



Groundwater Impact Assessment

230 Martin Road, Badgerys Creek, NSW, 2555

Prepared for: EMKC3 Pty Ltd
EP3390.004_v5 1 May 2026



230 Martin Road - SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS Matrix

Table 1 below sets out the Secretary's Environmental Assessment Requirements (SEARs) for the project. A consultant is identified against each SEAR matter. Each identified consultant will be responsible for addressing the relevant matter as part of the preparation of the State Significant Development Application (SSDA).

Table 2 sets out the additional Agency requirements and the consultant responsible for addressing these as part of the SSDA.

Table 1 SEARs requirements and responsible consultant

Item / Description	Responsibility
General Requirements	
▪ Water Management – an integrated water management strategy, including: – An assessment of potential surface and groundwater impacts associated with the development, including potential impacts on watercourses (Wianamatta – South Creek), key fish habitat and recreational fishing, groundwater, and groundwater dependent communities nearby – A detailed site water balance including a description of potable and non-potable water demands and breakdown of water supplies, and any water licensing requirements – Details of the proposed stormwater/wastewater drainage design including the capacity of onsite detention system(s), onsite sewage management and measures to treat, reuse or dispose of water, consistent with the requirements of the Phase 2 Aerotropolis Development Control Plan and the Blue Green Infrastructure framework of the Western Sydney Aerotropolis Precinct Plan – details of how the proposed stormwater drainage system will connect to Sydney Water's regional stormwater system, including details of any interim solution, consistent with the Department's 'Technical guidance for achieving Wianamatta–South Creek stormwater management targets' (2022) for both construction and operational phases – description of the measures to minimise water use – characterisation of water quality at the point of discharge to surface and/or groundwater against relevant water quality criteria	Sections 6, 7 & 8

– where water and drainage infrastructure works are required that would be handed over to the local council, or other drainage or water authority, provide full hydraulic details and detailed plans and specification of proposed works that have been prepared in consultation with, and comply with the relevant standards, the local council or other drainage or water authority. ▪ details of any surface or groundwater monitoring activities and methodologies.	

Table 2 Agency requirements and responsible consultant

Item / Description	Document Reference
Department of Planning and Environment (Biodiversity and Conservation)	
Water and Soils 1. The EIS must map the following features relevant to water and soils including: a. Acid sulfate soils (Class 1,2,3 or 4 on the Acid Sulfate Soil Planning Map) b. Rivers, streams, wetlands and estuaries c. Wetlands d. Groundwater e. Groundwater dependent ecosystems f. Proposed intake and discharge locations 2. The EIS must describe background conditions for any water resource likely to be affected by the development, including: a. Existing surface and groundwater b. Hydrology, including volume, frequency and quality of discharges at proposed intake c. And discharge locations	Sections 6, 7 & 8

3. The EIS must assess the impact of the development on hydrology, including: 1. Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas 2. Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems	
Waterway Health 4. EHG recommends the applicant address the provisions of section 2.3 Stormwater, Water Sensitive Urban Design and Integrated Water Management and section 2.5.5 Erosion and Sediment Control within the Phase 2 Aerotropolis Development Control Plan and Section 4.5 Blue-Green Infrastructure framework of the Western Sydney Aerotropolis Precinct Plan. In addressing the above, the applicant will need to access the technical guidance for achieving Wianamatta South Creek stormwater management targets (DPE, 2022) and associated MUSIC modelling toolkit.	Section 8

Groundwater Impact Assessment

230 Martin Road, Badgerys Creek, NSW, 2555

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1 May 2026

Our Ref: EP3390.004

LIMITATIONS

This Groundwater Impact Assessment was conducted on the behalf of EMKC3 Pty Ltd for the purpose/s stated in **Section 1**.

EP Risk has prepared this document in good faith but is unable to provide certification outside of areas over which EP Risk had some control or were reasonably able to check. The report also relies upon information provided by third parties. EP Risk has undertaken all practical steps to confirm the reliability of the information provided by third parties and do not accept any liability for false or misleading information provided by these parties.

It is not possible in a Groundwater Impact Assessment to present all data, which could be of interest to all readers of this report. Readers are referred to any referenced investigation reports for further data.

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QUALITY CONTROL

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v1	N. McGuire	14/03/2024	P. Simpson	14/03/2024	G. White	14/03/2024
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Executive Summary

EP Risk Management Pty Ltd (EP Risk) was engaged by EMKC³ Pty Ltd (EMKC³) to undertake a Groundwater Impact Assessment (the Assessment) to accompany a State Significant Development Application (SSDA) for the property located at 230 Martin Road, Badgerys Creek, New South Wales (NSW), 2555 (the Site). The location of the Site is shown in **Figure 1**.

The Site is legally described as Lot A in Deposited Plan (DP) 406215 and covers a total of approximately 24.28 hectares (ha). Under the State Environmental Planning Policy (Western Parkland City) 2021, the western end of the Site is currently zoned as Enterprise (ENT) and the eastern end of the Site is zoned as Environment and Recreations (ENZ). South Creek is located from the southeast to the northeast border of the Site and is classified as an environmentally sensitive area.

EMKC³ are planning to redevelop the western portion of the Site into a two-lot industrial estate under the existing land zoning within the ENT area (the Assessment Area) (see **Figure 1**).

The proposal seeks approval for two (2) contemporary warehouse or distribution centre buildings at 230 Martin Road, Badgerys Creek. The Development will comprise:

Site clearance works, including the removal of existing structures

Bulk earthworks and the installation and augmentation of utilities infrastructure and other services

Construction and operational use of two warehouse or distribution centres containing ancillary manufacturing use in the proposed Lot 1 building with associated parking, landscaping across the site and access

Other ancillary works including stormwater infrastructure (excluding works to be delivered by public authorities e.g., Park Edge Street and the Regional Stormwater Infrastructure basin) and delivery of the frontage upgrade of along Martin Road to facilitate access to the site.

This report has been prepared to address the following Planning Secretary's Environmental Assessment Requirements (SEARs) requirements for the project:

Water Management – an integrated water management strategy, including:

An assessment of potential surface and groundwater impacts associated with the development, including potential impacts on watercourses (Wianamatta – South Creek), key fish habitat and recreational fishing, groundwater, and groundwater dependent communities nearby

Details of any surface or groundwater monitoring activities and methodologies.

The scope of works to achieve the objectives include:

- A review of applicable legislation.
- A Desktop hydrogeological study.
- Review of the hydrogeological information provided in the previous report by EP Risk (2023).
- Calculation of drawdown, radius of influence and expected dewatering volumes for the proposed development using analytical methods such as Powers (1992) for the proposed construction/operation.
- Assessment of impacts to groundwater during construction.
- Assessment of impacts to groundwater during operation.
- Mitigation and management measures.

EP Risk understands that the proposed development involves the construction of a dual lot industrial estate comprising two (2) warehouses under the existing land zoning within the western ENT area. Thus, the proposed

development will occur under industrial land use. The remaining land area in the eastern portion of the Site currently zoned ENZ will remain undeveloped with additional tree planting.

The proposed warehouses and carpark are positioned above the predicted groundwater level at the Assessment Area and dewatering would only be expected for the installation of deep services such as sewer and stormwater.

Based upon the bulk cut and fill plans provided, groundwater would be encountered in the proposed bioretention basin in the north east portion of the Assessment Area.

Based on the calculations, the estimates of groundwater take over the proposed construction period is approximately **11.85 ML**. The maximum radius of influence was calculated to be 116 m from the edge of the excavation.

A further review of the proposed dewatering estimate should be undertaken after completion of the detailed design and prior to construction / dewatering.

Potential construction stage impacts include contamination from chemical or hydrocarbon spills and increased sediment loads being discharged to downstream systems as a result of runoff from exposed areas. Construction impacts would be managed through implementation of Surface Water Management Plans (SWMPs) in accordance with the Blue Book and detailed planning and management of construction sites to avoid impacting overland flow paths without appropriate mitigation.

Water quality impacts would be managed through implementation of water sensitive urban design measures.

Construction stage impacts on groundwater may occur due to minor short-term interception of groundwater by excavations associated with construction. Impacts on groundwater levels due to dewatering would occur during the construction phase only.

A summary of key impacts and proposed mitigation and monitoring measures are presented in **Table E1**.

Table E1 - Potential Construction and Operation Impacts and Mitigation Measures				
Activity	Potential Impacts	Risk Rating	Mitigation Measures	Residual Risk Rating
Interception of groundwater aquifer	Significant short-term drawdown due to dewatering operations during construction.	Moderate	Minimising the duration of time that excavations below the water table are open and consider alternative methods such as under boring for the installation of lead in services.	Low
Chemical or hydrocarbon spill	Contamination of groundwater.	Moderate	Storage of hazardous materials and refuelling to be undertaken in bunded areas. Spill kits to be kept onsite and staff informed of how to use them in an incident.	Low
Discharge of excess groundwater	Impact to stormwater networks by discharging groundwater.	Moderate	Where possible, use the extracted water as dust suppression onsite. Approval to treat and dispose to sewer / stormwater should be obtained if large volumes are required to be dewatered.	Low

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1 Introduction

EMKC Cubed (EMKC³) engaged EP Risk Management Pty Ltd (EP Risk) to undertake a Groundwater Impact Assessment (GWIA) of the proposed development site located at 230 Martin Road, Badgerys Creek, NSW, 2555 (the Site). The location and boundary of the Site is shown in **Figure 1**. The Site is approximately 24.28 ha. The western portion of the Site (the Assessment Area) which is within the proposed development boundary is approximately 8.1 ha and is currently zoned as Enterprise (ENT) and the larger eastern portion which sits outside the development boundary of the Site is zoned as Environment and Recreation (ENZ). South Creek is located from the southeast to the northeast border of the Site is classified as an environmentally sensitive area. This investigation will focus on the Assessment Area in the western portion of the Site zoned as ENT.

This report has been prepared to address the following Planning Secretary's Environmental Assessment Requirements (SEARs) requirements for the project:

Water Management – an integrated water management strategy, including:

An assessment of potential surface and groundwater impacts associated with the development, including potential impacts on watercourses (Wianamatta – South Creek), key fish habitat and recreational fishing, groundwater, and groundwater dependent communities nearby.

Details of any surface or groundwater monitoring activities and methodologies.

The Development will comprise:

- Site clearance works, including the removal of existing structures
- Bulk earthworks and the installation and augmentation of utilities infrastructure and other services
- Construction and operational use of two warehouse or distribution centres containing ancillary manufacturing use in the proposed Lot 1 building with associated parking, landscaping across the site and access
- Other ancillary works including stormwater infrastructure (excluding works to be delivered by public authorities e.g., Park Edge Street and the Regional Stormwater Infrastructure basin) and delivery of the frontage upgrade of along Martin Road to facilitate access to the site.

1.1 Background

EP Risk understands that the proposed development involves the construction of a dual lot industrial estate comprising two (2) warehouses under the existing land zoning within the Assessment Area. Thus, the proposed development will occur under a commercial / industrial land use. The remaining land area to the east is currently zoned as ENZ. Construction of the warehouses may involve excavation that may potentially intercept the groundwater and hence a groundwater impact assessment is required for the development proposal.

Lot 1 will comprise the following:

- Large format warehouse with ancillary office and manufacturing (including steel cutting) with:
 - o Warehouse and distribution centre – 16,465 m².
 - o Office GFA – 600 m².
 - o Carpark: 86 spaces.
 - o Landscaping – 4,206 m².
 - o Max Build Height – 12.95 m.

Lot 2 will comprise the following:

- Large format warehouse with ancillary office with:
 - o Warehouse and distribution centre – 18,564 m².
 - o Ancillary office building 2A GFA – 600 m².
 - o Ancillary office building 2B GFA – 504 m².
 - o Carpark: 119 spaces.
 - o Landscaping – 3,412 m².
 - o Max build height – 12.65 m.

1.2 Scope of Works

The GWIA will include:

- A review of applicable legislation.
- A Desktop hydrogeological study.
- Review of the hydrogeological information provided in the previous report by EP Risk (2023)¹.
- Calculation of drawdown, radius of influence and expected dewatering volumes for the proposed development using analytical methods such as Powers (1992) for the proposed construction/operation.
- Assessment of impacts to groundwater during construction.
- Assessment of impacts to groundwater during operation.
- Mitigation and management measures.

¹ EP Risk (2023), Detailed Site Investigation, 230 Martin Road, Badgerys Creek, NSW. Dated 20 December 2023 (EP3390.001 v1).

2 Site Condition and Surrounding Environment

2.1 Land Use and Layout

EP Risk prepared a Detailed Site Investigation (DSI)² of the Site, where on 23 October 2023 field personnel conducted a site inspection. The following features were observed during the inspection:

The Site was accessible via Martin Road to the west of the Site.

An exposed soil surface driveway off Martin Road led to a shed with two (2) shipping containers under the shed. The shed and shipping containers contained old tubs, crates and general rubbish.

Evidence of stored excavated or imported materials bounded by large cement blocks was observed at the rear of the shed. An elevated built-up mound of potentially uncontrolled fill covered in grass and weeds was observed behind the storage area and travelled towards the northern boundary.

The Site sloped downwards from southwest to the east/northwest.

Anthropogenic material was observed in the form of bathtubs, two (2) skip bins with barbed wire, containers, and vegetation inside, a 1,000 L container with unknown contents and plastic bag remnants across the Site.

A large dam was identified outside of the proposed development boundary in the central northern portion of the Site, immediately adjacent and downgradient of a composting facility located on the adjacent property to the north.

A figure showing the Site Location is presented in **Figure 1**.

2.2 Surrounding Land Use

The Site is located within a primarily industrial/ rural area. Surrounding land use comprised of the following:

To the North

- The adjacent site is operated by Australian Native Landscapes (ANL), a landscaping, agricultural and gardening supplier. It includes several 'warehouse' buildings. Aerial imagery shows large stockpiles on the site. Further north, the area is characterised by agricultural landholdings and some dwellings.

To the South

- The adjacent land currently comprises agricultural farm holdings, with South Creek beyond Residential properties.

To the East

- The Wianamatta South Creek waterway runs north to south along the sites eastern boundary and is Crown Land. An agricultural research station and cemetery is located beyond on its eastern bank.

To the West

- A large brick manufacturing facility operated by CSR (comprising several structures and existing dams) is located to the southwest of the site on the opposite side of Martin Road.

² EP Risk (2024) Detailed Site Investigation, 230 Martin Road, Badgerys Creek, NSW, dated 16 September 2024 (ref: EP3390.001 v2).

2.3 Topography and Drainage

The Site is relatively flat with a slight slope down to the north-east towards South Creek. The elevation of the Site ranged from 46 to 56 metres above the Australian Height Datum (mAHD). There were no significant topographic features within the Site boundary. Drainage is considered to follow surface gradients towards South Creek (east to north-east).

