Westlink Industrial Estate, Kemps Creek

Water and Stormwater Management Plan Stage 2

ESR Development (Australia) Pty Ltd

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Commercial in Confidence

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1. Introduction

This Water and Stormwater Management Plan (WSMP) has been prepared by AT&L on behalf of ESR Australia in support of a State Significant Development Application (SSD-46983729) for the proposed development of the site located at 1030-1064 Mamre Road Aldington Road and 59-63 Abbotts Road, Kemps Creek (the Site. This SSD builds on the Stage 1 approval SSD-9138102. Combined both these SSD's form the entire Westlink Industry Park.

1.1. Site Description

The extent of the site is presented in **Figure 1**.

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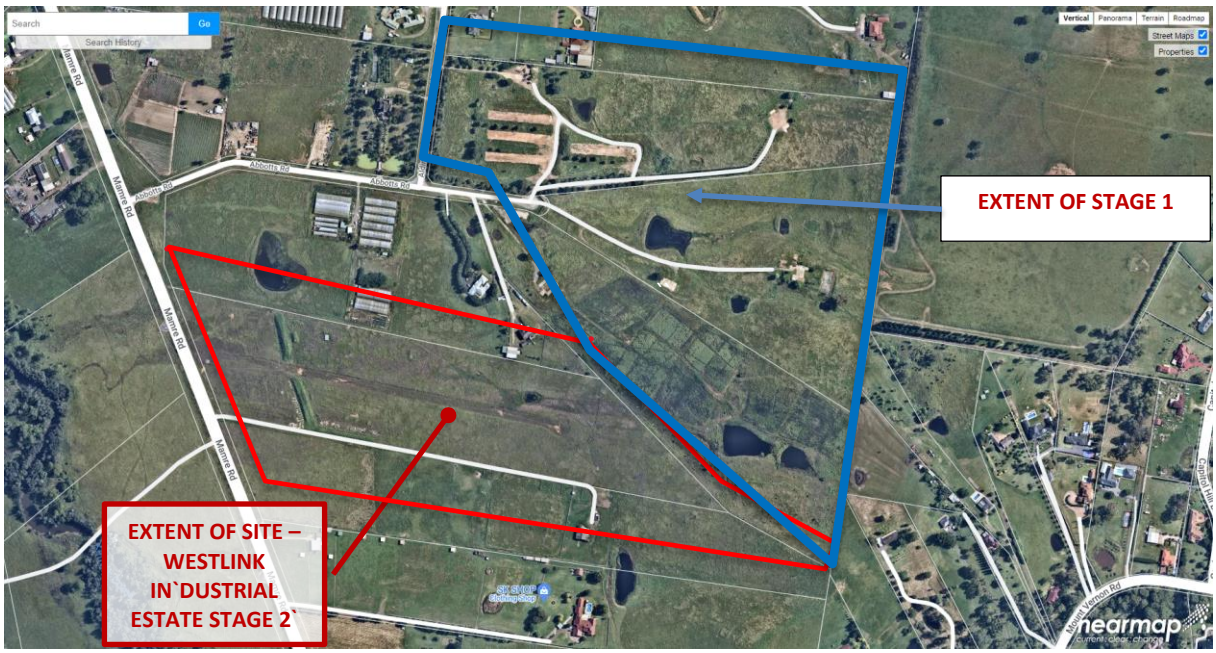

Figure 1: Site Extent (imagery from nearmap, dated 17 February 2022)

The site is located in the suburb of Kemps Creek, within the Penrith Local Government Area (LGA), and approximately 15 km south-east of the Penrith CBD and 5 km north-east of the under-construction Western Sydney Airport. The site is made up of the following allotments:

- Lots 3 and 4 DP250002 (1030-1064 Mamre Road, Kemps Creek)
- Lots 11 and 13 DP253503 (59-63 Abbotts Road, Kemps Creek)

The total area of the site is approximately 52 hectares.

Stage 1 SSD approval contains bulk earthworks, servicing and construction of Warehouse 1 and 4. Total work area is approximately 11.72Ha.

The proposed works associated for this Stage 2 SSD application is as follows and referenced in **Figure 2:**

- Construction of extension of Abbotts Road from Stage 1 extents to southern boundary
- Construction of Aldington Road extension to southern boundary
- Construction of private road north of Lot 6 linking Aldington Road with Abbotts Road extension
- Development of Lot 2
- Bulk earthworks and associated retaining walls within Lots 3, 5 and Lot 6

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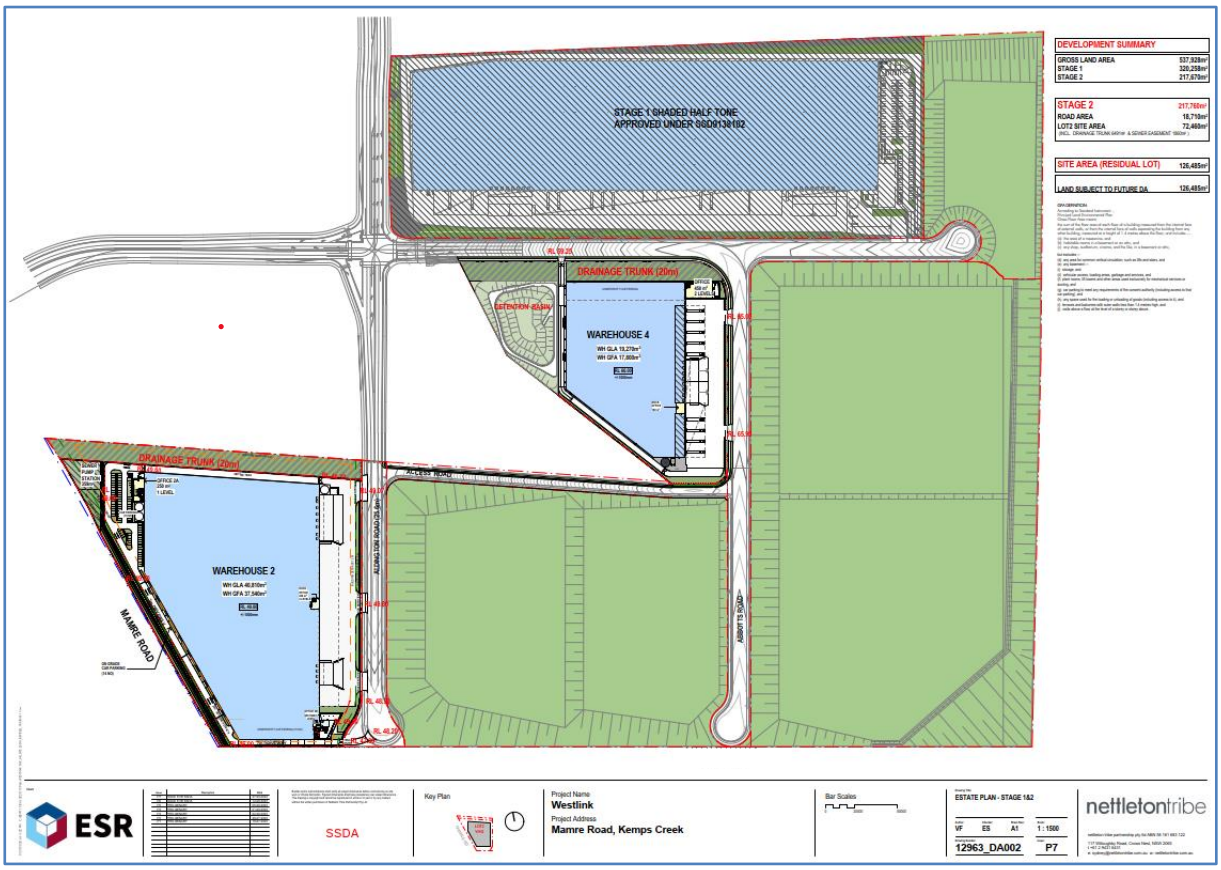


Figure 2 - Estate Plan Stage 2

The site is currently characterised as rural land and comprises residential dwellings, agricultural areas, sheds, greenhouses and some 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 Precinct Development Control Plan 2021*.

1.2. Supporting Documentation

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

- Civil Drawings (AT&L), 20-748-C5000 (Infrastructure) and C6000 (on-lot) series – refer to **Appendix 1**.
- Stormwater Management Layout Plan 20-748-C11075 in **Appendix 1**
- Pre-Development hydrology parameters and assumptions letter (LTR007-02)- refer to **Appendix 2**
- Life Cycle Costings , and O&M Manuals from Landcom & SPEL - refer to **Appendix 3**
- CPESC Report by LENECO Environmental Management
- Trunk Drainage Drawings and associated report by J.Wyndham Prince

2. Site Characteristics

2.1. Existing Topography and Catchments

The Site in its existing condition is characterised by undulating topography. The ground slope across most of the site has a general fall from the east to west towards Mamre Road with existing levels ranging from RL98 in the south-east, RL 93 in the north-east, RL 42.5 in the south and west adjacent Mamre Road.

The eastern portion of the site consists of four ridgelines that are generally aligned in an east-west direction. Ground slopes off these ridgelines towards local gullies within the site are typically between 10% and 15%. The western portion of the site adjacent to Aldington Road and Abbotts Road is generally flatter than the eastern portion, with ground slopes typically in the range of between 2% and 8%.

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

Delineation of the existing internal drainage catchments and external catchment that drain through the site is presented as **Figure 3**. Note that this includes the existing conditions before the commencement of Stage 1 works.

