



155-217 Aldington Road,
Kemps Creek
Water Cycle Management Strategy
SSD-17552047

Frasers Property

JUNE 2021

20-776

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Contents

1.	Introduction.....	1
1.1.	Site Description.....	1
1.2.	Supporting Documentation.....	1
2.	Compliance with SEARs.....	2
3.	Site Characteristics.....	3
3.1.	Existing Topography and Catchments.....	3
3.2.	Existing Drainage Lines.....	4
3.3.	Proposed Earthworks.....	5
3.4.	Post-Development Catchment Extents.....	6
4.	Soil and Water Management.....	7
4.1.	Erosion and Sediment Control.....	7
4.1.1.	Sources of Pollution.....	7
4.1.2.	Potential Impacts.....	7
4.1.3.	RUSLE Analysis.....	8
4.1.4.	Construction Phase Soil and Water Management Strategy.....	8
4.1.5.	Design of Erosion and Sediment Control Measures.....	9
4.1.6.	Site Inspection and Maintenance.....	9
4.1.7.	Sediment Basin Maintenance.....	10
4.1.8.	Conclusion.....	10
5.	Stormwater Drainage.....	11
5.1.	Stormwater Drainage Design Criteria.....	11
5.2.	Proposed Site Stormwater Drainage.....	11
5.3.	Trunk Drainage Infrastructure.....	12
6.	Stormwater Management Strategy.....	13
6.1.	Stormwater Management Strategy Objectives.....	13
6.2.	Hydrological and Hydraulic Modelling.....	13
6.3.	Stormwater Quality Modelling.....	14
6.4.	Proposed Stormwater Management Measures.....	16
6.4.1.	Rainwater Tanks.....	16
6.4.2.	Gross Pollutant Traps.....	17
6.4.3.	Bio-retention Systems.....	17
6.4.4.	On-Site Stormwater Detention.....	18
6.4.5.	Estate-wide Ponds.....	18
6.4.6.	Evaporative misting on roof areas.....	19
6.5.	Scenario Modelling.....	20
6.6.	MUSIC Model Results.....	22
6.7.	DRAINS Model Results.....	23
7.	Site Water Balance.....	24
7.1.	General.....	24

7.2.	Water Balance Objective	24
7.3.	Water Balance End Uses.....	24
7.4.	Total Site Demands and Non-Potable Reuse Rates.....	24
7.5.	Rainwater Reuse	24
7.6.	Proposed Rainwater Tank Parameters.....	25

1. Introduction

This report has been prepared by AT&L on behalf of Frasers Property in support of a State Significant Development Application (SSDA) for the proposed development of the site located between 155-217 Aldington Road, Kemps Creek (the Site).

1.1. Site Description

The site is located in the suburb of Kemps Creek, within the Penrith Local Government Area (LGA), and approximately 13 km south-east of the Penrith CBD and 6 km north-east of the under-construction Western Sydney Airport. The site is made up of the following allotments:

- Lot 33 DP258949 (155-167 Aldington Road, Kemps Creek)
- Lot 28 DP255560 (169-181 Aldington Road, Kemps Creek)
- Lot 27 DP255560 (183-197 Aldington Road, Kemps Creek)
- Lot 26 DP255560 (199 Aldington Road, Kemps Creek)
- Lot 25 DP255560 (201-217 Aldington Road, Kemps Creek)

The total area of the site is approximately 43 hectares.

The extent of the site is presented in Figure 1.

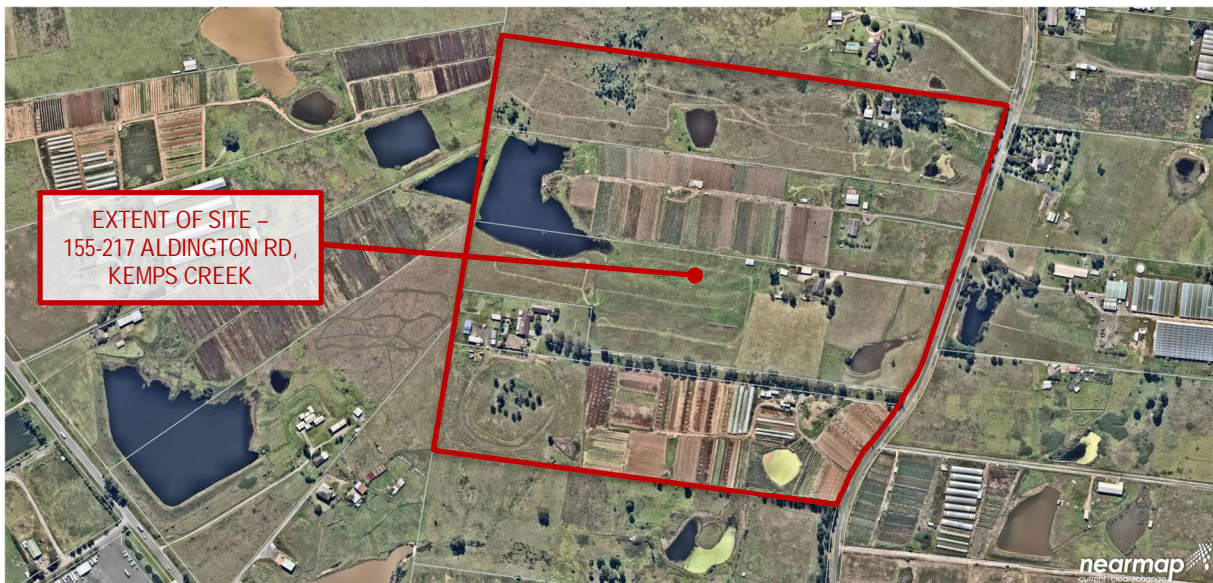


Figure 1: Site Extent (imagery from nearmap, dated 15 April 2021)

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

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

1.2. Supporting Documentation

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

- a) Civil Design Report (AT&L)
- b) Civil Drawings (AT&L)

2. Compliance with SEARs

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

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

Key issues listed in the SEARs	Response
Soil and Water	
– a topographic assessment and justification demonstrating the proposed earthworks are responsive and contextually appropriate	Section 3.3
– an assessment of the development's potential impacts on soil and water resources, topography, hydrology, groundwater, groundwater dependent ecosystem(s), drainage lines, watercourses and riparian lands on or nearby to the site, including mapping and descriptions of existing background conditions and cumulative impacts and measures proposed to reduce and mitigate impacts	Section 3
– a detailed site water balance including identification of water requirements for the life of the development, measures that would be implemented to ensure an adequate and secure water supply is available for the development and a detailed description of the measures to minimise water consumption at the site	Section 7
– demonstration satisfactory arrangements for drinking water, wastewater and, if required, recycled water services have been made	refer to Service Infrastructure Assessment prepared by LandPartners (March 2021)
– characterisation of water quality at the point of discharge to surface and/or groundwater against the relevant water quality criteria (including the Draft Mamre Road Precinct Development Control Plan) and proposed mitigation measures, monitoring activities and methodologies	Section 6
– a site-specific integrated water management strategy with details of stormwater/wastewater management system including how it will be designed, operated and maintained, including the capacity of on-site detention system(s), on-site sewage management and measures to treat, reuse (including indicative quantities) or dispose of water	Section 6
– demonstration of how stormwater discharge will comply with the trunk drainage infrastructure identified in the Mamre Road Precinct Draft Development Control Plan, including concept stormwater plans for both the proposed development and the ultimate developed estate	Section 5
– description of the proposed erosion and sediment controls during construction	Section 4

3. Site Characteristics

3.1. Existing Topography and Catchments

The site in its existing condition is characterised by undulating topography. The ground slope across most of the site is between 3% and 6%. The northern part of the site (155-167 Aldington Road) is steeper than the majority of the site, with slopes of up to 15%.