2.4 Geology

According to the Property Boundaries and Topographic Data from Department Finance, Services, and Innovation 2023 Geological Map (Lot Search 2023³), the Site is underlain by Alluvial floodplain deposits (Quaternary) and Bringelly Shale (Middle Triassic). Alluvial floodplain deposits are categorised by Silt, very fine- to medium grained lithic to quartz-rich sand, clay. The dominant lithology consists of clastic sediment. Bringelly Shale is categorized by Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal, the dominant lithology being shale.

2.5 Soil Landscapes

Based on information sourced from the NSW Department of Planning, Housing and Infrastructure⁴ (DPHI), the Site is located within the Kurosol soil order.

The South Creek Soil Landscape occupies a large portion of the Site, and the landscape is described as having floodplains, valley flats and drainage depressions of the channels on the Cumberland Plain; and usually flat with mainly cleared incised channels. Soil is often very deep layered sediments over bedrock or relict soils. The main soils of the South Creek Landscape where pedogenesis has occurred consist of Structured Plastic Clays or Structured Loams in and immediately adjacent to drainage lines; while Red and Yellow Podzolic Soils are most common terraces with small areas of Structured Grey Clays, leached clays, and Yellow Solodic Soils.

In addition, the Blacktown Soil Landscape occupies the western portion of the Site, and the landscape is described as gently undulating rises on Wianamatta Group Shales. Slopes are usually greater than five (5) percent, and local relief of 30 m. The landscape also includes broad rounded crests and ridges with gently inclined slopes, cleared Eucalypt woodland, and tall open – forest (dry sclerophyll forest). The main soils of the Blacktown Soil Landscape are shallow to moderately deep hard setting mottled textured contrast soils, Red and Brown Podzolic Soils on crests grading to Yellow Podzolic Soils on lower slopes and in drainage lines.

2.6 Acid Sulfate Soils

According to the State Environmental Planning Policy (Western Parkland City) 2021, the Site is not mapped within an area of acid sulfate soils. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) Atlas of Australian Acid Sulfate Soils (2013) indicates the Site to be within a Class C category for acid sulfate soils (ASS). The Class C category is considered to have an extremely low probability of ASS occurrence (1-5% chance).

³ Lotsearch Enviro Pro (Lotsearch, 2023), 230 Martin Road, Badgerys Creek, NSW, 2555, reference: LS044558 EP, dated 07 June.

⁴ NSW Department of Planning, Housing and Infrastructure, eSPADE v2.2

2.7 Hydrology

One (1) surface water body was located in the centre of the Site on the northern boundary. In addition, South Creek is located to the east of the Site, flowing towards the north.

It is assumed that the majority of the surface runoff will be directed to the dam in the centre of the Site or South Creek, flowing in a north to northeast direction following Site topography.

2.8 Meteorology

Average monthly and annual rainfall data from the nearby Prospect Reservoir weather station⁵ is presented in **Table 1**.

Table 1 – Rainfall data (mm)													
Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dev	Annual
Mean	95.1	99.2	103.1	75.5	68.5	75.5	57.8	50.2	46.3	60.2	72.8	75.5	878.6

A graph showing cumulative residual rainfall (or rainfall departure) over the period from 1887 to 2024 is presented as **Figure 2.8.1** below.

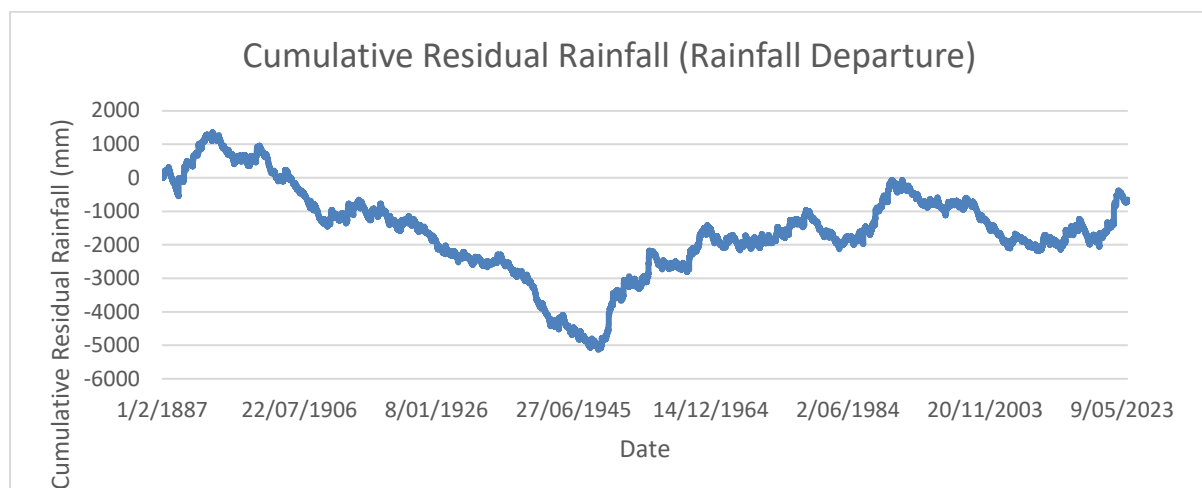


Figure 2.8.1 – Cumulative Residual Rainfall Graph for the Prospect Reservoir Weather Station

The cumulative rainfall departure is calculated as the difference in actual rainfall and average rainfall. The sum of the difference in actual and in average rainfall is calculated daily and presented over time to show areas of relatively high and low rainfall periods. Negative values represent dry periods while positive values represent wet periods. As shown above periods with above average rainfall include 1887 to 1904, 1949 to 1956, and 1986 to 1992. Periods of below average rainfall include from 1905 to 1948, 1979 to 1983 and 1992 to 2007. More recently from February 2020 to October 2022, the area has seen a significant increase in rainfall in a relatively short period of time (as show by the steep line from 2020 to 2022) and it's considered that recent infiltration and groundwater levels are relatively higher compared to the average.

⁵ The Badgerys Creek AWS (Site number 067108) was closer to the Site however, there was no rainfall data available prior to 1995. The Prospect Reservoir Station was chosen due to the extensive long term rainfall data dating back to 1887.

2.9 Hydrogeology

Aquifer Units

The Site is located within the Wianamatta Group which consists of three units: the Ashfield Shale, the Minchinbury Sandstone, and the Bringelly Shale, with the Minchinbury Sandstone of negligible thickness (McNally, 2004). In Western Sydney, the Wianamatta group has a maximum thickness of up to 300 m; however, a more typical thickness ranges from 100 m to 150 m.

Two (2) aquifer systems are associated with the shale formations of the Wianamatta Group. The upper aquifer typically has a depth of 3 m to 10 m and comprises of residual soils and colluvium derived from the shales, floodplain alluvium and the weathered saprolite. Hydraulic conductivities reportedly range between 10^{-3} and 10^{-5} m/day with the higher end conductivities suggesting open fractures in weathered shales or ferricrete bands. The lower aquifer system occurs below the base of the weathering and comprises of fine grained mud rocks with hydraulic conductivities reportedly range between 10^{-4} and 10^{-8} m/day, with the lower end reflecting the intrinsic impermeability of the unfractured shale. Both aquifers are reported to have limited storage and low bore yields, typically less than 0.1 ML/day (McNally, 2004; Brinckerhoff, 2013).

Aquifers in the Wianamatta Group are not generally targets for water supply due to lack of water-bearing zones, generally very low yields and in places highly saline groundwater (5,000 to >15, 000 mg/L in Western Sydney area) (Russell, et al., 2009).

Water Allocations

A summary of the water allocations for the aquifer is presented in **Table 2**.

Average Annual Recharge	Environmental Water from Recharge	Basic Landholder Rights	Native Title Rights	Water Utility Share Components	Other Utility Share Components	Extraction Limit
173,372	100% reserved from high conservation value areas. 75 % reserved from all other areas.	1,972	0	0	0	45,915

The location of the Sydney Basin Central Aquifer in relation to the wider sharing plan and the Sydney Basin is presented in **Figure 2.9.1** and **Figure 2.9.2**.

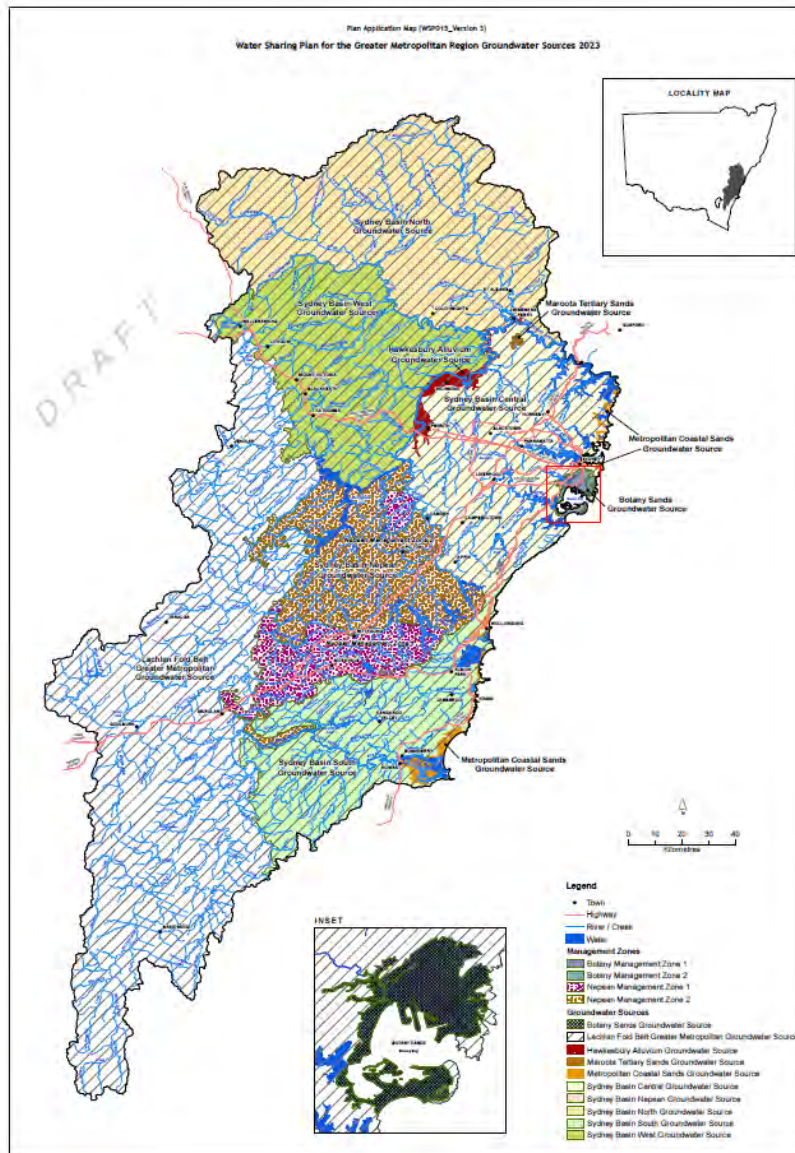


Figure 2.9.1 – Location of the Greater Metropolitan Region Groundwater Sources

A cross section of the Sydney Basin adopted from Herron et al. (2018) is presented in **Figure 2.9.3**.

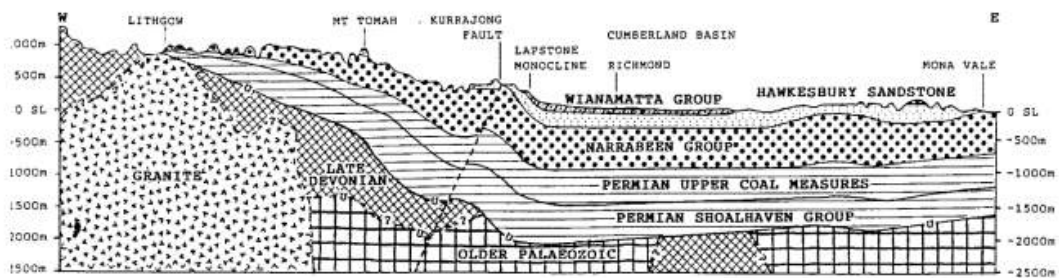


Figure 2.9.3 – Cross Section of the Sydney Basin (Herron, et al., 2018)

Licensed Groundwater information

A summary of the Lotsearch report (2023) stated that no registered groundwater bores were identified at the Site; however, nine (9) were identified within 2 km of the Site. All of the boreholes were greater than 800 m away from the Site and can be summarised as follows:

- The bores are used for monitoring, water supply and commercial / industrial purposes and were installed between 2001 and 2005.
- The closest monitoring bore is 843 m from the Site.
- The total depth of the bores ranged from 23.93 and 252.50 metres below ground level (m BGL).
- The salinity levels ranged from 1090 to 7840 mg/L.
- One bore (GW105016) reported a standing water level of 53 m and a yield of 0.200 L/s.

A map showing the location of the licensed bores surrounding the Site is presented in **Figure 2.9.4**.



Figure 2.9.4 – Licensed groundwater bores near the Site.

Site Specific Hydrogeological Information

Three (3) groundwater monitoring wells were installed at the Site on the 23rd May 2023 to a maximum depth of 8.50 metres below ground level (m BGL). The stabilised groundwater details are provided in **Table 3**.

Table 3 – Onsite Monitoring well details						
Well ID	Latitude	Longitude	Well Depth (mBGL)	TOC RL ² (m AHD)	Observed Groundwater Level (m BTOC ³)	Groundwater RL (m AHD)
GW01	-33.8923351	150.7655626	4.92	50.92	2.41	48.51
GW02	-33.8932015	150.7672809	5.34	51.34	2.55	48.79
GW03	-33.8920728	150.7681472	4.83	50.83	2.53	48.3

The maximum groundwater elevation across the Site on May 23rd 2023 was 48.79 m AHD and regional groundwater was expected to follow surface gradients towards South Creek (east to north-east).

EP Risk also sampled one (1) existing well on-site installed by Sydney Water (SC-BH06) which recorded the base of the well at 5.78 m BGL, and standing water level (SWL) as approximately 0.70 m BGL. No other wells are known to exist on the Site.

2.10 Hydrochemistry

Groundwater sampling was undertaken in the EP Risk Environmental Site Assessment (2023) at three (3) on-site monitoring wells. A review of the stabilised groundwater field quality parameters prior to sampling indicated the following ranges:

- Temperature = 16.1° - 17.2°.
- Electrical conductivity (EC) = to 1031 mS/cm to 2558 mS/cm.
- Dissolved Oxygen (DO) = 4.10 mg/L to 6.88 mg/L.
- Redox Potential (ORP) = 154.0 mV to 215.8 mV.
- pH = 6.2 to 7.5.
- Total dissolved solids (TDS) = 663.60 mg/L to 738.00 mg/L.

