Transport
for NSW

ZEB Macquarie Park Bus Depot

Review of Environmental Factors

May 2024

NSW GOVERNMENT

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Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which the ZEB Macquarie Park Bus Depot is proposed.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.

Approval and authorisation

Title	ZEB Macquarie Park Bus Depot – Review of Environmental Factors
Accepted on behalf of Transport for NSW by:	[redacted] – Senior Manager Environment and Sustainability
Signed	[redacted]
Date:	24 May 2024

Document review tracking

Draft No.	Date	Comments
v1	28/03/2024	First draft issue to Transport
v2	19/04/2024	Second issue to Transport
v3	21/05/2024	Final issue

Executive summary

The proposal

Transport for NSW (Transport) is proposing to build a new battery electric bus depot at 1A and 1B Talavera Road, Macquarie Park. The Macquarie Park Bus Depot (the proposal) will accommodate around 165 battery electric buses to support public transport services to the lower North Shore and Northwest suburbs of Sydney, stretching to Chatswood, Ryde and Paramatta. The proposal will be the first purpose built battery electric bus depot delivered as part of the Zero Emission Buses (ZEB) Program, a New South Wales (NSW) Government initiative to transition the State's 8,000 plus diesel and compressed natural gas buses, to zero emissions technology by 2047.

Key community benefits include:

- improved liveability in the area through reduced noise and air pollution from diesel and gas buses
- an improved passenger experience on board and at bus interchanges

Key features of the proposal include:

- building new facilities to support the future bus operations including:
  - a single-level underground staff and visitor car park accessed from Talavera Road
  - an administration office
  - a bus maintenance facility
  - a bus wash bay
- removal of an existing bike path connection between M2 Hills Motorway and Talavera Road
- up to 162 bus charging bays and maintenance bays
- one breakdown bay
- installation of gantries and charging structure
- installation of chargers for buses around the depot
- upgrading and widening of Pittwater Road to enable two-way bus access to and from the depot
- essential fire services
- installation of new dedicated walkways, security booths, fencing and lighting

Additional features of the proposal include:

- substantial earthwork including retaining walls to create a suitable level operating surface
- associated electrical infrastructure including power supply and switchgear
- drainage and flood storage provision, including culvert construction
- utilities adjustments
- temporary on-site ancillary facilities during construction

Construction is expected to commence early 2025 and would take around 18-24 months to complete.

Need for the proposal

The NSW Government is committed to achieving net zero emissions by 2050. The transport sector is a large contributor to emissions in NSW, of which Transport's bus operations are a significant component. Zero Emission Buses (ZEB) is a multi-billion dollar program to transition the state's 8,000 plus diesel and natural gas public transport buses to zero emissions technology. The ZEB Program is key to achieving the NSW's Government's targets of achieving 50 per cent carbon reduction by 2030 and net zero emissions by 2050.

The program will be delivered in stages to allow local industry time to prepare, and technology advancements to be assessed and adopted along the way. Starting with Greater Sydney Stage 1, Transport is proposing to convert 11 existing bus depots to zero emissions technology and a new battery electric bus depot built in Macquarie Park.

The ZEB Program will support the broader net zero target and deliver community, environmental, economic, and commercial benefits. The proposal is consistent with a number of strategic plans and policy documents including the NSW Government's Net Zero Plan Stage 1: 2020-2030, the Future Transport Strategy, the Transport Sustainability Plan 2021, and the Zero Emission Bus Transition Strategy 2021.

Proposal objectives

The proposal is part of the broader ZEB program, through which Transport will seek to deliver a range of benefits, skills and efficiencies while enabling investment into zero emissions technologies and paving the way for future mobility.

The key objectives of the broader ZEB program include:

- transition to net zero bus services and renewable energy sources in alignment with government policy
- increase liveability – reduction in bus noise and emissions, during operation, asset life & supply chain
- increase efficiencies in bus operations and maintenance
- improve fuel security and cost certainty
- increase mode shift to bus through improved passenger experience
- increase opportunities for local investment – (manufacturing, assembly, training and education).

The objective of this proposal is to provide a state-of-the-art facility to support the operation of a new battery electric bus fleet for use by both the current and future bus operators in collaboration with Transport and other stakeholders.

Options considered

The development processes for the proposal considered options for both the location of the depot and the layout.

Depot location

Transport began assessing feasible options for the location of the new depot. The key criteria for selecting the potential depot location are that it must be located within Transport-owned land in bus contract region 7 area, be of appropriate size to accommodate the required capacity requirements and be suitably located to ensure effective access and operational performance of the depot. The only option identified that met these criteria are land plots at 1A/1B Talavera Road at Macquarie Park. A Feasibility Assessment was undertaken which determined the suitability of the Macquarie Park site to accommodate a battery electric bus depot.

Depot layout

An initial depot layout was developed and considered in the Feasibility Assessment. This layout was then subject to an iterative optioneering process to ensure that it met all the development criteria.

The initial optioneering process for the concept design considered a number of layout options for the depot. From those identified, three layout options were developed, with varying proposed depot features. Following analysis of these three options at a workshop, a further nine iterative sub-options were produced to refine the depot layout and aim to achieve adherence with the development criteria.

Based on the outcome of the analysis undertaken during the optioneering process, the preferred option for the layout of the proposed depot was selected. The preferred option was developed and refined to ensure all development criteria were met, and the option taken forward to concept design. This depot layout forms the basis of this proposal.

Statutory and planning framework

The proposal is for the development of road infrastructure facilities and is to be carried out by or on behalf of Transport and can therefore be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)*. Development consent from City of Ryde Council is not required.

Transport is the determining authority for the proposal. This Review of Environmental Factors satisfies Transport's obligations under section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The proposal is not expected to result in impacts considered to be significant as defined by the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A referral to Australian Government Department of Climate Change, Energy, the Environment and Water under the EPBC Act is therefore not required.

Community and stakeholder consultation

Consultation with the community, government agency and stakeholders, and Aboriginal Elders has been undertaken during the development of the concept design, which has generally focused on input into the concept design and coordination with neighbours. Aboriginal community involvement has comprised a Walk on Country on-site with Aboriginal Elders.

Statutory consultation will be undertaken with City of Ryde Council and the State Emergency Services (SES) under the State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021.

Further detailed consultation is planned with workforce and other stakeholders as part of the design development process from this initial concept layout.

The proposal has the potential for some impacts on the community during construction, including construction noise and vibration, socio-economic and visual impacts. The REF will therefore be publicly displayed for comment in June 2024, during which time the community will be provided with the opportunity to make comment on the environmental impacts and mitigation measures for the proposal. Following the public display of the REF, all comments received will be recorded and addressed in a Submissions Report detailing how each issue raised would be considered in finalising the proposal design. The Submissions Report will be made available to the public on the project webpage on Transport's website.

Environmental impacts

The REF identifies comprehensive environmental management measures to avoid, manage, mitigate, and offset impacts during construction and operation of the proposal. These include best practice environmental planning, management techniques and urban design.

A summary of the main issues identified in the REF is outlined as follows. The majority of these impacts would occur during construction of the proposal and would be temporary. With effective implementation of the environmental management measures, most impacts would be minor or negligible.

The main environmental impacts of the proposal are:

Biodiversity

A Biodiversity Impact Assessment was undertaken for the proposal. Based on a worst-case estimate, the proposal would result in the clearance of about 2.2 hectares of vegetation within which an estimated 332 trees would be removed. Of these, 31 are hollow-bearing and suitable for occupation by fauna. To replace the loss of these trees, 1,140 trees are required to be replanted and 50 artificial hollows installed. Where this cannot be accommodated for locally [or only partially], Transport will be required to make payment into Transport's Conservation Fund, in line with the fund contributions outlined in Transport's *Tree and Hollow Replacement Guidelines EMF-BD-GD-0129* (Transport for NSW, 2023).

No threatened ecological communities, flora or fauna species listed, or currently being considered for listing, under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* or NSW *Biodiversity Conservation Act 2016* (BC Act) were identified. A precautionary approach was adopted to the potential presence of several threatened species (birds and bats) listed under the BC Act. The assessment concluded that the proposed work would not have a significant impact on the potentially occurring threatened birds or bats, or their habitat. Therefore, the matter does not require referral to the Federal Minister for the Environment as a controlled action, nor is the preparation of a Species Impact Statement (SIS) considered necessary.

Mitigation measures to reduce any ecological impact as a result of the proposal have been recommended including minimising impact through detailed design and adhering to Transport's *Biodiversity Management Guidelines*. Adoption of the mitigation measures set out in section 6.1 of this REF would ensure that the proposal is carried out in an ecologically sustainable manner.

An Arboricultural Impact Assessment (AIA) was undertaken to assess the impact on trees within the proposal boundary. A total of 281 trees were assessed as part of the work. The AIA identified that 179 trees would need to be removed to accommodate the proposal, and 96 trees would not be impacted by the proposal and could be retained. A further 5 trees would be subject to further investigation to determine whether they could be retained. Tree protection measures will be required during construction to protect retained trees from damage or harm.

It is noted that there is a discrepancy between the number of trees identified to be removed within the AIA and the BAR. This is likely due to differences in survey methods and assumptions made when surveying the site. Offsetting calculations and requirements will be undertaken in line with Transport's *tree and hollow replacement guideline* and confirmed based on the actual number of trees removed from the site. The BAR has assessed all vegetation within the proposal area to be removed, however the tree's marked for retention within the AIA will be retained.

Hydrology and flooding

The proposal is in the Lane Cove River catchment. Key receiving watercourses in the catchment include Porters Creek, a tributary of Lane Cove River. Porters Creek is located around 345 metres to the east of the proposal, and Lane Cove River around 535 metres to the east. Activities associated with the construction of the proposal may result in contaminated surface water run-off on-site, which, if discharged, could lead to degradation of the water quality in these downstream receiving watercourses. Surface water will be captured and treated on-site before being discharged, to ensure that water quality impacts are appropriately managed and minimised.

A hydrology and flooding assessment was carried out for proposal, and it was determined that the proposal is located in flood liable land. The concept design has been designed to effectively mitigate the risk of flooding, by including appropriate drainage and flood storage as part of the proposal. Additionally, it is proposed to put electrical equipment on plinths to ensure they are raised above flood levels, which will ensure the proposal is out of the flood risk zone. Flood risk has therefore been minimised for the proposal.

Soils and contamination

A Detailed Site Investigation (DSI) was undertaken for part of the proposal site, which identified potential sources of contamination on-site, particularly the presence of asbestos containing material within this area of the site. Contamination risks could lead to impacts on human health and ecological receptors within the vicinity of the proposal. Appropriate safeguards and management measures have been identified to remediate and minimise these contamination risks. A DSI for the remaining part of the site is currently being prepared.

Landscape character and visual impact

Landscape character and visual impacts would occur during the proposal's construction and operation.

Landscape character

During construction, the removal of trees and vegetation, along with the presence of construction plant, activities, workforce, construction traffic and temporary infrastructure will result in a change to the existing landscape character.

The operation of the proposal will result in a permanent change in landscape character, resulting from the change in land use from a partly used site to a fully operational bus depot, with new permanent infrastructure elements. The intensified land use associated with the operation of the depot will comprise increased traffic, which will impact the landscape character of the area.

Although the proposal will result in both temporary and permanent landscape character impacts, the proposal is consistent with the relevant NSW Government policies and strategies, including the Macquarie Park Innovation Precinct Place Strategy (August 2022), which sets out an ambition to diversify and create new employment.

Visual impacts

Key visual receptors were identified in the visual catchment area of the proposal. These included occupants of the neighbouring businesses, particularly those immediately to the west of the proposal, users of recreational spaces within the vicinity of the site, and motorists using the M2 Hills Motorway. Four viewpoints were selected to represent these views towards the proposal and assessed to determine the associated visual impacts.

During construction, visual impacts would primarily result from the removal of vegetation and trees required to construct the proposal, along with the introduction of construction traffic, plant and equipment, site compounds, stockpiles, and fencing/hoarding into views. The operation of the depot would result in a permanent change in view from certain locations surrounding the site. Where new permanent infrastructure elements associated with the depot are visible, this would result in permanent visual impacts during operation of the depot. Removal of vegetation and trees from within the site would

increase the visual exposure of the depot from some viewpoints. Temporary lighting during night-time construction work and permanent lighting associated with the operation of the depot at night may result in light spill.

Safeguards and management measures would be implemented to minimise landscape character and visual impacts. These are outlined in Section 6.6.

Traffic and transport

The proposal would generate additional traffic movements on the local road network, comprising construction traffic during construction, and bus and staff vehicle movements during operation.

The Traffic and Transport Assessment undertaken for the proposal identified that, with the implementation of the proposed traffic and transport solutions and mitigation measures outlined in Section 6.7.4, the existing transport network can accommodate the construction phase and operation of the depot.

Noise and vibration

Noise

The Noise and Vibration Impact Assessment (NVIA) assessed the predicted noise levels during construction and operation of the proposal, during standard daytime hours and night-time, at noise sensitive receivers including residential properties, commercial and industrial properties surrounding the proposal. A hotel located on the north side of Lane Cove Road was also assessed for construction impacts.

The proposed construction work is expected to have a minor impact on nearby residential properties only where activities are undertaken at night. It is anticipated that there may be potential noise impacts on the nearby commercial and industrial premises located to the west of the proposal. Given the proximity of these premises to the site, it is likely that they will experience some level of disturbance due to the construction activities.

The predicted noise levels indicate that compliance with the applicable noise criteria would be achieved during all time periods at all noise sensitive receiver locations identified. Noise mitigation measures have been recommended to reduce the construction noise impact at adjacent receivers.

Noise sources generated from the operation of the depot would generally be generated from buses entering and exiting the site, and key noise emitting plant and operations on-site. The predicted noise levels fall within acceptable noise limits during all time periods and therefore no additional mitigation measures are required.

Vibration

Construction activities associated with the construction of the proposal have the potential to result in exceedances of the vibration safe working distances at nearby industrial receivers. Compliance with construction vibration criteria can be achieved by adhering to the management measures presented in Section 6.8 of this REF.

Air quality

There may be some adverse air quality impacts during construction, resulting from dust generation and emissions from construction traffic, plant, and equipment. The operation of the depot may also result in localised air quality impacts associated with operations within the maintenance workshop, such as spray painting.

In the long-term the transition of the NSW public transport bus fleet to battery electric buses and net zero emissions technology will have a positive long-term impact on air quality.

Socio-economic

The closure of the bike path connecting the M2 Hills Motorway and Talavera Road may result in a minor adverse impact on social infrastructure in the vicinity of the proposal. Investigations into bike path usage and possible relocation opportunities would be explored. No other adverse socio-economic impacts were identified as a result of the proposal.

Greenhouse gas emissions

Transitioning the NSW public bus fleet from diesel and Compressed Natural Gas (CNG) to zero emissions technology, in conjunction with this proposal, will result in a permanent positive long-term impact due to reductions in operational greenhouse gas emissions, which will in turn provide public health and amenity benefits.

Justification and conclusion

The proposal is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined, and taken into account to the fullest extent possible, all environmental matters affecting or likely to be affected by the proposal.

