200 Aldington Road Industrial Estate, Kemps Creek, Lots 20-23 DP255560 and Lots 30-32 DP258949

Civil Infrastructure Report

CLIENT/ Fife Kemps Creek Limited

DATE/ JUNE 2022

CODE/ 19-609

Commercial in Confidence

Document Registration

Document Title	200 Aldington Road Industrial Estate, Kemps Creek, Lots 20-23 DP255560 and Lots 30-32 DP258949
Document File Name	R001-06-19-609-Civil Infrastructure Report - RTS3.docx
Section	Civil Engineering
Document Author	Debbie Fransen

Issue	Description	Date	Author	Checked	Approved
01	Draft	10-09-2020	Samip Shah	☒	☐
02	Draft	25-09-2020	Samip Shah	☒	☐
03	Draft	30-09-2020	Samip Shah	☒	☐
04	For Approval	09-09-2021	Alex Lohrisch	☒	☒
05	For Approval	14-04-2022	Debbie Fransen	☒	☒
06	For Approval	21-04-2022	Debbie Fransen	☒	☒
07	For Approval	29-06-2022	Debbie Fransen	☒	☒

Contents

List of Figures:

List of Tables:

1. Executive Summary

This report is a summary of the Civil infrastructure requirements to aid in the development known as 200 Aldington Road Industrial Estate located in, Kemps Creek. The site is located to the east of Aldington Road and is legally described as Lots 20-23 in DP 255560 and Lots 30-32 in DP 258949, with an area of approximately 72.09 hectares (ha) within the Penrith City Council Local Government Area (LGA).

The site has approximately 1,242m of direct frontage to Aldington Road with one proposed temporary intersection and two permanent intersections providing vehicular access to the development. Until connection is made to Aldington Road from the future Southern Link Road (located to the north) and the permanent intersection can be constructed, the access to Aldington Road will be provided via the temporary T intersection.

The site is located approximately 4km north-west of the future Western Sydney Nancy-Bird Walton Airport, 13km south-east of the Penrith CBD and 40km west of the Sydney CBD.

The site is part of the Broader Western Sydney Employment Area and is zoned land under the *State Environmental Planning Policy (Industry and Employment) 2021 (SEPP I&E).*

Consistent with the above, this report has been prepared to support a State Significant Development Application under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to enable the construction of industrial warehouse and distribution buildings within Stage 1.

2. Background and Summary of Project

This Civil Report forms part of a response to a Request for Additional Information for the proposed Concept State Significant Development Application for a new industrial estate on land at 106 – 228 Aldington Road, Kemps Creek.

The EIS for the project was placed on public exhibition between 18 November 2020 and 15 December 2020. During this period, a total of 18 submissions were received. These submissions were addressed and subsequent amendments to the project were made, as outlined in the Response to Submissions Report (dated 23 March 2021) prepared by Ethos Urban.

In written correspondence dated 28 April 2021, it was requested that FKC provide a further response to additional commentary raised by DPE, as well as additional comments raised by public authorities in their review of the first Response to Submissions Report. This was responded to via a second a Response to Submissions Report outlined by Ethos Urban (dated 22 September 2021).

Additional correspondence was received from DPE dated 15 November 2021 which has necessitated updates and additional information, as contained within this report.

Summary of Project for which development consent is now sought:

Consent is sought for the following development. It represents minor amendments and does not represent a significant material change to what was previously proposed under the second RTS Report (22 September 2021).

- A concept masterplan with an indicative total building area of 342,865 sqm, comprising:
  - 325,865 sqm of warehouse gross floor area (GFA);
  - 17,010 sqm of ancillary office GFA;
  - 13 individual development lots for warehouse buildings with associated hardstand areas and two lots for water management infrastructure purposes (each including a bio-retention basin);
  - Roads, including:
    - Internal road layouts;
    - Southern road connection to Aldington Road;
    - Northern boundary road (half road corridor) connecting to Aldington Road;
    - Road connections to adjoining landholdings to the north and east;
    - Provision for 1,516 car parking spaces; and
    - Associated concept site landscaping.

- Detailed consent for progressive delivery of site preparation, earthworks and infrastructure works (i.e., Stage 1 works) on the site, including:
  - Demolition and clearing of all existing built form structures;
  - Drainage and infill of existing farm dams and any ground dewatering;
  - Clearing of existing vegetation;
  - Subdivision of the site into 15 individual lots;

- Construction of a warehouse building with a total of 50,300 sqm of GFA, including:
  - 47,800 sqm of warehouse GFA;
  - 2,500 sqm of ancillary office GFA; and
  - 221 car parking spaces.
- Bulk earthworks including 'cut and fill' to create level development platforms for the warehouse buildings, and site stabilisation works (if required);
- Roadworks and access infrastructure, including an interim access road and a temporary junction with Aldington Road;
- Stormwater works including stormwater basins, diversion of stormwater;
- Utilities services including sewer and potable water reticulation
- Road and boundary retaining walls.

This report addresses the project for which development consent is now sought. It is a stand-alone report and supersedes the previous reports and supplementary information prepared for the original development application and subsequent response to submissions.

3. Compliance with Secretary's Environmental Assessment Reports (SEARs)

This report responds to the SEAR's issued by the NSW Planning and Environment in July 2020. Table 1 below summaries all key civil / infrastructure issues raised in the SEAR's and how they have been responded to.

Table 1 – Response to SEARS

Key Issue	Response
Traffic and Transport	
Connection of development to adjoining sites Detailing how the proposed development connects to adjoining sites to facilitate their future development for their intended purposes	Overall General Arrangement Plan 19-609–C1005 prepared by AT&L indicates internal road layouts which provide connection to adjoining lots. The land to the east is serviced by both Road 01 and Road 05. The land to the north is serviced by Road 02, as well as allowance for a future road along the northern boundary which can be constructed when land can be acquired. Intersections on Aldington Road have been coordinated with the landowner (Frasers Property) to the west of Aldington Road. This latest road layout is in accordance with the DCP.
Site access and internal road layout Detailed plans of the site access and proposed layout of the internal road and pedestrian network and parking on site in accordance with the relevant Australian Standards and Council's DCP	Access for the site is off Aldington Road via two intersections. Initially, access will be a temporary intersection towards the northern end of the site. The ultimate northern intersection is to be built once land is acquired or approval received from adjacent landowner. The temporary intersection will be removed once a permanent intersection is constructed (either north or south) Refer General Arrangement Plan 19-609–C1005 prepared by AT&L indicating site access along with the proposed internal road layouts. Note also pedestrian and share paths included within the GA plan and typical road sections. Refer to Architectural plans prepared by SBA for internal parking layouts. Internal road and pedestrian networks are in accordance with the DCP.
Swept path diagrams Swept path diagrams depicting vehicles entering, exiting, and manoeuvring throughout the site	Refer to Vehicle Turn Path drawings 19-609-C1131 to 19-609-C1142 prepared by AT&L. Turn paths on building lots including driveways are provided in the ASON Traffic Impact Assessment
Road upgrade detail Details of road upgrades, infrastructure works, or new roads or access points required for the development	All upgrade works for new roads within the development have been documented within the AT&L Civil drawings. There are also concept designs for the Aldington Road and Abbotts Road upgrade and the upgrade of the Abbotts / Mamre Road

	Intersection The LOG-E is currently liaising with Council and TfNSW on these upgrades expected to be completed via WIK agreement to provide improved access to the development (s).
Soils and Water	
Topographic assessment A topographic assessment and justification the proposed earthworks are site responsive and contextually appropriate	A Topographic assessment and justification on proposed earthworks are discussed within Section 6 and 7 of this report.
Detailed site water balance A detailed site water balance including identification of water requirements for the life of the project, 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 the water use at the site	Section 10 Waterway Health and Water Sensitive Urban Design of the Report addresses water balance details, water supply source, total water runoff, usage calculations and efficiency measures and demonstrates how the site meets the objectives of the DCP.
Satisfactory arrangements for drinking, wastewater, and recycled water Demonstration satisfactory arrangements for drinking water, wastewater and if required recycled water services have been made	Refer to Section 10.3.1 of this report for discussion on water and sewerage for the site along with servicing advice received from Sydney Water.
Discharge water quality Characterisation of water quality at the point of discharge to surface and/or groundwater against the relevant water quality criteria (including proposed mitigation measures to manage any impacts to receiving waters and monitoring activities and methodologies)	Refer Section 10 of this report which addresses Waterway health and WSUD Note all stormwater discharge generated from the site will be treated to ensure the DCP targets are achieved.
Site specific integrated water management strategy 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 onsite detention system(s), onsite sewage management and measures to treat, reuse (including indicative quantities) or dispose of water	Section 10 Waterway Health and Water Sensitive Urban Design of the Report for Integrated Water Management strategy.
Measures to minimise water use Description of the measures to minimise water use	Refer to Section 10 of this report for discussion on water re-use across the site using rainwater and stormwater harvest tanks. Sydney Water has also advised recycled water is to be incorporated into the development.
Flooding assessment Detailed flooding assessment	Pre and post development flood assessment of the site has been undertaken by Cardno. Refer Flood Risk Assessment and Flood Impact Assessment Report.
Erosion and sediment control Description of the proposed erosion and sediment controls during construction	Sediment and Erosion control measures across the site are addressed in the Erosion and Sediment Control Plan by EMM for the various stages of the development. These plans have been prepared in accordance with the DCP and the IECA.

Infrastructure Requirements	
Description of infrastructure required on site A detailed written and/or graphical description of infrastructure required on the site, including any upgrades required	Infrastructure requirements for the site have been documented in the civil engineering drawings prepared by AT&L. Section 11 of this report also discusses all service utilities within and adjacent to the site. Continued coordination with utility infrastructure providers has been undertaken concurrent to formal SSD-10479 exhibition to ensure that adequate arrangements are made to ensure required infrastructure will be made available when required.
Identification of infrastructure upgrades Identification of any infrastructure upgrades required off-site to facilitate the development, and describe any arrangements to ensure that the upgrades will be implemented in a timely manner and maintained	Refer to Section 11 which highlights proposed infrastructure upgrade works required to service the proposed development. Note all these works will need to be confirmed with the relevant service Authority during detailed design stages. Consultation with each of these Authorities has commenced as part of this SSD process and will continue so during detailed design.
Infrastructure delivery and staging plan An infrastructure delivery and staging plan, including a description of how infrastructure on and off-site will be co-ordinated and funded to ensure it is in place prior to the commencement of construction	Refer Section 12 for indicative infrastructure staging and funding arrangements.
Development impact on existing utility infrastructure An assessment of the impacts of the development on existing utility infrastructure and service provider assets surrounding the site.	Any impacts to existing utility infrastructure will be discussed with the relevant service Authority during the detailed design phase. 200 Aldington and AT&L has, and will continue to, coordinate with utility Authorities regarding the proposed SSD development to identify augmentations required to existing infrastructure because of the proposed development. No significant impacts on existing utility infrastructure surrounding the site are envisaged as part of the proposed 200 Aldington SSD development.
Agency Comments	
Penrith City Council	
External Road Access and Aldington Road	
Aldington Road is currently a local rural road with poor horizontal and vertical alignment that is not suitable for constant heavy vehicle use. It is considered imperative that the whole of Aldington Road be upgraded as intended works within this proposal, to an industrial collector type road with kerb & gutter, drainage, a parking lane and through lane in each direction along with a central landscaped median. Property acquisition may also be required to accommodate any road	Refer to Section 8 of this report for discussion on proposed road design. Refer also to drawings 21-842-C500 to 21-843-C594 prepared by AT&L indicating the Aldington & Abbotts Road and sketches Mamre Road intersection upgrade works.

widening and this should be explored by the proponent in the formation on concept civil design plans that accompany the application.	The Aldington Road typical section is shown within the 500 series drawings prepared by AT&L. As shown in the drawings, land required for the completion of the Aldington Road upgrade will be dedicated when required for the road cross section in accordance with the DCP. Detailed discussions with PCC are ongoing in relation to this upgrade.
The application shall address the use of Aldington Road by heavy vehicles to gain access to the state road network and identify required upgrade works.	Refer to Section 8 of this report for discussion on proposed road design. Refer also to 500 Series Drawings indicates the proposed Abbotts / Aldington Road works. The Abbotts Road Mamre Road intersection upgrade works have been prepared in concept in consultation with TfNSW and are appended.
A concept design (Stage 1) Road Safety Audit is to be undertaken for Aldington Road.	The Stage 1 Audit will be undertaken when the final arrangement is agreed with Penrith City Council.
Aldington Road is to be upgraded for the full property frontage and shall include kerb & gutter, street drainage, path paving, landscaping, and undergrounding of all utility assets.	Refer to Section 8 of this report for discussion on proposed road design. Refer also to 500 Series Drawings indicates the proposed Aldington Road upgrade works.
A 3m shared path is to be provided along the eastern side of Aldington Road.	Refer also to 500 Series Drawings indicates the proposed Aldington Road upgrade works. A 2.5m shared path has been provided on both sides of Aldington Road in accordance with the DCP layout.
Internal Roads	
A concept design (Stage 1) Road Safety Audit is to be undertaken for the internal road network. Internal roads are to have a 13m pavement, a 3.8m verge with 1.5m path, a 4.8m verge with 2.5m shared path. The proposed development shall be designed to be serviced by a B-Double Vehicle. The application shall be supported by turning paths in accordance with AS2890 clearly demonstrating satisfactory manoeuvring on-site and forward entry and exit to and from the public road.	Refer to drawing 19-609-C1010 prepared by AT&L for Typical Road Sections which shows the compliance with the Internal Roads requirements of the DCP. Refer to drawings 19-609C1131 to 19-609-C1142 which demonstrates that the internal roads are designed to be serviced by a B-Double vehicle and shows the B-Double vehicle turning paths in accordance with the AS2890. A Stage 1 Road Safety Audit will be completed once Regional Traffic Modelling is completed, and prior to detailed design.
Water Quality Management and Stormwater Management	
Water quality and water quantity are to be addressed. Post developed flows shall match pre-developed flows.	Refer Section 9 and 10 of this report where stormwater quantity and quality are discussed. Note all stormwater discharge generated on site

Water quality shall be in accordance with Council's DCP and WSUD policies. It is Council's preference that on-lot water quality and water quantity treatment be provided for rather than large open basins. If large basins are proposed, then they shall remain under the ownership and maintenance of the development site. Council will not accept the dedication of any drainage basin as a public asset.	will be treated to ensure the DCP requirements are achieved. Two stormwater basins are proposed to ensure the DCP stormwater management targets are met, in conjunction with GPT's positioned on each development lot. The basins are proposed to remain in the ownership of and be maintained by the Developer and will not be dedicated to Council as a public asset.
Any basin shall be located clear of the 1% AEP flood level from Ropes Creek. The application shall demonstrate that downstream stormwater systems have adequate capacity to accommodate stormwater flows generated from the development. Any on-site detention systems must be within common property and accessible from the street. A water sensitive urban design strategy prepared by a suitably qualified person is to be provided for the site. The strategy shall address water conservation, water quality, water quantity, and operation and maintenance.	Basin B has been positioned alongside the tributary to Ropes Creek. It is within the 1% AEP flood extent (by 352m^3) as shown in SKC124. Basin B is determined to have insignificant impacts on the localised flood level in the FIA report (Cardno). Refer Section 9 and 10 of this report where stormwater quantity and quality are discussed. Note all stormwater discharge generated on site will be treated to ensure the DCP is achieved. The WSUD design strategy has been prepared by a suitably qualified person for the proposed site works.
The application shall include MUSIC modelling (*.sqz file) demonstrating compliance with Council's adopted Water Sensitive Urban Design Policy and Technical Guidelines.	Refer to Appendix C which includes the MUSIC results demonstrating compliance with the DCP. MUSIC X has been used for this project therefore a '*.mxproj' file has been provided.
Mainstream Flooding	
The site is affected by mainstream flooding from Ropes Creek. The application must be accompanied by a Flood Report prepared by a suitably qualified person. The application must demonstrate that the proposal is compatible with the State Government Floodplain Development Manual and Council's Local Environmental Plan and Development Control Plan for Flood Liable Lands.	Pre and post development flood assessment of the site has been undertaken by Cardno. Refer Flood Risk Assessment and Flood Impact Assessments supporting this SSD.
Local Overland Flows	
The site is affected by local overland flow flooding from adjoining catchments. Details of how these flows are managed through the site are to be provided. The application must be accompanied by an Overland Flow Flood Report prepared by a suitably qualified person. The development shall not have any adverse impact upon any adjoining property through the damming, concentration or diversion of local overland flows or local flooding.	The local overland stormwater sources flowing into and from the development site are shown on drawing 19-609-C1081. The external catchment flowing into the site is connected to the stormwater system. The number of site outflows has been reduced to two plus the external catchment discharge. Basin A outflows to an overland flow path coordinated with the adjoining landowner. Basin B outflows to the first order stream which is where most of the site's water currently flows. Refer to Section 9 of this

	report for more details. There are no adverse impacts on adjoining properties. The drains model of the site demonstrates the design of the drainage network and roads that provide overland flow paths manages the overland flows within the site.
Finished Ground Levels Earthworks and Interface Considerations	
Any development proposal progressed on this site must be informed by a topographic analysis that has regard to existing site attributes and constraints that would inform the resulting spatial arrangement of the road network, allotment orientations, dimensions and area and benching to minimise excessive excavation of filling works. The request for SEAR's does not include a survey drawing of the land in question, which is considered fundamental in the consideration of the concept plan, and the preparation of comments as part of the SEAR's process. Without a topographic analysis it cannot be ascertained if the arrangement suggested has merit or would require substantial revision to better align with cross fall considerations, flooding and streetscape amenity. As such, it is required that a topographic analysis be submitted, that identifies the proposed earthworks proposed with cut and fill ratio indications and demonstrated that finished ground levels are site responsive, and that boundary edge conditions do not result in excessive retaining walls. Details of bulk earthworks including pad surface levels and retaining wall heights are to be provided. All retaining walls are to be located on private lots. The interface of retaining walls with Aldington Road is to be addressed.	A Topographic assessment and justification on proposed earthworks are discussed within Section 6 and 7 of this report. Also refer to the 1000 series drawings prepared by AT&L which demonstrates the bulk earthworks including pad surface levels and indicative pad levels and retaining wall heights to be located on private lots.
Easement Impacts	
Lot D suggests a basin which is within the easement extent as identified on the concept plans. It must be confirmed what this infrastructure is intended to serve (water quantity and quality or both) and how access and maintenance can be provided given TransGrid requirements.	The latest drawings prepared by AT&L shows the location of the proposed Basin B. As demonstrated on the drawing 19-609-C1052, the location of the Basin B is completely outside of the TransGrid Easement. Access remains available to the TransGrid easement.

4. Agency Consultation

This report summarizes all consultation and correspondence undertaken with the relevant authorities during the design phase. The following table summarizes these consultations and the relevant correspondence. It is noted that not all authorities were consulted during the initial design phase.

Table 2 – Agency Consultation

Agency Consulted	Correspondence
Sydney Water	Sydney Water's input to SEARs for SSD-10479 at 106-228 Aldington Road, Kemps Creek dated 17 July 2020 have been acknowledged and servicing arrangements for the 200 Aldington site and the Aldington Road Precinct. There are regular meetings and liaison with Sydney Water. The potable water and wastewater project briefs submitted by the Water Servicing Coordinator have been approved (Feb 2022), enabling design of these lead in services to commence.
Endeavour Energy	During the design phase of the SSDA, AT&L began the discussions with Endeavour Energy. An application has been lodged for the site (UIS0959), a design brief for the proposed method of supply was provided by EE in November 2021. In response a concept design has been prepared for submission.
TransGrid	Meeting held with TransGrid dated 1st July 2020, TransGrid's email correspondence dated 16 July 2020 for the 200 Aldington SSD and the SSDA Master Plan dated 18th September 2020. TransGrid provided a letter granting permission subject to conditions dated 12/7/21, subsequent changes to the masterplan are not deemed significant.
Transport for NSW	TfNSW's input for SSD-10479 dated 16 July 2020 and meeting held on 21st September 2020. Several further meetings have taken place in 2022 to resolve the traffic modelling and Mamre Road intersection design.
Water NSW	Water NSW's input for SSD-10479 dated 17 July 2020 have been acknowledged and acknowledged and these comments have been considered as part design documentation and responded to accordingly.
NRAR	The new proposal avoids modifying the stream and online dams to respond the NRAR concerns.

5. Responses to Submissions - 3

Responses to submissions received dated 15/11/2021 pertaining to the Civil design are listed below and responses are referenced within this or other reports where relevant.