The groundwater parameters indicated the groundwater across the site was fresh to brackish. The pH was reported to be neutral throughout the Site. Dissolved oxygen at the Site was reported to be moderate.

2.11 Groundwater Dependent Ecosystems

No groundwater dependant ecosystems (GDE) were identified at the Assessment Area, however, two were reported at the Site; these include:

High potential GDE – from national assessment – Vegetation – Terrestrial.

High potential GDE – from national assessment – River – Aquatic.

Additionally, a further three (3) GDE were identified within 1 km of the Site, including:

High potential GDE – from national assessment – Vegetation – Terrestrial (352 m southwest)

Moderate potential GDE - from national assessment – Vegetation - Terrestrial (388 m southwest)

Low potential GDE - from national assessment – Vegetation - Terrestrial (816 m northwest)

A map showing the location of the groundwater dependant ecosystems is presented in **Figure 2.11.1**.

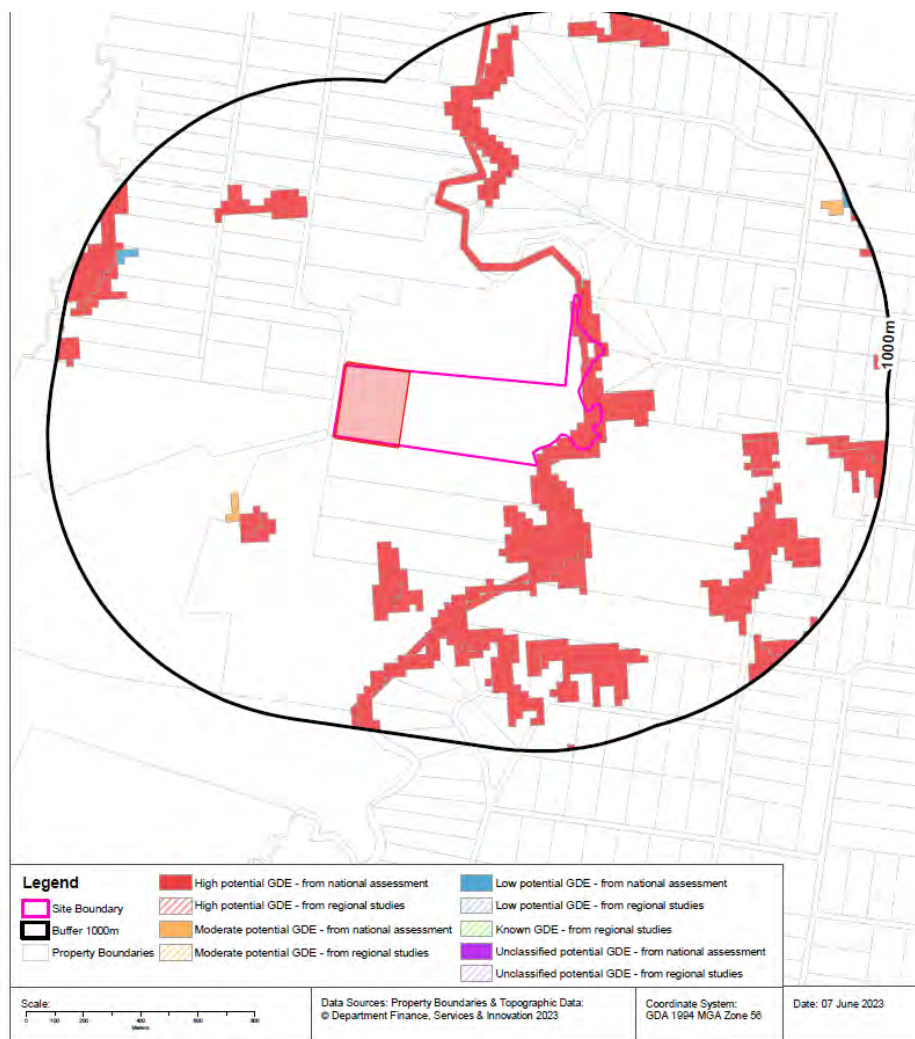


Figure 2.11.1 – Groundwater Dependant Ecosystems on and nearby the Site showing the Assessment Area in red.

3 Groundwater Conceptual Model

3.1 Hydrostratigraphy

Based on the Detailed Site Investigation (EP Risk, 2024), soil descriptions at the Assessment Area were mostly consistent across the site and comprised a grassed surface followed by a layer of TOPSOIL in the form of a clayey sandy silt/ sandy clayey silt extending to a maximum depth of approximately 0.2 m BGL, followed by natural material in the form of a silty sandy CLAY/ CLAY/ silty CLAY/ sandy CLAY was encountered to a maximum depth of 2.4 m BGL.

3.2 Aquifer Properties

A summary of the aquifer properties based on literature values is presented in **Table 4**.

Table 4 – Aquifer Properties		
Aquifer Property	Unit 1 – Upper Aquifer	Unit 2 – Lower Aquifer
Thickness (m) ⁶	3 to 10	Typically, 100 to 150
Hydraulic Conductivity ⁷ (m/day)	1×10^{-3} to 1×10^{-5}	1×10^{-4} to 1×10^{-8}
Porosity ⁸	0.3	0.2
Typical Bore Yield (ML/day)	<0.1	<0.1
Salinity (mg/L)	5,000 to >15,000	5,000 to >15,000

3.3 Proposed Development

EP Risk understands that the proposed development will occur under industrial land use. The remaining land area currently zoned ENZ will remain undeveloped.

The proposal seeks approval for two contemporary warehouse or distribution centre buildings at 230 Martin Road, Badgerys Creek. Specifically, the development will comprise:

- Site clearance works, including the removal of existing structures
- Bulk earthworks and the installation and augmentation of utilities infrastructure and other services
- Construction and operational use of two warehouse or distribution centres containing ancillary manufacturing use in the proposed Lot 1 building with associated parking, landscaping across the site and access
- Other ancillary works including stormwater infrastructure (excluding works to be delivered by public authorities e.g., Park Edge Street and the Regional Stormwater Infrastructure basin) and delivery of the frontage upgrade of along Martin Road to facilitate access to the site.

An overview showing the proposed development (concept plans) is attached as **Appendix A**.

⁶ EP Risk Detailed Site Investigation (2021).

⁷ McNally (2004).

⁸ Hatley (2004).

3.4 Conceptual Model Summary

A conceptual model is a graphical representation of the available hydrogeological information collected for the Site. The conceptual model is used to inform the groundwater dewatering analysis and subsequent impact assessments.

The conceptual model was created using the above information and a summary of the model is presented in **Figure 3.4.1**.

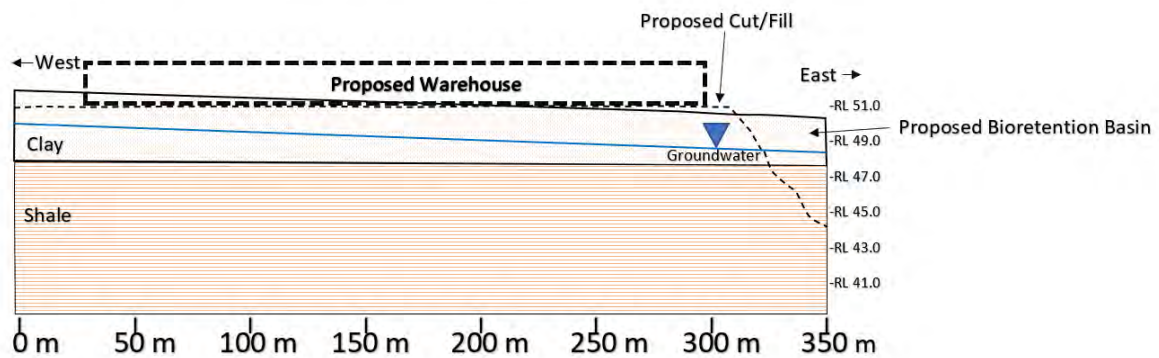


Figure 3.4.1 – Groundwater Conceptual Model Developed for the Assessment Area

4 Legislative Context

4.1 NSW Legislation

4.1.1 Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO) is NSW legislation administered by the NSW Environment Protection Authority (NSW EPA). The POEO Act regulates air and water pollution, noise control and waste management and outlines the provision of environmental protection licences that owners or occupiers of premises engaged in scheduled activities are required to hold and comply with. The proposal is not considered a scheduled activity under the POEO Act.

Under the POEO Act, there is a legal responsibility to ensure that runoff leaving a site meets an agreed minimum water quality standard, including water being discharged from the Site following storm events.

4.1.2 Protection of the Environment Administration Act 1991

The Protection of the Environment Administration Act 1991 is NSW legislation that establishes the EPA, Board of the EPA and community consultation forums. The objectives of the Act are to protect, restore and enhance the quality of the environment and to reduce risks to human health. It sets out obligations and responsibilities for managing activities that may cause environmental harm and allows the Board to determine whether the EPA should institute proceedings for serious environmental protection offences. Under the Act, any discharges into water of substances likely to cause harm to the environment as a consequence of the proposal activities must be reduced to harmless levels.

4.1.3 Water Act 1912 and Water Management Act 2000

The Water Act 1912 and the Water Management Act 2000 (WM Act) are the two major pieces of legislation for the management of water in NSW and contain provisions for the licencing of water access and use. The Water Act 1912 has historically been the main legislation for managing water resources in NSW, however, is currently being progressively phased out and replaced by water sharing plans (WSPs) under the WM Act.

The aim of the WM Act is to ensure that water resources are conserved and properly managed for sustainable use benefiting both present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and in-stream uses as well as to provide for protection of catchment conditions.

Water sharing plans

Water sources in NSW are managed via WSPs under the WM Act. Provisions within WSPs provide water to support the ecological processes and environmental needs of groundwater dependent ecosystems and waterways. WSPs also regulate how the water available for extraction is shared between the environment, basic landholder rights, town water supplies and commercial uses. Key rules within the WSPs specify when licence holders can access water and how water can be traded.

Water access licences (WAL) entitle licence holders to specified share components in the available water that may be sustainably extracted from a particular water source. The actual volume of water available to be extracted may vary, dependent on available water determinations made under the WM Act. Available water determinations are made for each WAL category in each water source and are generally made at the start of a water year, although may be altered at any time.

The Proposed Development is within the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023.

Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011

The proposal development is within the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 (NSW Government 2023) and is located in the Sydney Basin Central Groundwater Source. This plan applies to groundwater sources and includes rules for environmental water provisions, long term average extraction limits and access, trading and works approvals.

Water Access Licences (WAL)

Under Schedule 4, Part 1, clause 7 of the Water Management (General) Regulation 2018, extraction of < 3 ML of water from any aquifer for the purposes of excavation dewatering is exempt from requiring a WAL.

Water Supply Work Approval

Under the Water Management Regulations (2018), to construct a bore or 'work' to facilitate the dewatering, A water supply work approval must be granted. There are currently no exemptions to this requirement that apply to the Site.

4.2 Policies and Guidelines

The following policies and guidelines are relevant to this impact assessment.

4.2.1 General Policies and Guidelines

National Water Quality Management Strategy

Since 1992, the National Water Quality Management Strategy (NWQMS) (ARMCANZ & ANZECC 1994) has been developed by the Australian and New Zealand Governments in cooperation with state and territory governments. The NWQMS aims to protect the nation's water resources, by improving water quality while supporting the businesses, industry, environment and communities that depend on water for their continued development.

The NWQMS consists of three major elements: policy, process and guidelines. The main policy objective of the NWQMS is to achieve sustainable use of water resources, by protecting and enhancing their quality, while maintaining economic and social development. The process strives to form a nationally consistent approach to water quality management through the development of high-status national guidelines. The guidelines provide the point of reference when issues are being determined on a case-by-case basis. These include guidance on regulatory and market-based approaches to managing water quality as well as regional water quality criteria.

The Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines are relevant to this assessment.

Australian and New Zealand Guidelines for Fresh and Marine Water Quality

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) (henceforth referred to as the ANZG guidelines) are based on the policies and principles of the NWQMS. The main objective of the guidelines is to provide an authoritative guide for setting water quality objectives required to sustain

current or likely future environmental values for natural and semi-natural water resources in Australia and New Zealand. The guidelines provide a set of tools to enable the assessment and management of ambient water quality in a wide range of water resource types and define the recommended limits to acceptable changes in water quality.

It should be noted that these guidelines have not been designed specifically for direct application in activities such as discharge consents, recycled water quality or stormwater quality. They have been derived to apply to ambient waters that receive effluent or stormwater discharges and protect the environmental values they support. However, the ANZG guidelines have been used as the basis for the groundwater quality assessment presented in this report.

Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales

The Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales (DEC 2004) document lists the sampling and analysis methods to be used when complying with a requirement to test for the presence or concentration of matter in water and the volume, depth and flow of water or wastewater.

4.2.2 Groundwater Policies and Guidelines

NSW Aquifer Interference Policy

The NSW Aquifer Interference Policy requires that potential impacts on groundwater sources, including their users and groundwater dependant ecosystems, be assessed against the minimal impact considerations outlined in the policy. If the predicted impacts of the proposal are less than the minimal impact considerations, then the potential groundwater impacts of the proposal are acceptable.

The NSW Aquifer Interference Policy (NOW, 2012) was finalised in September 2012 and clarifies the water licencing and approval requirements for aquifer interference activities in NSW. Many aspects of this policy will be given legal effect in the future through an Aquifer Interference Regulation. Stage 1 of the Aquifer Interference Regulation started on 30 June 2011.

This policy outlines the water licensing requirements under the Water Act 1912 and WM Act. A water access licence is required whether water is taken for consumptive use or whether it is taken incidentally by the aquifer interference activity (such as groundwater filling a void) even where that water is not being used consumptively as part of the activity's operation.

Sufficient access licences must be held to account for all water taken from a groundwater or surface water source as a result of an aquifer interference activity, both for the life of the activity and after the activity has ceased. This take of water continues until an aquifer system reaches equilibrium and must be licensed.

The NSW Aquifer Interference Policy requires that potential impacts on groundwater sources, including their users and groundwater dependant ecosystems, be assessed against the minimal impact considerations outlined in the policy. If the predicted impacts of the proposal are less than the minimal impact considerations, then the potential groundwater impacts of the proposal are acceptable.

NSW State Groundwater Policy Framework Document

The objective of the NSW State Groundwater Policy Framework Document (DLWC 1997) is to manage the State's groundwater resources so that they can sustain environmental, social and economic uses for the people of NSW. The policy has three component parts:

NSW Groundwater Quantity Management Policy (DLWC 1998a).