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

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

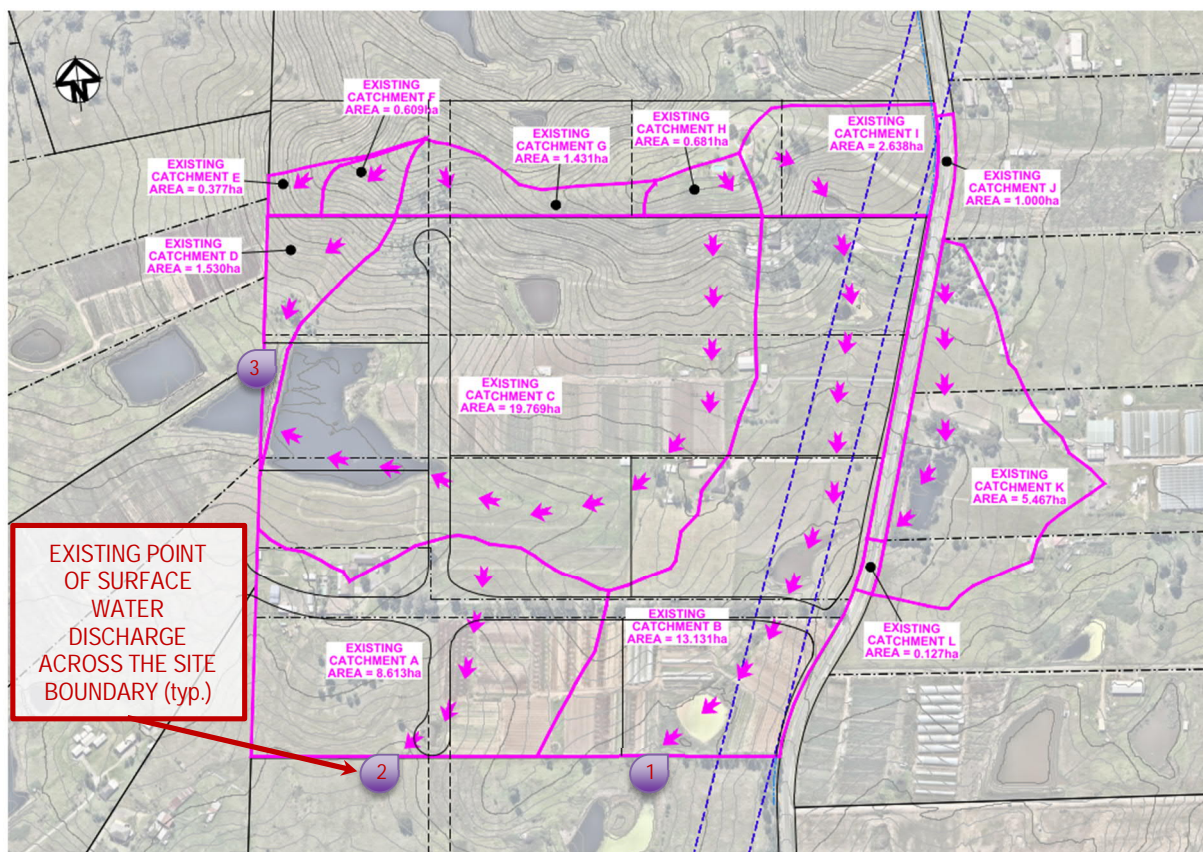


Figure 2: Catchment extents under existing conditions

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

- Existing Catchment A (8.61 ha) – discharges towards the southern boundary.
- Existing Catchment B (13.13 ha) – discharges towards the southern boundary.
- Existing Catchment C (19.77 ha) – discharges towards an existing farm dam located adjacent to the western boundary.
- Existing Catchment D (1.53 ha) – discharges towards the western boundary and bypasses the farm dam located adjacent to the western boundary.

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

3.2. Existing Drainage Lines

Based on large-scale topographic mapping (1:25,000 from NSW Six Maps), there are no mapped watercourses or drainage lines within the site, refer to Figure 3.

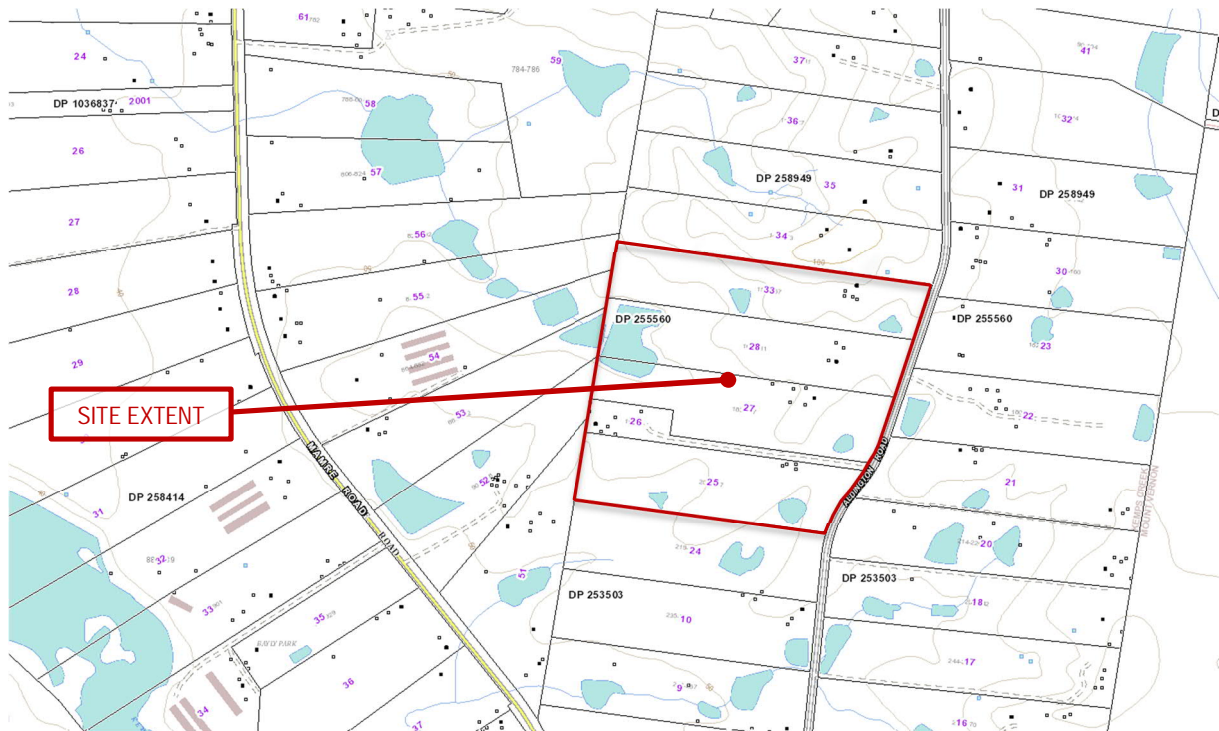


Figure 3: Topographic mapping showing drainage lines in the vicinity of the site (Source: NSW SIX Maps)

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

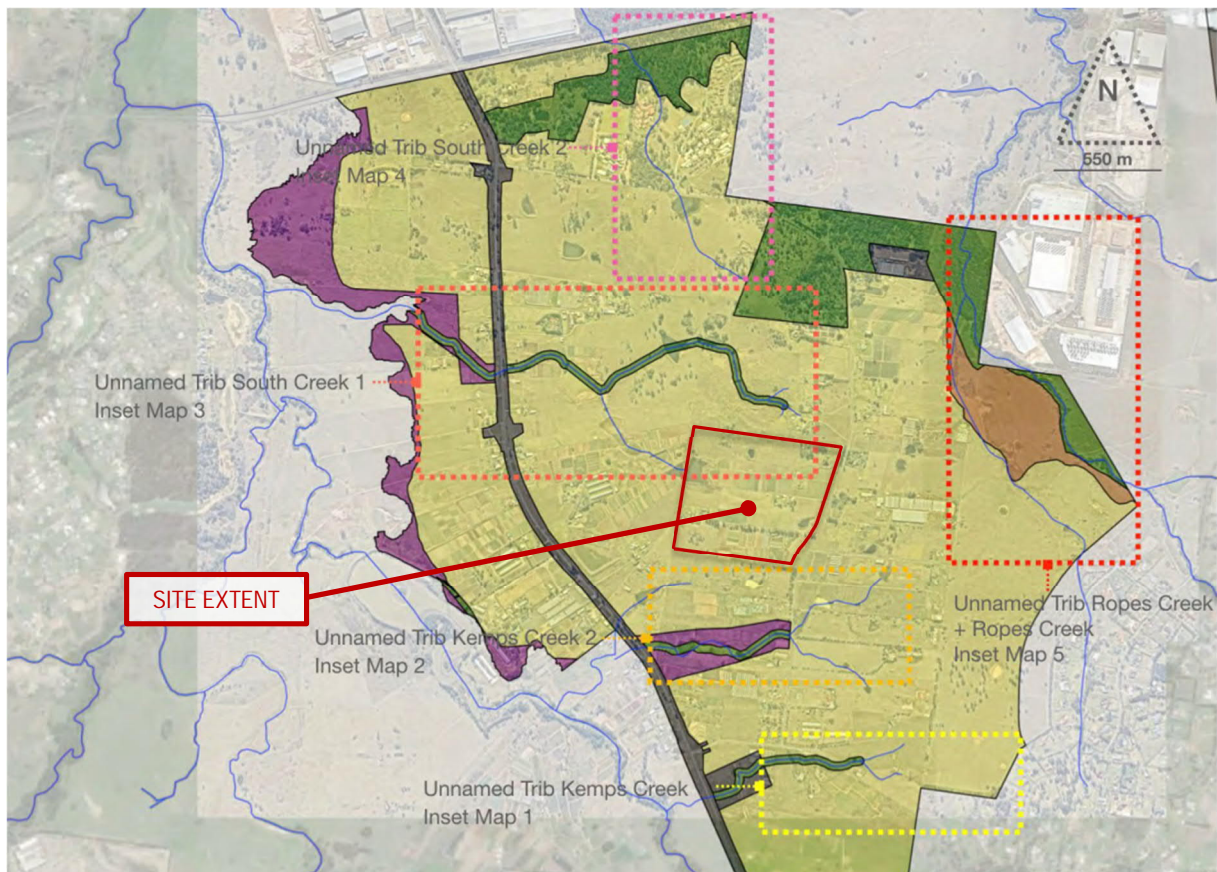


Figure 4: Extract of waterway mapping (CTEnvironmental, April 2020)

3.3. Proposed Earthworks

The intent of the proposed development of the site is to produce several level pads to facilitate the development of large-scale industrial lots, ranging in the order of 2.7 hectares (approximately 180 metres by 150 metres) up to 14.3 hectares (approximately 500 metres by 285 metres). The creation of large-scale industrial lots will require benched earthworks across the site to achieve level pads across each of the proposed lots.