Submission Comment	Response
Department of Planning Industry and Environment	
Mamre Road Precinct - Traffic and Access	
The Department notes that the interim 2026 modelling is based on 75% of the traffic associated with the LOG sites. Provide detailed justification for this approach and why traffic generated by other developments (approved or proposed) within the Precinct were not considered	This is addressed in the Ethos RTS report
The Department notes the outstanding concerns raised by Council in relation to the design and upgrade of Aldington Road and Abbotts Road to service the development. The design and delivery of these road upgrades are to be resolved in consultation with Council.	Refer section 8.5. Aldington Road on status of discussions with PCC
The Department also notes the issues raised by Transport for NSW (TfNSW) with regard to the design and performance of the Mamre Road/Abbotts Road intersection in their letter dated 25 October 2021. Please provide a response to these matters and undertake further consultation with TfNSW to ensure the proposed upgrades and modelling undertaken is to their satisfaction.	Refer section 8.5 on status of discussions with TfNSW and the Ethos RTS report
Stormwater Management	
The Department notes the advice provided by the Environment, Energy and Science Group that a regional approach has not been confirmed as viable option to meet stormwater management and quality targets. As requested previously, please demonstrate that the Concept proposal can achieve the controls in Section 2.6 of the draft Mamre Road Precinct Development Control Plan (MRP DCP), including the scenario where a regional solution will not be available.	This has been addressed in section 10 of this report and is not reliant on a regional solution.
Provide consideration of the trunk drainage infrastructure controls in section 2.6.1 of the draft MRP DCP and the stormwater management issues raised by Council in its letter dated 19 October 2021.	This has been addressed in section 9 Stormwater Management. Basins are not in accordance with the PCC std drawings however they achieve the targets within the DCP and will be maintained by the developer.
Please clarify where the proposed temporary swale on the site's northern boundary (identified in Figure 5 of the RTS report) will drain to.	This temporary swale will drain to the east along the northern boundary and into Basin B.
Earthworks and Retaining Walls	
The development proposes significant earthworks across the site and does not achieve balanced cut and fill. It must be ensured that earthworks meet the requirements of clause 33H of the WSEA SEPP. The development should seek to deliver balanced cut and fill and minimise retaining walls where possible. Retaining walls addressing the public domain must be stepped and have a maximum height of 6 m. The Department also notes the concerns raised by Council with regard to the design of retaining walls within the site and requests a response is provided to the matter	A response as relates to balancing cut and fill is included in section 7. Retaining walls have been redesigned to meet the DCP.

The Department continues to have concerns with the proposed fill retaining walls along the southern boundary of the site, including the height, design and adequacy of landscaping treatment to reduce visual and bulk impacts to the adjoining property. The draft MRP DCP requires retaining walls over 3.0m high be tiered	Retaining walls have been redesigned to meet the DCP. The landscape plans and visual impact reports address these concerns.
Please clarify the likely heights of any retaining walls required along the northern boundary of Lots A, B and C once the northern boundary road is constructed and confirm that the required setbacks and landscaping can be achieved.	An additional cross section has been provided in the civil drawings. The landscaping setbacks are shown on landscaping plans.
The Department notes the inclusion of the 'open space edge road' in the Concept and Stage 1 plans and proposed retaining walls between the road and RE2 zoned land. Consideration is to be given to the provisions of Section 4.4.1 and Control 23 in Section 3.4.1 of the draft MRP DCP with regard to levels and design of retaining walls adjoining the public domain.	This has been addressed in Ethos RTS report.
The Department notes there is a portion of earthworks proposed within the RE2 zone on Lot D, as shown on the Estate Masterplan. Please provide consideration of the permissibility of these works in the RE2 zone with regard to the zone objectives and land use table in Section 11 of WSEA SEPP	This has been addressed in Ethos RTS report The proposed development in RE2 zone does not increase the risk of natural hazards of the surrounding land (including, but not limited to, bush fire and flooding). As demonstrated by Cardno report
Internal Road Construction	
The Department notes that construction is proposed to commence on the northern part of the site, which results in the need for the 'Interim Access Road' to Aldington Road, as detailed in the RTS report. Please clarify the timing of construction of the remaining internal roads proposed as part of Stage 1 (i.e., prior to the issue of an occupation certificate for the Warehouse on Lot F).	All internal roads will be constructed prior to issue of an occupation certificate for Lot F
Please also provide additional justification for retaining the temporary road until the northern boundary road is constructed, rather than removing the road once the southern intersection with Aldington Road is completed and provide evidence of discussion with Council on this issue.	The temporary road can be conditioned to be removed once the southern or northern intersection with Aldington Road is completed. No response was received from PCC on this matter.
Provide evidence of consultation with landowner directly to the east with regard to the proposed road connections to their site (as mentioned in Section 7.2 of the RTS report).	A meeting was held with Capitol Hill Estate, the landowner to the east road levels were adjusted to suit their requirements.
The Department notes that the proposed roads have been designed with widths based on the 'expected' final MRP DCP. Unless the DCP is finalised in the meantime, the development should be designed to be compliant with the draft MRP DCP.	All roads are compliant with the DCP (adopted Nov 2021)
Landscaping	
Please clarify how landscaping between the proposed retaining walls and the external property boundaries will be accessed and maintained	There is sufficient space between walls and external property boundaries. The top of all retaining walls has safety fencing, gates will be provided where necessary.

Flooding	
Please provide further justification that the identified local impacts on flood levels and velocities will not have detrimental impacts on other properties or the environment in accordance with clause 33I of WSEA SEPP.	Addressed in the Cardno flood report. Additional explanation being prepared by AT&L with new plan.
Section 6.3 of the RTS report advises that the basin on Lot D has been relocated outside of the 1:100 flood level. However, Figure 3 of the updated Flood Assessment shows parts of the basin within this area. Please clarify.	The Basin on Lot D and Road R05 are above the post development 1% AEP level, as the retaining walls are above the PMF level. However, minor parts of Basin B and Road R05 are within the predevelopment 1% AEP. There is insignificant impact on flood flows (refer Cardno Report). Further justification for the incursion is included in the RTS report by Ethos.
Penrith City Council	
Traffic Management and Road Design Considerations	
Detailed design plans for the ultimate arrangement of Aldington Road and Abbotts Road is required prior to the consideration of any development form, as the development must respond to the adopted design plans for upgrade of existing local roads. Consideration of the proposal ahead of this adoption will not allow for orderly development with on lot arrangements on a master / concept plan that may not be deliverable or suitable when the final alignment and form of the road is known.	As per Section 8.5. The LOG-E group has submitted to PCC and TfNSW interim and ultimate concept designs for these upgrades. Once the concept is approved the detailed design can commence. The LOG-E is proposing construction of the interim where land is not available and to the DCP where land is available.
The proposed intersection and temporary / part road construction works including drainage and civil infrastructure works on Aldington Road must also be informed by infrastructure requirements outlined within the DCP and Contributions Plan when adopted. Key comments outlined in recent advice to the applicant was as follows • Road widths are to be in accordance with the final adopted Mamre Road Precinct DCP. • Full details of the temporary intersection on Aldington Road and the Temporary Road to service Stage 1 works shall be provided with the application. • A mechanism is to be proposed for closure of the Temporary Road (from Road 04 to Aldington Road) upon construction and dedication of either the southern access Road 01 or the northern access road.	The concept design for Aldington Road and Abbotts Road and the intersections are in accordance with the DCP. The details of the temporary intersection onto Aldington Road are shown on drawing C1073 of the Civil Drawings. The closure of the temporary road can be conditioned once an alternative access to the site is constructed.
Waterways Considerations	
The revised information notes that the two OSD/Water treatment basins are proposed to ensure Council's stormwater management requirements are met, alongside future GPT's positioned on each development lot. The basins must remain in the ownership and maintained by the Developer and not be dedicated to Council.	The two basins in the final layout are to remain in private ownership and will not be dedicated to Council.
There is currently no suggestion for on-lot OSD or stormwater treatment. As such, the proposed bioretention basins will also need to have capacity for OSD. As raised previously, Council does not support the resulting combined OSD / WSUD functions and resulting configurations of the 2 stormwater management basins nor the outcomes established via the proposed master plan. This includes the proposed depth which will not accommodate suitable planting to meet WSUD requirements	The Water management Solution is detailed in Section 10. The design meets the water quality and flow duration targets (minor noncompliance with cease to flow). The combined basin functionality design has been used successfully in nearby sites (Oakdale).

	The combined OSD/WSUD design mitigates redundant works if the regional solution is adopted, as the basin will only be required to function as an OSD basin. The basin will remain a private asset for ongoing operation and maintenance.
The proponent is again requested to reconsider the design and configuration of the stormwater management basins. This should include but not be limited to, the inlet design and flow configuration, depth of maximum ponding, sizing of basin, provision for access for maintenance, and vegetation densities and species. In this regard, there are many technical design guidelines (including those referenced in the Draft DPIE Music Modelling Toolkit which was referenced), available to assist in any revised design, including on Council's website which includes specifications for the design of bioretention systems.	As above.
The proposed the stormwater management approach is not fully consistent with Section 2.6 (Integrated Water Cycle Management) of the Draft DCP and this should be resolved prior to the approval of any stage	The water management requirements of the DCP have been achieved and are addressed in Section 10 of this report.
The application is seeking approval of Stage 1 works with a request to resolve the management for future stages as part of future applications, and when the Mamre Precinct Regional stormwater management arrangements are in place. The approach to stormwater management as a whole should be resolved prior to any approvals being granted as any early allowance would be premature if an overall strategic plan to manage stormwater is not established	The strategy has been reviewed and is not dependent on the regional solution. The water management requirements of the DCP have been addressed in Section 10 of this report.
Engineering and Stormwater Management Considerations	
The civil engineering drawings (Lot F) indicate that Aldington Road and Abbotts Road is the subject of works within this application with no design detail for those works. Any suggestion of works must form part of the application via design drawings. If the indication of works is due to the suggested letter of offer, this is yet to be agreed to by Council and is a critical threshold issue requiring resolution prior to the progression of this application.	As per Section 8.5 The LOG-E group has submitted to PCC and TfNSW interim and ultimate concept designs for these upgrades. Once the concept is approved the detailed design can commence. The LOG-E is proposing construction of the interim where land is not available and to the DCP where land is available.
Basin A still discharges low and emergency overflow to private property owned by others without an indication or demonstration of a secured easement or owners consent for the resulting discharge. This aspect is critical to the assessment of stormwater management and if consent cannot be obtained, a substantial redesign of the proposal may be required and in this event, Council would typically request an application be withdrawn until such time as a legal point of discharge is demonstrated and the proposal suitably responds to this.	Basin A discharges to private property in the location of the existing overland flow path. The neighbouring site culverts and open channel have been designed for this discharge. A draft easement plan has been presented to landowner for in principal approval.

Mamre Road Precinct DCP	
2.4 Integrated Water Cycle Management	
Waterway health and Water Sensitive Urban Design Control 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	Compliance with the DCP Flow duration option 2 has been achieved and this is demonstrated in Section 10.
Trunk Drainage Infrastructure Control 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 trunk drainage from the site to the west of Aldington Road has been provided through a pipe network located on private land.
Trunk Drainage Infrastructure Control 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.	Site stormwater drainage is provided within the road reserve. The external catchment from the west of Aldington Road is piped within private land.
Trunk Drainage Infrastructure Control 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	An overland flow report for the main waterway through the site in the north-east is provided via the Cardno Flood impact assessment report. The runoff from the minor external catchment (<4ha) and internal catchments have been modelled in DRAINS in accordance with PCC standards and the extract is provided in Appendix D. A copy of the DRAINS model can be provided for review.
2.5 Flood Prone Land	
Filling of Land At or Below the Flood Planning Level Control 16 Earthworks up to the PMF must meet the requirements of Clauses 33H and 33J of the WSEA SEPP as well as Sections 2.5 and 4.4 of this DCP. 17) Filling of floodways and/or critical flood storage areas in the 1% AEP flood will not be permitted. Filling of other land at or below the 1% AEP is also discouraged, but will be considered in exceptional circumstances where: The below criteria have been addressed in detail in the supporting FIRA; o The purpose for which the filling is to be undertaken is adequately justified; o Flood levels are not increased by more than 10mm on surrounding properties; o Downstream velocities are not increased by more than 10%; o Flows are not redistributed by more than 15%; o The cumulative effects of filling proposals is fully assessed over the floodplain; o There are alternative opportunities for flood storage; o The development potential of surrounding properties is not adversely affected; o The flood liability of buildings on surrounding properties is not increased; o No local drainage flow/runoff problems are created; and o The filling does not occur within the drip line of existing trees.	The site includes filling for road 5 and formation of part of the bund for basin B within the 1% AEP flood area. However, the FIRA shows that there is less than 10mm impact. Justification is the road layout and loss of developable IN1 land if basin and road were to move due to this small incursion into the 1% AEP zone. For full assessment against DCP and SEPP criteria refer Ethos Table of non-compliances.

6. Introduction

This report has been prepared to inform a State Significant Development Application (SSDA) for the development of 200 Aldington at Lots 20-23 and Lots 30-32 Aldington Road in Kemps Creek. Refer Figure 1 for the Site Location.

The aim of the report is to assess the potential impacts of the proposed development with respect to the Civil and Infrastructure and has been prepared in accordance with the Mamre Road Precinct DCP, Penrith City Council design guidelines, the relevant Australian Standards, and the relevant Austroads Guidelines.

This report supports an Environmental Impact Statement (EIS) prepared in respect of the proposal and should be read in conjunction with the EIS, supporting reports and development plans submitted with the SSDA.

The Site, outlined in blue on Figure 1 below, forms part of the wider proposed *State Environmental Planning Policy (Industry and Employment) 2021* ("I&E SEPP") which includes the Mamre Road Precinct. The pink lines are easements.

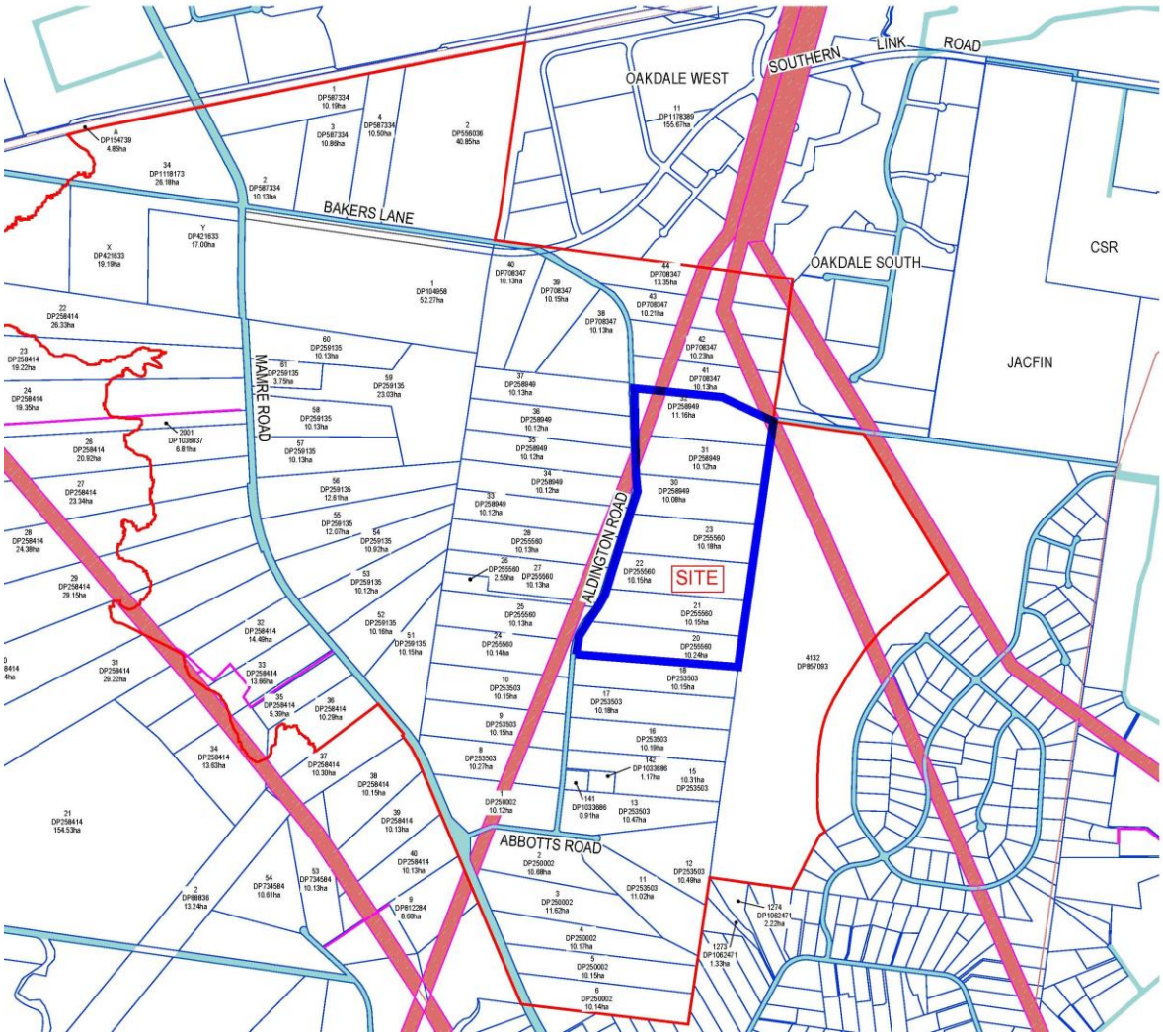


Figure 1 – Site Location

6.1. Existing Site

The Site has an area of approximately 72.09 Ha and is currently rural in use, comprising of dwellings, sheds, dams, and grassed fields.

The Site is located within Penrith City Council LGA approximately 2.5km south of Erskine Park and approximately 4km north-east from the proposed Western Sydney Airport. The Site is legally known as Lots 20-23 of DP 255560 and Lots 30-32 of DP 258949.

The site is bordered by Aldington Road to the west and existing rural lots to the north, east and south. Refer to Figure 2 below for aerial image.

Figure 2 – Site Location (aerial image)

6.2. Scope of Report

Objective of Report

The objective of this civil, stormwater and infrastructure services report, is to outline the design criteria used for the Engineering design of all components of the development and compare to the requirements of the Mamre Road Precinct Development Control Plan (DCP) and SEARs issued by the NSW Planning and Environment in July 2020.

This report should be read in conjunction with the AT&L Civil Engineering drawings submitted with this report. Supporting documentation that is referenced within the report include the following:

- Flooding - Site specific Flood Impact Assessment undertaken by Cardno, 2021
- Flooding - Wianamatta South Creek Flood Study, Advisian 2020
- Geotechnical Investigations (Douglas Partners & ADE)
- Riparian Assessment (Ecological Australia)
- Traffic Report (Ason)

- Erosion and Sediment Control Plan by EMM

7. Earthworks

7.1. Existing Geology

Based on a Geotechnical and Groundwater Summary undertaken by Douglas Partners (reference: R.002.Rev4, dated September 2021 for the site 200 Aldington Road, Kemps Creek, the following inferred sub surface soils were encountered across the site:

- TOPSOIL / topsoil filling to depths of 0.1 - 0.3m
- FILL to depths of 0.2 - 1.4m over parts of the site, but deeper in localised areas such as dam walls
- Residual Soil – variably stiff to hard silty clay, to depths in the range 0.6 - 3.3m
- BEDROCK - initially extremely low to very low strength shale or sandstone at first contact at depths of 0.6 – 2.8 m and continuing to the termination depths of 3 m. Very low to medium strength shale, sandstone or siltstone was identified in cored boreholes to termination depths of up to 8.4 m.

7.2. Cut/Fill Requirements

The cut / fill requirements within the site have been defined through multiple iterations and careful consideration of the following:

- Undulating topography within the Mamre Road Precinct resulting in the requirement for extensive cut and fill operations to facilitate economic development and provide flexibility to cater for the range of industrial customer requirements.
- Provisioning for connectivity to adjoining lands and managing existing upstream catchment flows.
- Minimising height of retaining walls fronting Aldington Road and mitigating retaining walls fronting internal public road reserves.
- Mitigate extensive cut in bedrock sub-surface units.
- Meet the requirements for the site to cater for IN1 – General Industrial employment which requires large flexible allotments.

The proposed earthworks design contained within the AT&L documentation provides the most contextually and economically appropriate design in consideration of the above requirements. Whilst retaining walls have been avoided as much as possible, there are high fill retaining wall along a section of the site southern boundary due to significant changes in level within the site and the goal of minimising imported fill.

