Eastern Creek Recycling Ecology Park – Throughput Increase

SSD-11606719

1 Kangaroo Avenue, Eastern Creek

Surface Water Impact Assessment

Bingo Industries Pty Ltd

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19-692

Commercial in Confidence

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1. Introduction

Dial-A-Dump (EC) (DADEC) Pty Ltd (the Applicant) (as owned by Bingo Industries Pty Ltd (Bingo)) are seeking approval to optimise the existing Eastern Creek Recycling Ecology Park (Eastern Creek REP) by increasing the throughput from the current two million tonnes per annum (Mtpa) by an additional 950,000 tonnes per annum (tpa), and by optimising internal infrastructure such as roads and stormwater ('the Proposal').

An Environmental Impact Statement (EIS) was prepared for the Proposal in accordance with Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Division 4.7 of the EP&A Act identifies the Minister for Planning, through the New South Wales (NSW) Department of Planning and Environment (DPE), as the consent authority for development that is identified as State Significant Development (SSD).

The EIS included a Surface Water Impact Assessment prepared by AT&L, on behalf of the Applicant to support an application for the approval of the Proposal. It was prepared in accordance with the Amended Secretary's Environmental Assessment Requirements (SEARs) issued on 1 October 2021 by the DPE, the EP&A Act, and Section 192 of the *Environmental Planning and Assessment Regulations 2021* (EP&A Regulations).

The EIS was publicly exhibited between 14 July 2022 and 10 August 2022. During this exhibition period, submissions were invited from all stakeholders including members of the community and government agencies.

In response to stakeholder consultation and further design development as the approvals process has progressed, several amendments to the Proposal presented in the EIS have been necessitated. Under clause 37(1) of the EP&A Regulation, an application for approval for SSD may be amended or varied with the approval of the Planning Secretary, before the application is determined.

This amended Surface Water Impact Assessment has been prepared to support the Amendment and Submissions Report (ASR).

1.1. EIS Proposal overview

The Proposal, as detailed and exhibited in the EIS, involves the upgrade and construction of supporting infrastructure to optimise the current operations at the Eastern Creek REP and facilitate the increased throughput proposed to be received at the Proposal Site.

The application was originally seeking approval for the following development:

- **Stage 1: Initial throughput:** Stage 1 would comprise 500,000 tpa of additional throughput to be received at the Eastern Creek REP to enhance resource recovery outcomes by increasing utilisation of onsite processing capabilities
- **Stage 2: Internal site optimisation:** Stage 2 would facilitate the remaining throughput increase (an additional 450,000 tpa of the total 950,000 tpa proposed) to be received and processed across the Eastern Creek REP and operation of one of the two proposed new exit connections. Stage 2 would include:
  - The construction and operation of a new exit connection to the Honeycomb Drive extension and installation of two associated outbound weighbridges and a dedicated weighbridge office
  - The construction and operation of a new exit connection to Kangaroo Avenue in the north east of the Proposal Site and the installation of two associated outbound weighbridges and a dedicated weighbridge office
  - Upgrade of existing internal roads as required
  - Earthworks for Stage 3 site establishment
  - Additional carparking and amenities
- **Stage 3: Installation of supporting infrastructure:** Stage 3 would comprise the redevelopment of the north-eastern corner of the Proposal Site. This would comprise:
  - Construction and operation of a site workshop (relocating this activity from elsewhere within the Proposal Site to a dedicated enclosed facility)

- Construction and operation of a skip bin maintenance and manufacturing workshop
- Installation of landscaping, signage, security fencing and finishing works.

1.2. Amended Proposal overview

The amended application seeks approval for the following development:

- **Stage 1: Initial throughput:** Stage 1 would comprise 500,000 tpa of additional throughput to be received at the Eastern Creek REP to enhance resource recovery outcomes by increasing utilisation of onsite processing capabilities
- **Stage 2: Internal site optimisation:** Stage 2 would facilitate the remaining throughput increase (an additional 450,000 tpa of the total 950,000 tpa proposed) to be received and processed across the Eastern Creek REP. Stage 2 would include:
  - Upgrade of existing internal roads as required
  - Earthworks for Stage 3 site establishment
  - Additional carparking and amenities
- **Stage 3: Installation of supporting infrastructure:** Stage 3 would comprise the redevelopment of the north-eastern corner of the Proposal Site. This would comprise:
  - Construction and operation of a site workshop (relocating this activity from elsewhere within the Proposal Site to a dedicated enclosed facility)
  - Construction and operation of a skip bin maintenance and manufacturing workshop
  - Construction of Basin B, a 2,150 m^3 stormwater detention basin inclusive of a 400 m^2 bio-retention system, located in the northeastern portion of the Proposal Site
  - Installation of landscaping, signage, security fencing and finishing works.

A General Arrangement of the Amended Proposal is presented as **Figure 1**.

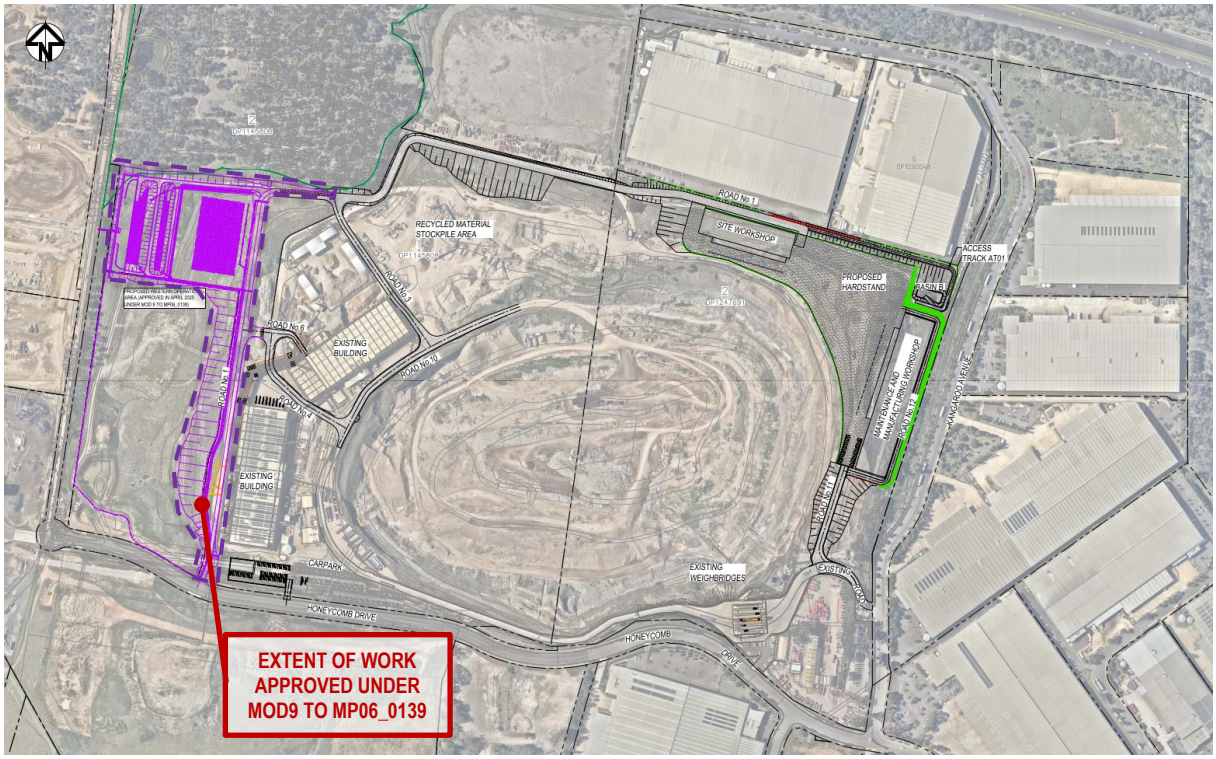

Figure 1: General Arrangement of the Amended Proposal

1.3. Site location

The Eastern Creek REP is located at 1 Kangaroo Avenue, Eastern Creek on Lot 1 DP1145808 and Lot 2 DP1247691, refer to **Figure 2**. The site is generally bound by the Western Motorway (M4) to the north, industrial land to the east and south and undeveloped land to the west.

Figure 2: Locality Plan (aerial imagery from nearmap, dated 3 February 2023)

The Amended Proposal Site is located within the Eastern Creek industrial precinct / M7 business hub and is surrounded by a large range of industrial developments, primarily to the east. These industrial developments include Techtronic Industries, H&M distribution warehouse, Kuehne + Nagel (Australia) Pty Ltd warehouse, Kmart distribution centre, Bunnings distribution centre and DB Schenker warehouse. Immediately to the west of the operational area of the Eastern Creek REP is vacant land that forms part of the broader Eastern Creek REP. Further, to the west of the Eastern Creek REP is the Fulton Hogan asphalt batching plant and a vacant area of undeveloped land.

The Eastern Creek REP is bounded by the Western Motorway (M4) to the north, Kangaroo Avenue to the east and Honeycomb Drive to the south. The planned future Archbold Road extension will run parallel to the western boundary of the Amended Proposal Site (Transport for NSW (TfNSW), 2019). The Eastern Creek REP is enclosed by commercial and industrial buildings to the immediate north, east and south. The closest residential receivers are located across the M4 Motorway approximately 400 m to the north in the suburb of Minchinbury and approximately 1.2 km west in the suburb of Erskine Park.

Existing access to the Eastern Creek REP is from Kangaroo Avenue which connects to Honeycomb Drive to the south and provides access to the broader arterial road network including the M4 and M7 motorways.

The surrounding area has generally low relief with no major hills or ridgelines, other than amenity berms adjacent to the landfill that were created from quarry overburden. Angus Creek, a small ephemeral drainage line is located immediately east of the Eastern Creek REP (between the landfill area and Kangaroo Avenue) which drains to the north into Eastern Creek. There are several other ephemeral drainage lines west of the

Eastern Creek REP which drain towards Ropes Creek, which is approximately 580 m west of the Eastern Creek REP.

The Site is located within the South Creek sub-catchment of the Hawkesbury-Nepean surface water catchment. The South Creek sub-catchment encompasses most of the Cumberland Plains of Western Sydney, covering an area of 620 square kilometres, and has been extensively modified and disturbed due to land clearing and urbanisation resulting in significant degradation of water quality, habitat and geomorphology. Drainage within the South Creek sub-catchment is from south to north towards the Hawkesbury River.

1.4. Site history

During the 1800s, the Eastern Creek REP site was used for both agricultural and breccia quarrying purposes. The quarrying activities had expanded by the 1930s and were then operated by the Ray Fitzpatrick Quarriers in the 1950s. Quarrying activities continued until September 2006, with the final quarry void estimated to be 12 million cubic metres (m^3).

In November 2009, Dial-A-Dump Industries (DADI) acquired the Eastern Creek REP site and gained approval for the construction and operation of the Genesis Xero Waste Management Facility (WMF) (now named the Eastern Creek REP) (MP 06_0139), comprising a resource recovery facility and non-putrescible landfill with a material handling capacity of 700,000 tpa. This facility commenced operations in 2012.

Bingo acquired DADI in February 2019, including all its NSW waste and recycling assets. Bingo took over the operation of the Eastern Creek REP following completion of the acquisition process.

The Eastern Creek REP was originally approved (MP06_0139) under Part 3A (now repealed) of the EP&A Act in 2009 and commenced operations in 2012 (Project Approval). Following the repeal of Part 3A of the EP&A Act on 1 October 2011, the project was subject to the transitional arrangements provided by the EP&A Regs. The transitional arrangements provided by EP&A Regs have now ceased, and the project was transitioned to a SSD on 2 October 2020.

Since the approval of MP 06_0139 in 2009, fifteen modification applications have been submitted, fourteen of which have been approved and one was withdrawn. Mod 9, which sought approval for expansion of the operational area of the Eastern Creek REP into part of Lot 2 DP1145808, was approved on 30 April 2025. Mod 9 to MP 06_0139 includes the development of a western operational area which would relocate existing approved activities to two new warehouses.

1.5. Purpose of this report

This report supports the ASR for the Amended Proposal and has been prepared as part of an SSD Application for which approval is sought under Part 4, Division 4.7 of the EP&A Act.

Table 1 provides a summary of the relevant SEARs which relate to surface water quality, quantity and hydrology and where these have been addressed in this report.

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

Key issues listed in SEARs addressed in this report	Response
Soil and Water	
An assessment of potential surface and groundwater impacts associated with the development (both quantity and quality), including impacts associated with the new access points. This is to include potential impacts on watercourses, riparian areas, groundwater, and groundwater-dependent communities nearby.	An assessment of construction impacts on surface water quality and quantity is presented in **Section 5**. An assessment of operational (full build) impacts on surface water quality and quantity is presented in **Section 6**.

Key issues listed in SEARs addressed in this report	Response
A detailed site water balance including a description of the water demands and breakdown of water supplies, and any water licensing requirements.	Details of the existing site water balance are presented in **Section 3.3**. Details of water demands and a breakdown of water supplies under the proposed operational scenario are contained in **Section 6.3**.
Details of existing and proposed stormwater/wastewater management system including the capacity of onsite detention system(s), onsite sewage management and measures to treat, reuse or dispose of water.	Refer to **Section 3** for details of the existing stormwater management system. Refer to **Section 4** for details of the proposed stormwater management system. Details of the existing site wastewater and leachate management systems are contained in the *Soil, Water and Leachate Management Plan* (March 2021). An overview of proposed upgrades that will be required to service the Amended Proposal is included in **Section 4.2.2**.
Description of the measures to minimise water use.	Refer to **Section 6.3** for a description of proposed measures to minimise water use across the Proposal Site.
Description of the proposed erosion and sediment controls during construction.	Refer to **Section 5** for details of erosion and sediment control measures to be implemented during construction.
Characterisation of water quality at the point of discharge to surface and/or groundwater against the relevant water quality criteria. This is to include details of the contaminants of concern that may leach from waste into the wastewater and proposed mitigation measures to manage any impacts to receiving waters and monitoring activities and methodologies.	Refer to **Section 2.2** for details of surface water quality targets that apply to the existing site and to the Amended Proposal.
Details of proposed surface and groundwater monitoring.	Surface and groundwater monitoring activities associated with the Amended Proposal will be consistent with the two Environmental Protection Licences (EPLs) for the site, as well as the approved Soil, Water and Leachate Management Plan (Arcadis, 2021). Details of these EPLs are contained in **Section 2.2**.
Characterisation of the nature and extent of any contamination on the site and surrounding area.	refer to **Section 3.1.4** for characterisation of contamination of the Amended Proposal Site.

Further to the above, the Environment Protection Authority, Blacktown City Council and NRAR require further details on specific requirements relating to their authority. These requirements are discussed throughout the report as indicated in Table 2.

Table 2: Local and State authority requirements and relevant report sections

Surface water and hydrology	Response
NSW EPA	
The assessment should demonstrate that all practical options to avoid discharge have been investigated and measures taken to reduce the level of contaminants in the discharge, so that any impact is reduced where a discharge is necessary.	Surface water discharge from the Site will be limited to the proposed OSD tank adjacent to the Western Operational Area and the proposed Basin B adjacent to the north-eastern corner of the Site. An assessment of site water balance and sensitivity analysis of water storage vs discharge volume is presented in Section 6.3.3. This assessment demonstrates that avoiding discharge is not practical due to spatial constraints and limited on-site water demand (refer to **Figure 19**). The level of contaminants in surface water discharge will be mitigated by the water quality control measures (bio-retention) and water quantity control measures (OSD volume).
Identify and estimate the quality and quantity of all pollutants that may be introduced into the water cycle by source and discharge point	Estimates of the quality and quantity of stormwater pollutants are based on MUSIC model results, which are presented in **Section 6.1**.
Describe the nature and degree of impact that any discharge(s) will have on the receiving environment. This includes consideration of all pollutants that pose a risk of non-trivial harm to human health and the environment (this should also include intercepted saline groundwater or acidic runoff generated by acid sulphate soil where appropriate).	Refer to **Section 5** and **Section 6** for a description of the nature and degree of impacts associated with surface water discharge from the Amended Proposal Site.
Demonstrate assessment against the ambient NSW Water Quality Objectives and environmental values for the receiving waters relevant to construction and operating activity. This includes the indicators and associated trigger values or criteria for the identified environmental values.	Discussion of the NSW Water Quality Objectives (WQOs) in relation to surface water discharge from the Amended Proposal Site is presented in **Section 2.2.1**.
Assess the significance of any identified impacts, including consideration of the relevant environmental values and ambient water quality outcomes. Assessment of discharges to surface waters should be guided by the ANZECC guidelines, using local Water Quality Objectives.	Discussion of the NSW Water Quality Objectives (WQOs) in relation to surface water discharge from the Amended Proposal Site is presented in **Section 2.2.1**.
Blacktown City Council	
Demonstrate how the new access roads off Kangaroo Avenue will drain to the site's existing stormwater management basins. Water quality and hydrology must comply with current site approvals issued through the NSW Land and Environment Court.	Details of the existing and proposed stormwater management measures are presented in **Section 4.2.1**. Due to the existing and proposed site topography, and consistent with the Ultimate Stormwater Management Strategy for the Amended Proposal Site contained in **Appendix B**, part of the access road off Kangaroo Avenue will drain to a new water quality and OSD basin (Basin B) – details of which are described in **Section 4.2.1**.

Surface water and hydrology	Response
DPE - NRAR Water	
The identification of an adequate and secure water supply for the life of the project. This includes confirmation that water can be sourced from an appropriately authorised and reliable supply. This is also to include an assessment of the current market depth where water entitlement is required to be purchased	Water demands within the existing site and any additional demands generated by the Amended Proposal will be met by potable water supply (via Sydney Water mains, details of which are described in **Section 3.4**) and rainwater that is harvested either within rainwater tanks or within the proposed stormwater treatment train in the north-western portion of the Amended Proposal Site.
A detailed and consolidated site water balance.	Details of the existing site water balance are presented in **Section 3.3**. Details of water demands and a breakdown of water supplies under the proposed operational scenario are contained in **Section 6.3**.
Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.	An assessment of construction impacts on surface water quality and quantity is presented in **Section 5**. An assessment of operational (full build) impacts on surface water quality and quantity is presented in **Section 6**.
Proposed surface and groundwater monitoring activities and methodologies	Surface and groundwater monitoring activities associated with the Amended Proposal will be consistent with the two Environmental Protection Licences (EPLs) for the site, as well as the approved Soil, Water and Leachate Management Plan (Arcadis, 2021). Details of these EPLs are contained in **Section 2.2**.
Consideration of relevant legislation, policies and guidelines, including the NSW Aquifer Interference Policy (2012), the Guidelines for Controlled Activities on Waterfront Land (2018) and the relevant Water Sharing Plans (available at https://www.industry.nsw.gov.au/water)	Relevant legislation is summarised in **Section 2.1.3**.
DPE - EES Group	
The EIS must map the following features relevant to water and soils including: ▪ Acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map). ▪ Rivers, streams, wetlands, estuaries (as described in s4.2 of the Biodiversity Assessment Method). ▪ Wetlands as described in s4.2 of the Biodiversity Assessment Method. ▪ Groundwater. ▪ Groundwater dependent ecosystems ▪ Proposed intake and discharge locations	Refer to the main body of the EIS for mapping of relevant water and soil features.
The EIS must describe background conditions for any water resource likely to be affected by the development, including: ▪ Existing surface and groundwater. ▪ Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations.	Background conditions for existing watercourses are described in **Section 3.1.5**.

Surface water and hydrology	Response
▪ Water Quality Objectives (as endorsed by the NSW Government http://www.environment.nsw.gov.au/ieo/index.htm) including groundwater as appropriate that represent the community's uses and values for the receiving waters. ▪ Indicators and trigger values/criteria for the environmental values identified at (c) in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government. ▪ Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions http://www.environment.nsw.gov.au/research-andpublications/publications-search/risk-based-framework-for-considering-waterway-healthoutcomes-in-strategic-land-use-planning	
The EIS must assess the impacts of the development on water quality, including: ▪ The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the development protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction. ▪ Identification of proposed monitoring of water quality. ▪ Consistency with any relevant certified Coastal Management Program (or Coastal Zone Management Plan)	Impacts of the Amended Proposal on water quality and proposed measures to mitigate these impacts are described in **Section 5** (for construction) and **Section 6** (for operation).
The EIS must assess the impact of the development on hydrology, including: ▪ Water balance including quantity, quality and source. ▪ Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas. ▪ Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems. ▪ Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches). ▪ Changes to environmental water availability, both regulated/licensed and	Impacts of the Amended Proposal on water quality and proposed measures to mitigate these impacts are described in **Section 5** (for construction) and **Section 6** (for operation).

Surface water and hydrology	Response
unregulated/rules-based sources of such water. ▪ Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options. ▪ Identification of proposed monitoring of hydrological attributes.	

Submissions on the EIS proposal relating to surface water management were made by Blacktown City Council and the EPA. Responses to these submissions in relation to the Amended Proposal are presented in **Table 3**.

Table 3: Responses to agency submissions on the EIS Proposal

Submission on the EIS Proposal	Response
Blacktown City Council – Asset Design Engineering	
The application should clearly show how it is consistent with the original development consent from Land and Environment Court (case 10994 of 2009) in relation to stormwater quantity management and provide details of these calculations.	Detail of the pre-development stormwater quantity modelling setup are described in **Section 2.3.2**. AT&L confirms that the hydrological modelling to determine pre-development flows from the Site has been amended to adopt RAFTS hydrology such that it is consistent with the parameters prescribed in the development consent from the LEC (case 10994 of 2009).
Provide amended plans and details for the proposed stormwater basins and associated drainage outlets	Amended plans and details are provided in AT&L's Civil Drawing package.
Blacktown City Council – Drainage	
Revised architectural plans are required for the Maintenance Workshop to detail the number of toilets required for the amenities so as to ascertain the water reuse requirements for this proposal.	Architectural Floor Plans are yet to have been prepared for the Maintenance Workshop. It is estimated that only 4 toilets within the Workshop will be required based on the proposed use of the Workshop and the area of the building.
Revised modelling from at&l is required for assessment of water quantity to address the following:	
1) The use of DRAINS to model the basins is incorrect. It contradicts condition 26 of the court order of 11 November 2010 that specifically requires RAFT modelling for these catchments.	Detail of the pre-development stormwater quantity modelling setup are described in **Section 2.3.2**. AT&L confirms that the hydrological modelling to determine pre-development flows from the Site has been amended to adopt RAFTS hydrology such that it is consistent with the parameters prescribed in the development consent from the LEC (case 10994 of 2009).
2) The RAFTS model is to use the specific parameters outlined in the court judgement noting higher pre-development losses than considered in the DRAINS model.	The RAFTS hydrological model adopts the specific parameters outlined development consent from the LEC (case 10994 of 2009).
3) For Basin B, set the base of the On-Site Detention at the Extended Detention Depth for the bioretention basin.	The base of the OSD within Basin B has been set at the top of the Extended Detention for the bio-retention component in Basin B.

Submission on the EIS Proposal	Response
4) *For the Northern and Southern Basins, set the base of the On-Site Detention at the permanent water level.*	The Northern and Southern Basins have been deleted from the Amended Proposal and will be replaced with the north-western treatment train, parameters for which are described in further detail in **Section 4.2**. On-site stormwater detention will be provided in a dedicated tank without a permanent pool volume. Therefore this comment is no longer applicable to the proposed arrangement of the north-western bio-retention basin.
5) *The RAFTS models are to be provided digitally for review by Council.*	AT&L have provided modelling files along with this SWIA for review by Council. [DRN003-02-19-692-TPut Increase SSDA.drn], issued 31 March 2023
6) *The DRAINS models where used for the pipe system are to be provided digitally for review by Council.*	AT&L have provided modelling files along with this SWIA for review by Council. [DRN003-02-19-692-TPut Increase SSDA.drn], issued 31 March 2023
7) *At Appendix B of the Surface Water Impact Assessment by at&I for AT&L Works As Executed drawings C01(2) and C03(3) a permanent water volume of 500 m3 is noted as available in the northern basin. A simple calculation based on the volume available below the permanent water level suggests that this would need to be drained completely to provide the non-potable volume require for reuse. Based on the nominated non-potable usage (cart) of 178 kl/day in Section 3.3 of the Surface Water Impact Assessment, this storage will be depleted in less than 3 days. Consequently, the northern basin cannot operate as a wetland and the wetland node should be deleted and modelled more as a pond.*	The existing Northern Basin has been deleted from the Amended Proposal and replaced with the proposed sediment basin, storage pond, bio-retention basin and OSD tank in the north-western portion of the Site. These proposed stormwater management measures will provide a significantly greater capacity for water reuse and water quality improvement than the existing water management infrastructure. Specifically, the Amended Proposal will result in a 50% increase in surface water storage capacity. A summary of the proposed improvement in water quality and water reuse is presented in **Section 6.1** and **Section 6.3** respectively. Further details, including a comparison of the stormwater management measures incorporated into the Amended Proposal against the EIS Proposal, are included in **Table 15**.