This REF fulfils Transport's obligation under Section 5.5 of the EP&A Act to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The proposal would result in some adverse impacts to the environment, road users and the community, however, would also result in reductions in operational greenhouse gas emissions and air pollution, which would in turn provide public health and amenity benefits. The safeguards and mitigation measures provided in this REF would mitigate the adverse impacts.

The proposal is justified because it meets all the project objectives and development criteria. The proposal is consistent with a number of strategic plans and policy documents and has been developed to address the need to achieve future sustainable transport in NSW, and the NSW Government's net zero emissions targets, and it would result in long-term benefits which would outweigh the identified environmental impacts and risks associated with this proposal.

Display of the review of environmental factors

This REF is on display for comment between 3 June and 24 June 2024. You can access the documents in the following ways:

Internet

The documents are available as pdf files on the Transport for NSW website at https://www.transport.nsw.gov.au/macpark-depot

Printed copies

The documents can be viewed at the following location:

- Ryde City Council Customer Service Centre at 1 Pope Street, Ryde NSW 2112.

How can I make a submission?

To make a submission about this proposal, please use on of the following methods:

1. Complete the survey at https://www.yoursay.transport.nsw.gov.au/macpark-depot
2. Email: projects@transport.nsw.gov.au
3. Phone: 1800 684 490
4. In person at one of our upcoming information sessions
5. Mail: Transport for NSW Senior Manager Environment & Sustainability, Zero Emission Buses Program, PO Box K659, Haymarket NSW 1240

Submissions must be received by 5pm, 24 June 2024. Submissions will be managed in accordance with the *Transport for NSW Privacy Statement*. A copy can be made available upon request.

What happens next?

Transport will collate and consider the submissions received during public display of the REF.

After this consideration, Transport will determine whether or not the proposal should proceed as proposed and will inform the community and stakeholders of this decision.

If the proposal is determined to proceed, Transport will continue to update the community and stakeholders prior to and during construction.

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1. Introduction

This chapter introduces the proposal and provides context for the environmental assessment. In introducing the proposal, the objectives and project development history are detailed, and the purpose of the report provided.

1.1 Proposal identification

Transport for NSW (Transport) is proposing to build a new battery electric bus depot at 1A and 1B Talavera Road, Macquarie Park. The ZEB Macquarie Park Bus Depot (the proposal) will accommodate around 165 battery electric buses to support public transport services to the lower North Shore and Northwest suburbs of Sydney, stretching to Chatswood, Ryde and Paramatta. The Proposal will be the first purpose built battery electric bus depot delivered as part of the Zero Emission Buses Program, a NSW Government initiative to transition the State's 8000 plus diesel and compressed natural gas buses, to zero emissions technology by 2047.

Key community benefits include:

- improved liveability in the area through reduced noise and air pollution from diesel and gas buses
- an improved passenger experience on board and at bus interchanges.

Key features of the proposal include:

- building new facilities to support the future bus operations including:
  - a single-level underground staff and visitor car park accessed from Talavera Road
  - a multi-level administration office
  - a bus maintenance facility
  - a bus wash bay
- removal of an existing bike path connection between the M2 Hills Motorway and Talavera Road
- up to 162 bus charging bays and maintenance bays
- one breakdown bay
- installation of gantries and charging structure
- installation of chargers for buses around the depot
- upgrading and widening of Pittwater Road to enable two-way bus access to and from the depot
- essential fire services
- installation of new dedicated walkways, security booths, fencing and lighting.

Additional features of the proposal include:

- retaining walls
- associated electrical infrastructure including power supply and switchgear
- drainage and flood storage provision
- utilities adjustments
- temporary on-site ancillary facilities during construction.

The proposal is located on land zoned as SP2 Infrastructure and E3 Productivity Support, under the *Ryde Local Environment Plan 2014* (LEP).

The proposal is located on a parcel of surplus land owned by Transport, which has been used consistently by construction projects in the past as compound and laydown areas. The northern portion of the site is currently being used as a laydown area by Transport's Easing Sydney's Congestion Program. The southern portion of the proposal is currently disused, however was previously utilised as a laydown yard for construction materials and construction waste (liquid and solid).

The site comprises a mix of vegetated and cleared areas. Vegetated areas are scattered in and around the boundaries of the proposal and an ephemeral stream flows in an easterly direction across the proposal.

The sloping site is bounded to the east by the M2 Hills Motorway, a 21-kilometre road linking Sydney's lower north shore and northwest regions, connecting with Westlink M7 and the Lane Cove Tunnel. Beyond the motorway, to the east, lies the boundary of Lane Cove National Park.

Various commercial and industrial spaces surround the proposal, including the Cleanaway Ryde Resource Recovery Centre, to the east, and existing commercial developments to the west and south. The closest residential properties are to the northeast of the proposal.

The location of the proposal is shown in Figure 1-1 and an overview of the proposal is provided in Figure 1-2. Chapter 3 describes the proposal in more detail.

Figure 1-1: Location of the proposal

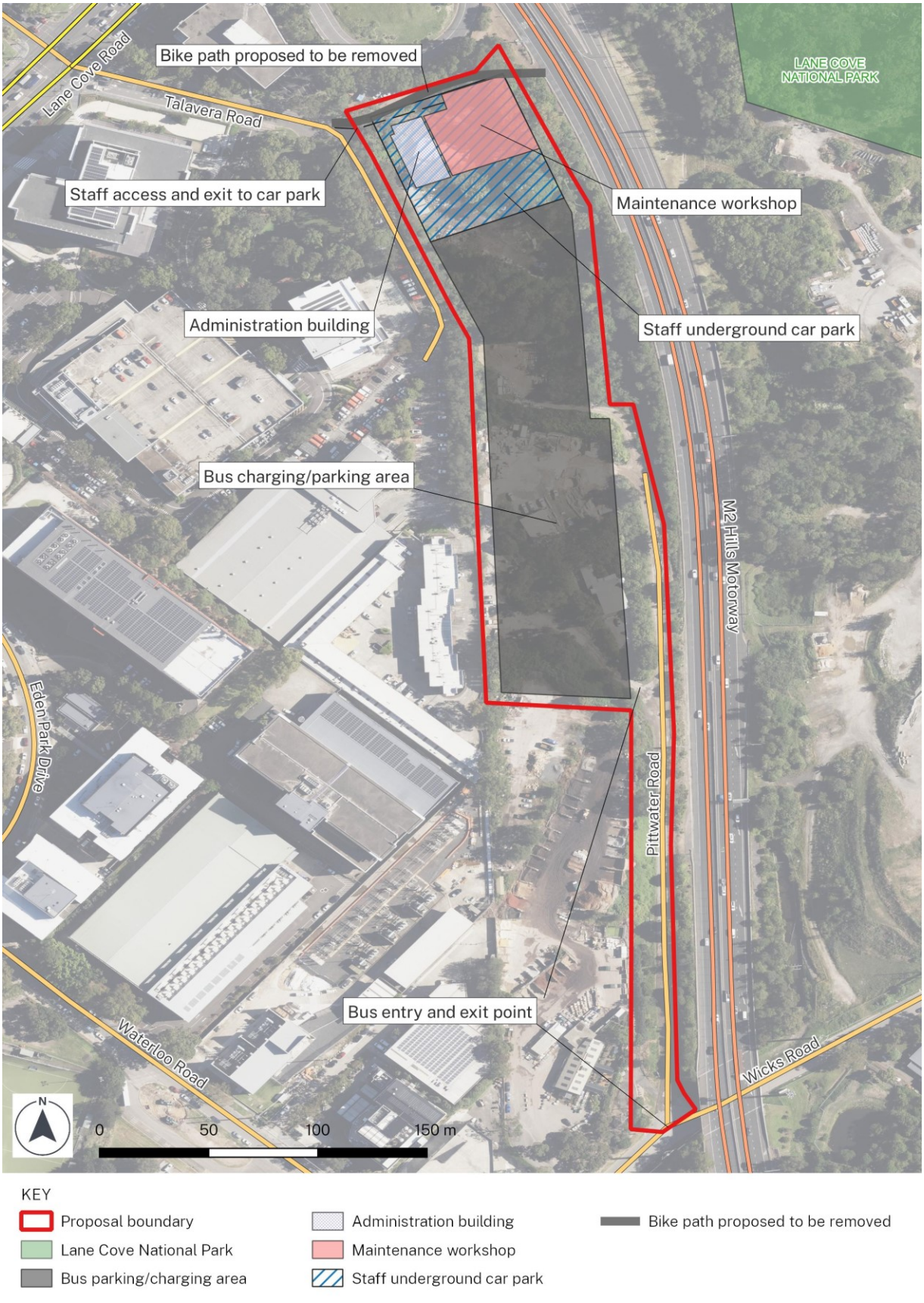


Figure 1-2: The proposal – indicative only, subject to detailed design

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by AtkinsRéalis on behalf of Transport. For the purposes of these works, Transport is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act).

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of section 171 of the Environmental Planning and Assessment Regulation 2021, the factors in *Guidelines for Division 5.1 assessments (DPE 2022)*, *Roads and Related Facilities EIS Guideline* (Department of Urban Affairs and Planning (DUAP), 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of:

- Section 5.5 of the EP&A Act including that Transport examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval sought from the Minister for Planning under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The significance of any impact on nationally-listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and if offsets are required and able to be secured.
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Department of Climate Change, Energy, the Environment and Water for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

The NSW Government is committed to achieving net zero emissions by 2050. The transport sector is a large contributor to emissions in NSW, of which Transport's bus operations are a significant component.

Transport's transition to zero emissions technology is key to achieving NSW Government targets of a 50 per cent carbon reduction by 2030 and net zero emissions by 2050.

The *Zero Emission Bus Transition Strategy* (Transport for NSW, 2021) outlines Transport's commitment to tackling a net zero transport system, by setting out a pathway to the transition of the entire 8,000 plus public transport bus fleet to zero emissions technology.

In June 2022, the NSW Government announced the ZEB Program outlining the rollout plan for battery electric buses across NSW. The ZEB program will see Sydney public buses fully transitioned to zero emissions technology by 2035, followed by Outer Metropolitan regions in 2040, and Regional NSW in 2047. The first stage of the transition has already commenced and will introduce 1,200 new battery electric buses for Greater Sydney passengers by 2028. Along with planned new battery electric buses and those already in service, there will be around 1,700 battery electric buses expected to be operating on Sydney roads by the end of 2028.

To achieve the first stage of the transition, 11 existing bus depots will be converted to support zero emissions technology and the new battery electric bus fleet. However, the installation of zero emissions technology infrastructure within the depots will lead to a loss of depot parking capacity. To maintain the required bus depot capacity, a new purpose-built battery electric bus depot will be required, which forms this proposal.

The transition to a net zero emissions NSW bus fleet will support the broader net zero target and deliver community, environmental, economic, and commercial benefits. The transition to battery electric buses will realise several direct outcomes including:

- environmental and health benefits from reduced emissions and improved air quality
- economic benefits from a boost to the NSW economy, jobs and regional industry development
- lower noise pollution, especially in high transit urban areas
- skills growth in emerging technology research and development, manufacturing and deployment
- improved urban amenity around bus depots and transport corridors
- improve efficiency and safety on roads by integrating smarter technology for bus operations
- greater financial sustainability from lower operating costs compared to diesel buses.

2.1.1 NSW Government policies and strategies

Table 2-1 identifies key NSW government policies and strategies applicable to the proposal. Further details of the application of NSW Government policies and strategies are discussed in Chapter 4.

Table 2-1: Key NSW Government policies and strategies applicable to the proposal

Strategy	Overview	Alignment
Net Zero Plan Stage 1: 2020-2030 (NSW Department of Planning, Industry and Environment, 2020)	The plan is the foundation for NSW's action on climate change and goal to reach net zero emissions by 2050. It outlines the NSW's Government's plan to protect the State's future by growing the economy, creating jobs, and reducing emissions over the next decade. The plan outlines a mandate and pathway to	Priority 4 of the plan is focused on ensuring the NSW Government leads by example. The NSW Government will build on its commitments and ambitions under the Government Resource Efficiency Policy (GREP) by replacing Sydney's public transport

Strategy	Overview	Alignment
	net zero emissions, to deliver a 70 per cent cut in emissions by 2035 compared to 2005 levels.	bus fleet with battery electric buses. This proposal directly supports this commitment by providing the infrastructure to accommodate the transition to battery electric buses.
Zero Emission Bus Transition Strategy 2021 (Transport for NSW, 2021)	The Transition Strategy outlines NSW Government's commitment to reaching net zero greenhouse gas emissions by 2050 and acknowledges that achieving net zero public transport emissions is an essential part of the agenda. The strategy sets out a pathway to transition NSW's fleet of diesel and compressed natural gas (CNG) powered buses to zero emissions technology as part of the NSW Government and Transport's commitment to transition the transport sector to net zero GHG emissions by 2050.	The proposal aligns to the Transition Strategy by providing the infrastructure required to facilitate the transition to a public transport fleet of battery electric buses, which in turn will contribute towards reaching net zero emissions by 2050.
Future Transport Strategy (Transport for NSW, 2022)	The Future Transport Strategy sets out Transport's direction for continuing to improve every part of the transport system for the benefit of customers, the community, and the economy. It outlines Transport's vision for safe, healthy, sustainable, accessible, and integrated passenger and freight journeys in NSW. Strategic direction P3 set outs Transport's commitment to achieving net zero emissions and support the NSW Government target of 50 per cent emissions reduction by 2030 and net zero emissions by 2050. The strategy states that Zero emission buses are a key part of transitioning to net zero emissions from Transport's fleet.	The proposal is aligned with the Strategy's vision, as it supports the move towards net zero greenhouse gas emissions, including enabling the uptake of new battery-electric buses. The proposal contributes towards the electrification of the NSW bus fleet, aligning specifically with strategic direction P3.1, which aims to achieve net zero emissions from operations and fleet by 2035.
Future Energy Strategy (Transport for NSW, October 2020)	Future Energy Strategy forms part of the Future Transport Strategy and outlines Transport's commitment to securing transport energy needs from sustainable sources and supports the transport sector's transition to net zero emissions by 2050, in line with the objectives of the NSW Government's climate change policy framework.	The installation of on-site EV charging stations as part of the proposal would align with Future Energy Strategy and Transport's commitment to secure transport energy needs from sustainable sources and supports the transition of the transport sector to net zero emissions by 2050.
Beyond the Pavement 2020 (Transport for NSW Centre for Urban Design, 2020)	Beyond the Pavement provides guidance on urban design approaches and lays out the design principles, methods, values, and broad objectives for projects. The urban design guidance and principles set out are to be integrated into Transport's infrastructure projects to help deliver 'high quality transport infrastructure'.	The detailed design of the proposal will be undertaken in alignment with the nine urban design principles included in Beyond the Pavement.
State Infrastructure Strategy 2022-2042 – Staying Ahead (Infrastructure NSW, May 2022)	The State Infrastructure Strategy 2022-2042 (SIS) sets the strategic vision for infrastructure in Greater Sydney over the next 20 years. The SIS outlines Infrastructure NSW's objectives and recommendations for priority transport infrastructure projects and initiatives for Sydney and NSW to 2042, to ensure the transport system creates opportunities for people and businesses to access the services and support they need. Chapter 6 focuses on achieving an orderly and efficient transition to net zero, outlining the NSW Government's plans to decarbonise the transport sector, including transitioning NSW's public bus fleet to zero emissions technology.	The proposal aligns with the strategy's plan by facilitating zero emissions technology, which will contribute to the decarbonisation of the transport sector.