Refer to Drawing 19-609-C1031 for Bulk Earthworks Cut/Fill Plan. Net import is the value highlighted in bold in Table 3 below, and is significantly less than the original proposal, and less than the previous submission in response to submissions 2. This import balance has now been reduced as much as possible while maintaining building pads at a level that allows them to be served by gravity services. This reduction in fill is attributed to additional design which included more detailed analysis of cut and fill volumes.

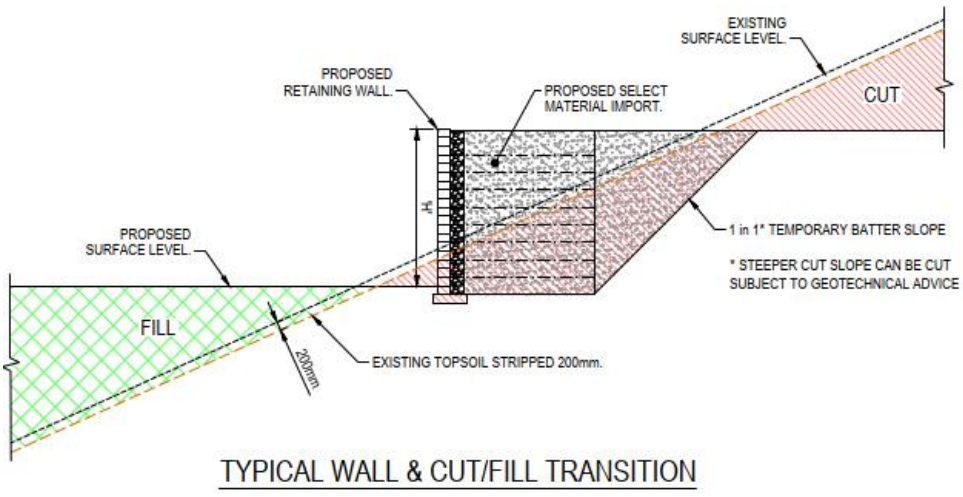


Table 3 – Cut/Fill Summary

Item	Volume (m^3)
Topsoil stripping	-135,015
Excavation of farm dams	-59,335
Net cut	-663,300
Net fill	895,479
Approx. erosion and sediment basins excavation balance	-28,968
Balance	**8,861 (Import)**

Note: volumes are based on the current proposed design, further detailed design may alter these. Negative indicates net cut whilst positive indicates import. It is assumed that all topsoil from the site will be re-used on site as per the geotechnical specification. Excess topsoil will be exported as required. Imported materials will comply with Fill Importation Protocols.

7.3. Erosion and Sediment Control

A separate Erosion and Sediment Control Plan (ESCP) for all phases of the development– demolition, construction, building and operation has been prepared by a CPESC at EMM Consulting.

7.4. Retaining Walls

Where possible, batter slopes will be provided to accommodate level changes. Where this is not possible retaining walls will be constructed along the estate road, lots and basins based on the current civil and earthworks design. A block product will be adopted for all retaining walls and will be detailed on the final civil drawings.

The proposed retaining walls will be built to the manufacturers design guideline requirements and verified by a structural engineer prior to construction. This practice has previously been adopted other

developments within the Penrith City Council LGA and considered input from the geotechnical engineer, utility coordination.

Retaining is required along the south and south-eastern site boundary where the proposed building pad levels will be cut down from existing. Refer to Drawing 19-609-C1080 for cut and fill wall locations. Retaining walls will be designed and constructed using standard industry practices. The tender for construction provides for the contractor to design and construct hence the detailed design has not been prepared at the time of this submission.

All retaining walls will be constructed on a staged basis as required to suit the development earthworks and stormwater basin works. Initially only retaining walls on boundaries where a wall is required to support roads or external boundaries will be constructed. Where the walls are not constructed due to uncertainty surrounding the final lot layout, a vegetated batter of 1 in 4 will be maintained for stability purposes. Temporary batters will be steeper (from 1 in 3 up to 1 in 1) and are to be stabilised and validated onsite by a geotechnical engineer.

All retaining walls will be located within private property and not within the road reserve areas.
All retaining walls will have pedestrian safety barriers and vehicular safety barriers if required in accordance with Austroads Guidelines as required.

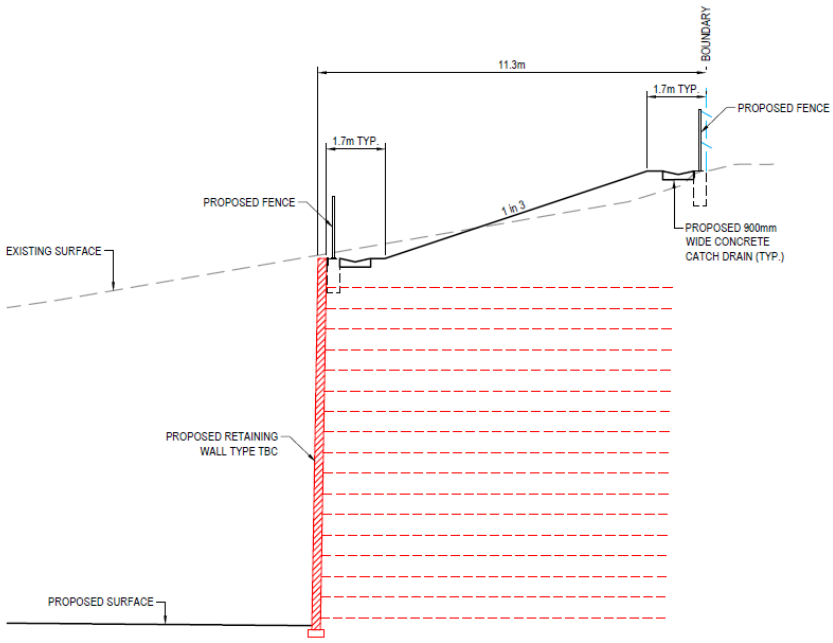


Figure 3 - Typical Retaining Wall

All retaining walls that are more than 2m high and are supporting land at a level of more than 1m above a road will be tiered and planted in accordance with the DCP, a typical detail is provided in Figure 4.

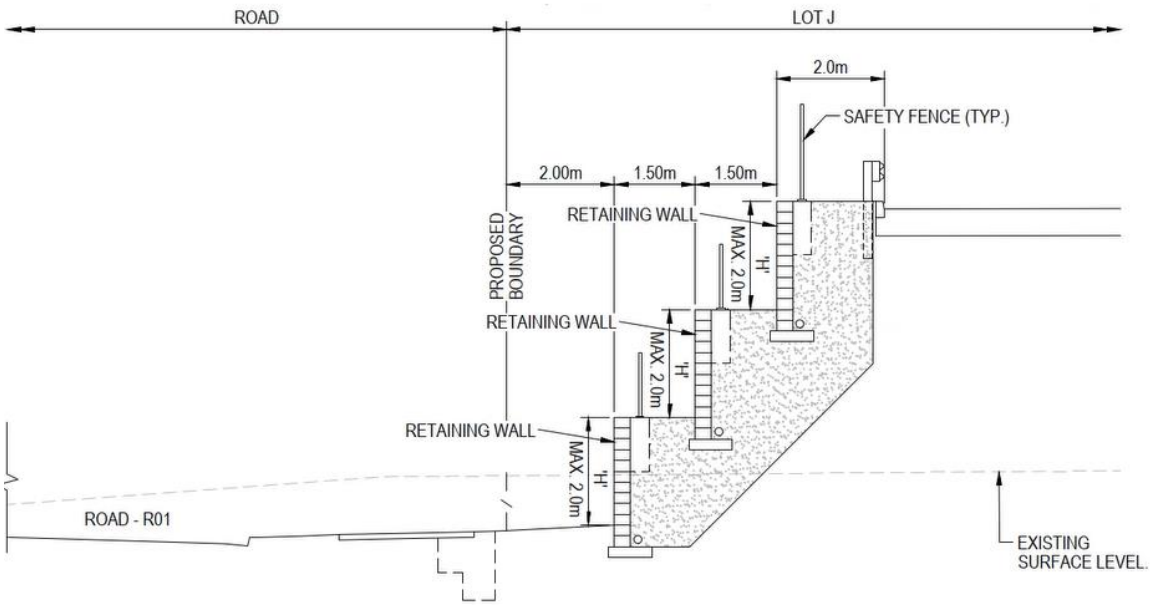


Figure 4 - Typical Tiered Retaining Wall

Where retaining walls are located within the PMF, as shown in 19-609 SKC124 these will be structurally designed and detailed for with PMF flow rates and velocities. This includes retaining wall 30 and 32 and the structures associated with the basin structure within Lot D.

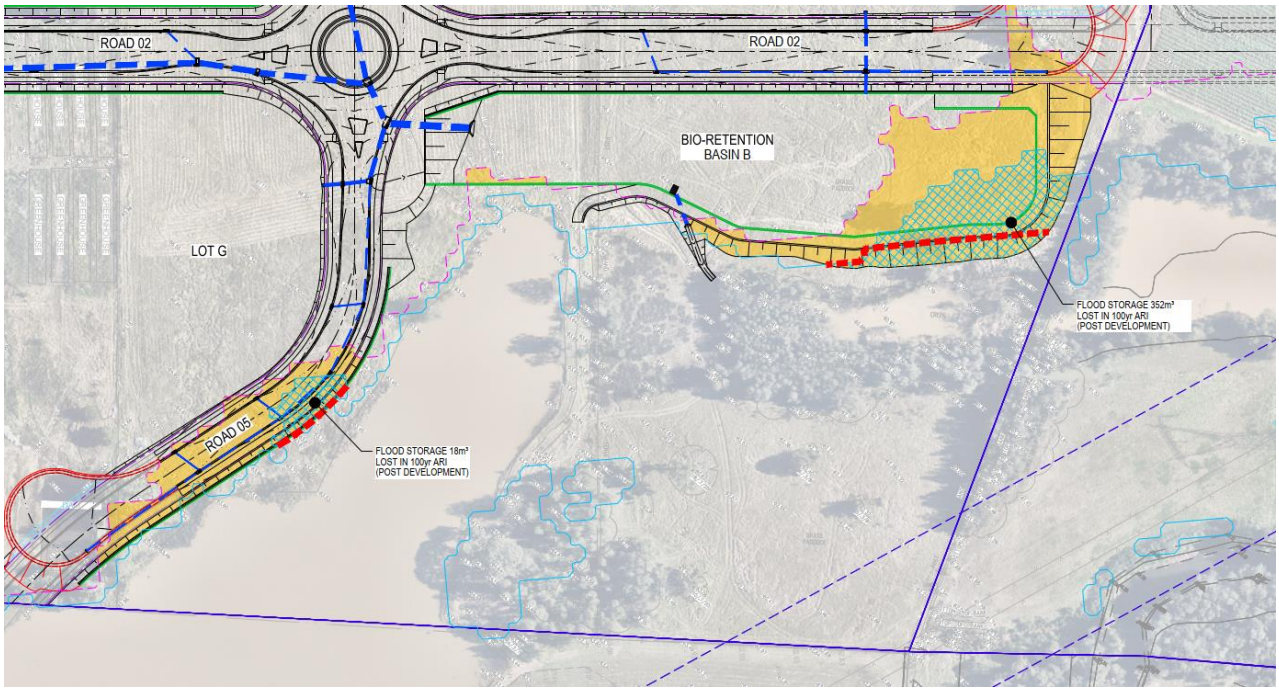


Figure 5 - Retaining Walls within the PMF (extract Sketch SKC 124)

8. Road Design

8.1. Internal Road Network

The internal road network will be designed and constructed in accordance with the DCP and Penrith City Council design and construction specifications.

The road network has been designed for 30m Performance Based Standards (PBS) Level 2 Type B vehicles and tested for a 36.5m PBS Level 3 Type A vehicles. This assessment and demonstrated compliance with the DCP are shown in the vehicle turn path plans in the civil drawing set 19-609 C1131-1142.

The internal roads follow the DCP road network hierarchy and cross sections. No guardrails have been shown or are envisaged at this stage, though these will be assessed at detailed design stage in accordance with Austroads. The proposed typical estate roads are designed in accordance with the typical sections in the DCP and are shown on civil drawings 19-609-C1010-C1011.

The design speed within the Estate Roads is 60km/hr and posted 50km/hr.

Road R01 into the site has been nominated as a Collector Road by the DCP. The DCP identifies that a median may be required. A median is provided only at the intersection with Aldington Road, a key signalised intersection. Analysis of the road and lot layout by Ason shows that a median on the full length of Road 01 would prevent access to the lots and conflict with swept turning paths and is not necessary for safety, therefore it is not included.

The internal road network includes cul-de-sacs at the end of R03 and R04 to provide access to lots that can't be accessed off local road R02 as direct vehicle access Aldington Road, a distributor road is not permitted.

Temporary turn heads have been provided on road R01 (collector road), R02 (local industrial road) and R05 (open space edge road) where through roads identified in the DCP are reliant on development of adjacent sites, to the north and east.

Cul-de-sacs will be designed and constructed in accordance with the Council guidelines requiring a 16.5m radius on the turn heads.

Fauna sensitive road design elements, to minimise vehicle strike during and after road construction were considered, particularly for the roads adjacent to the RE2 zoned land where fauna may be present. During construction site fencing will be placed along the edge of the retained farm dam/waterbody to prevent access by vehicles and people, except for during construction of the retaining wall. This will mitigate the risk to fauna during construction. Long term, after the construction the risk of fauna crossing is considered low due to the presence of retaining walls along the boundaries of these roads. The road will be higher than adjacent RE2 land and therefore not readily crossed.

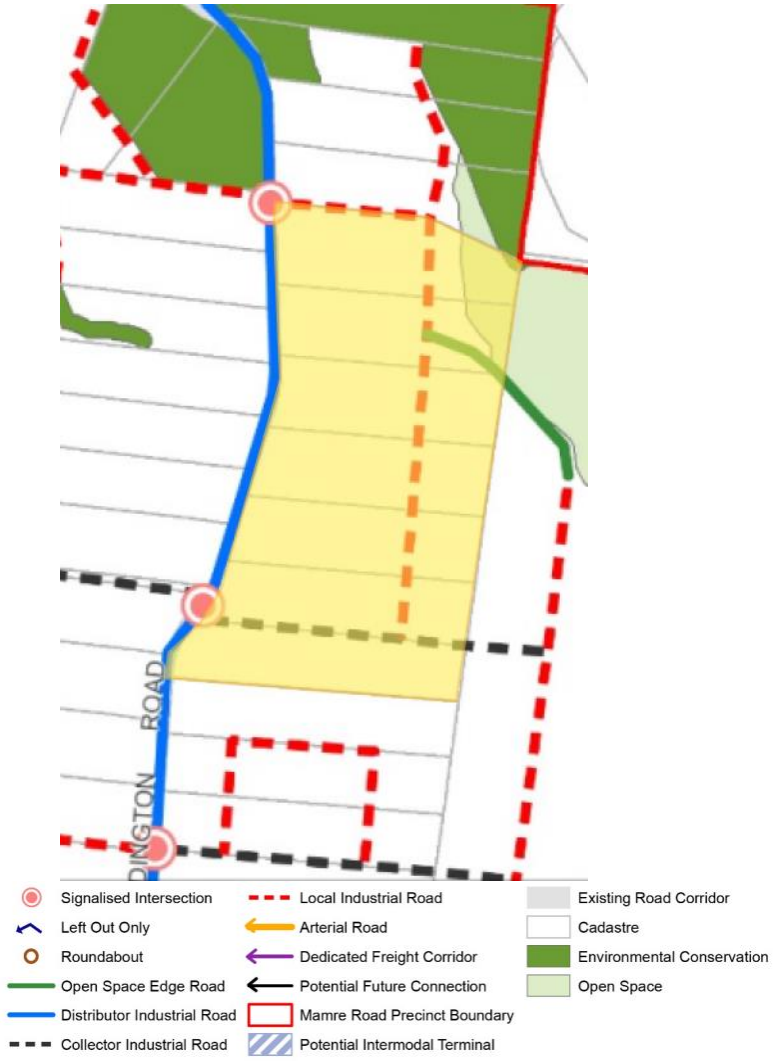


Figure 6 – DCP Road network hierarchy for site (shaded extract from DCP)

8.2. Access off Aldington Road

The DCP identifies two intersections with Aldington Road to support the traffic generated from the site, one on the northern boundary and one near the south. Initially, a temporary intersection and access road will be built within the TransGrid easement to provide access to the site, as shown in Figure 7. This will be used until an ultimate intersection with Aldington Road either to the north or south is constructed.

The construction of the permanent northern road requires agreement from the landowner to the north or acquisition to construct the road designed in the position identified in the DCP. Once an ultimate intersection with Aldington Road is constructed and dedicated, the interim intersection proposed in the TransGrid easement will be demolished. This has been agreed with TransGrid to solve the constraint that is currently restricting the development access in the northern part of the site.

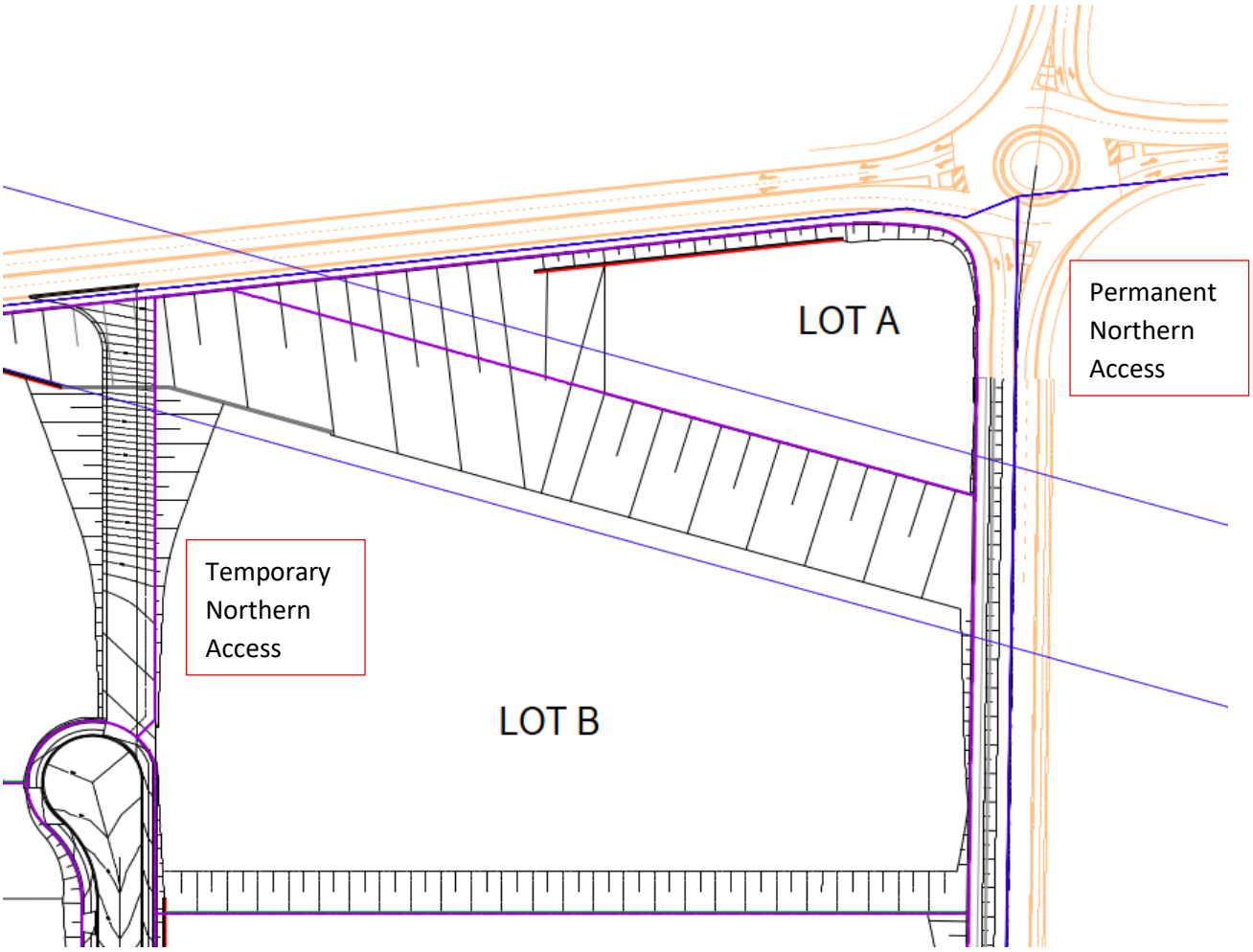


Figure 7 – Temporary and Permanent Northern Road

8.3. Pavement

Pavement will be designed based on the requirements of Austroads Pavement Design Guide – A Guide to the Structural Design of Road Pavements and recommendations provided by Douglas Partners reports 92364.01 & 92345 submitted as part of the application.