Submission on the EIS Proposal	Response
8) *At Appendix B of the Surface Water Impact Assessment by at&I for AT&L Works As Executed drawings C02(2) and C04(2) a permanent water volume of 500 m3 is noted as available in the southern basin as a specific additional storage with a non-planting zone. The Works As Executed does not make clear what the finished base level of the basin is however it is likely to be some additional storage over the basin extents in addition to the additional 500 m3 storage. Section 3.3 of the Surface Water Impact Assessment refers to 746 m3 for southern basin and this may account for this extra storage. Draining the 746 m3 to the northern basin via a transfer pipe to provide the non-potable volume required for reuse would suggest that the wetland would dry out, possibly for an extended period. Based on the nominated non-potable usage (cart) of 178 kl/day in Section 3.3 of the Surface Water Impact Assessment, this storage will drain in about 4 days. Consequently, the southern basin cannot operate as a wetland and. the wetland node should be deleted and modelled more as a pond.*	The existing Southern Basin has been deleted from the Amended Proposal and replaced with the proposed sediment basin, storage pond and OSD tank in the north-western portion of the Site (approved under Mod 9 to MP06_0139). These stormwater management measures will provide a significantly greater capacity for water reuse and water quality improvement than the existing water management infrastructure. Specifically, the Amended Proposal will result in a 50% increase in surface water storage capacity. Further details, including a comparison of the stormwater management measures incorporated into the Amended Proposal against the EIS Proposal, are included in **Table 15**.
9) *It is unclear how the flows from the permanent storages in basins South and North (shown with red dashed lines) operate in Model for Urban Stormwater Improvement Conceptualisation (MUSIC) and how/when they get water to the recycled water tanks.*	The existing Northern and Southern Basins have been deleted from the Amended Proposal and will be replaced with the north-western treatment train presented in **Figure 16**. Water stored in the proposed Storage Dam (refer to Figure 16) would be pumped either directly to water tanker trucks or to storage tanks located within the Operational Area. The water reuse demand has been applied to the Storage Dam (Pond) node in the MUSIC model.
10) *The rainwater tank internal usage (toilets) are too low. There are 4 toilets in the Site Workshop and additional information is sought to determine the number of toilets in the Maintenance workshop. The proposed usage at 0.1 kl/day/toilet or urinal applies for a standard 8 hour day. Where there are two shifts this figure should be 0.17 kl/day/toilet and where there is 24 hour operation the figure should be 0.23 kl/day/toilet. Review the usage.*	The internal layout of the Maintenance Workshop is yet to be determined, however the staff amenities are likely to be similar to those adopted in the Site Workshop. Therefore, it is assumed that 4 toilets will be provided in the Maintenance Workshop. The operation hours for both the Site Workshop and the Maintenance Workshop are proposed to be 6 am to 6 pm 7 days per week. Based on the demands noted by Council, a daily demand of 0.15 kL/toilet/day has been adopted (pro-rated from the 0.1 kL/toilet/day for an 8 hour day).
11) *In the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) model reduce the Rain Water Tank node volume by 10 % compared to the size of tank on the plans.*	The MUSIC model has been amended to reduce the nominal volume of the rainwater tanks by 10%.

Submission on the EIS Proposal	Response
12) *Basin B bioretention filter level is set 11.44 m below road No. 7. This will create a significant shadow that reduces the efficient growth of the plants. Determine the ineffective filter area based on section 11.8.4 of the Water Sensitive Urban Design developer handbook. Consider raising the level of the filter media and/or lowering road no. 7. Consider also the thermal impacts from the masonry retaining wall on the southern side of the basin as per section 11.8.4 as well.*	Road 7 and the proposed access to the Site from Kangaroo Avenue has been deleted. Based on deletion of the road from the Amended Proposal, overshadowing of the bioretention basin would not occur. Terraced walls have been adopted adjacent to the southern and western edges of the basin. The terraces between walls will be planted in accordance with the amended landscape plan.
13) *Provide the amended Model for Urban Stormwater Improvement Conceptualisation (MUSIC) digitally to Council.*	AT&L have provided modelling files along with this SWIA for review by Council. [MUS003-03-19-692-TPut Increase SSDA.sqz], issued 31 March 2023
Provide amended drainage plans from at&I Project No. 19-692 to address the following:	
1) *There is insufficient information shown on drawing C313(F) to understand how Basin K will operate. It is understood to be only a detention basin. On a dedicated separate plan provide detailed plans and sections through Basin K. Provide details of the control pits and weirs and pipe(s) out. Provide a vehicular access ramp down to the base of the basin.*	Basin K has been deleted from the Amended Proposal and will be replaced with the north-western treatment train, details of which are presented in **Section 4.2**.
2) *There is insufficient information shown on drawing C315(I) to understand how Basin B will operate. It is understood to be a combined bioretention and detention basin. On a dedicated separate plan provide detailed plans and sections through Basin B. Provide details of the control pits and weirs and pipe(s) out. Provide a sealed subsoil collection pit and discharge the subsoil flows downstream of the control pits. Bioretention generally to comply with the details outlined in Council's Water Sensitive Urban Design standard drawings with a saturated zone. Provide a vehicular maintenance access ramp down to the base of the basin with a track down one side of the bio.*	Refer to drawing C315 for details of Proposed Basin B.
3) *It is unclear whether basins B and Kare to be designed now with sufficient area/volume to allow for the ultimate filling of the site and contribution of additional catchment from the filled hole as depicted on at&I drawing SKC007 (P6) dated 26-10-15 as shown in Appendix C of the Surface Water Impact Assessment by at&I dated December 2021.*	Proposed Basin B and the basins that will be installed in the north-western treatment train have been sized to cater for the Site under the proposed conditions for which consent is being sought under the Amended Proposal (SSD-11606719). Any augmentation that may be required to the stormwater treatment train as a result of future filling and capping of the quarry would be subject to assessment under a separate application.

Submission on the EIS Proposal	Response
NSW EPA	
The Protection of the Environment Operations Act 1997 (the Act) makes clear that environmental performance is to be continuously improving. The EPA therefore requires that best management practices are considered for all new proposals. The need for best practice can be linked to section 3 of the Act including: *(d) to reduce risks to human health and prevent the degradation of the environment by the use of mechanisms that promote the following –* *(ii) the reduction to harmless levels of the discharge of substances likely to cause harm to the environment; and* *(iv) the making of progressive environmental improvements, including the reduction of pollution at source.*	**Section 3.1.6** identifies the outcomes of a catchment-wide surface water quality review. To facilitate design progression and respond to feedback from the EPA and Blacktown City Council, a holistic stormwater infrastructure approach that provides stormwater capacity and performance outcomes for potential future works (Modification 9) has been adopted. When implemented, the proposed surface water management measures described in **Section 4.2** will result in an improvement to surface water quality due to an increase in capacity to treat, store and capture surface water runoff on the Site. The proposed surface water management strategy for the Site represent at-source water pollution reduction measures that will contribute to progressive environmental improvement to water quality downstream of the Site.
Water discharge impact assessment *The SWIA does not characterise the water quality that is anticipated to be discharged from the proposed and existing detention basins during construction and operation. MUSIC modelling is used to assess impacts and it assumes pollutants are limited to total suspended solids, total nitrogen, total phosphorus and gross pollutants. MUSIC is a model developed for urban stormwater management and is therefore not appropriate for industrial sites with point source discharges.*	Characterisation of the water quality that is anticipated to be discharged from the Site is based on monitoring data from the existing site discharge points towards Ropes Creek. Water quality data from 2021/22 is presented in **Section 3.1.7**. Based on the increased capacity of the proposed stormwater management measures to improve water quality and quantity (flow volume), the design will represent an improvement on the existing monitoring data, and therefore the frequency of exceedances of pollutant concentration are expected to decrease. In addition to the ongoing monitoring of physical and chemical stressors at the points of discharge from the Site, further operational mitigation measures that are described in **Section 7.2** will be implemented.
The SWIA does not appear to consider the type of waste, how it is stored on the Premises and the potential for contaminant leaching to determine the contaminants of concern. The Landfill Licence and Resource Recovery Licence that apply to the Premises identify a limit for ammonia in discharges from the Premises. As a minimum, ammonia must also be included as a contaminant of concern.	Consideration of the types of waste and contaminants of concern is included in **Section 6.1**. With the provision of the proposed stormwater management infrastructure, any impacts associated with potential contaminant leaching from material stockpiles would be managed within the Site. It is also noted that the only open area where stockpiled materials will be stored is the SMA, which consists solely of inert material.

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The outcomes of the SWIA are not compared to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG2018) *which are the relevant guidelines for toxicants, or the* Performance criteria for protecting and improving the blue grid in Wianamatta-South Creek (State of NSW and Department of Industry, Planning and Environment, 2020) *which contains the relevant criteria for physical and chemical stressors.*	Comparison of the Site under existing conditions to ANZG2018 and the DPE Performance criteria documents is presented in **Section 3.1.7**. Comparison of the Site under proposed conditions to the DPE Performance criteria is presented in **Section 6.1**.
The EPA requires the SWIA be revised to:	The SWIA has been updated to address the points raised by EPA. Specifically:
· Characterise the discharge for the concentrations and loads of all pollutants with the potential to cause non-trivial harm during construction and operation.	Characterisation of the water quality that is anticipated to be discharged from the Site is based on monitoring data from the existing site discharge points towards Ropes Creek. Water quality data from 2021/22 is presented in **Section 3.1.7**.
· Assess the potential impact of all discharged pollutant concentrations and loads on the environmental values of the receiving waterway, including typical through to worst-case scenarios, with reference to the relevant guideline values for a slightly to moderately disturbed waterway consistent with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG2018) for toxicants and Table 4 of the Performance criteria for protecting and improving the blue grid in Wianamatta-South Creek (State of NSW and Department of Industry, Planning and Environment, 2020) for physical and chemical stressors. Reference to a site specific guideline value derived using a reference site consistent with ANZG (2018) and agreed to by the EPA is also an option.	
· The assessment must consider at minimum: ■ *the ambient water quality of the receiving environment.* ■ *the appropriate level of protection for the uses and values of the receiving environment.* ■ *the potential for pollutant loading and associated risk for both chronic toxicity and the promotion of nuisance species.*	Ambient water quality of the receiving environment, based on long-term monitoring by Blacktown City Council, is presented in **Section 3.1.6** and **Appendix D**. The waterways in the Ropes Creek and Angus Creek catchments are considered 'slightly to moderately disturbed' as defined by the *Australian and New Zealand Guidelines for Fresh & Marine Water Quality* (ANZG, 2018). As per ANZG (2018), the default guideline values (DGVs) for physical and chemical stressors provide a suitable level of protection for slightly to moderately disturbed ecosystems. The DGVs for various physical and chemical stressors are summarised in **Section 2.2.1** and an assessment of the existing site surface water quality against these DGVs is presented in **Section 3.1.7**. The potential for pollutant loading and risk for both chronic toxicity and promotion of nuisance species will be managed by the proposed stormwater management measures that have been incorporated into the Amended Proposal. The risk of pollutant

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	loading will be reduced under proposed conditions due to: ■ Increased capacity of internal stormwater capture and reuse compared to existing conditions. ■ Increased capacity of stormwater treatment measures (sediment basin, bio-retention systems) to capture stormwater pollutants (TSS, TP, TN, hydrocarbons and heavy metals) prior to discharge to Ropes Creek and Angus Creek.
· Demonstrate how the proposal will be designed, constructed and operated to: ■ *protect the Water Quality Objectives for receiving waters where they are currently being achieved.* ■ *contribute towards achievement of the Water Quality Objectives over time where they are not currently being achieved.*	■ Water quality objectives for the Wianamatta-South Creek catchment, which have been derived based on the general principle of ANZG2018, are outlined in **Section 2.2.1**. ■ Water quality monitoring results presented in **Section 3.1.7** demonstrate that for the majority of physical and chemical stressors, the Site under existing conditions is achieving the Wianamatta-South Creek WQOs. For certain stressors, the WQOs are not currently being achieved and therefore the intent of the proposed measures that have been incorporated into the Amended Proposal will be to contribute towards the achievement of the WQOs. ■ Proposed water quality and quantity management measures that form part of the Amended Proposal are described in **Section 4.2** of the SWIA. ■ An assessment of potential water quality impacts and benefits associated with the proposed water quality and quantity management measures is presented in **Section 6.1**. This assessment demonstrates that the Amended Proposal will contribute to the achievement of WQOs by improving the quality of surface water runoff from the Site compared to existing conditions.
· Demonstrate that all practical and reasonable measures to avoid or minimise water pollution and protect human health and the environment from harm are investigated and implemented.	The measures that have been incorporated into the design of the Amended Proposal, and that will be implemented in the operation and maintenance of the Amended Proposal, are considered reasonable and practical measures that will result in an improvement on current discharges (in terms of both water quality and water quantity) and will minimise water pollution towards receiving waters. As outlined in **Section 7**, ongoing water quality and quantity monitoring will be undertaken and an adaptive management framework will be adopted to ensure a continuous cycle of review and improvement of the surface water management measures.

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No demonstration of practical options to avoid discharge *The SWIA states surface water will be discharged under the Proposal from two existing OSD basins and the proposed Basin B. The SWIA does not outline why it is necessary for water to be discharged from the Premises and it has not been demonstrated that all practical and reasonable alternatives have been considered before other options are reviewed. It is considered best practice by the EPA for all water that has contacted waste to be managed as leachate.* *The EPA requires the SWIA be revised to demonstrate all practical and reasonable alternatives to discharge have been considered. If it is proposed for water to be discharged from the Premises, this must be adequately justified.*	Consistent with the existing water management measures on the Eastern Creek REP Site, all water that comes into contact with waste will be treated as leachate. This meets the EPA best practice requirement for management of water that has contacted waste. The stockpiles in the segregated material area consist solely of inert material and are not considered waste. Surface water from the remainder of the Operational Area that has not come into contact with waste will be treated within the proposed surface water management measures described in **Section 4.2**. Practical options that will reduce the volume of water discharged from the Site have been considered and incorporated into the Amended Proposal. As described in **Section 4.1**, these include an increase in non-potable reuse across the Site and an increase in the storage capacity within the Site. An assessment of site runoff with respect to storage capacity is included in **Section 6.3.3.** Surface water discharge from the western portion of the Site will occur due to the following factors: ▪ Rainfall on the site, particularly during periods of intense rainfall or prolonged moderate rainfall over several days. ▪ Limitations in the space available for water treatment and storage on the Site. ▪ Limitations in the demand for water reuse on the Site. Considering these three factors, it is not considered practical to avoid all surface water discharge from the Site under the proposed conditions. Based on the sensitivity analysis of storage pond volume and consideration of a range of design constraints, discharge of treated surface water from the Site is considered unavoidable but will be managed with the proposed stormwater management measures that have been incorporated into the Amended Proposal, as described in **Section 4.1**.
Detention basin pollutant capture *The SWIA indicates that increased impervious areas will increase surface water runoff on the site. The runoff will be directed to the new basins and one of the existing basins. The stormwater catchment plan shows the catchments for each basin and some features such as proposed buildings and some roads. The plan does not identify key features that may impact stormwater runoff quality such as uncovered stockpiles of waste. Page 20 of the SWIA mentions*	**Western catchments (towards Ropes Creek)** The catchment plan under proposed conditions, presented as **Figure 5**, has been updated to show the location of the segregated materials area and timber waste yard, which are the key features on the Site that may affect stormwater runoff quality. Runoff from the segregated materials area will discharge towards the proposed north-western treatment train. An assessment of the performance of the measures incorporated into the Amended

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the areas that drain to the bioretention system and/or OSD basin include stockpile areas. *The SWIA states water will be discharged from the Premises and into the receiving waterway, Angus Creek. The frequency and volume of discharges to the receiving waterway have not been identified in the SWIA.* *The EPA requires the identification of the materials/wastes which are stored in the stockpile areas which will drain to the bioretention system and/or OSD basin and the pollutants that may contribute to runoff must be identified. The EPA requires the frequency and volume of discharges to the receiving waterway to be included to provide an understanding of the risk to waterway health.*	Proposal is presented in **Section 6.1**. Runoff from the timber waste yard will continue to be pumped to the site leachate treatment system (i.e., will remain unchanged under Proposed conditions). An assessment of the likely frequency and volume of discharge from the western catchments under the Amended Proposal conditions is presented in **Section 6.2**. This demonstrates that the proposed stormwater management measures will have a positive impact in terms of a reduction in the frequency and volume of discharge towards Ropes Creek. **North-eastern catchment (towards Upper Angus Creek)** Surface water discharge towards Proposed Basin B, which will ultimately discharge towards Upper Angus Creek, will be limited to hardstand area and the proposed Site Workshop and Maintenance Workshop. The frequency and volume of surface water discharge towards Upper Angus Creek is commensurate with rainfall and runoff from the local catchment that discharges towards proposed Basin B. The proposed rainwater tanks that will collect roof runoff from the Site Workshop and Maintenance Workshop will contribute to the reduction in frequency and volume of discharge towards Upper Angus Creek. No uncovered stockpiles or waste areas will be located within the catchment that discharges towards Upper Angus Creek.

1.6. Reference Documentation

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

a) Civil Drawings (AT&L) – contained in **Appendix A**

b) Arcadis, *Eastern Creek Recycling Ecology Park (& Landfill); Soil, Water and Leachate Management Plan* (Revision B, March 2021).

c) AT&L, *Eastern Creek Recycling Ecology Park, MPC2 Modification Interim Stormwater Management Report*, August 2021. This report documents the stormwater management plan for the work approved under Mod 8.

d) AT&L, *DADI Eastern Creek Stormwater Management Plan* (Revision 04, October 2015).

e) AT&L, *Pre-Sorting Centre, Section 75W Approval – Stormwater Management* (Revision 1, December 2014). This report documented the stormwater quality and quantity management controls for the construction of the MPC2 building (previously referred to as the Pre-Sorting Centre).

f) Martens and Associates, *Consolidated Stormwater Management Plan*, October 2011.

g) Storm Consulting, *Site Surface Water Management Plan*, November 2008.

2. Assessment approach

This section outlines the policy framework, assessment approach and methodology for the Amended Proposal.

The water assessment has identified the potential impacts associated with the Amended Proposal as it relates to three key aspects:

- Water quality
- Water quantity (stormwater)
- Water use.

The Proposal Site is located in the upper reaches of the Ropes Creek and Angus Creek catchments. The *South Creek Flood Study* (Worley Parsons, 2015), which has been adopted by Penrith City Council, assessed overland flooding and indicates that the Proposal Site is not flood affected by Ropes Creek flooding in the probable maximum flood. The *Eastern Creek Hydraulic Assessment* (Catchment Simulation Solutions, 2014) assessed overland flooding of the Eastern Creek catchment and its tributaries, including Angus Creek, The Proposal Site is located upstream of the extent of the hydraulic assessment, and is not located within a flood risk zone. The entire Proposal Site is not affected by events up to and including the 1% Annual Exceedance Probability (AEP) event. Therefore, flooding has not been considered further within this assessment.

For each of the above aspects, the following steps were employed to identify the potential impact associated with the Amended Proposal:

1. Set objectives and performance targets
2. Review existing site features and water quality and hydrology infrastructure
3. Identify proposed additional controls
4. Assess the impact
5. Identify mitigation measures.

2.1. Statutory framework

As shown in **Figure 3**, the site is zoned *IN1 – General Industrial* under the *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (also referred to as SEPP 59).

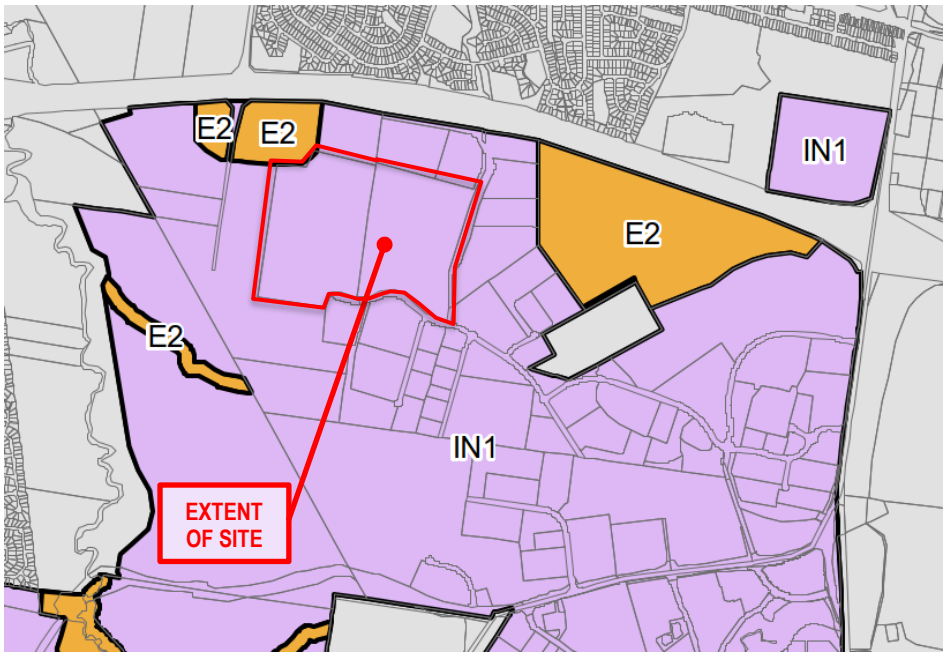


Figure 3: Extract of SEPP 59 Land Zoning Map (LZN_001_080_20200828)

Clause 19(2) of SEPP 59 states that in determining a development application that relates to any land to which an existing precinct plan applies, the consent authority is to take the existing precinct plan into consideration. The Proposal Site is located within the Eastern Creek Precinct, and provisions relating to the development of the Precinct and contained in the *Eastern Creek Precinct Plan (Stage 3)* (Blacktown City Council, December 2005).

Section 5 of the *Eastern Creek Precinct Plan (Stage 3)* outlines objectives and controls relating to stormwater management within the Eastern Creek Precinct. The Precinct Plan requires that Development Applications must be accompanied by a site-specific Stormwater Management Plan, designed to:

- Be consistent with the Precinct stormwater management system.
- Be consistent with the latest stormwater quality control requirements of Blacktown City Council.
- Include appropriate water quantity and quality control systems.
- Implement effective source controls of stormwater pollution and discharge.
- Manage flooding and water quality problems on site to ensure that there are no adverse downstream impacts.

To satisfy the requirements of the *Eastern Creek Precinct Plan (Stage 3)* in relation to stormwater management, stormwater management principles have been designed to comply with Blacktown City Council's *Engineering Guide for Development* (2005) and the *Blacktown Development Control Plan 2015*.

2.1.1. SEPP 59 Stormwater Management Provisions

Section 33L of SEPP 59 outlines provisions relating to stormwater, water quality and water sensitive design that apply to any proposed work on the site. The objective of these provisions is to '*avoid or minimise the adverse impacts of stormwater on the land on which development is to be carried out, adjoining properties, riparian land, native bushland, waterways, groundwater dependent ecosystems and groundwater systems*'.

Under SEPP 59, the consent authority must take into consideration whether water sensitive design principles are incorporated into the design of the development. These principles are as follows:

- *protection and enhancement of water quality, by improving the quality of stormwater runoff from catchments,*
- *minimisation of harmful impacts of development on water balance and on surface and groundwater flow regimes,*
- *integration of stormwater management systems into the landscape in a manner that provides multiple benefits, including water quality protection, stormwater retention and detention, public open space, habitat improvement and recreational and visual amenity,*
- *retention, where practical, of on-site stormwater for use as an alternative supply to mains water, groundwater, or river water.*

2.1.2. SEPP 59 Employment Lands Precinct Plan

Stormwater management objectives and controls that are applicable to development on the site are contained in the *State Environmental Planning Policy No. 59 – Employment Lands Precinct Plan (Eastern Creek Precinct)*.

The broad stormwater management controls relevant to the Proposal Site include:

- **Major drainage system** – to be designed to safely convey the stormwater flows under normal operating conditions for the critical 1% AEP (100 year ARI) flood event.
- **Minor drainage system** – shall be designed to have the capacity to convey stormwater flows under normal operating conditions for the 5% AEP (20 year ARI) event.
- **Detention Basins and Constructed Wetlands** – shall be sized to attenuate peak flows to a maximum of rural flows over a range of storms from the critical 0.5 EY (2 year ARI) event up to and including the critical 1% AEP event.
- **Water Quality** – best practice WSUD techniques are to be used for treating stormwater quality to the required standard and for the attenuation of flows to a pre-development level.

2.1.3. Other statutory and policy obligations

The legislation, planning instruments and guidelines considered during development of this plan are listed below with specific details provided in the Legislation Register within Appendix B of the EMS.

- *Environmental Planning and Assessment Act (EP&A) 1979*
- *Environmental Planning and Assessment Regulation (EP&A Reg) 2000*
- *Protection of the Environment Operations (POEO) Act 1997*
  - It is an offence to pollute waters under the Act
  - It is an offence to wilfully or negligently cause any substance to leak, spill or otherwise escape in a manner that harms or is likely to harm the environment
  - Pollution incidents causing or threatening material harm are to be reported to the EPA
- *Sydney Water Act 1994*
- *Water Management Act 2000* – based on the concept of ecologically sustainable development. The Act recognises:
  - the fundamental health of our rivers and groundwater systems and associated wetlands, floodplains, estuaries has to be protected.
  - the management of water must be integrated with other natural resources such as vegetation, soils and land.
  - to be properly effective, water management must be a shared responsibility between the government and the community.
  - water management decisions must involve consideration of environmental, social, economic, cultural and heritage aspects.
  - social and economic benefits to the state will result from the sustainable and efficient use of water. .

Additional legislation, standards and guidelines relating to the management of soil, water and leachate include:

- Environment Protection Licences:
  - EPL 20121 which allows for compositing, resource recovery and waste storage
  - EPL 13426 which allows for waste disposal (application to land) and waste storage
- NSW Aquifer Interference Policy (2012)
- NSW Office of Water, Guidelines for Controlled Activities on Waterfront Land (2018)
- Environmental Guidelines for Solid Waste Landfills (NSW EPA, 2016)
- Managing Urban Stormwater: Soils and Construction ('the Blue Book') (Landcom, 2004)
- Managing Urban Stormwater: Harvesting for reuse (Landcom, 2004)
- Storing and handling liquids: Environmental Protection Manual (DECC, 2007)
- Australian Rainfall and Runoff, Engineers Australia
- Blacktown City Council's Water Sensitive Urban Design (WSUD) Developer Handbook (2020)
- NSW Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Modelling Guidelines (Greater Sydney Local Land Services, 2015).

