system drainage has been designed such that development within the estate will not obstruct any overland flow paths. Suitable allowance for overland flow has been made within the design of the major and minor system. Refer to the Flood Assessment report prepared by AT&L for further details of allowance for overland flow within the estate for events up to the PMF.

DCP Controls	Response
24) Where existing natural streams do not exist, naturalised drainage channels are encouraged to ensure overland flows are safely conveyed via vegetated trunk drainage channels with 1% AEP capacity plus 0.5m freeboard. Any increase in peak flow must be offset using on-site stormwater detention (OSD) basins.	Refer to **Section 0** for details of the proposed trunk drainage infrastructure. Refer to **Section 7.8** for details of the proposed detention tanks that will attenuate peak flows within the estate prior to discharge across the estate boundary.
25) OSD is to be accommodated on-lot, within the development site, or at the subdivision or estate level, unless otherwise provided at the catchment level to the satisfaction of the relevant consent authority.	The locations of the proposed detention basins within the estate are presented on the overall Interim and Ultimate Arrangement Stormwater Management Plans (drawings 21-860-C160).
26) Stormwater basins are to be located above the 1% AEP.	The site is not subject to mainstream flooding, and therefore the proposed detention tanks will be located outside the extent of 1% AEP mainstream flooding.
27) Post-development flow rates from development sites are to be the same or less than pre-development flow rates for the 50% to 1% AEP events.	The performance of the proposed detention basins against the stormwater quantity targets in the Mamre Road Precinct DCP is summarised in **Section 7.1**
15) OSD must be sized to ensure no increase in 50% and 1% AEP peak storm flows at the Precinct boundary or at Mamre Road culverts. OSD design shall compensate for any local roads and/or areas within the development site that does not drain to OSD.	As demonstrated in **Table 14**, the proposed detention basins have been sized to ensure no increase in peak flows at the discharge point from the site.

The main objectives pertaining to the management of stormwater within the proposed development site are as follows:

- **Stormwater Quantity Management:**
  - To ensure post-development peak flow rates do not exceed the pre-development peak flow rates for a range of design storm frequencies and durations, up to and including the 1% AEP design event.
  - To demonstrate how the proposed site design and WSUD measures contribute to the interim NSW Government stormwater catchment flow objectives for the Wianamatta-South Creek catchment, such that the combined effect of site design and site WSUD measures (including on-lot, on street and end of pipe measures) shall contribute no more than 1.9 ML/ha/year in mean annual runoff at any discharge point.
- **Stormwater Quality Management:**
  - To provide a stormwater treatment train to satisfy pollutant reduction targets outlined in the Mamre Road Precinct DCP (NB: pollutant load reduction targets in the Draft DCP are significantly higher than those adopted in Penrith City Council's WSUD Technical Guidelines).
- **Stormwater Drainage and Flooding:**
  - To provide a stormwater drainage system that complies with Penrith City Council design guidelines and specifications.
  - Finished Floor Levels (FFL) of proposed buildings within the precinct shall have a minimum 500mm freeboard to 1% AEP overland flows.
- **Stormwater harvesting and reuse:**
  - To install rainwater tanks to meet 80% of non-potable demand including outdoor use, toilets, and laundry (refer to Section 10 of this report for a more detailed description on rainwater harvesting tanks).

The objective to control mean annual runoff volume (MARV) from the site to no more than 2 ML/ha/year will require measures to capture, store and reuse stormwater runoff in excess of those typically required to satisfy development controls contained in the Mamre Rd DCP. Such measures, as outlined in the *Mamre Road Flood, Riparian Corridor and Integrated Water Cycle Management Strategy* (Sydney Water, October 2020), could include:

- Rainwater reuse
- Street tree pits
- Permeable pavements
- Estate-wide irrigation
- Estate-based evaporation ponds
- Wetlands
- Evaporative roof misting

7.2. Water Management Strategy Overview

Since the release of the Mamre Road Precinct DCP in November 2021, AT&L has been working with several landowners in the Mamre Road Precinct, Government, other Industry Bodies, and experts in water management to resolve practical solutions that will address the stormwater flow targets that have been proposed in the finalised DCP

The *Mamre Road Flood, Riparian Corridor and Integrated Water Cycle Management Report* (FRCIWCM) (Sydney Water, 2021) addresses links between waterway health, hydrology and water quality targets, and recommended a stormwater runoff objective of 1.9 megalitres per hectare per year (ML/ha/yr) measured at any legal discharge point or estate boundary (since revised to 2 ML/ha/yr in the final DCP).

In the FRCIWCM, Sydney Water also discussed the potential for regional facilities to be implemented to satisfy the stormwater flow objectives for the Mamre Road Precinct. The FRCIWCM report states:

> *"It is noted that the most cost-effective way to achieve stormwater volume load reductions is via open water bodies and these have a maintenance implication for developers and a wildlife risk.*
>
> *Through master planning of the Wianamatta South Creek precinct, it will be possible to integrate regional wetlands and water bodies and offset the need for wetlands and open water to be distributed through the Precinct on private lands.*
>
> *This centralised management of water is preferable as it provides a more appropriate scale of WSUD assets for more cost-effective maintenance and management outcomes."*

In March 2021, in response to the Draft DCP and the Draft FRCIWCM, AT&L prepared a detailed report in response to the stormwater flow objectives and controls in the Draft DCP, which concluded that if stormwater flow targets were to be adopted, Government would need to consider a Precinct or Regional approach to managing stormwater.

The current Sydney Water Scheme plan shows that there will be wetlands and evaporation/reuse basins provided downstream of the development at Kemps Creek. These assets will provide full compliance for upstream developments to stormwater quality and flow duration requirements when they are constructed. However, these assets are estimated to be delivered after a portion of development in the Mamre Rd Precinct, which means that developments before this will require to meet targets internally. Whilst it is understood the proposed regional stormwater management scheme is at a very early stage of planning and design, this Water Management Strategy has been prepared on the basis that the regional stormwater management scheme will eventuate, albeit the timing of its delivery is uncertain at this stage.