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

- Undulating topography within the Mamre Road Precinct, resulting in the requirement of extensive cut and fill to allow Fraser Property to facilitate economic development and provide flexibility to cater for a wide range of industrial customer requirements.
- Provision for connectivity to and interfaces with adjoining lands.
- Provision for connectivity to Aldington Road, including allowance for the future upgrade of Aldington Road.
- Provision for connectivity to the adjacent development site to the west (Altis) and future development to the north and south of the site.
- Avoiding retaining walls fronting Aldington Road and minimising the extent of retaining walls fronting proposed estate roads as much as possible.
- Avoiding extensive cut in bedrock sub-surface units.
- Meeting the requirements for the end-use of the site, being that it will cater for IN1 – General Industrial land use which requires large flexible allotments.

- Achieving as close as possible to a balance of cut to fill to minimise the volume of material that needs to be imported or exported, allowing for management of topsoils and over-excavation (desilting) required within existing farm dams.
- Provision of a final design solution that addresses water management requirements, including stormwater quantity and quality management, external catchments, stormwater drainage (major and minor system), flooding and discharges.

It is recommended that the proposed earthworks design contained within the AT&L documentation provides the most contextually and economically appropriate design in consideration of the above requirements.

3.4. Post-Development Catchment Extents

A post-development catchment plan based on the proposed site grading is presented as Figure 5. Based on the proposed site grading, there will be three main points of surface water discharge from the site:

- 1 At the southern boundary near the south-eastern corner of the site. Discharge to this point will be via an open channel and level spreader with appropriate outlet scour protection.
- 2 At the southern boundary adjacent to proposed Road 2. In the interim, discharge at this point will be via an open channel and level spreader with appropriate outlet scour protection. Ultimately, stormwater drainage will connect to an extension of Road 2 beyond the southern boundary of the site.
- 3 At the western boundary and towards the proposed Altis development site. Discharge to the Altis site will be subject to further design coordination.

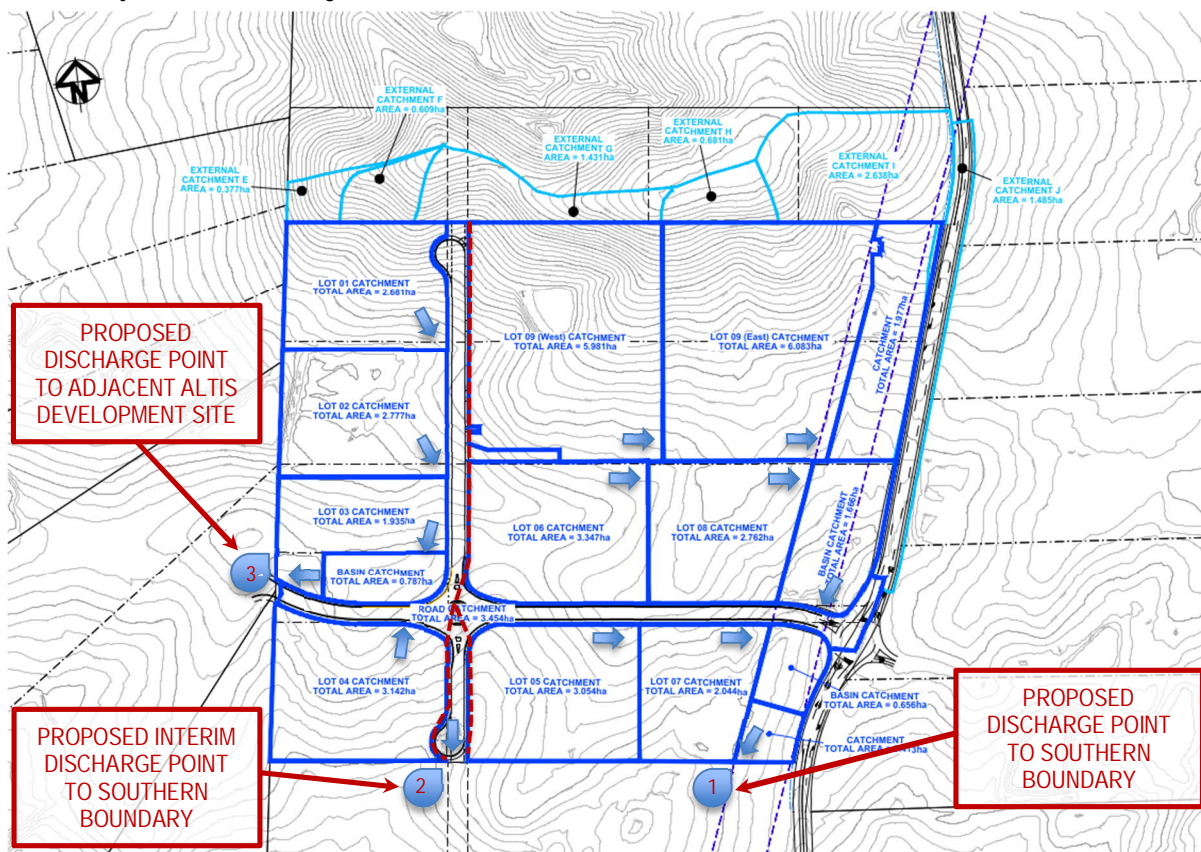


Figure 5: Catchment extents under proposed conditions

4. Soil and Water Management

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

4.1. Erosion and Sediment Control

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

The key objectives of the SWMP are:

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

4.1.1. Sources of Pollution

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

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

4.1.2. Potential Impacts

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

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

4.1.3. RUSLE Analysis

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

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

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

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

Table 2: RUSLE Analysis

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

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

4.1.4. Construction Phase Soil and Water Management Strategy

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

- Diversion of surface runoff from undisturbed areas away from disturbed areas and discharge via suitable scour protection.
- Provision of hay bale type flow diverters to catch drainage and divert to "clean" water drains.
- Diversion of sediment-laden water into temporary sediment control basins to capture the design storm volume and undertake flocculation (if required).
- Provision of construction traffic shaker grids and wash-down to prevent vehicles carrying soils beyond the site.
- Provision of catch drains to carry sediment-laden water to sediment basins.
- Provision of silt fences to filter and retain sediments at source.
- Rapid stabilisation of disturbed and exposed ground surfaces with hydro-seeding areas where future construction and building works are not currently proposed.
- All temporary sediment basins will be located clear of the 1% AEP flood extents from local overland flow within the site.
- Bio-retention basins are to be utilised as temporary sediment control basins. The bio-retention basins shall not be converted into the final/ultimate basins until such time as all building and construction works within the site has been completed and 90% of the site is stabilised.

Refer to AT&L Drawings 20-776-1201 for Erosion and Sediment Control Plans, for all proposed control and protection measures across the site until completion of on lot works.

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

4.1.5. Design of Erosion and Sediment Control Measures

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

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

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

With the proposed site being larger than 2,500m² in disturbed area, sediment basins will be required. The proposed stormwater detention basins are proposed to be used temporarily as sitewide sediment basin during the bulk earthworks construction. For this approval it has been assumed that the on-lot works will be completed simultaneously, negating the need for individual sediment basins. Ultimately, the final temporary sediment basin locations and sizes will be provided to suit development staging requirements and will be sized and maintained in accordance with the requirements of the above-mentioned authority documents.

4.1.6. Site Inspection and Maintenance

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

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

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

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

4.1.7. Sediment Basin Maintenance

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

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

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

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

4.1.8. Conclusion

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

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

5. Stormwater Drainage

5.1. Stormwater Drainage Design Criteria

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

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

5.2. Proposed Site Stormwater Drainage

The proposed drainage network within the estate has been designed to safely convey major and minor flows prior to discharging to neighbouring properties to the south and west. The following criteria have been adopted for the proposed drainage system:

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

The site is divided into two broad catchments: one discharging towards the south-eastern corner of the site and across the southern boundary and one discharging towards the western boundary. These two broad catchments are generally delineated by the proposed Road 2 that will run in a north-south direction through the site. The section of proposed Road 2 south of the roundabout will discharge towards the southern boundary via a level spreader and outlet scour protection to minimise potential impacts associated with scour beyond the site.