2.2. Objectives and targets

2.2.1. Water quality

Objectives and performance targets have been set to minimise the potential for pollutants to enter nearby waterways as a result of the Amended Proposal. Objectives and targets have been derived from the following:

- *Blacktown Development Control Plan 2015 (DCP) Part J – Water Sensitive Urban Design and Integrated Water Cycle Management*
- Australian and New Zealand Environment and Conservation Council (ANZECC), *Guidelines for Fresh and Marine Water Quality*, 2018.

There is a need to provide a design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by Council. The objectives for the management of water quality for the Amended Proposal has centred around the principles of WSUD and pollution reduction. The water quality objectives for the Amended Proposal are to:

- Maintain or improve existing water quality within receiving waterways
- Protect the aquatic environment of the downstream waterways
- Prevent bed and bank erosion and instability of waterways
- Provide sufficient flows to support aquatic environments and ecological processes
- Incorporate a WSUD approach into the design of the Amended Proposal
- Ensure appropriate erosion and sedimentation control measures are installed to mitigate potential impacts to receiving waterways.

Blacktown DCP

Stormwater runoff from the Proposal Site will need to be treated to satisfy the treatment objectives outlined in Part J of Blacktown City Council's DCP titled *Water Sensitive Urban Design and Integrated Water Cycle Management*. A stormwater treatment train is proposed that satisfies the treatment objectives prior to discharge via surface water runoff towards the Proposal Site boundary.

Specific requirements for stormwater quality management are summarised in **Table 4**.

Table 4: Council's post-construction stormwater management objectives

Pollutant	% post-development average annual load reduction
Gross Pollutants	90
Total Suspended Solids (TSS)	85
Total Phosphorus (TP)	65
Total Nitrogen (TN)	45
Hydrocarbons	90

ANZECC Guidelines

The Australian and New Zealand Environment Conservation Council (ANZECC) published the *Australian and New Zealand guidelines for fresh and marine water quality* in 2000. The guidelines were updated and revised in 2018. They form the central technical reference of the National Water Quality Management Strategy, which the federal and all state and territory governments have adopted for managing water quality.

General principles for the application of the ANZECC Guidelines are outlined in the document titled *Using the ANZECC Guidelines and Water Quality Objectives in NSW* (NSW Department of Environment and Conservation, 2006). For each catchment in NSW, the state government has endorsed the community's environmental values for water, known as the 'Water Quality Objectives' (WQOs).

The NSW WQOs are the environmental values and long-term goals for consideration when assessing and managing the likely impact of activities on waterways. They include community-based values, long term goals, and their associated national criteria drawn from ANZECC/ARMCANZ (2000) guidelines. As stated in *Using the ANZECC Guidelines and Water Quality Objectives in NSW* (NSW Department of Environment and Conservation, 2006), the NSW WQOs are not intended to be applied directly as regulatory criteria, limits or conditions. Rather, they are one factor to be considered by industry, the community, planning authorities and regulators when making decisions affecting the future of a waterway.

In modified environments such as the South Creek sub-catchment, there is the potential for the current water quality to not meet the existing guidelines and trigger values for protecting nominated environmental values. The NSW WQOs aim to improve poor water quality and maintain existing good water quality (Department of Environment and Conservation, 2006). On this basis, the overall objective of the proposed water management

systems at the Eastern Creek REP site is to ensure that the Amended Proposal will maintain or improve the quality of surface water that discharges from the site.

Australian & New Zealand Guidelines for Fresh & Marine Water Quality (ANZG, 2018)

The ANZG (2018) incorporates default guideline values (DGVs) for various physical and chemical stressors. As noted in ANZG (2018), the DGVs are considered a generic starting point for assessing water quality in the absence of more relevant jurisdictional or site-specific guideline values.

DGVs for various physical and chemical stressors, for which ongoing monitoring is currently being undertaken at the Eastern Creek REP Site (refer to Section 3.1.7), are summarised in **Table 5**.

Table 5: Default guideline values for various physical and chemical stressors (ANZG, 2018)

Physical / chemical stressor	Unit	95% level of species protection [1]	80% level of species protection [2]
Ammonia	mg/L	0.9	2.3
Arsenic	mg/L	0.013	0.14
Cadmium	mg/L	0.0002	0.0008
Chromium (III+VI)	mg/L	0.001	0.04
Copper	mg/L	0.0014	0.0025
Lead	mg/L	0.0034	0.0094
Mercury	mg/L	0.0006	0.0054
Nickel	mg/L	0.011	0.017
Zinc	mg/L	0.008	0.031

[1] 95% level of species protection, as defined in the ANZG (2018), is recommended for application for slightly to moderately disturbed ecosystems. However, the DGV may not protect key test species from chronic toxicity (this refers to experimental chronic values or geometric mean for species).

[2] 80% level of species protection, as defined in the ANZG (2018), may not protect key test species from acute (and chronic) toxicity.

Wianamatta-South Creek water quality objectives

In September 2022, the NSW Department of Planning and Environment (DPE) released the final version of the guideline document titled *Performance criteria for protecting and improving the blue grid in the Wianamatta–South Creek catchment*, which describes the background and methods for developing instream water quality and flow objectives for the catchment. The performance criteria adopted in the guideline were informed by extensive data collection and analysis across the Wianamatta-South Creek catchment, refer to **Figure 4**.

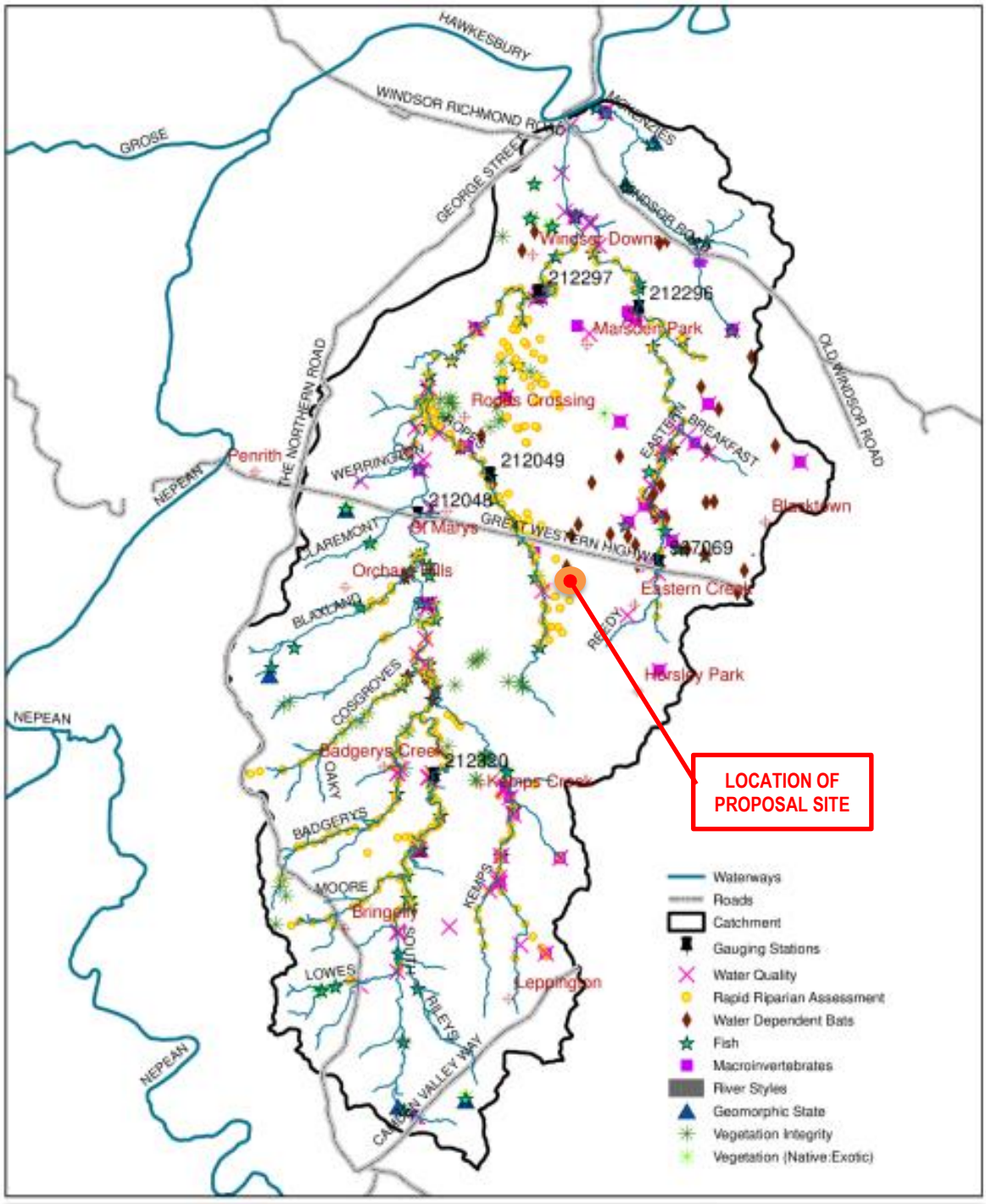


Figure 4: Locations of field monitoring sites in the Wianamatta-South Creek catchment (DPE, 2022)

The ambient water quality objectives (WQOs) of waterways and waterbodies in the Wianamatta-South Creek catchment that have been adopted in the DPE guideline are reproduced below in **Table 6**.

Table 6: Ambient water quality of waterways and waterbodies in the Wianamatta-South Creek catchment

Water quality objectives	Value
Total Nitrogen (TN)	1.72 mg/L
Dissolved Inorganic Nitrogen (DIN)	0.74 mg/L
Ammonia (NH3-N)	0.08 mg/L
Oxidised Nitrogen (NOx)	0.66 mg/L
Total Phosphorus (TP)	0.14 mg/L
Dissolved Inorganic Phosphorus (DIP)	0.04 mg/L
Turbidity (NTU)	50 NTU
Total Suspended Solids (TSS)	37 mg/L
Conductivity	1103 µS/cm
pH	6.20–7.60
Dissolved Oxygen (DO, %SAT)	43–75 %SAT
Dissolved Oxygen (DO)	8 mg/L

NSW EPA Environmental Protection Licences

In addition to the objectives and targets for surface water quality set by Blacktown City Council and ANZECC, the Eastern Creek REP site is subject to two Environmental Protection Licences (EPLs), which stipulate concentration limits for various water quality parameters. These EPLs are administered by the NSW EPA under the provisions of the *Protection of the Environment Operations Act 1997*.

The pollutant concentration limits that apply to the Eastern Creek REP site are presented in **Table 7**.

Table 7: Summary of EPL concentration limits that apply to the Eastern Creek REP site

Pollutant	Concentration limit (100 percentile)	Measured at
Ammonia	1 mg/l	North OSD Basin and South OSD Basin overflow weirs
pH	6.5 – 8.5	
Total suspended solids (TSS)	50 mg/l	

There is also a requirement in the EPLs that for each monitoring / discharge point (i.e., the North OSD Basin and the South OSD Basin) the licensee must monitor the concentration of various pollutants at the locations and frequencies as specified in the EPLs. This monitoring includes:

- Quarterly grab samples within the North OSD Basin and South OSD Basin for ammonia, pH, electrical conductivity, TSS, total organic carbon (TOC) and heavy metals.
- Grab samples from surface water that is discharged from the North OSD Basin and South OSD Basin for ammonia, pH, electrical conductivity, TSS and TOC at the following frequencies:
  - On the first day of an authorised discharge from one or both of the basins and weekly thereafter if the discharge continues.
  - Within three days of the first day of discharge that is occurring as a result of a rainfall event at the premises.

The water quality concentration limits and monitoring requirements stipulated in the EPLs for the site are not directly related to the water objectives and targets set by Blacktown City Council and ANZECC. However, they are applicable to the ongoing operation of the site and will continue to apply to the site (unless modified) during and following completion of the Amended Proposal.

The Construction and Operation of the Amended Proposal has been designed such that the concentration limits set by the EPLs can still be achieved, and that there is no requirement to amend the EPL concentration limits.

2.2.2. Water quantity (stormwater)

The Blacktown DCP Part J catchment areas map identifies the Eastern Creek REP as being subject to requiring permanent on-site stormwater detention (OSD). The DCP requires that any changes in flow rates and durations as a result of stormwater flows be limited as far as practicable. The objectives for the Amended Proposal are therefore to:

- Capture and manage surface water so as to maintain natural flow variability and maintain natural rates of change in water levels as far as practicable
- Ensure there would be no adverse impact on downstream drainage systems as a result of increases in peak flows as a result of the Amended Proposal.

The intent of this criterion is to reduce the impact of urban development on existing drainage system by limiting post-development peak flow rates to receiving waters to less than or equal to pre-development peak flow rates, and to ensure no flood affectation of upstream, downstream or adjacent properties.

2.2.3. Water use

The Blacktown DCP Part J prescribes that all industrial and business developments must supply 80% of their non-potable demand using non potable sources. Rainwater is required to be the primary source of non-potable water supply and should only be supplemented by recycled water when rainwater cannot meet 80% of the demand. As such, the water use objectives for the Amended Proposal are to:

- Supply 80% of non-potable water demand associated with the Amended Proposal from non-potable sources
- Maximise use of rainwater as a non-potable water source.

2.3. Impact assessment methodology

As noted in **Section 1.1,** the Amended Proposal would be developed across three stages. Water impacts are largely related to physical changes onsite and the introduction of new built form. The assessment of water related impacts can largely therefore be considered on a 'footprint' basis, rather than in relation to the operational staging. As such the impact assessment has considered two scenarios:

- Construction related impacts associated with the construction phases of the Amended Proposal (Stage 2 & Stage 3)
- Operation (full build): Changes in stormwater flows (quality and quantity) and water use based on the ultimate full build scenario for the Amended Proposal.

Based on the above, potential water impacts have been assessed using the methodology described in **Section 2.3.1**, **Section 2.3.2** and **Section 2.3.3**.

2.3.1. Water quality

Proposed stormwater treatment measures (refer **Section 4.2**) have been modelled using the MUSICX software package (version 1.1.0). Modelling has been undertaken in accordance with the NSW MUSIC Modelling Guidelines (BMT WBM, August 2015) and Council's guideline titled *WSUD developer handbook: MUSIC modelling and design guide 2020*.

Rainfall and Evaporation Data

Council's MUSIC-link climate data (rainfall and evapotranspiration) was used in the MUSIC model. The default meteorological data includes:

- Historical rainfall data from the Liverpool (Whitlam Centre) rainfall gauge between 1967 and 1976 (annual average rainfall = 857mm). The annual average rainfall over this period is representative of the long-term average within the Blacktown LGA.

- Monthly potential evapotranspiration (PET) as presented in Table 5 of Council's WSUD developer handbook (reproduced below):

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
PET millimetres	180	135	128	85	58	43	43	58	88	127	152	163

Table 5. Monthly evapotranspiration for the Sydney region

Source nodes and pollutant generation

Pollutant events mean concentrations (EMCs) for base flow and storm flow scenarios have been adopted from Table 6 of Council's WSUD developer handbook (reproduced below). The EMC values are applied to source nodes in the MUSIC model to estimate annual pollutant loads exported from the Proposal Site under the proposed ultimate development scenario.

Land-use category		Log10 TSS (mg/L)		Log10 TP (mm/L)		Log10 TN (mg/L)	
		Storm flow	Base flow*	Storm flow	Base flow*	Storm flow	Base flow*
BCC Roof areas (Roof)	Mean	1.30	1.20	-0.89	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
BCC Road Areas (Sealedroad)	Mean	2.43	1.20	-0.30	-0.85	0.34	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
BCC Other Impervious areas (Unsealedroad)	Mean	2.15	1.20	-0.60	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
BCC Pervious Areas (Revegetatedland)	Mean	2.15	1.20	-0.60	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12

Table 6. Stormwater quality parameters for MUSIC Source Nodes

Rainfall-runoff parameters

The rainfall-runoff parameters adopted in the MUSIC model are consistent with the parameters adopted in Council's WSUD developer handbook (reproduced below):

Parameter	Recommended values
Rainfall threshold (mm)	1.4
Soil capacity (mm)	170
Initial storage (percentage)	30
Field capacity (mm)	70
Infiltration capacity coefficient a	210
Infiltration capacity coefficient b	4.7
Initial depth (mm)	10
Daily recharge rate (percentage)	50
Daily baseflow rate (percentage)	4
Deep seepage (percentage)	0

Table 7. Rainfall-runoff parameters

Catchment delineation

For post-development conditions, the Operational Area and the extent of work under the Amended Proposal has been delineated into several sub-catchments based on the locations of discharge points from the Site, as well as the locations of existing and proposed water management measures. These catchments and the existing and proposed water management measures are presented as **Figure 5**.

The adopted catchments areas and parameters are presented in **Table 8**. Cells shaded grey indicate sub-catchments that will remain unchanged as a result of the Amended Proposal.

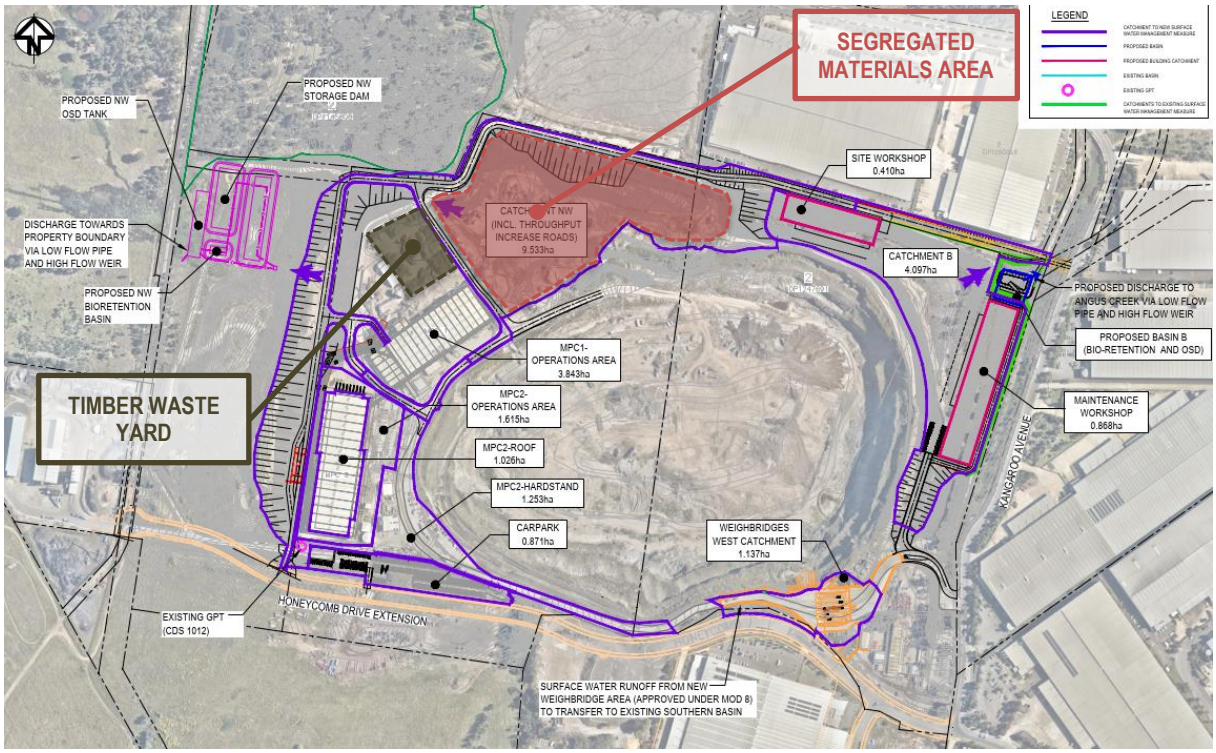


Figure 5: Stormwater catchment plan under post-development conditions

Table 8: Catchment areas adopted in the MUSIC model

Catchment	Area (ha)	% impervious	Land-use category (1)	Discharges to:
Catchment B	4.097	100%	BCC Road Area (Sealed Road)	Bio-retention Basin B → Angus Creek
Maintenance Workshop	0.868	100%	BCC Roof Area (Roof)	50% to Rainwater Tank → Bio-retention Basin B → Angus Creek 50% to Bio-retention Basin B → Angus Creek
Catchment NW (incl. Access Roads)	9.533	70%	BCC Road Area (Mixed)	North-west treatment train
Site Workshop	0.410	100%	BCC Roof Area (Roof)	50% to Rainwater Tank → North-west treatment train 50% direct to North-west treatment train
MPC1 Operation Area	3.843	100%	BCC Road Area (Mixed)	North-west treatment train
MPC2 Roof	1.026	100%	BCC Roof Area (Roof)	MPC2 Rainwater Tank
MPC2 Hardstand	1.253	100%	BCC Road Area (Sealed Road)	GPT (CDS 1012) → North-west treatment train
MPC2 Operation Area	1.615	100%	BCC Road Area (Sealed Road)	GPT (CDS 1012) → North-west treatment train
Mod8 Car Park	0.871	80%	BCC Road Area (Sealed Road)	GPT (CDS 1012) → North-west treatment train

Catchment	Area (ha)	% impervious	Land-use category (1)	Discharges to:
Weighbridges West	1.137	80%	BCC Road Area (Sealed Road)	GPT (CDS 1012) → North-west treatment train

(1) from Table 6 of Council's WSUD developer handbook

Water quality control measures

A series of water quality control measures have been adopted (as part of the current site operation) or will be adopted to satisfy the water quality objectives for the Proposal Site (described in **Section 2.2.1**). A description of the existing and proposed stormwater management measures across the Eastern Creek REP is presented in **Section 4.2.1**.

Post-development scenario MUSIC model

A MUSIC model has been developed based upon the land uses and catchment delineation described above. The layout of the post-development scenario MUSIC model is presented below as **Figure 6**.

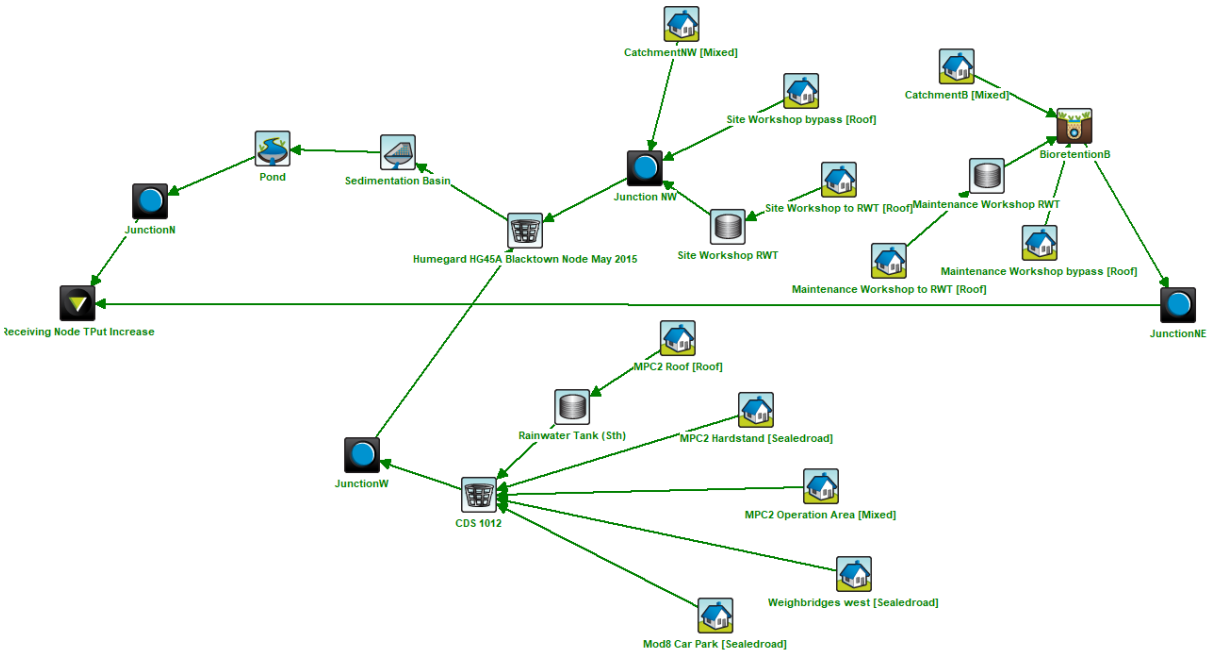


Figure 6: Layout of post-development scenario MUSIC model

Results of the MUSIC modelling are presented in **Section 6.1**.

2.3.2. Water quantity (stormwater)

A hydrological and hydraulic model of the proposed extent of work associated with the full build scenario for the Amended Proposal has been setup using the DRAINS software package (adopting both ILSAX and storage network routing hydrological models). The purpose of this modelling is to confirm that the Amended Proposal can be accommodated within existing and proposed stormwater quantity management measures.

The DRAINS model has been developed to simulate a range of design storm events and to predict peak flow rates from the Proposal Site. The detention basin modelling capability in DRAINS has been used to calculate the stormwater detention volumes required to ensure the post-development peak flow rates are less than or equal to pre-development peak flow rates at each of the existing and proposed basins within the Eastern Creek REP site.

Key model parameters are described in the following sections.

Rainfall intensity frequency duration (IFD) data

IFD data has been sourced from the Bureau of Meteorology (BoM) Design Rainfall Data System (2016).