The Water Management Strategy has been developed for two scenarios:

a) An Interim Arrangement (refer to drawing 21-860-C250), for which approval is being sought under SSD-17552047. This Arrangement is intended to be implemented to satisfy stormwater quality, quantity and flow controls in the absence of regional stormwater management interventions with the inclusion of the 6500m^2 evaporation/sediment pond.

b) An Ultimate Arrangement (refer to drawing 21-860-C251), which incorporates measures to address stormwater attenuation controls within the Estate. This Arrangement has been developed on the basis that a regional stormwater management scheme is in place to satisfy the stormwater quality and flow controls for the Mamre Road Precinct. This Arrangement is proposed to supersede the Interim Arrangement, without modification to any development approval in place, once regional stormwater management measures that will service the site have been delivered. If the regional scheme is in place, or otherwise by agreement with Sydney Water and DPIE, it may be built with the original works, removing the need for the evaporation pond to ever be constructed.

A summary of the proposed stormwater management measures that would be required to satisfy stormwater quality, quantity and flow controls under both the Interim and Ultimate Arrangements is presented in **Table 5**.

Table 5: Proposed water management measures under the Interim and Ultimate Arrangements

	Interim Arrangement		**Ultimate Arrangement**	
Rainwater tanks for non-potable reuse (refer to **Section 7.6.1** for further details)	✓	for Lot 1A, 1B/1C only, to comply with the following DCP control: *Where development is not serviced by a recycled water scheme, at least 80% of its non-potable demand is to be supplied through allotment rainwater tanks.*	✓	The current understanding with Sydney Water is that these rainwater tanks would be decommissioned and be superseded by the functioning recycled water mains. Bypass drainage should be provided for this eventuality.
Gross pollutant traps (GPTs) (refer to **Section 0** for further details)	✓	GPTs to be installed before discharge from the allotments to the road drainage. Non-SQIDEP GPTs may only treat gross pollutants. OceanGuard® (or equivalent) stormwater pit inserts required as there is no downstream GPT present.	✓	GPTs to be installed before discharge from the allotments to the road drainage. Non-SQIDEP GPTs may only treat gross pollutants. OceanGuard® (or equivalent) stormwater pit inserts required as there is no downstream GPT present.
On-Site Stormwater Detention (refer to **Section 7.6.4** for further details)	✓	Required to satisfy stormwater attenuation requirements.	✓	Required to satisfy stormwater quantity controls.
Evaporation pond (refer to **Section 7.6.5** for further details)	✓	Required to satisfy stormwater flow duration curve controls. Irrigation to be supplied onto residual lot 2 from the pond.	×	Will not be required on the basis that stormwater flow controls will be incorporated into the regional stormwater management scheme. Pond to be decommissioned before Lot 2 is constructed.
Sediment basins (refer to **Section 0** for further details)	✓	Sediment basins required to satisfy construction phase stormwater quality requirements only, refer to **Section 5** for further details.	✓	Sediment basins required to satisfy construction phase stormwater quality requirements only, refer to **Section 5** for further details.

7.3. Hydrological and Hydraulic Modelling

DRAINS modelling software has been used to calculate the Hydraulic Grade Line (HGL) of the proposed estate-wide stormwater network, including pits, pipes, overland flow paths and detention basins. DRAINS is a computer program used for designing and analysing urban stormwater drainage systems and catchments. It is widely accepted by Council's across NSW as the basis for stormwater design and has been confirmed by Penrith City Council as the preferred stormwater software analysis package.

A summary of the key hydrological and hydraulic design parameters adopted in DRAINS to develop a major and minor system drainage design for the proposed development are as follows:

- Minor system (pit and pipe) drainage has been designed to accommodate the 5% AEP storm event.
- The combined pit and pipe drainage and overland flow paths have been designed to accommodate the 1% AEP storm event.
- Where trapped low points are unavoidable and potential for flooding private property is a concern, an overland flowpath capable of carrying the total 1% AEP storm event has been provided. Alternatively, the pipe and inlet system has been upgraded to accommodate the 1% AEP storm event.
- Rainfall intensities have been adopted using the Bureau of Meteorology Design Rainfall Data System (2016).
- Times of concentration for each sub catchment have been determined in line with council guidelines
- The width of flow in the gutter does not exceed 2.5 metres and pits are spaced no further than 75 metres apart.
- Velocity x depth product shall not exceed 0.4 m^2/s for all storms up to and including the 1% AEP event.
- Minor storm bypass from any pit on grade shall not exceed 15% of the total flow at the pit; and
- Blockage factors of 20% and 50% shall be adopted for on-grade and sag pits respectively.
- A hydraulic grade line HGL design method shall be adopted for all road pipe drainage design.
- Pipelines in roadways shall have a minimum diameter of 375mm.
- A desirable minimum grade of 1% for all pipelines is preferred for self-cleansing under low flow velocities. An absolute minimum grade of 0.5% has been adopted.
- The minimum cover over pipes shall be 450mm in grassed areas and 600mm within carriageways.
- Where minimum cover cannot be achieved due to physical constraints the pipe class shall be suitably increased.
- All pipes in trafficable areas will be Reinforced Concrete Pipes (RCP) or Fibre Reinforced Cement (FRC) equivalent.
- Pipes discharging to an overland flow path shall adopt a minimum tailwater level equivalent to respective overland flow level.
- Pit Loss coefficients have been calculated in accordance with the Hare Charts as documented in the Queensland Urban Drainage Manual.
- A minimum 150mm freeboard has been maintained between pit HGL and pit surface levels for the minor design storm event (5% AEP).
- Overland flowpaths maintain a minimum of 300mm freeboard to all habitable floor levels.

7.4. Stormwater Quality Modelling

The Model for Urban Stormwater Improvement Conceptualisation (MUSICX, Version 1.10.0.12491) was used to estimate pollutant loads from the estate based on proposed site development. The model has been developed using the *MUSIC* parameters from the *MUSIC Modelling Toolkit – Wianamatta* (DPE, 2022).

This includes pluviometer data (six-minute rainfall intensity) for Penrith Lakes AWS (Station 67113), and evapotranspiration rates as per table 6 of the Modelling Toolkit. Other parameters that need to be nominated in the MUSIC model (soil characteristics, pollutant event mean concentrations (EMCs)) are consistent with those outlined in the MUSIC Modelling Toolkit – Wianamatta (DPE, 2022) and the Penrith City Council *WSUD Technical Guidelines* (October 2020).