Strategy	Overview	Alignment
NSW Electric Vehicle Strategy 2021 (State of NSW, 2021)	The strategy details NSW's Government's plan to accelerate the State's vehicle fleet of the future. Action 4 of the Strategy sets out the commitment to maximising the employment and economic benefits from increasing the uptake of EVs in the State. As part of this action, the NSW Government will drive a skills and training agenda for the EV industry. In conjunction with this, specialised training will be provided to support the introduction of electric buses in NSW. This will involve short courses to help mechanics upskill in EV technologies. The strategy also refers directly to the commitment to transitioning the State's 8000 buses to zero emissions technology.	The commitment of the strategy to upskill mechanics in EV technologies will support the introduction of battery electric buses and ensure the continued effective operation of the battery electric bus fleet, which will benefit the operational stage of the proposal.
Future Transport Technology Roadmap 2021 – 2024 (Transport for New South Wales, March 2021)	The Technology Roadmap is NSW's headline transport technology strategy. It outlines six priority programs to transform passengers' transport experience, including rapid transition to battery electric buses and EV to help NSW reach net zero emissions by 2050. A key goal of this priority program is to transition NSW's bus fleet to battery electric buses.	The transition of NSW's public bus fleet to battery electric buses can help enable or accelerate many elements of the Roadmap and form the foundation for more sustainable and connected buses, including emerging modes (electric and hydrogen) using intelligent systems, intelligent sensors, and real-time digital twins. The proposal facilitates the installation of infrastructure required to support the transition to battery electric buses, which is aligned with the Roadmap's Future technology programs for NSW and the commitment to deliver zero-emissions buses.
Greater Sydney Services and Infrastructure Plan (Transport for NSW, March 2018)	The Greater Sydney Services and Infrastructure Plan builds on the state-wide transport outcomes identified in the Future Transport Strategy and outlines the economic, social and environmental benefits which passengers can expect from the transport system in Greater Sydney. The Plan establishes specific customer outcomes for the movement of people and freight in Greater Sydney and identifies the policy, service and infrastructure initiatives to achieve these. Customer Outcome 12 is "*A resilient transport system that contributes to the NSW Government's objectives of net-zero emissions by 2050.*"	The proposal would assist in achieving Customer Outcome 12 by providing a new battery electric bus depot, which facilitates the transition towards a system that contributes towards the NSW Government's net zero emissions objective.
NSW Clean Air Strategy 2021 – 2030 (State of NSW and Department of Planning and Environment, February 2022)	The NSW Clean Air Strategy 2021 -2030 presents the NSW Government's approach to improving air quality and protecting communities. The strategy sets out five priority action areas to mitigate community exposure to poor air quality. The main priority area relevant to this proposal is cleaner transport, engines, and fuels.	The proposal would contribute to cleaner transport, engines, and fuels priority area, by providing the infrastructure required to effectively operate battery electric buses, which would further reduce air emissions and impacts from vehicles, fuels, and non-road diesel sources.
Transport Sustainability Plan 2021 (Transport for NSW, 2021)	One of the main sustainability focus areas in the Transport Sustainability Plan 2021 is to respond to climate change, with a goal of achieving net zero emissions from their operations and fleet by 2035.	The proposal aligns with this plan as the transition to battery electric buses will help contribute towards achieving net zero emissions from

Strategy	Overview	Alignment
	The plan commits to reducing up to 90 per cent of carbon emissions from public transport operations by transitioning the NSW Bus Fleet to Zero Emission Buses powered by net zero energy.	operations and fleet by 2035. The proposed new bus depot will accommodate the battery electric bus fleet and provide the EV chargers required to power the buses.
Greater Sydney Region Plan: A Metropolis of Three Cities (Greater Sydney Commission, 2018)	The Greater Sydney Region Plan: A Metropolis of Three Cities sets out the Greater Sydney Commission's vision for Sydney to 2056. The plan divides the Sydney Metropolitan Area into three cities: Western Parkland City, Central River City and Eastern Harbour City. It provides directions, metrics, and objectives to achieve the vision for Sydney 2056. The suburb of Macquarie Park falls within the North District of the Eastern Harbour City. It also forms the northern end of the Eastern Economic Corridor, which extends to Sydney Airport. The plan also identifies Macquarie Park as an Urban Renewal Area.	This proposal supports the initiatives in the Greater Sydney Region Plan by improving public transport efficiency and connectivity between Sydney's local centres.
North District Plan (Greater Sydney Commission, 2018)	The North District Plan is a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision of Greater Sydney. It is a guide for implementing the Greater Sydney Region Plan – A Metropolis of Three Cities (Greater Sydney Commission, 2018), at a district level and is a bridge between regional and local planning. Planning Priority N21 is focused on reducing carbon emissions and managing energy, water and waste efficiently. Objective 33 under this priority aims to achieve a low-carbon city which contributes to net zero emissions by 2050 and mitigates climate change.	The proposal supports Objective 33 under Planning Priority N21 of the plan. The proposal will support the transition to zero emissions technology, which will help to reduce carbon emissions in the North District and contribute towards achieving net zero emissions by 2050.
Planning Ryde Local Strategic Planning Statement 2020 (City of Ryde Council, 2020)	The Planning Ryde Local Strategic Planning Statement 2020 (Ryde LSPS) brings together existing relevant adopted Council studies, documents, plans and policies to guide future development in the City of Ryde LGA. The priorities and actions detailed in the plan build on the Greater Sydney Commission's A Metropolis of Three Cities and the North District Plan. The LSPS sets a land use planning vision for Ryde and specifies related planning priorities and actions. Section 5.2.4 in Part 5 (Sustainability) sets out a target of net zero carbon emissions across the City of Ryde by 2050 (carbon neutral). Action E3.5 under Planning Priority E3 supports the transition to low emission transport.	The proposal would help to achieve Planning Priority E3 through the transition of the public transport bus fleet in the Ryde LGA to zero emissions technology, thereby reducing carbon emissions.
Macquarie Park Innovation Precinct Place Strategy (NSW Department of Planning and Environment, 2022)	The Macquarie Park Place Strategy is a 20-year masterplan to oversee the transformation of Macquarie Park into a world-leading innovation district. The Strategy aims to prioritise the pursuit of talent and technology to create diverse economic and employment opportunities to drive the transformation of Macquarie Park into an innovation precinct.	The proposal will result in economic and employment opportunities, which is consistent with the strategy's ambition to diversify and create new employment. The proposal aligns with the strategic vision of Action 5.6 of the Strategy through the introduction of battery electric buses in Macquarie Park.

Strategy	Overview	Alignment
	Action 5.6 of the Strategy aims to contribute to the goal of net zero emissions by 2050 across the Macquarie Park Corridor.	
Waterloo Road Active Street Master Plan (Hassell, 2020)	The Waterloo Road Active Street Master Plan establishes a clear master plan framework for the transformation of Waterloo Road from a 'movement corridor' into a 'vibrant street', prioritising active transport as an alternative to private vehicles and alleviating traffic congestion. A key objective of the masterplan is to encourage the use of public transport and reduce car dependency (and congestion). The plan also recognises improved liveability as providing a future competitive advantage for Sydney.	The proposal aligns with the key objective, by aiming to provide the community with an improved passenger experience on board and at bus interchanges, which could encourage the use of public transport. The proposal also aims to achieve improved liveability in the area through reduced noise and air pollution from diesel and gas buses, which aligns with the master plan for buses operating along Waterloo Road.

2.2 Limitations of existing infrastructure

Limitations of the existing infrastructure include:

- once the existing depots are converted to support battery electric buses, there will be insufficient bus parking capacity, and therefore limited future growth capability
- the transition is likely to require upgrades to the electricity grid, due to capacity constraints and the necessary levels of power required to support zero emissions technology
- the current fleet of primarily diesel buses release harmful emissions into the atmosphere which is detrimental to the environment. Continuing with the use of diesel buses in NSW will not fulfil the NSW Government's objective of net zero emissions by 2050.

2.3 Proposal objectives and development criteria

The proposal is part of the broader ZEB program, through which Transport will seek to deliver a range of benefits, skills and efficiencies while enabling investment into zero emissions technologies and paving the way for future mobility.

2.3.1 Proposal objectives

The key objectives of the broader ZEB program include:

- transition to net zero bus services and renewable energy sources in alignment with government policy
- increase liveability – reduction in bus noise and emissions, during operation, asset life and supply chain
- increase efficiencies in bus operations and maintenance
- improve fuel security and cost certainty
- increase mode shift to bus through improved passenger experience
- increase opportunities for local investment – (manufacturing, assembly, training, and education).

The objective of this proposal is to provide a state-of-the-art facility to support the operation of a new battery electric bus fleet for use by both the current and future bus operators in collaboration with Transport and other stakeholders.

2.3.2 Development criteria

The development criteria for the proposal include:

1. New battery electric bus depot to be located within Transport or Government-owned land

2. Located within the bus contract region 7 area
3. Depot capacity required to accommodate charging/parking bays for 126 standard buses and 22 articulated buses, 14 maintenance bays, a bus wash facility, associated maintenance, security, administration and staff parking spaces
4. Adequate operational performance of the depot
5. Suitable access and egress of buses, vehicles, and people (staff, contractors/original equipment manufacturers, and visitors)
6. Ability to include appropriate charging typology and associated electrical infrastructure.

2.3.3 Urban design vision and objectives

The Zero Emission Bus Depots Urban Design Framework (Transport for NSW, 2022) has been established for the broader ZEB program to ensure optimum sustainable outcomes are delivered for the proposal. The Framework encourages urban design to be undertaken collaboratively and considered at the onset, and continued through development, implementation and delivery. The Framework provides guidance on some of the potential considerations and opportunities to be incorporated in the battery electric bus depots to improve amenity for the public and bus operators.

A proposal-specific Urban Design Report (Taylor Brammer Landscape Architects Pty Ltd, 2024) has been prepared which details the urban design vision and principles of the proposal, in alignment with the Urban Design Framework.

Urban design vision

The urban design vision for the proposal is a sophisticated, environmentally and culturally sustainable outcome for generations to come.

The design will integrate leading design and environmental initiatives to respect Country, maximise the wellbeing of staff in rest, shift and break areas and regenerate Country using a wholly native and sustainable planting outcome. This strategy will grow the vegetation canopy to the maximum extent when balanced with the operational outcomes of this important site.

Retaining and other boundary transitions will be investigated to include opportunities for interpretive and immersive artistic opportunities. For the benefit of users, neighbours, and the general public where possible.

The location of the buildings within the proposal will be complementary to the established streetscape character in terms of setback and vegetated setting and appropriately scaled when considering existing buildings in Talavera Road. This scale, location and treed setting will provide a suitable urban design and streetscape amenity for the development and area broadly.

Urban design principles

The following urban design principles have been used to develop the design of the proposal. The principles and design outcomes are outlined as follows:

- Country-centred
  - Engagement with Elders in an ongoing manner through design, construction. and operational lifecycle.
  - Maximise view opportunities to natural landforms beyond the proposal
  - Creation of sympathetic design outcomes through the use of natural materials and natural colours and tones.
  - Integration of public art within architecture
  - Use of wholly native planting proposal
  - Repurposing existing found materials in the proposal for seating, screening, and timber work
- Responsive to place and context
  - Maximise existing tree retention to boundary interfaces
  - Investigate further planting in M2 Hills Motorway boundary interfaces
  - Limit bus movements to Wicks Road to maximise pedestrian amenity to administration building and Talavera Road edges

  - Co-locate proposed building to urban edges
  - Utilise existing pedestrian/vehicle access point on Talavera Road
- A connected and comfortable workplace
  - Maximise view opportunities to natural landforms beyond the proposal
  - Extend existing shared path from 5 Talavera Road into the proposal
  - Create various outdoor environments for staff and visitors to cater for various sized gatherings and passive activities
- Efficient, safe and secure
  - Provide separated and dedicated pedestrian path through bus parking areas with shade and amenity.
  - Integrate public art into edge treatment for visual interest and cultural awareness
  - Consider access control measures at site access points
- Adaptable, sustainable and resilient
- Integrated, upgraded and diverse
  - Recycle existing materials on-site for future amenity use
  - Integrate green roof infrastructure and urban greening across the proposal
  - Integrate light colour pavements of permeable nature in open areas
  - Integrate shade tree planting throughout open areas
  - Manage stormwater through water sensitive urban design (WSUD) areas

These principles have, in general, been captured during the development of the concept design and will continue to be developed and integrated into the detailed design of the proposal.

2.4 Alternatives and options considered

Options for transitioning to zero emissions technology were developed as part of the business case for the proposal. The development of the proposal involved an iterative method of investigation, identification, evaluation, and refinement, as detailed in this section.

An Options Memo was prepared on 9 November 2023, detailing the options that have been considered for the layout and design of the proposed battery electric bus depot.

2.4.1 Methodology for selection of preferred option

To achieve the transition to battery electric buses, a new depot facility is required. Therefore, the first stage of the optioneering process was to identify feasible options for the location of the new depot.

This commenced with assessing the existing depot space and calculating the expected overflow of buses resulting from the introduction of battery electric charging infrastructure, to determine the number of displaced bus parking spaces required. Potential areas of land for the depot were then identified based on the displaced capacity requirements, along with the ability to meet other development criteria, set out in Section 2.3.2.

Following the identification of a potentially suitable depot location, an initial depot layout was prepared. This layout was then the subject of a more detailed feasibility assessment involving further analysis to determine its overall suitability for a new battery electric bus depot. The results of the feasibility assessment are reported in the *Macquarie Park Greenfield Depot Feasibility Assessment* (WSP Australia, April 2022) ('Feasibility Assessment').

Once the Feasibility Assessment determined that the location was a viable option, an iterative optioneering process was undertaken to further develop the depot layout to ensure that it met all the development criteria set out in Section 2.3.2. The options development process commenced in September 2023. Regular input from Transport and the bus operator was provided throughout the optioneering process, to achieve acceptance on the design approach and depot layout design.

Depot layout design options were identified through an integrated design-led approach and an Options Workshop was held on 6 October 2023. During the workshop, the identified layout options were analysed, and an iterative process was subsequently undertaken to develop refined sub-options, which aimed to meet all the development criteria.

The outcome of the optioneering process was the selection a final preferred layout option that met all the development criteria, which formed the basis of the concept design.

2.4.2 Identified options

The project objectives, outlined in Section 2.3.1, identify the need to transition NSW's public bus fleet to zero emissions technology, to contribute towards achieving net zero emissions by 2050. A 'do nothing' approach would not be able to accommodate the transition to zero emissions technology and therefore would not be in line with the proposal objectives. A 'do nothing' approach was therefore discounted at the outset of the optioneering process.