Hydrological model parameters

In accordance with the consolidated conditions of consent for MP01_0139 (Mod 5), pre-development peak flow rates have been estimated using the following pre-development catchment parameters (RAFTS):

- Initial rainfall loss = 25mm
- Continuing rainfall loss = 2.5mm
- Impervious percentage = 5%
- Catchment vectored slope = 5%
- Pern (manning's 'n' roughness coefficient) = 0.04 (for Quarry and Upper Angus catchments) and 0.05 (for Quarry North catchment)

Hydrological modelling of the pre-development condition has been modelled using the RAFTS storage network routing module in DRAINS (the XP-RAFTS software has been discontinued by the software developer Innovyze®).

For post-development conditions only, the ILSAX hydrological model has been adopted to simulate rainfall / runoff properties of the site. Parameters that have been adopted in the DRAINS model are as follows:

- Paved (impervious) area depression storage = 1mm
- Supplementary area depression storage = 1mm (NB: Supplementary areas not adopted in the model)
- Grassed (pervious) area depression storage = 5mm
- Soil Type = 3 (indicative of slow infiltration rates)

Catchment parameters

Details of the sub-catchment areas and percentage impervious are presented in **Appendix C**.

For pre-development conditions, the catchment extents have been based on the precinct-wide catchment delineation shown in the *Eastern Creek Precinct Plan* (Blacktown City Council, 2015) and amended to exclude the portion of the site that drain towards the existing Leachate Management System (i.e., that do not discharge across the Proposal Site boundary and towards an existing watercourse). The extent of the pre-development catchments for the purpose of estimating pre-development peak flow rates is presented in **Figure 7**. The catchment area adopted to determine the pre-development peak flow rates are as follows:

- Quarry catchment = 17.29 ha
- Quarry North catchment = 5.42 ha
- Upper Angus Creek catchment = 4.25 ha

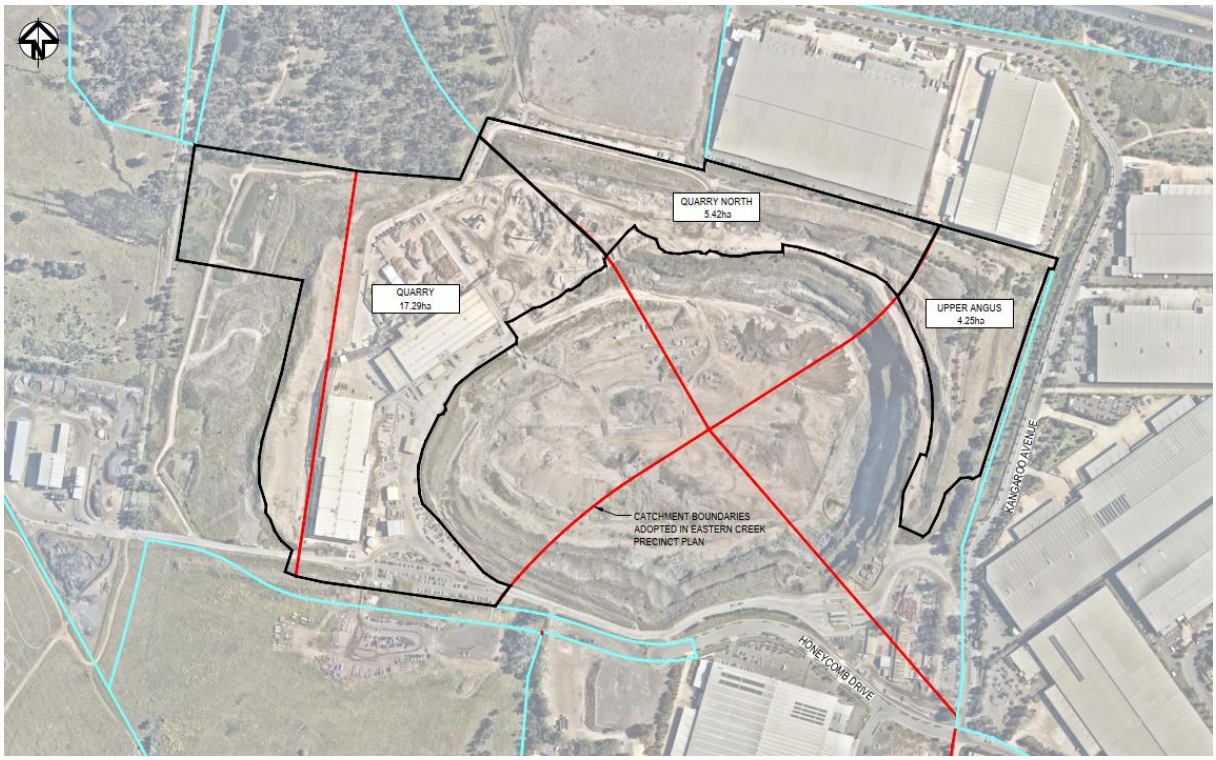


Figure 7: Stormwater catchment plan under pre-development conditions

DRAINS model layout

The layout of the DRAINS model, showing 1% AEP (100-year) peak flows on each sub-catchment and within pipes and overland flow paths is presented below as **Figure 8**.

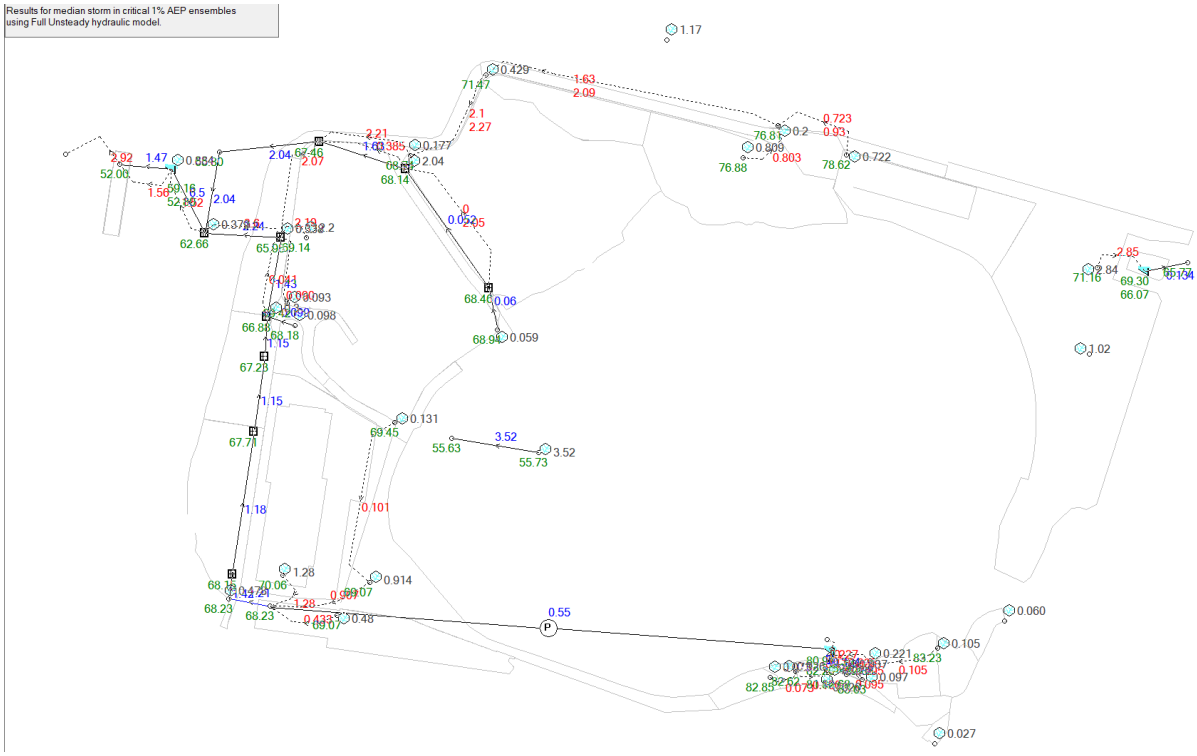


Figure 8: DRAINS model layout

Further discussion of the DRAINS model results as they relate to the proposed water quantity management strategy is presented in **Section 6.2**.

2.3.3. Water use

A water balance model was developed using the MUSIC software package and simulated to allow the evaluation of various elements of the water cycle to be assessed. Details of the water balance model results are presented in **Section 6.3**.

3. Existing environment

3.1. Water quality

3.1.1. Catchments and land uses

The Amended Proposal Site is located within the South Creek and Eastern Creek sub-catchments of the Hawkesbury-Nepean surface water catchment. Eastern Creek is a major tributary of South Creek, discharging into South Creek approximately 17 km north of the Proposal Site. The South Creek sub-catchment encompasses most of the Cumberland Plains of Western Sydney, covering an area of 620 square kilometres, and has been extensively modified and disturbed due to land clearing and urbanisation resulting in significant degradation of water quality, habitat and geomorphology. Drainage within the South Creek sub-catchment is from south to north towards the Hawkesbury River.

The catchment is gently undulating, with local relief between 10 and 30 metres. Slopes are generally less than five per cent but occasionally up to 10 per cent. Elevation on the Proposal Site ranges from 74 metres Australian Height Datum in the eastern Stage 2 boundary to 97 metres Australian Height Datum in the Stage 3 boundary. The majority of the Proposal Site slopes in a western direction towards the unformed section of Archbold Road. A portion of the Proposal Site slopes in an easterly direction towards Kangaroo Avenue.

The Proposal Site is not located within the Sydney drinking water catchment (as defined by the *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011*) and therefore the water quality provisions of this SEPP do not apply to the Amended Proposal.

The Proposal Site has previously been utilised for agricultural purposes and then as a quarry prior to construction of the current waste management facility, which commenced operations in 2012. Apart from the landfill, ground levels on the Proposal Site are generally between RL 60 and RL 85 mAHD.

Delineation of the internal catchments within the Site is presented in **Figure 5**. The extent of stockpile areas, which will remain unchanged under the Amended Proposal, is also presented in **Figure 5**. The segregated material stockpile area currently discharges to the existing Northern OSD basin, and under proposed conditions will discharge to the north-western treatment train (described in further detail in **Section 4**). The timber yard currently discharges towards storage tanks, which are pumped to the site leachate treatment system. This arrangement will not change under the Amended Proposal.

3.1.2. Hydrogeology

A search of the groundwater bores summary records available on the WaterNSW website revealed four monitoring wells within a 0.5 kilometre radius of the Proposal Site. The closest wells are located along the northern and south-western boundary of the Proposal Site and are used for monitoring purposes.

The depth to standing groundwater levels ranged from 5 to 12 metres below ground level. These levels were confirmed with monitoring wells installed by Arcadis in 2018 in the eastern portion of the Stage 2 Proposal Site.

The nearest groundwater receptor is Ropes Creek, located approximately 500 metres to the west. Natural groundwater is expected to flow to the north-west and north under low hydraulic gradients. However, since a portion of the Eastern Creek REP site is quarried, a very strong inward hydraulic gradient is present (IGGC, 2012) which suggests that the bulk formation hydraulic properties (including fracturing) of the surrounding geology are low.

A hydrogeological investigation was undertaken by ERM (2018) on the broader Eastern Creek REP which found two distinct groundwater systems present on the study site: a shallow perched and intermittent in the fill, weathered shale and clay, and deeper regional aquifer in the shale and volcanic sediments. Leachate impact into the perched groundwater is likely to be minimal due to leachate levels in the landfill remaining below shallow aquifer levels. The deeper regional groundwater was found to have a low permeability (less than leachate clay liners) and fracture zones were found to be unlikely to significantly impact flow.

3.1.3. Soils and geology

Based on the Penrith 1:100,000 surface geology mapping sheet (Clark & Jones, 1991) the Proposal Site is underlain by Bringelly Shale of the Wianamatta Group.

A review of the Penrith 1:100,000 soil landscape mapping sheet (Chapman and Murphy, 1989) identifies that the Proposal Site generally overlies residual soils belonging to the Blacktown Soil Landscape. The Blacktown soil landscape is susceptible to localised seasonal waterlogging, localised water erosion hazard and localised surface movement potential (DPIE, 2020). The soil groups that comprise the Proposal Site are characterised as very slow filtration. As such, runoff potential would be high to very high.

3.1.4. Acid sulfate soils and contaminated lands

Acid sulfate soils (ASS) are relatively stable when they are not exposed to air. If sulfide bearing or pyritic soils are disturbed by excavation or dewatering, thereby creating an exposure pathway to air, an oxidation process takes place resulting in the generation of sulfuric acid, or acid sulfate. If these acid sulfates accumulate, they can negatively impact the environment and damage infrastructure. Areas of acid sulfate soils are typically found in low-lying and flat locations that are often swampy or prone to flooding.

The Australian Soil Resource Information System's (ASRIS, 2013) online acid sulfate soils risk map indicates the Proposal Site is mapped within an area considered to have an extremely low probability of acid sulfate soils occurrence, indicating that there is no known or expected occurrence of acid sulfate soils within the construction footprint. Acid sulfate soils are not considered further due to the extremely low probability of occurrence and very low risk.

3.1.5. Watercourses

The watercourses located within the surface water study area include:

- Ropes Creek, which flows in a northerly direction, approximately 800 metres to the west of the Proposal Site
- An unnamed Ropes Creek tributary, approximately 50 metres southwest of the Proposal Site
- The channel of Upper Angus Creek, which originates next to the eastern site boundary and runs north into an artificial drainage system through Minchinbury and connects to Eastern Creek
- Eastern Creek which flows in a northerly direction approximately 1.5 kilometres east of the Proposal Site.

Ropes Creek is a third order Strahler stream that is perennial in nature and forms a tributary of South Creek. Records taken from WaterNSW water level gauge at Ropes Creek (WaterNSW, 2020), located about 5.3 kilometres downstream of the Proposal Site, indicate that the mean monthly water level varied between 0 to 0.66 metres in depth between January 2014 and November 2021, with fluctuations corresponding largely with rainfall events.

The section of Angus Creek located adjacent to the Proposal Site and upstream (south) of the M4 Motorway is a first order Strahler stream that is ephemeral in nature. It is a tributary of Eastern Creek, and discharges into Eastern Creek approximately 4.5 km north-east of the Proposal Site. There are no water level gauges on Angus Creek or Eastern Creek in the vicinity of the Proposal Site.

3.1.6. Catchment-wide surface water quality

A review of available existing water quality data indicates that the southern portion of Ropes Creek is generally in poor condition and representative of a heavily urbanised system.

Blacktown City Council has reported the southern portion of Ropes Creek to have "Good" water quality, according to the *Waterway Health Report Card for 2020 – 2021* (Blacktown City Council, 2021). The report states that water quality indicators remain within guideline limits 85% of the time at the Ropes Creek south monitoring site, and those results remained consistent to the previous reporting period (2019 – 2020). The major water quality issues in the South Creek catchment are related to nutrient concentrations and resulting algal and aquatic weed growth.

Water quality in the South Creek Catchment is classified as very poor due to runoff from urban and agricultural areas and discharge from the St Marys, Quakers Hill and Riverstone sewage treatments plants (Rae, 2007). The

major water quality issues in the South Creek catchment are related to nutrient concentrations and resulting algal and aquatic weed growth.

The *Waterway Health Report Card for 2020-2021* states the waterway health grade for Angus Creek is "Poor" (Graded D on a scale of A to F), meaning the water quality indicators are within the guideline limits less than 50% of the time at the Angus Creek water quality monitoring site, which is located approximately 4.5 km north-east of the Proposal site.

The nearest water quality sampling points to the Proposal Site that are referenced in the DPE guideline *Performance criteria for protecting and improving the blue grid in the Wianamatta–South Creek catchment* are presented in **Figure 9**. The four sampling points that provide context for the catchment-wide surface water quality in the vicinity of the Site are:

- Ropes Creek 2 – approximately 1.8 km north-west (downstream) of the Proposal Site.
- Ropes Creek 1 – approximately 7.2 km north-west (downstream) of the Proposal Site.
- Angus Creek 2 – approximately 3.2 km north-east (downstream) of the Proposal Site.
- Angus Creek 1 – approximately 3.8 km north-east (downstream) of the Proposal Site.

Figure 9: Locations of water quality sampling points near the Eastern Creek Recycling Ecology Park

Detailed water quality data for these four sampling points that has been provided by Blacktown City Council is presented in **Appendix D**. In summary, the concentration of urban stormwater pollutants at these four points has been found to be generally below the Wianamatta-South Creek WQOs, however there have been exceedances of the WQOs at all four sites. Specifically:

- Total suspended solids and turbidity – within Ropes Creek, including several occasions at Ropes Creek 1
- Total phosphorus – at all four sampling points
- Total nitrogen and ammonia – at all four sampling points, including several occasions at Angus Creek 2
- Conductivity – at all four sampling points, including several occasions in Angus Creek
- pH - at all four sampling points

3.1.7. Site surface water quality

Surface stormwater runoff generated on-site is categorised into one of three broad streams, based on the general quality of runoff and the measures required to manage and treat it. These three streams, and the general water quality management measures in place to treat contaminants prior to off-site discharge, are summarised in **Table 9**. Further description of the site water management system is presented in **Section 3.3**.

Table 9: Site surface water streams and management measures

Surface water stream	Water quality management measures
▪ Rainfall on roof areas that drains to a rainwater tank, where it is either: ▸ Stored for reuse on-site (depending on the volume of storage available during a rainfall event); or ▸ Overflows the rainwater tank and discharges to an existing or proposed water management measure.	No specific water quality management required for rainfall on roof areas where it captured and reused. Overflow discharges to site stormwater management measures described in **Section 3.1.8**.
▪ Rainfall on the portions of the site outside the landfill catchment, including internal roads, hardstands, car parks and stockpile areas.	Drains to or is pumped to an existing or proposed surface water management measure (bio-retention system and/or OSD basin) and is then either pumped out for on-site reuse or drains towards a point of discharge from the site.
▪ Rainfall on the landfill catchment and timber waste yard, or stormwater that has come into contact with mixed waste and uncovered landfill waste.	This is directed to the Site Leachate Management System via a network of gravity drainage lines and pumping systems.

Site water quality results for the 2021/22 monitoring period at the north-western and south-western discharge points, which ultimately discharge to Ropes Creek, are summarised in **Table 10** and **Table 11** respectively.

Table 10: Water quality monitoring results for 2021/22 at the north-western discharge point

Parameter	Unit	EQL	25/05/2021	7/09/2021	17/12/2021	23/02/2022
Ammonia	mg/L	0.005	0.390	0.048	0.150	0.86
Arsenic	mg/L	0.001	0.00	0.002	0.003	0.003
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI)	mg/L	0.001	0.002	0.002	0.001	**0.011**
Copper	mg/L	0.001	**0.004**	**0.006**	**0.004**	**0.005**
EC (field)	uS/cm	n/a	2,166	1,619	2,070	206
Lead	mg/L	0.001	0.005	<0.001	0.002	<0.001
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Nickel	mg/L	0.001	0.008	0.005	0.007	0.003
pH (Field)	-	n/a	8.07	8.80	7.95	8.61
TOC	mg/L	1	17	12	12	13
TSS	mg/L	5	26	5	12	57
Zinc	mg/L	0.001	0.021	0.009	0.009	0.004

[1] Cells shaded blue denote values below the testing detection limits

[2] Cells shaded orange denote values that exceed the water quality objectives adopted for the Wianamatta-South Creek catchment (DPE, 2022)

[3] Cells with red text denote values that exceed the default guideline value for an 80% level of species protection as defined in the *Guidelines for Fresh & Marine Water Quality*

Table 11: Water quality monitoring results for 2021/22 at the south-western discharge point

Parameter	Unit	EQL	25/05/2021	7/09/2021	17/12/2021	23/02/2022
Ammonia	mg/L	0.005	0.017	0.80	<0.005	0.010
Arsenic	mg/L	0.001	0.001	0.001	0.002	0.002
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI)	mg/L	0.001	0.002	0.002	0.001	0.002
Copper	mg/L	0.001	**0.003**	**0.005**	**0.004**	**0.005**
EC (field)	uS/cm	n/a	566	681	1,200	780
Lead	mg/L	0.001	0.002	<0.001	0.003	0.006
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Nickel	mg/L	0.001	0.004	0.003	0.005	0.002
pH (Field)	-	n/a	8.11	8.81	8.03	8.22
TOC	mg/L	1	5	12	10	8
TSS	mg/L	5	10	24	18	54
Zinc	mg/L	0.001	0.016	0.008	0.014	0.03

[1] Cells shaded blue denote values below the testing detection limits

[2] Cells shaded orange denote values that exceed the water quality objectives adopted for the Wianamatta-South Creek catchment (DPE, 2022)

[3] Cells with red text denote values that exceed the default guideline value for an 80% level of species protection as defined in the *Guidelines for Fresh & Marine Water Quality*

Following is a summary of the results of the water quality testing undertaken in 2021/22 with respect to the Wianamatta-South Creek water quality objectives and the default guideline values (DGVs) for toxicants specified in the Australian and New Zealand Guidelines for Fresh & Marine Water Quality:

- Concentrations of ammonia were recorded to be in excess of the Wianamatta-South Creek WQO (0.08 mg/L) in three out of four samples at the north-western discharge point and one out of four samples at the south-western discharge point. However, all samples were within the concentration limit specified in the EPL (1 mg/L) and were below the DGV for a 95% level of species (LOS) protection, which is the value *recommended for application for slightly to moderately disturbed ecosystems* (ANZG, 2018).
- Concentrations of chromium (III+VI) were recorded to be in excess of the DGV for a 95% level of species (LOS) protection (1.0 µg/L) in two out of the four samples at both discharge points. One sample at the north-western discharge point was found to be in excess of the DGV for 80% LOS protection.
- Concentrations of copper were recorded to be in excess of the DGV for an 80% LOS protection in all samples at both discharge points.
- Conductivity (a measure of salinity in surface water runoff) was found to be higher than the WQO in three of the four samples at the north-western discharge point and one of the four samples at the south-western discharge.
- pH was found to be higher than the upper WQO limit (7.6) for all of the four samples at both discharge points, but was below the EPL limit of 8.5 in all but one of the samples (September 2021). High pH is likely to be attributed to surface water coming into contact with concrete stockpiles in the segregated materials area (SMA).
- Total suspended solids (TSS) was found to be generally below the WQO value of 37 mg/L, except for samples taken on 23rd February 2022. It is likely that the high TSS value recorded on this date is attributable to rainfall at the Site in the days preceding the testing. Daily rainfall recorded at the Erskine Park rainfall gauge shows a total of 33mm over the 22nd and 23rd February 2022. A total of 119mm was

recorded in January 2022 and 79mm in the first three weeks of February, indicating the catchment was likely saturated and the capacity to treat TSS in the existing basins was constrained by high inflows and storage levels in the basins.

The majority of the analytes presented in **Table 10** and **Table 11** are not included in the EPL for the Site, and therefore exceedance against either the WQOs or the ANZG DGVs do not indicate non-compliance against the EPL or current Project Approval. The design of the Amended Proposal is expected to improve on water quality discharges as described in **Section 6.1**.

3.1.8. Onsite water quality infrastructure

The main surface water management strategy is to separate clean surface water, dirty surface water and leachate, thus preventing cross contamination and allowing clean water to be used on site or discharged to the environment. At the same time, this strategy would prevent surface water infiltration into the landfill, helping to reduce the quantity of leachate generated and requiring treatment.

The Eastern Creek REP has been designed and constructed to include several stormwater infrastructure components for the diversion and separation of cleaner surface water runoff from water that is managed via the Site Leachate Management System. Some of these features include:

- Two OSD basins with capacity to store surface water flows from the operational areas and also to contain and attenuate runoff for the 1 in 100 year rainfall event (refer Section **3.2.3**).
- A leachate trench, sump, bunding and site grading which allows runoff within the landfill pit to be separated into stormwater and leachate. This system minimises clean surface water flows into the active landfill area therefore reducing overall creation of leachate.
- Sediment control measures around the stormwater discharge point including a check dam and double layer of geotextile-wrapped filter bales to ensure discharged stormwater is free of sediment which could impact downstream waterways.
- Separately allocated and bunded refuelling location to minimise risk of pollutants from spills associated with refuelling.
- Water quality monitoring points (boreholes) to continually monitor and test water quality.

Erosion and sediment controls are also implemented across the Eastern Creek REP and are detailed in the approved *Eastern Creek Soil, Water and Leachate Management Plan* (Bingo, 2021).

Leachate is separate from clean surface water. All leachate generated in the landfill pit is collected in a leachate collection system and prevented from escaping into groundwater or surface water. This system is comprised of the following key features:

- A drainage layer comprising a permeable granular blanket of geosynthetic and granular materials on the floor of the pit which were installed prior to the commencement of filling
- A leachate trench on the pit floor which collects leachate runoff from uncovered areas of the active tipping area
- A sump with rises and extraction pumps located at the lowest elevation of the pit base which collects the leachate in preparation for removal
- Leachate storage tanks which are protected by bunding.

No changes are proposed to the landfill operations or leachate management as a part of the Amended Proposal. Leachate management is therefore not considered further within this report.

3.2. Water quantity

3.2.1. Eastern Creek REP sub-catchments

Section 3.1.1 describes the regional water catchment for the Eastern Creek REP. The Eastern Creek REP is located within the following sub-catchments (refer **Figure 10**):

- **Quarry Catchment**, which generally discharges in a north-westerly direction towards the M4 Motorway.

- **Quarry North Catchment**, which also generally discharges in a north-westerly direction towards the M4 Motorway.
- **Upper Angus Creek Catchment**, which generally discharges in a northerly direction parallel to Kangaroo Avenue, then towards a precinct-wide basin and onward towards the M4 Motorway.
- **Ropes Creek Tributary Catchment**, which generally discharges in a north-westerly direction and ultimately into Ropes Creek approximately 800 metres west of the Eastern Creek REP site.