MUSIC model input parameters including rainfall-runoff, base flow concentration and stormflow concentration parameters for various catchment types were adopted as per the guidelines listed above.

Rainfall-runoff parameters

The rainfall-runoff parameters adopted in the MUSIC model are consistent with the parameters adopted in *MUSIC Modelling Toolkit – Wianamatta*, refer to **Table 6**.

Table 6: Rainfall-runoff parameters adopted in MUSIC

Parameter	Unit	Value
Impervious area parameters		
Rainfall Threshold	mm/day	1.0
Pervious area parameter		
Soil Storage Capacity	mm	150
Initial Storage	% of Capacity	30
Field Capacity	mm	130
Infiltration Capacity Coefficient α	-	175
Infiltration Capacity Coefficient β	-	2.5
Groundwater properties		
Initial Depth (groundwater)	mm	10
Daily Recharge Rate	%	25
Daily Baseflow Rate	%	1.4
Daily Seepage Rate	%	0.0

Source nodes and pollutant generation

Pollutant events mean concentrations (EMCs) for base flow and storm flow scenarios have been adopted from Penrith City Council *WSUD Technical Guidelines* (October 2020), consistent with the *MUSIC Modelling Toolkit - Wianamatta*. The EMC values are applied to source nodes in the MUSIC model to estimate annual pollutant loads exported from the site under the proposed ultimate development scenario. The adopted pollutant EMCs for various catchment types are summarised in **Table 7**.

Table 7: Stormwater quality parameters for MUSIC source nodes

Landuse category		log10 TSS (mg/l)		log10 TP (mg/l)		log10 TN (mg/l)	
		Base flow	Storm flow	Base flow	Storm flow	Base flow	Storm flow
Roof areas	Mean	1.20	1.30	-0.85	-0.89	0.11	0.30
	Std dev	0.17	0.32	0.19	0.25	0.12	0.19
Road areas	Mean	1.20	2.43	-0.85	-0.30	0.11	0.34
	Std dev	0.17	0.32	0.19	0.25	0.12	0.19
Pervious areas	Mean	1.20	2.15	-0.85	-0.60	0.11	0.30
	Std dev	0.17	0.32	0.19	0.25	0.12	0.19

7.5. Water Quality Objectives

These stormwater management objectives will be applied to treating stormwater runoff from the development to meet pollution reduction targets outlined in **Table 8**.

Table 8: Stormwater pollutant target reductions

Pollutants	Penrith DCP Target Reduction	Option 1 Mamre Road Precinct (NSW DPIE) Target Reduction	Option 2 Targets Allowable mean annal load from development
Total Suspended Solids (TSS)	85%	90%	80kg/ha/y
Total Phosphorus (TP)	60%	80%	0.3kg/ha/y
Total Nitrogen (TN)	45%	65%	3.5kg/ha/y
Gross Pollutants	90%	90%	16kg/ha/y

7.6. Proposed Stormwater Management Measures

A series of stormwater quantity and quality control measures are proposed to be adopted within the site to satisfy the stormwater management strategy objectives listed in **Section 7.1**. A general description of the proposed stormwater treatment train components is presented in the following sections.

7.6.1. Rainwater Tanks

Rainwater tanks retain a significant proportion of stormwater that falls on roof areas. Given the large-scale industrial development proposed on the site, rainwater tanks can provide a significant contribution to the objective of minimising the total volume of runoff discharging from the site.

Typically, the rainwater tank would be external to the buildings, either an above ground tank or an underground tank under the pavement. The tank would generally provide reuse in the form of toilet/urinal flushing, as well as landscape irrigation.

Considering rainwater tanks are likely to be fitted with first flush devices, it is likely that they would have minimal water quality benefit. They would be required to satisfy the Mamre Rd DCP requirement to meet at least 80% of non-potable demand when not connected to the regional scheme. If the regional scheme is operational, lots will not be required to provide rainwater tanks, instead being serviced by the recycled water mains in the roads. Rainwater tanks are understood to be required to be decommissioned when the regional scheme becomes operational.

The MUSIC model was developed to estimate the rainwater tank volume required to satisfy the Mamre Rd DCP requirement. To determine the tank volume required to meet at least 80% of non-potable demand on individual lots, the following assumptions have been made based on the *Technical Guidance for achieving stormwater management targets* (DPE, 2022):

- Non-potable demand of 15L/persons/day has been adopted for an estimate of toilet reuse, as per the technical guidance for achieving stormwater management targets. Estimates of equivalent persons have been taken as 25 persons/ha for the gross area of each allotment.
- Non-potable demand of 3ML/ha/year has been adopted for irrigation of landscape areas on each lot. This is based on the allowance of 600mm/y over 50% of landscaped areas. Residual land may be irrigated at the full 600mm/y over 100% of reasonably flat areas (only present for the evaporation pond in this case).
- 50% of the total warehouse roof area would drain to the rainwater tank. Detailed design of the allotments may vary the size vs roof area with further MUSIC modelling.
- Reuse demands are defined with a monthly pattern which is (Jan–Dec): 13%, 6%, 6%, 4%, 2%, 0%, 4%, 7%, 12%, 14%, 13%, 19%

A summary of the rainwater tank volumes adopted in MUSIC is presented below in **Table 9**. Lot 2 provides theoretical reuse values for connection with the regional scheme.

Table 9: Rainwater tank volumes and reuse

Lot Area	Total Area (ha)	Roof area to rainwater tank (ha)	Non-potable demand in toilets (kL/day)	Non-potable irrigation demand (ML/year)	Adopted rainwater tank volume (kL)	% of reuse demand met
1A	1.711	0.435	0.77	1.54	220	80.6
1B/1C	3.114	0.877	1.4	2.80	350	82.6
2	2.840	N/A	1.71	1.10	N/A	N/A

7.6.2. Gross Pollutant Traps

The proposed stormwater treatment train would consist of gross pollutant traps (GPTs) as a means of primary stormwater treatment. GPTs are designed to capture litter, debris, coarse sediment, as well as some oils and greases. However, Sydney Water are unwilling to accept TSS, TP or TN treatment from GPTs unless there is a SQIDEP approval for the model proposed. There are currently no SQIDEP approved GPTs available, so any provided in this submission are only provided for gross pollutant removal.