The proposed estate-wide drainage system will incorporate three detention basins. Key parameters relating to these proposed basins are described in Table 3. Further specific design criteria relating to stormwater quantity management is presented in Section 6.4.4.

Table 3: Key detention basin parameters

Basin ID	Location	Collects stormwater from:	Discharges to:
A	Lot 7, within the Transgrid easement and adjacent to Aldington Road	Proposed lots 5 and 7 Road 1 east of the proposed roundabout Basin B	Transgrid easement on Lot 7, and ultimately to a level spreader and outlet scour protection adjacent to the southern boundary via a new overland flow channel.
B	Lot 8, within the Transgrid easement and adjacent to Aldington Road	Proposed lots 6, 8 and 9 Part of Transgrid easement north of Basin B External catchments D and E	Basin A via a culvert under proposed Road 1.

Basin ID	Location	Collects stormwater from:	Discharges to:
C	Lot 3, on the north-western corner of proposed Roads 1 and 2	Lots 1, 2, 3 and 4 Road 2 north of the roundabout Part of Road 1 west of the roundabout	Proposed stormwater drainage network in Road 1 and ultimately across the western boundary and into the future stormwater network on the Altis development site.

5.3. Trunk Drainage Infrastructure

The *Draft Mamre Road Precinct DCP* includes indicative locations of trunk drainage infrastructure across the precinct, refer to Figure 6. The two indicative trunk drainage lines within the site are:

- B07 (in the south-eastern portion of the site and downstream of proposed Basin A) – outflow from Basin A (both piped and via a controlled overflow weir) will be directed to an open channel that will discharge towards the southern boundary of the site.
- D05 (adjacent to the western boundary of the site) – outflow from proposed Basin C will be directed to the proposed drainage system in Road 1 and ultimately towards the adjacent Altis development site. The nature and extent of trunk stormwater drainage at the interface between the two development sites will be subject to coordination at the detailed design phase. Should the Altis development not be completed or underway at the time of construction, the stormwater discharge will be diverted to a level spreader along the boundary.

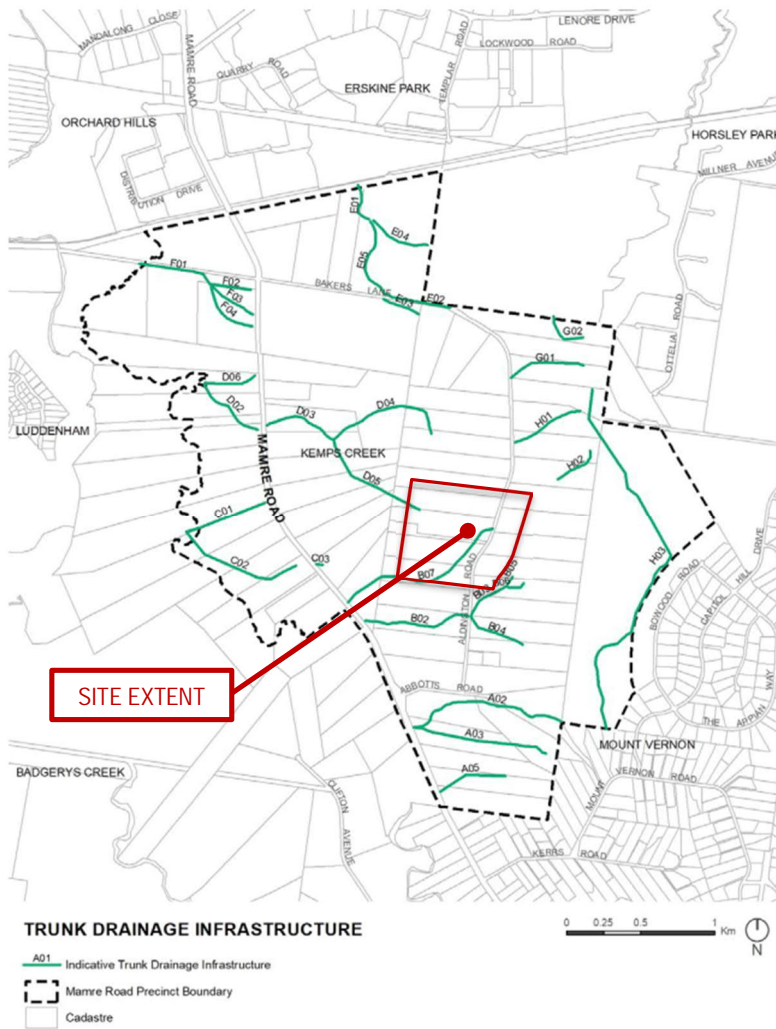


Figure 6: Trunk Drainage Infrastructure identified in the Draft Mamre Road Precinct DCP

6. Stormwater Management Strategy

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

6.1. Stormwater Management Strategy Objectives

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

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

The objective to control mean annual runoff volume (MARV) from the site to no more than 1.9 ML/ha/year will require measures to capture and store stormwater runoff in excess of those typically required to satisfy development controls contained in the Penrith DCP 2014. Such measures, as outlined in the *Mamre Road Flood, Riparian Corridor and Integrated Water Cycle Management Strategy* (Sydney Water, October 2020), could include:

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

6.2. Hydrological and Hydraulic Modelling

DRAINS modelling software has been used to calculate the Hydraulic Grade Line (HGL) of the proposed estate-wide stormwater network, including pits, pipes, overland flow paths and detention basins. DRAINS is a computer program used for designing and analysing urban stormwater drainage systems and catchments. It is

widely accepted by Council's across NSW as the basis for stormwater design and has been confirmed by Penrith City Council as the preferred stormwater software analysis package.

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

- Minor system (pit and pipe) drainage has been designed to accommodate the 5% AEP storm event.
- The combined pit and pipe drainage and overland flow paths have been designed to accommodate the 1% AEP storm event.
- Where trapped low points are unavoidable and potential for flooding private property is a concern, an overland flowpath capable of carrying the total 1% AEP storm event has been provided. Alternatively, the pipe and inlet system has been upgraded to accommodate the 1% AEP storm event.
- Rainfall intensities have been adopted using the Bureau of Meteorology Design Rainfall Data System (2016).
- Times of concentration for each sub catchment have been determined using the kinematic wave equation.
- The width of flow in the gutter does not exceed 2.5 metres and pits are spaced no further than 75 metres apart.
- Velocity x depth product shall not exceed 0.4 m²/s for all storms up to and including the 1% AEP event.
- Bypass from any pit on grade shall not exceed 15% of the total flow at the pit; and
- Blockage factors of 20% and 50% shall be adopted for on-grade and sag pits respectively.
- A hydraulic grade line HGL design method shall be adopted for all road pipe drainage design.
- Pipelines in roadways shall have a minimum diameter of 375mm.
- A desirable minimum grade of 1% for all pipelines is preferred for self-cleansing under low flow velocities. An absolute minimum grade of 0.5% has been adopted.
- The minimum cover over pipes shall be 450mm in grassed areas and 600mm within carriageways.
- Where minimum cover cannot be achieved due to physical constraints the pipe class shall be suitably increased.
- All pipes in trafficable areas will be Reinforced Concrete Pipes (RCP) or Fibre Reinforced Cement (FRC) equivalent.
- Pipes discharging to an overland flow path shall adopt a minimum tailwater level equivalent to respective overland flow level.
- Pit Loss coefficients have been calculated in accordance with the Hare Charts as documented in the Queensland Urban Drainage Manual.
- A minimum 150mm freeboard has been maintained between pit HGL and pit surface levels for the minor design storm event (5% AEP).
- Overland flowpaths maintain a minimum of 300mm freeboard to all habitable floor levels.

6.3. Stormwater Quality Modelling

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC, Version 6.3.0) was used to estimate pollutant loads from the estate based on proposed site development. The model has been developed using the *MUSIC-link* parameters for Penrith City Council.

Pluviometer data (six-minute rainfall intensity and evapotranspiration) for Penrith Lakes AWS (Station 67113) was used in the MUSIC model. Other parameters that need to be nominated in the MUSIC model (soil characteristics, pollutant event mean concentrations (EMCs)) are consistent with those outlined in the *NSW MUSIC Modelling Guidelines* (August 2015) and the Penrith City Council *WSUD Technical Guidelines* (October 2020).

MUSIC model input parameters including rainfall-runoff, base flow concentration and stormflow concentration parameters for various catchment types were adopted as per the guidelines listed above. These are presented in Table 4 to Table 7 inclusive.