Depot location

A number of options were considered for the new depot location including:

- locations of vacant land
- over-depot development, such as multi-storey commercial or residential building
- procurement of private land.

The key criteria for selecting the potential depot location are that it must be located within Transport-owned land in bus contract region 7 area, be of appropriate size to accommodate the required capacity requirements and be suitably located to ensure effective access and operational performance of the depot.

Based on this, the only option identified that meets these criteria are land plots at 1A/1B Talavera Road at Macquarie Park. There were no other potential depot locations that met all the criteria.

The analysis for the location of the depot is provided in Section 2.4.3.

2.4.3 Analysis of options

Depot location

As discussed in Section 2.4.1, a Feasibility Assessment was undertaken to determine the suitability of the Macquarie Park site for a battery electric bus depot, and to ensure the development criteria, set out in Section 2.3.2, could be achieved in this location.

In relation to development criteria 1, the Macquarie Park location is within Transport-owned land and therefore complies with this criterion. The alternative option of procuring private land to accommodate the new battery electric bus depot would not result in the proposal being located in Transport-owned land and therefore not fulfill development criteria 1. The alternative option was consequently not considered further.

Bus services in the Greater Sydney Metropolitan area are divided into fifteen bus contract regions. Development criteria 2 requires the new depot to be in bus contract region 7, which covers part of the lower North Shore and North West suburbs, stretching to Ryde and Parramatta. The 453 buses allocated to bus contract region 7 are currently housed at Ryde depot and Willoughby depot. The conversion of these existing depots to suit the operation of battery electric buses will result in a loss of depot parking capacity at both Ryde and Willoughby. Additionally, these depots are operating in a constrained manner and reallocation of buses will provide an overall benefit. The shortfall in capacity is required to be replaced within the same bus contract region. The proposed depot location at Macquarie Park is within bus contract region 7.

Development criteria 3 sets out the depot capacity requirements. The available land plots at Macquarie Park would be of sufficient size to accommodate the minimum requirement of 165 charging/parking bays, maintenance facilities, breakdown bay, bus wash facility and associated administration, staff parking and security requirements.

To determine compliance with development criteria 4, a detailed analysis of the operational performance of the identified depot location at Macquarie Park was undertaken and reported in the *Zero Emissions Buses Greater Sydney Tranche 1 Final Business Case Region 7 Greenfield Depot Operations Report* (NSW Government, May 2022) ('Operations Report'). The analysis included data validation and cleaning, power modelling and detailed modelling to determine the operational suitability of the proposed depot location. The analysis considered the following factors:

- Proximity to Macquarie Park Station, which is well located to provide support for emergency line closures

- Number of bus services that currently operate through Macquarie Park
- Operational performance of the depot
- Complex trade-offs with respect to the selection of charging infrastructure, including optimal charging rates, Ideal ratios of buses to chargers and emergency charging types.

The outcome of the analysis was that the proposed depot location at Macquarie Park is strategically located near multiple bus interchanges and termini, with many services starting and ending near the site. It was deemed that bus services would benefit from using this site for overnight parking and charging instead of their currently allocated depot. Overall, the Operations Report concluded that changing the route termini to Macquarie Park would result in a more efficient operational performance than the current bus schedule.

In relation to development criteria 5, route accessibility was considered as part of the Feasibility Assessment. The site was identified to have suitable access and egress points from Talavera Road and Pittwater Road, which could accommodate heavy and light vehicles required during the operation of the depot, which aligns with development criteria 5.

To achieve development criteria 6, charging infrastructure requirements were considered in the Operations Report, which included the analysis of vehicle arrival and departure patterns to identify charging patterns, reviewing charger ratings and the potential impact on the peak demand, charging optimisation and assessment of potential solutions.

A preliminary maximum demand assessment was conducted to identify the power consumption requirements of the proposed depot. Consultation was undertaken with Ausgrid to determine whether the identified power demand could be suitably met. Whilst Ausgrid indicated the need for a new dedicated 11kV feeder, a suitable connection with adequate capacity was identified at Ausgrid's Macquarie Zone Substation ZN800, near to the proposal, which fulfils development criteria 6.

Overall, the results of the Feasibility Assessment indicated that there is nothing specifically precluding the Macquarie Park site being repurposed as a new battery electric depot.

Further analysis identified that the Macquarie Park site aligned with the development criteria requirements and was suitable to operationally accommodate a battery electric depot.

2.5 Preferred option

Depot location

The results of the options analysis determined that the Macquarie Park site was suitable to accommodate a battery electric depot, as it is located in Transport-owned land within bus contract region 7, is an adequate size to accommodate the required bus capacity, provides an optimal location in terms of operational performance, has suitable access for both buses and light vehicles, and is suitably located to accommodate the required electrical infrastructure for a battery electric depot.

The location of the Macquarie Parks site meets all the development criteria and therefore this option was selected as the preferred option.

Depot layout

Based on the outcome of the analysis undertaken during the optioneering process, Option 7B was selected as the preferred option for the layout of the proposed depot.

Option 7B was developed as the refined depot layout to ensure all development criteria were met, and therefore it was decided to take this option forward to concept design. The Option 7B depot layout forms the basis of this proposal.

2.6 Design refinements

Following on from the initial depot layout included in the Feasibility Assessment, during the optioneering process to refine the depot layout, the layout evolved to include the following design refinements:

- Footprint of the administration building and maintenance workshop building – the footprint of the buildings was determined through an optioneering process, as detailed in the Options Memo. The buildings have been laid out in as efficient a manner as possible from a building services engineering perspective combining all services rooms in the administration building.

- Underground car park – the initial layout for the depot in the feasibility assessment included an above ground multi-storey car park for staff and visitors, however the preferred option features an underground car park to maximise surface level pavement space for the bus parking/charging bays.
- Integrated charging systems – the medians along the western side of the charging bays were widened compared to the layout in the feasibility assessment to allow for charging systems with a dimension of 6.8 x 1.5 x 2.5 metres and with a one metre clearance.
- Layout of bus parking/charging spaces – the depot layout in the feasibility assessment comprised one large stack of 10 rows, however during optioneering the layout was refined to comprise more than one stack with a six metre clearance between stacks to ensure fire protection. The bus bays were positioned in a south facing direction to allow for faster deployment from the depot during the morning peak.
- Fire protection infrastructure – introduction of hardstand for one fire truck, fire pump room and fire control centre to manage fire risk.
- Introduction of a pedestrian zone – a pedestrian walkway was introduced to the layout to allow pedestrian access around the depot.
- Emergency access of Talavera Road – this was introduced to be used by buses in case of an emergency if the Pittwater Road access is compromised.
- Bus circulation lane – a one-way circulation approach was adopted to minimise buses travelling in opposing directions, which improves the operational and safety performance of the depot. The lane was widened to 5.5 metres to allow two buses to pass in case of emergency.
- Security shed and boom gate control – security measures were introduced to allow monitoring of the site access points.
- Bus wash bay requirements – the preferred layout includes one bus wash bay that could accommodate both standard and articulated buses, which was reduced from the two bays proposed in the feasibility assessment layout based on the requirements of the bus depot operator.
- Minimising reversing into charging bays – reversing movements were minimised to reduce the risk of collision and increase the operational efficiency of the depot.
- Maintenance bay positioning – the layout was developed so that the bays were not in rows, which reduces the potential for blocked access.

The design will continue to be refined throughout the detailed design stage. The following areas are still to be further investigated as part of the design development:

- international best practice for fire safety
- geotechnical assessment of the existing ground conditions to determine material reuse suitability
- confirmation of office space requirements for administration building
- viability of installing transponders on the buses to electronically open the gates as well as automatic allocation of bus parking/charging bay
- confirm protection measures for the charging equipment
- further detailed design of the underground staff car park, including access ramp
- consideration of all modes of staff travel to site (including public transport, walking and cycling). Details will be included in a Green Travel Plan.
- detailed design of retaining wall solution
- detailed design of gantry solution
- consideration of water sensitive urban design and reduction of impermeable pavements where possible.
- flood modelling to be performed to confirm the capacity requirements of the detailed design (including climate change considerations)
- exploration into the opportunity to reuse water on site and the resulting water quality arrangements required. Possible water sources include rainwater off roofs, rainwater off pavements, and water from wash bays. Possible water uses include bus washing, fire services water, and irrigation

- further development of initial sustainability requirements for rainwater harvesting and solar photovoltaic (PV) for administration building.

3. Description of the proposal

This chapter describes the proposal and provides descriptions of existing conditions, the design parameters including major design features, the construction method and associated infrastructure and activities.

3.1 The proposal

Transport is proposing to build a new battery electric bus depot at 1A and 1B Talavera Road, Macquarie Park. The ZEB Macquarie Park Bus Depot (the proposal) will be a state-of-the-art facility accommodating around 165 battery electric buses to support public transport services to the lower North Shore and Northwest suburbs of Sydney, stretching to Chatswood, Ryde and Paramatta. The Proposal will be the first custom built battery electric bus depot delivered as part of the Zero Emission Buses Program, a NSW Government initiative to transition the State's 8000 plus diesel and compressed natural gas buses, to zero emissions technology by 2047.

Key community benefits include:

- improved liveability in the area through reduced noise and air pollution from diesel and gas buses
- an improved passenger experience on board and at bus interchanges.

Key features of the proposal would include:

- building new facilities to support the future bus operations including:
  - a single-level underground staff and visitor car park accommodating up to 163 cars including accessible parking spaces, car share spaces, electric vehicle spaces with charging equipment and bike storage options, accessed from Talavera Road
  - a multi-level administration office featuring office spaces and staff facilities including toilets, change rooms, a kitchen, a first aid room, social breakout and gaming rooms, and an outdoor rooftop garden
  - a bus maintenance facility accommodating up to 30 staff and featuring a spray booth, inspection pits and a multilevel staff facility including an outdoor BBQ area, a kitchen, change rooms and toilet facilities
  - a designated bus wash bay with washing and water recycling equipment
- removal of the existing one-way bike path connection between the M2 Hills Motorway and Talavera Road to make way for the new bus maintenance facility
- delivering up to 162 bus parking spaces including around:
  - 126 charging bays for 12.5 metre standard rigid buses
  - 22 charging bays for 19 metre articulated buses
  - 14 maintenance bays
- one breakdown bay
- installation of gantries to facilitate the preferred bus arrangement and charging structures
- installation of standard and fast chargers for buses around the depot
- upgrading and widening Pittwater Road to enable two-way bus access to and from the bus depot
- essential fire services such as hydrant and sprinkler system, a fire control room and pump building, smoke detection and warning systems, hardstand area for one fire truck, portable fire extinguishers and fire blankets
- installation of new dedicated walkways, security booths, fencing and lighting.

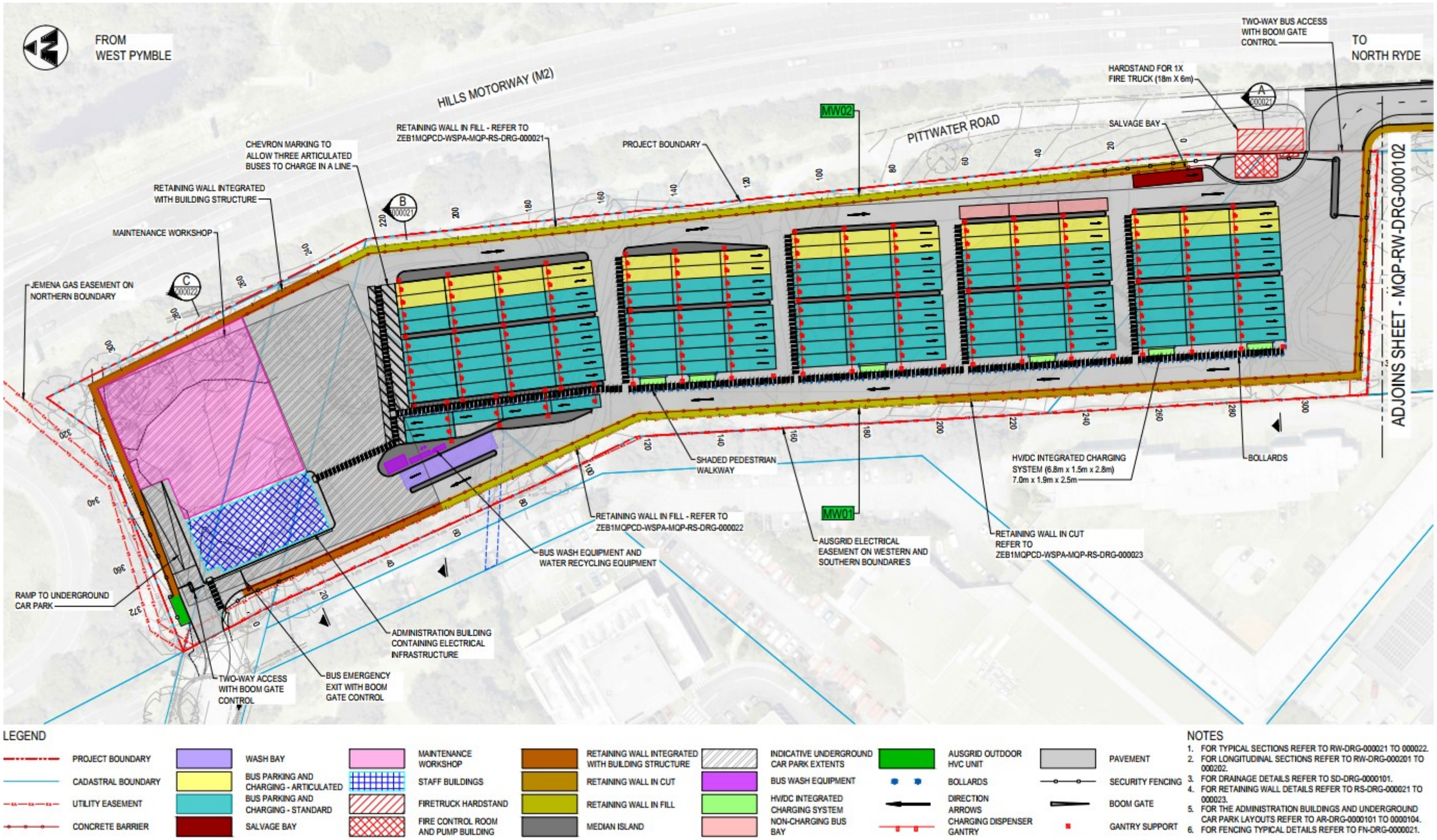
Additional features of the proposal include:

- substantial earthwork including retaining walls to create a suitable level operating surface
- associated electrical infrastructure including power supply and switchgear
- drainage and flood storage provision, including culvert construction

- utilities adjustments
- temporary on-site ancillary facilities during construction.