Proprietary GPTs are proposed to be placed on each lot upstream of OSD tanks. Enviropod pit baskets are proposed in road pits as there is no further GPT provided before discharge into the naturalised trunk drain.

A high-flow bypass for the on-lot GPTs would be provided as 2EY flows, requiring bi-yearly maintenance. Design flows for the GPTs are to be confirmed in the detailed design of the development. With the current design, indicative GPT models are selected below:

- **Lot 1A GPT** – Minimum treatable flow 210L/s, Atlan SVO.220 or equivalent
- **Lot 1B,1C GPT** – Minimum treatable flow 310L/s, Atlan SVO.360 or equivalent
- **Lot 2 GPT** – Minimum treatable flow 290L/s, Atlan SVO.360 or equivalent

7.6.3. Filter Systems (HumeFilter)

The Humefilter Universal Pollutant Trap is a SQIDEP approved tertiary treatment device provided to reduce the TSS, TN and TP with high efficiency. The UPT is provided as an off-line system with a high flow bypass for flows above treatable flows.

Lot 1B and 1C are proposed to be treated by a single HumeFilter UPT (UPT1200) between the GPT and the OSD tank for those lots. Lot 1A does not require a HumeFilter to satisfy the full site treatment requirements. Lot 2 does not require treatment under the assumption that the regional scheme will be present when it is constructed.

7.6.4. On-Site Stormwater Detention

As discussed in **Section 3.4**, the site in its existing condition is broadly divided into three internal catchments incorporating the warehouse lots plus the internal road network, with external catchments draining through the site via the northern and eastern boundaries of the site.

The stormwater for each lot is proposed to be collected via pits and pipes and connect into one of three OSD tanks. Road catchments bypass directly into the trunk drainage reserve.

- **OSD Tank A** – Lot 1A, within the internal northern Hardstand/Loading Dock area to the north of the proposed warehouse
- **OSD Tank B** – Lot 1B/1C, within the internal northern Hardstand/Loading Dock area to the north west of the proposed warehouses
- **OSD Tank C** – Lot 2, within the internal southern fire access road the south of the proposed warehouse

Internal roads will be directed to a pit and pipe system towards the south-western channel outlet of the site

Surface water discharging from existing catchments (if un-developed) is proposed to be picked up with catch drains and diverted directly into the trunk drainage channels. The southern existing catchment will sheet flow into the road in larger storm events. None of these catchments will be directed into the OSD tanks. Limited attenuation may occur in the interim case where flows are directed into the evaporation basin.

For the post-development scenario, it is proposed to maintain the existing points of discharge as close as possible and to design a solution where post-development peak flow rates are no greater than pre-development peak flow rates at each discharge point. Controlled outlets from the OSD tanks will include low and high flow orifices where necessary. Refer to Drawing 21-860-C160 for the OSD basin details.

7.6.5. Evaporation Ponds

Ponds are considered to provide an effective means of reducing runoff volume from the site as water would be lost via evaporation over a large area. A pond can be relatively cheap to construct with the potential to capture large quantities of stormwater runoff, while also being relatively easy to maintain.

Large-scale MUSIC modelling undertaken by AT&L indicates that, in combination with other measures, ponds can achieve a relatively high reduction of stormwater runoff volume.

The pond proposed for this site intakes flows diverted from the trunk drainage channel towards the downstream end of the site. All of the site flow with the exception of a small bypassing catchment from the trunk channel will pass through this basin, as well as external flows into the site. While there may be some treatment benefit for the external flows present, this has not been included in our MUSIC model. Excess flows will weir overflow into the trunk drainage channel.

This Stormwater Management Strategy, which addresses the stormwater flow targets adopted in the Mamre Road Precinct DCP, incorporates an evaporation pond under the Interim Arrangement on future Lot 2. Key parameters adopted for the pond are summarised below in **Table 10**. This pond would only be required as an interim measure, until the regional stormwater management scheme is in place, when it can be decommissioned in order for lot 2 to be constructed.

Evaporation ponds follow the same assumptions for reuse values and rates as **Section 7.6.1** where relevant.

Table 10: Adopted estate-wide evaporation pond parameters

Parameter	Lot 2 Interim Evaporation Pond
Inflow from:	Lots 1A, 1B, 1C, Lot2 Road 1 Road 2 All External Catchments
Outflow to:	Discharge point adjacent to western site boundary via trunk drain
Surface Area (m^2)	6500
Permanent pool volume (m^3)	5850
Exfiltration rate (mm/hr)	0 (Lined)
Evaporative loss (% of PET)	100
Outlet (equivalent pipe diameter)	450
Irrigation capacity (Lot 2 irrigation available excluding basin area)	13,000 KL/y
Modelled irrigation	5500KL/y

From the table above, the evaporation pond is not required to be maximised to achieve our targets. This leaves flexibility of placement of the irrigation areas within lot 2 subject to the irrigation design in the detailed design.

7.6.6. Erosion and Sediment Control Basins

Sediment basins have been provided during the construction phase of each allotment to satisfy construction phase stormwater quality targets. Bulk surfaces should be directed into these sediment basins. These have been excluded from the modelling as they are not present during the operational phase of the development.

For more detailed information, see **Section 105**.

7.7. Scenario Modelling

A MUSIC model was created to simulate the post-development scenario. The post-development model has been created based upon the proposed post-development catchment extents presented in **Figure 6**. Source nodes for each of the proposed lots have been adopted based on typical large-scale industrial land uses. The layout of the post-development scenario is presented in **Figure 11**.