The basis of this design is:

- Design Traffic Loading: N =1x10^7 ESA (in accordance with Penrith City Council requirements for Heavy Industrial)
- Design subgrade CBR = 2% (based on Section 6.7.1 of the Douglas Partners Report 92345)

Based on these parameters the pavement design is as follows:

- 70mm AC 14 320 Bitumen
- 7mm Spray Seal

- 250mm DGB 20 (placed in two layers)
- 500mm Select Sandstone Fill with minimum CBR = 35% (placed in three layers)

If the subgrade CBR = 5% the bottom 200mm of select sandstone fill can be replaced with select fill with minimum CBR of 5%.

CBR testing is proposed to be undertaken at the subgrade level to confirm this pavement design. Polymer modified asphalt will be used within all cu-de-sacs with the asphalt concrete layer becoming a 75mm thick polymer modified AC 14.

8.4. Batter Design

Any permanent batter's steeper than 1 in 5 will be vegetated in accordance with Penrith City Council requirements. All external batters to the development have been limited to 1 in 4 as a minimum generally, with the maximum localised batter being 1 in 3.

Any temporary batters constructed during the works will be in accordance with the geotechnical report and ongoing advice from the geotechnical engineer and may be 1 in 1 slope or steeper if required.

8.5. Aldington Road Upgrade

The existing Aldington Road is as a rural road with a narrow, 6-8 wide sealed surface with tables drains on either side within a 20.1m road reserve.

The development will require an upgrade of Aldington Road, identified by the DCP as a distributor road requiring a 30.6m road reserve.

Figure 8 – Aldington Road, viewed north

The Aldington Road upgrade will adopt a cross-section generally as shown in the concept in Figure 9. With this in mind, we anticipate a 5.2m wide reservation along the frontage of the site to allow for the widening.

NOTE: The design and construction of the Aldington Road upgrade is proposed to be delivered under Works In Kind (WIK) arrangements and the detail is still being discussed with stakeholders, and once agreed will proceed to the detailed design phase. The Aldington Road upgrade is being reviewed as a separate workstream; however, some detail is provided in this section.

The following external road upgrade works are proposed:

- Improved access to the Mamre Road precinct via an intersection upgrade at Mamre and Abbotts Road to TfNSW requirements. It is proposed this intersection upgrade is to the final design that is larger than required for the traffic generated by the development. The design maximises the capacity of the intersection and requires acquisition of land on the north side of Abbotts Road. Sketches of this upgrade have been included in this report. The turn paths have been tested and shown to achieve the requirements of the DCP.
- Abbotts Road and Aldington Road are proposed to be upgraded from Mamre Road to the site with an interim upgrade where width is dependent on availability of adjacent land. As shown on drawings 21-843 - 500 series included with this application.
- If more land is acquired prior to detailed design, by adjacent developers or Council acquisition, the ultimate cross section shown in 21-843- C508 Section 7 (Figure 9 below) will be constructed.

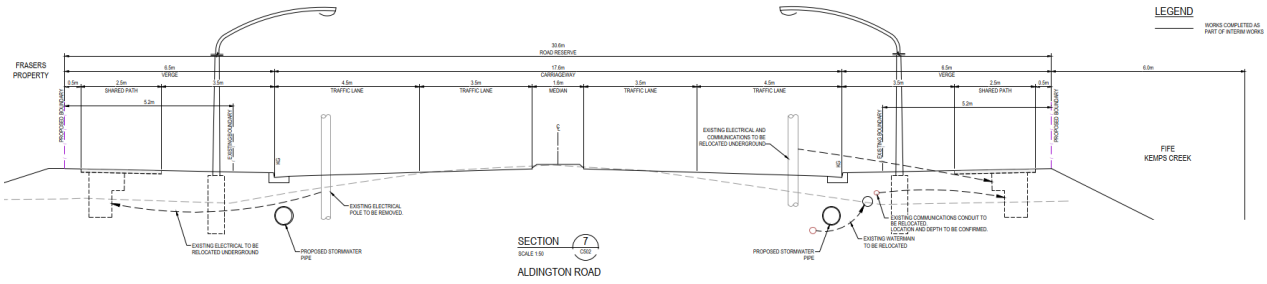


Figure 9 – Typical Section Distributor Road, Concept Aldington Road (Cross Section 7)

8.6. Conclusion

All road design is in accordance with the DCP, Austroads Standards and the requirements of Penrith City Council, as a minimum.

A professional geotechnical engineer will be engaged to design the structural pavement. This will be in accordance with Austroads Pavement Design Guide – A Guide to Structural Design of Road Pavements.

9. Stormwater Management

9.1. Existing Site Stormwater Drainage

Currently the site comprises rural land and is classified as a “greenfield” site with an entire coverage of pervious areas and farm dams except for sporadic residences and structures.

The existing site is approximately 72.09Ha in area with internal catchments falling to the north, east, south, and west. There is a minor external catchment entering the site in the northwest corner with an area of 3.93Ha. The indicative trunk drainage paths as identified in the DCP are shown in Figure 10. As the contributing catchment is less than 15Ha the controls within the DCP relating to provision of naturalised trunk drainage are not applicable.

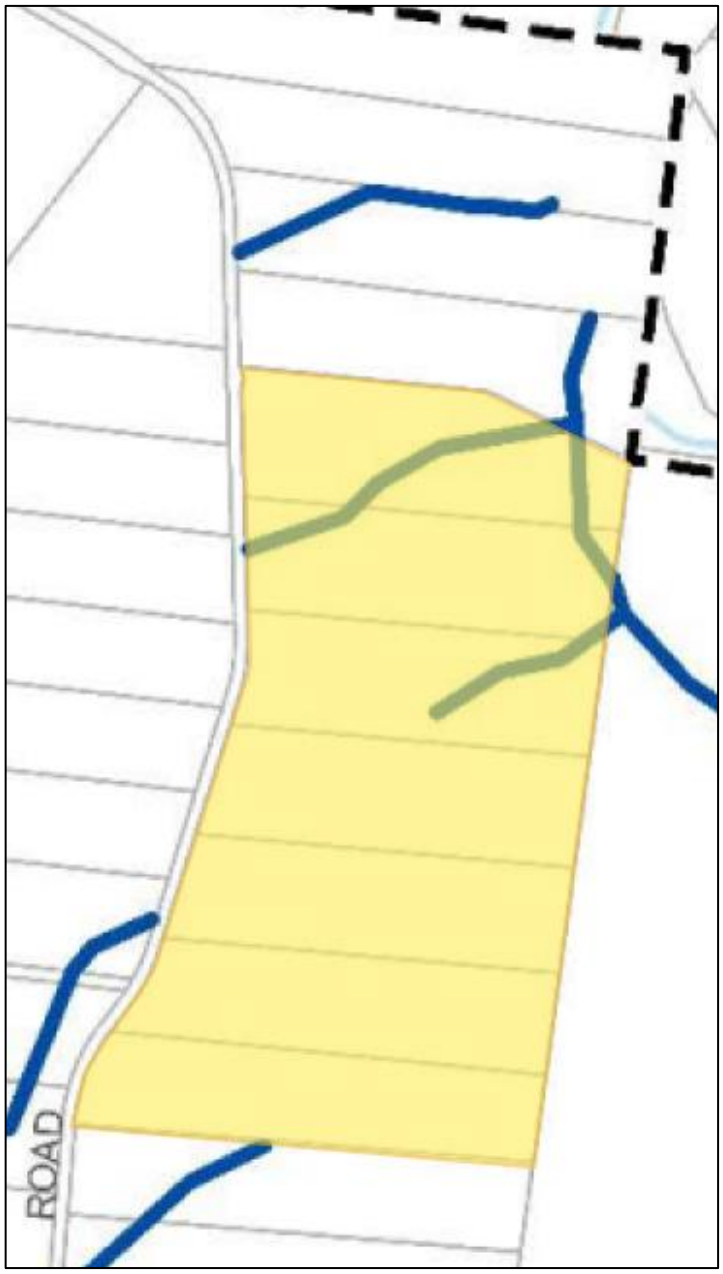


Figure 10 Indicative trunk drainage paths

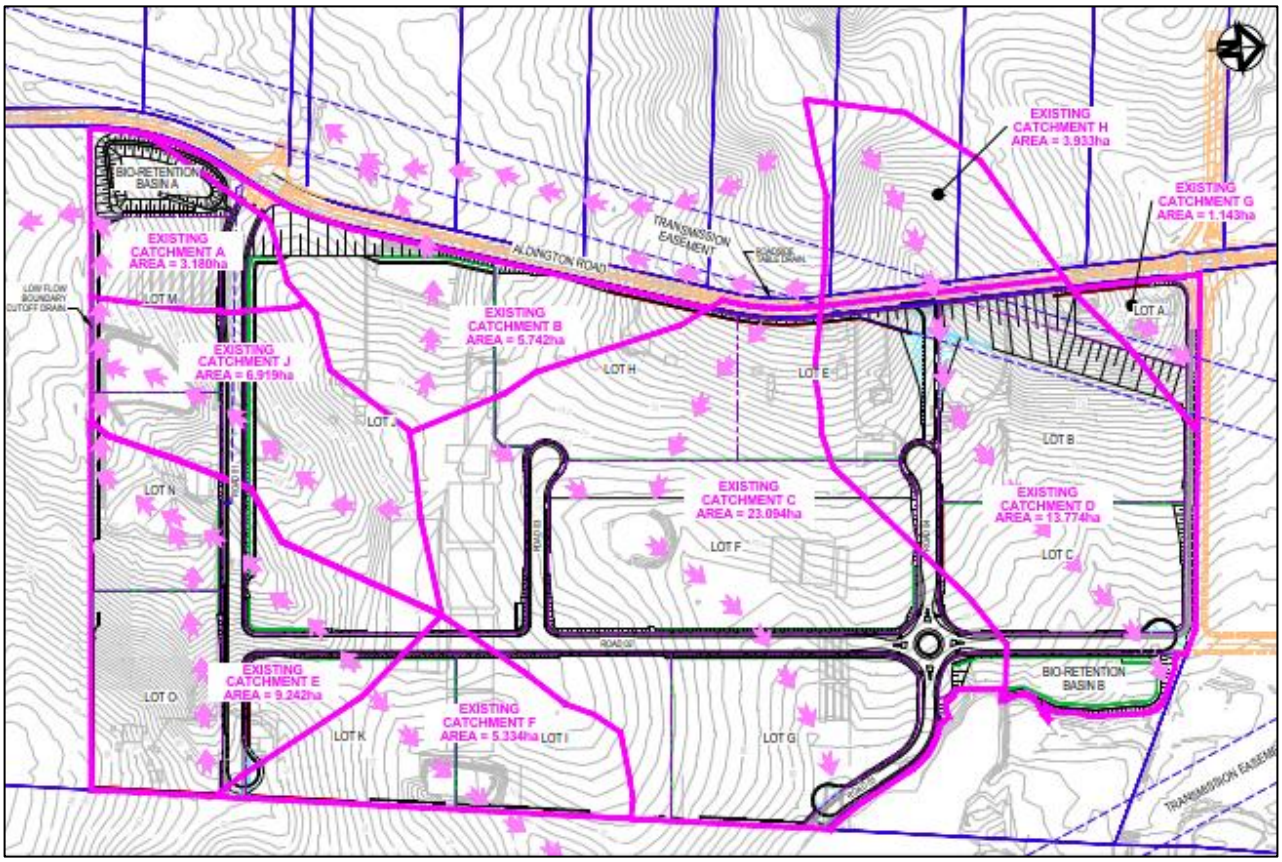


Figure 11 Catchments - Pre development (Civil drawing 19-609-C1081)

The pre-development stormwater catchment plan is shown in Figure 11.The primary high point within the site is located towards the south of the site and ranges from approximately RL74.5m to RL80.5m. A secondary high point is located in the north-western corner. The northern portion of the site flows towards the northern and eastern boundary into the existing dam on a stream. The southern portion of the site flows towards the western side of the southern boundary and an existing swale/dam located on the adjacent property to the south. A small portion of the site flows west towards Aldington Road.

For the analysis of the pre-development flow rates all dams on the site are assumed to be full, with no capacity available.

9.2. Proposed Site Stormwater Drainage

The main objective for the stormwater drainage design of the proposed development is to ensure post-developed catchment flows do not exceed the pre-developed catchment flows. On-site detention (OSD) systems are installed to limit discharges to pre-developed rates, this will ensure the downstream catchments will not experience an increase in flow due to development, to mitigate flooding downstream of the development. Design documentation has been completed in accordance with the Penrith City Council Engineering guidelines and the DCP.

Refer to the drawing 19-609-C1082 for details of the proposed catchment plan.

The site is mainly divided in to two stormwater catchments – larger catchment in the north and smaller catchment to the south. The stormwater on the lots and within the road reserve for the southern catchment of the site is proposed to be collected via pits and pipes and connect into an On-Site Detention basin in the south west corner of the site, Basin A. Stormwater on the lots and within the road reserve for the larger catchment to the north of the site is proposed to be collected via pits and pipes and connect into an On-Site Detention basin in the north east corner of the site, Basin B. Refer to Figure 12 below for the locations of proposed Basins A and B (highlighted).

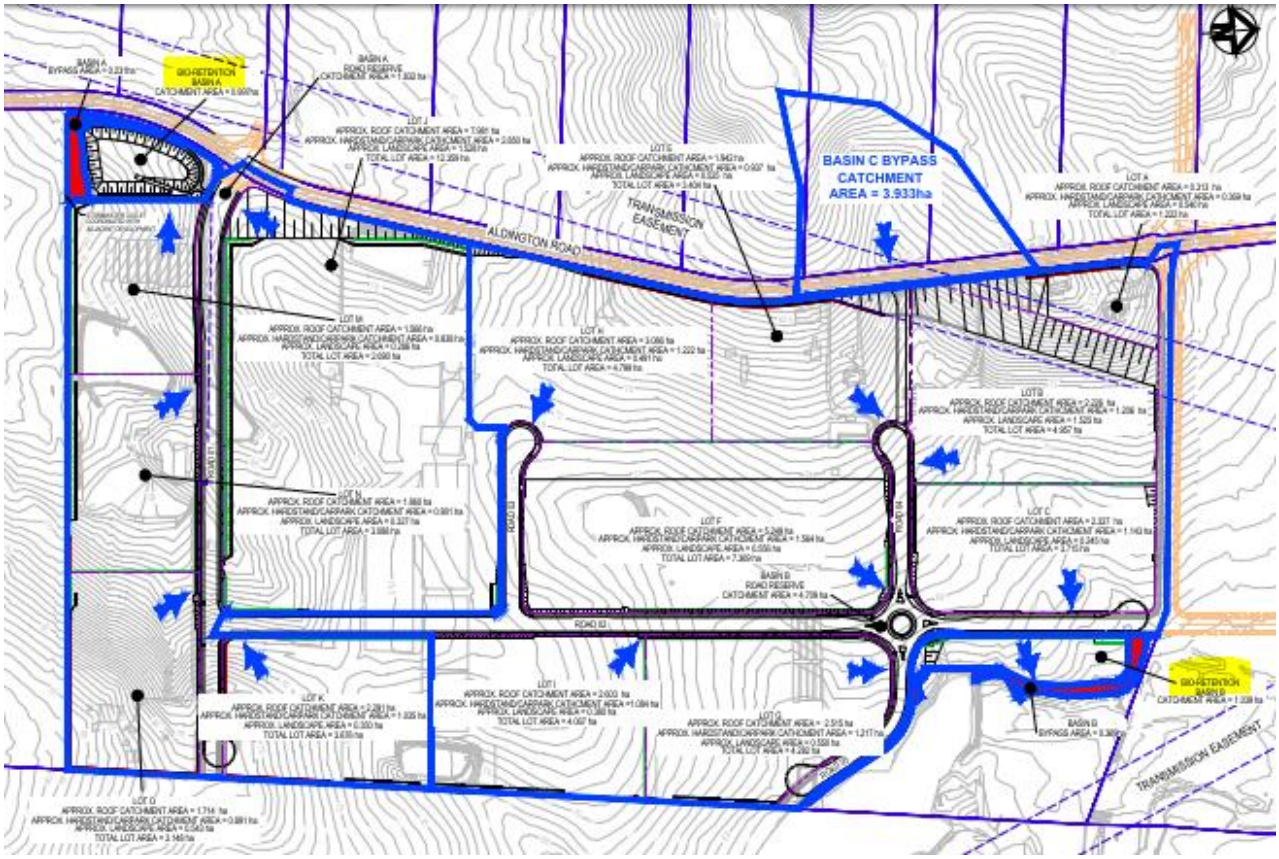


Figure 12 – Proposed Catchment Plan with OSD Basin Locations (civil drawing 19-609-C1082)

The existing low points currently receive flows from the site. The two basin outlets are coordinated with existing streams and infrastructure.

Basin B discharges to north-east of the site to the 1st order stream, a tributary of Ropes Creek via a channel.
Basin A discharges to a channel and into a culvert which has been coordinated with the landowner of the DA approved development site to the south. Refer to the Figure 13 which shows the proposed conveyance arrangement which was prepared for the adjacent development and used for the basis of coordination.

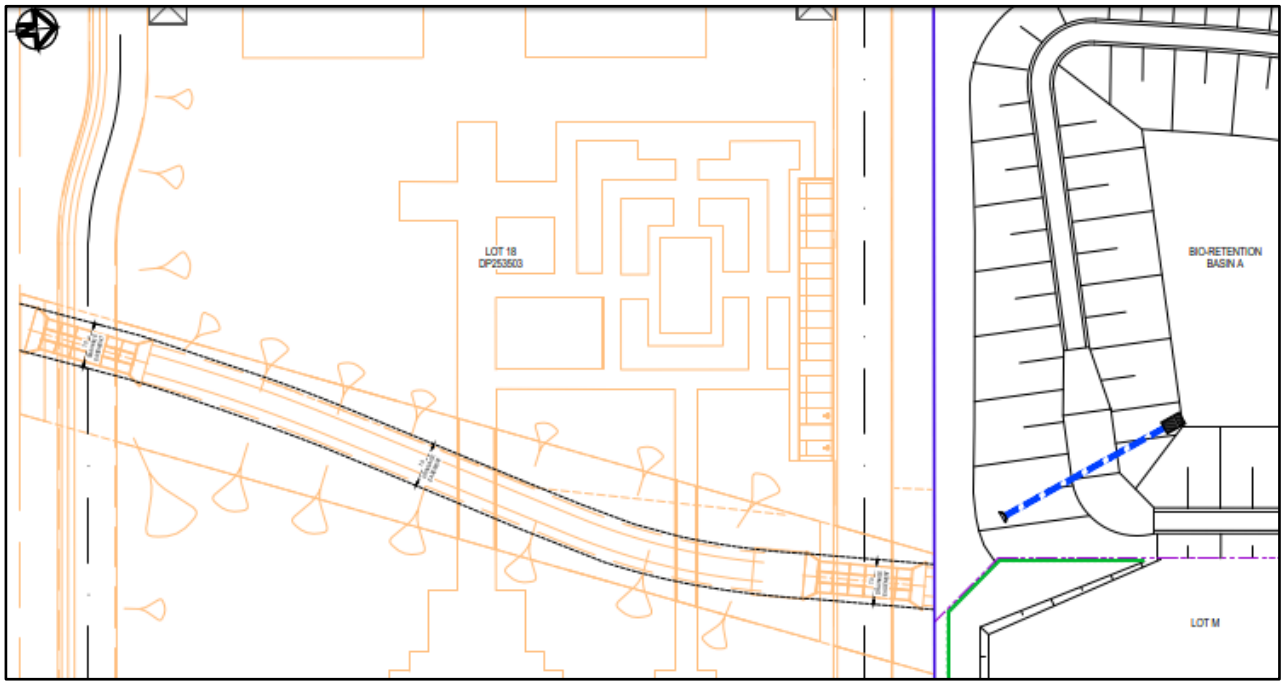


Figure 13 – Discharge from Basin A to via property to the south

9.3. External Upstream Stormwater Drainage

Part of the overall stormwater strategy for the site involves conveying the stormwater flows associated with upstream catchments. The DCP identifies indicative trunk drainage paths through the site Figure 10.