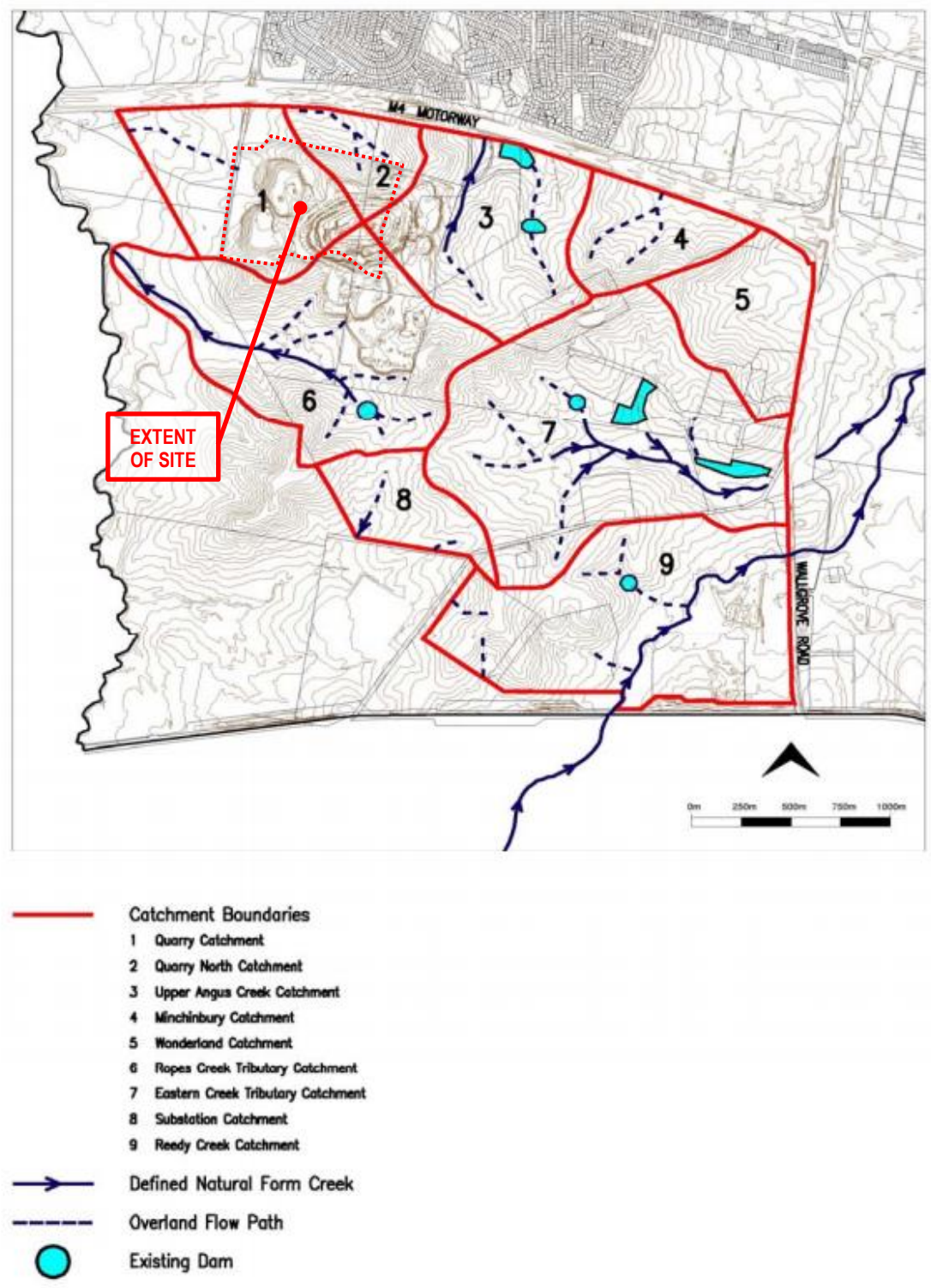


Figure 10: Existing Drainage Conditions (from SEPP59 – Eastern Creek Precinct Plan, Blacktown City Council, 2005)

3.2.2. Rainfall and climatic conditions

The temperature and rainfall statistics for the area surrounding the Proposal Site, obtained from the closest Bureau of Meteorology climate station at Prospect Reservoir (site number 067019), are presented in Figure 11.

Mean rainfall, determined using data obtained from the Bureau of Meteorology over the period of 1887 to 2021, is greatest in March, with a mean monthly rainfall of approximately 101 mm. Mean rainfall is generally lowest in September with a mean monthly rainfall of approximately 46 mm.

Mean maximum temperatures generally peak in the summer months at 29°C. Mean maximum and minimum temperatures generally occur in July, at approximately 17°C and 6°C, respectively.

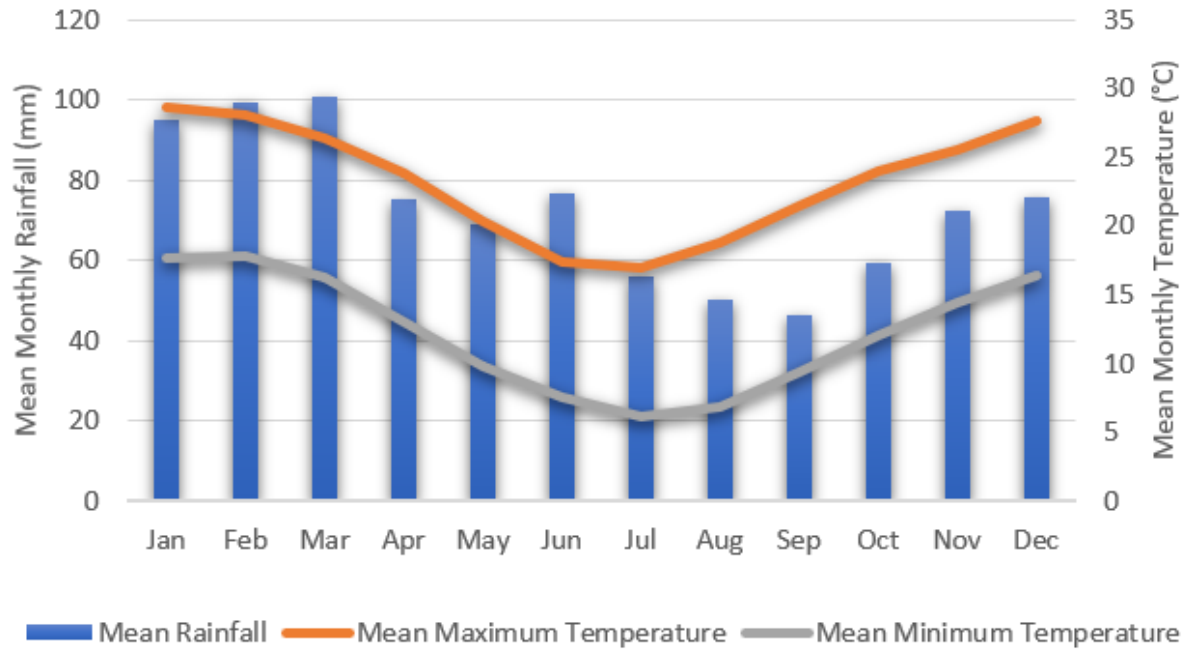


Figure 11 Mean Rainfall and Temperature

3.2.3. Onsite water quantity infrastructure

As presented in **Figure 5**, existing water quantity management infrastructure on the Eastern Creek REP comprises:

- Northern OSD Basin – located approximately 250 metres north-west of the MPC1 building (refer to **Figure 12**)
- Southern OSD Basin – located approximately 200 metres west of the MPC2 building (refer to **Figure 13**).

The southern basin is connected by a gravity pipe to the northern basin. Both basins overflow during extended rainfall period through natural drainage to Ropes Creek. Stored water from the northern on-site detention basin is transferred via a pump station to four aboveground reuse water tanks with a total combined capacity of 112.5 kilolitres.

The catchment areas and parameters are described in **Table 12**. Both of these catchments are contained within and discharge to the broader Quarry Catchment (refer to **Figure 10**) that is defined in the *SEPP 59 – Eastern Creek Precinct Plan (Stage 3)*.

Table 12: Catchment details of the northern and southern basins

Basin	Catchment area
Northern OSD basin	12.44 ha (not including the timber waste yard)
Southern OSD basin	10.43 ha

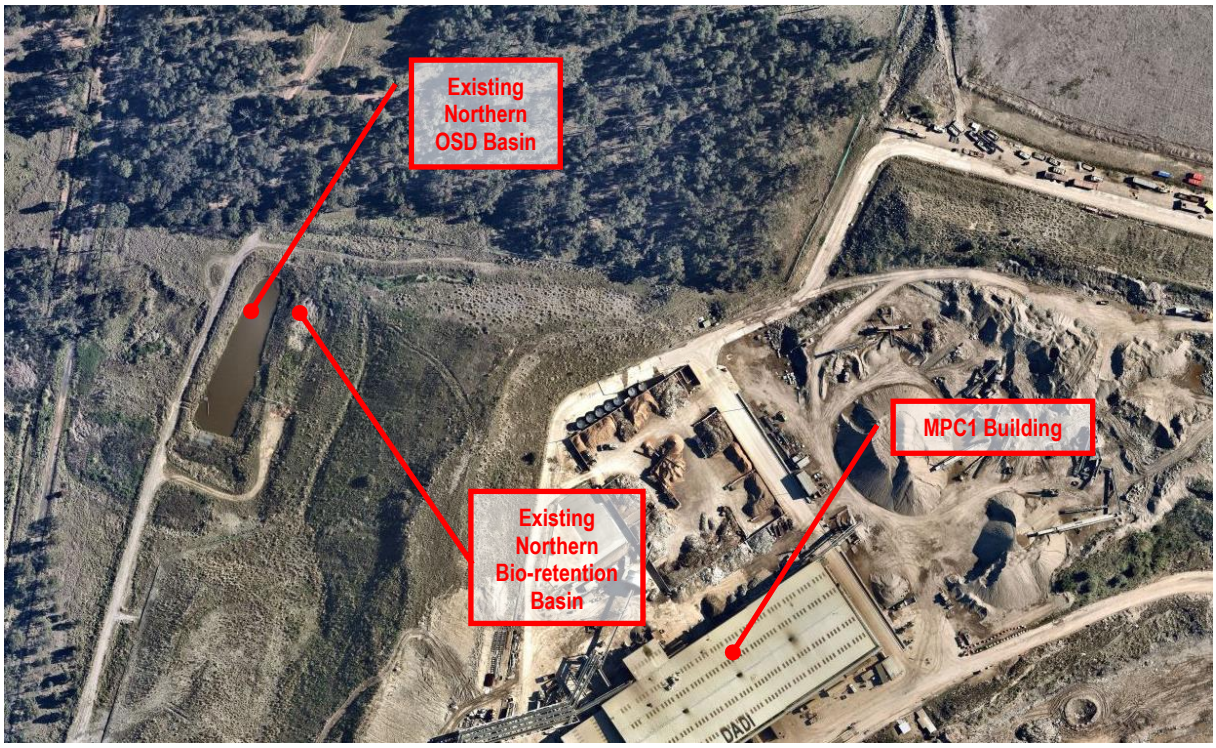


Figure 12: Existing Northern OSD Basin (nearmap, 17 October 2021)

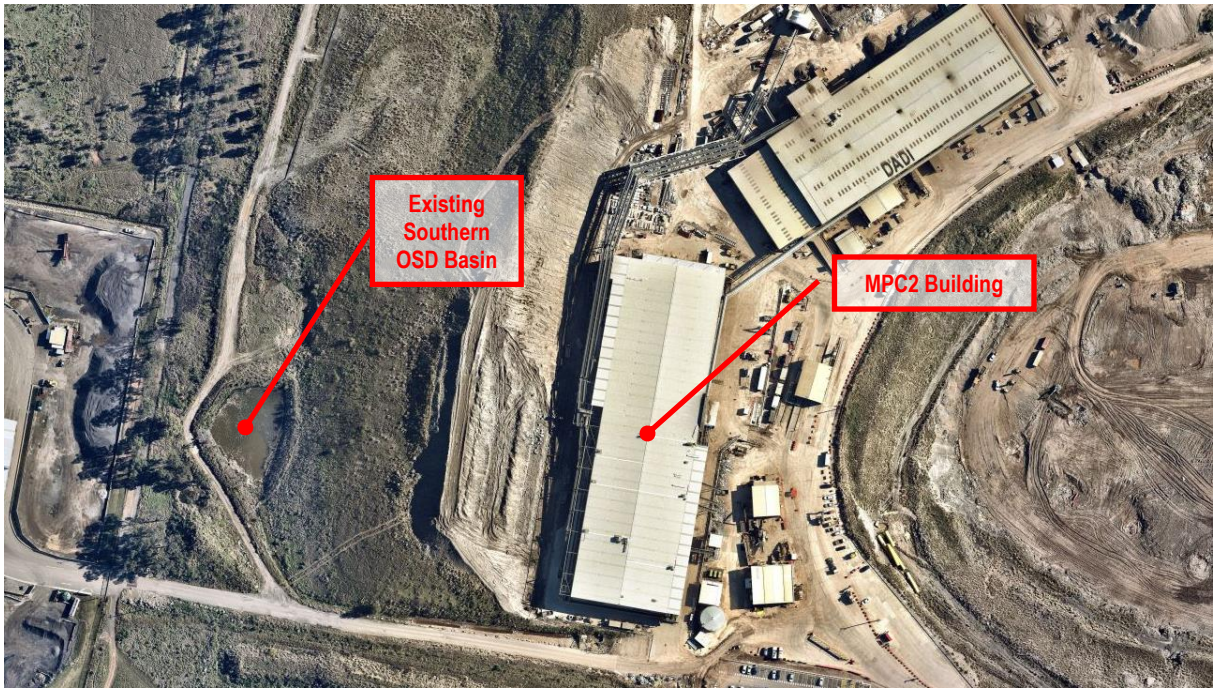


Figure 13: Existing Southern OSD Basin (nearmap, 17 October 2021)

3.3. Water use

Existing water uses across the Eastern Creek REP include:

- Internal potable water (e.g., employee showers and inside tap use)
- Internal non-potable (e.g., toilet flushing)

- External non-potable (e.g., irrigation)
- Fire and dust management services (e.g., sprinklers and fire service tanks).

The operational water management system comprises the following systems and is schematically represented in **Figure 14**:

- Surface water management
- Wastewater and leachate management.

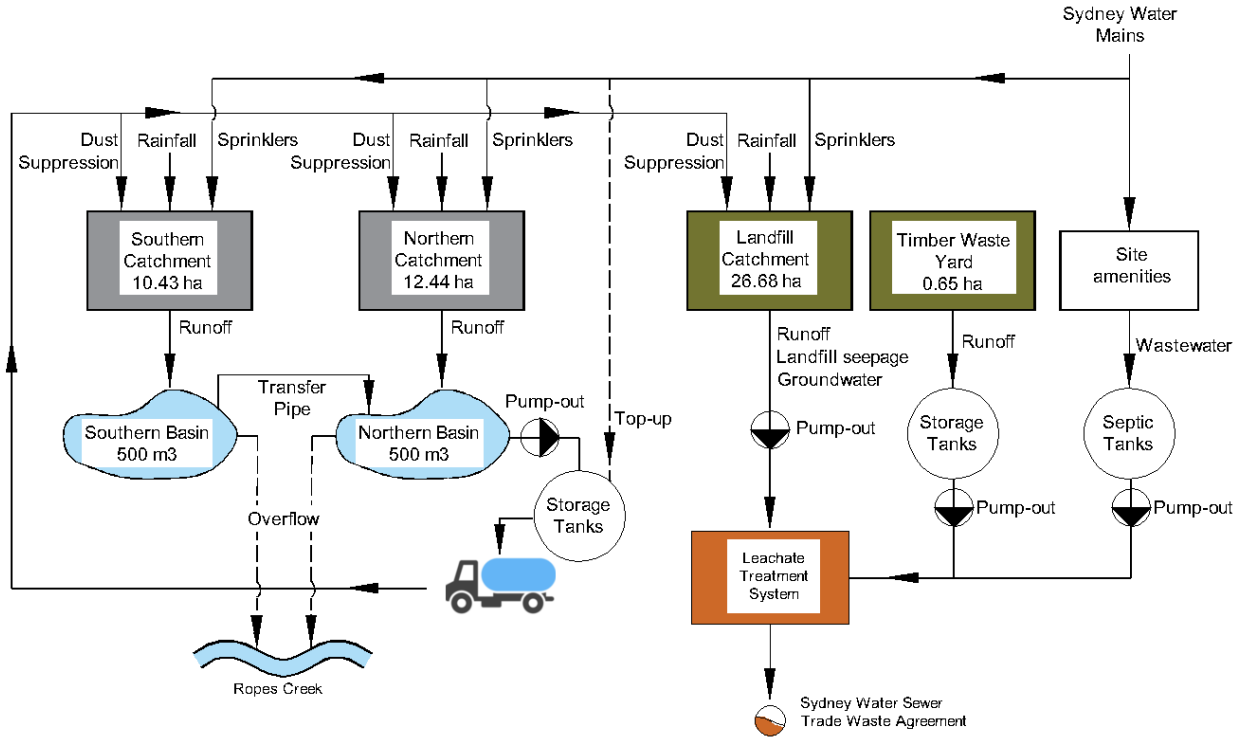


Figure 14: Schematic of the Proposal Site's Existing Water Management System

Mains water (supplied by Sydney Water to Eastern Creek REP) is used for site amenities, for dust suppression (sprinklers and misters) within the MPC buildings and for operational use within the landfill pit. Mains water is also used to supplement four aboveground water tanks (which are primarily supplied from the basins via the pump station).

Annual total mains water usage (for the 2020 period) was recorded as 41,337 KL/year, or an average of 113 kL/day.

Water from the northern OSD (which is connected to the southern OSD basin via a transfer pipe) is pumped to four aboveground reuse water tanks with a total combined capacity of 112.5 kL, to supply water to Eastern Creek REP's water carting facility. While both the northern and the southern OSD basins are primarily used for on-site detention, both basins have permanent pool volumes (below the outlet invert level) that can be used for reuse purposes. The volume capacity details for these basins are presented in **Table 13**.

Table 13 Capacity details of the northern and southern OSD basins

Basin	Provided permanent pool volume (kL)	Source of information
Northern OSD basin	500	Consolidated Stormwater Management Plan (Martens Consulting Engineers, November 2011)
Southern OSD basin	746	Pre-Sorting Centre, Eastern Creek – Section 75W Approval, Stormwater Management Report (AT&L, December 2014)

Earlier reports estimated the average annual reuse demand to be 110 kL/day (Martens' Consolidated Stormwater Management Plan 2011 and ATL's Section 75W Approval Stormwater Management Report (2014). However, based on a recent three-day audit undertaken by Bingo in January 2021, the average daily water cart use is estimated to be 178 kL/day, or 64,970 kL/year, accounting for weather variations.

Based on records of the total mains water usage for the 2020 period (41,337 kL/year) and the estimated water reuse (64,970 kL/year), on-site water reuse makes up approximately 61% of the total water demand across the Site.

3.4. Existing water utility infrastructure

A summary of the existing utility infrastructure that services the Eastern Creek REP site is presented below in **Table 14**.

Table 14 Existing water utilities – Eastern Creek REP

Utility Service	Existing assets
Potable Water (Sydney Water)	▪ DN375 DICL main to the western end of Honeycomb Drive (terminates within the Proposal Site approx. 400m east of the MPC2 building). ▪ DN300 DICL main on the eastern side of Kangaroo Avenue.
Sewerage (Sydney Water)	▪ DN90 PE main on the southern side of Honeycomb Drive ▪ DN225 PP main on the eastern side of Kangaroo Avenue
Recycled Water	▪ No reticulated recycled water in the vicinity of the Proposal Site. ▪ Stored water from the northern and southern OSD basins is transferred via a pump station to four above ground water reuse tanks (total capacity 112.5kL), where it is reused in water carts and for truck wet-down.

4. Proposed site conditions

Section 1.1 provides an overview of the Amended Proposal and its staging, summarised as follows:

- Stage 1: Initial throughput: Stage 1 would comprise 500,000 tpa of additional throughput to be received at the Eastern Creek REP to enhance resource recovery outcomes by increasing utilisation of onsite processing capabilities
- Stage 2: Internal site optimisation: Stage 2 would facilitate the remaining throughput increase (an additional 450,000 tpa of the total 950,000 tpa proposed) to be received and processed across the Eastern Creek REP and operation of a proposed new exit connection.
- Stage 3: Installation of supporting infrastructure: Stage 3 would comprise the redevelopment of the north-eastern corner of the Proposal Site.

This section provides a more detailed description of the key elements of the Amended Proposal that are likely to impact water or form part of the proposed water management features.

4.1. Comparison of EIS Proposal and Amended Proposal

The Amended Proposal incorporates revisions to the proposed stormwater treatment train, which will result in an increase in treatment capacity and therefore improvement in water quality and quantity management compared to the EIS Proposal. A comparison of the stormwater treatment train components under both the EIS Proposal and the Amended Proposal is presented in **Table 15**.

Table 15: Comparison of stormwater management measures under the EIS Proposal and Amended Proposal

Stormwater Management Measure	EIS Proposal	Amended Proposal [1]	Comment
Gross pollutant traps (GPTs)	CDS1012 unit (existing) New GPT to treat western access road	CDS1012 unit (existing) Proposed Humegard HG45 (or approved equivalent) to treat runoff from western catchments draining to Ropes Creek (approved under Mod 9 to MP06_0139)	Improvement on EIS Proposal due to higher proportion of operational area being directed to a GPT
Sediment basin	Nil	4,130 m^3 sediment basin treat runoff from western catchments draining to Ropes Creek (approved under Mod 9 to MP06_0139)	Improvement on EIS Proposal Increased capacity to target suspended solids and pollutants that bind to suspended solids (including heavy metals)
Surface water storage for harvesting and reuse	Rainwater tanks for proposed Site Workshop and Maintenance Workshop Water tanks for external reuse (112.5kL existing and 112.5kL proposed) Existing northern and southern basins: combined storage volume = 3,823 m^3	Rainwater tanks for proposed Site Workshop and Maintenance Workshop 5,090 m^3 water storage basin / pond (approved under Mod 9 to MP06_0139)	Improvement on EIS Proposal due to increase in water storage for harvesting and reuse (approximately 50% increase on existing capacity).

Stormwater Management Measure	EIS Proposal	Amended Proposal [1]	Comment
Bio-retention	Existing northern bio-retention basin (400 m^2) Proposed bio-retention Basin B (400 m^2)	Proposed bio-retention Basin B (400 m^2)	Smaller bio-retention area in Amended Proposal due to effectiveness of proposed upstream treatment measures (sediment basin and water storage dam)
On-site stormwater detention	Basin B (discharge to Upper Angus Creek): 2150 m^3 Basin K (discharge to Ropes Creek): 3920 m^3 Existing northern and southern basins (discharge to Ropes Creek): 2300 m^3	Basin B (discharge to Upper Angus Creek): 2150 m^3 North-western OSD tank: 6900 m^3 (approved under Mod 9 to MP06_0139)	Improvement on EIS Proposal due to increase in OSD storage volume in the western catchment.
Rainwater tanks for roof capture and storage	2 x 10 kL tanks – one each for proposed Site Workshop and Maintenance Workshop	2 x 10 kL tanks – one each for proposed Site Workshop and Maintenance Workshop	No change from EIS Proposal

[1] Blue text indicates measures that have changed between the EIS Proposal and Amended Proposal

As summarised in **Table 15**, the proposed stormwater management measures that comprise the Amended Proposal will result in an increased capacity for surface water treatment, capture and detention and therefore represent an improvement in overall site surface water management when compared to the EIS Proposal.

The operational water management system under the Amended Proposal conditions is schematically represented in **Figure 15**.

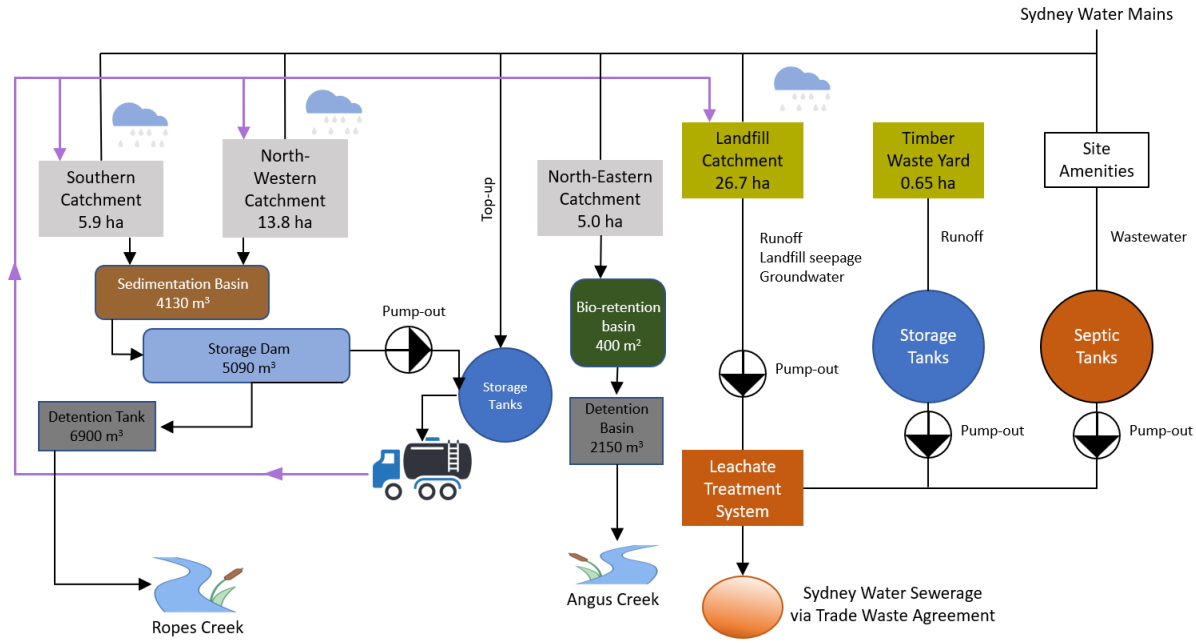


Figure 15: Schematic of the proposed water management system under the Amended Proposal conditions

4.2. Water infrastructure

4.2.1. Water quality and quantity

Existing water quality and quantity infrastructure across the Eastern Creek REP is described in **Section 3.1.8** and **Section 3.2.3**, and presented in **Figure 5**. This section provides a description of the water infrastructure that would be utilised and/or is proposed as part of the Amended Proposal. Key water quality features include:

- Gross pollutant traps
- A new sediment basin to replace the existing northern and southern basins
- A water storage dam in the north-western corner of the Site
- Bio-retention systems
- Onsite stormwater detention (tanks or basins)
- Rainwater tanks (described in **Section 4.2.2**).