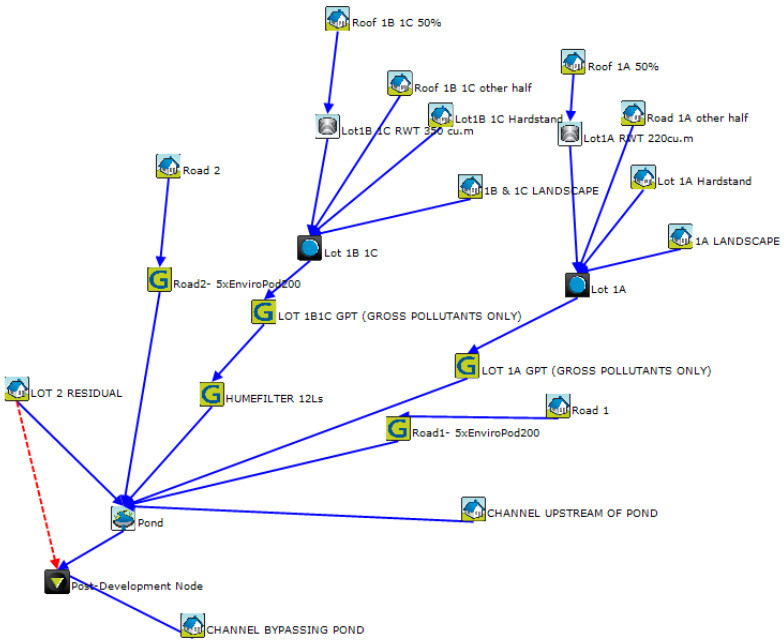

Figure 11: Stage 1 Post-development MUSIC model layout

The post-development (Interim Arrangement/ Stage 1) model has been created based upon the proposed post-development catchment extents presented in **Figure 6**. Source nodes for each of the proposed lots have been adopted based on the Technical Guidelines for Achieving Wianamatta South Creek Stormwater Management Targets (DPE, 2022). The layout of the post-development scenario in MUSIC is presented in **Figure 10** above.

Table 11: Post-development scenario land use breakdown

Catchment	Total Area (ha)	Roof area – warehouses and offices (ha)	Hardstand/road area (ha)	Landscape area (ha)
Lot 1A	1.711	0.870	0.585	0.257
Lot 1B/1C	3.114	1.754	0.893	0.467
Lot 2	2.840	0	0	2.84
Roads (Total)	0.89	0	0.712	0.134
Channels (Total)	1.492	0	0.298	1.194

The post-development scenario model incorporates the following stormwater management measures:

- Rainwater tanks, as per the parameters presented in **Table 9**.
- GPTs, as per the parameters described in **Section 7.6.2**.
- Filtration systems
- OSD tanks, as per the parameters described in **Section 7.6.4**
- Evaporation pond on proposed lot 10, as per the parameters presented in **Table 10**.

The attributes for each of the proposed stormwater management measures have been determined such that they will satisfy the pollutant reduction targets and waterway health targets as outlined in **Section 7.1**.

7.8. Performance against stormwater quality targets

MUSIC modelling results presented as mean annual loads at the receiving node indicate that the adopted target reductions are achieved, as shown in **Table 12**. Bold means target satisfied, red means not satisfied.

Table 12: Summary of MUSIC modelling results

Parameter	Source Load	Residual Load	Reduction (%)	Target Reduction (%)	Target allowable mean annual load from development
Flow (ML/yr)	32.96	14.98	54.6	Refer to Section 7.9	N/A
TSS (kg/yr)	5727	720	87.4	90	**90**
TP (kg/yr)	11.31	2.17	80.8	**80**	**90**
TN (kg/yr)	74.93	21.47	71.3	**65**	**90**
Gross Pollutants (kg/yr)	947.2	26.12	97.2	**90**	**162**

The MUSIC model results shows that for the Stage 1 interim targets, the "allowable mean annual load from development" target is met, despite the DCP % target reduction not being met. Under stage 1 developed conditions, the mean annual load target is more achievable due to the relatively clean runoff from the residual lot 2 area and naturalised trunk drainage.

Under the Ultimate Arrangement, stormwater quality management measures would be incorporated into the regional stormwater management scheme to be designed and delivered by the Waterway Manager (Sydney Water). Lot 2 will be able to be constructed with no further internal stormwater treatment. The evaporation pond and HumeFilter may be decommissioned once the regional scheme is operational.

7.9. Performance against stormwater flow targets

MUSIC model results demonstrating performance of the proposed stormwater management measures in the Interim Arrangement against the stormwater flow targets are presented below in **Table 13**. The resultant flow duration curve is presented as **Figure 12**.

Table 13: Summary of MUSIC model results against stormwater flow targets under the Interim Arrangement

Parameter	Result	DCP Target	Complies with DCP target	
			Option 1	Option 2
Mean annual runoff volume (ML/ha/yr)	1.48	2.0	✓	n/a
95%ile flow (L/ha/day)	8,292	3000 to 15000	n/a	✓
90%ile flow (L/ha/day)	2,663	1000 to 5000	✓	✓
75%ile flow (L/ha/day)	293	100 to 1000	n/a	✓
50%ile flow (L/ha/day)	27	5 to 100	✓	✓
10%ile flow (L/ha/day)	0.0	0	✓	n/a
Cease to flow	22%	10% to 30%	n/a	✓