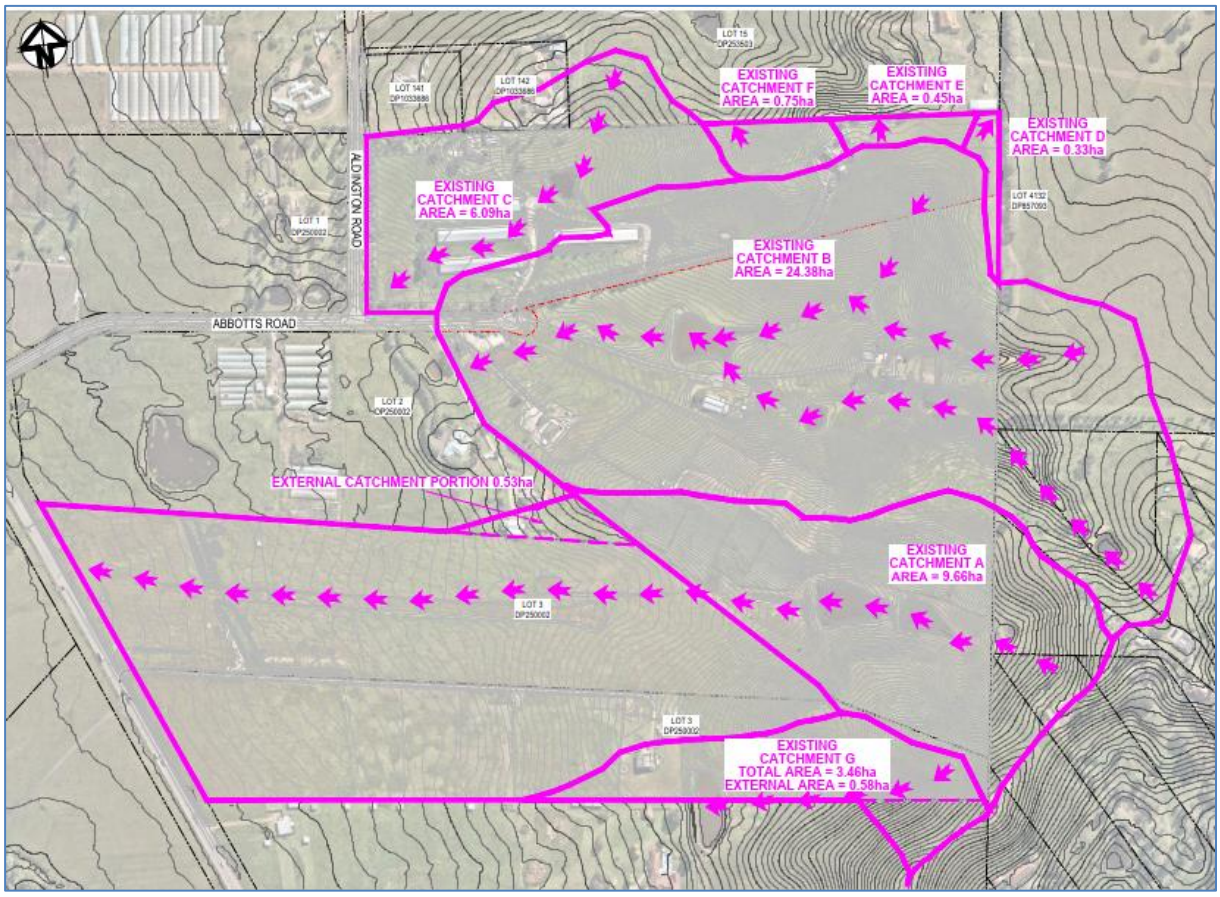


Figure 3: Catchment extents under existing conditions

A summary of the internal catchments under existing conditions is presented in **Table 1**.

Table 1: Description of internal and external catchments under existing conditions

Catchment ID	Area (ha)	Description
A	28.82	Discharges towards Mamre Road via residual land 1030-1064 Mamre Rd.
B	24.38	Discharges towards the eastern boundary of 1016-1028 Mamre Road (Lot 2 DP250002) and ultimately into a catch drain that runs along the southern edge of Abbotts Road.
C	6.09	Discharges towards the intersection of Abbotts Road and Aldington Road.
D	0.33	Discharges in a north-easterly direction towards 19-105 Capitol Hill Drive Mount Vernon (Lot 4132 DP857093)
E	0.45	Discharges in a northerly direction towards 272 Aldington Road (Lot 15 DP253053)
F	0.75	
G	3.46	Discharges into a shared existing farm dam, which overflows into the 1066-1074 Mamre Rd property to the south.

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

2.2. Existing Drainage Lines

Based on large-scale topographic mapping (1:25,000 from NSW Six Maps), there is one mapped overland drainage lines within the site, refer to **Figure 4**.

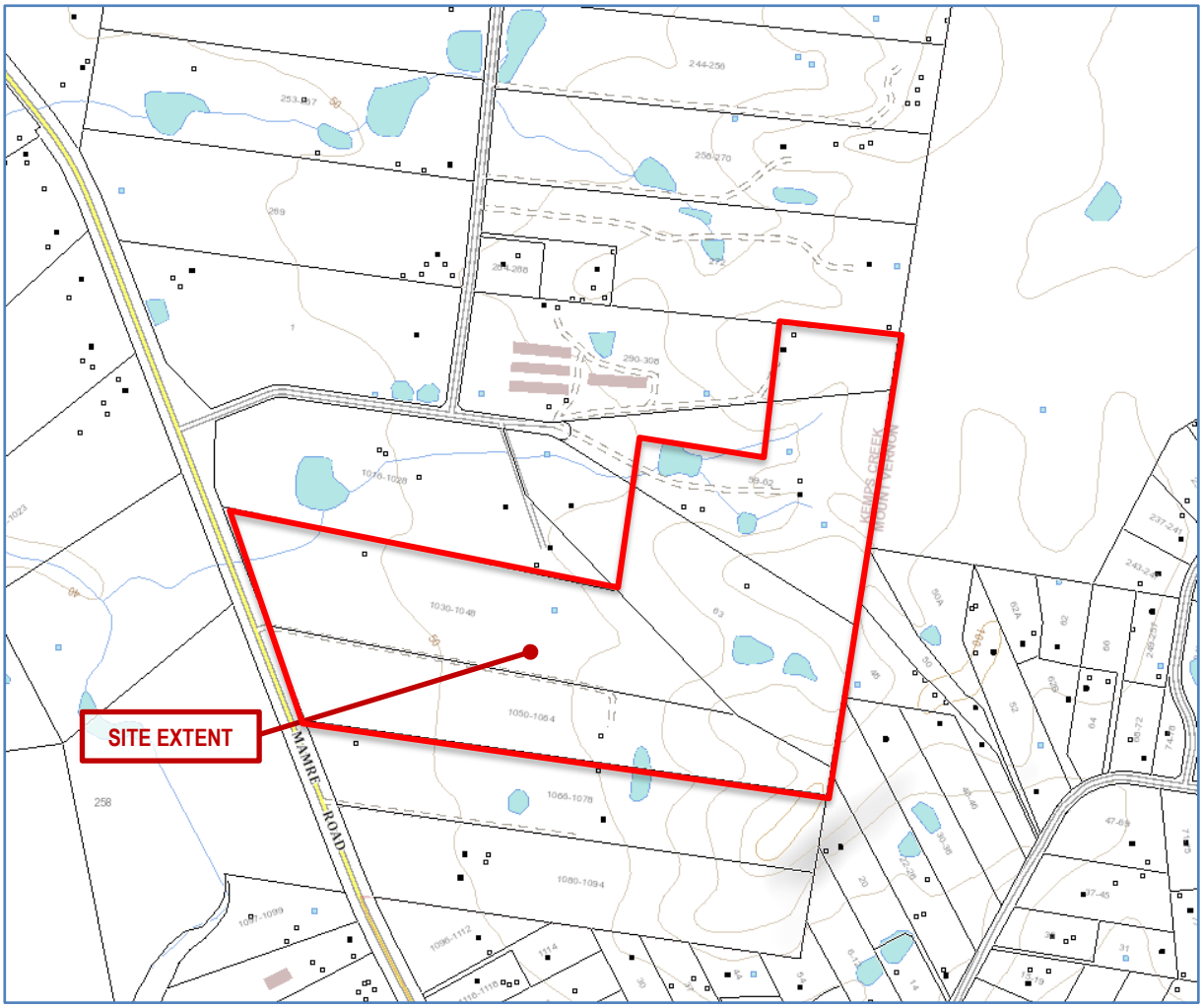


Figure 4: Topographic mapping showing drainage lines in the vicinity of the site (Source: NSW SIX Maps)

The *Mamre Road Precinct Waterway Assessment* (CT Environmental, 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 5**. This shows an unnamed tributary of Kemps Creek passing through the site.

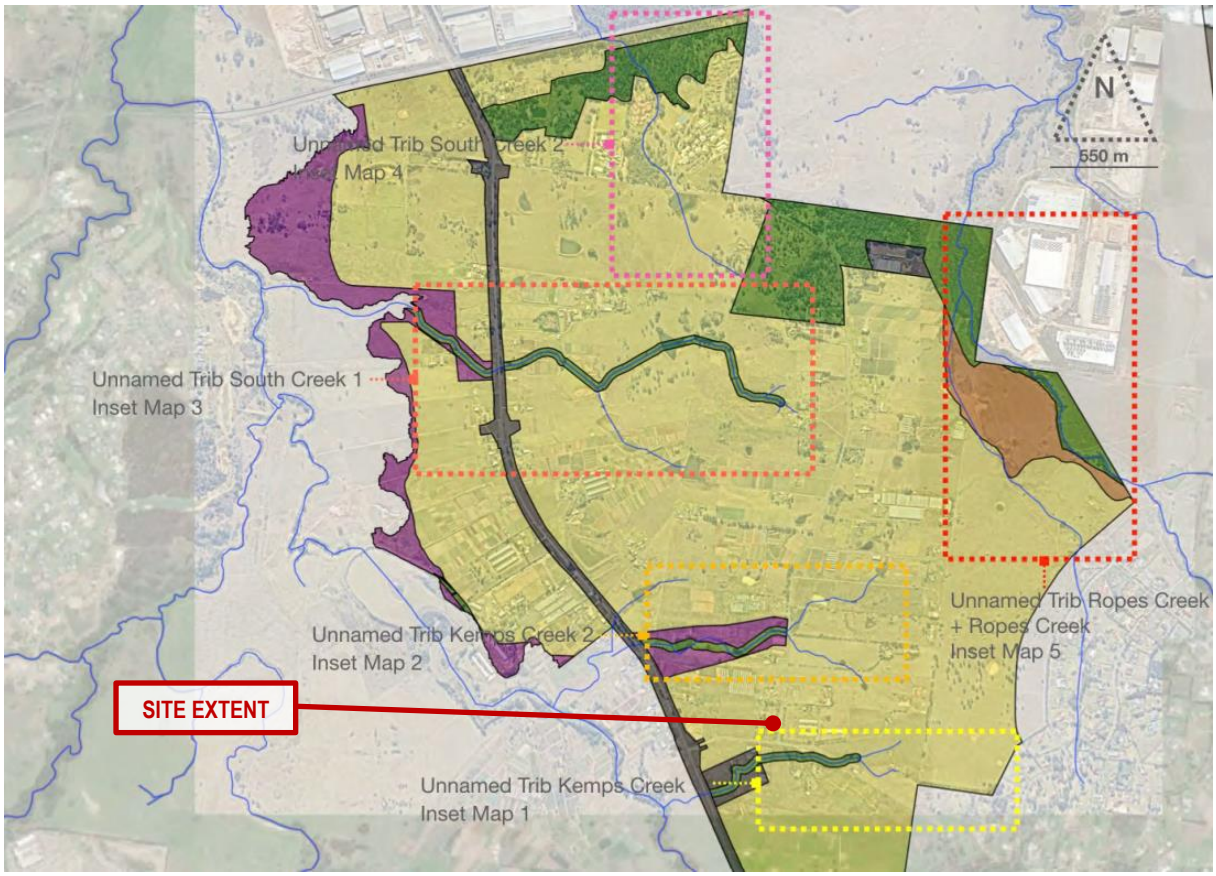


Figure 5: Extract of waterway mapping (CT Environmental, April 2020)

Results of the inspection of the unnamed tributary of Kemps Creek are described in the *Mamre Road Precinct Waterway Assessment* (CT Environmental, April 2020), and are summarised below:

- Two first order watercourses were evident in the headwaters which run to the north and south of the recently demolished house on 59-62 Abbotts Road.
- A clear flow path was evident below the confluence of the two first order watercourses, which validated the presence of a second order watercourse.
- The flow path did not have defined bed and banks, likely due to the presence of three upstream farm dams.
- From a point approximately 200 metres downstream (west) of the confluence of the first order watercourses, the flow path was observed to be heavily modified and formed into a drainage channel that runs parallel to and on the southern side of Abbotts Road. The flow path continues to Mamre Road.
- The section of mapped watercourse downstream of the Westlink Industrial Estate Stage 1, and passing through Stage 2, was not present, refer to **Figure 6**.
- Due to the lack of vegetation along the upper section of the headwater and significant modification to the drainage channel in the lower section, the watercourse had minimal ecological value.