Table 4: Rainfall-runoff parameters adopted in MUSIC

Parameter	Unit	Value
Rainfall Threshold	mm/day	1.40
Soil Storage Capacity	mm	105.00
Initial Storage	% of Capacity	30.00
Field Capacity	mm	70.00
Infiltration Capacity Coefficient α	-	150.00
Infiltration Capacity Coefficient β	-	3.50
Initial Depth (Ground Water)	mm	10.00
Daily Recharge Rate	%	25.00
Daily Baseflow Rate	%	10.00
Daily Seepage Rate	%	0.00

Table 5: Base Flow/Stormwater Concentration Parameters – Impervious (Roofed) Areas

Pollutant	Baseflow Concentration Parameter – Mean (log mg/L)	Baseflow Concentration Parameter – Std Dev (log mg/L)	Stormflow Concentration Parameters – Mean (log mg/L)	Stormflow Concentration Parameters – Std Dev (log mg/L)
TSS	0.000	0.000	1.300	0.320
TP	0.000	0.000	-0.890	0.250
TN	0.000	0.000	0.300	0.190

Table 6: Base Flow/Stormwater Concentration Parameters – Pervious Areas

Pollutant	Baseflow Concentration Parameter – Mean (log mg/L)	Baseflow Concentration Parameter – Std Dev (log mg/L)	Stormflow Concentration Parameters – Mean (log mg/L)	Stormflow Concentration Parameters – Std Dev (log mg/L)
TSS	1.200	0.170	2.150	0.320
TP	-0.850	0.190	-0.600	0.250
TN	0.110	0.120	0.300	0.190

Table 7: Base Flow/ Stormwater Concentration Parameters - Road

Pollutant	Baseflow Concentration Parameter – Mean (log mg/L)	Baseflow Concentration Parameter – Std Dev (log mg/L)	Stormflow Concentration Parameters – Mean (log mg/L)	Stormflow Concentration Parameters – Std Dev (log mg/L)
TSS	0.000	0.00	2.430	0.320
TP	0.000	0.000	-0.300	0.250
TN	0.000	0.000	0.340	0.190

6.4. Proposed Stormwater Management Measures

A series of stormwater quantity and quality control measures are proposed to be adopted within the site to satisfy the stormwater management strategy objectives listed in Section 6.1. A general description of the proposed stormwater treatment train components is presented in the following sections.

6.4.1. Rainwater Tanks

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

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

Considering rainwater tanks are likely to be fitted with first flush devices, it is likely that they would have minimal water quality benefit. However, they would be required to satisfy the Penrith DCP requirement to meet at least 80% of non-potable demand.

The MUSIC model was developed to estimate the rainwater tank volume required to satisfy the Penrith DCP requirement. To determine the tank volume required to meet at least 80% of non-potable demand on individual lots, the following assumptions have been made:

- Non-potable demand of 0.1 kL/toilet/day has been adopted. The number of toilets within each lot has been estimated based on the floor area of warehouses and offices. Fixed daily demands have been pro-rated based on the warehouses and offices being occupied six days per week (Monday to Saturday).
- Non-potable demand of 2.5 ML/ha/year has been adopted for irrigation of landscape areas on each lot. Irrigation demand has been estimated based on potential evapotranspiration minus rainfall (PET – rain) to account for the likely variability in irrigation demand throughout the year (i.e., high demand in summer, low demand in winter).
- 50% of the total warehouse roof area would drain to the rainwater tank.

A summary of the rainwater tank volumes adopted in MUSIC is presented below in Table 8.

Table 8: Rainwater tank volumes adopted in MUSIC

Lot	Total Area (ha)	Roof area to rainwater tank (ha)	Non-potable demand in toilets (kL/day)	Non-potable irrigation demand (ML/year)	Adopted rainwater tank volume (kL)	% of reuse demand met
1	2.68	0.74	2.40	1.01	150	80.3
2	2.78	0.76	2.40	1.04	170	81.5
3	1.94	0.53	2.40	0.73	150	81.0
4	3.14	0.86	2.40	1.18	170	80.6
5	3.05	0.84	2.40	1.15	170	80.9
6	3.34	0.92	2.40	1.25	170	81.2
7	2.04	0.56	2.40	0.76	150	81.0
8	2.75	0.76	2.40	1.03	170	81.5
9W	5.98	1.64	2.40	1.02	120	80.9
9E	6.08	1.45	2.40	2.40	260	81.1

6.4.2. Gross Pollutant Traps

The proposed stormwater treatment train would consist of gross pollutant traps (GPTs) as a means of primary stormwater treatment. GPTs are designed to capture litter, debris, coarse sediment, as well as some oils and greases.

Proprietary GPTs such as the Ocean Protect OceanSave would be adopted to capture and treat low flows prior to discharge to proposed bio-retention basins. The GPT(s) would be located adjacent to the proposed bio-retention / detention basins. In addition, Enviropod (or similar) stormwater pit inserts are proposed for the extent of Road 1 (west of the proposed roundabout) and Road 2 (south of the proposed roundabout) that will bypass the bio-retention basins.

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

6.4.3. Bio-retention Systems

The objective of bio-retention systems is to provide a filtering effect when stormwater runoff flows through a vegetation layer and sand and/or gravel filter media to remove pollutants from the runoff. Bio-retention systems generally consist of an open space containing landscaping of native grasses, shrubs and trees with an underlying filter media.

Surface water runoff from the proposed lots and within the internal roads is proposed to be collected via pits and pipes and discharge into one of three OSD basins:

- Basin A – located near the south-eastern corner of the site, adjacent to Aldington Road and within the Transgrid easement.
- Basin B – located adjacent to the eastern boundary of the site, between proposed Lot 8 and Aldington Road, and within the Transgrid easement.
- Basin C – located near the western boundary of the site and north-west of the proposed intersection of Road 1 and Road 2.

MUSIC model parameters adopted for the bio-retention basins are consistent with those outlined in *Penrith City Council, WSUD Technical Guidelines (Version 4 – October 2020)*. These general parameters, as well as the proposed surface area and filter area of the three proposed basins, are summarised in Table 9.

Table 9: Bio-retention basin parameters

Parameter	Unit	Value		
		Basin A	Basin B	Basin C
Surface area	m ²	1450	4800	3200
Filter area	m ²	1000	4400	2800
Extended detention depth	m	0.30		
Unlined filter media perimeter	m	0.01		
Saturated hydraulic conductivity	mm/hr	125		
Filter depth	m	0.50		
TN content of filter media	mg/kg	800		
Orthophosphate content of filter media	mg/kg	40		
Exfiltration rate	mm/hr	0 (assumed pond is lined)		
Base Lined	-	Yes		

Parameter	Unit	Value		
		Basin A	Basin B	Basin C
Vegetation properties	-	Vegetated with effective nutrient removing plants		
Overflow weir width	m	10		
Underdrain present	-	Yes		
Submerged zone	-	No		

6.4.4. On-Site Stormwater Detention

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

The stormwater on the lots and within the road reserve for the overall development of the site is proposed to be collected via pits and pipes and connect into one of three OSD basins:

- Basin A – located near the south-eastern corner of the site, adjacent to Aldington Road and within the Transgrid easement.
- Basin B – located adjacent to the eastern boundary of the site, between proposed Lot 8 and Aldington Road, and within the Transgrid easement.
- Basin C – located near the western boundary of the site and north-west of the proposed intersection of Road 1 and Road 2.

Surface water runoff from the external catchments is proposed to be managed as follows:

- External catchments A, B and C – to be collected adjacent to the northern site boundary and conveyed in a new pit and pipe system in a westerly direction towards the north-western corner of the site and ultimately into the proposed Mirvac development site.
- External catchments D and E – to be collected adjacent to the northern boundary and conveyed in a new pit and pipe system in an easterly direction towards the Transgrid easement adjacent to proposed Lot 9.
- External catchment F (Aldington Road) – Once the upgrades of Aldington Road are completed, this catchment will bypass the site and will discharge into the property immediately south of the site (219-233 Aldington Road, Kemps Creek). In the interim, this catchment will discharge into proposed Basin B.
- External catchment G – This catchment is part of the Stockland Fife Kemps Creek (FKC) site. Ultimately it will be directed to a proposed detention basin on their site and will bypass the Frasers Property site. In the interim scenario this catchment will discharge across Aldington Road and towards proposed Basin B.

For the post-development scenario, it is proposed to maintain the existing points of discharge as close as possible and to design a solution where post-development peak flow rates are no greater than pre-development peak flow rates at each discharge point. Controlled outlets from the OSD basins will include surcharge pits connected to subsurface drainage pipes (for low flows) and weirs across the basin crests (for high flows). Refer to Drawing 20-776-C1071 & 20-776-C1072 for the OSD basin details.

6.4.5. Estate-wide Ponds

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

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

A major drawback of estate-wide ponds is the significant portion of developable land that would need to be set aside. MUSIC modelling undertaken of a typical large-scale industrial estate indicates that, to achieve the target of MARV of 1.9 ML/ha/year, around 15% of the total area of an estate would need to be set aside for ponds.

This Stormwater Management Strategy, which addresses the target MARV of 1.9 ML/ha/year specified in the *Draft Mamre Road Precinct DCP*, incorporates ponds on proposed Lots 3, 7 and 8. Key parameters adopted for the three ponds are summarised below in Table 10.