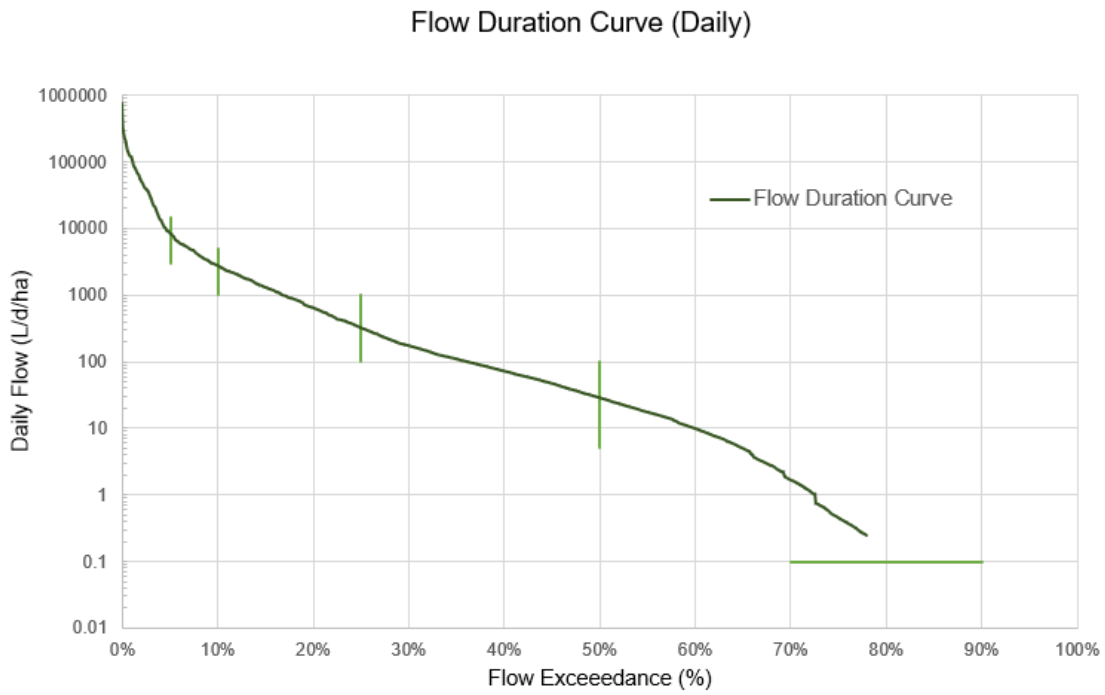

Figure 12: Flow duration curve for the proposed stormwater management measures

The results presented in **Table 13** demonstrate the proposed stormwater management measures that will be implemented under the Interim Arrangement satisfy the stormwater flow targets for the site. Both targets are met completely with the proposed measures

7.10. DRAINS Model Results

Table 14 presents the pre-development and post development flow rates for all storm events at the outlet of the proposed OSD tanks. The OSD within the tank has been designed to achieve the following outcomes for all pre and post developed cases. Table 13 shows the OSD tank volumes for each area. The Allotment OSD is compensating for the un-attenuated road catchments, as can be seen by the over-achieved targets.

Design Storm Event	Pre-Development Peak Flow Rate (m^3/s) (1)			Post-Development Peak Flow Rate (m^3/s) (2)		
	Discharge Pt Lot 1A	Discharge Pt Lot 1B/1C	Discharge Pt Lot 2	Discharge Pt Lot 1A	Discharge Pt Lot 1B/1C	Discharge Pt Lot 2
50%AEP	0.117	0.176	0.16	0.108	0.15	0.13
5% AEP	0.448	0.737	0.672	0.344	0.445	0.612
1% AEP	0.662	1.08	0.986	0.554	0.644	0.658

Table 14: Pre-development and post-development peak flow rates from the proposed development

Warehouse Area	OSD Tank Volume
Lot 1A	750 m^3
Lot 1B/1C	1375 m^3
Lot 2	1250m^3

Table 15: OSD Tank Volumes

Estate scale attenuation is difficult to determine due to the presence of the trunk drainage channels. Trunk drainage channels have not been considered in the DRAINS attenuation calculations due to the high perviousness and large upstream flows from external developments passing through. The flood impact assessment (AT&L, 2023)conducted with TuFLOW shows that the estate does not negatively impact the downstream properties and should be sufficient to show that the trunk drainage channels do not significantly impact flooding and attenuation outcomes.

7.11. Ongoing Management and Maintenance

All proposed water management measures that make up the Interim Arrangement of the water management strategy would be managed and maintained by the proponent. An Inspection and Maintenance Plan will be prepared and lodged with the construction certificate for the subdivision works, once final design details and the extent and layout of all proposed water management measures is confirmed. It is anticipated that the Inspection and Maintenance Plan would be prepared using current best practice guidance such as *Water sensitive urban design inspection and maintenance guidelines* (Blacktown City Council, 2019) and would describe:

- Each of the functional components of each water management measure
- Expertise required to inspect, maintain and (where necessary) repair or replace components
- Minimum required frequency of inspection, repair or replacement activities
- Inspection and maintenance forms that list all necessary activities and contain a record of activities completed.

As described in **Section 7.2**, the Ultimate Arrangement would incorporate some estate-based measures such as on-lot rainwater tanks, on-lot GPTs and estate-wide detention basins. These measures would be managed and maintained by the proponent, with inspection and maintenance requirements consistent with those described above. The planned regional stormwater management scheme, which would incorporate measures to manage stormwater quality and volume across the Mamre Road Precinct, would be managed and maintained by the Waterway Manager.

7.12. Conclusions of Water Management Strategy

As shown in the above sections, the Westgate development provides sufficient OSD and flood mitigation measures to satisfy the attenuation requirements of the DCP under both the ultimate and interim (stage 1) conditions. The flood impact assessment (AT&L, 2023) verifies that negative impacts are not created by the development.

While stormwater quality treatment and stormwater volume control (MARV and Flow Duration Curve) are not required to be provided under the stage 2 conditions when connected to the ultimate Sydney Water Regional Scheme, stage 1 satisfies all criteria through the use of rainwater tanks, a large evaporation pond, and proprietary products on-lot.

8. Site Water Balance

This section outlines a detailed site water balance including identification of water requirements for the life of the development, measures that would be implemented to ensure an adequate and secure water supply is available for the development and a detailed description of the measures to minimise water consumption at the site.

8.1. General

A water balance model was developed using the MUSIC software package simulated to allow the evaluation of various elements of the water cycle to be assessed.

Penrith City Council WSUD policy (July 2015) stipulates that rainwater tanks are required to meet 80% of non-potable demand including outdoor use, toilets and laundry.

8.2. Water Balance Objective

Potable water supplies in the Sydney area are in recognised short supply with projected population increases, potential climate change and periods of extended drought. It is acknowledged that any development in the Sydney region places greater demands on an already limited water supply. As a result, government bodies, together with Sydney Water have encouraged sustainable development by the implementation of an integrated approach to water cycle management (potable water, sewerage, stormwater and rainwater) to minimise potable water demand and maximise the potential for non-potable water sources to replace potable water demand where possible.

Whilst opportunities for water reuse could include such initiatives as regional stormwater harvesting and reticulated recycled water, this development is limited to rainwater collection harvesting and reuse on an individual lot by lot basis (at 100% developed).