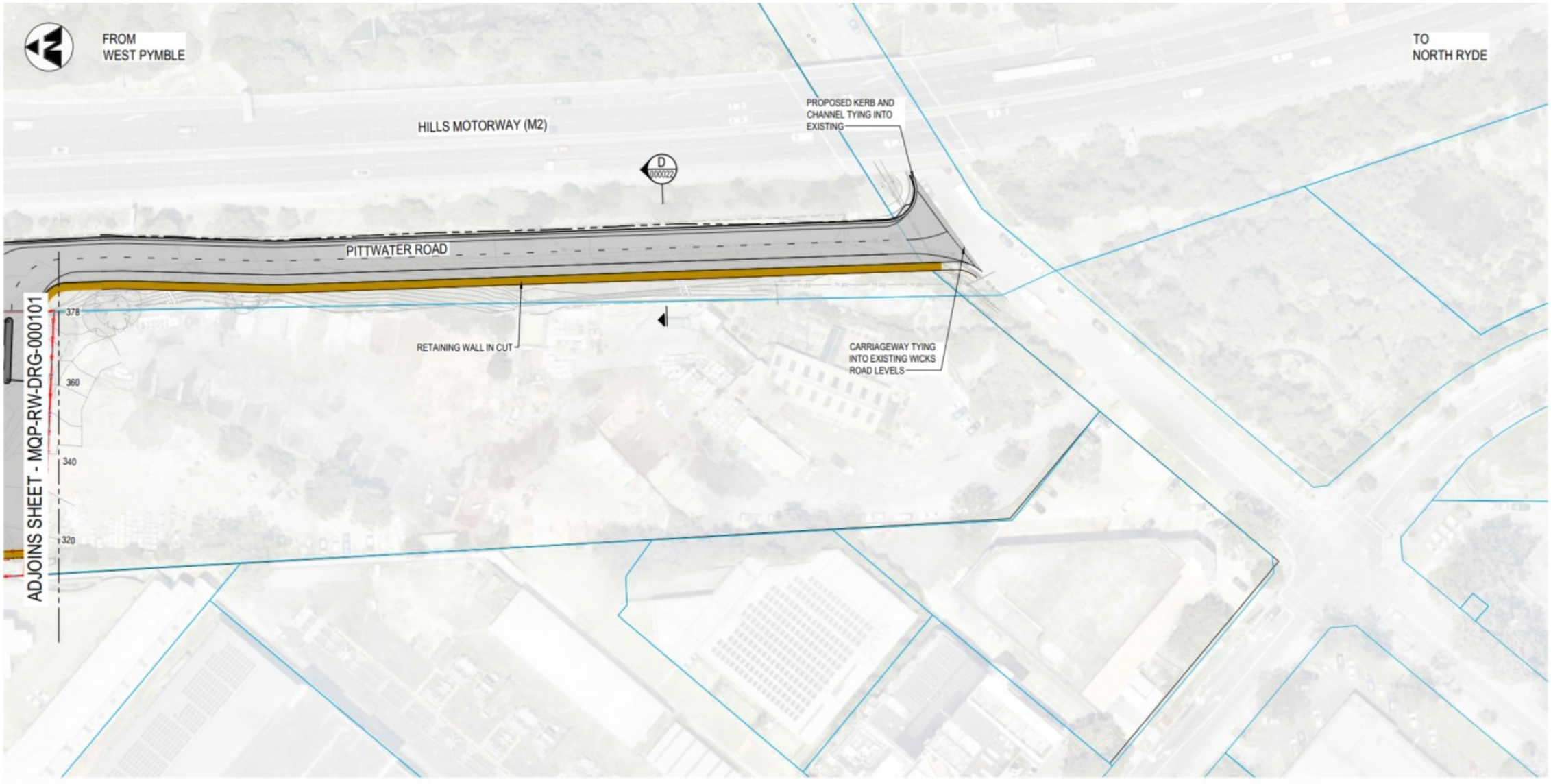
The proposed bus depot area is shown in Figure 3-1 and the Pittwater Road access in Figure 3-2.

A typical cross-section of the proposal is provided in Figure 3-3.



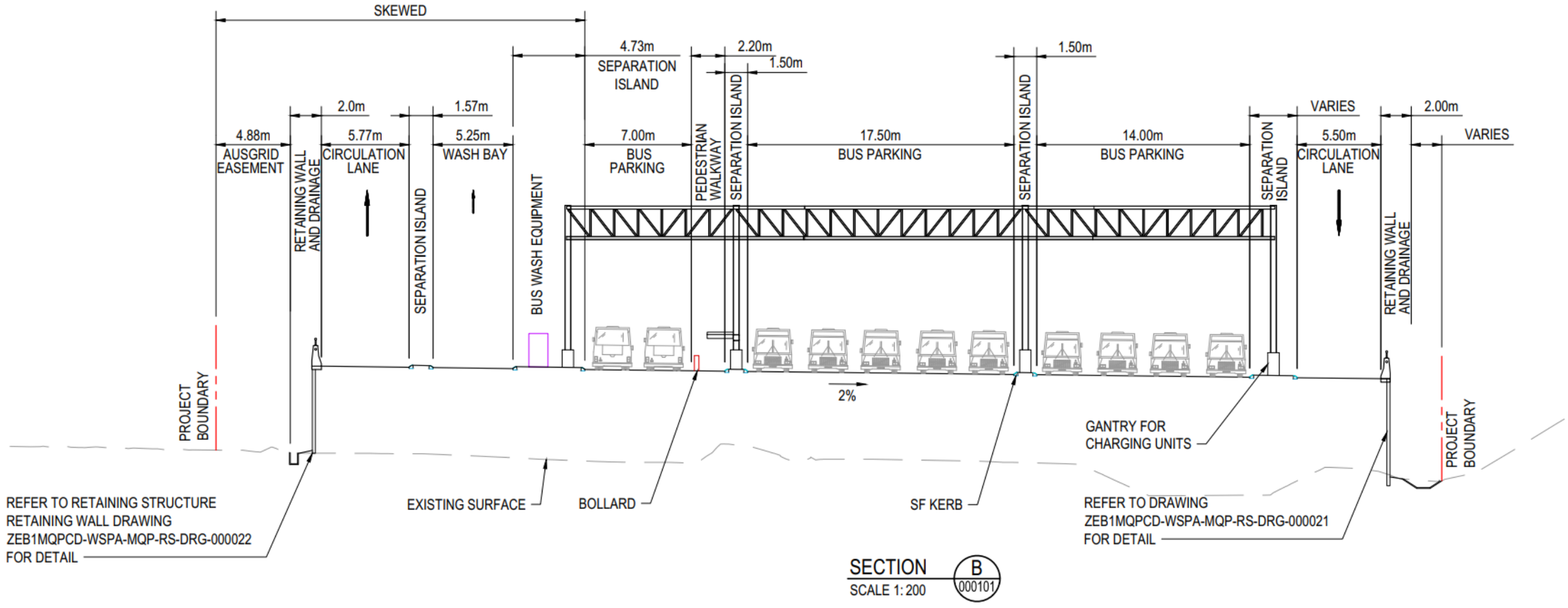
Source: Transport

Figure 3-1: The proposal (depot area) – indicative only, subject to detailed design



Source: Zero Emission Buses Greater Sydney Tranche 1 – Macquarie Park Depot – 80% Concept Design Report (WSP Australia, 2024)

Figure 3-2: The proposal (Pittwater Road access) - indicative only, subject to detailed design



Source: Zero Emission Buses Greater Sydney Tranche 1 – Macquarie Park Depot Concept Design Report (WSP Australia, 2024)

Figure 3-3: Typical cross-section (B) showing indictive gantry arrangement for charging units - indicative only, subject to detailed design

Further details on the key features of the proposal are provided in the following sections (3.1.1 to 3.1.16).

3.1.1 Bus charging area

It is proposed to provide bus charging/parking space for a total of 165 buses within the depot. In total, 148 of these spaces would be dedicated bus charging spaces, and the remaining bays would incorporate maintenance bays, a bus wash bay and a salvage bay.

The dedicated bus charging/parking bays would been separated into stacks, with the relevant separation distances for fire protection purposes and to allow emergency access to the stacks

The bus bays would accommodate standard public transport buses up to 12.5 metres in length and articulated buses up to 19 metres in length. Bus bays would be provided for 126 standard buses and 22 articulated buses.

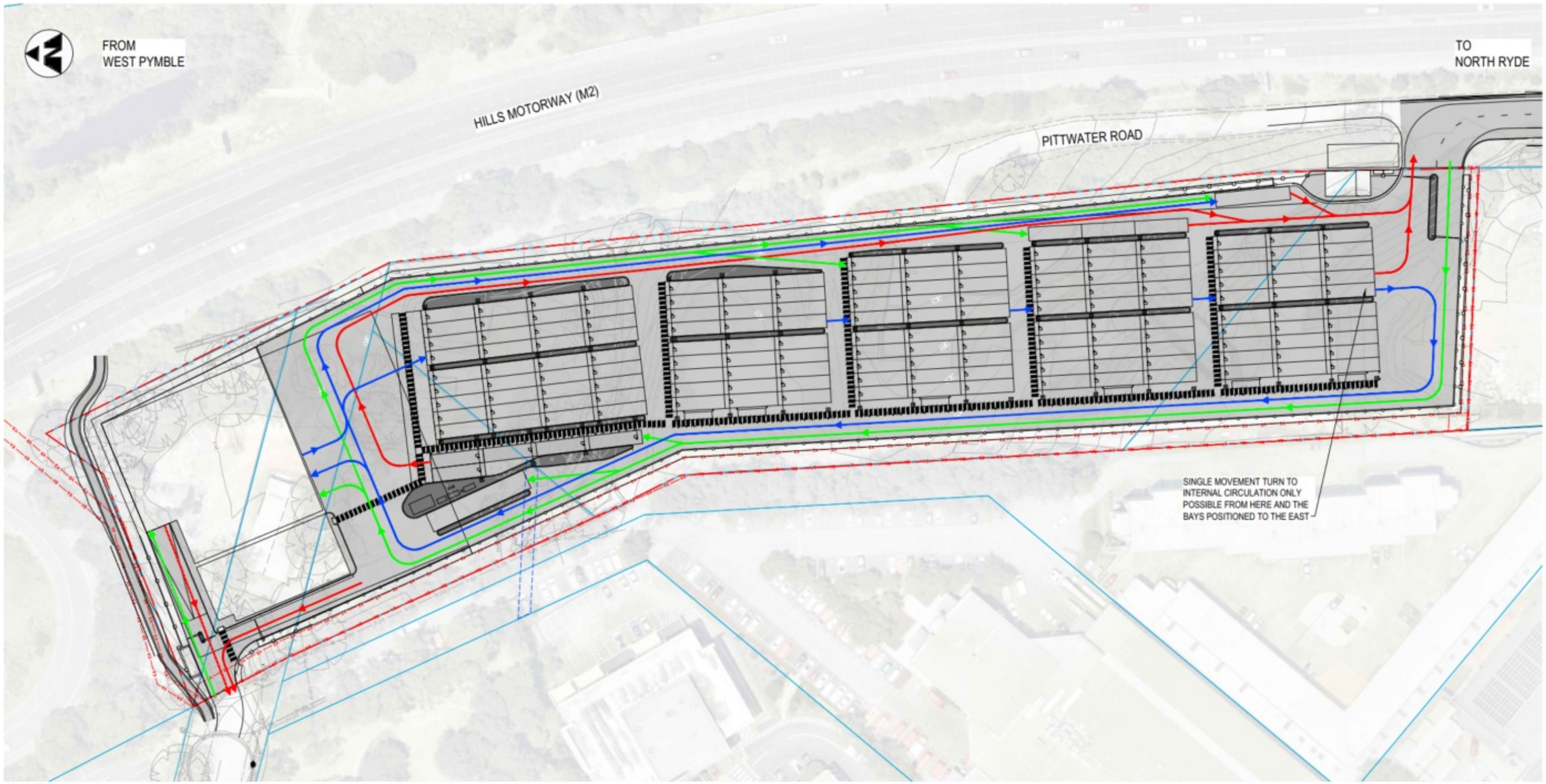
Each bus bay would have minimum dimension of 3.5 metres in width and 13.5 metres in length for standard buses. Two articulated buses would be able to park in an area marked as three standard bays. The arrangement allows for flexibility within the layout to accommodate fleet changes.

The proposed bus charging/parking spaces are shown in Figure 3-1.

3.1.2 Bus circulation lane

The peak departure rate for buses is anticipated to be 63 buses per hour during the morning peak (6.45-7.45am) and the maximum rate of arrivals would likely be 40 buses per hour between 9am and 10am.

A circulation lane around the depot would be implemented to ensure bus movements within the depot are optimal. The bus circulation lane is shown on the traffic flow access plan in Figure 3-4.



Source: Zero Emission Buses Greater Sydney Tranche 1 – Macquarie Park Depot – 80% Concept Design Report (WSP Australia, 2024)

Figure 3-4: Proposed access and traffic flow plan - indicative only, subject to detailed design

3.1.3 Access and egress

Access to and egress from the site is proposed from two locations, via Talavera Road, to the northwest of the proposed depot, for all light vehicles and via Pittwater Road, to the southeast of the proposal, for all buses and service/heavy vehicles.

The proposed access road along Pittwater Road will need to be widened and sealed to accommodate two-way bus movements Pittwater Road would comprise approximately 3.5-metre-wide lanes with a shoulder on each side. Pittwater Road would also need to be raised to meet the height of the depot pavement.

Access off Talavera Road would comprise two-way light vehicle access to the underground staff and visitor car park. Further details relating to the car park can be found in Section 3.1.9.

As discussed in Section 3.1.9, the site is well connected to existing public transport and vehicular routes. Staff would therefore be encouraged to utilise public transport to travel to and from the site. Bicycle parking would also be provided within the depot, and pedestrian entry and exit to the proposed depot would be via Talavera Road.

An emergency access route is proposed to be provided within the site for heavy vehicles and buses to use the Talavera Road access point in the event of an emergency, if required.

3.1.4 Bus charging technology

Bus charging capability would be provided to each bus parking space.

It is likely that the bus charging infrastructure would comprise charging containers with plug-in overhead cable reel dispensers.

Each charging container cabinet would house the necessary equipment to provide power to the plug-in charging dispensers.

The charging containers would be powered by high voltage (HV) power supplied from the substation and routed via HV switchboards. Further details are outlined in Section 3.1.5.

3.1.5 Electrical infrastructure

High Voltage power supply

A new dedicated 11kV feeder is required to meet the site's maximum power supply demand. The ZEB Macquarie Park Bus Depot HV power supply upgrades are subject to separate environmental assessment and approval.

HV switching station

The depot would be connected to the Ausgrid network via an Ausgrid HV switching station, which would be required for the connection of the HV power to charge the buses. The switching station would comprise two high voltage connector (HVC) R-type kiosks, located on the north-western boundary of the proposal near the Talavera Road access point. Appropriate easement and authority access would be provided.

HV switch room

A private HV switch room would be located within the ground floor of the administration building. This switch room will house HV underground reticulations that extend from the Ausgrid HV switching station to the private HV room.

HV reticulations to charging containers

HV reticulation systems would connect the HV switch room to the charging containers. The charging containers are located adjacent to their associated cable reel dispensers (or pedestals) for access.