NSW Groundwater Quality Protection Policy (DLWC 1998b).

The NSW State Groundwater Dependent Ecosystem Policy (DLWC 2002).

NSW Groundwater Quality Protection Policy

The NSW Groundwater Quality Protection Policy (DLWC 1998b) is a component of the NSW State Groundwater Policy. The focus of this policy is to protect from pollution water below the ground surface in aquifers, and ecosystems from which these waters are recharged or into which they discharge. It provides a framework for the sustainable management of groundwater quality.

The NSW State Groundwater Dependent Ecosystems Policy

The NSW State Groundwater Dependent Ecosystems Policy (DLWC 2002) is a component of the NSW State Groundwater Policy. It is designed to protect valuable ecosystems which rely on groundwater for survival and provides guidance on how to protect and manage these natural systems in a practical sense.

Guidelines for groundwater quality protection in Australia

The Guidelines for groundwater quality and protection in Australia (DAWR 2013) are designed to support the objectives of the NWQMS as they relate to groundwater. They provide currently known principles and key methods for maximising groundwater quality protection under the three following frameworks:

Groundwater management – which deals with groundwater entitlements and allocations.

Land-use planning – which controls decisions on land development.

Environmental protection – which deals with environmental maintenance and hazardous activities.

Risk Assessment Guidelines for Groundwater Dependent Ecosystems

The Risk Assessment Guidelines for Groundwater Dependent Ecosystems (OEH 2012) document assists in support of the requirements of the Water Management Act 2000 in relation to groundwater dependent ecosystems (GDEs). It provides guidance on the methods to identify and value GDEs and risk assessment framework.

Minimum Requirements for Building Site Groundwater Investigations and Reporting

The minimum requirements for building site groundwater investigations and reporting (NSW DPIE 2021) assists in support of the requirements of the Water Management Act 2000 in relation to groundwater dewatering and the assessment framework.

Groundwater Assessment Toolbox for Major Projects in NSW – Overview Document

The primary aim of the toolbox is to create a collaborative, transparent, and enabling environment for the preparation and reviewing of groundwater assessments in New South Wales (NSW), in particular, for state-significant developments (SSD) and state-significant infrastructure (SSI) projects.

Guidelines for Groundwater Documentation for SSD/SSI Projects (Major Projects)

The main objective of the groundwater documentation guideline is to clarify and inform the requirements for groundwater assessment and documentation required for major projects in NSW. These projects can include activities located above the water table and below the water table.

Minimum Requirements for Groundwater Modelling

This technical guideline presents the minimum requirements for groundwater modelling for major projects in NSW. It is not intended to duplicate or replace pre-existing national best-practice guidelines, notably the Australian groundwater modelling guidelines (AGMG; Barnett et al., 2012). Rather, it is a complementary document that describes further modelling requirements specific to major projects in NSW (MGMR-MP).

Information Paper on Cumulative Groundwater Impact Assessment

The information paper presents:

how to assess if a project should consider cumulative impacts.

the regulatory framework for water management.

aspects to consider when identifying cumulative impacts on water resources.

case studies of groundwater cumulative impact assessment in NSW.

Further, key recommendations are provided to assist project proponents with planning their approach to predict, apportion, and manage cumulative impacts of projects according to the requirements of the planning approval and water licensing processes in NSW.

5 Dewatering Assessment

The proposed warehouse and carpark are positioned above the predicted groundwater level at the Site and dewatering would only be expected for the installation of deep services such as sewer and stormwater as well as the construction of the bioretention basin.

The bulk cut and fill plans indicate that groundwater would be encountered in the proposed bioretention basin in the north east portion of the Site. It's understood the bioretention basin would be lined and not hydraulically connected to the groundwater.

Dewatering calculations were undertaken to determine the estimated groundwater take.

5.1 Summary of Proposed Dewatering Methodology

Groundwater will be intercepted during the bulk excavation of the bioretention basin, and installation of services therefore dewatering will be required throughout the project. Vertical dewatering (using vertical spears) would likely be the preferred dewatering method to allow bulk excavations to take place in the proposed bioretention basin. The groundwater would likely need to be treated given the high salinity at the Site. The treatment method would likely comprise pH adjustment and settlement to remove solids to meet the water quality objectives.

Opportunities for reuse of water at the Site that meet the water quality objectives should be prioritised for all dewatering activities however reuse applications may be limited due the limited footprint of the Site. Where large volumes of water are produced, alternative options such as treatment and disposal to stormwater or sewer under a trade waste agreement (TWA) would likely be alternative disposal options. A detailed water treatment design should be prepared once the dewatering method has been decided and disposal / reuse options determined.

5.2 Calculation of Groundwater Take

To estimate the total groundwater take during the proposed construction works, calculations were undertaken in accordance with the theory presented by Powers (2007) *Construction Dewatering: New Methods and Applications* as presented below.

Dewatering via a vertical dewatering bore can be approximated using plane flow and partially penetrating slots in an unconfined aquifer. The radius of the cone of depression of the water table of a large diameter bore is approximated by the following equations (**Equation 1, 2 and 3**) as follows:

$$R_0 = 3000(H - h)\sqrt{K} \quad - \text{Equation 1}$$

Where:

- R_0 = radius of influence (m)
- H = Saturated thickness of aquifer prior to dewatering (m)
- h = Saturated thickness of aquifer at maximum drawdown (m)
- K = Hydraulic conductivity (m/sec)

$$r_s = \sqrt{\frac{ab}{\pi}} \quad - \text{Equation 2}$$

Where:

- r_s = radius of the equivalent well system (m)

a = Length of the excavation (m)

b = Width of the excavation (m)

The calculation of pumping rate can be calculated from **Equation 3** below.

$$Q = \frac{\pi K(H^2 - h^2)}{\ln\left(\frac{R_0}{r_s}\right)} \quad - \text{Equation 3}$$

Where:

H = Saturated thickness of the aquifer prior to pumping (m)

h = Saturated thickness of the aquifer at maximum drawdown (m)

K = Hydraulic conductivity (m/sec)

R₀ = radius of influence (m)

R_s = equivalent radius of the well system (m)

Q = pumping rate from the dewatering system (m³/sec)

Based on the calculations attached as **Appendix B**, the estimates of groundwater take over the proposed construction period is approximately **11.85 ML**. The maximum radius of influence was calculated to be 116 m from the edge of the excavation.

6 Construction Impact Assessment

6.1 Groundwater Level Impacts

Due to being underlain by Wianamatta Group Shales, the proposal area is classed as a “less productive groundwater source” under the NSW Aquifer Interference Policy (AIP). A less productive groundwater source is defined by the AIP as a groundwater source having total dissolved solids greater than 1,500 milligrams per litre or does not contain water supply works that can yield water at a rate greater than five litres per second.

The NSW Aquifer Interference Policy requires that potential impacts on groundwater sources, including their users and groundwater dependant ecosystems, be assessed against the minimal impact considerations outlined in the policy. If the predicted impacts are less than the Level 1 minimal impact considerations for less productive fractured rock groundwater sources, then the potential groundwater impacts of the proposal are acceptable. The Level 1 minimal impact considerations for less productive porous and fractured rock water sources are:

Less than or equal to 10 per cent cumulative variation in the water table, allowing for typical climatic ‘post-water sharing plan’ variations, at a distance of 40 metres from any high priority GDEs or high priority culturally significant site listed in the schedule of the relevant water sharing plan.

A maximum of a two-metre water table decline cumulatively at any water supply work.

Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 metres of the activity.

The proposal has been assessed against the adopted Level 1 minimal impact considerations below.

6.1.1 Water supply works

The maximum radius of influence for the proposed dewatering was calculated as 116 m and the closest water supply works is at least 800 m away from the Assessment Area and therefore the proposal would not result in any impacts to a water supply work.

6.1.2 High priority culturally significant sites

There are no high priority culturally significant sites listed in the Water Sharing Plan for the Southern Sydney Rivers Groundwater Sources. Therefore, the proposal would not result in any impacts to a culturally significant site.

6.1.3 Groundwater dependent ecosystems

There are two high priority GDE's to the east of the Site (both aquatic and terrestrial) associated with the South Creek, however the GDEs are located approximately 480 m east of the proposed dewatering activities. Given the radius of influence for the proposed dewatering activities is less than this it's not considered likely to impact on the GDE.

6.1.4 Summary

The proposal is not predicted to result in any decline in groundwater pressure or groundwater head at any water supply works or high priority GDE and is not predicted to alter the beneficial use of the groundwater. Therefore, the proposed impact is considered to be less than the Level 1 minimal impact consideration and is considered acceptable.

6.2 Water Quality Impacts

The following potential impacts of the construction phase of the proposal on surface water and groundwater quality have been identified:

Increased erosion from a range of construction activities resulting in an increase in sedimentation in downstream waterways.

Contamination of waterways or groundwater from chemical or hydrocarbon spills.

Discharge of excess groundwater resulting in pollution of receiving drainage networks and watercourses.

To manage these potential impacts a Soil and Water Management Plan (SWMP) will be prepared and implemented and include measures to manage and reduce the risk of water quality impacts associated with the works. Mitigating any potential impacts will need to consider best practice in managing the Site, in accordance with the Blue Book (Landcom 2004 / DECC 2008).

Assessment of the water quality outcomes against the ANZECC (2000b) and ANZG (2018) guidelines will be undertaken during detailed design once a water quality monitoring program has been implemented and sufficient water quality data are available. The detailed design would then take into consideration the findings of the assessment and any recommendations for water quality treatment measures, which may include gross pollution traps to remove litter and debris.

6.2.1 Initial Construction Works

During the initial stages of construction, various preparatory works would be undertaken such as site establishment works and construction access provision. These works would also include:

Installation of environmental controls, including sediment and erosion controls following best practice guidelines such as the Blue Book (Landcom 2004 / DECC 2008).

Any necessary flood mitigation measures to manage overland flows and minimise adverse impacts on surrounding environment where possible.

6.2.2 Erosion and Sedimentation

Soil is the most likely potential contaminant that could impact surface water quality during the construction phase if runoff is allowed to mobilise soils from exposed areas. Increased erosion and sedimentation would be influenced by the severity of a storm event and the slope and footprint of the disturbed area.

Where possible, construction and drainage activities would be planned considering the upcoming weather forecast to minimise the risks of potential heavy rainfall and major surface runoff events.

Although planning of activities in this manner would not prevent construction during periods of potentially heavy rainfall, the risk of having disturbed construction areas or unpreparedness during heavy rainfall periods would be reduced.

6.2.3 Spills and Leaks

Chemical spills and leaks have the potential to contaminate both surface water via rainfall runoff processes or groundwater through infiltration. Prior to construction the need for spill kits should be assessed along with the best location for such equipment. Storage of hazardous goods, maintenance activities and refuelling activities would be undertaken in bunded areas and away from waterways and stormwater drains. These locations would be identified in the SWMP.

6.2.4 Dewatering Discharges

Where excavation activities are deep enough to intercept groundwater, dewatering may be required. Discharge of groundwater without assessment or treatment to receiving environments can introduce pollutants. Where possible the dewatered groundwater should be used on-site for irrigation or dust suppression activities. If on-site use is not possible then offsite discharge or disposal options should be considered in consultation with DPHI and WaterNSW.

7 Operational Impact Assessment

7.1 Groundwater Level Impacts

The existing Site comprises a large cleared rural / residential property and the proposed development would increase the impermeable hardstand areas in the western portion of the Site only. The majority of the Site will not be developed and will be maintained for environmental conservation.

Given that the Proposed Development is limited to a small portion of the Site and runoff from hard stand areas will continue to flow east towards South Creek, the reduction in rainfall infiltration is likely to have a negligible effect in flows available to groundwater receptors in the area.

Due to the lack of long-term interaction of the proposed development with groundwater, the proposed development is not predicted to result in any long-term impact on groundwater level. Therefore, it is predicted that the groundwater impacts would be less than the Level 1 minimal impact considerations specified in the NSW Aquifer Interference Policy and are therefore considered acceptable.

7.2 Water Quality Impacts

As mentioned above, due to the lack of long-term interaction of the proposed development with groundwater, proposed development is not predicted to result in any long-term impact on groundwater quality. Therefore, it is predicted that the groundwater impacts would be less than the Level 1 minimal impact considerations specified in the NSW Aquifer Interference Policy and are therefore considered acceptable.

8 Mitigation and Management Measures

8.1 Construction Phase

8.1.1 Surface water and groundwater management and mitigation

A Soil and Water Management Plan (SWMP) will be prepared as part of the Construction Environmental Management Plan (CEMP). The SWMP would define the control and mitigation of potential surface water and groundwater quality impacts during construction. The SWMP will be developed to incorporate the most appropriate or 'best practice' controls and measures in accordance with the Blue Book (Landcom 2004/DECC 2008). The SWMP will be staged to suit the changing needs as the works progress. Due consideration would also be given to the extent of works and situation relative to the sensitivity of the environment surrounding the construction activity.

Both the CEMP and SWMP would typically include strategies such as:

Bunding of storage areas containing hazardous goods and undertaking of refuelling activities in banded areas.

The staging of construction to minimise potential impacts.

Separating clean and dirty water and preventing infiltration of impacted surface water into the underlying groundwater system.

Preventing groundwater seepage from contacting potentially contaminating site activities by minimising ponding of water in active areas and making storage facilities impermeable.

Preventing impacted groundwater from entering the surface water management system unless it represents a credible treatment option.

Adequately storing and handling site chemicals.

Identifying and responding to chemical spills and managing their clean-up.

Monitoring for the emergence of diffuse water quality impacts and implementing response procedures to remediate any impact.

With appropriate strategies in place, the risk of increased sedimentation in the receiving watercourses would be substantially reduced.

Further, existing open swale drains and any other open drainage channels provided through construction areas will help provide an opportunity to cut off, via emergency bunding where required, any spills and leaks that may begin running off-site or into underground stormwater drainage networks. This would be in the unlikely event of chemical spills or leaks occurring within the proposal area.

Construction-related risks, such as earthworks, spills, and stockpile and equipment locations, are common for projects of this size and type and would be managed in accordance with the Blue Book (Landcom 2004 / DECC, 2008).

Impacts on groundwater due to excavations below the groundwater table and associated dewatering should be mitigated by considering alternative construction methodology where applicable (e.g. under-boring), minimising time that excavations are left open, minimising size of excavations and siting excavations away from groundwater receptors where possible. Any dewatered groundwater may be used on-site for dust suppression or irrigation, with excess water potentially discharged to stormwater. If excess water is to be discharged then testing is recommended prior to discharge.