Figure 6: Field validated flow paths and watercourses within and downstream of the site

2.3. Existing Geology

Based on the Preliminary Geotechnical Investigation undertaken by Douglas Partners (reference: 92352.00, dated August 2019) for 59-63 Abbotts Road and the Geotechnical Investigation Report prepared by Alliance Geotechnical (reference: 9687-GR-1-1, dated October 2019) for 290-308 Aldington Road, the following inferred sub surface soils were encountered across the site:

- TOPSOIL / topsoil filling to depths of 0.1 - 0.6m
- FILL to depths of 2.3m over parts of the site
- Residual Soil – variably stiff to hard silty clay, to depths in the range 2.5-3.5m
- BEDROCK - initially extremely low to very low strength shale or sandstone at first contact at depths of 0.7

2.4. Post-Development Catchment Extents

A post-development catchment plan based on the proposed site grading is presented as **Figure 7**.

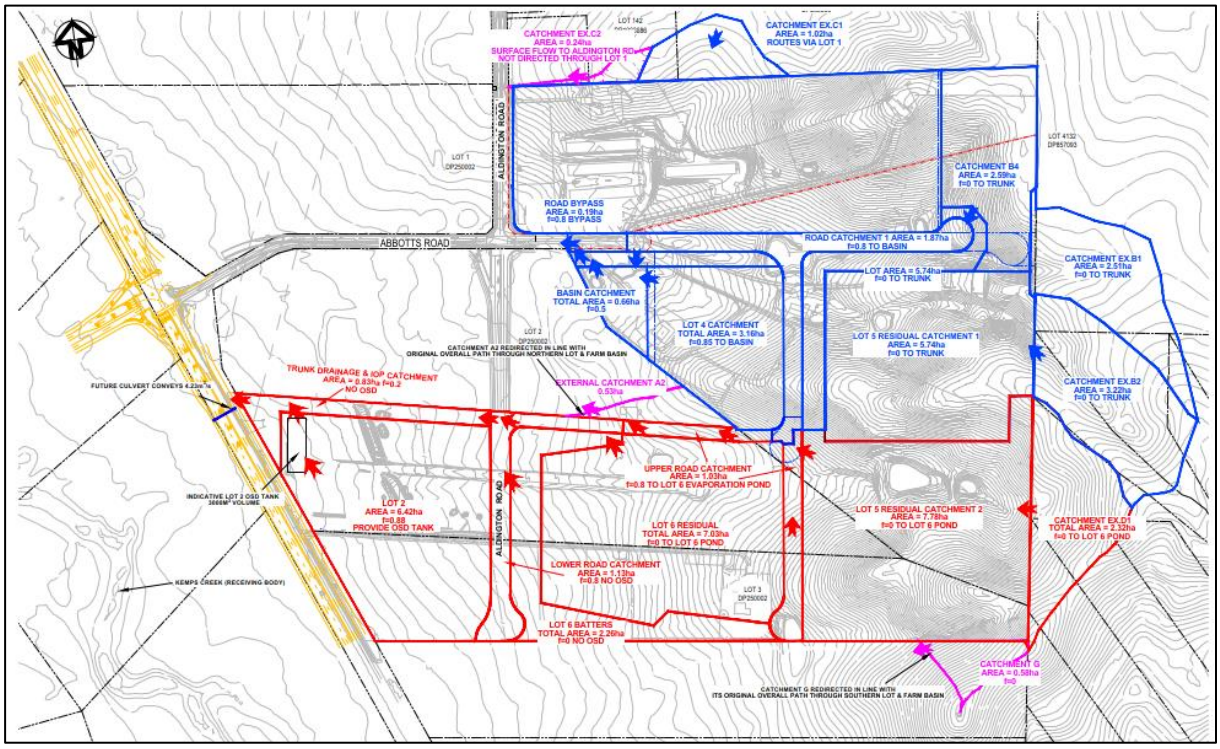


Figure 7: Catchment extents under proposed conditions

The post developed catchment extents are proposed to drain to the existing culvert beneath Mamre Road in the northwest corner of Stage 2 site as per **Figure 7**. It is noted the existing culverts beneath Mamre Road are scheduled to be upgraded in approximately the same timeline as the Westlink development.

Prior to draining through the culvert beneath Mamre Road, the Stage 2 catchment is proposed as such:

- The Trunk Drainage & Sewer IOP easements bypass all OSD and treatment, draining directly into the downstream culvert
- Developed Lot 2 (western Lot) – drains via a proposed underground OSD tank with orifice outlet and proprietary treatment within the western portion of the lot to drain into the 20m open trunk drainage channel along the north of Lot 2
- Lots 6 and southern half of Lot 5 (both bulk surface only), and the southern portion of Abbotts Road to drain into an evaporation pond on Lot 6, then discharging into the open trunk drainage channel via proprietary treatment and GPT.
- The lower road catchment including Aldington Rd and a number of batters from lot 6 drain into the trunk drainage channel via proprietary treatment and GPT
- Lot 3 and northern portion of Lot 5 (both bulk surface only) to drain into the stage 1 trunk drainage channel (as per the Stage 1 stormwater management plan)
- Undeveloped External catchment to east to drain via lot 5 as surface flows.

Once Lot 5 and Lot 6 and eastern external catchments are developed, detention and treatment measures within each site will be required to be implemented to ensure peak post flows into the open channel do not exceed the pre-developed flows and quality requirements. This will need to be determined as part of the Development Applications on each of these lots. As such the open trunk drainage channel is designed for pre-developed flow rates.

3. Stormwater Drainage

3.1. 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 2021*.
- NSW Department of Planning, Industry and Environment (DPIE), *MUSIC Modelling Toolkit – Wianamatta*, 2 August 2021.
- Penrith City Council, *Design Guidelines for Engineering Works for Subdivisions and Developments*, as amended 20 November 2013.
- Penrith City Council, *Water Sensitive Urban Design (WSUD) Policy*, December 2013.
- Penrith City Council, *WSUD Technical Guidelines*, Version 4 – October 2020.

3.2. 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 neighbouring properties to the south and 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.
- Flood Impacts from external catchments are to be minimised to an acceptable level for all floods up to the PMF.

The minor system stormwater drainage has been designed to drain towards the culvert crossing beneath Mamre Road in the northwest corner of the site. Limited road overland flow paths discharge into the southern property when exceeding the minor drainage system capacity.

3.3. Trunk Drainage Infrastructure

The *Mamre Road Precinct DCP* includes indicative locations of trunk drainage infrastructure across the precinct, refer to **Figure 8**. A 25m trunk drainage line is situated within the ESR Westlink Stage 2 site, which would drain in a westerly direction to Mamre Road. J. Wyndham Prince (JWP) has investigated the hydraulics and spatial design of the open trunk drainage channel in stage 2.

Confirmation has been received in discussions with Sydney Water in August 2023 that the naturalized trunk drainage channel within the development can be reduced in width from 25m (as per the Precinct DCP) to 20m and length to solely be located along the northern boundary between the Aldington Road extension at the east and Mamre Road to the west.

As such all documentation refers to the naturalized trunk drainage channel being 20m wide. This open channel is to form the naturalized trunk drainage network as per the DCP and the Mamre Road Precinct Stormwater Scheme Plan (**Figure 8**). Refer to JWP Channel Drawings for location and extents of open trunk drainage channel.

At the time of writing this report there is no detailed design of this stormwater naturalized trunk drainage channel provided by SWC to the west of Mamre Road and into the proposed Regional Wetland 17 as indicated in **Figure 9** – Mamre Road Precinct Stormwater Scheme Plan.

It is assumed construction of the open trunk drainage channel within the Westlink Estate will occur prior to construction of the Regional Wetland and associated channel west of Mamre Road. As such outlet flows into the culvert beneath Mamre Road will be modelled to ensure pre-developed peak flows are not exceeded and existing flow paths west of Mamre Road are maintained.

The future downstream culvert as part of the Mamre Road upgrade is understood to be capable of conveying the entire Westlink Estate stage 2 catchment at pre-developed flows (but excludes the external catchment EX.D1). The culvert requires re-alignment to the updated trunk drainage alignment. This is formally accepted by Sydney Water. We are currently in discussions with TfNSW as the Mamre Road owners, and Transgrid, who have an easement over part of the culvert proposed alignment, for their formal approval. Design of the culvert is not yet fully confirmed, so while the Westlink Stage 2 is based on indicative design from Sydney Water and the Mamre Road upgrade team, it may need to be adjusted as the design process continues.

Latest correspondence with TfNSW indicates the program for the upgrade construction of Mamre Road, including the culvert crossing , is schedule to commence Q1 2024 and be completed by Q1/Q2 2025. Integration of the detail design of the road upgrade will occur during detailed design.

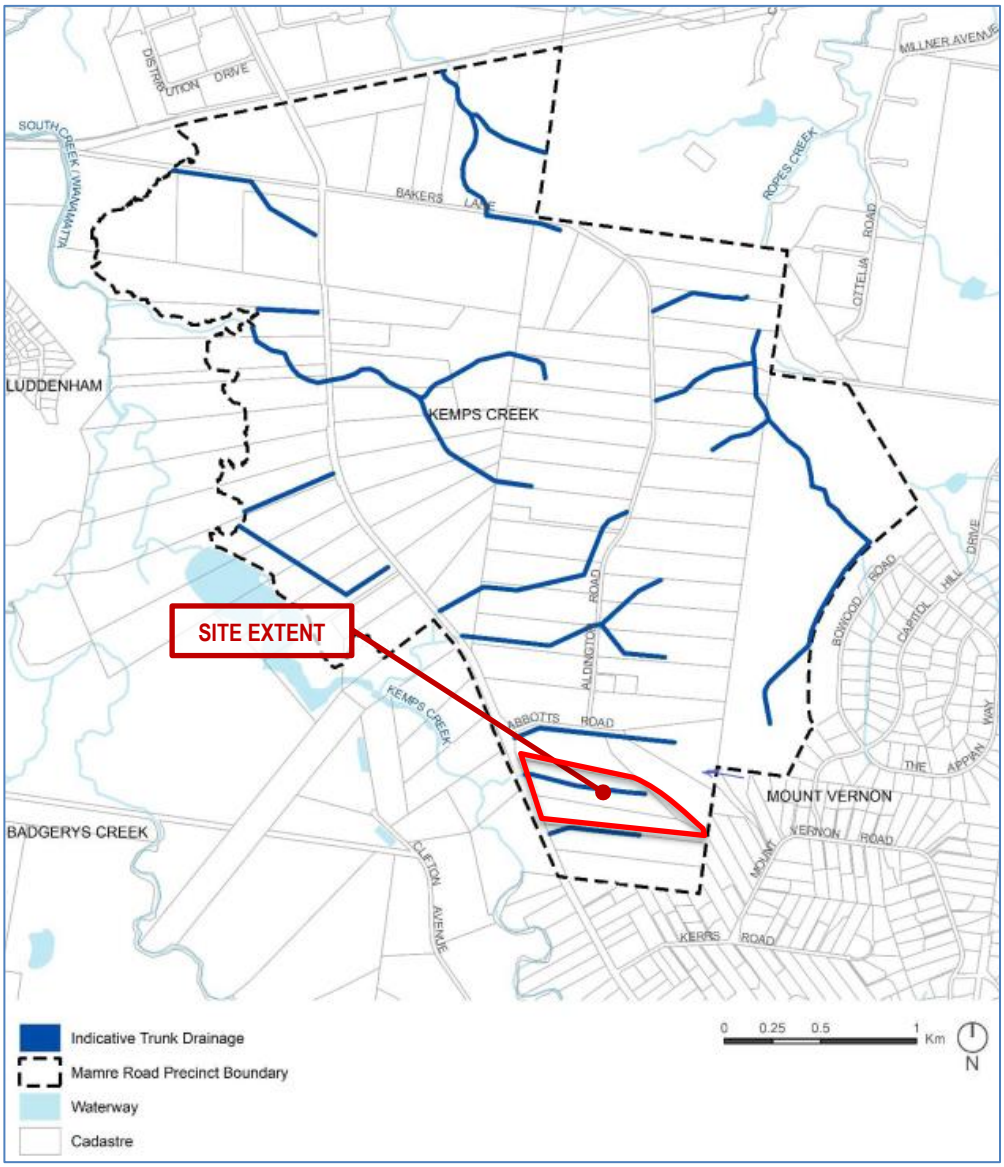


Figure 8: Trunk drainage infrastructure identified in the Mamre Road Precinct DCP