Table 10: Adopted estate-wide pond parameters

Parameter	Pond 3	Pond 7	Pond 8
Inflow from:	Lots 1 and 2 Road 2 north of roundabout	Lot 5 Pond 8 / Basin B	Lots 6 and 9
Outflow to:	Basin C	Basin A	Basin B
Surface Area (m ²)	13500	13200	21500
Permanent pool volume (m ³)	20250	19800	32000
Exfiltration rate (mm/hr)	0	0	0
Evaporative loss (% of PET)	75	75	75
Outlet (equivalent pipe diameter)	375	375	525

6.4.6. Evaporative misting on roof areas

Roof misting is a relatively new and emerging technology that can be used for cooling and dust suppression. It is a method for reducing ambient temperatures inside and outside of buildings that is promoted by the Low Carbon Living CRC (2017) as an urban cooling strategy to reduce the impacts of extreme heat and as a means of reducing stormwater runoff volumes (Sydney Water, 2020).

While a significant water storage is required for each industrial lot, the misting infrastructure is relatively basic and can be incorporated into the final building services design.

To estimate the potential water loss by evaporation for a roof misting system, additional rainwater tanks have been modelled in MUSIC. As per the *Mamre Road Precinct FRCIWCM Report* (Sydney Water, 2020), a notional demand rate of 4.5ML/Nha/yr has been adopted and distributed as a fixed annual demand, variable by PET minus rainfall.

The storage tanks required for roof misting could be amalgamated into rainwater reuse tanks for non-potable water reuse. For this Stormwater Management Strategy, it is assumed that the rainwater reuse tanks for non-potable water supply would be separate to the tanks for evaporative misting supply.

Due to potential impacts of roof misting systems on the performance of rooftop solar panels, it has been assumed that misting would be applied to no more than 50% of the total warehouse roof area.

Further analysis would be required at the detailed design phase to verify evaporative misting system design parameters such as:

- Extent of roof area that would drain to a rainwater tank installed for the purpose of evaporative misting.
- The available roof area for misting, taking into consideration the cost of misting infrastructure and interface with other infrastructure such as solar panels.
- The impact of an additional pipe network and the corresponding roof weight on the structural design.
- Ongoing maintenance and WHS considerations associated with roof misting infrastructure.

A summary of the rainwater tanks for roof misting adopted in MUSIC is presented below in Table 11.

Table 11: Summary of roof misting tank parameters

Lot	Total Lot Area (ha)	Roof area to misting tank (ha)	Adopted roof misting tank volume (kL)	Annual misting demand (ML/yr)	MUSIC Node Water Balance Results		
					Inflow (ML/yr)	Misting Supply (ML/yr)	Tank Overflow (ML/yr)
1	2.68	0.74	520	3.32	4.36	2.75	1.61
2	2.78	0.76	520	3.44	4.51	2.82	1.70
3	1.94	0.53	520	2.39	3.14	2.11	1.03
4	3.14	0.86	520	3.89	5.11	3.10	2.02
5	3.05	0.84	520	3.78	4.96	3.03	1.94
6	3.34	0.92	520	4.14	5.43	3.24	2.20
7	2.04	0.56	520	2.52	3.31	2.2	1.11
8	2.75	0.76	520	3.41	4.47	2.81	1.67
9W	5.98	1.64	750	7.37	9.67	5.47	4.24
9E	6.08	1.45	520	6.54	8.59	2.43	6.15

6.5. Scenario Modelling

A MUSIC model was created to simulate both the pre-development and post-development scenarios. The pre-development model has been developed to estimate the mean annual runoff and pollutant loads under existing conditions, and is based on the broad internal and external catchments under existing conditions. The layout of the pre-development MUSIC model is presented in Figure 7.

The post-development model has been created based upon the proposed post-development catchment extents presented in Figure 5. Source nodes for each of the proposed lots have been adopted based on typical large-scale industrial land uses, including those depicted for proposed Lot 9 in the Estate Plan prepared by Frasers Property. The layout of the post-development scenario is presented in Figure 8.

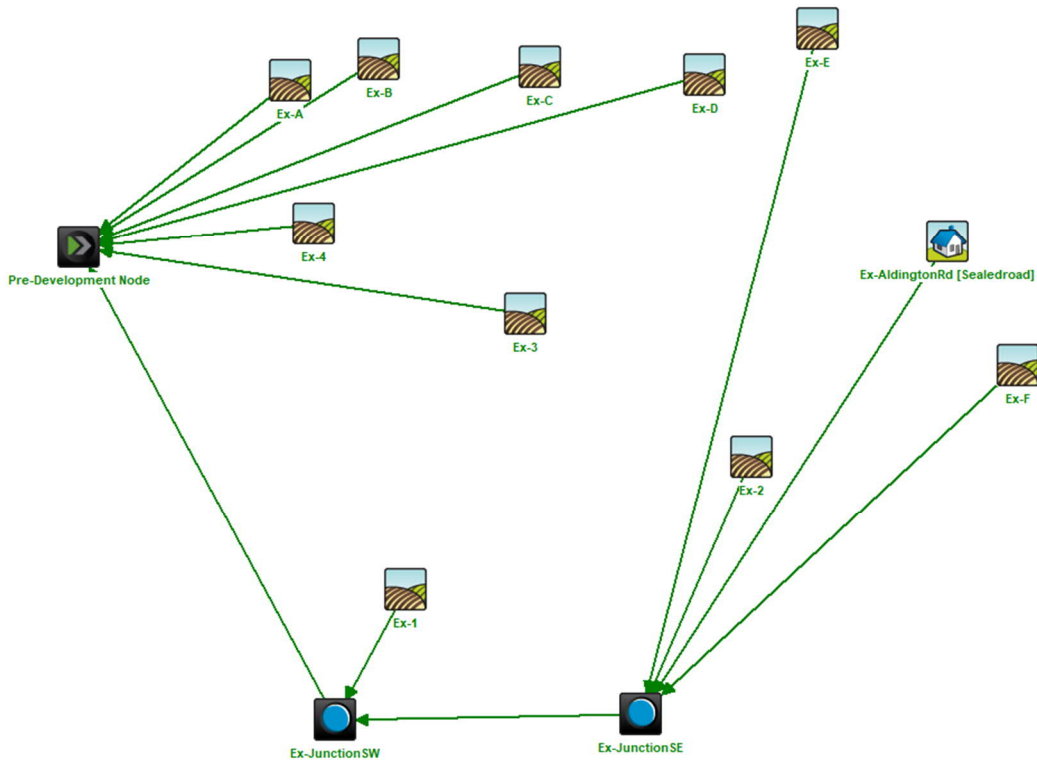


Figure 7: Pre-development MUSIC model layout

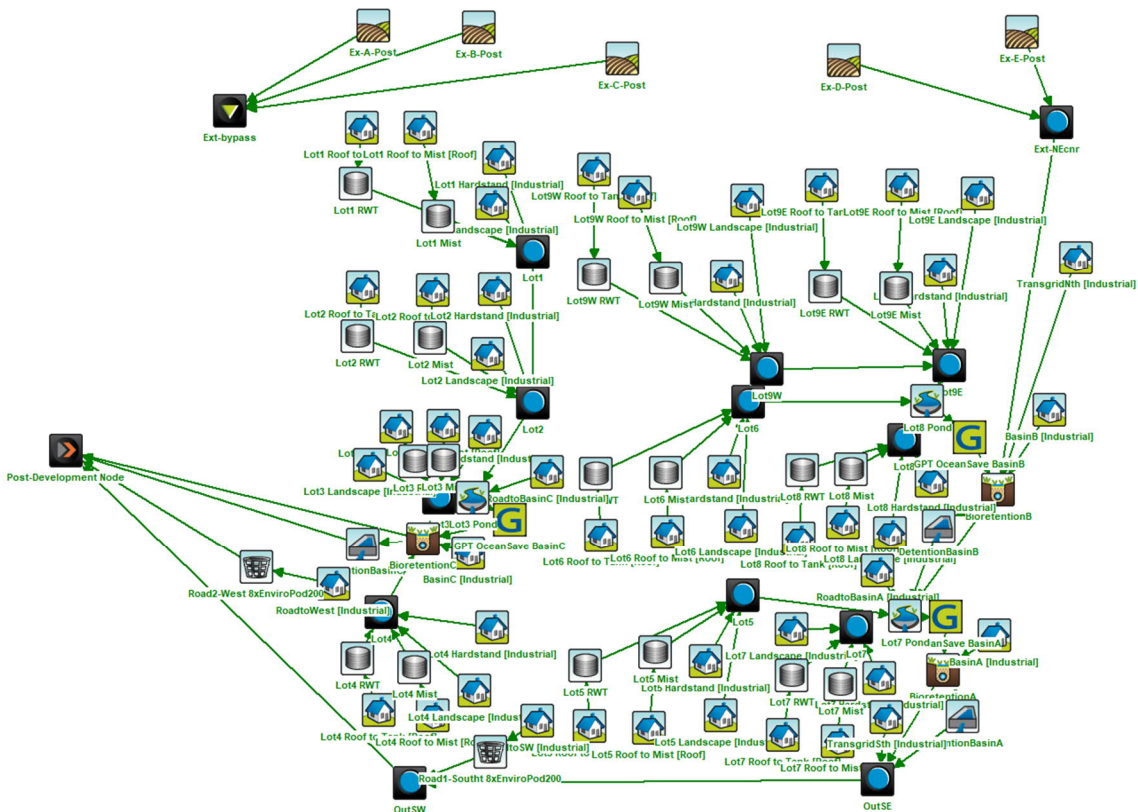


Figure 8: Post-development MUSIC model layout

The proposed land use breakdown for each of the catchments under the post-development scenario is presented in Table 12.