Bunding of storage areas containing hazardous goods and undertaking of refuelling activities in bunded areas would reduce the risk of the proposal impacting on groundwater quality. All hazardous goods and re-fuelling activities would be undertaken in these bunded areas. These practices would be outlined in the SWMP.

8.1.2 Surface water flow monitoring

Monitoring of surface water flows is not required as impacts from the proposal are considered to be negligible.

8.1.3 Residual Impact

Residual impacts of the construction phase of the proposal may include slightly increased surface runoff and transport of litter and other pollutants to receiving watercourses. Water quality impacts would be managed through implementation of runoff and erosion control measures and the water quality monitoring program. It's considered the residual impacts would be acceptable.

8.2 Operational Phase

8.2.1 Surface water and groundwater management and mitigation

The intent of the proposal design with regard to surface water quality would be to minimise impacts on the receiving systems and implement the design criteria. In general, Water Sensitive Urban Design (WSUD) principles should be incorporated including erosion control measures such as soil stabilisation, landscaping, planting native vegetation and mulching.

The intent of the proposal design with regard to groundwater quality would be to balance reduced infiltration as a consequence of increased impervious area with the need to minimise infiltration of compromised surface water into the groundwater system. In general, the measures outlined for the management of surface water above have been implemented in this project and should adequately achieve this balance.

8.2.2 Material Reuse

To minimise the potential for dispersive erosion following completion of the construction phase, gypsum stabilisation of site won material reused as general fill should be considered.

8.2.3 Surface water flow monitoring

Monitoring of surface water flows is not required as impacts are considered negligible.

8.2.4 Groundwater elevations and drawdown

There is no requirement to monitor groundwater elevations and drawdowns as impacts are considered negligible during the operational phase.

8.2.5 Surface water and groundwater quality monitoring

It is not proposed that surface water or groundwater monitoring is required during the operational phase of the Project.

8.2.6 Residual impact

Residual impacts of the operational phase of the proposal may include slightly increased surface runoff and transport of litter and other pollutants to receiving watercourses. Water quality impacts would be managed

through implementation of water sensitive urban design measures and the residual impacts are considered acceptable.

9 Conclusion

A summary of the findings of the impact assessment are presented below. Some impacts have been identified however with the implementation of appropriate mitigation and monitoring controls it is expected that the impacts identified will be acceptable.

Potential construction stage impacts include contamination from chemical or hydrocarbon spills and increased sediment loads being discharged to downstream systems as a result of runoff from exposed areas. Construction impacts would be managed through implementation of SWMPs in accordance with the Blue Book and detailed planning and management of construction sites to avoid impacting overland flow paths without appropriate mitigation.

Water quality impacts of the operational phase of the development would be managed through implementation of water sensitive urban design measures.

Construction stage impacts on groundwater may occur due to minor interception of groundwater by excavations associated with construction. Impacts on groundwater level due to dewatering would occur during the construction phase only.

A summary of the key impacts and proposed mitigation and monitoring measures are presented in **Table 5**.

Table 5 – Potential Construction and Operation Impacts and Mitigation Measures				
Activity	Potential Impacts	Risk Rating	Mitigation Measures	Residual Risk Rating
Interception of groundwater aquifer	Significant drawdown due to dewatering operations	Moderate	Minimising the duration of time that excavations below the water table are open and consider alternative methods such as under boring for the installation of lead in services.	Low
Chemical or hydrocarbon spill	Contamination of groundwater	Moderate	Storage of hazardous materials and refuelling to be undertaken in bunded areas. Spill kits to be kept onsite and staff informed of how to use them in an incident.	Low
Discharge of excess groundwater	Contamination of stormwater networks by discharging contaminated groundwater.	Moderate	Where possible, use the extracted water as dust suppression onsite. Approval to treat and dispose to stormwater / sewer should be obtained if large volumes are required to be dewatered.	Low

10 References

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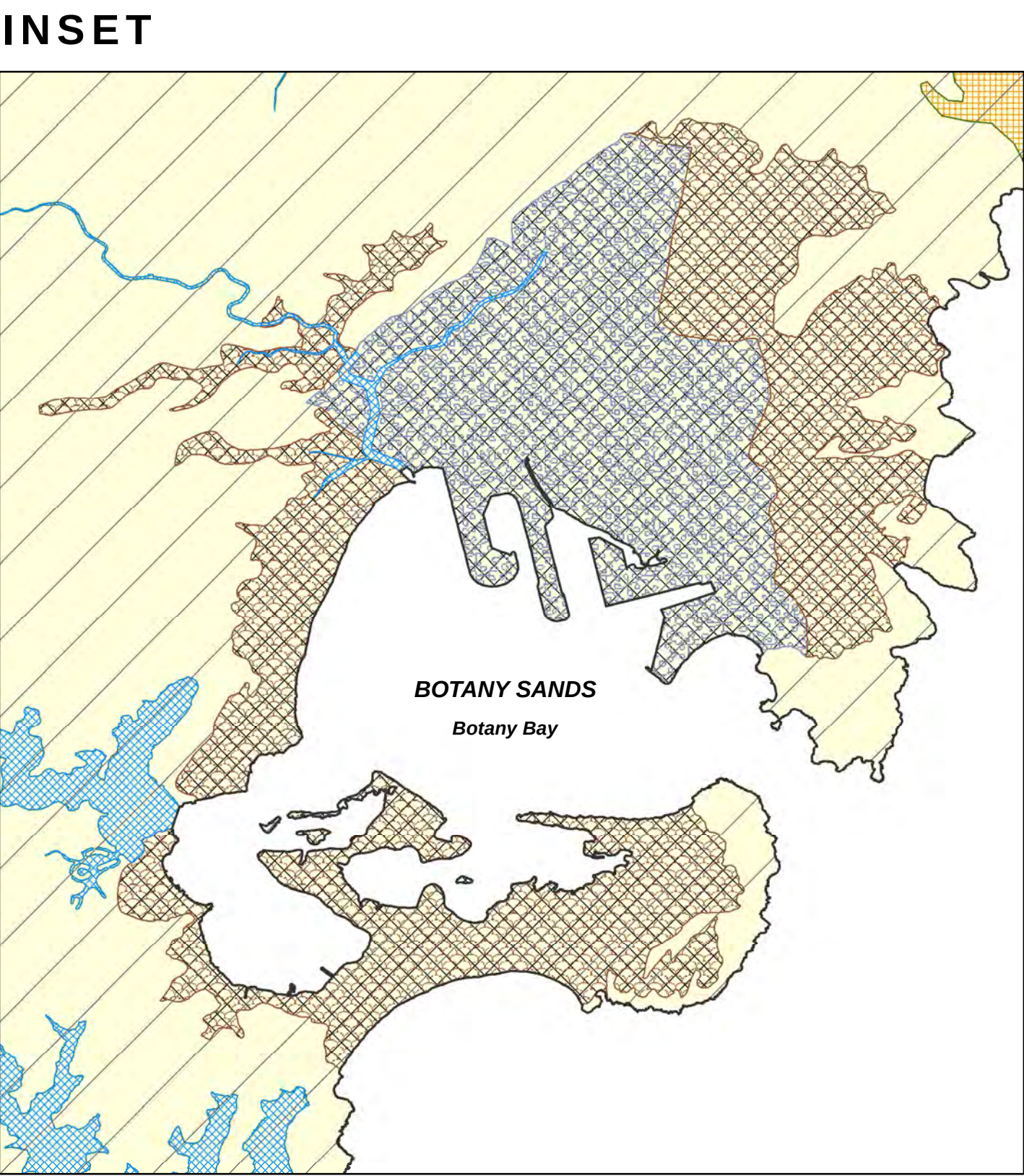
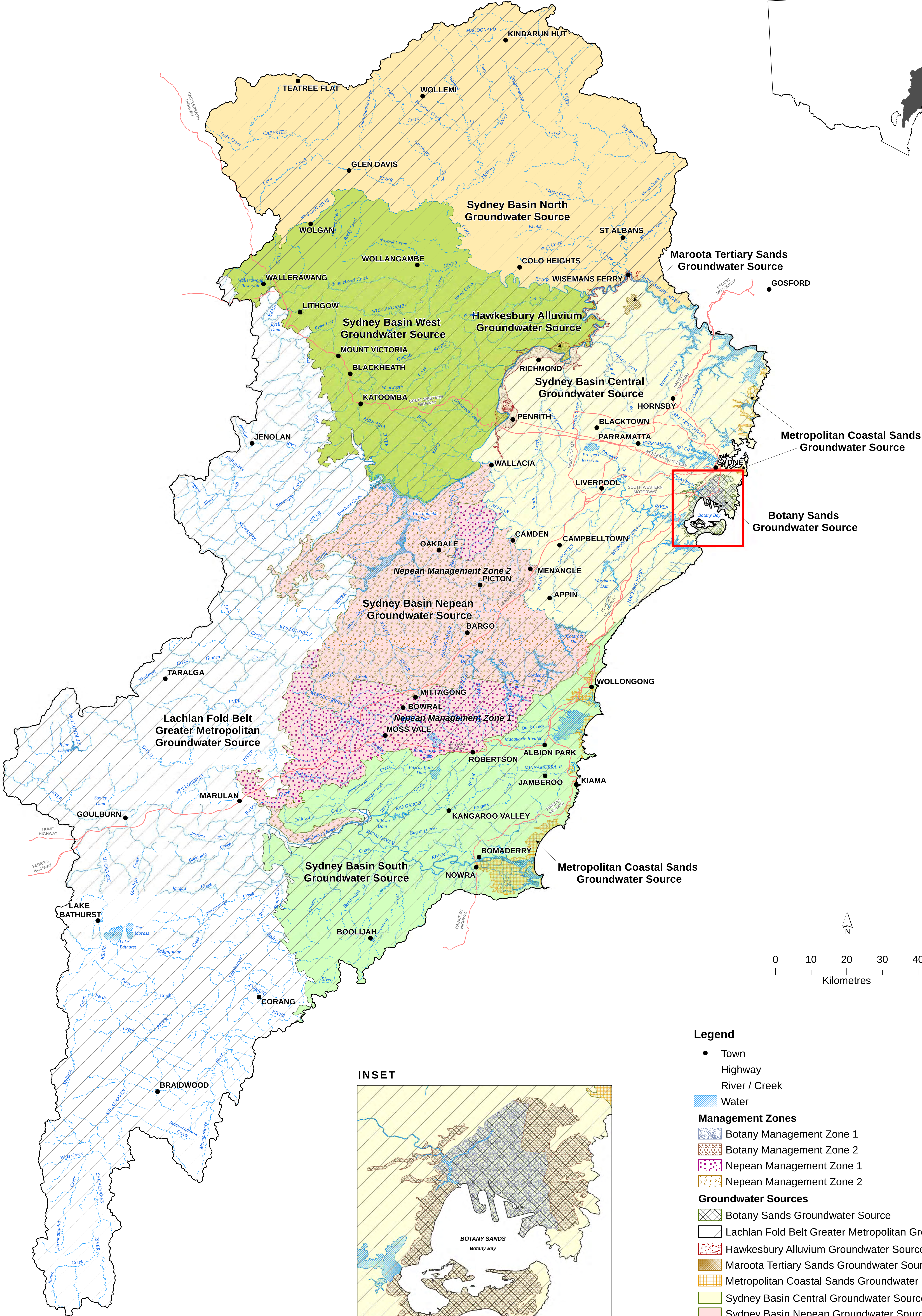
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Figures



Figure 1 - Site Location and layout

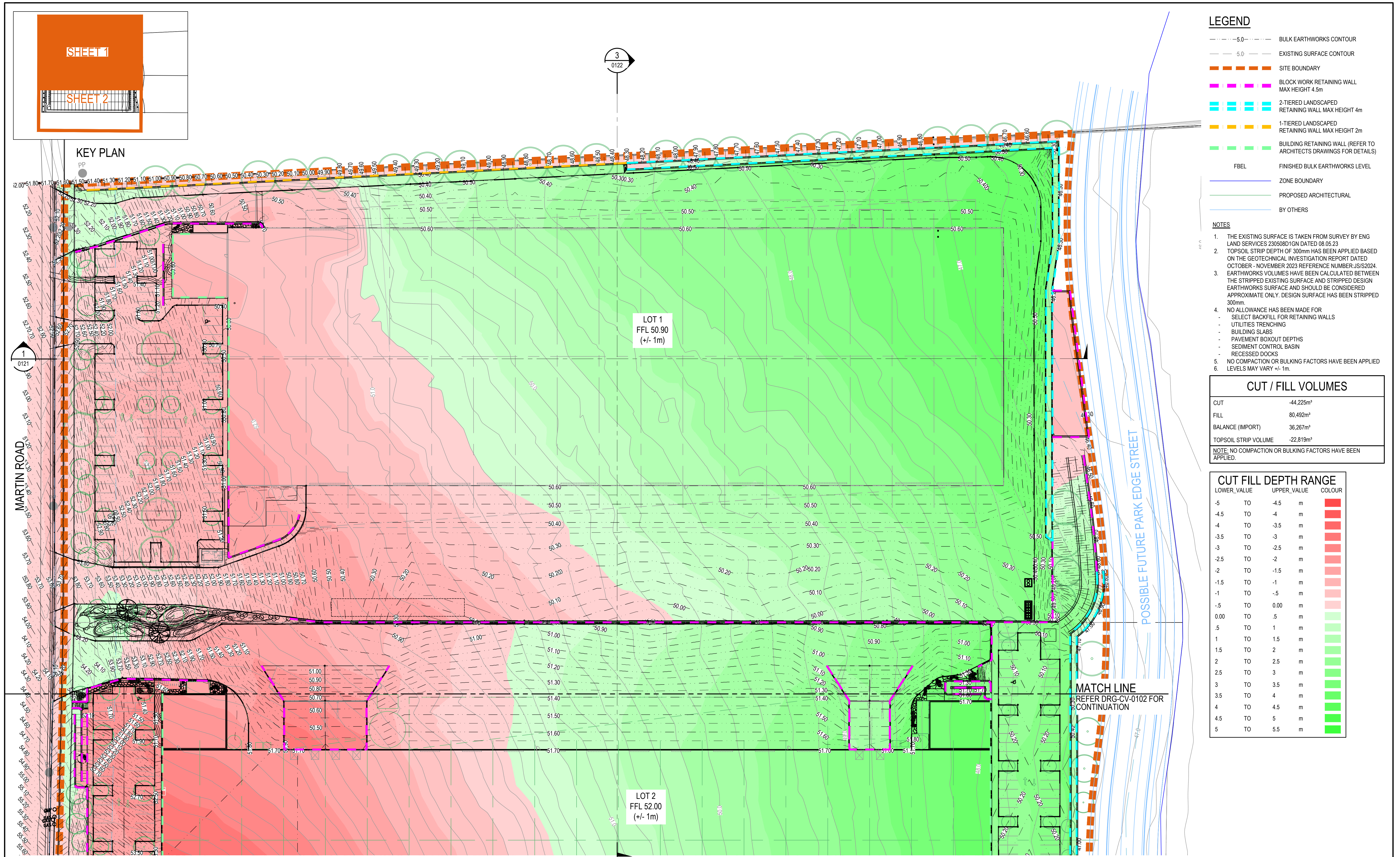
Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023