Low voltage power supply

Two 11kV/400V 1000kVA auxiliary transformers are proposed to be installed to supply low voltage (LV) electrical power services to the building services loads. These would be located within the administration building.

LV power supply would be provided via underground cables to the administration building, maintenance workshop and auxiliary buildings, including the fire pump room, security kiosks, bus wash and underground car park.

LV power would be required for lighting (internal building and external streetlighting), hydraulic services, fire services, small power outlets, EV chargers in the underground car park, and the solar PV system.

3.1.6 Overhead gantry

To facilitate the preferred bus charging bay arrangement, a structure over the charging bays may be required.

Subject to detailed engineering design, the proposed structure is likely to comprise a steel portal frame gantry structure where the columns are cantilevered off ground. The frames would be positioned to align with the plug-in charging dispensers.

3.1.7 Maintenance workshop

The proposed maintenance workshop will provide space for around 11 standard buses and three articulated buses, including a spray booth and inspection pits.

Maintenance bays would be around six metres wide to allow sufficient room for working space and equipment, as well as storage.

The associated maintenance workshop building would be constructed of steel portal frames and perimeter braced frames.

A solar PV generation system would be provided for the depot, with solar panels on the roof of the maintenance workshop building. The system would meet the operational power need of the building.

3.1.8 Administration building

The proposal includes an administration building to accommodate staff. The building facilities would be sized accordingly to the workforce (i.e., toilets, kitchens, workstations) plus additional meeting/training rooms. The dimensions of the building would typically be around 16.5 metres by 35 metres, with a floor area of approximately 7,770 square metres, and a height of 12.8 metres.

The building would also contain the operation control room and HV and LV switch rooms, as well as a rooftop recreation area including garden beds and landscaping.

The depot building services would include potable cold water, sanitary drainage, rainwater reuse, and a UV treatment plant. Rainwater from the wash bay would be recycled and used as the primary domestic cold-water supply for the administration building. Mechanical services within the buildings would include air conditioning and ventilation systems.

3.1.9 Car parking

The proposal includes an on-site underground staff and visitor car park under the administration building and maintenance workshop. The car park would be accessed via Talavera Road and would provide car parking for around 163 cars.

The site is well connected to existing public transport and vehicular routes. Talavera Road is identified as a shared path. Two bus stops are located on Lane Cove Road within 250 metres of the site. Based on expected site staff numbers and given the proximity of the depot to high quality public transport, the car parking capacity was calculated on a private share mode of approximately 90 per cent. It is anticipated that a high portion of shift workers will rely on private vehicle access for personal safety reasons, particularly at night.

The car park would be a single level concrete structure, supported by piled footings, comprising an area of around 4,570 square metres and a floor to ceiling height of around 3.3 metres.

The car park would comprise the following parking types:

- one per cent accessible spaces
- five per cent visitor spaces
- 10 per cent EV spaces – 15 chargers at 7 kW per charger
- 2.5 per cent car share spaces.

3.1.10 Retaining walls

The existing topography within the proposal boundary is relatively steep and varied in elevation. To ensure a suitable maximum depot pavement grade of 2%, retaining walls supporting both cut and fill are required along the majority of the site perimeter to tie in the design surface level to the existing surface level.

Subject to detailed engineering design, a combination of reinforced soil walls and soldier pile walls are likely to be required for the site perimeter. The soldier pile walls are likely to be clad with concrete fascia panels. The proposed total length of perimeter retaining walls is around 580 metres and the maximum height is around 8.5 metres.

The proposed perimeter retaining wall types and extents are detailed in Table 3-1.

Table 3-1: Perimeter retaining walls

ID	Control Line	Cut/ Fill	Approximate chainage	Retaining wall type	Approximate length (m)	Approximate wall height (m)
RW01	MW01	Fill	40 to -210	Reinforced soil wall	170	1 to 6
RW02	MW01	Cut	210 to -380	Soldier pile	160	1 to 7
RW03	MW02	Cut	0 to -250	Reinforced soil wall	250	1 to 8.5

3.1.11 Flood storage and drainage

There is an existing drainage system of pipes and channels from Talavera Road which runs through the proposal and outlets at the existing M2 Hills Motorway culvert inlet. Localised flooding of up to two metres occurs upstream of the existing M2 culvert.

Additional surface water runoff would be generated by the proposal, due to the significant increase in hard, impermeable surfaces.

The proposed change in site levels and in site permeability would remove a large portion of the existing surface storage upstream of the M2 culvert and flood mitigation storage would be required.

Flood mitigation would be provided by a tank storage to offset flood storage losses and increases in the site imperviousness. This would be formed by a twin storage Reinforced Concrete Box Culvert (RCBC) which would traverse the site and discharge into the M2 culvert. The RCBC would be approximately 85-metre-long by 3.6-metre-wide by 3.6-metre-high and located between 3.5 and 5.5 metres below the site surface. All external upstream flows and site flows would be directed to this storage area. It would be open at each end to allow for inspection and maintenance. Two mid-culvert access points would be provided to the surface, each with a grated cover.

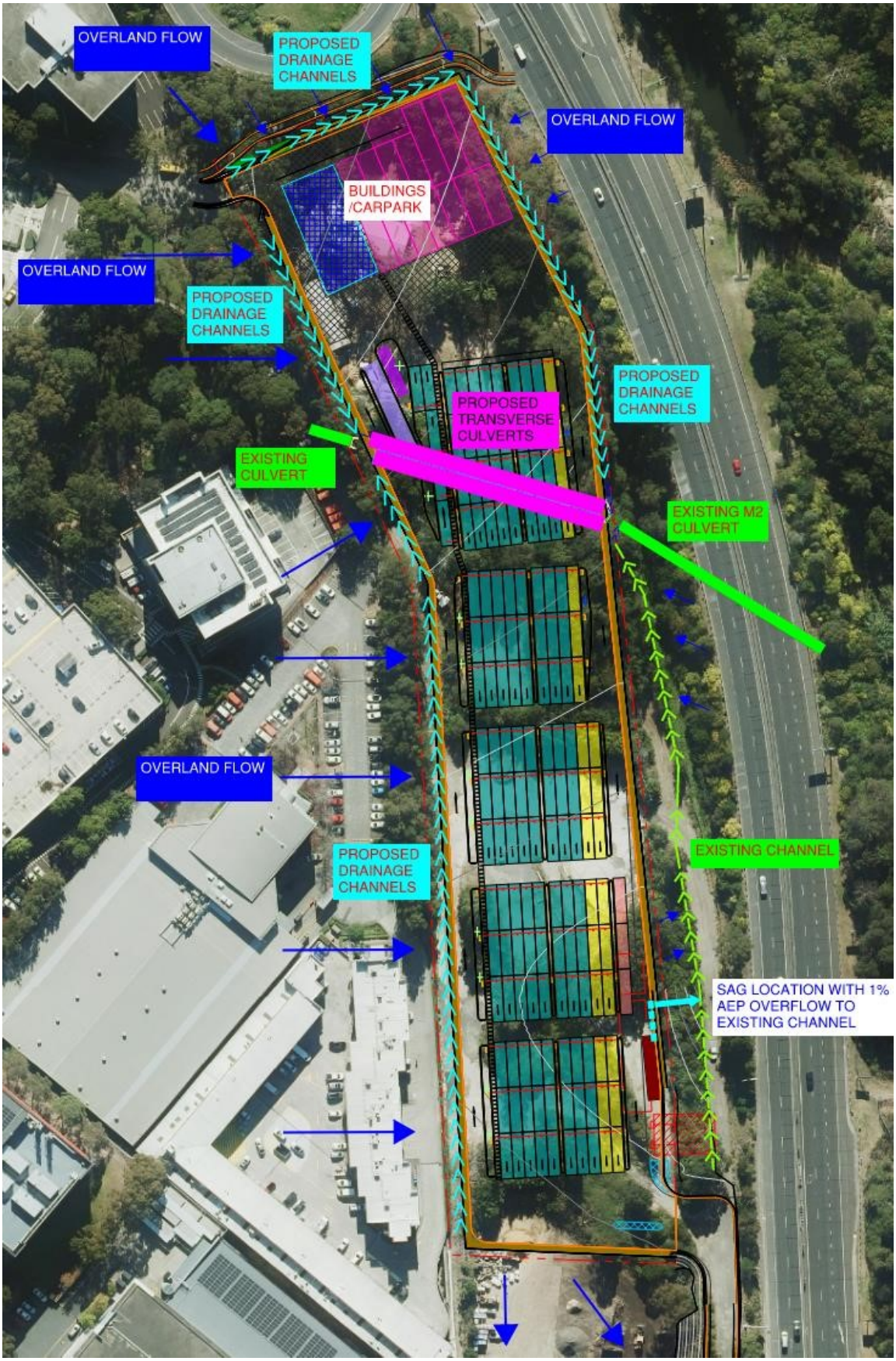
The RCBC would interface with upstream perimeter channels and the existing M2 culvert. Interfaces would be managed by the removal of 4.8 metres of the existing downstream culvert to create adequate room for perimeter channels and maintenance access, localised gabions, and rip rap protection to the culvert entry area.

It is anticipated that the culverts would self-cleanse during large storm events.

Additional drainage features proposed would include:

- drainage channels installed at the bottom of the retaining walls around the perimeter to intercept the surface flows and manage the external overland flows and Council drainage systems. The channels would include appropriate lining for scour protection.
- internal pit and pipe system to collect internal runoff and direct to the drainage culvert and tank storage
- additional sag capacity and outlet pipe to manage larger storm events
- minor pump-out system for the underground staff car park and ramp.

A general drainage overview is provided in Figure 3-5.



Source: Zero Emission Buses Greater Sydney Tranche 1 – Macquarie Park Depot – 80% Concept Design Report (WSP Australia, 2024)

Figure 3-5: Proposed drainage layout - indicative only, subject to detailed design

3.1.12 Water quality

The existing on-site stormwater drain discharges into Porters Creek, a tributary of Lane Cove River. The NSW River Condition Index (RCI) is a long-term reporting tool for assessing river condition, which uses inputs from a range of indicators, including water quality, to cover all aspects of river health. The NSW RCI classifies Porters Creek and Lane Cove as 'Moderate' water quality in the area surrounding the proposal.

Other surface water features include two bodies of water were also observed and appear to be fed by overflow stormwater runoff.

During field surveys and sampling, the water quality of the existing stormwater drain was observed to be heavily turbid and to be pale grey to grey in colour. The two bodies of water were observed to be stagnant. Duck weed, vegetation, general waste and litter were present within all surface water bodies.

A water quality treatment device would be installed to capture and treat internal runoff before being discharged to the waterways, to ensure the protection of the water quality.

3.1.13 Fencing

The depot is proposed to be secured, with security fencing installed around the proposal boundary.

The boundary fencing is anticipated to comprise close space welded mesh, typically 2.4 metres in height with a roll of short barbed tape, resulting in a maximum height of three metres.

Fencing is only proposed where level access to the site is achievable, as the retaining walls would limit access across most of the site, which would minimise the amount of fencing required. The M2 Hills Motorway fencing and the western easement fencing also provides further protection.

3.1.14 Removal of bike path

An existing dedicated bike path is located within the proposal boundary, running along the northern boundary of the site, The bike path connects Talavera Road with the cycle lane on the westbound carriageway of the M2 Hills Motorway.

The bike path will require removal to accommodate the proposal. Investigations into the possible relocation of the bike path are underway. The bike path proposed to be removed is shown on Figure 1-2.

3.1.15 Fire services

Fire services are required within the depot to manage fire risk. The proposal would incorporate the following fire protection services:

- fire hydrant and sprinkler system
- fire control room and pump building
- fire/smoke detection and occupant warning systems
- hardstand for one fire truck
- portable fire extinguishers and fire blankets.

Fire hydrants would be installed around the perimeter of the site. Approximately three hydrants would operate simultaneously at bus stacking areas.

A common fire control room and pump building would be located near the access point off Pittwater Road. The pump room would contain electrical sprinkler and hydrant pumps, as well as jacking and jockey pumps.

A hardstand area, approximately 18 metres by six metres in size, would accommodate one fire truck and would be located adjacent to the pump room.

The fire strategy would be confirmed with Fire and Rescue NSW at a later stage of development.

3.1.16 Lighting

External lighting would be provided to cover the bus parking area, site pedestrian footpaths and marked walkways, bus circulation lane, administration building, maintenance building and underground car park.

The external lighting would comprise low bay lighting fixtures mounted to cable gantries, light poles, walls and the site fence. Lighting would feed via the nearest distribution board, or a dedicated external panel.

New streetlights, mounted onto steel streetlight columns, are proposed along the edge of the reworked Pittwater Road, typically spaced 60 metres apart. A new LV pillar would also be required. The lights would be fed from Ausgrid's LV network on Wicks Road.

All luminaires would utilise energy efficient light sources. All lighting will be to the respective Australian Standards and use energy efficient technology that minimises maintenance.

3.2 Design

A concept design has been developed for the proposal which is subject to change during detailed design. This section outlines the minimum design criteria, engineering constraints and sustainability initiatives which have been considered during the concept design development process.

The key design criteria which are based on the functional depot requirements are identified in Table 3-2.

Table 3-2: Key design criteria

Design aspect	Criteria
Bus charging bays	126 standard bus charging bays and 22 articulated bus charging bays
Bus charger	Fast charging for around 10% of charging spaces with a plug-in charging solution at 1:1 charger to on duty bus ratio. Standard plug-in charging solution at 1:1 charger to on duty bus ratio.
Maintenance building	Office and facilities for 30 workers. Spray booth that can accommodate single 18m articulated bus or two standard 12.5m bus. 3 articulated bus maintenance bays, 9 standard maintenance bays with 3 of the bays having inspection pits.
Staff parking	Minimum of 157 car park spaces considering: • 1% accessible spaces • 5% visitor spaces • 10% EV spaces • 2.5% car share spaces.
Bus wash	1 x 18m bus wash facility.
Administration building	87 staff occupancy including drivers.
Access (entry/exit)	One bus access points from Pittwater Road and staff car park access point from Talavera Road.

3.2.1 Engineering constraints

The proposal has several project constraints, as follows:

- land – the depot is to be constructed within the lot boundary and must have capacity to store a minimum of 165 buses within the depot
- utilities – there are existing transmission cables that will need to be relocated or retained/protected for the construction of the retaining walls along the western boundary of the site
- site level – the existing ground levels are required to tie back into the existing and Talavera Road and Pittwater Road. Large fill volumes and high retaining walls are required.
- drainage/flooding:
  - existing drainage flow path and flood storage capacity between the existing culverts at the eastern and western extents of the site is to be maintained
  - overland flow paths across the site impacted by the site fill levels are to be maintained

  - existing stormwater and drainage through the site to be intercepted at Talavera Road and redirected
- contamination – the site has been confirmed as a location where asbestos contaminated fill has been stored
- traffic – existing network conditions limit the use of Talavera Road for site operations
- bike path – existing bike path is located along the northern boundary of the proposal, within the site, and must be removed
- depot pavement – maximum 2% fall for pavement across the site.