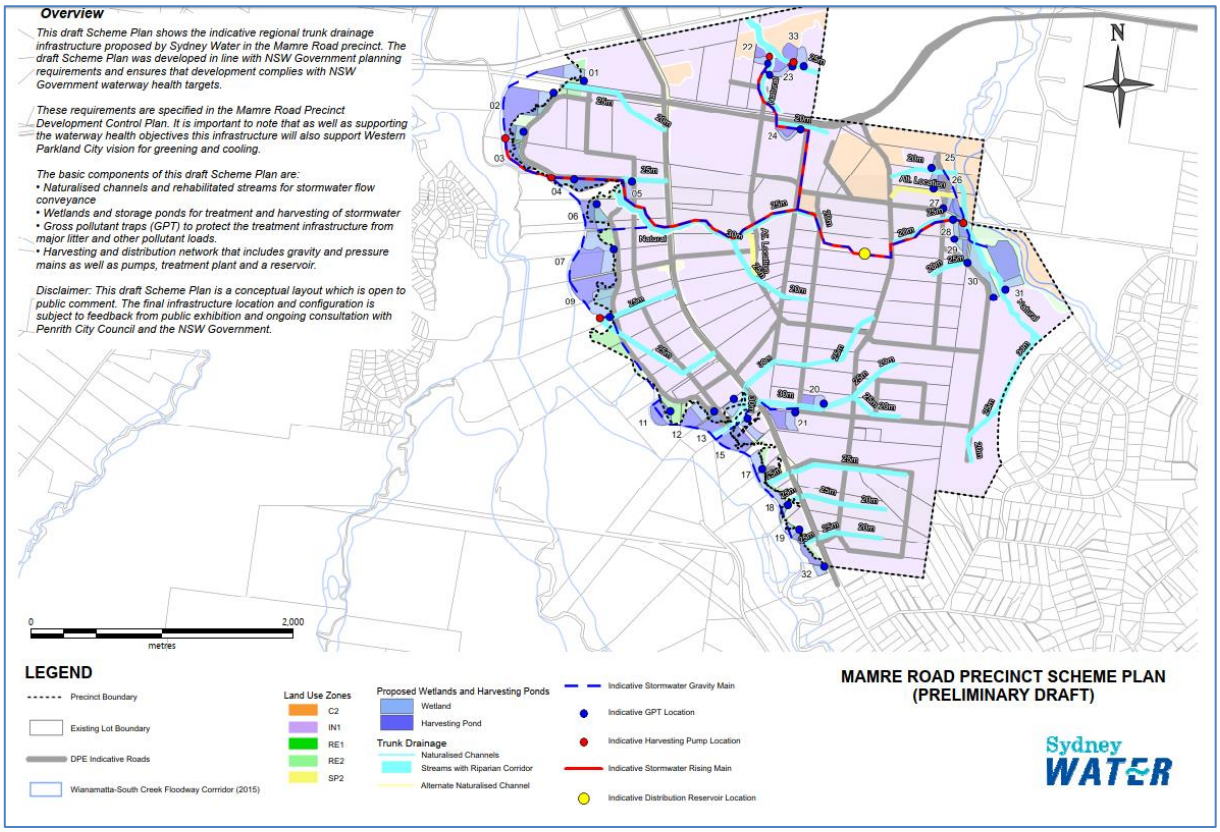


Figure 9 - Mamre Road Precinct Stormwater Scheme Plan

3.4. Downstream Culvert Hydraulics

As of October 2023, the downstream culvert from the stage 2 open channel (at Mamre Road) is still in the strategic design process with TfNSW. It is understood that there are two culvert sizes being considered. For the purposes of the design of stage 2 SSDA, the more conservative of the two options as the downstream culvert, a 0.6m x 3.3m culvert at IL41.911 has been assumed. This provides a higher tailwater level for design of RL 43.024.

It is understood that by the time Stage 2 SSD is approved, the culvert design will be finalised and as such the hydraulic parameters confirmed which will be used at the Detailed Design of the open channel. Assuming the more conservative (higher tailwater level) for the western end of the open channel provides flexibility once detailed design commences.

4. Water Management Strategy

This section summarises the proposed water management strategy for the site, including details of the proposed stormwater management measures and characterisation of water quality, quantity and flow volume at the points of discharge at the site boundary against the controls outlined in the Mamre Road Precinct DCP.

4.1. Water Management Strategy Objectives and Controls

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, is summarised below in **Table 2**.

Table 2: 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 **Section 4.2.** Performance against the construction phase stormwater flow & quality targets is shown indicatively in plan 20-748-C5201 noting that contractors are to create their own plan detail for construction. A CPESC has revised the plan and confirms the detail in the documentation is sufficient for the SSD. Performance of the proposed water management strategy against the operational stormwater flow targets is presented in **Table 13**, which includes measures for Lot 2 Warehouse under the interim arrangement. The strategy is also demonstrated on plan 20-748-C5220.
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**. Option 1 has been satisfied.
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 4**, 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.

DCP Controls	Response
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 4.10**. 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. Acceptable WSUD measures to retain stormwater within the development footprint and subdivision are shown in Table 7 (DCP).	A summary of the proposed WSUD infrastructure adopted in the water management strategy is presented in **Table 3**.
6) Development must not adversely impact soil salinity or sodic soils and shall balance the needs of groundwater dependent ecosystems.	Refer to Geotechnical Investigation Reports prepared by Douglas Partners (for 59-63 Abbotts Road) and Alliance Geotechnical (for 290-308 Aldington Road) 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 4.5.5** for details of proposed rainwater tanks and demand statistics.
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 2 will form one of the components of the Interim Arrangement. The supply of harvested rainwater for non-potable uses within the development will be prioritised over reticulated recycled water. Rainwater tanks would not be required under the Ultimate Arrangement. Any tanks constructed on Lot 2 would be required to be decommissioned upon completion of recycled water mains within the Precinct which this Estate will utilise. Refer to **Section 4.5.4 and Table 3.**

DCP Controls	Response
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;* *unless otherwise agreed by the consent authority.*	Details of the proposed trunk drainage infrastructure are included in **Section 3.3**.
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.	Based on discussions with Sydney Water there is no detailed design on the naturalised trunk channel downstream of the Estate. It is proposed at detailed design to coordinate with Sydney Water on the design and rehabilitation of the naturalised trunk drainage channel to match into any downstream open channels. This must also be co-ordinated with TfNSW for the culvert connection across Mamre Road.
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.*	The alignment of the naturalised trunk drainage has been altered with the approval of Sydney Water. The naturalised trunk drainage path is now along the northern boundary of Lot 2 which was deemed to not compromise the objectives of the trunk drainage, while assisting in preferred layouts of the industrial development. As described above, trunk drainage infrastructure in the form of a 20m wide open channel along the northern boundary between Aldington Road extension and Mamre Road is proposed as the naturalised trunk drainage path. This system will have sufficient capacity to capture and convey flows up to or exceeding the 1% AEP design event. Refer to JWP drawings for further detail.
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 trunk drainage lines within the site will (as per the J. Wyndham Prince Design): ▪ Comply with requirements for flow conveyance and freeboard. ▪ Incorporate sufficient access points for maintenance – maximum spacing of pits will not exceed 75 metres, which is consistent with Penrith City Council's *Design Guidelines for Engineering Works for Subdivisions and Developments* (considered an appropriate reference in the absence of any specific Sydney Water guideline or standard). ▪ Have sufficient capacity to capture and convey flow from the external catchments to

DCP Controls	Response
	the east of the Westlink Industrial Estate, and will therefore not result in adverse flood impacts on neighbouring properties
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 located in private lands considered part of Lot 2 gross land area. Maintenance covenants over the trunk drainage channel and easements over public stormwater infrastructure located within private lands will be incorporated in the deposited plans prepared by a Registered Surveyor.
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.	Not applicable as pipe/culverts are not proposed as part of the trunk drainage. Open channel drainage is proposed which will be situated within private lands and not within public road reserve. The downstream culvert design is as part of Mamre Rd works.
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.	Batters at maximum 1:4 slope are incorporated across the Estate however given the existing sloping topography of the site along with proposed "flat" pads for industrial warehouses (as the estate is zoned for) retaining walls are unavoidable. Tiered walls as per the Mamre Rd DCP are proposed. Refer Civil Drawings.
18) Raingardens and other temporary water storage facilities may be installed online in naturalised trunk drainage paths to promote runoff volume reductions.	Not applicable to the Westlink Industrial Estate as proposed.
19) Subdivision and development are to consider the coordinated staging and delivery of naturalised trunk 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).	The proposed trunk drainage infrastructure will be staged and delivered commensurate with the staging of earthworks and infrastructure across the estate. The trunk drainage infrastructure 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 lines, including connections to infrastructure downstream of the Westlink Industrial Estate, will be undertaken at a suitable stage of development and will be subject to further consultation with the Sydney Water (the nominated Waterway Manager).

DCP Controls	Response
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 lines will be designed and delivered by the proponent.
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 Sydney Water (the nominated 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 Flood Risk Impact Assessment prepared by Stantec.
Overland Flow Flooding	
10) 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. Any future development in the external catchments must be attenuated to this flow regime. The flood impact assessment will address storms above the 1% AEP.
11) 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 3.3** for details of the proposed trunk drainage infrastructure. While the existing conditions show overland flows primarily as sheet flows, the developed case concentrates into the naturalised trunk drainage system. For stage 2 development, the OSD on Lot 2

DCP Controls	Response
	is overcompensating for bypassing roads such that peak flows are below pre-development levels.
12) 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 location of the proposed detention tank within Lot 2 is presented on drawing 20-748-C5071. On site detention is provided on an estate level, not an allotment level, however future lot 5 and lot 6 will require OSD to be provided on-lot.
13) Stormwater basins are to be located above the 1% AEP.	No stormwater basins are proposed as part of this SSD.
14) 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 site post developed flows against the stormwater quantity targets in the Mamre Road Precinct DCP is summarised in **Table 12**
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 12**, the proposed detention tank and outlet from the open channel has been sized to ensure no increase in peak flows at the discharge point from the estate. Stantec flood modelling. The Lot 2 OSD tank overcompensates for bypassing road catchments.

4.2. Water Management Strategy Overview

Since the release of the Draft Mamre Road Precinct DCP in November 2020, 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 adopted in the final DCP.