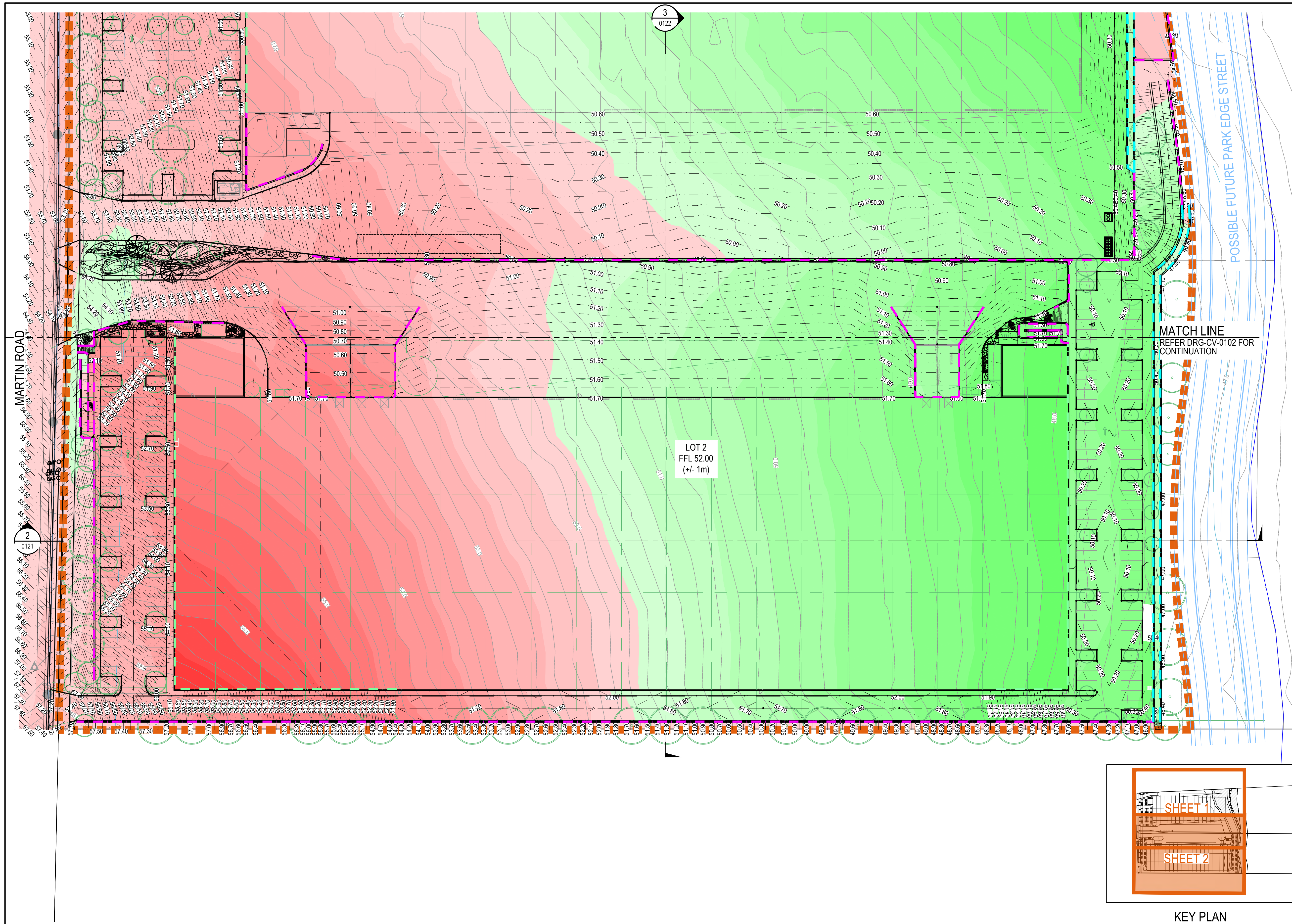
- Legend**
- Town
 - Highway
 - River / Creek
 - Water
- Management Zones**
- Botany Management Zone 1
 - Botany Management Zone 2
 - Nepean Management Zone 1
 - Nepean Management Zone 2
- Groundwater Sources**
- Botany Sands Groundwater Source
 - Lachlan Fold Belt Greater Metropolitan Groundwater Source
 - Hawkesbury Alluvium Groundwater Source
 - Maroota Tertiary Sands Groundwater Source
 - Metropolitan Coastal Sands Groundwater Source
 - Sydney Basin Central Groundwater Source
 - Sydney Basin Nepean Groundwater Source
 - Sydney Basin North Groundwater Source
 - Sydney Basin South Groundwater Source
 - Sydney Basin West Groundwater Source

Appendix A

PROPOSED DEVELOPMENT PLANS



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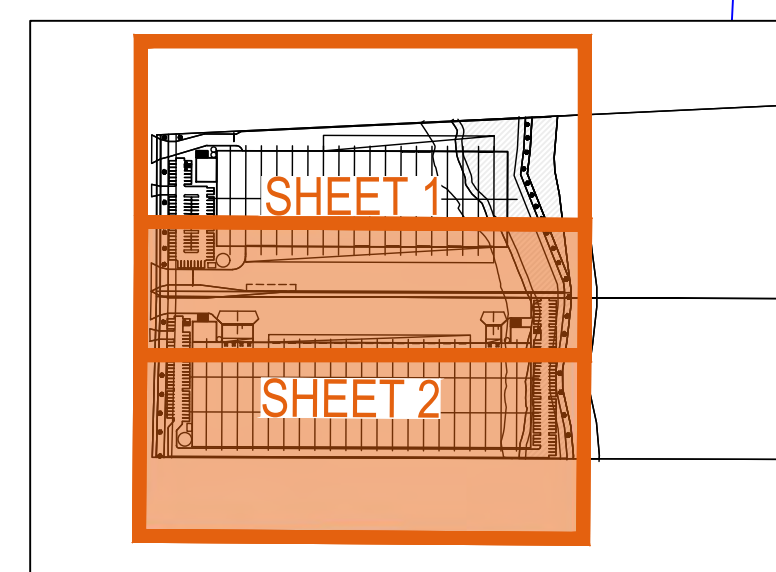
- BULK EARTHWORKS CONTOUR
- EXISTING SURFACE CONTOUR
- SITE BOUNDARY
- BLOCK WORK RETAINING WALL
MAX HEIGHT 4.5m
- 2-TIERED LANDSCAPED
RETAINING WALL MAX HEIGHT 4m
- 1-TIERED LANDSCAPED
RETAINING WALL MAX HEIGHT 2m
- BUILDING RETAINING WALL (REFER TO
ARCHITECTS DRAWINGS FOR DETAILS)
- FBEL
- FINISHED BULK EARTHWORKS LEVEL
- ZONE BOUNDARY
- PROPOSED ARCHITECTURAL
- BY OTHERS

- NOTES**
- THE EXISTING SURFACE IS TAKEN FROM SURVEY BY ENG LAND SERVICES 23050801GN DATED 08.05.23
 - TOPSOIL STRIP DEPTH OF 300mm HAS BEEN APPLIED BASED ON THE GEOTECHNICAL INVESTIGATION REPORT DATED OCTOBER - NOVEMBER 2023 REFERENCE NUMBER:JS/2024.
 - EARTHWORKS VOLUMES HAVE BEEN CALCULATED BETWEEN THE STRIPPED EXISTING SURFACE AND STRIPPED DESIGN EARTHWORKS SURFACE AND SHOULD BE CONSIDERED APPROXIMATE ONLY. DESIGN SURFACE HAS BEEN STRIPPED 300mm.
 - NO ALLOWANCE HAS BEEN MADE FOR
 - SELECT BACKFILL FOR RETAINING WALLS
 - UTILITIES TRENCHING
 - BUILDING SLABS
 - PAVEMENT BOXOUT DEPTHS
 - SEDIMENT CONTROL BASIN
 - RECESSED DOCKS
 - NO COMPACTION OR BULKING FACTORS HAVE BEEN APPLIED
 - LEVELS MAY VARY +/- 1m.

CUT / FILL VOLUMES	
CUT	-44,225m³
FILL	80,492m³
BALANCE (IMPORT)	36,267m³
TOPSOIL STRIP VOLUME	-22,819m³

NOTE: NO COMPACTION OR BULKING FACTORS HAVE BEEN APPLIED.

CUT FILL DEPTH RANGE		
LOWER_VALUE	UPPER_VALUE	COLOUR
-5	TO -4.5	m
-4.5	TO -4	m
-4	TO -3.5	m
-3.5	TO -3	m
-3	TO -2.5	m
-2.5	TO -2	m
-2	TO -1.5	m
-1.5	TO -1	m
-1	TO -0.5	m
-0.5	TO 0.00	m
0.00	TO 0.5	m
0.5	TO 1	m
1	TO 1.5	m
1.5	TO 2	m
2	TO 2.5	m
2.5	TO 3	m
3	TO 3.5	m
3.5	TO 4	m
4	TO 4.5	m
4.5	TO 5	m
5	TO 5.5	m



KEY PLAN

Issue	Description	DR	CH	VE	Date
04	FOR APPROVAL	JD	KM	KM	25.11.25
03	FOR COORDINATION	JD	KR	KM	21.10.25
02	FOR APPROVAL - RESPONSE TO TOA COMMENTS	JL	KR	KM	24.04.25
01	FOR APPROVAL	JL	KR	JH	13.09.24

Scales

1 : 500

0 5 10 20 30 40 50m

Surveyor

Client & Architect

FOR APPROVAL NOT TO BE USED FOR CONSTRUCTION			
© Copyright reserved			
Original Issue Signatures			
Drawn	J. LOPEZ	Original Size	A1
Designed	K. ROBINSON	Height Datum	AHD
Design Manager	K. MCAREAVEY	Grid	MGA/20-56
Verified	J. HEYDON		

Project

230 MARTIN ROAD,
BADGERYS CREEK

Title

BULK EARTHWORKS PLAN
SHEET 2

Arcadis Australia Pacific Pty Limited
Level 16, 580 George Street
SYDNEY NSW 2000
ABN 76 104 485 289
Tel No: +61 2 8907 9000
www.arcadis.com/au

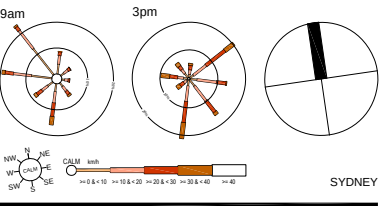
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Issue	04

Drawing No: MAR-AAP-DA-01-DRG-CV-0102



REVISIONS

A PRELIMINARY 14.09.23

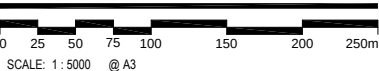


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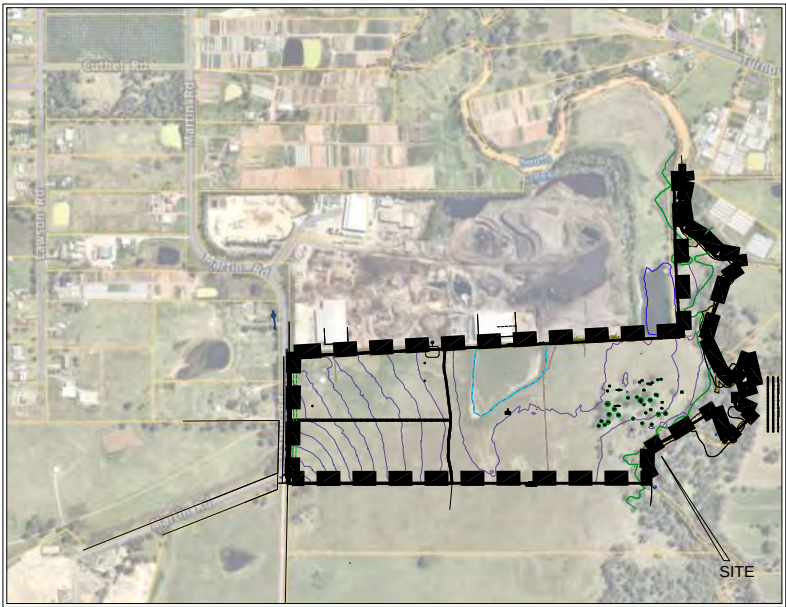
PROJECT
METROLL & SPEC
230 MARTIN ROAD
BADGERYS CREEK, NSW