As per Figure 12 (AT&L drawing 19-609-C1081), the external upstream catchment is located towards the north-western corner of the site, west of Aldington Road. This catchment flows towards the site via a culvert under Aldington Road. In the existing situation the flow from this catchment runs overland within the site and in high flows would eventually discharge into the existing creek located in the north-east corner of the site. The size of the external catchment is 3.933Ha.

The proposal conveys the upstream catchment via underground pits and pipes along the edge of the TransGrid easement and along the alignment of the northern boundary, within private property adjacent to the future northern road. Runoff has been modelled based on existing land features, as any future development site must achieve this discharge condition. For alignment refer civil stormwater drawings C1043, 1044, 1048 and 1052. The flows from this upstream catchment will discharge north of Basin B. Scour protection will be designed specifically for the outlet. This piped network will convey all storm events up to the 1% AEP. An extract from DRAINs is provided in Appendix D.

The other external catchment is the tributary to Ropes Creek that passes through the north-eastern corner of the site, via a series of existing farm dams. This waterway is addressed in the Cardno Flood impact assessment report of the wider catchment.

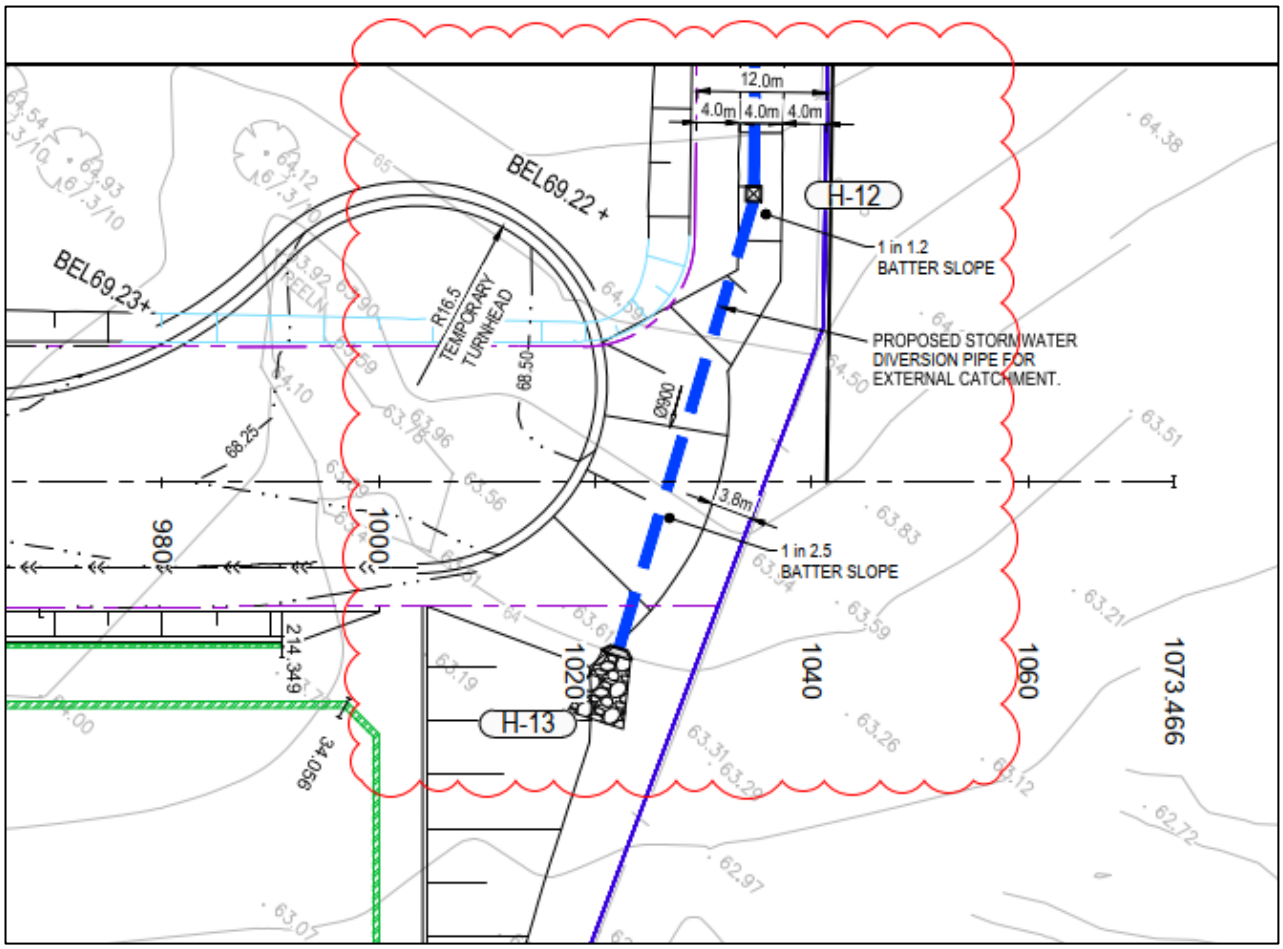


Figure 14 Discharge of external catchment flow

NOTE: The development of the land in the external catchment is required to meet post development water quantity and quality targets required by the Mamre Road Precinct DCP, prior to be discharging to this infrastructure, hence this has been assumed in the modelling.

9.4. Riparian Assessment

A Riparian Assessment report was undertaken by Eco Logical Australia (ELA) to support the application for the site. The Riparian report, identified two mapped watercourses located in the development area. The site survey identified that the 1st order watercourse at the south of the site did not meet the definition of a 'river' under the Water Management Act 2000 (WM Act). The 1st order watercourse in the north-east of the site was likely to meet the definition of a 'river' under the WM Act due to the defined nature of the watercourse upstream of the study area.

The unnamed first order watercourse to the north-east of the site is a tributary of Ropes Creek, within the Hawkesbury Nepean catchment.

Figure 15 – Watercourse to north east of site, Tributary to Ropes Creek (Riparian Assessment, ELA 2021)

There were 11 farm dams identified within and adjacent to the study area. Most of these had limited aquatic habitat and eight are to be removed as part of the proposed development. The dam in the northern-most section of the site had moderate levels of aquatic habitat and was representative of a wetland environment. This dam will be retained, and the surrounding vegetation managed to maintain habitat values.

The Geotechnical Report by ADE, 2022 identifies that the retained dams are safe based on initial geotechnical investigations, with ongoing monitoring recommended. The downstream land use is Environmental Protection Land (C2) which mitigates the risk associated with these dams.

The infrastructure associated with this development is designed to not alter this first order stream and ensures Basin B discharge follows the predevelopment flow path and continues to reach the watercourse.

9.5. Council Requirements & Recommendations

All estate level stormwater drainage for the site is designed to comply with the following:

- Mamre Road Precinct DCP 2021 (DCP)
- Penrith City Council Design Guidelines for Engineering Works.
- Penrith City Council Water Sensitive Urban Design (WSUD) Policy December 2013.

A summary of the design requirements adopted is listed below:

- Precinct based basin will serve the development as detention and bioretention basins. The basin will be designed to comply with PCC standard WSUD requirements.

- All drainage in the road reserves of roads dedicated to PCC will be to PCC specifications.
- All stormwater drainage within the lots will be the responsibility of the individual property owners.
- OSD is to mitigate post development flows to pre-developed flows for flood events up to the 1% AEP.
- All OSD basins have been designed with a 3.0m wide stabilised access road along the berm to ensure maintenance vehicles can access the entire exterior of the basin.
- Finished Floor Levels (FFL) of proposed buildings within the precinct (separate approval) to have minimum 500mm freeboard to 1% AEP overland flows; and

9.6. Modelling Software

DRAINs modelling software has been used to calculate the Hydraulic Grade Line (HGL) of the estate stormwater pipes. 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. DRAINs data files and output results are attached in Appendix D.

9.7. Hydrology

- Pipe drainage shall be designed to accommodate the 5% AEP storm event.
- The combined piped and overland flow paths shall be 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 shall be provided. Alternatively, the pipe and inlet system may be upgraded to accommodate the 1% AEP storm event.
- Rainfall intensities shall be as per the Intensity-Frequency-Duration table in accordance with the Australian Rainfall and Runoff (AR&R).
- Times of concentration for each sub catchment shall be determined using the kinematic wave equation.
- Runoff coefficients shall be calculated in accordance with AR&R. The fraction impervious shall be determined from analysis of the sub catchments.
- Flow width in gutter shall not exceed 2.5m for the minor design storm event.
- Velocity depth ratios shall not exceed 0.4 for all storms up to and including the 1% AEP event.
- Inlet pits to be spaced so that flow width shall not exceed 80 l/sec.
- 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 pits on grade and at sags respectively, with these blockage factors in-built to each pit within the DRAINs model.

9.8. Hydraulics

- A hydraulic grade line HGL design method shall be adopted for all road pipe drainage design.
- The minimum pipe size shall be 375mm diameter RCP.
- Maximum spacing between pits shall not exceed 75m.
- The minimum pipe grade shall be 0.5%.
- All pipes shall be Rubber Ring Jointed unless noted otherwise.
- 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 shall be Reinforced Concrete Pipes or Fibre Reinforced Cement equivalent.
- The pipe friction coefficients to adopted shall be:

Materials	Mannings – n	Colebrook-White – k	Min. Pipe Class
RCP	0.012	0.3	3
FRC	0.01	0.15	3

- All pipe classes shall be designed for the ultimate service loads and where applicable, construction loads will be designed for.
- Pipes discharging to the overland flow path shall adopt a minimum tailwater level equivalent to respective overland flow level.
- Pit Loss coefficients shall be calculated in accordance with Missouri Charts.
- A minimum 150mm freeboard shall be maintained between pit HGL and pit surface levels for the minor storm event.
- Overland flow paths shall maintain a minimum of 300mm freeboard to all habitable floor levels; and
- Pits deeper than 1.2m shall contain step irons at 300 mm centres.

9.9. Catchments

The overall developed site is proposed to be split into two catchments as per drawing 19-609-C1082.

A summary of each catchment and the outflow and overflow locations are described below:

Catchment 1 – Northern Catchment

- Total Area = 39.56Ha (excl external upstream catchment).
- Includes: northern Lots: A to I, Road 02, Road 03, Road 04, Road 05 and 50% of Future Northern Road.
- Flow path is north and east following the road network to Basin B; and
- Outlet and overland flow from Basin B to drain to existing creek located on the north-eastern corner of the site.

Catchment 2 – Southern Catchment

- Total Area = 27.79Ha.
- Includes: Southern half of Lots: J to O, and Road 01.
- Flow path to southwest following the road network to Basin A; and
- Outlet and overland flow from the Basin A to drain to the south into the existing low point located within the adjacent property which is proposed to be conveyed via a culvert then an open channel as shown on the DA drawings prepared for the adjacent development.

External Upstream Catchment

- Total area 3.933
- Flows along TransGrid easement to south of northern road (within private property)
- Discharges north of basin B to an outlet where it can flow overland to enter the waterway in the north-east.

9.10. On-Site Detention (OSD)

The objectives of the stormwater management of the proposed development include ensuring post-developed catchment flows do not exceed pre-developed catchment flows for all storms from the 50% to 1% AEP events and the flow duration targets are achieved.

For the post-development case it is proposed to maintain the existing point of discharge and ensure peak flow rates are not increased via the OSD basin and control outlets using a low flow orifice and high flow weirs. Refer to Drawing 19-609-C1085 to 19-609-C1089 for the basin details.

The table below indicates the pre and post developed flow rates for all storm events at the outfall of both the basins.

This modelling is conservative and does not consider the on lot underground storage tanks provided for collection and reuse of runoff as these are potentially an interim solution until the regional solution has been proven.

Table 4 - Pre-Post Development Flows from the proposed development

Storm Return Period	Pre-Developed Flows Southern Catchment (m^3/s)	Post Developed Flows Basin A (m^3/s)	Pre-Developed Flows Northern Catchment (m^3/s)	Post Developed Flows Basin B (m^3/s)
1 EY (1-Year ARI)	1.24	0.809	2.77	1.77
40% AEP (2-Year ARI)	2.12	1.24	4.75	1.78
18% AEP (5-Year ARI)	3.67	2.42	8.23	1.92
10% AEP (10-Year ARI)	4.38	3.26	9.81	2.00
5% AEP (20-Year ARI)	5.09	4.06	11.4	2.59
1% AEP (100-Year ARI)	6.35	4.51	14.2	4.51

Basin A and B drain in 7 hours (430mins) in the 1% AEP 6hr duration storm event. This the storm duration with the longest time to drain.

The top water level in each of the basins have been modelled on actual basin capacity profiles and resulted in:

Basin A TWL RL 64.00m
Basin B TWL RL 66.54m

9.11. Overland Flows

Overland flows from the west of the site will be conveyed within a piped network that conveys up to the 1% AEP flow. The overland flows from within the site have been designed to be safely conveyed within the road carriageway to comply with flow widths and velocities within the Penrith City Council

Design Guidelines for Engineering Works. The DRAINS output is provided for reference in Appendix D and can be provided electronically for review by Council.

9.12. Conclusion

As highlighted in the above section all stormwater drainage within the development has been designed in accordance with the DCP and Penrith City Council Engineering Guidelines. This includes design of the stormwater network (pits and pipes) and On-Site Detention basins.
To summarise:

- OSD has been to be sized to mitigate post development flows to pre-developed flows for 50% to 1% AEP events.
- Finished Floor Levels (FFL) to have minimum 500mm freeboard to 1% AEP overland flows.

10. Waterway Health and Water Sensitive Urban Design

10.1. General Requirements

Water Sensitive Urban Design (WSUD) encompasses all aspects of urban water cycle management, including water supply, wastewater, and stormwater management. WSUD is intended to minimise the impacts of development upon the water cycle, improve waterway health and achieve more sustainable forms of urban development.

The proposal demonstrates general compliance with the waterway health objectives established in the DCP. A Water Management Strategy (WMS) has been prepared detailing the proposed Water Sensitive Urban Design (WSUD) approach and how the WMS complies with the DCP stormwater targets, demonstrated through MUSIC modelling.

The MUSIC Model for Urban Stormwater Improvement Conceptualisation (MUSIC X, Version 1.1.0) was used to evaluate the site for stage 1 (this SSDA) and the Estate Masterplan scenario to demonstrate performance at a conceptual level. A conceptual view of the MUSIC models used in this report is provided in Appendix B. The MUSIC model has been submitted to enable review.

10.1.1. MUSIC Base Parameters

All building lot catchment areas were measured to establish the breakup of surfaces including roof, pavement, and landscape areas (refer SBA Masterplan). These were input into the Music model.

MUSIC X model input parameters for these catchments including rainfall-runoff, base flow concentration and stormflow concentration parameters are from the Music Modelling Toolkit – Wianamatta; which also refers to the WSUD developer handbook, MUSIC modelling and the Water Quality Objectives of the DCP. Additional design parameters from the Penrith City Council, WSUD Technical Guidelines (Version 4 – October 2020).

Table 5 – Rainfall Runoff Parameters for All Catchment Areas

Parameter	Unit	Music Modelling Toolkit Value
Rainfall Threshold	mm/day	1.00
Soil Storage Capacity	mm	150.00
Initial Storage	% Of Capacity	30.00
Field Capacity	mm	130.00
Infiltration Capacity Coefficient	a	175.00
Infiltration Capacity Coefficient	b	2.50
Initial Depth (Ground Water)	mm	10.00
Daily Recharge Rate	%	25.00
Daily Baseflow Rate	%	1.40
Daily Seepage Rate	%	0.00

10.2. Water Management Strategy (WMS)

Potable water supplies in the Sydney area are in recognised short supply with projected population increases, potential climate change and periods of extended drought and any development in sources of the Sydney region places increasing demands on an already reduced 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, sewage, stormwater, and rainwater) to minimise demands of potable water supplies.

Sydney Water is working towards a regional water management solution for in the precinct which will improve the precinct water balance and quality. However as this is not yet approved the current design demonstrates compliance using onsite solutions only.

10.2.1. WMS Options analysis

Various WSUD options were considered prior to arriving at the proposed WMS. A summary of the evaluation of these options for this development site is provided in Table 6 below. To test the effectiveness of achieving the flow targets these options were also analysed in the Music Model. While offering water quality improvements some did not have the required impact on the flow duration curve and therefore were not utilised in the WMS.

Table 6 – WSUD options analysis

WSUD measure	Positive	Negative	Utilised
Stormwater and Rainwater harvesting	Effective at achieving flow targets	Large storage required – cost	☒
Roof Cooling – through irrigation	No land lost Effective for cooling building	Cost to build – structural impact Large storage required - cost Maintenance	☒
Street tree pits	No land lost	High capital and maintenance cost Minimal impact on flow duration curve	☐
Irrigation – landscape and public domain areas	Aids establishment and supports vegetation and canopy, ongoing cooling Low cost	Large storage required - cost Maintenance	☒
Bioretention basins in IN1 land	Effective at quality and quantity improvements	Large area required – loss of developable land	☒
Permeable pavement	Low visual/layout impact	Extra cost to standard pavement Ineffective at reducing high flows due to soil type on site (although infiltration permissible based on-site	☐

		Salinity and Sodicity investigation, ADE 2022)	
Infiltration to deep soil		Soil type – clay doesn't support high infiltration (although infiltration permissible based on-site Salinity and Sodicity investigation, ADE 2022)	☐
Gross pollutant traps	Small footprint Effective at water quality improvements	Single benefit High maintenance cost	☒
Green walls	Visual benefit Vegetation	High capital and maintenance cost Ineffective at reducing high flows	☐

Each of the runoff generating components of the development were assessed against the options in table 7 of the DCP and the WSUD measure to be utilised on each has been identified in Table 7.

Table 7 - WSUD measure utilised by runoff generating component

Component of development	Water Sensitive Urban Design (WSUD) measure utilised
Roof	• Rainwater harvesting - for reuse, landscape and roof irrigation
Hardstand	• Stormwater harvesting - for reuse, landscape and roof irrigation
Carparks	• Stormwater harvesting - for reuse, landscape and roof irrigation
Landscaped areas	• Infiltration into deep soil • Plant selection • Irrigation from stormwater and rainwater harvesting
Public open space	• Infiltration into deep soil • Irrigation from stormwater and rainwater harvesting
Naturalised trunk drainage paths	• N/A
Public Roads, driveways and crossovers	• Bioretention

Each of the WSUD measures is discussed in more detail in the subsequent sections.

Street trees - detailed design

The benefits of street trees provided with passive irrigation from stormwater runoff to enhance growth and provide water quality benefits are recognised. However, the MUSIC modelling showed insignificant impact on the flow duration curve with 'Wianamatta street trees' and they were therefore excluded from the modelling. During detailed design the designers will work with Council to find a mutually acceptable design for street trees that considers the whole of life cost of these features.

10.2.2. Water Management Strategy - Elements

The WMS for the Masterplan is designed to accommodate for the eventual development of all lots. As lots are developed the aim is to transition to the regional water management solution proposed by Sydney Water, which provides the lowest cost solution and has broader community benefits. This WMS therefore seeks to minimise onsite infrastructure to reduce possible redundant infrastructure and the associated cost to development and related inefficiencies.

The estate WMS consists of harvesting, storage and reuse of runoff for irrigation to support the on-site landscaped areas, Lot D and landscaping within the road reserves, to encourage the growth of tree canopy and vegetation to support the precinct vision and create an attractive place for people to work.

The strategy also provides for irrigation of warehouse roofs which reduces the heat generated by the roof and will minimise the need for cooling inside the building.

There will also be stormwater basins in each catchment that allow for detention, bioremediation, evaporation and controlled release of runoff to achieve flow duration and water quality targets.

Each of these WMS elements is described in more detail in the subsequent sections.

10.2.3. Stormwater and Rainwater Harvesting and Reuse

The parameters adopted in the design and modelling of the stormwater and rainwater harvesting and reuse scheme for the Estate are shown in the following tables.