As such, we have used MUSIC to establish an estimated tank size for each lot within the development and demonstrated the volume of water reuse possible and provide a more sustainable servicing solution.

8.3. Water Balance End Uses

AT&L has identified the following water demand end uses to be required across the development:

- Toilet flushing (within the proposed warehouse and office developments).
- Landscape watering irrigation (outdoor garden use).

The proportion of total water demands for irrigation and toilet flushing within the development could be met with the use of recycled roof water drained directly into a rainwater tank. The tank should be sized to ensure the site meets the requirement to meet the 80% non-potable reuse requirement. This is in accordance with Penrith City Council's WSUD policy.

8.4. Total Site Demands and Non-Potable Reuse Rates

The following rates were adopted from the *Penrith City Council WSUD Technical Guidelines for Industrial and Commercial Developments* (Section 4.5):

- 3 ML/ha/yr for landscape irrigation (600mm over 50% of landscaped areas).
- 15L/persons/day for toilet and urinal flushing, estimated at 25 persons/ha of industrial allotment.

8.5. Rainwater Reuse

The use of rainwater collected in rainwater tanks from runoff on the roofs of the warehouse roofs provides a valuable alternative to potable water for a variety of non-potable end uses, such as vehicle washing, air conditioning cooling, and toilet flushing and watering.

It has been assumed for this development that irrigation systems will be plumbed to rainwater tanks. Other uses of harvested rainwater such as truck washing may be considered at the detailed design stage but would be dependent on the water demands of individual tenants within the estate.

A rainwater tank model was constructed to simulate the rainwater tank operations and select the optimal rainwater tank size. In doing so, the following considerations were made:

- Rainfall on the catchment
- Roof area (it is assumed that rainwater harvesting would be limited to roof areas only)
- First flush
- Rainwater demands (by end use)

8.6. Proposed Rainwater Tank Parameters

As presented in **Table 9**, the MUSIC model results demonstrate that rainwater tanks on each of the individual lots can satisfy the Mamre Rd DCP requirement for non-potable water supply throughout the development.

The adoption of rainwater harvesting tanks as part of the site water management strategy, and the design basis to size the tanks to comply with the requirement that 80% of all non-potable water demand on each lot can be sourced from the tank, demonstrates a commitment to water recycling and minimising the usage of potable water throughout the development. This is in line with the industry best practice and the NSW Government's objective of reducing the amount of potable (drinking) water consumed for non-potable uses.

9. Flooding

The site is located outside the extent of the Flood Planning Area identified in the *Penrith Local Environment Plan 2010* (refer to **Figure 13**).

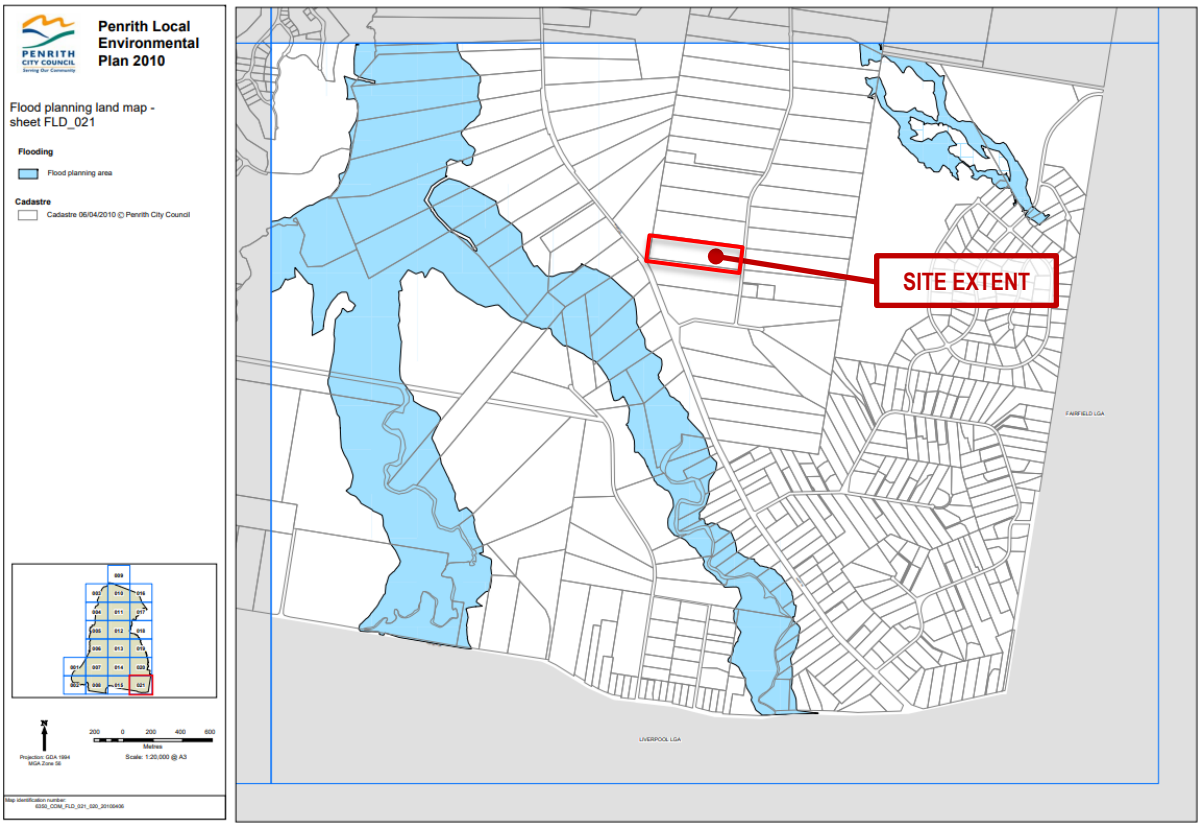

Figure 13: Extract of flood planning land map (Penrith LEP 2010)

Mapping of the 1% AEP flood extent from local catchments within the Mamre Road Precinct is presented in the *Mamre Road Flood, Riparian Corridor and Integrated Water Cycle Management Strategy* (Sydney Water, October 2020), and is reproduced as **Figure 14**. This mapping shows the extent and depth of overland flow from local catchments within the site.