3.2.2 Sustainability in design

A Sustainability Plan has been prepared for the proposal. The *ZEB Macquarie Park Depot Sustainability Plan* (WSP, 2024) provides a framework for identifying and managing sustainability risks, impacts and opportunities associated with the proposal. The plan outlines the key sustainability targets, actions, and initiatives for the project. It also sets out the proposed sustainability assurance rating pathways for the proposal.

The following sustainability requirements and assurance mechanisms are applicable to the proposal:

- NSW Government Resource Efficiency Policy (GREP)
- Transport Baseline Sustainability Requirements (BSRs)
- Transport's *Sustainable Design Guidelines v4.0* (SDGs) – a minimum silver rating is targeted
- Green Star – 5 Star Green Star rating under the Buildings Tool is targeted
- National Australian Built Environment Rating System (NABERS) rating 5 star.

Sustainability initiatives identified during concept design have been captured in the *ZEB Macquarie Park Depot Sustainability Plan* and relevant concept design drawings and reports. Many of these initiatives support the achievement of the sustainability requirements and proposed rating pathways for the proposal.

Green Star

The proposal aims to achieve a 5-star Green Star Buildings rating, for the office spaces and other habitable areas of the admin and maintenance buildings. As part of the rating requirements to meet a minimum 5 star rating the Climate Positive Pathway must be met. The Green Star Buildings rating tool has three levels of credit requirements: minimum expectations, credit achievement and exceptional performance.

All ratings must meet all the minimum expectation credits, in summary, buildings must be designed and built to:

- protect environmentally significant areas
- emit less carbon in construction and during operations
- be water efficient
- have improved air, light, acoustics, and product finishes
- promote physical activity
- be built with climate change in mind
- manage environmental impacts during construction
- embrace the diversity of our population
- enable practices that reduce operational waste
- be verified to work.

3.3 Construction activities

The proposal would require the following key construction activities:

- establishing site, including site environmental controls
- demolishing existing structures and concrete slabs

- removing asbestos-containing and contaminated materials
- clearing all vegetation and trees within the proposal boundary comprising around 2.2 hectares of vegetation and 332 trees
- removal of bike path
- constructing retaining walls
- bulk earthwork
- constructing flood storage culvert
- Constructing underground staff car park, administration building and maintenance workshop
- constructing charging gantries
- constructing pavement, remaining services and other infrastructure
- site demobilisation.

The construction footprint required to undertake the proposed activities is shown in Figure 3-1.

3.3.1 Work methodology

The general sequencing of the proposed construction activities is identified in Table 3-3. This staging is currently indicative and based on the current concept design. Detailed methodologies and staging would be determined during construction planning.

Table 3-3: Indicative construction staging

Stage	Activities	Site facilities and access
1 – Site Establishment, clearing, demolition	• establish environmental controls • removal of asbestos-containing and contaminated materials • clear and grub existing vegetation • demolish existing structures and concrete slabs	• establish site access via Pittwater Road and Talavera Road • establish temporary site facilities on Pittwater Road • establish temporary crossing of drainage line
2 – Flood storage culvert, retaining wall MW01 and bulk earthwork	• remove existing bike path • construct retaining wall MW01 (CH120-CH376) • construct retaining wall MW02 (CH0-CH70) • earthwork bulk cut to fill around retaining wall MW01 (CH120-CH376) • construct flood storage culvert	• primary site access via Pittwater Road • secondary site access via Talavera Road where access is not possible across the drainage corridor from Pittwater Road • temporary site facilities on Pittwater Road • temporary crossing of drainage line
3 – Bulk earthwork, retaining wall MW01 and administration building	• construct retaining wall MW01 (CH60-CH120) • Earthwork bulk fill around completed flood storage culvert • construct temporary access crossing of completed flood storage culvert and remove previous temporary crossing • commence construction of underground staff car park, staff buildings and maintenance workshop	• primary site access via Pittwater Road • secondary site access from Talavera Road for new staff buildings only where access is not possible across the drainage corridor from Pittwater Road • temporary site facilities on Pittwater Road • crossing of drainage corridor relocated to flood storage culvert
4 - Bulk earthwork, retaining wall MW02, administration building and maintenance workshop	• construct remaining section of flood storage culvert • construct retaining wall MW02 (CH70-CH235) • earthwork bulk fill to remaining areas	• primary site access via Pittwater Road • secondary site access from Talavera Road for new staff buildings only where access is not possible across

Stage	Activities	Site facilities and access
	• continue constructing underground staff car park, staff buildings and maintenance workshop	the drainage corridor from Pittwater Road • temporary site facilities on Pittwater Road
5 - Charging gantries, administration building and maintenance workshop	• construct charging gantries • complete underground staff car park, staff buildings and maintenance workshop	• primary site access via Pittwater Road • secondary site access from Talavera Rd for new staff buildings only where access is not possible across the drainage corridor from Pittwater Road • temporary site facilities on Pittwater Road
6 - Pavement and finishing work	• construct pavement, remaining services and other infrastructure • demobilise site facilities	• primary site access via Pittwater Road • secondary site access from Talavera Road for new staff buildings only where access is not possible across the drainage corridor from Pittwater Road • temporary site facilities on Pittwater Road

The construction methodology would be further developed during the detailed design of the proposal by the nominated construction contractor in consultation with Transport.

3.3.2 Construction workforce

Workforce requirements would fluctuate over the duration of the construction work. The peak construction workforce is anticipated to be during Stage 3 (bulk earthwork, retaining wall MW01, administration building and maintenance workshop), when multiple concurrent activities are occurring across the site for both building and civils work.

The anticipated numbers of personnel on-site are likely to comprise 10-14 project management and supervision, and 20-40 direct labour.

Final numbers of construction workers would be confirmed by the construction contractor prior to commencement of construction.

3.3.3 Construction hours and duration

Subject to approval, construction is anticipated to commence early 2025 and take around 18-24 months to complete, weather permitting.

The majority of the work required for the proposal would be undertaken during standard construction work hours, which are as follows:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm Saturdays.
- no work on Sundays or public holidays.

However, some activities are anticipated to be carried out outside these hours, such as:

- new utilities and service connections
- upgrade to the intersection of Pittwater Road and Wicks Road, where it cannot be safely conducted during standard working hours
- large concrete pours for slabs and rigid pavements occurring during periods of high daytime temperature
- noise intensive activities, such as piling, that could impact neighbouring local businesses during standard construction work hours

- driveway work at the Talavera Road entrance, comprising minor work to the kerb crossing
- any emergency work, such as damage to services, flooding or severe weather events, or an accident/incident on-site.

For work required outside standard hours, feasible and reasonable work practices to minimise noise nuisance would be planned and implemented through a construction noise and vibration management plan. This would include notifying potentially affected residents and businesses. Further details are contained in Section 6.8.5.

3.3.4 Plant and equipment

Anticipated plant and equipment requirements during construction are summarised in Table 3-4.

Table 3-4: Anticipated plant and equipment requirements during construction

Work activity	Plant and equipment requirement
Clearing and demolition	• 20-30t excavators • semi-trailer tippers • truck and dogs • tub grinder/mulcher • water truck • motor grader • demolition hammers • small tools • generators and air compressors • water pump
Bulk earthwork	• 20-40t excavators • truck and dogs • 815 soil compactor • vibrating roller • water truck • motor grader • water pump
Flood storage culvert	• franna crane • mobile hydraulic crane • concrete pump • formwork • concrete vibrators • small tools • generators and air compressors • elevated work platforms • water pump
Retaining walls	• shotcrete pump (where required for temporary/permanent slope stabilisation) • drill rig (where rock dowels are used) • elevated work platforms • formwork and falsework • 12-20t excavator • vibrating roller • concrete vibrators • small tools • generators and air compressors • franna crane • mobile hydraulic crane (where large precast panels are used) • elevated work platforms
Drainage and services	• 15-20t excavator • trench compactor • small tools • generator
Pavement work	• truck and dog • motor grader

Work activity	Plant and equipment requirement
	• vibrating roller • water cart • power broom • smooth drum roller • asphalt paver • bitumen spray truck • concrete pump • small tools • generators and air compressors
Concrete work	• franna crane • concrete pump • formwork and falsework • concrete vibrators • small tools • generators and air compressors
Building work	• piling rig • 5-20t excavators • franna crane • forklift/materials handler • mobile cranes • self-erecting crane • concrete pump • formwork and falsework • scaffolding • concrete vibrators • welder • small tools • generators and air compressors • elevated work platforms

This list is indicative and the final list of plant and equipment to be utilised would be determined by the construction contractor during construction planning.

3.3.5 Earthwork

The site presents constraints such as utility easements and the M2 Hills Motorway corridor, as well as the level differences across the site. The proposal would require substantial earthwork, including earthmoving and levelling to create a depot site that will accommodate the number of buses and associated infrastructure on the site. The access point along Pittwater Road would also need to be levelled up to the existing site.

To maximise the footprint of the depot, retaining walls are proposed close to the proposal boundary, which allow the charging bays to be maximised and prevent earthwork and batter spilling over adjacent properties.

The total estimated earthwork volumes are included in Table 3-5. The earthwork volumes include the widening of Pittwater Road and the removal of the bike path.

Table 3-5: Estimated earthwork volumes

Area	Cut (m^3)	Fill (m^3)	Net (m^3)
Depot operational area	31,825.07	70,741.16	38,916.09 fill
Car park	5,562.11	151.96	5,410.15 cut

Adjustments would be required to account for topsoil, buried drainage and services, contaminated materials, unsuitable material, retaining wall backfill, pavement materials, and the thickness of retaining wall structures.

The earthwork cut and fill balance will require importation of fill material. Bulk earthwork fill materials are likely to be imported at a rate of 100-150 cubic metres per hour.

3.3.6 Source and quantity of materials

The preliminary earthwork volumes have been calculated as 30,000 cubic metres of cut and 70,000 cubic metres of fill based on the existing and proposed design surfaces. Adjustments would be required to account for topsoil, buried drainage and services, contaminated materials, unsuitable material, retaining wall backfill, and pavement materials, and the thickness of retaining wall structures.

A summary of the various materials, their anticipated sources and a high-level estimate of quantities required is provided in Table 3-6.

Table 3-6: Estimate of material sources/destination and requirements

Material type	Source/destination	Estimated quantity
Topsoil	Disposal off-site. There is likely to be limited opportunities to reuse topsoil on-site.	1,200 - 2,000m^3
Drainage and services	Spoil likely reused on-site. Bedding likely imported from commercial quarries rather than reusing site-won materials	Insufficient details available to estimate quantity. To be confirmed during detailed design.
Contaminated materials	Disposal off-site to an appropriately licenced facility Potential opportunity to encapsulate/contain fill on-site subject to further investigations and remedial action plan	Insufficient details available to estimate quantity. To be confirmed during detailed design.
Unsuitable materials	Disposal off-site. There is likely to be no opportunities to dispose of any spoil material on-site.	500 - 5,000m^3
Retaining wall backfill	Imported from commercial quarries	9,000 – 14,000m^3
Pavement materials	Pre-existing pavement materials on-site that may be able to be recycled off-site (concrete pavement) Imported from commercial quarries (batch plants for concrete pavement layers)	Insufficient details available to estimate quantity. To be confirmed during detailed design. 7,500 – 14,500m^3
Structures and foundations	N/A	N/A
General fill (imported)	Commercial quarry	15,000 – 28,500m^3

Unsuitable and contaminated material to be disposed off-site is likely to be taken to the appropriately licenced facility.

Materials would be sourced from local suppliers where practical.

The source of imported materials would be determined during the detailed design stage of the proposal and would consider the requirements of Transport's *Sustainable Design Guidelines Version 4.0* (Transport for NSW, 2017).

Reuse of existing and recycled materials would be undertaken where feasible. Consideration would also be given to lifecycle impacts of each material chosen which would be calculated by assessing the environmental impacts of materials from the point of extraction, through to transportation, use, operation, and end of life.

3.3.7 Traffic management and access

Construction of the proposal is expected to generate up to approximately 66 heavy vehicle and light vehicle movements per day at the peak of construction activity.

The heavy vehicle movements would mainly be associated with transport of construction machinery and equipment, and the import and movement of bulk earthwork and materials.

Primary construction access for the works would be from Pittwater Road, with limited access from Talavera Road.

The majority of construction vehicle movements would occur during standard construction work hours. The increase in traffic on the surrounding road network, as a result of construction vehicle movements associated with the proposal, would not be substantial in relation to existing traffic conditions.

Standard traffic management measures would be implemented at the Pittwater Road/Wicks Road intersection, where required, to manage the short-term traffic impacts during construction. These measures would be identified in a Traffic Management Plan (TMP) and would be developed in accordance with Transport's *Traffic Control at Work Sites Technical Manual* (Transport, 2022) and *QA Specification G10 Control of Traffic* (Transport for NSW, 2008).

Work during out of hours would be undertaken in accordance with a Road Occupancy Licence (ROL), where required.

During all stages of construction, access to residential properties or businesses would be maintained. There would be no temporary access restrictions or modifications as a result of the proposal.

During construction, workers would be encouraged to utilise public transport to travel to and from the site. However, there will still be a need for some trades to bring tools and equipment with them on a daily basis which would require parking on site. Construction workforce parking would be provided on-site within the construction footprint.

3.4 Ancillary facilities

Ancillary facilities would be required during construction of the proposal. All proposed temporary ancillary facilities would be accommodated within the proposal boundary.

Ancillary facilities are expected to be established during Stage 1 (Site establishment, clearing and demolition) of construction, as described in Section 3.3.1. The ancillary facility would operate during the construction hours described in Section 3.3.3.

The site compounds are typically designed to two-year flood event and are located outside of the 1 in 100-year average recurrence interval (ARI) to avoid inundation during a storm event.

Should there be the need for ancillary facilities outside the proposal boundary, these would be subject to further assessment.

3.4.1 Site compounds and laydown areas

Temporary site compounds, laydown areas and storage to facilitate construction of the proposal. Further details of primary and secondary site facilities (for civil work and buildings), site storage and laydown areas are detailed in the following sections.

Primary and secondary site facilities

Primary site facilities would provide offices, crib, and ablution facilities to support the project management and supervisory team, whilst secondary site facilities would provide crib and ablution facilities to support the on-site labour.