The Draft *Mamre Road Flood, Riparian Corridor and Integrated Water Cycle Management Report* (FRCIWCM) (Sydney Water, 2020) addresses links between waterway health, hydrology and water quality targets. The stormwater management objectives outlined in the FRCIWCM Report, which have ultimately been adopted in the Mamre Road Precinct DCP, were developed by applying the *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions* (NSW OEH, 2017). The effects-based assessment outlined in the FRCIWCM Report addressed three metrics relating to waterway health and stormwater management:

1. Flow volume – mean annual runoff volume (MARV), measured in ML/ha/year. The target adopted in the Mamre Road Precinct DCP is 2 ML/ha/year (revised from 1.9 ML/ha/year in the Draft DCP). The outcomes for the Westlink Industrial Estate are summarised in **Section 4.9**.

2. Seasonal pulses – as shown by flow duration curves. The targets and outcomes demonstrated by a flow duration curve under post-development conditions is presented in **Section 4.9**.

3. Water quality – as indicated by stormwater pollution reduction. The targets and outcomes demonstrated as reduction in average annual pollutant load are summarised in **Section 4.7**. Note that as this design contains significant natural catchment, we have adopted the concentration targets as provided in the 21/09/2022 "Technical guidance for achieving Wianamatta South Creek stormwater management targets" produced by DPE.

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.

Subsequent to the release of the Draft DCP and Draft FRCIWCM, the Mamre Road Landowners Group (of which ESR Australia is a participant) has consulted with Sydney Water on several occasions to discuss the potential for regional stormwater management interventions to at least partially achieve the stormwater flow targets for the precinct. Sydney Water has indicated they are in the early stages of developing scheme plans for a precinct-wide stormwater management scheme, which would consist of a series of open water bodies (wetlands or ponds) and stormwater harvesting infrastructure (pumps, water treatment and a recycled water reticulation network throughout the precinct). 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 for Stage 2 has been developed to satisfy the flow targets fully without the regional solution being in place, by taking advantage of residual undeveloped land as part of the catchment area. It is important to note that for the full site (i.e. further lots becoming developed) to satisfy the flow

duration and MARV requirements, the stage 2 measures may need to be altered. By the time that the future development is under assessment, it may also be the case that the regional scheme is further progressed, and these measures may be reduced or decommissioned instead. This report focuses on the "Estate" level flow duration and MARV strategies.

A summary of the proposed stormwater management measures that would be required to satisfy stormwater quality, quantity and flow controls under both the "Estate" and "Regional" Arrangem*ents is presented in* ***Table 3****.*

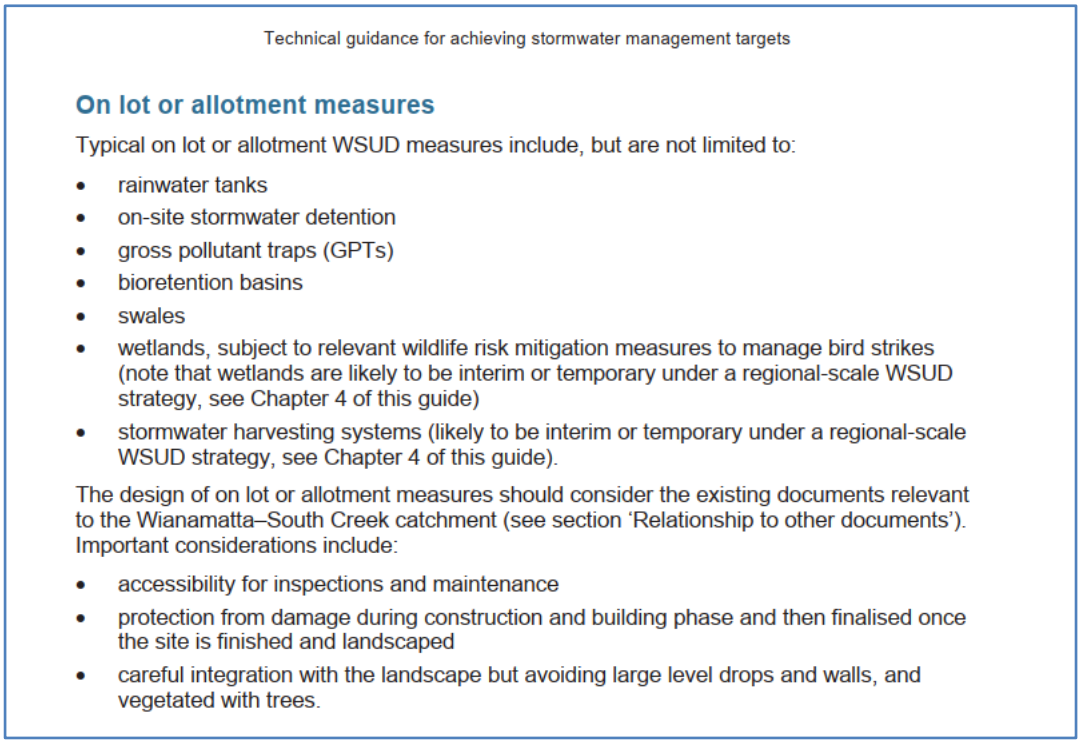
Table 3: Proposed water management measures under the Estate and Regional Arrangements

	Estate Arrangement (Stage 2) (prior to implementation of regional stormwater management scheme)		**Regional Arrangement** (with regional stormwater scheme to be operated by Sydney Water)	
Rainwater tanks for non-potable reuse (refer to **Section 4.5.5** for further details)	✓	Required for proposed Lot 2 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.*	×	Rainwater tanks would not be required under the Ultimate Arrangement. Any tanks constructed on Lot 2 would be required to be decommissioned upon completion of recycled water mains within the Precinct which this Estate will utlitise.
Gross pollutant traps (GPTs) (refer to **Section 4.5.1** for further details)	✓	GPTs with capacity for hydrocarbon and sediment removal to be installed upstream of the proposed OSD tank and open drainage channel as a pre-treatment measure for the regional stormwater management scheme. Note that currently no GPT is rated under SQIDEP to treat sediment and hydrocarbons.	✓	GPTs with capacity for hydrocarbon and sediment removal to be installed upstream of the proposed detention basin and open drainage channel as a pre-treatment measure for the regional stormwater management scheme. Note that currently no GPT is rated under SQIDEP to treat sediment and hydrocarbons.
Detention Tank (refer to **Section 4.5.2** for further details)	✓	Required to satisfy stormwater quantity controls.	✓	Required to satisfy stormwater quantity controls.
Evaporation / Storage ponds and residual irrigation (refer to **Section 4.5.3** for further details)	✓	Required to satisfy interim stormwater flow controls and stormwater quality treatment.	×	Will not be required on the basis that stormwater flow controls and stormwater quality treatment will be incorporated into the regional stormwater management scheme.

4.2.1. Technical Guidance for achieving Wianamatta-South Creek stormwater management targets

In September 2022 The Department of Planning and Environment released a *Technical guidance for achieving Wianamatta-South Creek stormwater management targets.* This guideline was prepared to give advice on modelling to undertake, assumptions to make and which data is to be used to demonstrate that the water targets are being achieved. It also provided a range of example WSUD strategies that could be utilised to meet the water quantity targets.

Refer to **Figure 10** below for extract from the Technical Guidelines (page 14) which indicates typical WSUD measures which could be implemented to meet the required water quantity targets.



Technical guidance for achieving stormwater management targets

On lot or allotment measures

Typical on lot or allotment WSUD measures include, but are not limited to:

- rainwater tanks
- on-site stormwater detention
- gross pollutant traps (GPTs)
- bioretention basins
- swales
- wetlands, subject to relevant wildlife risk mitigation measures to manage bird strikes (note that wetlands are likely to be interim or temporary under a regional-scale WSUD strategy, see Chapter 4 of this guide)
- stormwater harvesting systems (likely to be interim or temporary under a regional-scale WSUD strategy, see Chapter 4 of this guide).

The design of on lot or allotment measures should consider the existing documents relevant to the Wianamatta–South Creek catchment (see section 'Relationship to other documents'). Important considerations include:

- accessibility for inspections and maintenance
- protection from damage during construction and building phase and then finalised once the site is finished and landscaped
- careful integration with the landscape but avoiding large level drops and walls, and vegetated with trees.

Figure 10 - Extract from Technical Guidance

For this SSD all the dot points as noted within **Figure 10** aside from wetlands and bioretention basins are being incorporated into the civil design to ensure the water quantity targets are met. Refer to **Section 4.5** for additional details.

4.3. 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 software package 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 flow path 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 using the kinematic wave equation.
- 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.
- Bypass from any pit on grade shall not exceed 15% of the total flow at the pit.
- 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 flow paths maintain a minimum of 300mm freeboard to all habitable floor levels.

4.4. Stormwater Quality Modelling

The proposed stormwater treatment train has been modelled using the MUSICX software package (Version 1.1.0). Modelling has been undertaken in accordance with the *MUSIC Modelling Toolkit – Wianamatta* (NSW DPIE, 2021).

Rainfall and evaporation data

Penrith City Council's MUSIC-link climate data (rainfall and evapotranspiration) was adopted in the MUSIC model, as well as some evapotranspiration data from the MUSIC Modelling toolkit. The meteorological data includes:

- Pluviometer data (six-minute rainfall intensity and evapotranspiration) for Penrith Lakes AWS (Station 67113) for the period between 1999 and 2008 inclusive (average annual rainfall over this period = 691mm).
- Monthly potential evapotranspiration (PET) as per the *MUSIC Modelling Toolkit - Wianamatta*.

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 4**.

Table 4: 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 Table 6 of Blacktown City Council's WSUD developer handbook (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 5**.

Table 5: 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

4.5. 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 4.1**. A general description of the proposed stormwater treatment train components is presented in the following sections.

4.5.1. Gross Pollutant Traps

The proposed stormwater treatment train under the Interim Arrangement would consist of gross pollutant traps (GPT) upstream of the proposed OSD tank on Lot 2 and connection into open trunk drainage channel as a means of primary stormwater treatment. GPTs are designed to capture litter, debris, coarse sediment, as well as some oils and greases. All GPT's are proposed to be located within private lands with two located within Lot 2 and the other upstream (east) of the open trunk drainage channel.

A high-flow bypass for the GPTs would nominally be equivalent to the 4 EY (3-month ARI) peak flow rate discharging to the GPT. Design flows for the GPTs and their final configuration would be confirmed at the detailed design phase. SQIDEP approved proprietary tertiary treatments have been proposed downstream

4.5.2. Detention Tanks

Stormwater runoff from the developed Lot 2 is proposed to be collected via pits and pipes and discharge into the proposed detention tank within the north west corner of the lot. This underground tank will provide storage and with a controlled outlet structure detain all storm events up to and including the 1% AEP event. Proprietary treatment devices will be installed within the tank to ensure the stormwater nutrient targets as met to comply with the Mamre Road DCP. Part of the tank volume (excluded from OSD volume) is to be used as stormwater storage for reuse purposes. This is discussed further in **section 4.5.4.**

A summary of the key detention tank parameters and DRAINS model results for the major and minor system flow is presented in **Table 6.**

Table 6 : Key Lot 2 Detention Tank & Reuse tank parameters and Drains model results

Parameter	Unit	Lot 2 Basin
Base level	mAHD	42.25
Reuse Tank max Still Water Level	mAHD	43.00
Low Flow orifice level	mAHD	43.00
Low Flow orifice diameter	mm	375 (To HumeFilter)
High Flow orifice level	mAHD	44.10
High flow orifice diameter	mm	750
Outlet pipe diameter	mm	3x375dia
Outlet pipe upstream IL	mAHD	42.50
Outlet pipe downstream IL (at channel)	mAHD	42.30
Outlet pipe length	m	17m (with off-line treatment)
Tank Roof Level	mAHD	45.25
Total Tank Volume	m^3	3650
Total Tank Reuse Volume	m^3	900
Total Tank OSD Volume	m^3	2750
5% AEP		
Peak Inflow	m^3/s	1.99
Peak Outflow total	m^3/s	0.832
Peak basin water level	mAHD	44.54
Peak basin storage	m^3	1873
1% AEP		
Peak Inflow	m^3/s	2.73
Peak Outflow total	m^3/s	1.38
Peak OSD water level	mAHD	44.94
Peak basin storage	m^3	2372

4.5.3. Evaporation Ponds

Ponds 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 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 and are generally more efficient than irrigation.