Table 12: Post-development scenario land use breakdown

Catchment	Total Area (ha)	Roof area – warehouses and offices (ha)	Hardstand area (ha)	Landscape area (ha)
1	2.68	1.47	0.80	0.40
2	2.78	1.53	0.83	0.42
3	1.94	1.06	0.58	0.29
4	3.14	1.73	0.94	0.47
5	3.05	1.68	0.92	0.46
6	3.34	1.84	1.00	0.50
7	2.04	1.12	0.61	0.31
8	2.75	1.51	0.83	0.41
9W	5.98	3.27	2.30	0.41
9E	6.08	2.91	2.22	0.96

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

- Rainwater tanks, as per the parameters presented in Table 8.
- GPTs, as per the parameters described in Section 6.4.2.
- Bio-retention systems, as per the parameters presented in Table 9.
- OSD basins, as per the parameters described in Section 6.4.4.
- Estate-wide ponds on proposed lots 3, 7 and 8, as per the parameters presented in Table 10.
- Evaporative misting using rainwater collected in dedicated tanks, as per the parameters in Table 11.

The attributes for each of the proposed stormwater management measures have been determined such that they will satisfy the pollutant reduction targets and MARV target outlined in Section 6.1.

6.6. MUSIC Model Results

MUSIC modelling results presented as mean annual loads at the receiving node indicate that the adopted target reductions are achieved, as shown in Table 13.

Table 13: Summary of MUSIC modelling results

Parameter	Sources – Pre-Development	Sources – Post-Development	Residual Load Post-Development ^[1]	Reduction (%)	Target Reduction (%) – ESS Music Toolkit ^[2]	Target Reduction (%) – Penrith DCP
Flow (ML/yr)	58.6	171	81.6	52		
TSS (kg/yr)	9440	17800	741	96	90	85
TP (kg/yr)	16.8	38.1	7.13	81	80	60
TN (kg/yr)	118	374	72.3	81	65	45
Gross Pollutants (kg/yr)	168	4690	12.9	100	100	90

[1] Target flow reduction based on post-development flow calculated in MUSIC and target MARV of 1.9 ML/ha/yr * 43 ha = 81.7ML/yr

[2] ESS Music Toolkit – Wianamatta provided 2nd August 2021

6.7. DRAINS Model Results

Table 14 presents the pre-development and post development flow rates for all storm events at the outlet of the proposed OSD basins. The OSD within the basin has been designed to achieve the following outcomes for all pre and post developed cases.

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

Design Storm Event	Pre-Development Peak Flow Rate (m ³ /s) ⁽¹⁾			Post-Development Peak Flow Rate (m ³ /s) ⁽²⁾		
	Discharge Pt 1	Discharge Pt 2	Discharge Pt 3	Discharge Pt 1	Discharge Pt 2	Discharge Pt 3
1 EY	0.53	0.39	0.26	0.51	0.10	0.28
0.2 EY	2.86	1.53	1.26	2.58	0.17	0.37
5% AEP	4.72	2.54	2.02	4.23	0.25	1.47
1% AEP	7.33	3.81	3.07	5.90	0.34	3.06

(1) refer to Figure 2 for locations of discharge points under existing conditions

(2) refer to Figure 5 for locations of discharge points under post-development conditions

7. Site Water Balance

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

7.1. General

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

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

7.2. Water Balance Objective

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

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

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

7.3. Water Balance End Uses

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

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

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

7.4. Total Site Demands and Non-Potable Reuse Rates

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

- 2.5 ML/ha/yr for landscape irrigation (variable by potential evapotranspiration minus rain).
- 0.1 kL/day per toilet per year for toilet flushing.

7.5. Rainwater Reuse

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

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

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

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

7.6. Proposed Rainwater Tank Parameters

As presented in Table 8, the MUSIC model results demonstrate that rainwater tanks on each of the individual lots can satisfy the Penrith DCP requirement for non-potable water supply throughout the development.

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

8. Flooding

The site is located outside the extent of the Flood Planning Area identified in the *Penrith Local Environment Plan 2010* (refer to Figure 9).

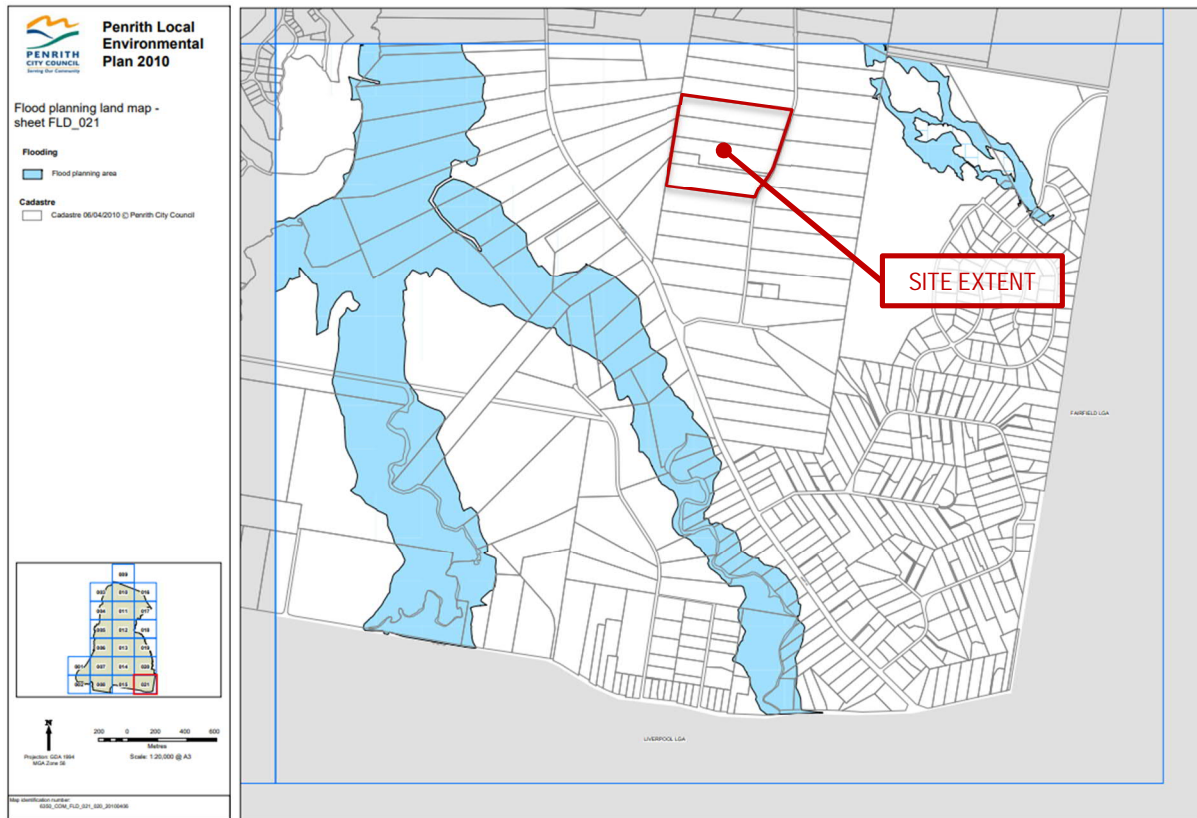


Figure 9: Extract of flood planning land map (Penrith LEP 2010)

Mapping of the 1% AEP flood extent from local catchments within the Mamre Road Precinct is presented in the *Mamre Road Flood, Riparian Corridor and Integrated Water Cycle Management Strategy* (Sydney Water, October 2020), and is reproduced as Figure 10. This mapping shows the extent and depth of overland flow from local catchments within the site.