Table 8 - Stormwater and rainwater harvesting parameters adopted in MUSIC model

Variable	Parameter adopted
Collection Sources	Roof and hardstand areas (treated with stormwater pit inserts or in line GPT's)
Tank Volume	Varies by Lot (refer Table 9)
Tank Depth	2m
Initial volume	Assume tank full at beginning of modelling period based as this is the conservative approach.
Tank Location / Type	Modular tank located under carpark (EnviroModule from Ausdrain or similar) – not under tree pits – Refer Civil Drawing 3100 set for details on Lot F. All tank water will be filtered prior to reuse through a SPEL Puraceptor (or similar) which has treatable flow rates up to 200L/s.
Irrigation Demand	0.40 kL/m2/year (WSUD Guidelines PCC and Blacktown) Demand based on Potential evapotranspiration (PET) for Penrith less rainfall to account for high demand in summer, lower demand in winter. Landscaped areas are detailed in Table 9 and include on lot and public domain / road reserve areas as per (Appendix E – Irrigation areas)

Non potable reuse	0.10 KL/toilet/ day (WSUD Guidelines PCC)
Roof Irrigation – for cooling	4.5 ML/ha/year over 75% of warehouse roof area. Rate from Sydney Water Stormwater and Water Cycle Management Study. Discussions with the supplier indicate this rate is conservative and could be a lot higher in this project's application, however the Sydney Water rate has been utilised for modelling until detailed design is undertaken. Demand is based on Potential evapotranspiration (PET) for Penrith less rainfall to account for high demand in dry conditions and lower demand in wet conditions.

Table 9 - Stormwater Harvesting parameters (by Lot)

Lot	Lot Area (Ha)	Non-Potable Demand Toilets (Kl/day)	Irrigation Demand on Lot (Kl/yr)	Irrigation Demand External (Kl/yr)	Roof Irrigation Demand (Kl/yr)	Tank Volume Kl or m^3
A	1.13	0.9	4390		1055	600
B	4.97	4.6	16097		6990	3000
C	3.72	4.9	4014		7331	1500
D	5.25	0.0	16,818[1]		0	
E	3.34	4.1	5364		6008	1800
F	7.37	11.0	7306	3674[2]	16767	6000
G	4.28	5.4	5135	8409[1]	8262	6000
H	4.73	6.5	5317		9902	2500
I	4.07	5.4	4581	8409[1]	8201	6000
J	12.30	16.8	18211	1466[3]	25652	7000
K	3.67	4.7	5074		7152	1800
L	1.24	0.0			0	
M	2.69	3.3	3637		4806	1200
N	3.08	3.9	3567		5697	1500
O	3.14	3.8	4574		5694	1500

Notes: Lot D and L are undeveloped and contain stormwater management basins

[1] The landscape and basin area within Lot D (4.2 ha) is to be irrigated by Lot G and I, which will assist riparian and basin plant growth in dry conditions.

[2] Northern Roads landscaping area

[3] Southern Roads landscaping areas

ROOF COOLING – BENEFITS AND CONCEPT DESIGN

The benefit of irrigating the roof of large buildings is a reduction of air temperature both outside and inside the building. Roof irrigation reduces ambient air temperature as the cooler water absorbs ambient heat to be evaporated in the air. Depending on the weather conditions an air temperature reduction of 5-15˚C may occur in the immediate area around the Roof Irrigation. (Osmond, 2017). Note it is understood that 'misting' indicates smaller droplets, while irrigation indicates larger droplets

that will not migrate beyond the roof area, hence the use of the term roof irrigation in our proposal. To be clear, this proposal is to cool the roof through evaporation of irrigated roof.

Sensors, on the surface of the roof, will monitor the roof temperature. Once water is irrigated onto the roof surface, the system pauses, allowing the water to evaporate, reducing the temperature of the roof.
The system will not commence again until the temperature increases to a point in which more water is required for cooling. This precise control eliminates water runoff while achieving maximum cooling. The system has few moving parts and requires little maintenance. Water is dispersed evenly across the roof using nozzles, it is proposed to irrigate 75% of the roof area.

10.2.4. Stormwater Basin for Bioretention and OSD

The objective of stormwater basin is to provide both OSD and bio-retention through a vegetation layer and sand and/or gravel filter media to remove pollutants from the runoff. Bio-retention systems consist of a basin in an area containing landscaping of native grasses, shrubs and trees with an underlying filter media.

During the construction phase the basins will operate as an OSD only to prevent siltation of the media. In accordance with the PCC std drawings 100 (notes) following completion of bulk earthworks a partially completed bioretention with sacrificial layer will be constructed. Following completion of 90% of construction a fully functional bio retention system will be made operational. If a regional solution is adopted prior to this time the basin will continue to operate as an OSD only with the water quality being provided by the regional solution currently being proposed by Sydney Water in the Western Sydney Aerotropolis WMS Final Report (Dec 2021), which is the same scheme as that proposed for the Mamre Precinct.

The layout achieves the water quality and quantity targets of the DCP however the design isn't in accordance with the PCC WSUD standard drawings because these assets will be owned and maintained by the developer and tested regularly, like all other water quality devices to ensure functioning. At a time when testing reveals basin not functioning, the basin media will be replaced. The combined OSD and bio-retention basins are proposed on the basis that stormwater quality controls would be provided in the regional stormwater management scheme to reduce redundant features of the design and improve cost effectiveness. The combined design has been successfully adopted on neighbouring sites within the PCC LGA.

MUSIC X model parameters adopted for design of the bioretention basin are shown in the table below.

Table 10 – Bio-Retention Basin Parameters

Parameter	Unit	Basin A (Southern catchment)	Basin B (Northern Catchment)
Extended Detention Depth	m	0.30	0.30
Surface Area	m2	17,000	25,000
Filter Area	m2	2,800	7,800
Unlined Filter Media Perimeter	m	0.01	0.01
Saturated Hydraulic Conductivity	mm/hour	100	100
Filter Depth	m	0.70	0.70
TN Content of Filter Media	mg/kg	800	800
Orthophosphate Content of Filter Media	mg/kg	40.0	40.0
Exfiltration Rate	mm/hour	0.00 (pond is clay lined)	0.00 (pond is clay lined)
Vegetation Properties	(unitless)	Vegetated with Effective Nutrient Removal Plants	Vegetated with Effective Nutrient Removal Plants
Overflow Weir Width	m	2.00	2.00
Underdrain Present	(unitless)	Yes	Yes
Submerged Zone	(unitless)	No	No

10.2.5. Gross Pollutant Traps (GPT)

The proposed stormwater treatment train will include 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.

A proprietary GPT will be installed all inlets that drain to the stormwater harvesting tank on each lot.

A high-flow bypass for the GPTs will be in place if a pit capacity is exceeded. Any overflow from on lot or from roads that is not through a GPT will pass through a stormwater basin which will collect gross pollutants.

10.2.6. Stormwater Flow – Masterplan

The subdivision has been modelled assuming the regional water solution has not been implemented and all management measures are within the estate.

The flow duration curve for the masterplan development based on the parameters and design features described in the WMS are provided in Table 11.

Table 11 – Stormwater Flow Results - Operational Phase - Masterplan

Parameter	DCP Target	Masterplan result	Compliance with DCP Target Option 2 Flow Duration Approach
95%ile flow (L/ha/day)	3000 – 15000	13935	Y
90%ile flow (L/ha/day)	1000 – 5000	1066	Y
75%ile flow (L/ha/day)	100 – 1000	105	Y
50%ile flow (L/ha/day)	5 – 100	19	Y
Cease to flow	Between 10% and 30% of the time	7%	N

As can be seen in Table 11 the flow duration (option 2) targets of the DCP are met on all but the cease to flow target of 10-30% of the time. The site discharge ceases to flow 7% of the time, while in the predevelopment case the cease to flow is 5% of the time. Between the 7% and 10% percentile flow the average flow is 0.04L/ha/day, which for the site (72.09ha) is 2.88L/day.

The 10-percentile discharge is 0.08L/ha/day equating to a flow of 5.8L from the site per day, which is less than a standard 10L bucket per day. This is viewed as being within the order of magnitude of error of modelling and is it is recommended that 0.1 L/ha/day be considered as effectively zero by the assessor. It must be acknowledged the Model for Urban Stormwater Improvement Conceptualisation (MUSIC), is a model for conceptualisation and is not exact, therefore this marginal difference is not viewed as a non-compliance.

This flow duration curve for the fully developed site and the predeveloped site have been plotted against the DCP targets Figure 16. This demonstrates an improvement in meeting the targets in the post development scenario versus the predeveloped site.

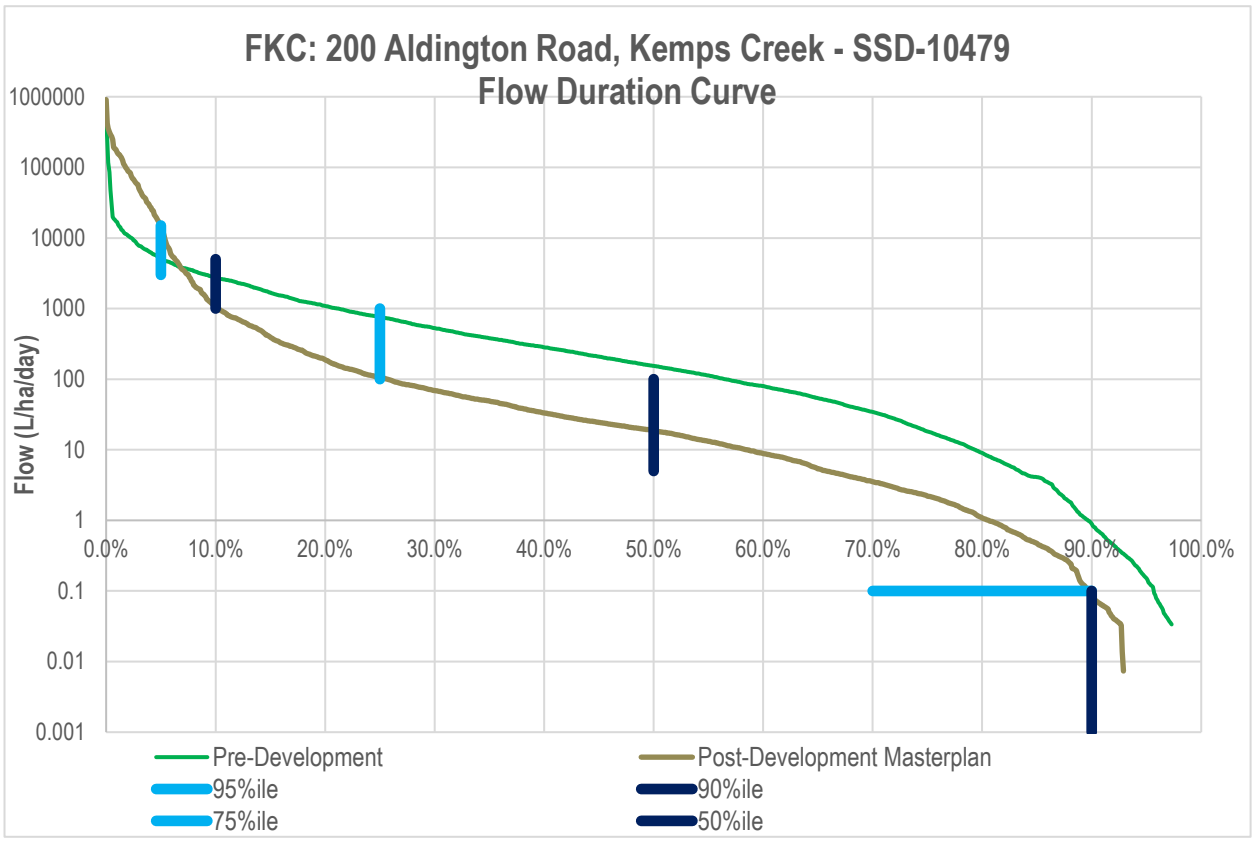


Figure 16 - Pre and post development Flow Duration Curve

10.2.7. Water Quality Results – Construction Phase

The stormwater flow will be managed during the construction phase in accordance with the ESCP as developed by EMM to achieve the following water quality target identified in the DCP.

	Construction Phase Target
TSS and pH	All exposed areas greater than 2500 square metres must be provided with sediment controls designed, implemented and maintained to a standard achieving at least 80% of the average annual runoff volume of the contributing catchment treated (i.e. 80% hydrological effectiveness) to 50mg/L TSS or less, and pH in the range 6.5–8.5.
Oil, litter and waste contaminants	No release of oil, litter or waste contaminants.
Stabilisation	Prior to completion of works for the development, and prior to removal of sediment controls, all site surfaces must be effectively stabilised including all drainage systems. An effectively stabilised surface is defined as one that does not, or is not likely to result in visible evidence of soil loss caused by sheet, rill or gully erosion or lead to sedimentation water contamination.

10.2.8. Water Quality Results – Operational Phase- Masterplan

In this scenario, the subdivision has been modelled assuming the regional water solution has not been implemented and all management measures are within the site. All lots are constructed to the masterplan. MUSIC X modelling results presented as mean annual loads at the receiving node indicate that the results exceed the required target reductions, as shown below.

Table 12 – MUSIC X Water Quality Results – Masterplan Receiving Node

Pollutant	Sources (Kg/yr)	Residual Load (Kg/yr)	Reduction (%)	DCP Target Reduction (%)
Gross Pollutants	9827	4	100	90
Total Suspended Solids	52,430	3355	93.6	90
Total Phosphorus	110	20	81.7	80
Total Nitrogen	791	195	75.8	65

10.2.9. Water Management Strategy (Operation and Maintenance)

The Water management Strategy elements will remain in private ownership and the shared assets will be maintained under the community title through the community association. This includes Lot D (Basin A) and Lot L (Basin B). On lot components will be maintained by the tenant of each lot including on lot irrigation systems, roof irrigation and on lot GPTs.

The cost of operating the WMS is detailed in Table 13 and Table 14. The draft WSUD Maintenance Plan is provided in Appendix C.

Table 13 –Whole of life cost (Masterplan) for general WMS elements

WSUD feature	Capital cost	Asset Life	Operational & Maintenance cost / annum	Renewal cost $/ 30 years
Sediment ponds (during construction)	$0.50M	1-5 years	$80,000 (for construction period only)	N/A
GPTs – on Lot [1]	$1.0M	10 years (filters)	$80,000	$0.5M
Basin A - OSD [2]	$0.65M	80 years		
Basin B – OSD [2]	$0.80M	80 years		
Irrigation network incl pumps (whole site)	$0.25M	15 years	$20,000	$0.5 M
Total	$3.20M		$100,000	$1.0M

Note[1] In the Regional WMS Solution scenario GPTs would be provided upstream of basins, rather than on lot. This price assumes on lot GPTS.
Note [2] In the Regional WMS Solution scenario the basins would provide OSD but not bioremediation.

Table 14 –Whole of life cost (Masterplan) – for elements that would be unnecessary with implementation of the Regional Solution.

WSUD feature	Capital cost	Asset Life	Operational & Maintenance cost / annum	Renewal cost $/ 30 years
Roof Irrigation	$ 4.3M	30 -50 years	$50,000	$1.5M
Underground water storage tanks (incl filters)	$13.0 M	Tank 80 yr / Filters 20yr	$50,000	N/A
Basin A - Bioremediation	$0.55M	30 years	$15,000	$0.3M
Basin B - Bioremediation	$0.70M	30 years	$15,000	$0.4M
Total	$18.55M		$130,000	$2.2M

10.3. Conclusion

The site will utilise rainwater and stormwater harvesting to provide for nearly all the non-potable water demands, irrigation demand for landscaping on lot and of public domain areas and for roof irrigation for cooling of the buildings. These actions demonstrate a commitment to water recycling and minimising the usage of potable mains supplied water as well as significantly reducing runoff quantity and quality. This is in line with the industry best practice and the NSW Stage Government's objective of reducing the amount of potable (drinking) water consumed for non-potable uses.

The use of on lot storage tanks reduces the amount of open water thereby and reduces the risk of attraction of wildlife which is of concern to the Western Sydney Airport.

The intention is for the site to connect to and be part of the regional water management solution proposed by Sydney Water, once approved. However, in the interim the masterplan of the development exceeds the water quality targets established in the DCP which is demonstrated through the Music Modelling Toolkit and meets all the targets except technically ceasing to flow 10-30% of the time.

The site discharge ceases to flow 7% of the time, which is an improvement on the current situation of around 5% of the time. The 10-percentile flow for the site is 0.08L/ha/day. This is very small and within the order of magnitude of errors expected from a model. It is therefore not deemed a non-compliance, rather it is within the bounds of accepted modelling errors.

10.3.1. Technical Guidance

The MUSIC Modelling Toolkit – Wianamatta (NSW DPIE, August 2021) notes that the toolkit document would be supported by the 'Technical guide to demonstrate compliance with the Wianamatta-South Creek waterway health objectives and stormwater management targets'.

The DCP also notes that the NSW Government has prepared technical guidance on calibrated MUSIC modelling parameters that should be used to demonstrate compliance with the targets. These technical guides were not available at the time of preparation of the modelling or reporting. In the absence of this technical guidance or supporting information to assist in the preparation of stormwater management strategies that can practically address the stormwater flow targets, further resolution of measures that could be included or amended in the proposed water management strategy may be required to be conditioned and developed post-approval.

11. Services Investigation

Based on an initial desk top study conducted from information obtained from Dial Before You Dig (DBYD) records, the following utility services are located within the vicinity of the Site:

- Potable water – Sydney Water Corporation.
- Electrical – Endeavour Energy; and
- Telecommunications – Telstra only.

No sewer or gas was noted to be located within the vicinity of the Site.

Investigations of the Site were carried out based on:

- Site inspection.
- Dial Before You Dig (DBYD) search.
- Sydney Water Hydra System.
- Penrith City Council Engineering Design Specification.
- LIDAR Survey information; and
- Sydney Water Southwest Growth Servicing Plan 2020-2025

11.1. Potable Water

11.1.1. Existing Potable Water

Dial Before You Dig (DBYD) indicates the following water services within the area:

- 100mm diameter DICL potable watermain on the eastern side of Aldington Road adjacent and north of the site
- 180mm diameter PE potable watermain on the eastern side of Aldington Road south of the site

These assets are supplied from a 200uPVC main approximately 220m north of the site which is current supplied from the Cecil Park reservoir supply zone.

There is now a recently completed 300mm diameter potable water main at the northern end of Bakers Lane that is positioned for connection on Aldington Road.

11.1.2. Proposed Potable Water

Consultation has been undertaken with Sydney Water regarding potable water servicing strategies for the Broader Western Sydney Employment Area (BWSEA), which includes the wider Aldington Road Precinct and the Site.

The proposed watermain is to be constructed from the connection point at the northern end of Aldington Road, southbound in the road reserve along Aldington Road and to the southern boundary of this site. It will provide sufficient water to this development site via two connections at both intersections proposed on Aldington Road and internal estate roads. The main can be extended for

future development to the south later or connected to by future development on the opposite site of the road.

In February 2022 Sydney water approved the business case for the investigation and design of this potable water main lead in by the developer.

11.2. Proposed Recycled Water

The site will allow for future connection to a recycled water scheme, by bringing a purple pipe for recycled water to the boundary, as required under Clause 2.39 of the I&E SEPP. Sydney Water has not yet determined a design for the lead-in to the site.

11.3. Sewer

11.3.1. Existing Sewer

Dial Before You Dig (DBYD), and a review of the Sydney Water Hydra System indicates there is no existing sewer infrastructure located at or adjacent to the Site.

11.3.2. Proposed Sewer

Consultation has been undertaken with Sydney Water regarding wastewater servicing strategies for the Broader Western Sydney Employment Area (BWSEA) which includes the wider Aldington Road Precinct and the Site.

The proposed lead in infrastructure will allow some connections from lands surrounding this development site. Refer to the Figure 17 below for the current proposed layout of the sewer service.