This Water Management Strategy under the Estate Arrangement (in the absence of the regional stormwater management scheme), which addresses the stormwater flow targets adopted in the Mamre Road Precinct DCP, incorporates an evaporation pond within the residual pad of Lot 6. Key parameters adopted for the ponds are summarised below in **Table 7**. The Lot 6 pond is interim only until the final stage 3 of the development is constructed.

Table 7: Adopted estate-wide evaporation pond parameters

Parameter	Lot 6 Pad
Contributing catchment:	Southern half Lot 5 pad, Lot 6 pad, Private access Road and southern portion of Abbotts Road extension
Outflow to:	Mamre Rd Culverts via Open Trunk Drainage channel
Low flow bypass (l/s)	0
Surface Area (m^2)	3000
Permanent pool volume (m^3)	3000
Exfiltration rate (mm/hr)	0
Evaporative loss (% of PET)	100

4.5.4. Stormwater Harvesting for Irrigation

As per the Technical guidance for achieving Wianamatta-South Creek stormwater management targets stormwater harvesting and reuse is another effective way to reduce stormwater flow volumes from frequent flows events to achieve the water quantity targets.

Water runoff from the developed Lot 2 is proposed to be stored in tank volume underneath the OSD tank volume (refer Section **4.5.2)** within Lot 2 carpark. Refer to Drawing 20-748 C6121 for early layout. Water from this reuse tank will be stored and used as irrigation in the residual lot 6 pads. Refer to Drawing 20-748 C5220 for extent of residual lands to be irrigated via this basin. It is noted this basin arrangement is interim only, to be used before the regional basins are constructed.

4.5.5. 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.

A rainwater tank reuse system on individual lots can be installed in many different configurations, including placing the tank above or below ground and using gravity or pressure systems (pumps) to supply rainwater for non-potable domestic uses. These uses typically include toilet flushing, laundry, hot water installations, car washing and irrigation.

The MUSIC model was developed to estimate the rainwater tank volume required to satisfy the Mamre Road Precinct 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:

- Non-potable demand of 15L/person/day at 25 persons/ha has been adopted as per the Wianamatta Creek MUSIC modelling guidelines. This has been calculated on a gross hectare basis
- 50% of the total warehouse roof area would drain to the rainwater tanks.

A summary of the rainwater tanks total sizing for all reuse purposes adopted in MUSIC is presented below in **Table 8.**

.Note that this will vary with roof catchment available in more detailed design. As per **Table 3** these rainwater tanks are incorporated in the Stage 2 design to meet the waterway health guidelines. Once the regional Sydney Water basins are constructed and recycled water is available for the Estate it is proposed the on lot tanks will be decommissioned. This is in line with discussions with Sydney Water**.** Tank sizing may be adjusted by the future on-lot design based on changed roof catchment areas if MUSIC modelling can show the reuse goals are achieved.

Table 8: Summary of rainwater and reuse tank parameters under the Stage 2 Arrangement

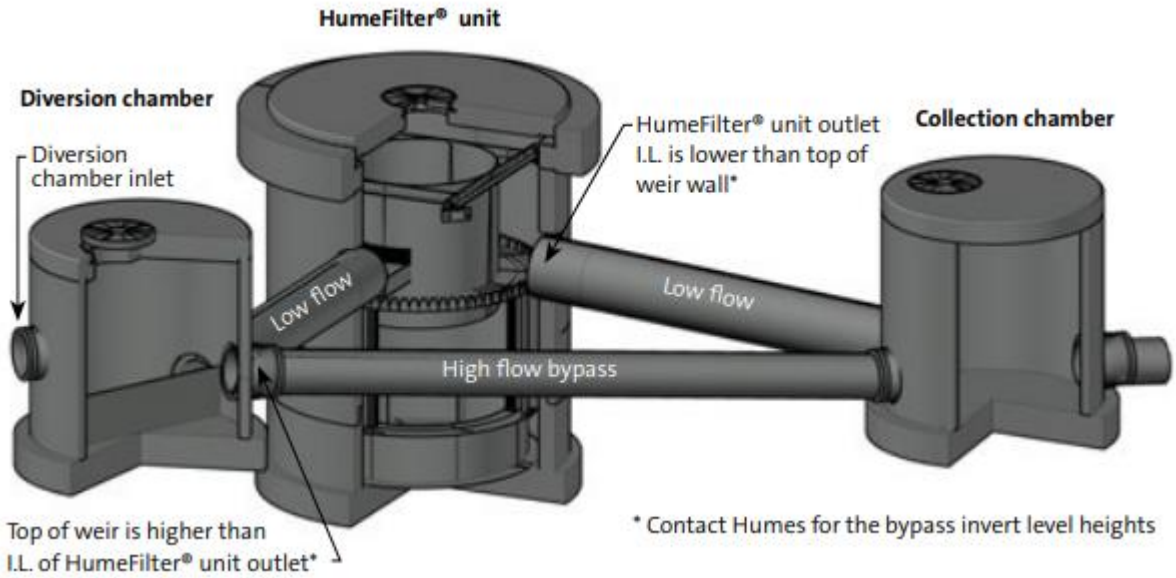
Lot	Total Lot Area (ha)	Catchment Area of Tank (ha)	Estimated annual irrigation demand (kL/yr)	Estimated Toilet reuse demand (kL/d)	Rainwater storage required (kL)
2 (RWT)	7.16	1.349 (Roof Only)	192	2.4	100
2 (Storage tank)	7.16	6.42	10000 (On Lot 6)	0	900

4.5.6. HumeFilter Proprietary Product

To satisfy the concentration-based stormwater treatment requirements, 2 HumeFilter UPT3600 units are proposed, to treat stormwater runoff from the newly impervious areas prior to discharging to the open trunk channel. The first unit is to be placed downstream of the Lot 2 OSD & storage tank before discharging into the southern open trunk drainage channel. The second unit is proposed to be placed upstream (east) of the open trunk drainage channel headwall and will be maintained by the developer. The HumeFilter units are SQIDEP approved and all values for MUSIC are in line with the SQIDEP review document. Both units will be located within private lands and not public road reserves. Refer to Civil Plan for location of each unit.

Design of the HumeFilter chamber has been coordinated with tailwater levels at the future downstream culverts. The 1% AEP level at the downstream culvert is currently estimated at RL43.024 (based on modelling being undertaken as part of the strategic design of Mamre Road upgrade by TfNSW) which will translate to a 170m inundation of the Lot 2 Humefilter. This is within acceptable limits for the unit in a major storm, and the driving hydraulic head of the upstream tank will prevent any backflow issues. There is no inundation in the 5% AEP storm (or smaller).

Each UPT3600 unit has a treatable flow of 160L/s. Flows exceeding the treatable flow will bypass over a weir due to the off-line nature of the unit. We have specified upstream GPTs with treatable flow in excess of 160L/s, so that the HumeFilter does not quickly fill up with gross pollutants.



4.6. Scenario Modelling

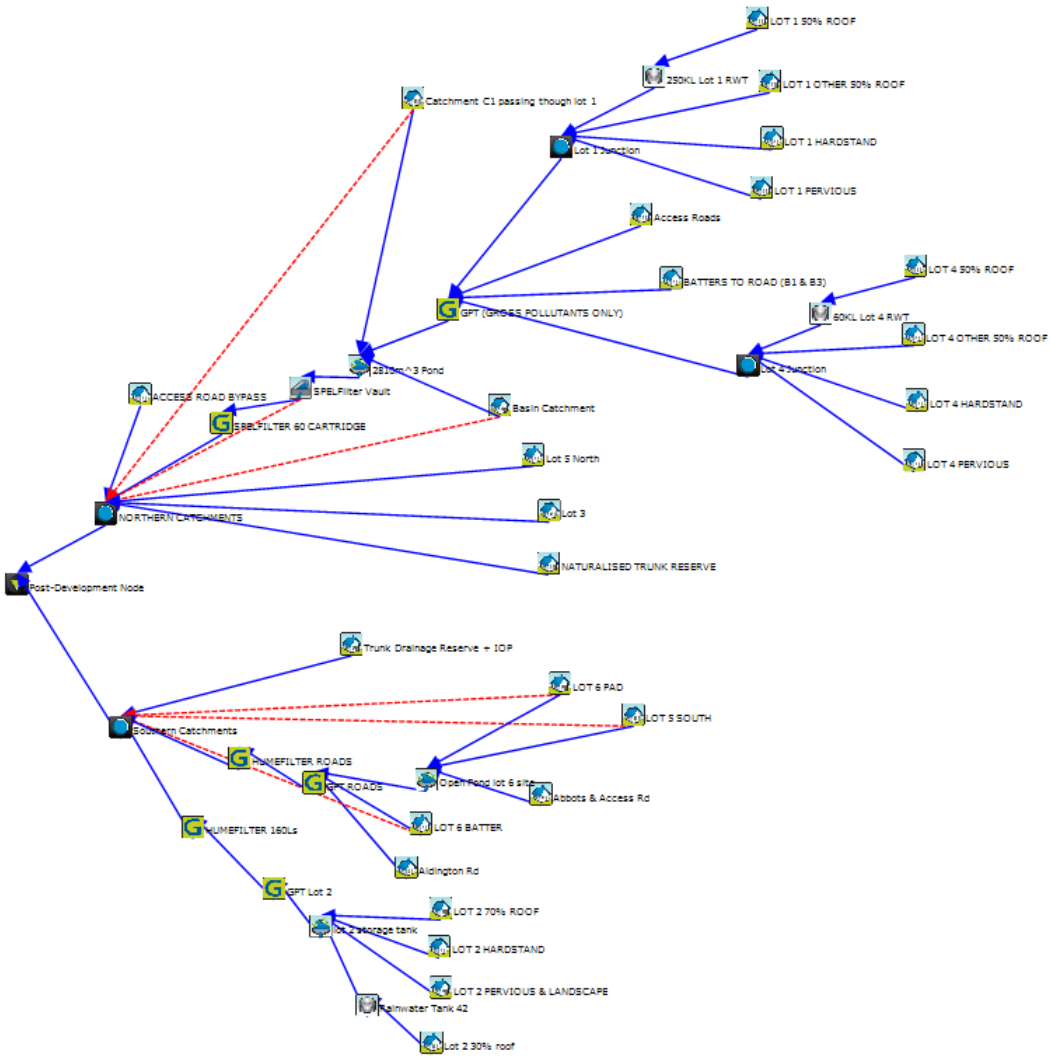


Figure 11: Post-development MUSIC model layout (Stage 2 Arrangement)

A MUSIC model was created to simulate post-development mean annual loads under the Stage 2 scenario. The post-development model has been created based upon the proposed post-development catchment extents presented in **Figure 7** and includes the approved Stage 1 scenario. Source nodes for each of the proposed lots have been adopted based on typical large-scale industrial land uses, including those depicted in the Estate Plan prepared by Nettleton Tribe. The layout of the post-development scenario is presented in **Figure 11.** Note that the natural catchments draining externally are not included in the MUSIC modelling, or in per hectare targets.