DRAWING TITLE
EXISTING SITE PLAN

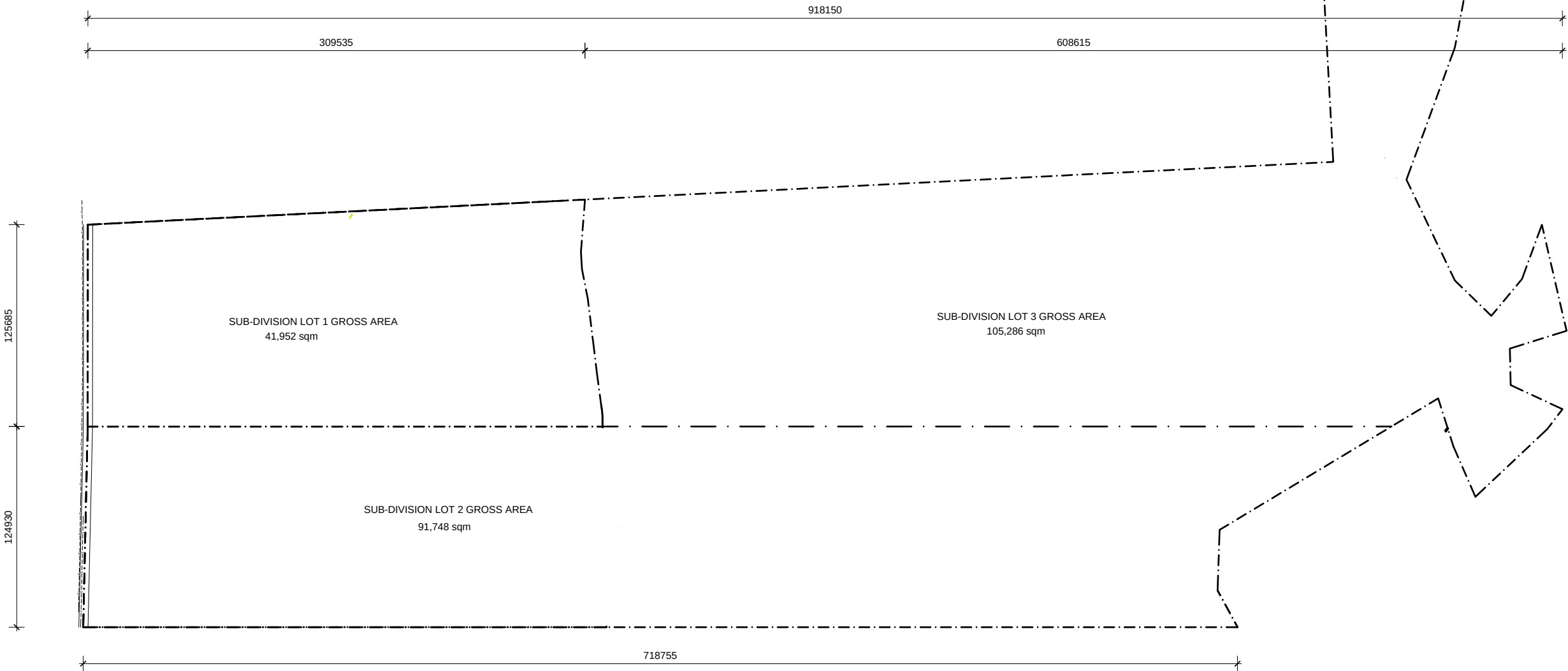


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LAST SAVED BY: HAN XU

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LOCATION PLAN

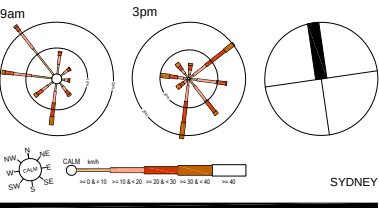


**ENVIRONMENT AND RECREATION AREA BOUNDARY IS INDICATIVE ONLY
FINAL DIMENSION WILL BE SUBJECT TO DETAIL SURVEY

REVISIONS		
A	PRELIMINARY	14.09.23

DEVELOPMENT SUMMARY

TOTAL SITE AREA	238,986 sqm
SUB-DIVISION LOT 1 GROSS AREA (17.6%)	41,952 sqm
SUB-DIVISION LOT 2 GROSS AREA (38.4%)	91,748 sqm
SUB-DIVISION LOT 3 GROSS AREA (44%)	105,286 sqm



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PROJECT
METROLL & SPEC
230 MARTIN ROAD
BADGERYS CREEK, NSW

DRAWING TITLE
PROPOSED SUBDIVISION SITE PLAN

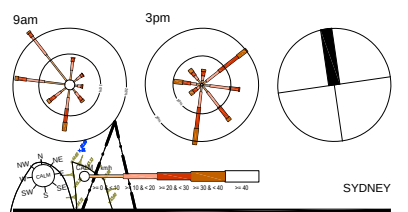
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CREATE DATE : 21.04.2026	PLOT DATE : 22.01.2026
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REVISIONS		
A	PRELIMINARY	14.09.23
B	REVISION- RELOCATION OF PARK EDGE STREET	16.09.25
C	REVISION- UPDATED IN ACCORDANCE TO CIVIL	26.11.25

DEVELOPMENT SUMMARY

TOTAL SITE AREA	238,986 sqm
ENVIRONMENT AND RECREATION	157,215 sqm
ENTERPRISE ZONING	81,771 sqm
ROAD WIDENING MARTIN ROAD	750 sqm
PARK EDGE STREET	5,204 sqm
LOT 1 AREA	41,414 sqm
LOT 2 AREA	39,607 sqm



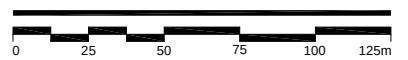
EMKC³
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DEP0003112 | PDP0001062

~~PROJECT~~

METROLL & SPEC
230 MARTIN ROAD
BADGERYS CREEK, NSW

DRAWING TITLE
ZONING SITE PLAN



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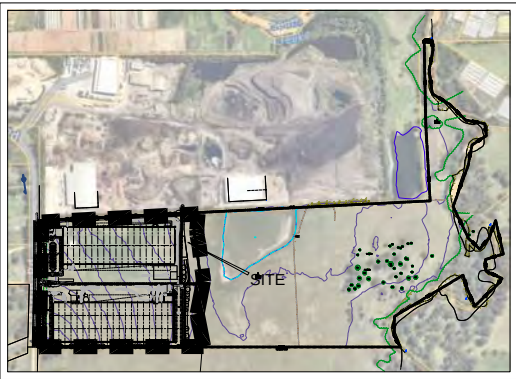
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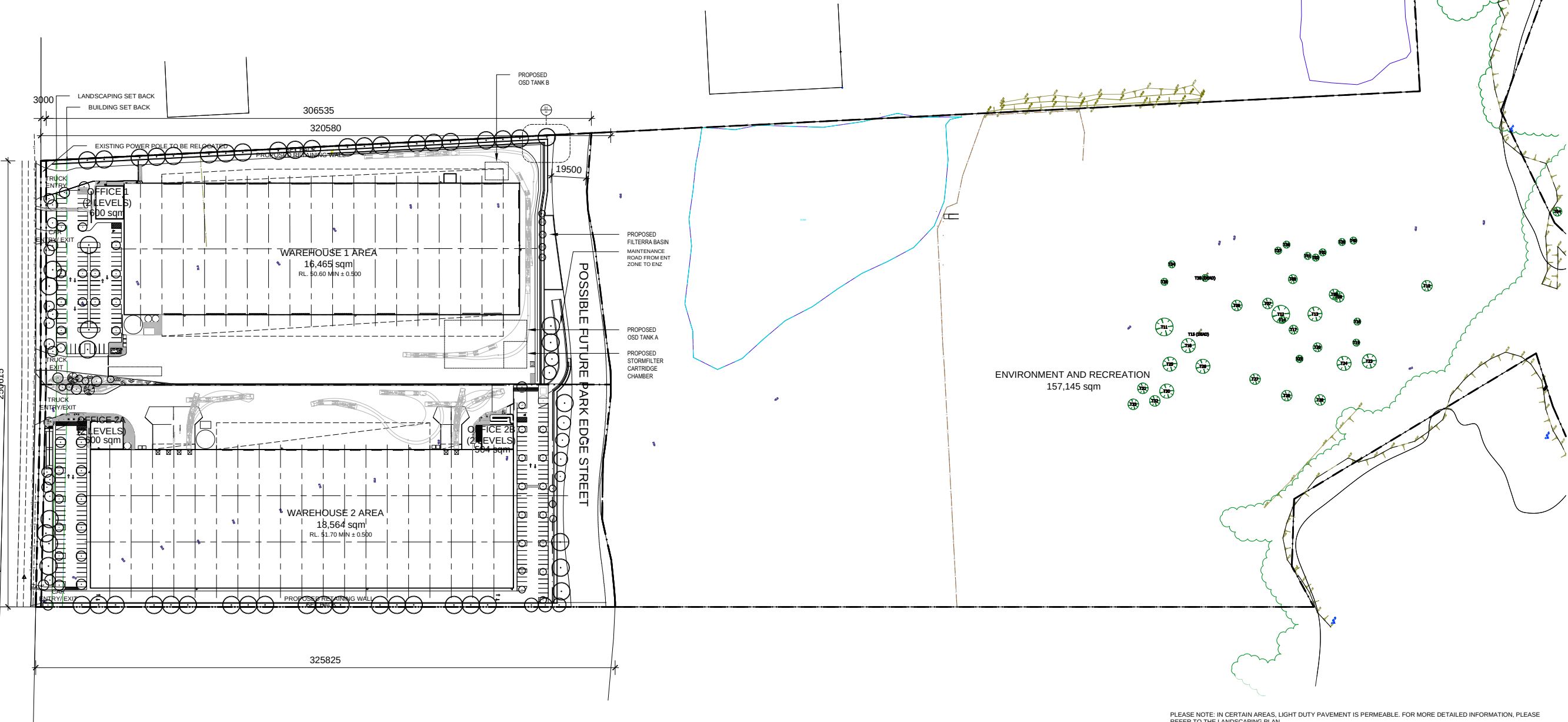
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**ENVIRONMENT AND RECREATION AREA BOUNDARY IS INDICATIVE ONLY
FINAL DIMENSION WILL BE SUBJECT TO DETAIL SURVEY



LOCATION PLAN



REVISIONS		
E	REVISION – PAD LEVEL CHANGE	15.02.24
F	REVISION – ADDITIONAL WESTERN CAR ENTRY/EXIT	15.02.24
G	REVISION – 2B CARPARKING LEVEL CHANGE + 2B OFFICE RAMP	24.04.24
H	REVISION – REMOVED ADDITIONAL WESTERN CAR ENTRY/EXIT	24.06.24
I	REVISION – UPDATED IN ACCORDANCE TO CIVIL AND LANDSCAPE	09.07.24
J	REVISION – ADDED DANGEROUS GOODS AND RACKING	02.05.25
K	REVISION – RELOCATION OF PARK EDGE STREET	16.09.25
L	REVISION – UPDATED IN ACCORDANCE TO CIVIL	26.11.25
M	REVISION – UPDATED IN ACCORDANCE TO TRAFFIC & FIRE CONSULTANTS	22.01.26

DEVELOPMENT SUMMARY

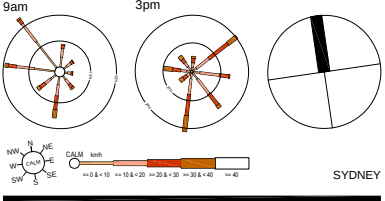
LOT 1

SITE AREA SUBDIVISION	41,414 sqm
WAREHOUSE AREA	16,465 sqm
OFFICE (2 LEVELS)	600 sqm
AMENITIES BLOCK	37 sqm
TOTAL BUILDING AREA	17,102 sqm
EFFICIENCY	41.3 %
AWNING (5-8m)	1,439 sqm
AWNING (12m)	2,304 sqm
CARPARKING PROVIDED	86 spaces
HEAVY DUTY PAVEMENT (H)	13,838 sqm
LIGHT DUTY PAVEMENT (L)	2,631 sqm
LANDSCAPING AREA	4,206 sqm
PARK EDGE STREET AREA	2,759 sqm

DEVELOPMENT SUMMARY

LOT 2

SITE AREA SUBDIVISION	39,607 sqm
WAREHOUSE AREA	18,564 sqm
OFFICE (2 LEVELS)	1,104 sqm
TOTAL BUILDING AREA	19,668 sqm
EFFICIENCY	49.66 %
AWNING (3m)	108 sqm
AWNING (15m)	1,800 sqm
CARPARKING PROVIDED	119 spaces
HEAVY DUTY PAVEMENT (H)	7,993 sqm
LIGHT DUTY PAVEMENT (L)	5,024 sqm
LANDSCAPING AREA	3,412 sqm
PARK EDGE STREET AREA	2,445 sqm



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PROJECT

METROLL & SPEC

230 MARTIN ROAD
BADGERYS CREEK, NSW

DRAWING TITLE

PROPOSED MASTERPLAN W BUILT FORM



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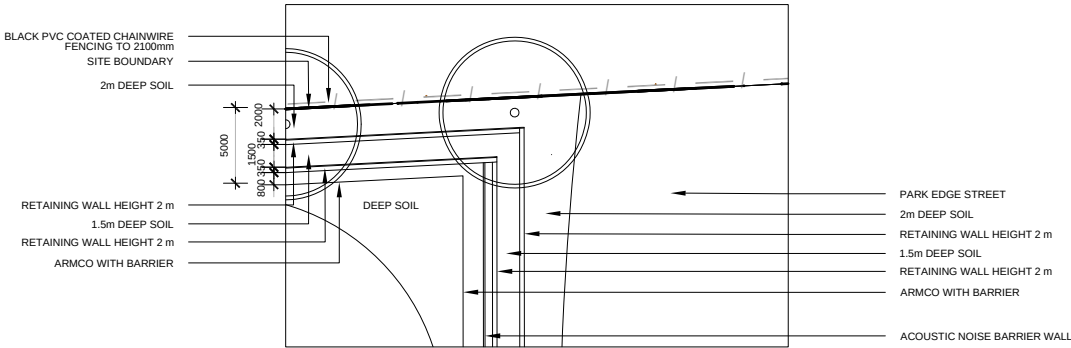
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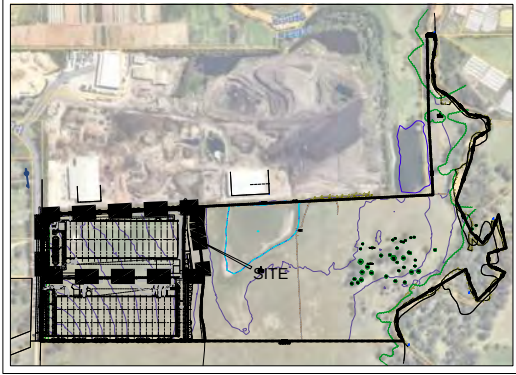
LAST SAVED BY: HAN XU

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PLEASE NOTE: IN CERTAIN AREAS, LIGHT DUTY PAVEMENT IS PERMEABLE. FOR MORE DETAILED INFORMATION, PLEASE REFER TO THE LANDSCAPING PLAN



01
04 RETAINING WALL AND ACOUSTIC NOISE BARRIER WALL



LOCATION PLAN

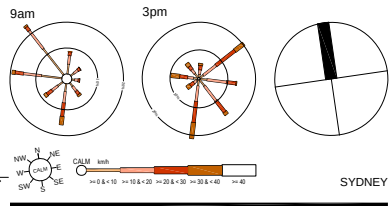
REVISIONS

REVISIONS	
A PRELIMINARY	14.09.23
B REVISION - CAR PARK & LANDSCAPING	11.10.23
C REVISION - CAR PARK & LANDSCAPING	19.10.23
D REVISION - PAD LEVEL CHANGE	19.10.23
E REVISION - PAD LEVEL CHANGE	15.02.24
F REVISION - ADDITIONAL WESTERN CAR ENTRY/EXIT	15.02.24
G REVISION - 2B CARPARKING LEVEL CHANGE + 2B OFFICE RAMP	24.04.24
H REVISION- REMOVED ADDITIONAL WESTERN CAR ENTRY/EXIT	24.06.24
I REVISION- UPDATED IN ACCORDANCE TO CIVIL AND LANDSCAPE	09.07.24
J REVISION- ADDED DANGEROUS GOODS AND RACKING	02.05.25
K REVISION- RELOCATION OF PARK EDGE STREET	16.09.25
L REVISION- UPDATED IN ACCORDANCE TO CIVIL	26.11.25
M REVISION- UPDATED IN ACCORDANCE TO TRAFFIC & FIRE CONSULTANTS	22.01.26