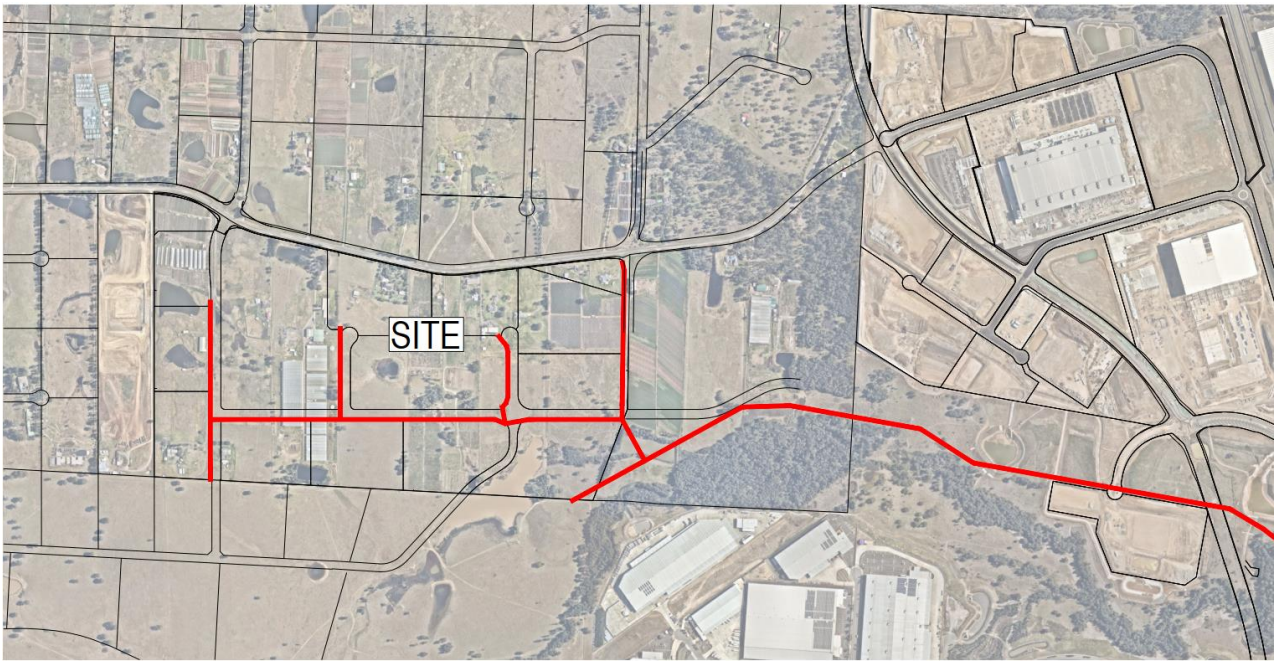


Figure 17 – Proposed Sewer Connection within the Precinct

Sydney Water in February 2022 agreed to fund the design and construction of the Sewer lead-in in general accordance with this concept design. Servicing strategies are subject to Sydney Water, IPART and Consent Authority approvals. Therefore, the final design of the 200 Aldington site lead-in may be different to what is proposed here.

11.4. Electrical

11.4.1. Existing Electrical

Recent site inspection indicates that there is an overhead power line (11kV and 240v) on the eastern side of Aldington Road reserve parallel to the boundary. Dial Before You Dig (DBYD) indicates that there are no underground services within the vicinity of the Site.

Endeavour Energy is in 2022 commissioning a new zone substation at South Erskine Park Zone and will provide an underground feed along Aldington Road from this new Zone Substation. They have plans for a second zone substation at this site to meet future demand. This is to supplement the current supply from:

- Kemps Creek Zone Substation: located approximately 7km south of the Site off Elizabeth Drive; and
- Mamre Substation: Approximately 25 MVA spare capacity

11.4.2. Proposed Electrical

Consultation has been undertaken with Endeavour Energy regarding electrical servicing strategies for the Western Sydney Employment Area (WSEA) which includes the wider Mamre Road Precinct and the Site.

The Endeavour Energy 'Western Sydney Priority Growth Area – Area Plan April 2018' indicates the proposed high voltage network to be delivered as part of the wider Endeavour Energy electrical network required to service the Aerotropolis.

Consultation with Endeavour Energy for this project has been undertaken. Endeavour Energy has advised the while it was expected the project's initial power supply would come off the existing overhead in Aldington Road, it's possible that now the South Erskine Park Zone Substation is to be commissioned in 2022, a new 22kV feeder to the SEPZS will be installed directly to the site via Aldington Road and future Southern Link Road corridor by September 2022 which will service the majority of the future building requirements, prior to the site being developed.

11.5. Telecommunications

Dial Before You Dig (DBYD) indicates that Telstra below ground conduits are located within the Aldington Road Reserve parallel to the boundary.

Site inspection has identified there are aboveground assets along the western side of Aldington Road.

NBN is proposed to be installed within the estate roads and along Aldington Road, while existing Telstra will be relocated to ensure it is maintained for existing users. NBN will design and install the lead in infrastructure required for this precinct.

11.6. Gas

There are no existing Jemena gas mains located within the vicinity of the Site. No contact has been made with Jemena to determine if there are plans to service the area in future.

11.7. Conclusion

This section demonstrates that services including wastewater, potable water, power, and telecommunications can be made available to the site.

Recycled water will be reticulated to the boundary of the lots, ready for commissioning and connection by Sydney Water when the recycled water mains are installed.

Formal applications have been made to the relevant service authorities for connections to sewer, water, communications and electrical. Detailed design discussions with these authorities are ongoing.

12. Infrastructure Staging

12.1. Staging

The Estate wide civil infrastructure works will be undertaken within Stage 1 of the development, prior to OC of the first building. The infrastructure includes Internal Estate Roads, intersections with Aldington Road, associated footpaths and verge, earthworks, retaining walls, stormwater drainage systems, Stormwater Basins, and services infrastructure to provide service to the allotments.

Fife Kemps Creek is working with Council and TfNSW and the LOG-E (Landowner Group - East) to design and construct the external road upgrades (Aldington Road, Abbotts Road, and the intersection with Mamre Road) to provide access that will appropriately provide for the estates. The timing of this upgrade is dependent on approvals independent but expected to be linked to development of this site.

12.2. Funding arrangements

The assumed funding arrangement for infrastructure are as follows:

- **Abbotts / Mamre Road Intersection:** Proposed to be delivered as Works in Kind for TfNSW and offset against SIC Levy. This work is proposed to be delivered in partnership with other landowners, known as the Landowners Group – East (LOG-E).
- **Aldington Road Upgrades:** Proposed to be delivered as Works in Kind for Penrith City Council and offset against Section 7.11 contributions. This work will be delivered in partnership with other landowners, known as the Landowners Group – East (LOG-E).
- **Lead-in services:** Developer funded with potential reimbursements subject to relevant authority approvals and procurement processes.
- **Internal Estate works:** Developer funded.

All funding arrangements are subject to authority approvals.

APPENDIX A – Civil Engineering Plans

(Refer to the PDF Drawings submitted with the application)

1000 SERIES –CIVIL INFRASTRUCTURE	
DRAWING No.	DRAWING TITLE
19-609-C1000	COVER SHEET
19-609-C1001	DRAWING LIST
19-609-C1002	GENERAL NOTES
19-609-C1005	GENERAL ARRANGEMENT PLAN
19-609-C1010	TYPICAL ROAD SECTIONS SHEET 1
19-609-C1011	TYPICAL ROAD SECTIONS SHEET 2
19-609-C1012	TYPICAL ROAD SECTIONS SHEET 3
19-609-C1013	TYPICAL ROAD SECTIONS SHEET 4
19-609-C1014	TYPICAL ROAD SECTIONS SHEET 5
19-609-C1015	TYPICAL SITE SECTIONS SHEET 1
19-609-C1016	TYPICAL SITE SECTIONS SHEET 2
19-609-C1017	TYPICAL SITE SECTIONS SHEET 3
19-609-C1018	TYPICAL SITE SECTIONS SHEET 4
19-609-C1020	BOUNDARY INTERFACE PLAN
19-609-C1021	BOUNDARY INTERFACE SECTIONS SHEET 1
19-609-C1022	BOUNDARY INTERFACE SECTIONS SHEET 2
19-609-C1030	BULK EARTHWORKS GENERAL ARRANGEMENT PLAN
19-609-C1031	BULK EARTHWORKS CUT\FILL PLAN
19-609-C1041	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 1
19-609-C1042	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 2
19-609-C1043	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 3
19-609-C1044	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 4
19-609-C1045	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 5
19-609-C1046	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 6
19-609-C1047	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 7
19-609-C1048	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 8
19-609-C1049	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 9

19-609-C1050	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 10
19-609-C1051	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 11
19-609-C1052	BULK EARTHWORKS AND STORMWATER DRAINAGE PLAN SHEET 12
19-609-C1061	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 1
19-609-C1062	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 2
19-609-C1063	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 3
19-609-C1064	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 4
19-609-C1065	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 5
19-609-C1066	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 6
19-609-C1067	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 7
19-609-C1068	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 8
19-609-C1069	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 9
19-609-C1070	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 10
19-609-C1071	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 11
19-609-C1072	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 12
19-609-C1073	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 13
19-609-C1074	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 14
19-609-C1075	ROADWORKS AND STORMWATER DRAINAGE PLAN SHEET 15
19-609-C1076	ROAD LONGITUDINAL SECTIONS SHEET 1
19-609-C1077	ROAD LONGITUDINAL SECTIONS SHEET 2
19-609-C1078	ROAD LONGITUDINAL SECTIONS SHEET 3
19-609-C1079	ROAD LONGITUDINAL SECTIONS SHEET 4
19-609-C1080	ROAD LONGITUDINAL SECTIONS SHEET 5
19-609-C1081	STORMWATER DRAINAGE CATCHMENT PLAN (PRE-DEVELOPED)
19-609-C1082	STORMWATER DRAINAGE CATCHMENT PLAN (POST-DEVELOPED)
19-609-C1085	BIO-RETENTION BASIN A DETAIL PLAN
19-609-C1086	BIO-RETENTION BASIN A SECTIONS
19-609-C1087	BIO-RETENTION BASIN B DETAIL PLAN SHEET 1
19-609-C1088	BIO-RETENTION BASIN B DETAIL PLAN SHEET 2
19-609-C1089	BIO-RETENTION BASIN B SECTIONS
19-609-C1090	RETAINING WALL GENERAL ARRANGEMENT PLAN
19-609-C1091	RETAINING WALL PROFILES SHEET 1
19-609-C1092	RETAINING WALL PROFILES SHEET 2

19-609-C1093	RETAINING WALL PROFILES SHEET 3
19-609-C1094	RETAINING WALL PROFILES SHEET 4
19-609-C1095	RETAINING WALL PROFILES SHEET 5
19-609-C1096	RETAINING WALL PROFILES SHEET 6
19-609-C1097	RETAINING WALL PROFILES SHEET 7
19-609-C1098	RETAINING WALL PROFILES SHEET 8
19-609-C1099	RETAINING WALL PROFILES SHEET 9
19-609-C1100	RETAINING WALL PROFILES SHEET 10
19-609-C1101	SERVICES AND UTILITIES COORDINATION PLAN SHEET 1
19-609-C1102	SERVICES AND UTILITIES COORDINATION PLAN SHEET 2
19-609-C1103	SERVICES AND UTILITIES COORDINATION PLAN SHEET 3
19-609-C1104	SERVICES AND UTILITIES COORDINATION PLAN SHEET 4
19-609-C1131	VEHICLE TURNPATH PLAN SHEET 1
19-609-C1132	VEHICLE TURNPATH PLAN SHEET 2
19-609-C1133	VEHICLE TURNPATH PLAN SHEET 3
19-609-C1134	VEHICLE TURNPATH PLAN SHEET 4
19-609-C1135	VEHICLE TURNPATH PLAN SHEET 5
19-609-C1136	VEHICLE TURNPATH PLAN SHEET 6
19-609-C1137	VEHICLE TURNPATH PLAN SHEET 7
19-609-C1138	VEHICLE TURNPATH PLAN SHEET 8
19-609-C1139	VEHICLE TURNPATH PLAN SHEET 9
19-609-C1140	VEHICLE TURNPATH PLAN SHEET 10
19-609-C1141	VEHICLE TURNPATH PLAN SHEET 11
19-609-C1142	VEHICLE TURNPATH PLAN SHEET 12

500 SERIES – ABBOTTS ROAD AND ALDINGTON ROAD CONCEPT DESIGN	
DRAWING No.	DRAWING TITLE
21-843-C500	COVER SHEET
21-843-C501	DRAWING LIST
21-843-C502	GENERAL ARRANGEMENT
21-843-C505	TYPICAL ROAD SECTIONS SHEET 1
21-843-C506	TYPICAL ROAD SECTIONS SHEET 2
21-843-C507	TYPICAL ROAD SECTIONS SHEET 3

21-843-C508	TYPICAL ROAD SECTIONS SHEET 4
21-843-C510	ROADWORKS PLAN SHEET 1
21-843-C511	ROADWORKS PLAN SHEET 2
21-843-C512	ROADWORKS PLAN SHEET 3
21-843-C513	ROADWORKS PLAN SHEET 4
21-843-C514	ROADWORKS PLAN SHEET 5
21-843-C515	ROADWORKS PLAN SHEET 6
21-843-C516	ROADWORKS PLAN SHEET 7
21-843-C517	ROADWORKS PLAN SHEET 8
21-843-C518	ROADWORKS PLAN SHEET 9
21-843-C519	ROADWORKS PLAN SHEET 10
21-843-C520	ROADWORKS PLAN SHEET 11
21-843-C521	ROADWORKS PLAN SHEET 12
21-843-C522	ROADWORKS PLAN SHEET 13
21-843-C523	ROADWORKS PLAN SHEET 14
21-843-C524	ROADWORKS PLAN SHEET 15
21-843-C525	ROADWORKS PLAN SHEET 16
21-843-C530	ROAD LONGITUDINAL SECTIONS SHEET 1
21-843-C531	ROAD LONGITUDINAL SECTIONS SHEET 2
21-843-C532	ROAD LONGITUDINAL SECTIONS SHEET 3
21-843-C533	ROAD LONGITUDINAL SECTIONS SHEET 4
21-843-C534	ROAD LONGITUDINAL SECTIONS SHEET 5
21-843-C550	PAVEMENT AND LINEMARKING PLAN SHEET 1
21-843-C551	PAVEMENT AND LINEMARKING PLAN SHEET 2
21-843-C552	PAVEMENT AND LINEMARKING PLAN SHEET 3
21-843-C553	PAVEMENT AND LINEMARKING PLAN SHEET 4
21-843-C554	PAVEMENT AND LINEMARKING PLAN SHEET 5
21-843-C555	PAVEMENT AND LINEMARKING PLAN SHEET 6
21-843-C556	PAVEMENT AND LINEMARKING PLAN SHEET 7
21-843-C557	PAVEMENT AND LINEMARKING PLAN SHEET 8
21-843-C558	PAVEMENT AND LINEMARKING PLAN SHEET 9
21-843-C559	PAVEMENT AND LINEMARKING PLAN SHEET 10
21-843-C560	PAVEMENT AND LINEMARKING PLAN SHEET 11

21-843-C561	PAVEMENT AND LINEMARKING PLAN SHEET 12
21-843-C562	PAVEMENT AND LINEMARKING PLAN SHEET 13
21-843-C563	PAVEMENT AND LINEMARKING PLAN SHEET 14
21-843-C564	PAVEMENT AND LINEMARKING PLAN SHEET 15
21-843-C565	PAVEMENT AND LINEMARKING PLAN SHEET 16
21-843-C566	PAVEMENT AND LINEMARKING PLAN SHEET 17

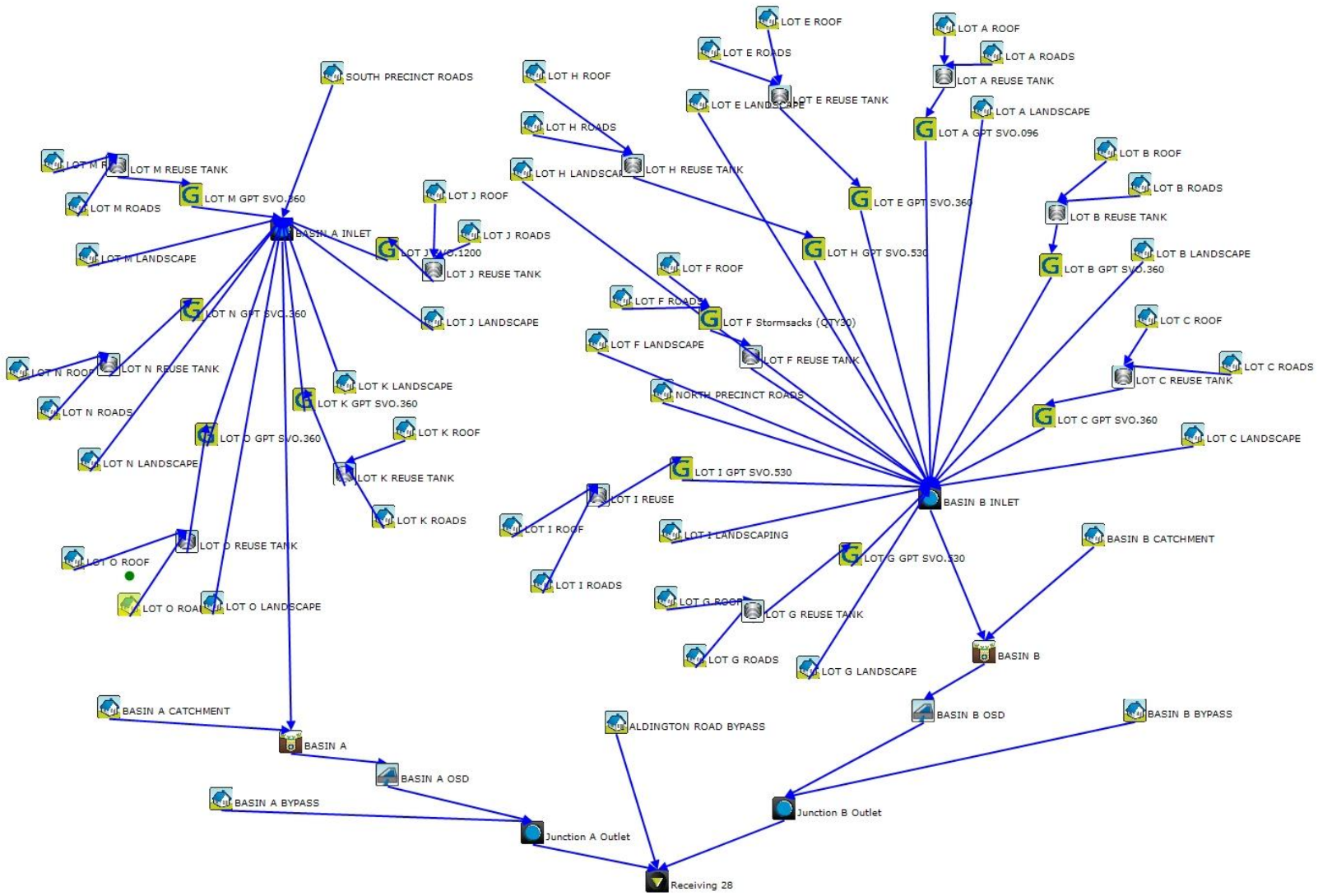
600 SERIES – ABBOTTS ROAD AND ALDINGTON ROAD ULTIMATE DESIGN	
DRAWING No.	DRAWING TITLE
21-843-C600	COVER SHEET
21-843-C601	LINEMARKING ULTIMATE PLAN SHEET 1
21-843-C602	LINEMARKING ULTIMATE PLAN SHEET 2
21-843-C603	LINEMARKING ULTIMATE PLAN SHEET 3
21-843-C604	LINEMARKING ULTIMATE PLAN SHEET 4
21-843-C605	LINEMARKING ULTIMATE PLAN SHEET 5
21-843-C606	LINEMARKING ULTIMATE PLAN SHEET 6
21-843-C607	LINEMARKING ULTIMATE PLAN SHEET 7
21-843-C608	LINEMARKING ULTIMATE PLAN SHEET 8
21-843-C609	LINEMARKING ULTIMATE PLAN SHEET 9
21-843-C610	LINEMARKING ULTIMATE PLAN SHEET 10
21-843-C611	LINEMARKING ULTIMATE PLAN SHEET 11
21-843-C612	LINEMARKING ULTIMATE PLAN SHEET 12
21-843-C613	LINEMARKING ULTIMATE PLAN SHEET 13
21-843-C614	LINEMARKING ULTIMATE PLAN SHEET 14
21-843-C615	LINEMARKING ULTIMATE PLAN SHEET 15
21-843-C616	LINEMARKING ULTIMATE PLAN SHEET 16
21-843-C617	LINEMARKING ULTIMATE PLAN SHEET 17
21-843-C618	LINEMARKING ULTIMATE PLAN SHEET 18
21-843-C619	LINEMARKING ULTIMATE PLAN SHEET 19
21-843-C620	LINEMARKING ULTIMATE PLAN SHEET 20
21-843-C621	LINEMARKING ULTIMATE PLAN SHEET 21
21-843-C622	LINEMARKING ULTIMATE PLAN SHEET 22
21-843-C623	LINEMARKING ULTIMATE PLAN SHEET 23