The majority of the proposed water quality and quantity infrastructure will be located in the north-western portion of the Site (refer to **Figure 16**), within the extent of work that forms the future Western Operation Area (WOA) that has been approved under Mod 9 to MP06_0139.

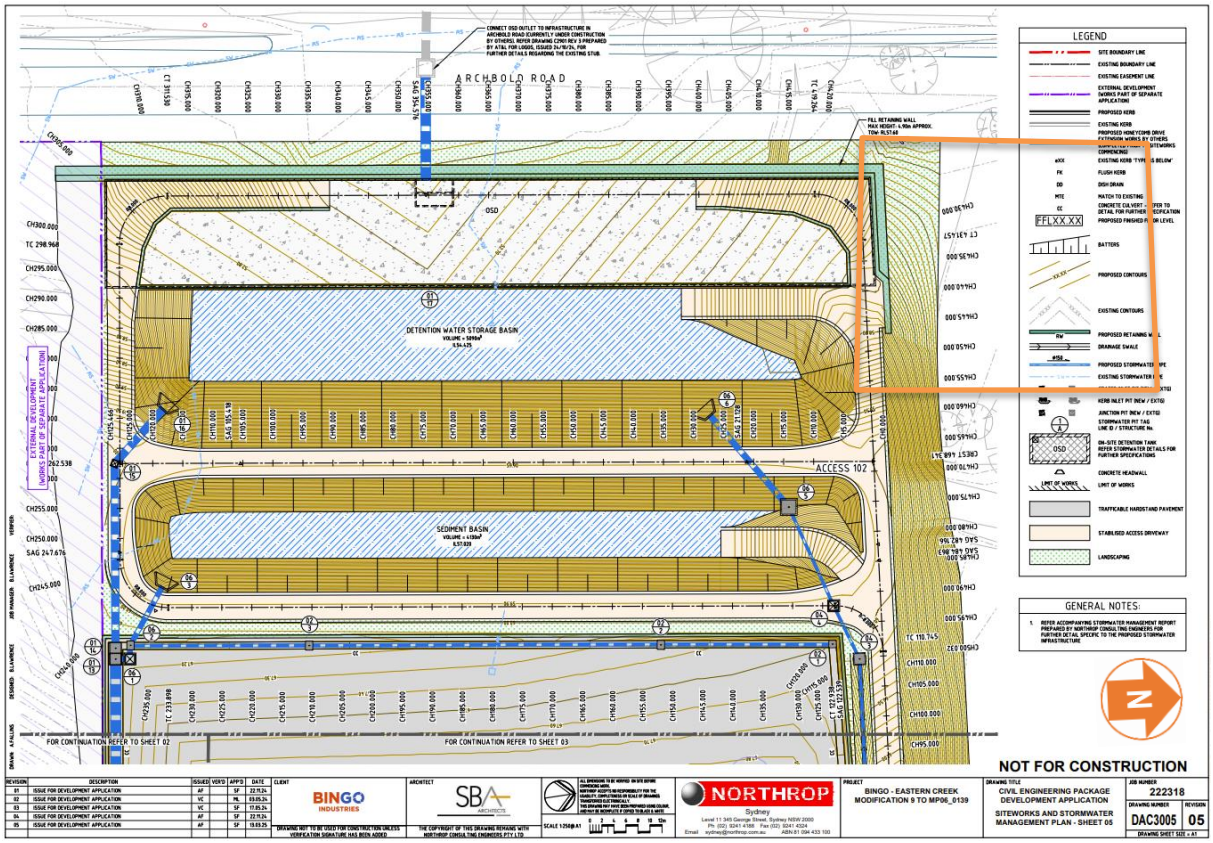


Figure 16: Proposed north-western stormwater management measures (Northrop, November 2024)

Gross pollutant traps

The stormwater treatment train for the Amended Proposal utilises the existing CDS1012 unit, which is located south of the existing MPC2 building. This GPT provides primary treatment of surface water runoff from the MPC2 building, car park and adjacent hardstand areas.

A new GPT incorporating capacity for removal of hydrocarbons will be installed in the north-western portion of the Site to capture and treat surface water runoff from the north-western portion of the Site. Details of the

GPT, including configuration and sizing, will be confirmed at the subsequent phase of design of the WOA (approved under Mod 9 to MP06_0139).

Sediment basin

A new sediment basin will be installed to capture surface water runoff from the western portion of the Site that discharges towards Ropes Creek. The sediment basin was approved under Mod 9 to MP06_0139. This basin will have a nominal capacity of 4,130 m^3 and an average depth of 1.5 metres. The basin will primarily capture and store suspended solids and heavy metals from surface water runoff. If required, and subject to confirmation at detailed design, baffles could be incorporated into the basin to increase flow path length and therefore improve the capacity for settlement of solids.

Water storage basin

A new water storage basin, with a nominal storage volume of 5,010 m^3, is proposed downstream of the sediment basin. The water storage basin was approved under Mod 9 to MP06_0139. This main purpose of this basin is to store water for reuse across the Proposal Site, thereby reducing the frequency of surface water discharge towards Ropes Creek.

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 filer 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.

To meet the pollutant reduction targets for the Amended Proposal (refer to **Section 6.1**), a 400 m^2 bio-retention system is proposed within Basin B. The location of this basin is shown in **Figure 5** and on drawing 19-692-C315 (contained in **Appendix A**). The exact configuration of the bio-retention system within the proposed OSD basin is subject to confirmation at detailed design. This bio-retention system has been sized to meet the pollutant reduction targets for Catchment B prior to discharge across the eastern boundary of the Eastern Creek REP and into Angus Creek.

General parameters for the proposed bio-retention systems that form part of the proposed water management system at the Eastern Creek REP site are summarised in **Table 16**.

Table 16: Bio-retention system parameters under proposed conditions

Parameter	Proposed Bio-retention Basin B (refer to Figure 5 and Civil Drawings in Appendix A)
High-flow bypass	1 EY (1-year ARI peak flow)
Filter area	400 m^2
Extended detention depth	0.4m
Saturated hydraulic conductivity	90 mm/hour
Filter depth	500mm
TN content of filter media	800 mg/kg
Orthophosphate content	40 mg/kg
Exfiltration rate	0

MUSIC model parameters adopted for the proposed bio-retention system are consistent with those outlined in the Blacktown *WSUD developer handbook*.

On-site stormwater detention

As shown on Civil Drawings 19-692-C310 to 19-692-C316 inclusive (refer to **Appendix A**), stormwater runoff within the Proposal Site is proposed to be collected via a network of stormwater drainage infrastructure, including pits, pipes and table drains. This infrastructure would discharge to a proposed on-site stormwater

detention (OSD) basin prior to discharge from the Proposal Site. The intent of the OSD basins is to attenuate post-development peak flow rates to no greater than pre-development conditions at each point of discharge across the site boundary.

There are two existing OSD basins (northern and southern) that currently capture and detain surface water runoff from the Eastern Creek REP operational area (refer **Section 3.2.3**). These basins will be replaced with a new OSD tank (nominal volume 6900 m^3), which will attenuate surface water runoff from the Eastern Creek REP site. The north-western OSD tank has been approved under Mod 9 to MP06_0139.

The eastern portion of the Site that discharges towards Upper Angus Creek will discharge towards a new basin (Basin B), which will be located near the north-eastern corner of the Proposal Site, adjacent to the Upper Angus Creek corridor that runs parallel to Kangaroo Avenue. Basin B will also include a bio-retention system, which will be positioned adjacent to the OSD component of the basin such that there would either be no OSD or a shallow OSD depth over the bio-retention system.

Parameters for the proposed OSD basins that form part of the stormwater treatment train for the Amended Proposal are presented in **Table 17**.

Table 17: OSD basin parameters under proposed conditions

Parameter	Proposed Basin B (subject to approval under SSD-11606719)	Proposed NW OSD Tank (approved under Mod 9 to MP06_0139)
Volume between bottom of OSD storage and top of overflow weir	2150 m^3	6900 m^3
Outlet orifice diameter	300mm	500mm

4.2.2. Water use

Rainwater tanks for roof runoff capture and storage

To satisfy the water reuse objectives for the Site, the Amended Proposal incorporates two new rainwater tanks, one each for the proposed Site Workshop and the proposed Maintenance and Manufacturing Workshop.

Rainwater tanks can retain a significant proportion of stormwater that falls on roof areas. Considering tanks would be fitted with first flush devices, it is likely that they would have minimal water quality benefit as the first flush off roof areas generally contain the highest concentration of pollutants. However, rainwater tanks would be required to maximise water reuse opportunities within the Proposal Site and to satisfy the Blacktown DCP requirement to meet at least 80% of non-potable demand.

A MUSIC model was developed to determine the rainwater tank volume required to satisfy the Blacktown DCP requirement. To determine the tank volume, the following assumptions have been made:

- Non-potable demand of 0.15 kL per toilet per day has been adopted (based on operation of 12 hours per day). The number of toilets within the two proposed workshops has been estimated based on their respective floor area.
- At least 50% of the total warehouse roof area would drain to the rainwater tank.

A summary of the rainwater tank volumes proposed to support the Amended Proposal are presented below in **Table 18**.

Table 18: Non-potable water demand and rainwater tank volumes adopted in MUSIC

Component	Roof area to rainwater tank (ha)	Estimated non-potable demand in toilets (kL/day)	Adopted rainwater tank volume	% of reuse demand met
Site Workshop	0.205	0.6	10 kL	80.8%
Maintenance Workshop	0.434	0.6	10 kL	83.9%

Water storage for external reuse

As noted in **Section 3.3**, four above ground tanks are currently in place already at the Eastern Creek REP. These tanks store water harvested from the existing North and South OSD basins. The four tanks have a combined capacity of 112.5 kL.

It is likely that the daily demand for non-potable water will increase across the site as a result of the Amended Proposal. This estimate is based on the increase in road surface area that will require dust suppression, as well as the increase in volume of material that will be processed on the Proposal Site. Whilst the likely quantum of any increase in demand is difficult to quantify, it has been assumed that daily non-potable water demand would rise from 178 kL/day to 334 kL/day. This estimate is based on the following:

- The majority of the demand for non-potable water within the Proposal Site would be external uses, primarily for dust suppression of stockpiles and internal access roads. It is estimated the proportion of external non-potable water use is approximately 90% of the total non-potable water use across the site, with the remaining 10% being internal uses including misting systems and hosing of waste within the materials processing buildings.
- There would be no significant increase in the demand for 'internal' non-potable water as a result of the Amended Proposal.
- The increase in throughput would result in a higher rate of stockpile turnover, requiring an increase in stockpile management and demand for water for dust suppression. It is estimated that this increase would represent up to 20% of the current non-potable water use across the Site.
- Additional infrastructure would be put in place that can utilise non-potable water harvested from the Site. This will include:
  - A new wheel wash, which has an estimated daily non-potable water demand of 70 kL/day.
  - Street sweepers across the Site, which have an estimated daily non-potable water demand of 50 kL/day.

To cater for the anticipated increase in external non-potable water demand, and to reduce the frequency of discharge from the Site, a new water storage basin (approved under Mod 9 to MP06_0139) with a nominal storage volume of 5,010 m^3 is proposed in the north-western corner of the Site. This basin will provide a significant increase in storage capacity compared to existing conditions. This additional storage volume will contribute to the water management objectives for the site, in particular maximising water reuse opportunities and minimising the volume of potable water required for non-potable use.

On-site sewage management, treatment and reuse

Outlined below is a summary of upgrades to the existing on-site sewage management, treatment and reuse measures that will be required to service the Amended Proposal.

- **Landfill seepage and pump-out** – No upgrades required, as the Amended Proposal will result in a reduction in the catchment area draining towards the landfill seepage system.
- **Storage tanks and pump-out for Timber Waste Yard** – no upgrades required, on the basis the Timber Waste Yard will not increase in area.
- **Septic tanks and pump-out for Site Amenities** –minor upgrades to the existing on-site sewage reticulation system will be required for new amenities in the proposed Site Workshop and Maintenance

and Manufacturing Workshop buildings. Details of these upgrades will be confirmed at the subsequent phase of design when the final building layouts are determined.

- **Leachate treatment system** – based on the area of the catchment draining to the landfill reducing as a result of the Amended Proposal, no upgrades to the existing leachate treatment system will be required.
- **Sydney Water Trade Waste Agreement** – no amendment to the current Trade Waste Agreement will be required as a result of the Amended Proposal.

4.2.3. Water utilities

Existing utilities are described in **Section 3.4**. As a result of the Amended Proposal a number of upgrades are required to existing utilities (as described in **Table 19**).

Table 19: Existing utility services and upgrades required to service the Amended Proposal

Utility Service	Required Upgrades
Potable Water (Sydney Water)	Minor upgrades to internal site reticulation to provide a water supply to the proposed Site Workshop and Maintenance and Manufacturing Workshop.
Sewerage (Sydney Water)	Extension of the internal wastewater management system, to connect the proposed Site Workshop and Maintenance and Manufacturing Workshop to the Leachate Management System.
Recycled Water	Upgrades to the internal recycled water system, including capacity to transfer stored water from the proposed storage dam in the north-western treatment train and additional water storages commensurate with the increase in throughput capacity.

5. Construction impact assessment

As noted in **Section 2.3** the Amended Proposal would be developed across three stages. However, as water impacts are largely related to physical changes onsite and the introduction of new built form the water impact assessment has considered a construction scenario (outlined in this section) and a full build scenario (refer to **Section 6**).

This section provides a description of the potential impacts from the Amended Proposal associated with construction works. Stage 2 would comprise the majority of the physical changes to the Proposal Site as well as the majority of the earthworks required. The majority of these impacts are therefore likely to be experienced during the construction of Stage 2.

5.1. Water quality

Key construction activities that have the potential to impact on surface water quality would include:

- Erosion and sediment control installation
- Grading and earthworks to suit building layout, drainage layout and pavements.
- Stormwater and drainage works
- Service installation works
- Building construction works.

Disturbances to soils during construction could result in surface water runoff (e.g., sediment laden water) into the downstream receiving waters. This has the potential to transport pollutants such as sediment, chemicals, oils and grease into the downstream receiving waters which could result in water quality and biodiversity impacts.

Without any mitigation measures and during typical construction activities, site runoff may convey a substantial sediment load. In addition to the existing controls already in place across the Eastern Creek REP (described in **Section 3.1.8**), an erosion and sediment control plan (ESCP) will be prepared and implemented through the construction phase of the Amended Proposal. The ESCP and the proposed controls will be established prior to the commencement of construction of Stage 2 of the Amended Proposal and will outline measures to protect the downstream drainage system and receiving waters from sediment laden runoff. The erosion and sediment controls outlined in the ESCP (and listed in **Section 7)** will include but not be limited to:

- Stabilised site access shall be constructed at all entry and exit points to the Proposal Site to prevent the migration of soil and sediments.
- At the upstream end of works, clean water shall be temporarily diverted around disturbed areas.
- Sediment fences shall be installed at the downstream end of any disturbed areas.
- The area of soil disturbed at any one time shall be minimised where possible. Any stockpiled material shall be covered, kept moist or planted with hydromulch.
- Any disturbed areas shall be rehabilitated as soon as practical.
- Sediment basins and/or traps (including sediment fences) shall be cleaned when the structures are at a maximum of 60% full of solid materials and disposed of in a manner that prevents further pollution of the site.
- Measures will be inspected regularly and after significant rainfall (nominally more than 25mm over a 24-hour period) and will be cleaned and repaired, as necessary.

Section 3.1.3 describes the risk of soil erodibility across the Eastern Creek REP, noting that the soil properties would make the erosion risk high. In addition to the erosion and sediment control measures listed above, the existing and proposed OSD basins will mitigate the potential impact of sediment-laden runoff from the Proposal Site by capturing and containing runoff from the operational areas and the extent of work under the Amended Proposal.

During construction, fuels and chemicals required for construction would be stored on the Proposal Site and within construction compounds. Due to this, there is potential for fuels and chemicals to spread to the surrounding environment through spills and leaks.

5.2. Water quantity

Construction of new access roads, hardstands and buildings will progressively result in an increase in impervious areas within the Proposal Site. As the impervious fraction of the Proposal Site increases, the peak flow rates from surface water runoff across the Proposal Site will increase.

In order to mitigate increases in water quantity and an increase in peak flow rates, the two proposed detention basins (Basin B and Basin NW, refer to **Figure 5** and Civil Drawings in **Appendix A**) would be constructed prior to the installation of new impervious surfaces. These basins would be installed and maintained as sediment basins for the duration of construction works and would therefore mitigate potential water quality and quantity impacts during construction. Upon completion of the final built-form works (including road pavements and building works), the basins would be desilted and final works to convert them to detention basins would be completed (e.g., installation of hydraulic outlet controls such as orifice plates).

5.3. Water use

Potential impacts relating to water use on-site would be limited to minor increases in demand for activities such as dust suppression, wheel wash facilities for construction vehicles exiting the Proposal Site and site office amenities.

The operational water management system for the Proposal Site (presented as **Figure 14**) would apply during construction of the Amended Proposal.

Any construction phase activities that require non-potable water, such as dust suppression and wheel wash, should prioritise the use of non-potable water captured and stored on-site.

6. Operation (full build) impact assessment

6.1. Water quality

Section 4.2.1 describes the proposed water quality infrastructure that would be installed as part of the Amended Proposal. Unless stormwater management measures are put in place, the proposed internal access roads, workshop buildings and hardstand area have the potential to increase pollutants in surface water runoff.

When combined with surface water runoff generated by direct rainfall on the site, dust and sediment from site operations and stockpiled material would result in a relatively high concentration of TSS.

The Amended Proposal will not result in any change from the current operation of the Site in terms of types of waste and how they are stored in the Segregated Materials Area. Nonetheless, there is potential for contaminant leaching from stockpile areas towards the proposed discharge point across the western boundary (which ultimately drains to Ropes Creek). Specific water quality parameters / pollutants that may be affected by stockpiles within the segregated materials areas include pH (high alkalinity associated with crushed concrete stockpiles), ammonia (potentially generated by soil stockpiles) and some heavy metals (e.g., copper, chromium, zinc).

The assessment of potential water quality impacts within the Proposal Site has been undertaken in three broad categories:

a) **Urban stormwater pollutants (TSS, TP, TN, gross pollutants)** – using the MUSIC modelling software package to assess potential impacts
b) **Hydrocarbons** – applying principles outlined by Blacktown City Council for the adoption of suitable management measures to address hydrocarbons
c) **Heavy metals, pH and ammonia** – applying a qualitative approach to consider their potential impact based on the proposed water management measures that will be implemented across the Site. With the proposed water management measures in place to capture and treat surface water runoff from the western operational area, the likelihood of discharge from the site will be low. Therefore, the risk associated with the discharge of heavy metals and ammonia is low as a result of the likelihood of discharge. On this basis, a qualitative assessment is considered appropriate.

This qualitative assessment supplements the detailed quantitative review of water quality both within the Eastern Creek REP Site (refer to **Section 3.1.7**) and the broader Ropes Creek and Angus Creek catchments (refer to **Section 3.1.6**).

Urban stormwater pollutants

A MUSIC model has been established to determine the performance of the Amended Proposal in achieving water quality discharge objectives for TSS, TP and TN, as defined in **Section 2.2.1**.

Based on the existing and proposed stormwater quality management measures to be implemented as part of the Amended Proposal, results from the MUSIC model demonstrating the treatment train effectiveness for the discharge points towards Ropes Creek and Angus Creek are presented in **Table 20** and **Table 21**. As shown the proposed treatment measures would achieve a percentage reduction significantly greater than the target reduction for all parameters. This is due to the stormwater quality and quantity management measures proposed as part of the Amended Proposal (refer to **Section 4.2.1**).

Table 20: MUSIC model results – north-western discharge point (Ropes Creek catchment)

Pollutant	Sources – Post-Development (kg/yr)	Residual Load – Post-Development (kg/yr)	% reduction	Target load reduction
TSS	21,600	1,430	93.4%	85%
TP	36.7	6.21	83.1%	65%
TN	245	69.2	71.7%	45%
Gross Pollutants	3110	0	100%	90%

Table 21: MUSIC model results – north-eastern discharge point (Angus Creek catchment)

Pollutant	Sources – Post-Development (kg/yr)	Residual Load – Post-Development (kg/yr)	% reduction	Target load reduction
TSS	5,240	762	85.5%	85%
TP	9.19	3	67.3%	65%
TN	75.4	33.1	56.1%	45%
Gross Pollutants	920	0	100%	90%

Cumulative frequency graphs have been generated from the MUSIC model results, which present the likelihood of exceedance of a certain pollutant concentration. Based on these model outputs, the likelihood of exceedance of the Wianamatta-South Creek WQO is summarised in **Table 22**. These model results indicate a very low likelihood of exceedance of the WQOs adopted for the Wianamatta-South Creek catchment.

Table 22: Likelihood of exceedance of Wianamatta-South Creek WQO for pollutants modelled in MUSIC

Pollutant	Wianamatta-South Creek WQO Concentration (mg/L)	Likelihood of exceedance at discharge towards Ropes Creek [1]
TSS	37	0.4%
TP	0.14	0.8%
TN	1.72	0.9%

[1] Based on MUSIC model output of flow weighted daily mean concentrations

Hydrocarbons

As outlined in Council's *WSUD developer handbook*, there is currently no defined way for MUSIC or any other industry-standard water quality model to assess the removal of hydrocarbons or oils from stormwater. Blacktown Council therefore relies on deemed-to-comply solutions to satisfy the target of 90% removal of the average annual load of hydrocarbons.

Council adopts five deemed-to-comply solutions for hydrocarbon in low-risk developments, such as the Eastern Creek REP site:

- Method 1. Gross pollutant trap with hydrocarbon trap
- Method 2. Oil baffle (excluding Jellyfish)
- Method 3. Oil baffle for Jellyfish
- Method 4. Bio-retention with shallow or no OSD
- Method 5. Fully covered carparks and driveways

For the catchments discharging towards proposed Basin B and the north-western treatment train, Method 4 (Bio-retention with shallow or no OSD) is proposed to satisfy the deemed-to-comply requirement for hydrocarbon removal. This is proposed on the basis that:

a) As described in **Section 4.2.1**, the proposed bio-retention component of Basin B will be located adjacent to the OSD component of the basin, such that there would either be no OSD or a shallow OSD depth over the bio-retention system. The bio-retention basin configuration would comply with Council's requirements outlined in Section 11.16 of the *WSUD developer handbook*.
b) The catchment discharging towards the north-western outlet drains to the proposed bio-retention basin, located upstream of the proposed OSD tank.

With the proposed stormwater management measures in place, it is expected that the target of 90% removal of the average annual load of hydrocarbons will be achieved.

Heavy metals, pH and ammonia

Potential impacts associated with heavy metals, pH and ammonia will be limited to the western portion of the Site, as these pollutants have the potential to be generated from material stockpiles that will only be contained in the western catchment. The proposed development of the north-eastern catchment that discharges towards Upper Angus Creek will not incorporate materials stockpiling or processing infrastructure and will be limited to the two proposed workshop buildings and associated hardstand areas. Pollutants generated by the operation of these areas will be typical of an industrial development and will be managed by the proposed Basin B, incorporating bio-retention and OSD.

The proposed north-western treatment train (approved under Mod 9 to MP06_0139), consisting of a GPT, sediment basin and water storage dam (for harvesting and reuse across the Proposal Site) will remove heavy metals and ammonia by means of sedimentation, primarily within the sediment basin, but also within the water storage dam.

The removal efficiency of TSS from the north-western treatment train (93.4% average annual load reduction), to which the majority of heavy metals are bound, will result in a reduction in the average annual volume of heavy metals discharged from the Site towards Ropes Creek. A similarly high level of reduction in the average annual volume of heavy metals discharged from the north-western treatment train is expected.

These approved stormwater management measures that form the north-western treatment train will result in an increased capacity to treat, capture and store surface water runoff from the operational areas of the Site and will therefore result in an improved performance in comparison to the existing infrastructure and the EIS proposal.

As noted in **Section 3.1.7**, surface water runoff from the Site under existing conditions has been found to have a pH higher than the WQOs for the Wianamatta-South Creek catchment, but within the limits set by the EPL for the Site. pH can be highly variable due to several factors such as temperature, dissolved minerals and decomposition of organic material. If pH levels are found to be consistently high and pH correction is warranted to mitigate potential impacts on surface water quality within Ropes Creek, corrective dosing (e.g., muriatic acid, sodium bisulfate) could be applied to the proposed water storage dam which would enable the site to meet the EPL and WQO targets for pH.