DEVELOPMENT SUMMARY

LOT 1

SITE AREA SUBDIVISION	41,414 sqm
PARK EDGE STREET	2,759 sqm
WAREHOUSE AREA	16,465 sqm
OFFICE (2 LEVELS)	600 sqm
AMENITIES BLOCK	37 sqm
TOTAL BUILDING AREA	17,102 sqm
EFFICIENCY	41.3 %
AWNING (5-8m)	1,439 sqm
AWNING (12m)	2,304 sqm
CARPARKING PROVIDED	86 spaces
HEAVY DUTY PAVEMENT (H)	13,838 sqm
LIGHT DUTY PAVEMENT (L)	2,631 sqm
LANDSCAPING AREA	4,206 sqm
PARK EDGE STREET AREA	2,759 sqm



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PROJECT

METROLL & SPEC

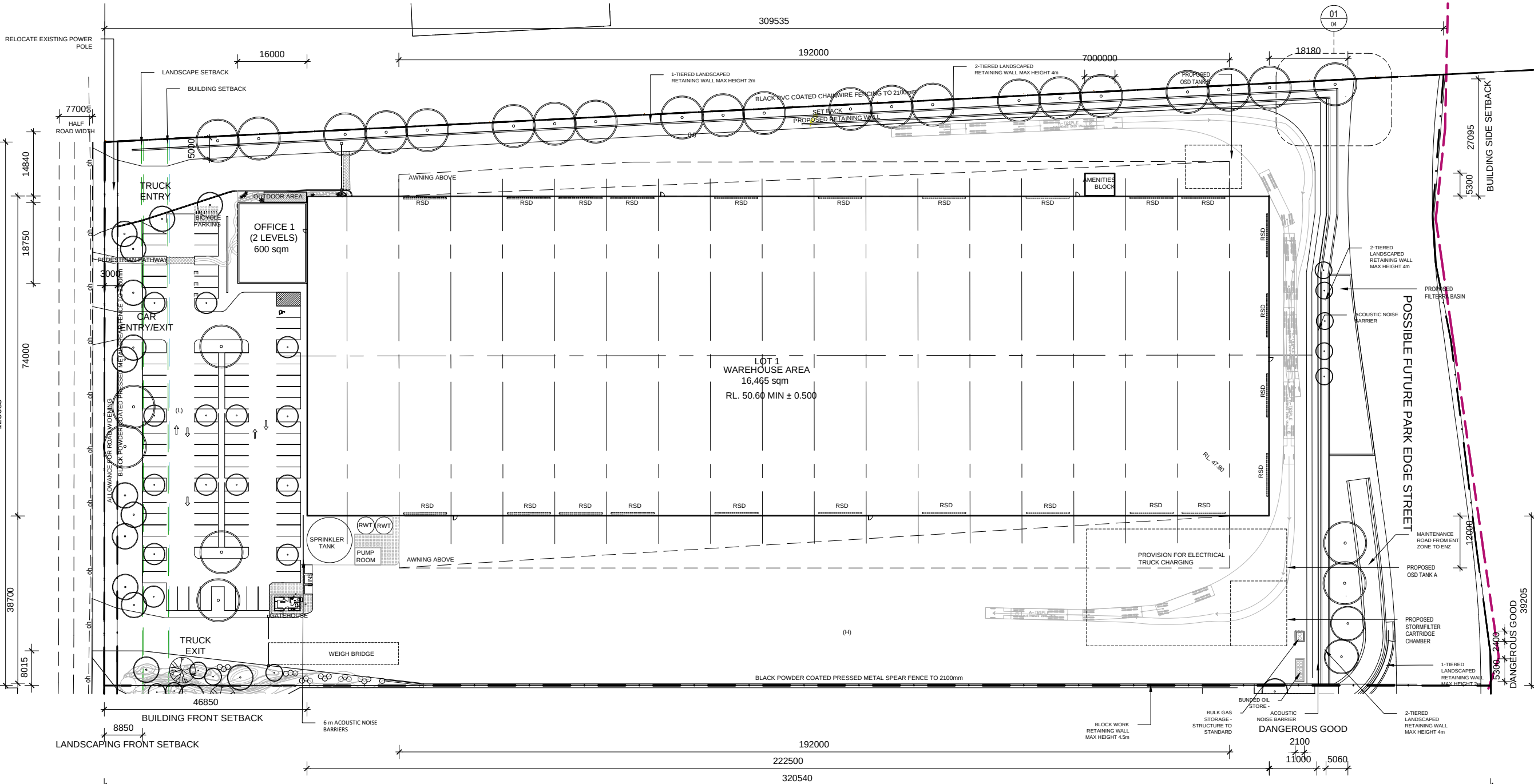
230 MARTIN ROAD
BADGERYS CREEK, NSW

DRAWING TITLE
PROPOSED SITE PLAN

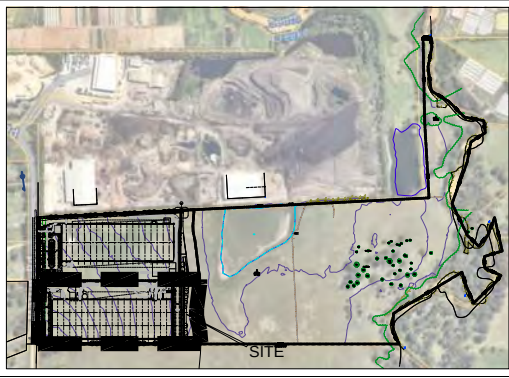
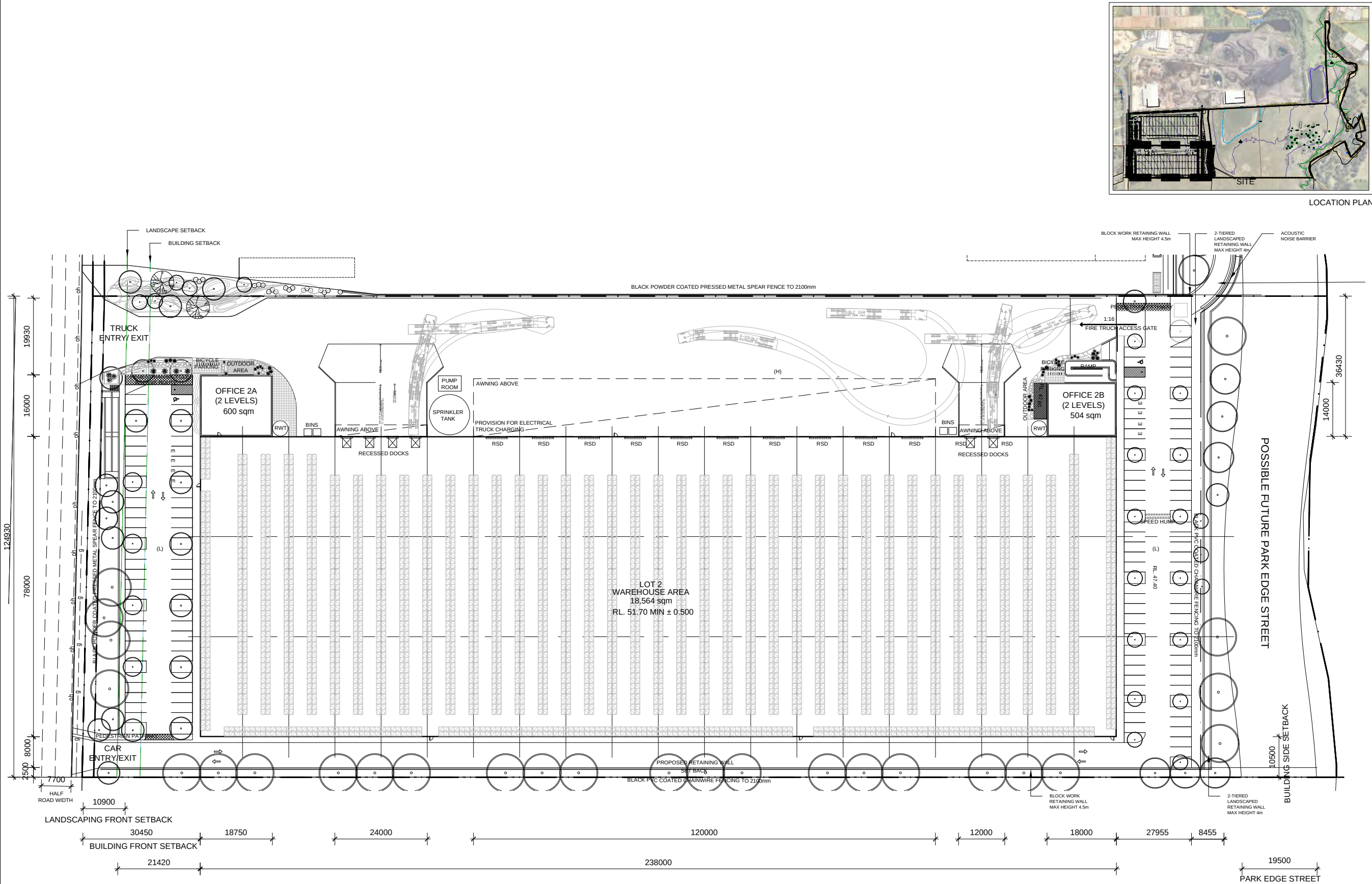


CREATE DATE : 21.04.2026 PLOT DATE : 22.01.2026
LAST SAVED BY: HAN XU

100471 DA06 004 L



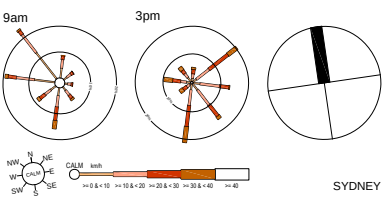
PLEASE NOTE: IN CERTAIN AREAS, LIGHT DUTY PAVEMENT IS PERMEABLE. FOR MORE DETAILED INFORMATION, PLEASE REFER TO THE LANDSCAPING PLAN



REVISIONS		
A	PRELIMINARY	14.09.23
B	REVISION - CAR PARK & LANDSCAPING	11.10.23
C	REVISION - CAR PARK & LANDSCAPING	19.10.23
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M	REVISION- UPDATED IN ACCORDANCE TO TRAFFIC & FIRE CONSULTANTS	22.01.26

DEVELOPMENT SUMMARY

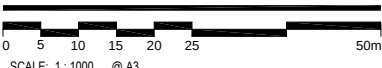
LOT 2	
SITE AREA SUBDIVISION	39,607 sqm
PARK EDGE STREET	2,445 sqm
WAREHOUSE AREA	18,564 sqm
OFFICE (2 LEVELS)	1,104 sqm
TOTAL BUILDING AREA	19,668 sqm
EFFICIENCY	49.66 %
AWNING (3m)	108 sqm
AWNING (15m)	1,800 sqm
CARPARKING PROVIDED	119 spaces
HEAVY DUTY PAVEMENT (H)	7,993 sqm
LIGHT DUTY PAVEMENT (L)	5,024 sqm
LANDSCAPING AREA	3,412 sqm
PARK EDGE STREET AREA	2,445 sqm



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ARBY 17867 | NSW ARB 10125 | BOAQ 5835
DEP0003111 | PDP0001062

PROJECT
METROLL & SPEC
230 MARTIN ROAD
BADGERYS CREEK, NSW

DRAWING TITLE
PROPOSED SPEC SITE PLAN



SCALE: 1: 1000 @ A3
CREATE DATE: 21.04.2026
LAST SAVED BY: HAN XU
PLOT DATE: 22.01.2026

100471 DA06 005 M

Appendix B

DEWATERING CALCULATIONS

Badgery's Creek Dewatering Assessment
EP3390.004
Preliminary Dewatering Calculations

Formula assuming plane flow and partially penetrating slots in an unconfined aquifer to estimate vertical extraction

$$Ro = 3000(H - h)\sqrt{K}$$

Equation 1 - Schardt's formula

$$rs = \sqrt{\frac{ab}{\pi}}$$

Equation 2 - equivalent radius

$$Q = \frac{\pi K (H^2 - h^2)}{LN \left(\frac{Ro}{rs} \right)}$$

Equation 3 - Dewatering

Where
Ro = radius of influence
rs = radius of the well system
H = saturated thickness of aquifer
h = saturated thickness after drawdown
K = hydraulic conductivity
Q = flowrate
a = length of excavation
b = width of excavation

Option A - No Sheet Piling

Parameter	Description	Amount	Unit
Depth of aquifer		42	[m AHD]
K =	Hydraulic conductivity	1.00E-04	[m/sec]
	RL of groundwater	48.50	[m AHD]
	Depth to groundwater		[mBGL]
POS	Factor of safety	1.5	-
	% re-infiltration	100	[%]

Source
Winniamatta upper aquifer 3-10 m average of 6.5 m thick
Based upon McNally (2004), between 10-3 and 10-5 m/s

Stage	Area	Average depth of base (m AHD)	Additional depth of excavation below base (m)	Depth of excavation (m AHD)	RL of Groundwater	Groundwater encountered?	Depth of dewatering below base (m AHD)	Dewatering target depth (m AHD)	a (m)	b	a/b	Method	Average natural surface level (m AHD)	H (m)	Saturated thickness at maximum drawdown (h _{ae}) (m)	k (m/sec)	No (m)	rs (m)	Q (m ³ /sec)	Q (m ³ /day)	Q (L/day)	Q (ML/day)	No. days	Dewatered Volume (ML)
Stage 1	Bulk Excavation - Wetland Area	45.250	-0.100	45.150	48.500	yes	-0.500	44.650	24	75	0.32	Rectangular	46.5	6.50	2.650	1.00E-04	116	24	0.0070318	608	607545	0.608	13	11.8471
Assumptions:																						TOTAL	11.85	

- 1 The aquifer is unconfined
- 2 The aquifer has an unlimited aerial extent
- 3 The aquifer is homogenous, isotropic and uniform thickness
- 4 The water table is horizontal prior to pumping
- 5 The aquifer is pumped at a constant pumping rate
- 6 The well only partially penetrates an estimated thickness of the aquifer
- 7 Assume r_e is calculated assuming a rectangular system
- 8 Assumes horizontal flow and no vertical component to flow
- 9 These calculations do not factor in the effects of shoring or sheet piling
- 10 Assumes that the base of the aquifer is level
- 12 Assumes steady state conditions
- 13 Assumes a 24 hour day of pumping
- 14 Proposed depth of excavation of 0.1 m below the sewer invert level to allow for bedding gravel.

Sum Total 11.85 (ML)