21-843-C624	LINEMARKING ULTIMATE PLAN SHEET 24
21-843-C630	ROAD LONGITUDINAL SECTIONS SHEET 1
21-843-C631	ROAD LONGITUDINAL SECTIONS SHEET 2
21-843-C632	ROAD LONGITUDINAL SECTIONS SHEET 3
21-843-C633	ROAD LONGITUDINAL SECTIONS SHEET 4
21-843-C634	ROAD LONGITUDINAL SECTIONS SHEET 5

3100 SERIES – LOT F BUILDING CIVIL DRAWINGS	
DRAWING No.	DRAWING TITLE
19-609-C3100	COVER SHEET
19-609-C3101	DRAWING LIST AND GENERAL NOTES
19-609-C3105	GENERAL ARRANGEMENT PLAN
19-609-C3111	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 1
19-609-C3112	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 2
19-609-C3113	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 3
19-609-C3114	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 4
19-609-C3115	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 5
19-609-C3116	SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 6
19-609-C3120	PAVEMENT PLAN

CONCEPT SKETCH – MAMRE & ABBOTTS ROAD INTERSECTION CIVIL DRAWINGS	
DRAWING No.	DRAWING TITLE
21-843-SKC23	LAND ACQUISITION – MAMRE ROAD AND ABBOTTS ROAD INTERSECTION UPGRADE
21-843-SKC26	MAMRE ROAD AND ABBOTTS ROAD INTERIM INTERTERSECTION WORKS IN KIND PLAN

APPENDIX B – MUSIC Model


SOUTH PRECINCT ROADS
LOT M REUSE TANK
LOT M GPT SVO.360
LOT M ROADS
LOT M LANDSCAPE
BASIN A INLET
LOT J ROOF
LOT J ROADS
LOT J GPT SVO.1200
LOT J REUSE TANK
LOT J LANDSCAPE
LOT N GPT SVO.360
LOT N REUSE TANK
LOT N ROADS
LOT N LANDSCAPE
LOT K LANDSCAPE
LOT K GPT SVO.360
LOT O GPT SVO.360
LOT K ROOF
LOT K REUSE TANK
LOT K ROADS
LOT O REUSE TANK
LOT O ROOF
LOT O LANDSCAPE
BASIN A CATCHMENT
BASIN A
BASIN A OSD
BASIN A BYPASS
Junction A Outlet
LOT E ROOF
LOT E ROADS
LOT E REUSE TANK
LOT E LANDSCAPE
LOT A ROOF
LOT A ROADS
LOT A REUSE TANK
LOT A LANDSCAPE
LOT A GPT SVO.096
LOT H ROOF
LOT H ROADS
LOT H LANDSCAPE
LOT H REUSE TANK
LOT E GPT SVO.360
LOT H GPT SVO.530
LOT B ROOF
LOT B ROADS
LOT B REUSE TANK
LOT B LANDSCAPE
LOT B GPT SVO.360
LOT F ROOF
LOT F ROADS
LOT F Stormsacks (QTY30)
LOT F LANDSCAPE
LOT F REUSE TANK
NORTH PRECINCT ROADS
LOT C ROOF
LOT C ROADS
LOT C REUSE TANK
LOT C GPT SVO.360
LOT C LANDSCAPE
LOT I GPT SVO.530
LOT I REUSE
BASIN B INLET
LOT I ROOF
LOT I LANDSCAPING
BASIN B CATCHMENT
LOT I ROADS
LOT G GPT SVO.530
LOT G ROOF
LOT G REUSE TANK
BASIN B
LOT G ROADS
LOT G LANDSCAPE
ALDINGTON ROAD BYPASS
BASIN B OSD
BASIN B BYPASS
Junction B Outlet
Receiving 28

APPENDIX C - WSUD MAINTENANCE PLAN (DRAFT)

The Water management Strategy elements within the site will remain in private ownership. The shared assets will be maintained under the community title through the community association. This includes Lot D (including Basin B) and Lot L (Basin A). On lot components will be maintained by the tenant of each lot including on lot irrigation systems, roof irrigation and on lot GPTs.

Table C1: Bioretention Basin maintenance plan

Bioretention Basin maintenance plan Location: 200 Aldington Road Basin A / Basin B SSDA 10479			
Inspection Items	**Frequency**	**Action required**	**Action taken & date**
Surface vegetation	6 months	• Inspect health of plants and trim where necessary • Remove and replace diseased/dead plants *with same species • Remove weeds	
Debris/sediment	3 monthly	Inspect and clean debris/sediment build-up from surface, inlet area and overflow Disposal to sorting facility to separate recyclables and organic material to suitable composting facility	
Outlet / Overflow	3 monthly	If ponding occurs for more than 3 days after storms, check whether underdrain or filter media is blocked	
Pits / outlets	12 monthly	Repair cracking	
Under drainage	5 years	Flush underdrainage	
Filter media	Approx. 30 years	Replace filter media	

Additional reference material available online through Maintaining Vegetated Stormwater Assets - Water by Design

*A detailed landscape plan will be prepared following detailed design of the basin.

Table C2: Stormwater pit GPT maintenance plan

Stormwater Pit GPT maintenance plan **Location: 200 Aldington Road** **Lot X** **SSDA 10479**			
Inspection Items	**Frequency**	**Action required**	**Action taken & date**

Pit insert/filter	3 months * or after heavy rain	• Inspect
		  ○ Filter /bag
		  ○ Frame
		  ○ seal
		• Empty filter/bag in accordance with manufacturer instructions
		• Record quantity of debris removed)
		• Dispose of debris appropriately
		• Repair if damaged	

Outlet pipe	6 months	Check for blockages	

*Review required frequency after 12 months of monitoring and recording

Table C3: Rainwater and Stormwater harvesting Tank maintenance plan

Rainwater and Stormwater Harvesting Tank maintenance plan – Including filter **Location: 200 Aldington Road** **Lot X** **SSDA 10479**			
Inspection Items	**Frequency**	**Action required**	**Action taken & date**
Filter prior to reuse – Puraceptor (or similar)	6 months	Inspect Clean in accordance with manufacturer instructions	
Pump	6 monthly	Inspect / test	
Tank access	12 monthly	Check lid condition of access	
Likely pollutants			
Hardstand – oil, grease, litter Roof – leaves Landscaped areas –litter, bark			

Table C4: Roof Irrigation maintenance plan

Roof Irrigation maintenance plan **Location: 200 Aldington Road** **Lot X** **SSDA 10479**			
Inspection Items	**Frequency**	**Action required**	**Action taken & date**
Roof Irrigation nozzles	12 months	• Inspect nozzles • Remove and replace damaged nozzles •	
Sensors	12 months	Inspect / calibrate	

Table C5: Irrigation System maintenance plan

Irrigation System maintenance plan **Location: 200 Aldington Road** **Lot X** **SSDA 10479**			
Inspection Items	**Frequency**	**Action required**	**Action taken & date**
Pump	6 months	Inspect Test	
Nozzles	6 months	Check for blockages and leaks Record location of damage Repair	
Irrigation Controller	3 months	Check for faults	

APPENDIX D - OVERLAND FLOW – MINOR EXTERNAL & ESTATE CATCHMENTS

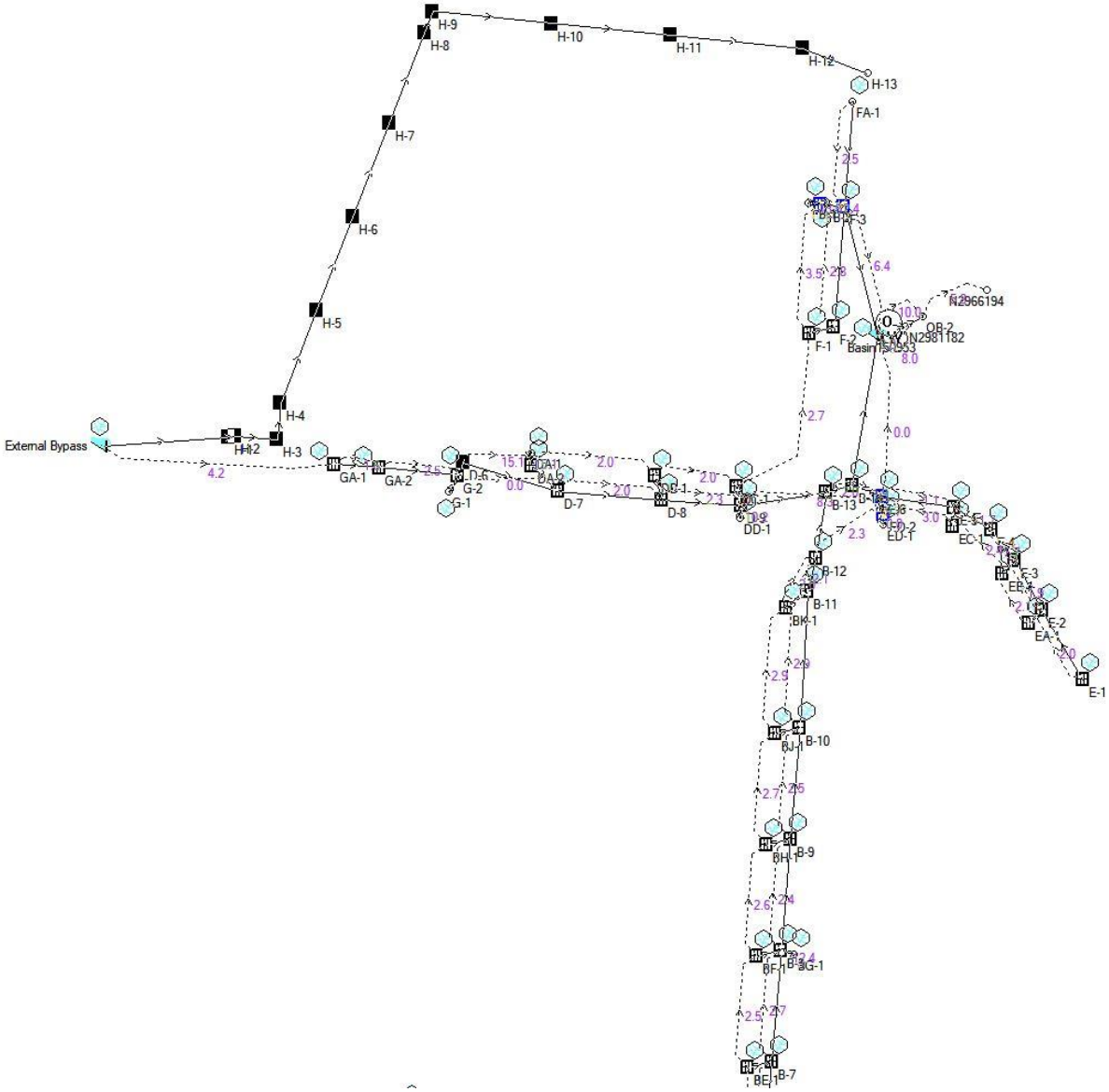


Figure D1 DRAINS Output External and Estate Northern Catchment

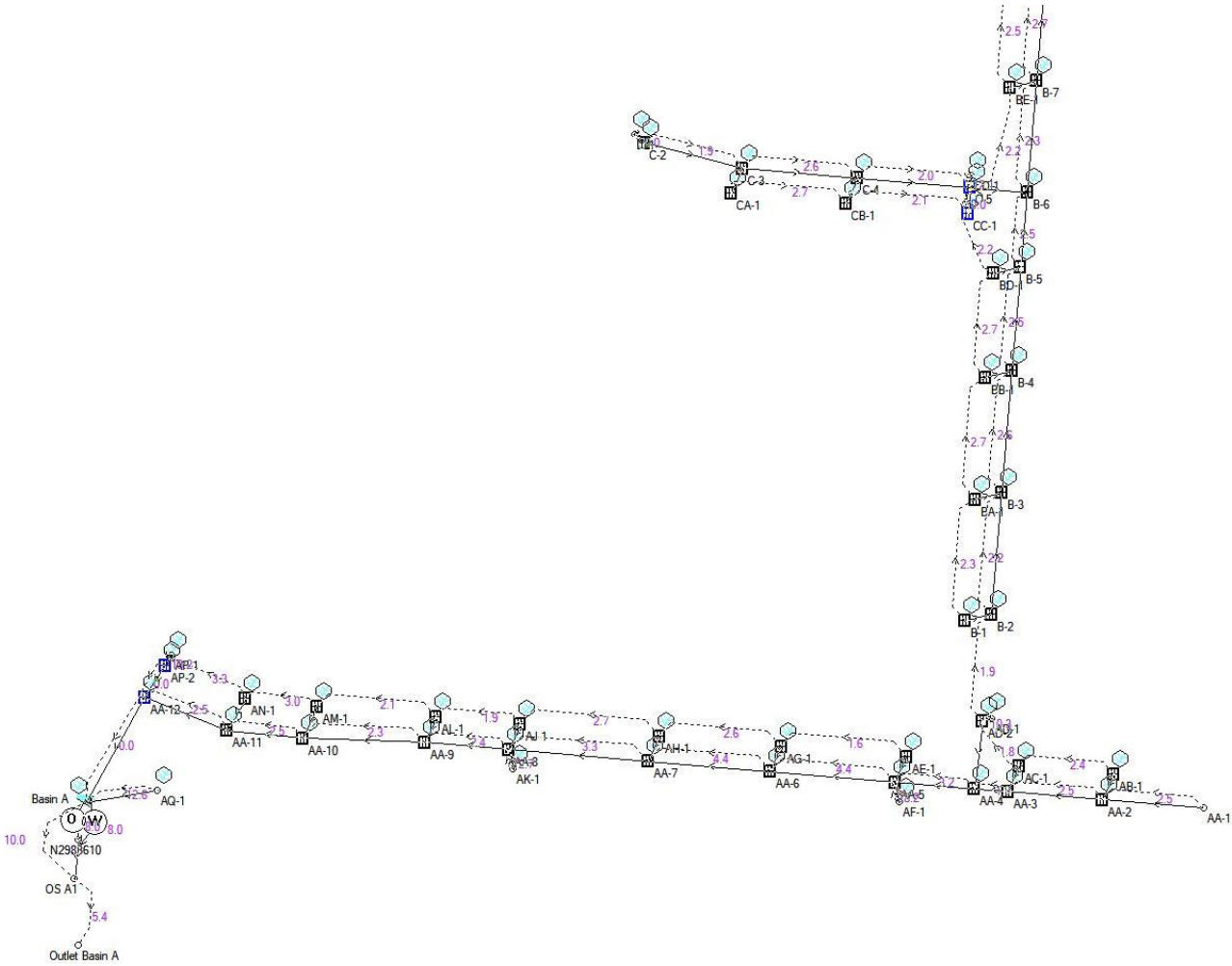
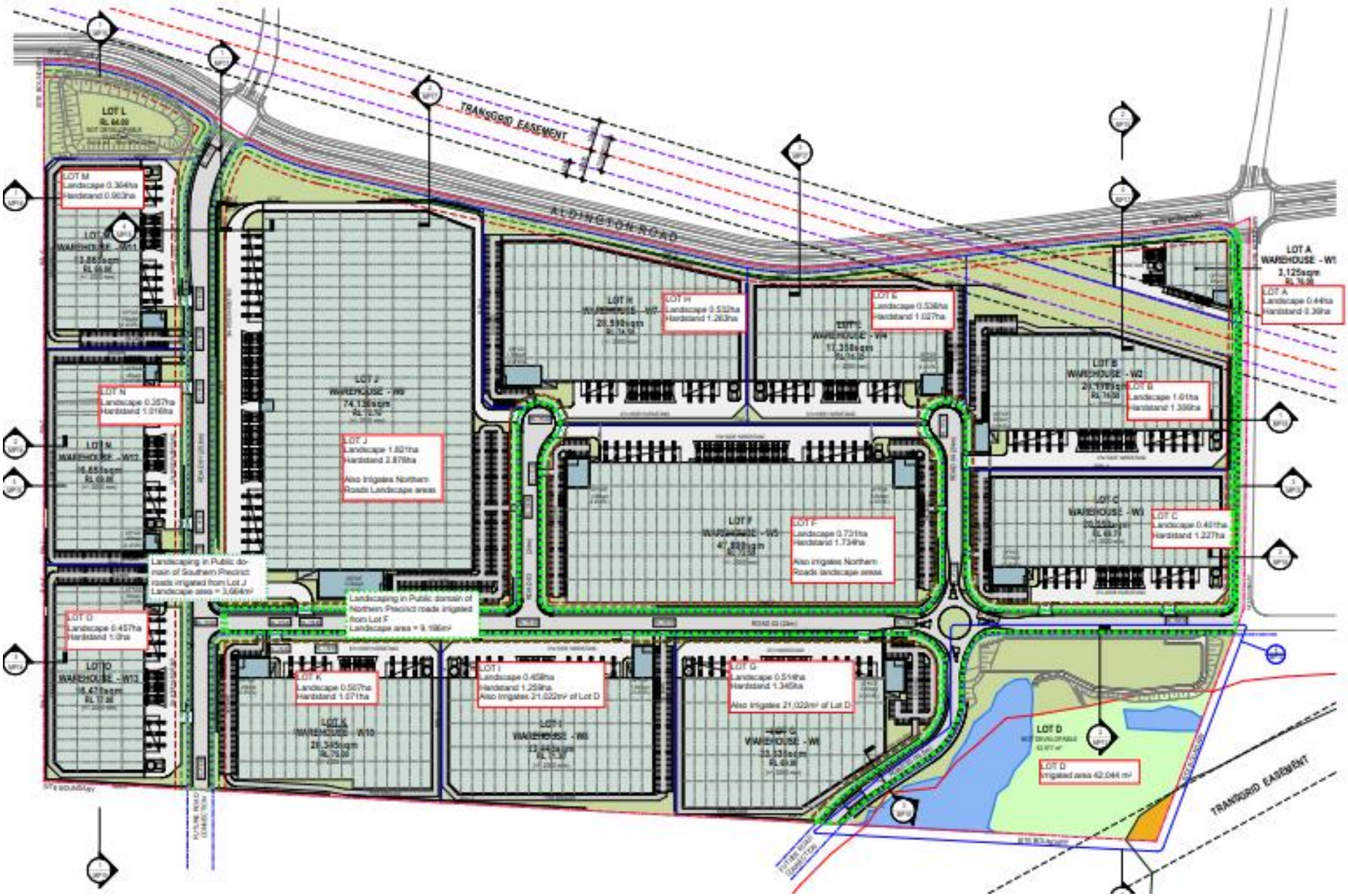


Figure D2 DRAINS output – Estate Southern Catchment

APPENDIX E - IRRIGATION AREAS (WMS)


TRANSGRID EASEMENT
ATHINGTON ROAD
LOT L
RL 64.00
LOT M
Landscape 0.364ha
Hardstand 0.963ha
LOT N
Landscape 0.357ha
Hardstand 1.016ha
LOT O
Landscape 0.457ha
Hardstand 1.0ha
LOT J
Landscape 1.821ha
Hardstand 2.876ha
Also Irrigates Northern Roads Landscape areas
LOT H
Landscape 0.532ha
Hardstand 1.263ha
LOT E
Landscape 0.536ha
Hardstand 1.027ha
LOT B
Landscape 1.01ha
Hardstand 1.366ha
LOT A
Landscape 0.44ha
Hardstand 0.36ha
LOT F
Landscape 0.731ha
Hardstand 1.734ha
Also Irrigates Northern Roads landscape areas
LOT C
Landscape 0.481ha
Hardstand 1.227ha
LOT K
Landscape 0.567ha
Hardstand 1.071ha
LOT I
Landscape 0.458ha
Hardstand 1.259ha
Also Irrigates 21,022m² of Lot D
LOT G
Landscape 0.514ha
Hardstand 1.346ha
Also Irrigates 21,022m² of Lot D
LOT D
Irrigated area 42,044 m²
Landscaping in Public domain of Southern Precinct roads irrigated from Lot J
Landscape area = 3,664m²
Landscaping in Public domain of Northern Precinct roads irrigated from Lot F
Landscape area = 9,186m²

at&l

NORTH SYDNEY
LEVEL 7
153 WALKER STREET
NORTH SYDNEY NSW 2060
029439 1777
INFO@ATL.NET.AU

PARRAMATTA
LEVEL 4
17-21 MCQUARIE STREET
PARRAMATTA NSW 2150
INFO@ATL.NET.AU

BRISBANE
SUITE A1 LEVEL 20
127 CREEK STREET
BRISBANE QLD 4000
07 3211 9581
INFO-QLD@ATL.NET.AU

MELBOURNE
7 BENNETT DRIVE
ALTONA NORTH VIC 3025
INFO-VIC@ATL.NET.AU

atl.net.au