6.2. Water quantity (stormwater)

Section 3.1.8 describes the existing onsite detention and stormwater quantity infrastructure and **Section 4.2.1** outlines the proposed additional OSD that would be installed as part of the Amended Proposal. A DRAINS model (refer Section **2.3.2**) has been developed to determine the adequacy of the existing and proposed OSD to adequately manage stormwater flows for the full build infrastructure of the Amended Proposal.

The OSD requirement for the Proposal Site will mitigate the impact of the Amended Proposal as a result of an increase in impervious surfaces (roads, hardstands and buildings). Unmitigated, any increase in the impervious fraction of the site has the potential to increase peak flow rates towards the points of discharge across the Proposal Site boundary.

Pre-development and post-development conditions have been modelled in DRAINS using the RAFTS and ILSAX hydrological models respectively. Model parameters have been adopted based on the proposed operational site conditions and with the proposed stormwater management measures described in **Section 4.2.1**.

Results of pre-development and post-development DRAINS modelling for the median storm in the critical ensembles for a range of storm events between and including the 0.5 EY (2 year ARI) and the 1% AEP (100 year ARI) design storm events are summarised in **Table 23**.

Table 23: Summary of DRAINS model results

	Quarry (NW OSD tank)		Quarry North		Upper Angus Creek (Basin B)	
	Pre-Development peak flow (m^3/s)	Post-Development peak flow (m^3/s)	Pre-Development peak flow (m^3/s)	Post-Development peak flow (m^3/s) [1]	Pre-Development peak flow (m^3/s)	Post-Development peak flow (m^3/s)
0.5 EY	0.769	0.764	0.254	0	0.212	0.121
10% AEP	1.53	1.01	0.497	0	0.446	0.125
5% AEP	1.97	1.13	0.618	0	0.551	0.121
1% AEP	3.52	2.92	1.17	0	1.02	0.134

[1] Post-development flow for the Quarry North catchment would be zero for all design storm events, as the catchment will be diverted into the Quarry catchment and through proposed stormwater management measures adjacent to the western boundary of the Site.

These results demonstrate that the proposed OSD basins will attenuate post-development flow to less than pre-development flow rates for a range of design storms up to the 1% AEP event. Because the post-development flow rates would be less than pre-development flow rates at each of the three discharge points from the Proposal Site, there would be no adverse impact on downstream drainage systems as a result of the Amended Proposal.

The MUSIC model has been analysed to estimate the frequency and volume of inflow and outflow at the two discharge points (north-western towards Ropes Creek and north-eastern towards Upper Angus Creek) to assess the performance of the stormwater management measures in terms of reduction in frequency and volume of discharge. Flow duration curves presenting both inflow and outflow at the north-western discharge point and the north-eastern discharge point are presented as **Figure 17** and **Figure 18** respectively.

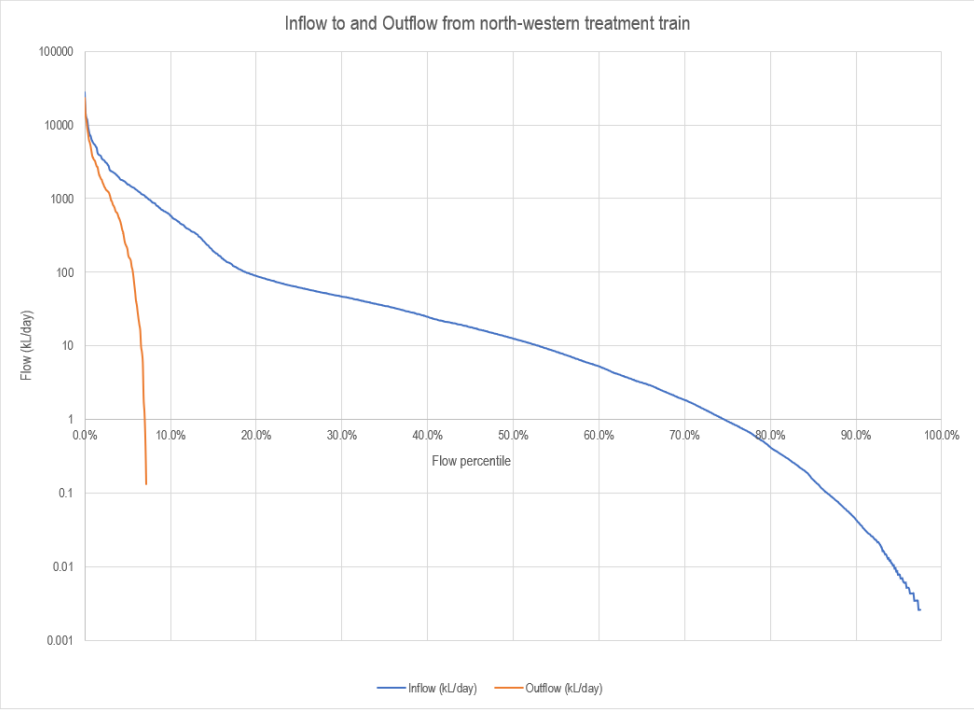


Figure 17: Flow duration curve for inflow to and outflow from the proposed north-western treatment train

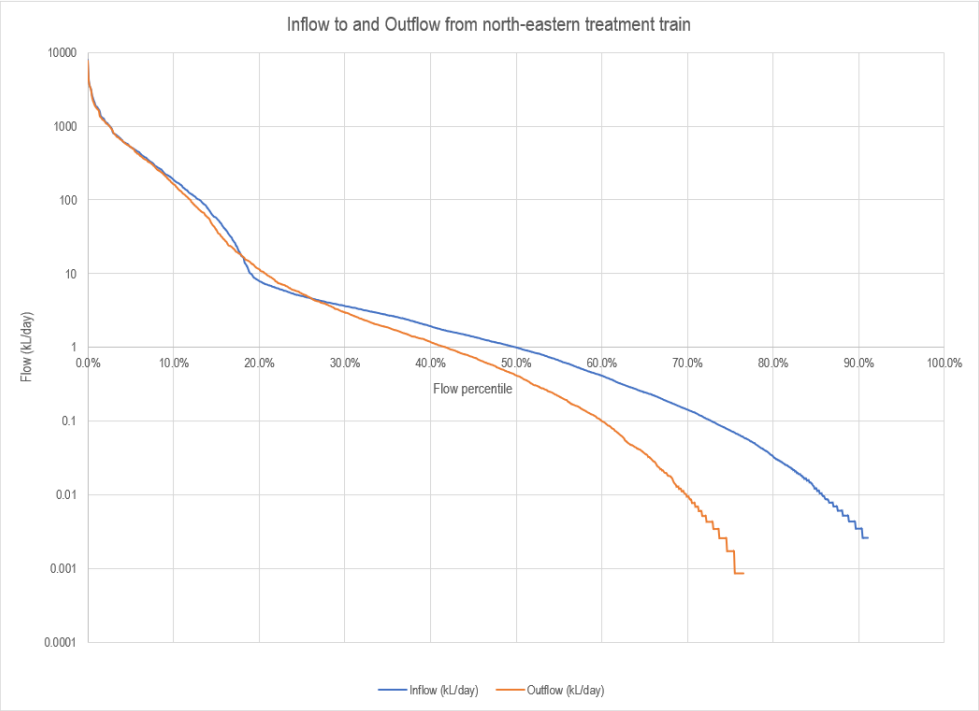


Figure 18: Flow duration curve for inflow to and outflow from the proposed north-eastern treatment train

The MUSIC model results demonstrate the following:

North-western treatment train

- In probabilistic terms, inflow to the north-western treatment train is likely to occur at least 97% of days over the 10-year modelling period simulated in MUSIC.
- With the proposed stormwater management measures that have been incorporated into the Amended Proposal in place, outflow towards the western boundary is estimated to occur on only 7% of days over the 10-year modelling period simulated in MUSIC (i.e., there would be no outflow for 93% of the days over the modelling period).
- In probabilistic terms and based on the MUSIC modelling results, inflow volumes towards the north-western treatment train are estimated to be:
  - Approximately 840 kL/day for the 8.3 percentile (approximately once per month)
  - Approximately 5,570 kL/day for the 1.1 percentile (approximately three times per year)
  - Approximately 11,900 kL/day for the 0.3 percentile (approximately once per year)
- In probabilistic terms and based on the MUSIC modelling results, outflow volumes towards the western boundary are estimated to be:
  - Zero for the 8.3 percentile (approximately once per month)
  - No greater than 3,480 kL/day for the 1.1 percentile (approximately three times per year)
  - No greater than 9,260 kL/day for the 0.3 percentile (approximately once per year)

North-eastern treatment train

- In probabilistic terms, inflow to the north-eastern treatment train is likely to occur at least 91% of days over the 10-year modelling period simulated in MUSIC.
- With the proposed stormwater management measures that have been incorporated into the Amended Proposal in place, outflow from Basin B towards the eastern boundary of the site is estimated to occur on 77% of days over the 10-year modelling period simulated in MUSIC (i.e., there would be no outflow for 23% of the days over the modelling period).
- In probabilistic terms and based on the MUSIC modelling results, inflow volumes towards the north-western treatment train are estimated to be:

- Approximately 269 kL/day for the 8.3 percentile (approximately once per month)
- Approximately 1,814 kL/day for the 1.1 percentile (approximately three times per year)
- Approximately 3,335 kL/day for the 0.3 percentile (approximately once per year)

- In probabilistic terms and based on the MUSIC modelling results, outflow volumes towards the western boundary are estimated to be:
  - Approximately 252 kL/day for the 8.3 percentile (approximately once per month)
  - Approximately 1,726 kL/day for the 1.1 percentile (approximately three times per year)
  - Approximately 3,355 kL/day for the 0.3 percentile (approximately once per year)
- The MUSIC model results indicate that the residual outflow from the north-eastern treatment train would be a 4.8% reduction in outflow compared to inflow from the catchment.

Based on the results presented above:

- It is evident that the stormwater management measures that have been approved under Mod 9 to MP06_0139 will result in an improvement in terms of the frequency and volume of discharge towards the western boundary of the Site.
- The stormwater management measures that have been incorporated into the Amended Proposal for the north-eastern catchment (being a rainwater tank and bio-retention basin) will result in a reduction in outflow due to the implementation of the proposed maintenance workshop rainwater tank and Bio-retention Basin B.

6.3. Water use

This section outlines a detailed site water balance including a description of water demands, breakdown of water supplies and any water licensing requirements. As noted in **Section 2.3.3** a water balance model was developed using the MUSIC software package and simulated to allow the evaluation of various elements of the water cycle to be assessed. The MUSIC model has been developed to estimate the volume of rainwater storage required to satisfy the water use objectives for the Amended Proposal.

6.3.1. Mains water use

Section 3.3 outlines existing mains water use within the Proposal Site.

The Amended Proposal will result in a minor increase in potable water demand as a result of the following uses:

- **New amenities within the proposed Site Workshop and Maintenance and Manufacturing Workshop buildings.** Potable water would be supplied for taps, showers and to supplement rainwater tanks for toilet flushing (NB: roof runoff harvested in rainwater tanks would be the primary source of supply for toilet flushing). The Amended Proposal would require up to an additional 20 FTE employees within the MPC1 and MPC2 facilities and 50 FTE employees for the Maintenance and Manufacturing Workshop, taking the total number of employees to 254, representing a 38% increase in the number of employees on site. The 70 additional FTE employees would result in an increase in potable water demand of approximately 1022 kL/year (based on amenities water use of 40 L/person/day). This represents an increase in potable water demand of approximately 2.5% compared to the total mains water usage recorded in 2020 (refer to **Section 3.3**).
- **Top-up of the water tanks for external reuse** (primarily dust suppression). As documented in the approved *Soil, Water and Leachate Management Plan* (Arcadis, 2021), non-potable water use provided by mains water was estimated to be 39,001 kL in 2020, based on the total mains water usage and the estimated amenities water use. The volume of mains water top-up for non-potable use will vary from year to year, due to the variability of rainfall on the Site and the likely variability in non-potable demand due to weather and seasonal conditions. An estimate of average annual mains water top-up for non-potable supply has been determined based on the results of MUSIC modelling, which are described further in **Section 6.3.3**.

6.3.2. Rainwater reuse within buildings

The use of rainwater collected in rainwater tanks from runoff on 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, toilet flushing and landscape irrigation.

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.

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)

To determine the tank volume required to meet at least 80% of non-potable demand, the following assumptions have been made:

- Non-potable demand of 0.1 kL per toilet per day has been adopted. The number of toilets within each building has been estimated based on the floor area of the workshops.
- At least 50% of the total warehouse roof area would drain to the rainwater tank.

Based on the parameters listed above, a summary of rainwater tank water balance results from the MUSIC model is presented in **Table 24**. These results are generated from the Node Water Balance for each of the proposed tanks and represent average annual volumes over the model simulation period. These model results indicate that 10 kL rainwater tanks at each of the two proposed workshop buildings would be capable of supplying more than 92% of the non-potable water demand in the two buildings, which is assumed to be limited to toilet flushing. Furthermore, the relatively low non-potable water demand modelled would result in a high proportion of inflow to the tank overflowing the tank towards the existing and proposed OSD basins. This indicates that there is opportunity to utilise the proposed rainwater tanks as supplementary storages to supply other non-potable water demands across the site.

Table 24: Water balance results for rainwater tanks

Component	Adopted rainwater tank volume (kL)	Tank inflow (kL/yr)	Tank overflow (kL/yr)	Non-potable reuse supplied (kL/yr)	Reuse demand (kL/yr)	% of reuse demand met
Site Workshop	10	1500	1399	101	110	92.2%
Maintenance Workshop	10	3175	3073	102	110	93.2%

6.3.3. Other non-potable water use

As described in **Section 3.3**, the average daily water cart use under existing conditions is estimated to be 178 kL/day. The water cart facility is currently used for truck wet down and dust suppression across the Site. Stored water from the North OSD basin (and the South OSD basin via a transfer pipe to the North OSD basin) is transferred to four above ground water tanks with a total combined capacity of 112.5 kL.

As outlined in **Section 4.2.2**, it is estimated that the daily demand for non-potable water will increase across the site as a result of the Amended Proposal from 178 kL/day to 334 kL/day.

The MUSIC model for the Proposal Site has been used to estimate the impact of an increase in non-potable water demand on the demand for mains water to supplement non-potable water sources. Two scenarios have been simulated:

- Scenario 0: Current site conditions, based on existing non-potable water demand (178 kL/day) and water storage capacity within the water storage tanks (112.5 kL).
- Scenario 1: Proposed site conditions, with an increase in non-potable water demand (334 kL/day) and including the proposed increase in water storage capacity in the Storage Dam (5010 kL).

A summary of the MUSIC model results for these two scenarios is presented in **Table 25**. These results demonstrate that the proposed increase in water storage volume would increase the average annual volume of water supplied for external reuse.

Table 25: Water balance results for site-wide non-potable water supply and demand scenarios

Parameter	Scenario 0	Scenario 1
Adopted non-potable water demand	178 kL/day	334 kL/day
Water tank / dam storage volume	112.5 kL	5090 kL
Average annual volumes from Node Water Balance in MUSIC		
[A]: Water Storage Inflow	37,960 kL	111,070 kL
[B]: Water Storage Overflow	7,050 kL	49,960 kL
[C]: Reuse supplied	30,920 kL	59,990 kL
[D]: Reuse demand	65,020 kL	121,900 kL
[E]: Potential mains water top-up (= [D] – [C])	34,100 kL	61,910 kL
[F]: % of reuse supplied by non-potable water (= [C] ÷ [D])	47.6%	49.2%
[G] % of inflow to water storage supplied for non-potable reuse (= [C] ÷ [A])	81.5%	54.0%

The water balance model results presented above demonstrate that the proposed increase in water storage for external reuse would satisfy the water use objectives for the Site, as the additional storage volume would maximise water reuse and minimise the volume of potable water required to meet non-potable water demand across the Site.

A sensitivity analysis of the MUSIC model results has been undertaken to determine the mean annual runoff volume (MARV) for a range of pond storage volume scenarios. A graph showing MARV vs pond volume is presented in **Figure 19**. This assessment demonstrates that:

- For the adopted storage pond volume of 5,090 m^3 and the increased rate of non-potable reuse across the site (334 kL/day), the MARV from the north-western treatment train towards the western boundary would reduce by 55.7% to approximately 50 ML/year.
- Various scenarios with larger storages volumes demonstrate that even with a storage volume ten times the adopted volume, there would still be discharge from the Site.
- The graph presented as **Figure 19** shows that an increase in storage volume in the north-western pond would result in a reduction in mean annual discharge volume from the site. However, due to limitations in the demand for non-potable water across the operational area, a significantly larger pond volume would not result in zero discharge from the north-western treatment train.

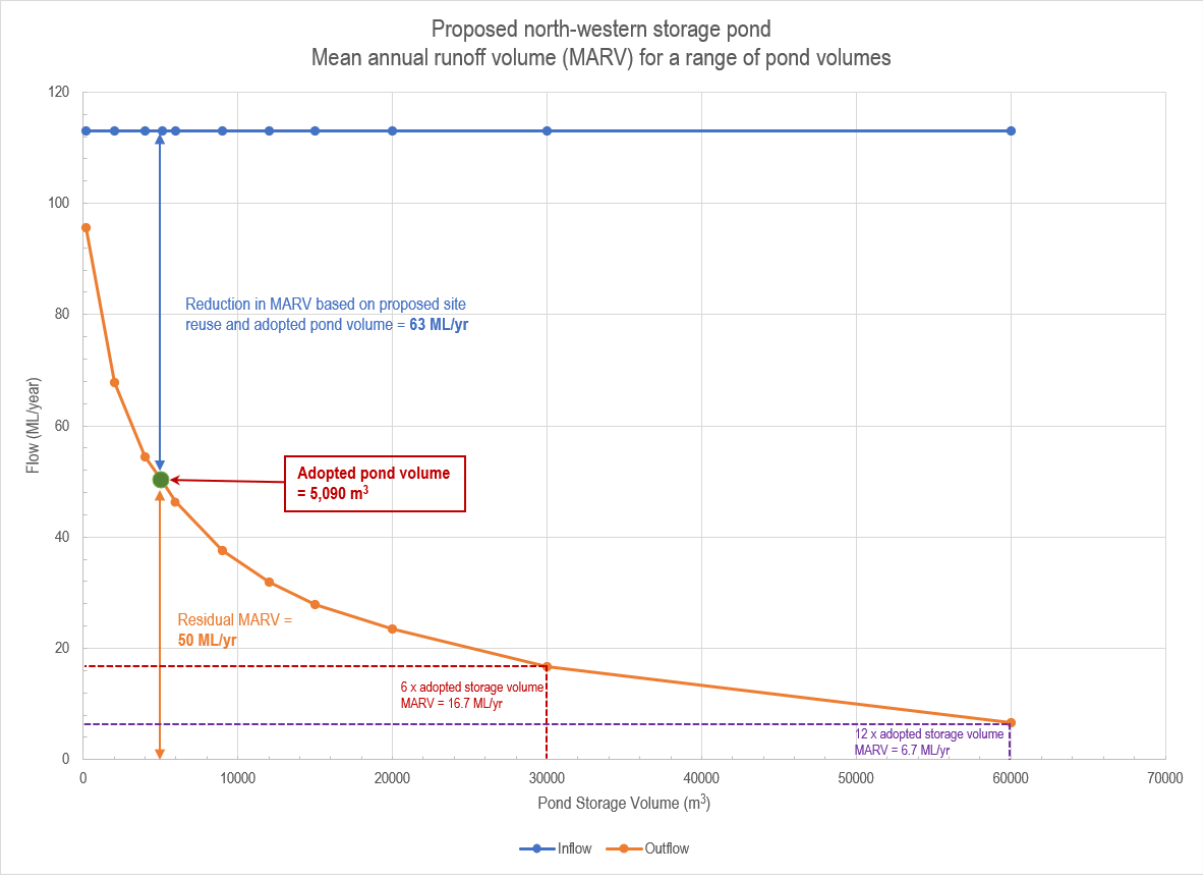


Figure 19: Mean annual runoff volume vs pond storage volume for proposed north-western storage pond

The adopted pond volume of 5,090 m^3 is considered the largest volume that could be reasonably accommodated within the Site. There are several constraints around which the proposed storage pond has been designed, including:

- Topography (noting existing ground slopes in the location of the north-western treatment train are around 25-35%, or between 1 in 4 and 1 in 3).
- Interface with the other proposed stormwater management measures in the north-western treatment train (sediment basin, detention tank).
- Consideration of other factors such as dam safety (noting a larger and deeper storage volume has a higher risk of dam failure and potential impact on adjoining properties).

7. Mitigation measures

7.1. Construction

During construction of the Amended Proposal, erosion and sediment control measures will be implemented in accordance with *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004). As per management measure SW2 of the existing Soil, Water and Leachate Management Plan for the Eastern Creek REP, any new earthworks (movement of berms, cutting into pit) will be undertaken in accordance with the erosion and sediment control measures outlined in *Managing Urban Stormwater: Soils and construction*.

An Erosion and Sediment Control Plan (ESCP) that shows measures required to minimise soil erosion and the transfer of sediment to downstream waters is included in the civil works package, refer to **Appendix A**. As per this ESCP, it is recommended that as a minimum the following measures be implemented:

- Stabilised site access shall be constructed at all entry and exit points to the site to prevent the migration of soil and sediments.
- At the upstream end of works, clean water shall be temporarily diverted around disturbed areas.
- Sediment fences shall be installed at the downstream end of any disturbed areas.
- The area of soil disturbed at any one time shall be minimised where possible. Any stockpiled material shall be covered, kept moist or planted with hydromulch.
- Any disturbed areas shall be rehabilitated as soon as practical.
- Sediment basins and/or traps (including sediment fences) shall be cleaned when the structures are at a maximum of 60% full of solid materials and disposed of in a manner that prevents further pollution of the site.
- Measures will be inspected regularly and after significant rainfall (nominally more than 25mm over a 24-hour period) and will be cleaned and repaired, as necessary.

These erosion and sediment control measures would ensure that there are no significant adverse impacts on the quality of stormwater in receiving waters during construction periods.

7.2. Operation

The existing *Soil, Water and Leachate Management Plan* would be updated to include upgrades to water management infrastructure comprised within the Amended Proposal. The Amended Proposal would be operated in accordance with the management measures in Section 8 of the existing *Soil, Water and Leachate Management Plan*.

Consistent with one of the key concepts in the *Guidelines for Fresh & Marine Water Quality* (ANZG, 2018), an adaptive management framework will be incorporated into the operation of the water management measures across the Proposal Site. The technique of adaptive management is defined as: '*a continuous cycle of improvement based on setting goals and priorities, developing strategies, taking action and measuring results, and then feeding the results of monitoring back into new goals, priorities, strategies and actions*'.

Key adaptive management principles that are embedded in the ANZG Water Quality Management Framework and their pertinence to ongoing water management at the Eastern Creek REP Site include the following:

- **Improvement in conceptual understanding** of the water management system, for example application of real-time monitoring and/or control of water storages and discharges to better understand the correlation between rainfall, runoff, water usage and site discharges.
- **Periodic review of management strategies** in place using an agreed monitoring program to confirm they are operating as intended and meeting the water quality objectives and limits specified in the site EPL. Where required, adjustment to the strategies may be needed. For example, technologies such as automated flocculant dosing could be adopted in the proposed sediment basin where concentrations of suspended solids or heavy metals exceed the WQOs or DGVs adopted in ANZG (2018).