The post-development model has been created based upon the proposed post-development catchment extents presented in **Table 9**. This table only presents catchments associated with Stage 2.

Table 9: Music Modelling Catchments

Catchment	Total Area (ha)	Impervious Area (ha)	Pervious Area (ha)
LOT 2 70% ROOF	3.14	3.14	-
LOT 2 HARDSTAND	1.13	1.13	-
LOT 2 PERVIOUS & LANDSCAPE	0.75	-	0.75
LOT 2 30% ROOF	1.35	1.35	-
ALDINGTON RD	1.13	0.90	0.23
LOT 6 BATTER	2.28	-	2.28
RESIDUAL LOT 6 PAD	7.03	-	7.03
RESIDUAL LOT 5 SOUTH	7.83	-	7.83
ABBOTS & ACCESS RD	1.03	0.82	0.21
TRUNK DRAINAGE RESERVE + IOP	0.79	0.16	0.64
STAGE 1 AREA (APPROVED UNDER PREVIOUS SSD)	27.2		
TOTAL INTERNAL	**53.66**	**22.11**	**31.55**

Table 10: Post-development scenario land use breakdown under the Interim Arrangement

Catchment	Total Area (ha)	Roof area to rainwater tanks (ha)	Other impervious area (ha)	Pervious area (ha)	% Pervious area
Lot 2 (including drainage reserve)	7.16	1.35	4.43	1.39	19.4
Access Roads to Southern Trunk	2.16	-	1.73	0.43	20
Stage 2 Developed Areas	9.32	1.35	6.16	1.82	19.5
Residual catchments draining through stage 2	19.39	-	-	19.39	100

Pond area is considered impervious area.

Note: Residual and External catchments are assumed to represent existing greenfield flows and not included within the Music modelling for flow duration or stormwater quality management, as agreed with EH&G in the consultation period.

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

- Pervious landscape target of 15% as per Clause 4.2.3 (4) of the Mamre Road DCP s achieved as the total % pervious area for the developed portion of Stage 2 equates to 19.5% (**refer Table 10**).
- Rainwater tanks, as per the parameters presented in **Section 4.5.5**.
- GPTs, as per the parameters described in **Section 4.5.1**.
- Detention tank, as per the parameters described in **Section 4.5.2**.
- Stormwater reuse tank for irrigation, as per the parameters presented in **Section 4.5.4**
- Evaporation basin for flow reduction targets, described in **Section 4.5.3**

- Landscape irrigation, at 3.0ML/ha of pervious space (600mm/year with 50% of area irrigated).
- Residual land irrigation at 6.0ML/ha (600mm/year with 100% of area irrigated)
- Baseflow from pervious residual land surfaces is assumed to drain directly to the receiving node over time (red dashed arrows in **Figure** 11).
- HumeFilters to provide interim water quality treatment before discharge into trunk drainage system, as presented in **Section 4.5.6**.

The attributes for each of the proposed stormwater management measures have been determined such that they will satisfy the stormwater quality, quantity and flow targets outlined in **Section 4.1**.

4.7. Performance against stormwater quality targets

The "MUSIC MODELLING TOOKIT – WIANAMATTA" Published on 20/04/2022 by DPE, supplied to "support assessments and development of proposals for State Significant Development", provides two options for operational phase stormwater quality targets. The first option is the traditional "reduction in mean annual load from unmitigated development", while the new Option 2 provides an allowable mean annual load. For this development, due to the high amount of residual land, the allowable mean annual load target has been selected.

MUSIC model results presented as mean annual loads per hectare per year at the receiving node indicate that the adopted stormwater quality target reductions are achieved, as shown in **Table 11**.

Table 11: Summary of MUSIC modelling results against stormwater quality targets (kg/ha/year)

Parameter	Proposed Layout Source Load (kg/ha/yr)	Proposed Layout Residual Load for Stage 2 (kg/ha/yr)	Target allowable Mean Annual Load (kg/ha/yr)
TSS (kg/ha/yr)	422.5	**66.18**	80.00
TP (kg/ha/yr)	0.88	**0.20**	0.30
TN (kg/ha/yr)	6.13	**2.26**	3.50
Gross Pollutants (kg/ha/yr)	74.10	**2.05**	16

The MUSIC model results presenting treatment train effectiveness shows that while the adequately satisfies the allowable mean annual loads (Option 2). Due to the large proportion of un-developed land contributing to the treatment train, the reduction targets are less feasible than in a fully developed estate assessment.

Under the Sydney Water Regional strategy, stormwater quality management measures would be incorporated into the regional stormwater management scheme to be designed, delivered and operated by Sydney Water. In this case, the Stage 1 SPEL Filter, Stage 2 HumeFilters, residual irrigation, rainwater tanks, evaporation ponds and storage ponds are expected to become redundant, with treatment targets met by Sydney Water centralised assets.

4.8. Performance against stormwater quantity targets

Table 12 presents the pre-development and post development flow rates, generated by hydrologic and hydraulic modelling in DRAINS, for a range of events between and including the 50% AEP and 1% AEP design storm events at the discharge points from the site.

Table 12: Pre-development and post-development peak flow rates (Interim and Ultimate Arrangements)

Design Storm Event	Pre-Development Peak Flow Rate (m^3/s)	Post-Development Peak Flow Rate (m^3/s)
50% AEP	1.37	0.993
20% AEP	2.09	2.07
10% AEP	3.00	2.98
5% AEP	4.01	3.9
2% AEP	6.13	5.18
1% AEP	7.42	6.34

The DRAINS model results demonstrate that the post-development peak flow rates would be less than or equal to pre-development peak flow rates for a range of storm events between (and including) the 50% AEP and 1% AEP design events. Therefore, the stormwater drainage system and detention basins as proposed would satisfy the development controls relating to stormwater quantity management.

The Westlink Estate design flows have been derived using IL-CL methods and post development flows use ILSAX modelling to these limits. It is understood that the higher level modelling undertaken by Sydney Water uses RAFTS modelling, resulting in significantly lower pre-development peak flow rates ($5.1m^3/s$ for the 1% AEP). RAFTS is not practical or accurate for finely modelling urban catchments to the level of detail the civil design must reach. Our understanding is that while using ILSAX and IL-CL results in higher flow rates, as long as we are consistent with our internal modelling of pre-development and post-development this will be acceptable to Sydney Water. The flood modelling by Stantec will provide a like for like analysis against Sydney Water modelling showing that the development does not negatively impact the downstream catchments, regardless of the modelling method used for the urban catchments.

4.9. Performance against stormwater runoff volume 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 (Interim Arrangement)

Parameter	Result	DCP Target	Complies with DCP target	
			DCP Option 1 (MARV approach)	DCP Option 2 (Flow Duration Curve approach)
Mean annual runoff volume (ML/ha/yr)	1.94	2.0	Yes	n/a
95%ile flow (L/ha/day)	24,359	3000 to 15000	n/a	No
90%ile flow (L/ha/day)	2,334	1000 to 5000	Yes	Yes
75%ile flow (L/ha/day)	338	100 to 1000	n/a	Yes
50%ile flow (L/ha/day)	50	5 to 100	Yes	Yes
10%ile flow (L/ha/day)	0	0	Yes	n/a
Cease to flow	12%	10% to 30%	n/a	Yes

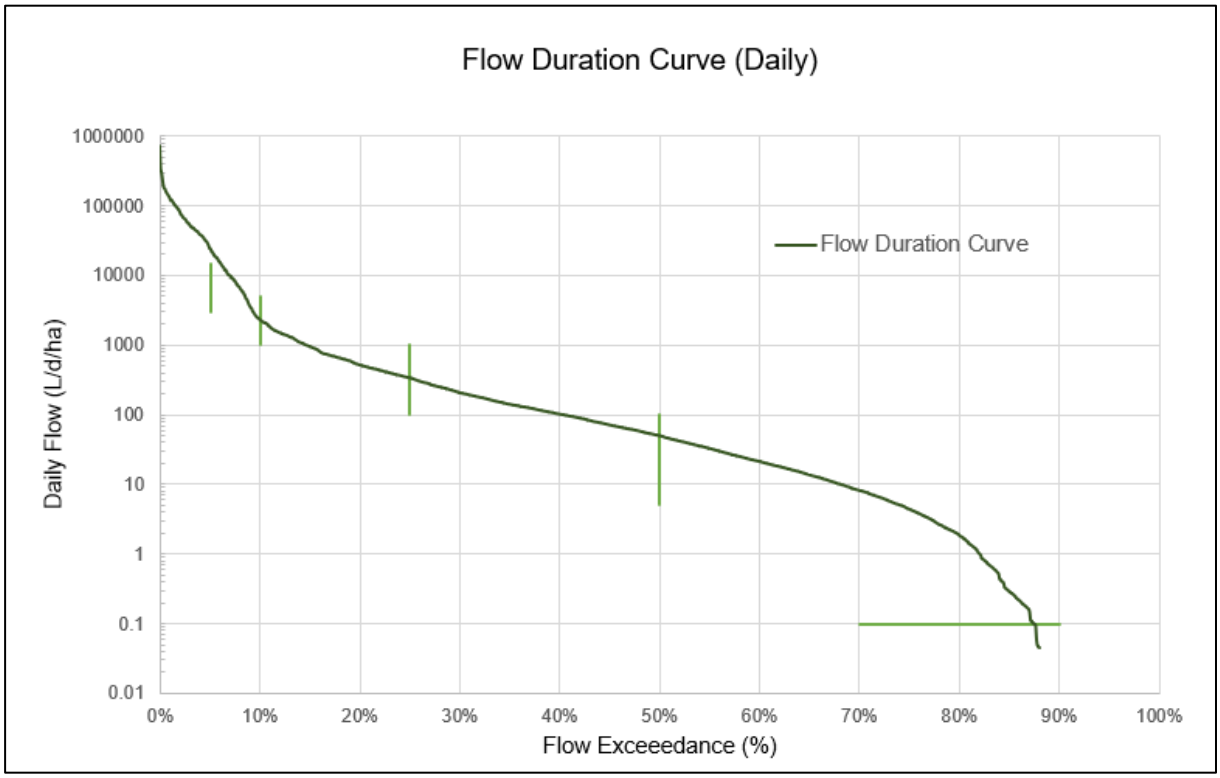


Figure 12: Flow duration curve for the proposed stormwater management measures

The results presented in **Table 13** demonstrate the proposed stormwater management measures that will be implemented under the Interim Arrangement satisfy the Option 1 DCP stormwater flow targets for the site.

4.10. 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.

The Estate Arrangement would incorporate some estate-based measures such as on-lot rainwater tanks, GPTs and an estate-wide detention basin. 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 Sydney Water.

5. Site Water Balance

5.1. Water Balance Overview

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 demand 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.