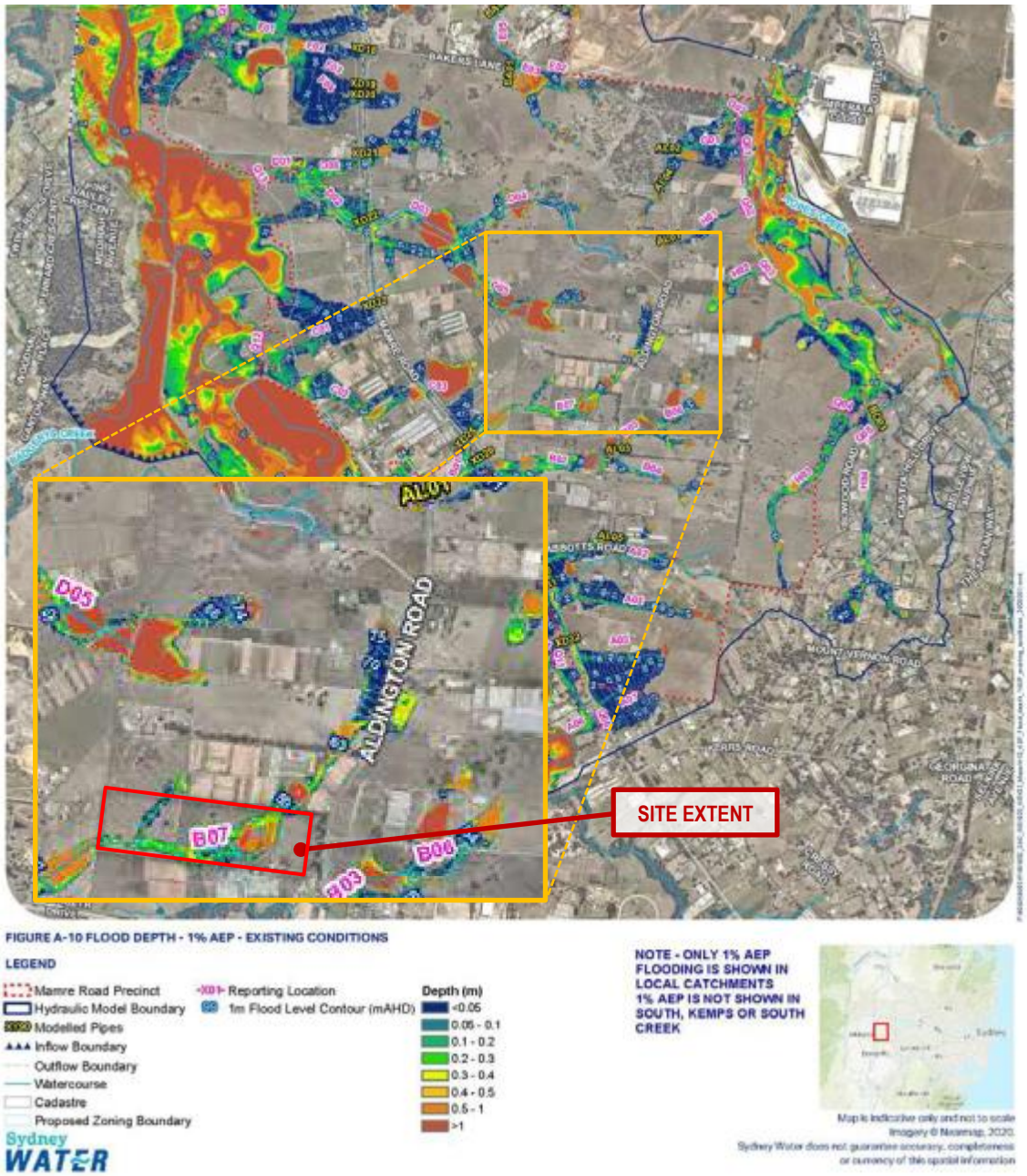

Figure 14: 1% AEP flood depth from local catchments under existing conditions (Sydney Water, 2020)

The proposed development of the site, including bulk earthworks, construction of a major and minor drainage system and construction of OSD basins, will satisfy the development controls related to flood prone land outlined in Section 2.7 of the DCP.

The design of major system drainage elements is consistent with the principles of the *NSW Government Floodplain Development Manual* and Council's *Stormwater Drainage Specification for Building Developments*. Under the post-development scenario, overland flow will be safely contained within the proposed road reserves and within the Transgrid easement adjacent to Aldington Road.

As presented in **Table 14**, the post-development peak flow rates will be less than the pre-development peak flow rates at each of the discharge points for all design storm events between (and including) the 1 EY and the 1% AEP event. Therefore, there will be no flood impact on adjacent properties associated with the proposed development of the site. This is confirmed by the Flood Impact Assessment *REP004-01-21-860-20-776 FIRA (AT&L 2023*),

10. Appendix A: Sydney Water In Principle Approval to Submit SSDA

31 July 2023

David Badenoch-Jones
RP Infrastructure
Level 9
20 Bond Street
Sydney NSW 2000

Reference: In principle endorsement to lodge state significant development application (SSDA)

Dear David,

Thank you for the recent meeting between Sydney Water and the design team to discuss the current masterplan for Westgate (dated: 11/07/2023) and the letter (re: 253-267 Aldington Road, Kemps Creek – Trunk Drainage). Icon Oceania are requesting support from Sydney Water for lodgement of an SSDA to the Department within the next few months based on this masterplan.

Sydney Water acknowledges the inclusion of naturalised trunk drainage channels through the site in the current masterplan as per Sydney Water's previous feedback and that the masterplan is more closely in line with published Mamre Rd Precinct Stormwater Scheme Plan than previous versions submitted to Sydney Water.

While further modelling, information and design refinement is required to endorse the proposal for determination, we are satisfied that the current proposal is an adequate starting point from which to work with Icon Oceania to arrive at an approvable design through the SSDA process.

We endorse Icon Oceania submitting an SSDA for Westgate based on consideration of stormwater matters, with the condition that the lodgement includes documentation of the items provided in Attachment 1 of this letter.

Yours sincerely,

Name : Anna Thompson
Title : Wianamatta Stormwater Lead

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