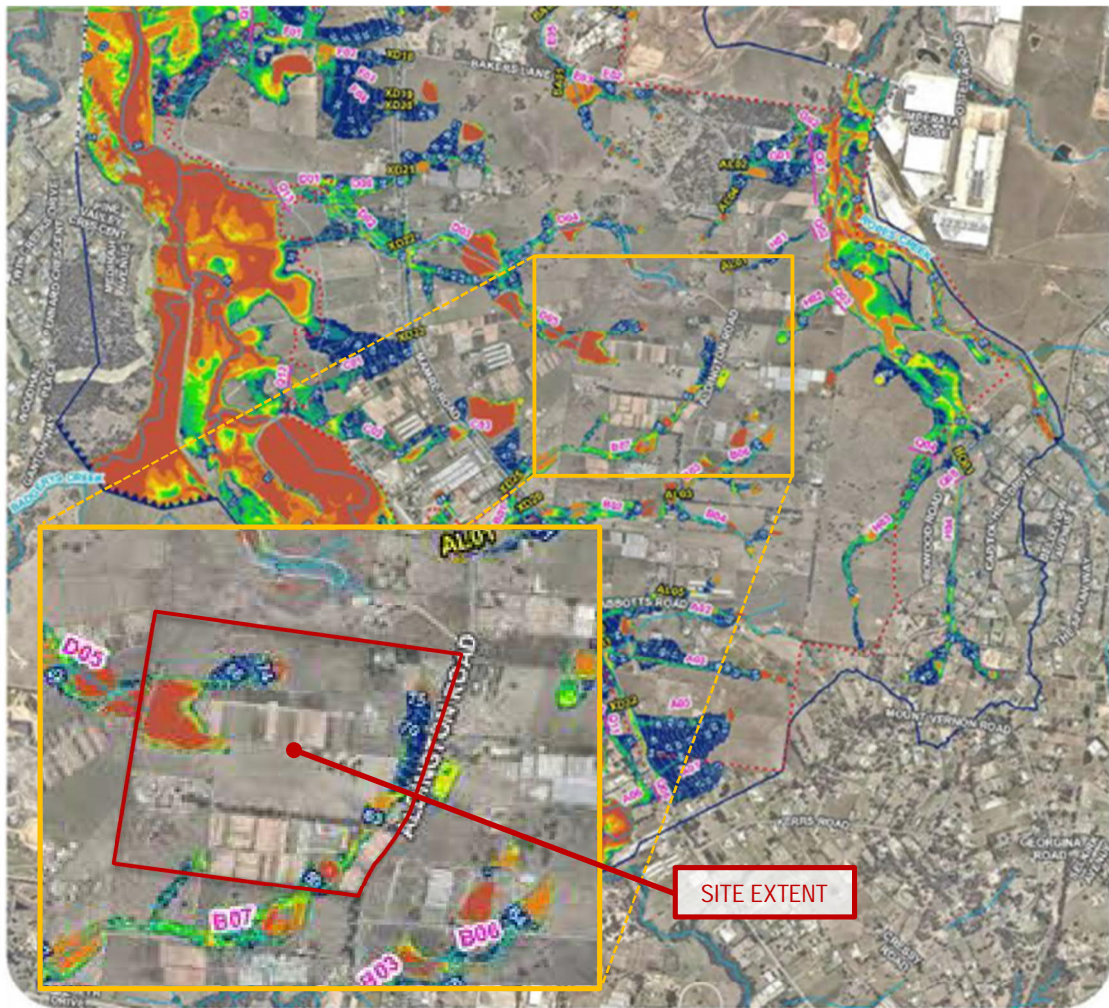


FIGURE A-10 FLOOD DEPTH - 1% AEP - EXISTING CONDITIONS

LEGEND

- - - Mamre Road Precinct
 - - - Hydraulic Model Boundary
 - - - Modelled Pipes
 - ▲▲▲ Inflow Boundary
 - - - Outflow Boundary
 - - - Watercourse
 - - - Cadastre
 - - - Proposed Zoning Boundary
 - X- Reporting Location
 - 1m Flood Level Contour (mAHD)
- | Depth (m) |
|--------------------|
| <math><0.05</math> |
| 0.05 - 0.1 |
| 0.1 - 0.2 |
| 0.2 - 0.3 |
| 0.3 - 0.4 |
| 0.4 - 0.5 |
| 0.5 - 1 |
| >1 |

NOTE - ONLY 1% AEP FLOODING IS SHOWN IN LOCAL CATCHMENTS
1% AEP IS NOT SHOWN IN SOUTH, KEMPS OR SOUTH CREEK



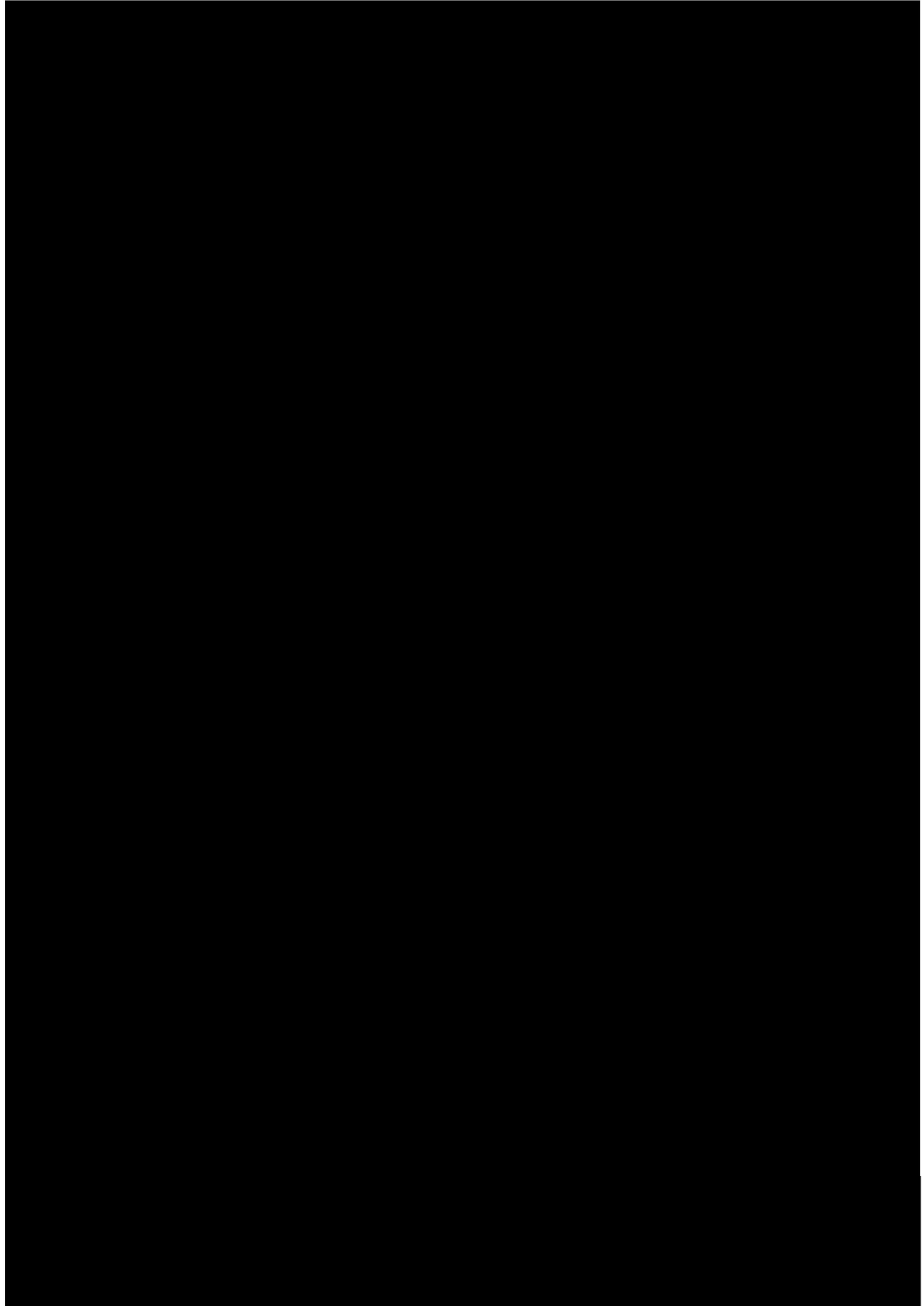
Map is indicative only and not to scale
Imagery © Navmap, 2020
Sydney Water does not guarantee accuracy, completeness or currency of this spatial information

Figure 10: 1% AEP flood depth from local catchments under existing conditions (Sydney Water, 2020)

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

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

As presented in Table 14, the post-development peak flow rates will be less than the pre-development peak flow rates at each of the discharge points for all design storm events between (and including) the 1 EY and the 1% AEP event. Therefore, there will be no flood impact on adjacent properties associated with the proposed development of the site.





SYDNEY

LEVEL 7 153 WALKER STREET
NORTH SYDNEY NSW 2060
02 9439 1777
INFO@ATL.NET.AU

BRISBANE

SUITE A LEVEL 11
127 CREEK STREET
BRISBANE QLD 4000
07 3211 9581
INFO-QLD@ATL.NET.AU

atl.net.au