With the appointment of Sydney Water as the regional Waterway Manager and the announcement of a regional stormwater management scheme, opportunities for water reuse within the Mamre Road Precinct will include regional stormwater harvesting and reticulated recycled water.

5.2. Water Requirements

Water requirements within the Westlink Industrial Estate will be typical of large format warehouses and distribution centres. Sources of demand for water within the proposed allotments and public domain will include:

- Office amenities (kitchen, bathrooms)
- Landscape irrigation
- Dust suppression (depending on end user requirements)

5.3. Water Sources

The primary source of water to the Westlink Industrial Estate will be Sydney Water's potable water reticulation network.

A "third-pipe" reticulated recycled water network will supply non-potable water throughout the Mamre Road Precinct. Non-potable water will be supplied from two sources:

- Stormwater harvested within precinct-wide wetlands / ponds, to be delivered and operated by Sydney Water as part of a regional stormwater management scheme.
- Recycled water from the planned Upper South Creek Advanced Recycled Water Centre.
- Recycled roof runoff water treated and pumped on site.

5.4. Water Use Minimisation

Sydney Water provides a wide range of advice and guidance relating to water use minimisation and water efficiency. Whilst warehouses and distribution centres are relatively low water users in comparison to other industrial users, the following water use minimisation principles will apply to development within the Westlink Industrial Estate:

- **Avoid using water** where possible, such as sweeping hard surfaces instead of washing them.
- **Reduce water use** by installing water-efficient appliances and equipment (e.g., toilets, urinals, shower heads).
- **Reuse water** from manufacturing or cooling processes to toilet flushing, landscape irrigation and dust suppression.

6. Overland Flow 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.**

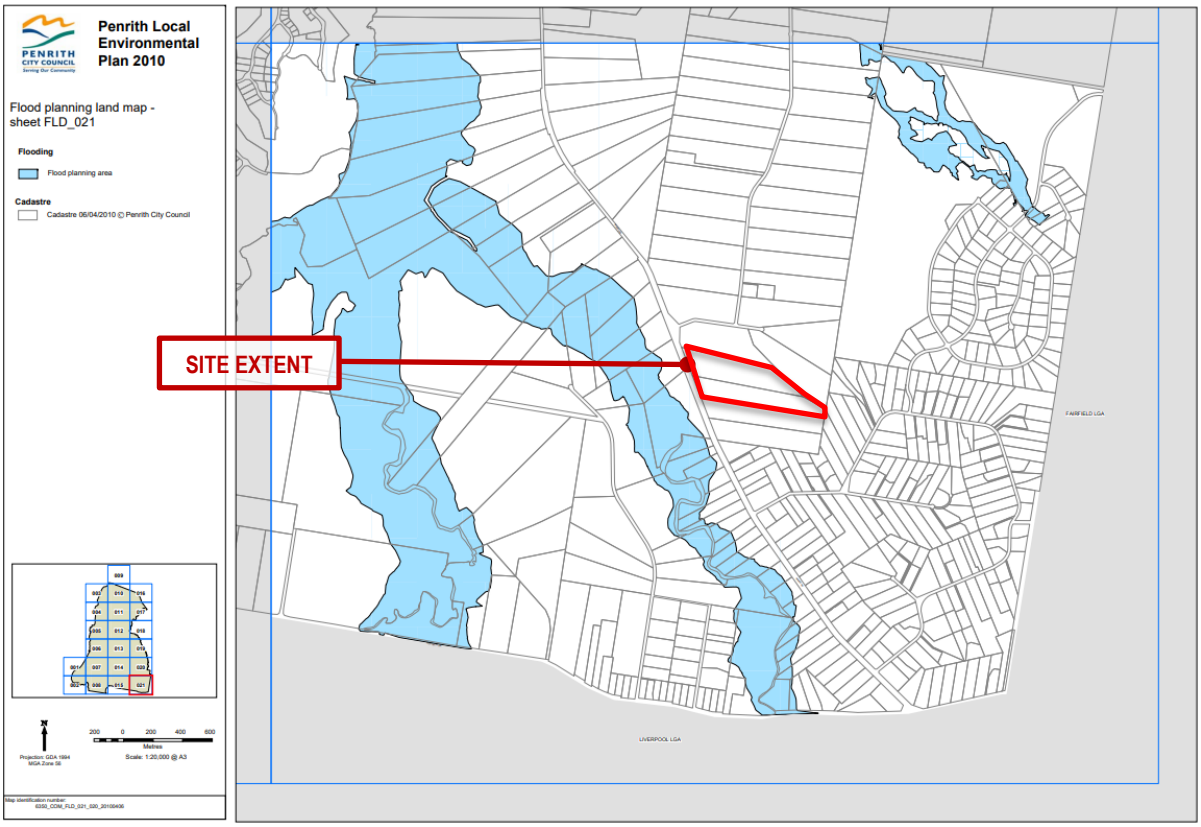


Figure 13 : Extract of flood planning land map (Penrith LEP 2010)

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 Error! Reference source not found. This mapping shows the extent and d epth of overland flow from local catchments within the site.

The proposed development of the site, including bulk earthworks, construction of a major and minor drainage system and construction of the proposed detention basin, will satisfy the development controls related to flood prone land outlined in Section 2.5 of the Mamre Road Precinct DCP.

The design of major system drainage elements is consistent with the principles of the NSW Government *Floodplain Development Manual* and Penrith City Council's *Stormwater Drainage Specification for Building Developments*. Under the post-development scenario, overland flow will be safely contained within the proposed road reserve and within trunk drainage infrastructure that has been incorporated into the design of the subdivision works.

As presented in **Table 12**, 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 50% AEP and the 1% AEP event. Therefore, there will be no flood impact on adjacent properties associated with the proposed development of the site.

Refer to **"Flood Impact Assessment Westlink Industrial Estate – Stage 1 290-308 Aldington Road, Kemps Creek"** and **"Flood Risk Assessment Westlink Industrial Estate – Stage 1 290-308 Aldington Road, Kemps Creek"** by Stantec for further details including 2D flood modelling of downstream impacts.

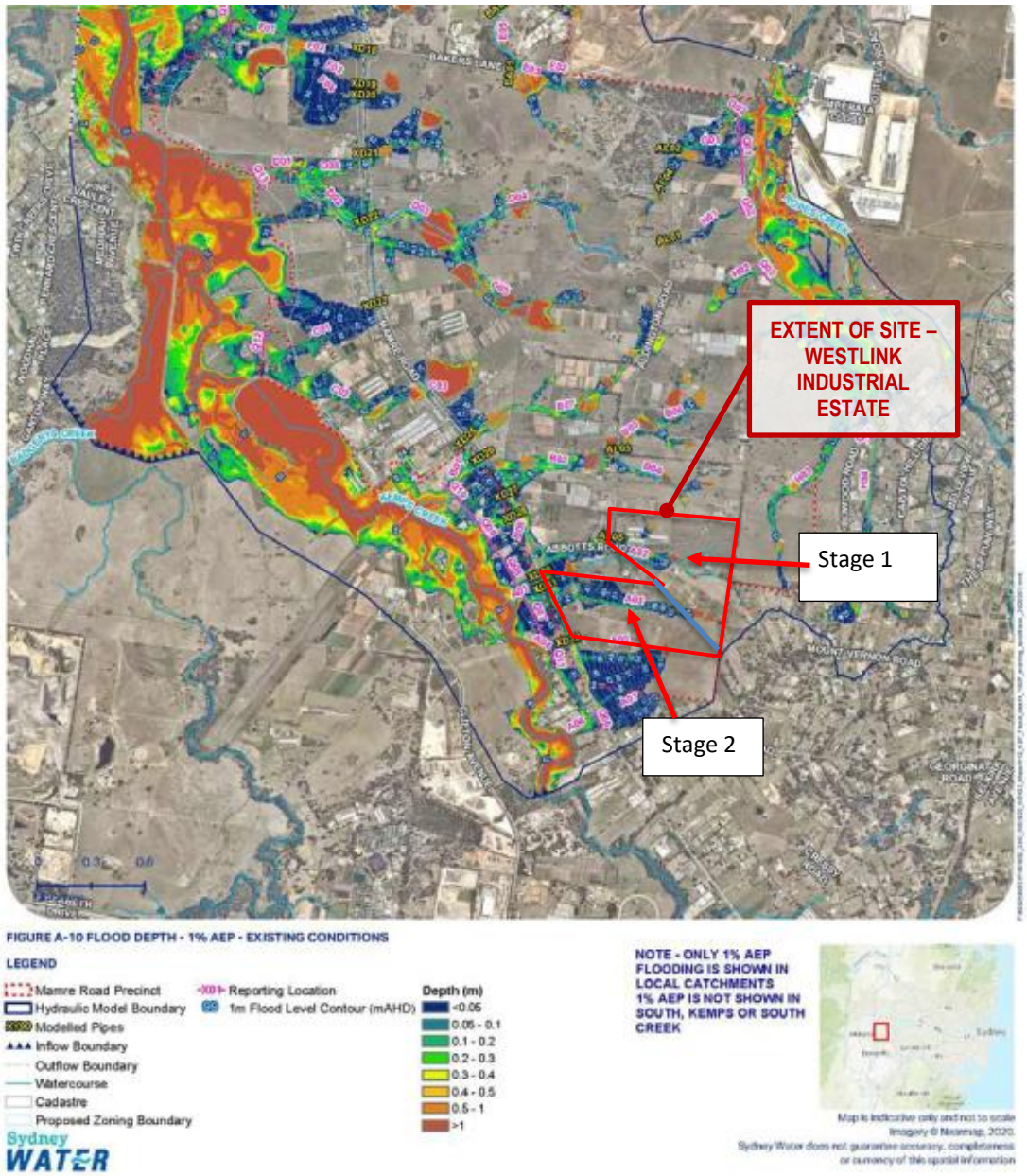


Figure 14: 1% AEP flood depth from local catchments under existing conditions (Sydney Water, 2020)

Figure 14 above shows that there are some flood impacts under the existing conditions within the stage 2 site.

The Stantec modelling for stage 2 indicates that while storms below the 200 year ARI overall reduce downstream flooding impacts compared to the pre-developed flooding, there are moderate downstream impacts during the 500yr and PMF events on the south western boundary of stage 2. Note that the modelling only has modelled the existing conditions of the downstream Mamre Road, which is expected to be upgraded by Transport for New South Wales including the culverts under the road. It is likely that these upgrades will reduce flooding particularly for the west of stage 2 which is affected by existing building up of flooding adjacent to Mamre Road. This is to be confirmed in a future flood model which considers the upgraded Mamre Road culverts when the design information becomes available.

7. Maintenance and Lifecycle Costs

7.1. Maintenance and Operations

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.

The Ultimate Arrangement would incorporate some estate-based measures such as on-lot rainwater tanks, GPTs, an estate-wide detention basin and detention tanks. These measures would be managed and maintained by the proponent, with inspection and maintenance requirements consistent with those described above. Given the GPT will be a proprietary device maintenance and operation procedures will also be in line with the manufacture's specifications. Refer to **Appendix 3** for example of maintenance manuals for the proprietary devices specified within the Stormwater Management Plan.

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 Sydney Water.

APPENDIX 1 – CIVIL DRAWINGS

- 20-748-C5000 SERIES (INFRASTRUCTURE)
- 20-748-C6000 SERIES (ON-LOT)