APPENDIX A – Civil Drawings

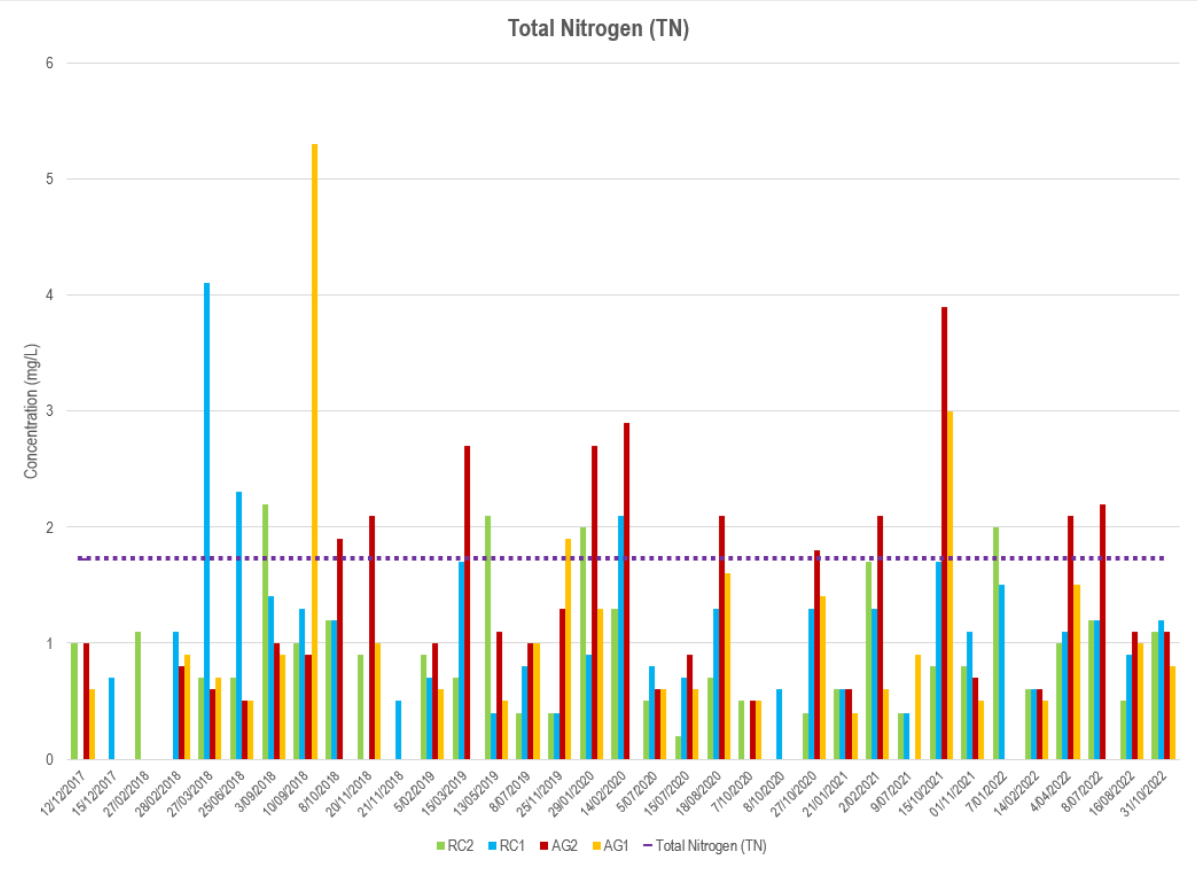
APPENDIX B – Ultimate Stormwater Management Plan

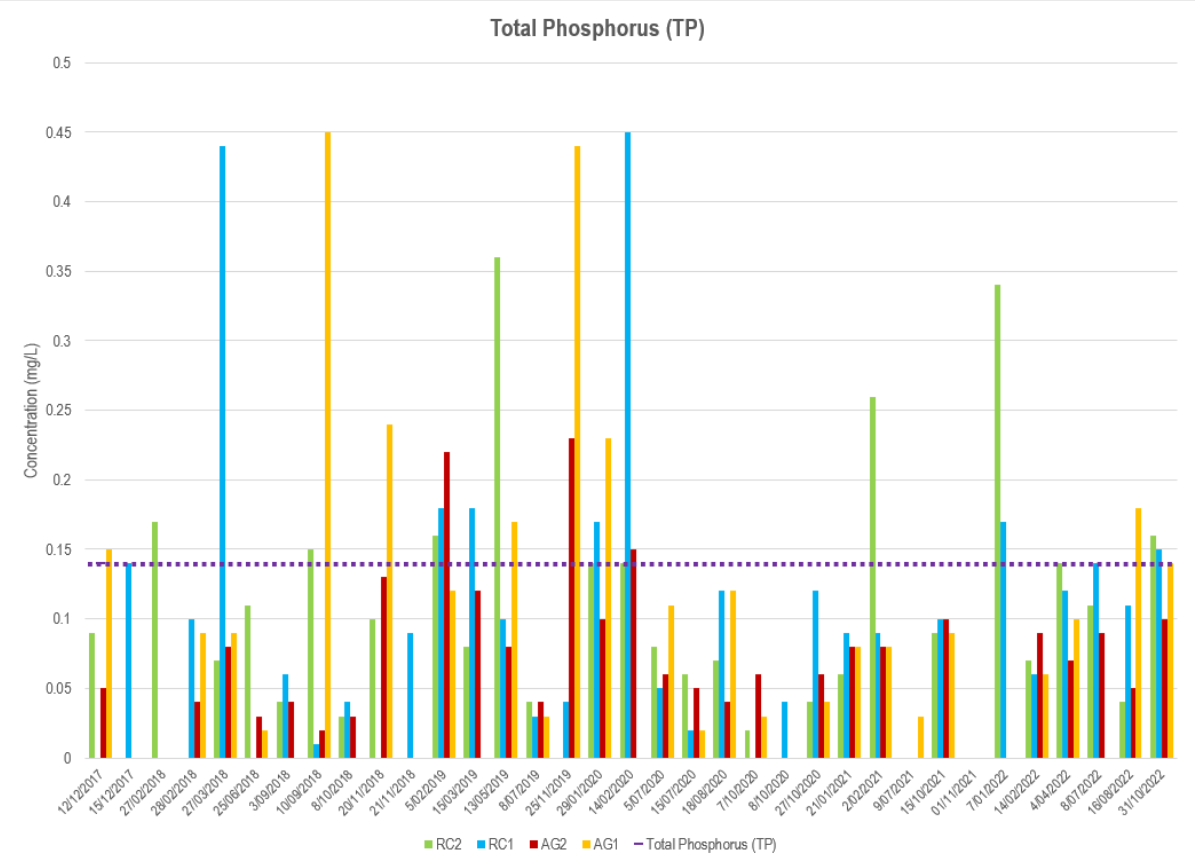
APPENDIX C – DRAINS Data and Results

APPENDIX D – Water quality data for Ropes Creek and Angus Creek

Water quality data at Ropes Creek and Angus Creek

The following charts present the results of water quality sampling data undertaken by Blacktown City Council between 2017 and 2022. The charts show the results at the Ropes Creek 2 (RC2), Ropes Creek 1 (RC1), Angus Creek 2 (AG2) and Angus Creek 1 (AG1), the locations of which relative to the Eastern Creek REP Site are presented in **Figure 9**. The horizontal lines on the charts represent the water quality objective adopted in the DPE guideline *Performance criteria for protecting and improving the blue grid in the Wianamatta–South Creek catchment*, which are summarised in **Table 6**.




Total Phosphorus (TP)
Concentration (mg/L)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
12/12/2017
15/12/2017
27/02/2018
28/02/2018
27/03/2018
25/06/2018
3/09/2018
10/09/2018
8/10/2018
20/11/2018
21/11/2018
5/02/2019
15/03/2019
13/05/2019
8/07/2019
25/11/2019
29/01/2020
14/02/2020
5/07/2020
15/07/2020
18/08/2020
7/10/2020
8/10/2020
27/10/2020
21/01/2021
2/02/2021
9/07/2021
15/10/2021
01/11/2021
7/01/2022
14/02/2022
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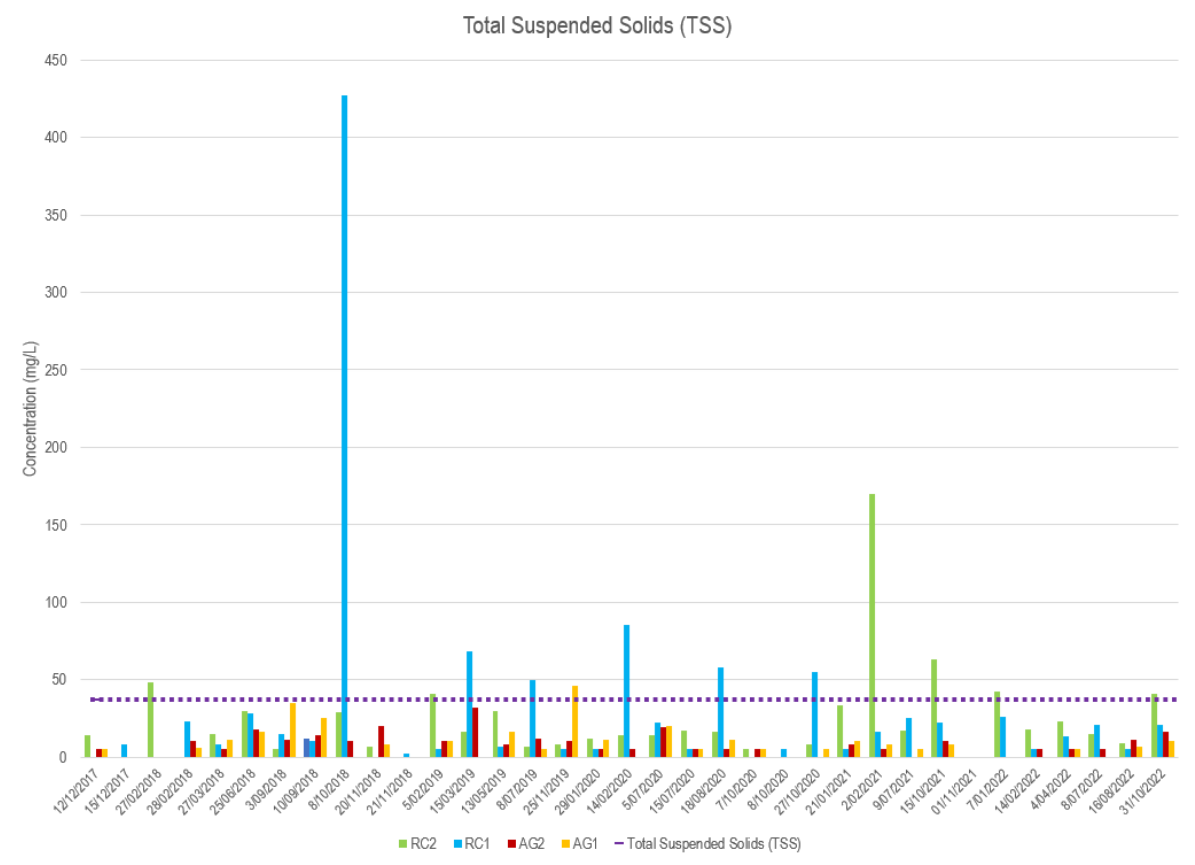
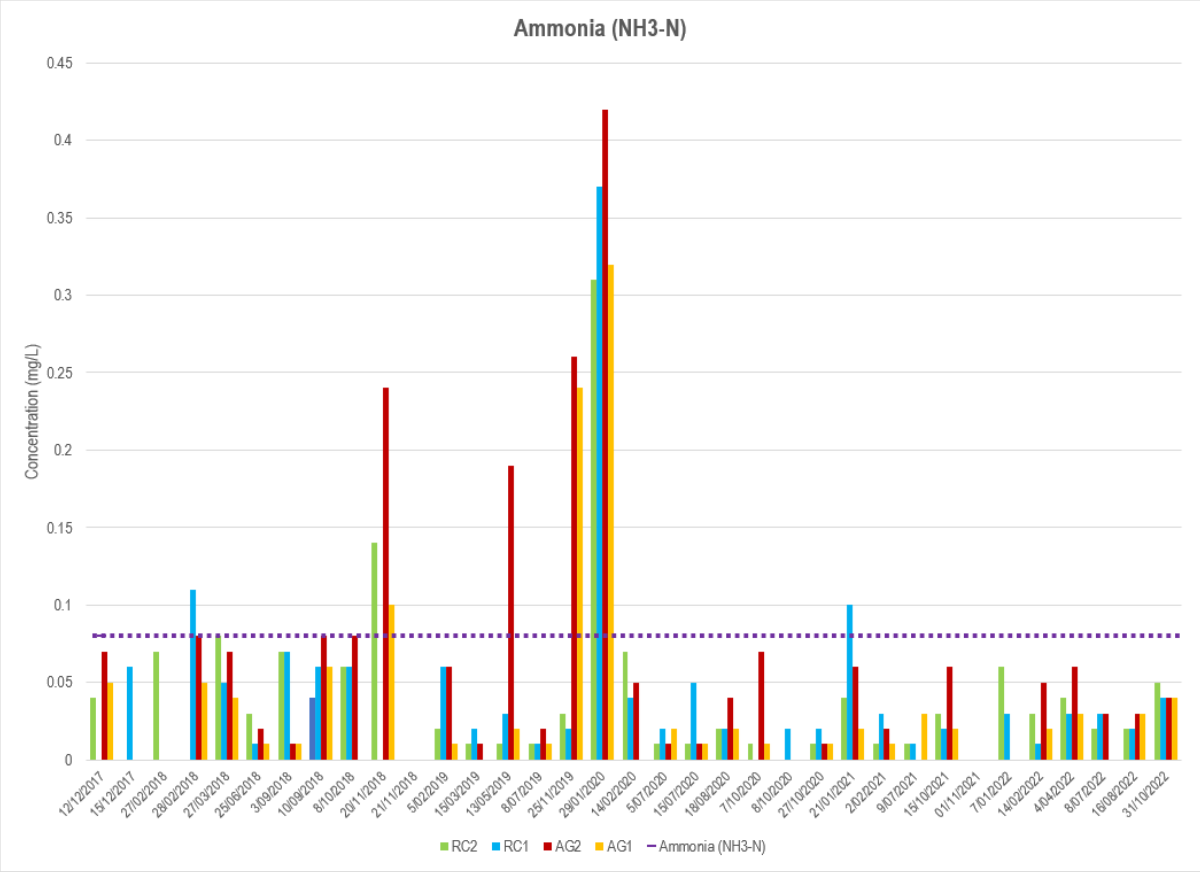
8/07/2022
16/08/2022
31/10/2022
RC2
RC1
AG2
AG1
Total Phosphorus (TP)


Total Suspended Solids (TSS)
Concentration (mg/L)
450
400
350
300
250
200
150
100
50
0
12/12/2017
15/12/2017
27/02/2018
28/02/2018
27/03/2018
25/06/2018
3/09/2018
10/09/2018
8/10/2018
20/11/2018
21/11/2018
5/02/2019
15/03/2019
13/05/2019
8/07/2019
25/11/2019
29/01/2020
14/02/2020
5/07/2020
15/07/2020
18/08/2020
7/10/2020
8/10/2020
27/10/2020
21/01/2021
2/02/2021
9/07/2021
15/10/2021
01/11/2021
7/01/2022
14/02/2022
4/04/2022
8/07/2022
16/08/2022
31/10/2022
RC2
RC1
AG2
AG1
Total Suspended Solids (TSS)


Ammonia (NH3-N)
Concentration (mg/L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
12/12/2017
15/12/2017
27/02/2018
28/02/2018
27/03/2018
25/06/2018
3/09/2018
10/09/2018
8/10/2018
20/11/2018
21/11/2018
5/02/2019
15/03/2019
13/05/2019
8/07/2019
25/11/2019
29/01/2020
14/02/2020
5/07/2020
15/07/2020
18/08/2020
7/10/2020
8/10/2020
27/10/2020
21/01/2021
2/02/2021
9/07/2021
15/10/2021
01/11/2021
7/01/2022
14/02/2022
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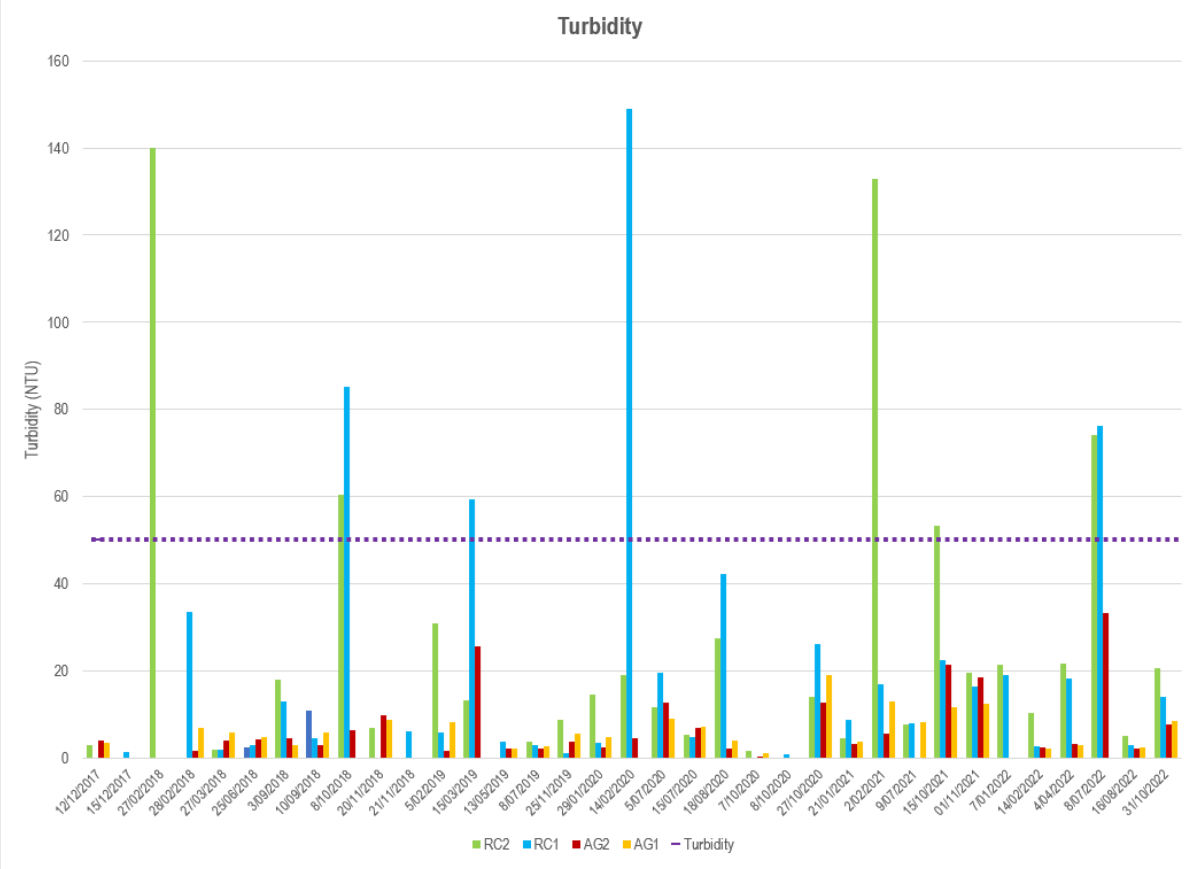
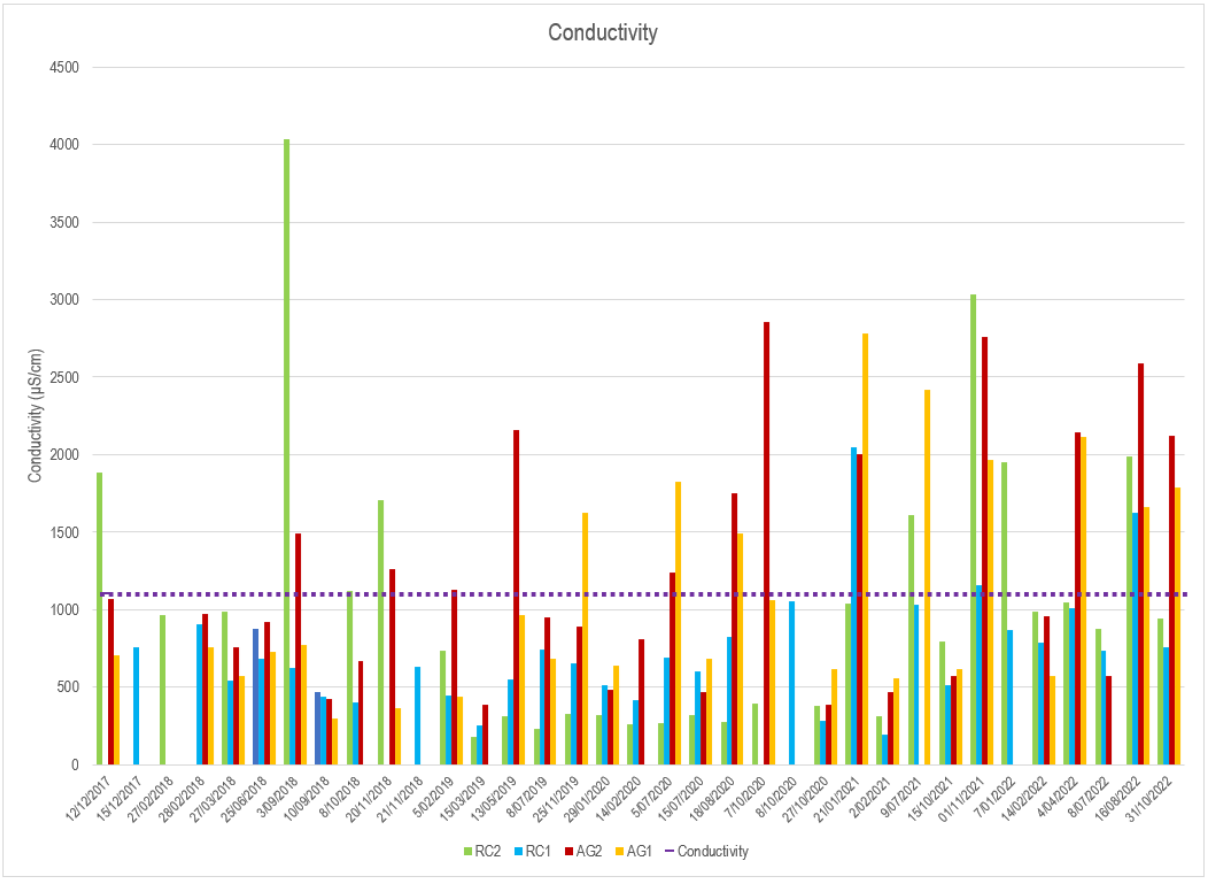
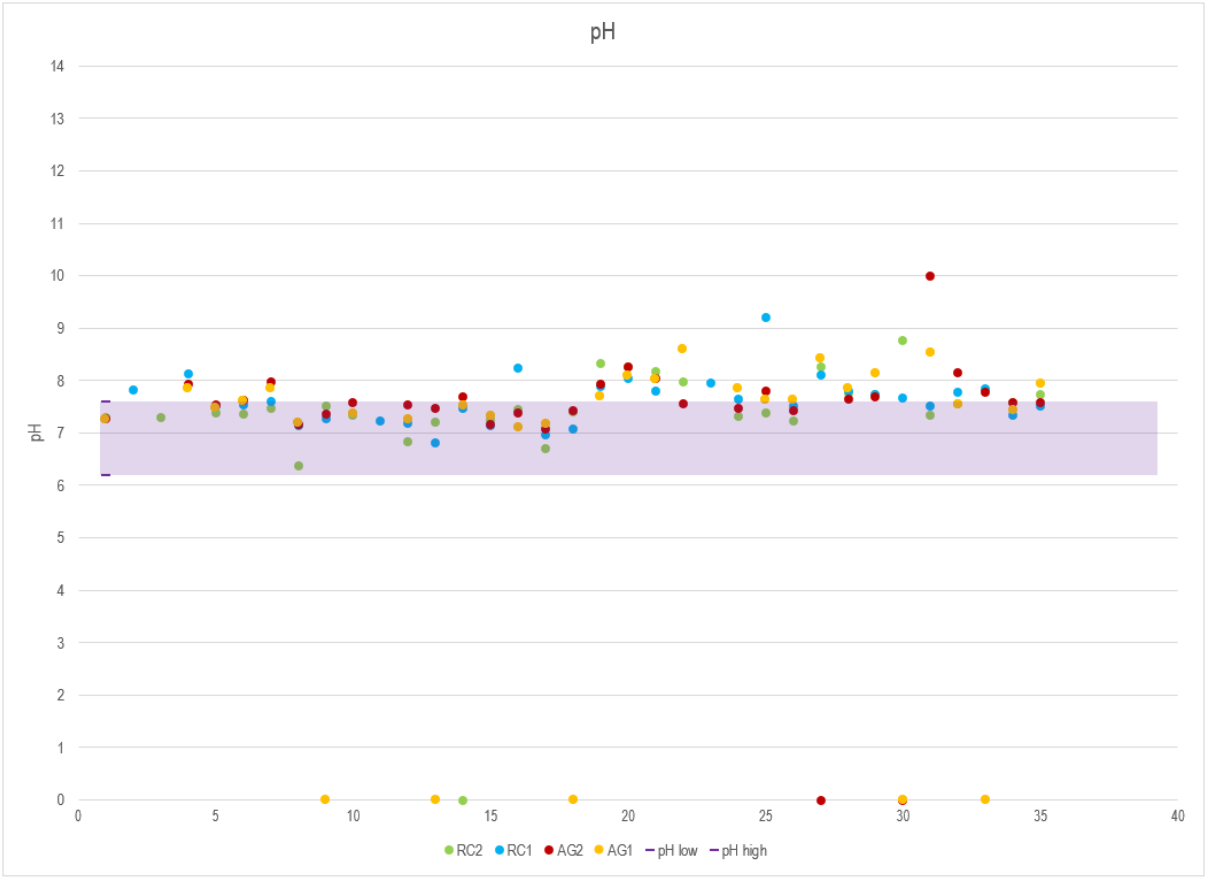
31/10/2022
RC2
RC1
AG2
AG1
Ammonia (NH3-N)


Turbidity
Turbidity (NTU)
160
140
120
100
80
60
40
20
0
12/12/2017
15/12/2017
27/02/2018
28/02/2018
27/03/2018
25/06/2018
3/09/2018
10/09/2018
8/10/2018
20/11/2018
21/11/2018
5/02/2019
15/03/2019
13/05/2019
8/07/2019
25/11/2019
29/01/2020
14/02/2020
5/07/2020
15/07/2020
18/08/2020
7/10/2020
8/10/2020
27/10/2020
21/01/2021
2/02/2021
9/07/2021
15/10/2021
01/11/2021
7/01/2022
14/02/2022
4/04/2022
8/07/2022
16/08/2022
31/10/2022
RC2
RC1
AG2
AG1
Turbidity


Conductivity
Conductivity (µS/cm)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
12/12/2017
15/12/2017
27/02/2018
28/02/2018
27/03/2018
25/06/2018
3/09/2018
10/09/2018
8/10/2018
20/11/2018
21/11/2018
5/02/2019
15/03/2019
13/05/2019
8/07/2019
25/11/2019
29/01/2020
14/02/2020
5/07/2020
15/07/2020
18/08/2020
7/10/2020
8/10/2020
27/10/2020
21/01/2021
2/02/2021
9/07/2021
15/10/2021
01/11/2021
7/01/2022
14/02/2022
4/04/2022
8/07/2022
16/08/2022
31/10/2022
RC2
RC1
AG2
AG1
Conductivity


pH
pH
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0
5
10
15
20
25
30
35
40
RC2
RC1
AG2
AG1
pH low
pH high

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