It is proposed to have two separate facilities, one dedicated to the civil work and a second to the building work (i.e., the underground car park, administration building and maintenance facilities). Therefore, the on-site primary and secondary facilities would likely comprise the following:

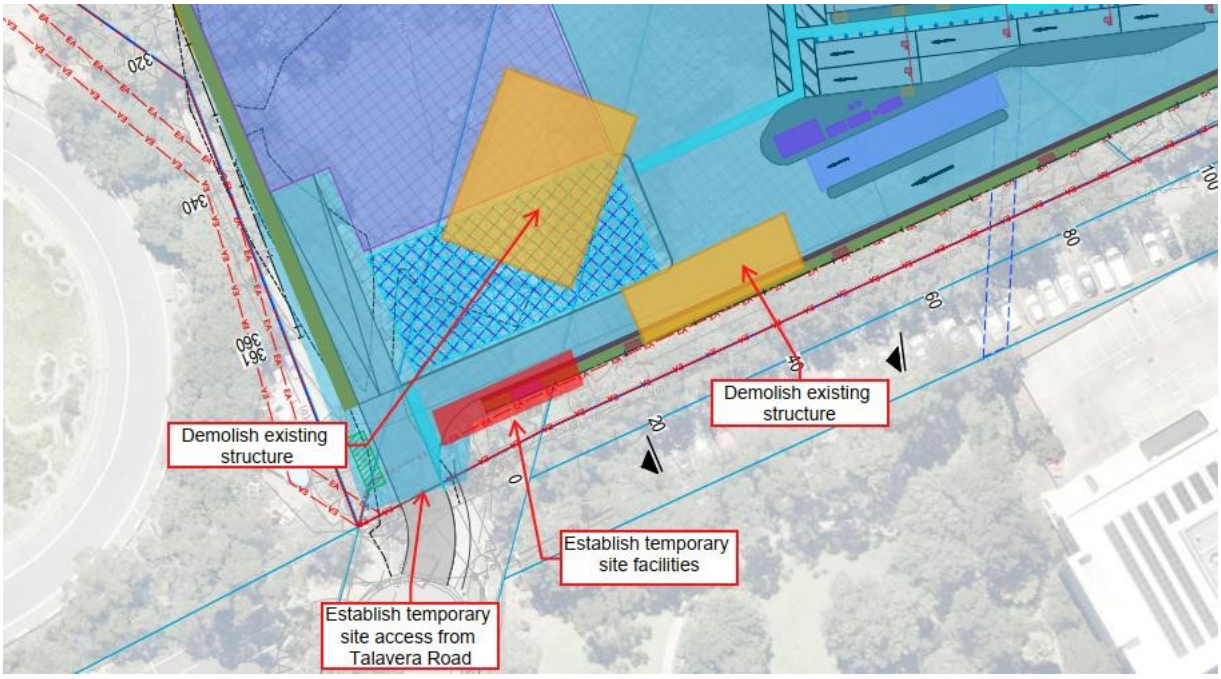
- civil site facilities:
  - two 12m x 3m demountable offices
  - one 12m x 3m demountable crib room
  - one 6m x 3m demountable ablution
  - 12 staff, supervisor and visitor parking spaces
  - 30 workforce parking spaces
- building site facilities:
  - one 12m x 3m demountable offices
  - one 12m x 3m demountable crib room

- one 6m x 3m demountable ablution
- six staff, supervisor and visitor parking spaces
- 20 workforce parking spaces.

Building site facilities

The temporary building site facilities are proposed to be located within the Ausgrid easement, subject to approval from Ausgrid. The location is shown in Figure 3-6.

This would require a small area of vegetation clearance within the easement. Once the underground car park has been constructed, there is potential for these site facilities to be relocated within the ground level.



Source: Macquarie Park Zero Emission Bus Depot Constructability Report – 80% Concept Design (Bellwether, 2024)

Figure 3-6: Proposed location of the temporary building site facilities within Ausgrid easement to northwest of the proposal - indicative only, subject to detailed design

Site storage

Site storage would generally comprise of secured shipping containers for storage of small tools and equipment, consumables, hazardous materials, and other small items which either need to either be stored securely or out of the elements. It would likely require the following:

- civil site storage:
  - three 20-foot containers
  - one 10-foot bunded hazardous good container
- building site storage:
  - two 20-foot containers
  - one 10-foot bunded hazardous good container.

The containers would be located within the site footprint and could be relocated around the site as required.

Laydown areas

Laydown areas are required to accommodate larger materials which can be stored outside such as the RCBC segments, geotextile fabric, reinforcing steel, reinforce soil slope wall panels, and conduits. The intent is that these materials would be delivered to site as required, immediately before their installation.

The largest laydown area likely to be required would be around 1000 square metres for the RCBC segments. All laydown areas would be accommodated within the construction footprint of the proposal.

The building work would require an on-site laydown area of around 400-600 square metres. This could be accommodated within the earthwork footprint adjacent to the building pad. As the building work progress, these materials could potentially be stored within, or on top of, the underground car park.

3.4.2 Stockpiles

Stockpiles would be required for the duration of construction. Stockpile sites would temporarily store materials for construction, or materials generated from within the construction site. This could include road base constituents, asphalt millings, stripped topsoil, mulch, pre-cast concrete components and excess spoil unsuitable for use by the proposal.

Materials would be stockpiled at various locations within the construction footprint of the depot. The exact locations of the stockpiles are unknown at this stage but would be identified during detailed design and included in the Erosion and Sediment Control Plan (ESCP).

All stockpiles would be managed in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1 ("The Blue Book) (4th edition)* (Landcom, 2004).

3.5 Public utility adjustment

A comprehensive review of data, desktop searches and information provided by utility authorities was conducted by the design team to identify existing utilities within the proposal area to inform design. Information was obtained from:

- Transport for New South Wales Digitised Existing Utilities Data
- Before you Dig Australia (BYDA) information
- Ausgrid Look Up and Live GIS.

Various existing utility assets which cross and surround the proposal were identified. Where existing utilities require relocation or modification, the relevant service providers will be consulted. Any disused utilities would either be abandoned, or grout filled and concrete capped. This would be confirmed for each utility during detailed design.

The proposed utility adjustments are detailed as follows.

Electrical

Ausgrid assets are located around and within the proposal boundary. These include HV cables within two 125-millimetre-diameter polyvinyl chloride (PVC) conduits which run in an Ausgrid Transmission Easement along the western boundary of the proposal. There is an additional right of way easement along the southern boundary.

The existing electrical connections are to be decommissioned as part of the demolition work.

The existing overhead and underground electrical connections along Pittwater Road are to be relocated to the boundary to allow for construction of the access road.

Sewer

A large quantity of fill is proposed to be placed on the sewer pipe (ref: SM U E S PIP 0015), which crosses the site to the south of the existing drainage corridor. The proposed retaining wall MW02 will also clash with an existing sewer pit (ref: SM U E PIP 0004). As a result, the sewer will require relocation to accommodate the proposed work. A bespoke design to connect the new sewer main to the existing concrete encased section of 300-millimetre-diameter PVC pipe is proposed.

Sewer mains along Pittwater Road (refs: SM U E S PIP 003 and SM U E S PIP 0007) are also impacted by the pavement work and will also require relocation.

Further consultation is required with Sydney Water to confirm tie in locations and discuss the opportunity to combine dual mains into a single main.

Potable water

Existing potable water connections, including a pipe (ref: WM U E W PIP 0015 – 0019) and meter, are to be decommissioned as part of the demolition work. All other water main assets are to be protected during construction work.

Communication

There is an existing Telstra overhead asset (ref: TZ U E C TE PIP 0001) that runs above the proposed bus depot to Pittwater Road. The overhead asset (ref: TZ U E C TE PIP 0002) continues down Pittwater Road and would require relocation outside of the proposed pavement area.

It is proposed to replace the overhead asset with an underground route that crosses the depot.

Further investigation during detailed design is required to confirm where the cables are servicing, and appropriate design levels required to avoid conflicts with the construction of retaining walls.

Gas

There is a 1050 kilopascals (kPA) high-pressure gas main located within a 3.5-metre-wide easement beyond the northern boundary of the proposal.

Consultation with the utility owner Jemena, will be undertaken regarding any work within three metres of the gas main (or five metres for piling work). Design approval, presence of a protection officer and vibration monitoring may be required during construction.

The following features of the proposal would interface with the high-pressure gas main and would require further discussions with Jemena:

- retaining wall along northern boundary of the proposal
- driveway access off Talavera Road.

3.6 Property acquisition

The proposal is located on the following land plots:

- Lot 12 DP 883750
- Lot 13 DP 883750
- Lot 25 DP 232697
- Lot 27 DP 232964
- Lot 105 DP 1001474

The lots comprise surplus Transport land, acquired as part of the M2 Hills Motorway project, therefore there is no requirement for any property acquisition or modification to accommodate the proposal.

The proposal does not fall under any special category of land use or have a special status.

4. Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, local environmental plans and other legislation.

4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the framework for environmental planning and assessment in NSW.

This proposal is subject to the environmental impact assessment and planning approval requirements of Division 5.1 of the EP&A Act. Division 5.1 specifies the environmental impact assessment requirements for activities undertaken by public authorities, such as Transport for NSW, which do not require development consent under Part 4 of the EP&A Act. In accordance with Section 5.5 of the EP&A Act, Transport, as the proponent and determining authority, must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposal.

Clause 171 of the *Environment Planning and Assessment Regulation 2021* (EP&A Regulation) prescribes the minimum environmental factors which must be considered when determining if an activity assessed under Division 5.1 of the EP&A Act has or is likely to have a significant effect on the environment.

Chapter 6 of the REF provides an environmental impact assessment of the proposal in accordance with the requirements of section 171 of the EP&A Regulation, and Appendix A of this REF specifically responds to the factors for consideration under section 171 of the EP&A Regulation.

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the State.

Section 2.109 of the SEPP (Transport and Infrastructure) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for road infrastructure facilities and is to be carried out by Transport, it can be assessed under Division 5.1 of the EP&A Act. Development consent from City of Ryde Council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under State Environmental Planning Policy (Resilience and Hazards) 2021, State Environmental Planning Policy (Precincts—Eastern Harbour City) 2021 or State Environmental Planning Policy (Planning Systems) 2021.

Section 2.10 to 2.15 of the SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by the SEPP (Transport and Infrastructure) (where applicable), is discussed in Chapter 5 of this REF.

Under the *State Environmental Planning Policy (Transport and Infrastructure) Amendment (Electric Vehicles) 2023*, changes were made to the SEPP (Transport and Infrastructure) to expand the policy provisions for electric vehicle charging facilities. The amending SEPP updates the existing provisions of the SEPP (Transport and Infrastructure) to be responsive to changes in technology and consumer demand. The planning approval pathway for electric vehicle charging units (EVCU) is now included within the SEPP (Transport and Infrastructure). The installation of EVCU within a bus depot is classed as exempt development, as set out in 2.124D of the SEPP (Transport and Infrastructure).

State Environmental Planning Policy (Resilience and Hazards) 2021

Hazardous and offensive development

State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) officially began on 1 March 2022, and consolidates and repeals the provisions of SEPP 33 – Hazardous and Offensive Development.

Chapter 3 of the Resilience and Hazards SEPP contains a systematic approach for assessing development proposals for potentially hazardous and offensive industry or storage. Under Section 3.7 of the Resilience and Hazards SEPP, in determining whether a development is hazardous or offensive storage establishment, hazardous industry or other potentially hazardous industry, consideration must be given to current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development.

The NSW *Planning Circular PS 21-031: Planning and assessment guidelines for hazardous industry* (NSW Department of Planning and Environment, 2021) outlines the obligations under the Hazards and Resilience SEPP to consider potential hazards and signposts to the relevant NSW Government guidelines. The Planning Circular signposts to the *Hazardous and Offensive Development Application Guidelines 'Applying SEPP 33'* (NSW Department of Planning, 2011) which sets out an approach to identify developments which must be assessed under the SEPP and explains the assessment requirements of the policy. Section 7 and Appendix 4 of the guidelines provide a risk screening method to determine whether a proposed development is potentially hazardous and thus affected by the SEPP.

The first step of the risk screening method is to determine the type and quantity of hazardous materials present and how they are used or stored on site. The materials should be classified in accordance with *Australian Code for the Transport of Dangerous Goods by Road and Rail* (Commonwealth Government, 2014) ('Dangerous Goods Code').

The proposed battery electric buses would be powered by lithium-ion batteries. Lithium ion-batteries are hazardous materials because of their potential to cause fire hazards. Under the Dangerous Goods Code, lithium-ion batteries are classified under Class 9 - Miscellaneous dangerous substances and articles. As stated in Appendix 4 of the *Hazardous and Offensive Development Application Guidelines 'Applying SEPP 33'* (NSW Department of Planning, 2011), Class 9 is excluded from the risk screening in the SEPP. The SEPP does therefore not consider the proposal to be potentially hazardous and/or offensive, and therefore Chapter of the SEPP is not applicable to this proposal.

Hazards associated with these lithium-ion batteries related to fires are detailed in the *Zero Emission Buses Greater Sydney Tranche 1 - Macquarie Park Asset Fire Life Safety Strategy Report* (WSP Australia Pty Ltd, 2024).

Remediation of land

Chapter 4 of the Resilience and Hazards SEPP provides for a consistent state-wide planning approach to the remediation of contaminated land. The chapter states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. If the land is unsuitable, remediation must take place before the land is developed. However, as the proposal is assessed under Division 5.1 of the EP&A Act, the Resilience and Hazards SEPP would not formally apply to the proposal, but the proponent would need to show regard for the aims and objectives of the SEPP.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

Vegetation in non-rural area

Section 2.7 of the State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) states that an authority to clear vegetation under this policy is not required if it is a clearing authorised under section 60(O) of the Local Land Services Act 2013. Section 60(O) provides an exemption for clearing under Part 5 of the EP&A Act, and therefore consent for the proposal is not required under the SEPP.

Sydney Harbour Catchment

Chapter 6 of the Biodiversity and Conservation SEPP outlines the planning considerations and policies that govern planning proposals in the Sydney Harbour Catchment. The proposal is within the Sydney Harbour Catchment, which is defined as a regulated catchment under the SEPP. The proposal will therefore consider the aims, objectives, and planning principles of Chapter 6 of the SEPP (Biodiversity and Conservation) SEPP.

Demolition on certain land

Under Section 6.23 of the Biodiversity and Conservation SEPP, development that involves the demolition of a building or work in a regulated catchment may be carried out only with development consent.

4.1.2 Ryde Local Environment Plan 2014

The Ryde Local Environment Plan 2014 (Ryde LEP) (City of Ryde Council, 2014) is the prevailing planning instrument for the City of Ryde LGA.

Under Part 2 of the Ryde LEP, the proposal is located within land that is zoned SP2 Infrastructure (Classified Road), and E3 Productivity Support. The land zoning is shown in Figure 4-1.

The LEP provides the objectives for these land use zones, which are set out in Table 4-1.

Table 4-1: Land use zone objectives

Land zone	Objective
SP2 Infrastructure	• To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure. • To ensure the orderly development of land so as to minimise any adverse effect of development on other land uses.
E3 Productivity Support	• To provide a range of facilities and services, light industries, warehouses, and offices. • To provide for land uses that are compatible with, but do not compete with, land uses in surrounding local and commercial centres. • To maintain the economic viability of local and commercial centres by limiting certain retail and commercial activity. • To provide for land uses that meet the needs of the community, businesses, and industries but that are not suited to locations in other employment zones. • To provide opportunities for new and emerging light industries. • To enable other land uses that provide facilities and services to meet the day to day needs of workers, to sell goods of a large size, weight, or quantity or to sell goods manufactured on-site. • To promote sustainable development, including public transport and working environments. • To encourage industries involved in research and development.

The proposal is consistent with the objectives of the SP2 and E3 zones. However, as the proposed activity is associated with road infrastructure facilities, Section 2.7 of the SEPP (Transport and Infrastructure) prevails over the LEP, and the consent requirements of the LEP do not apply.

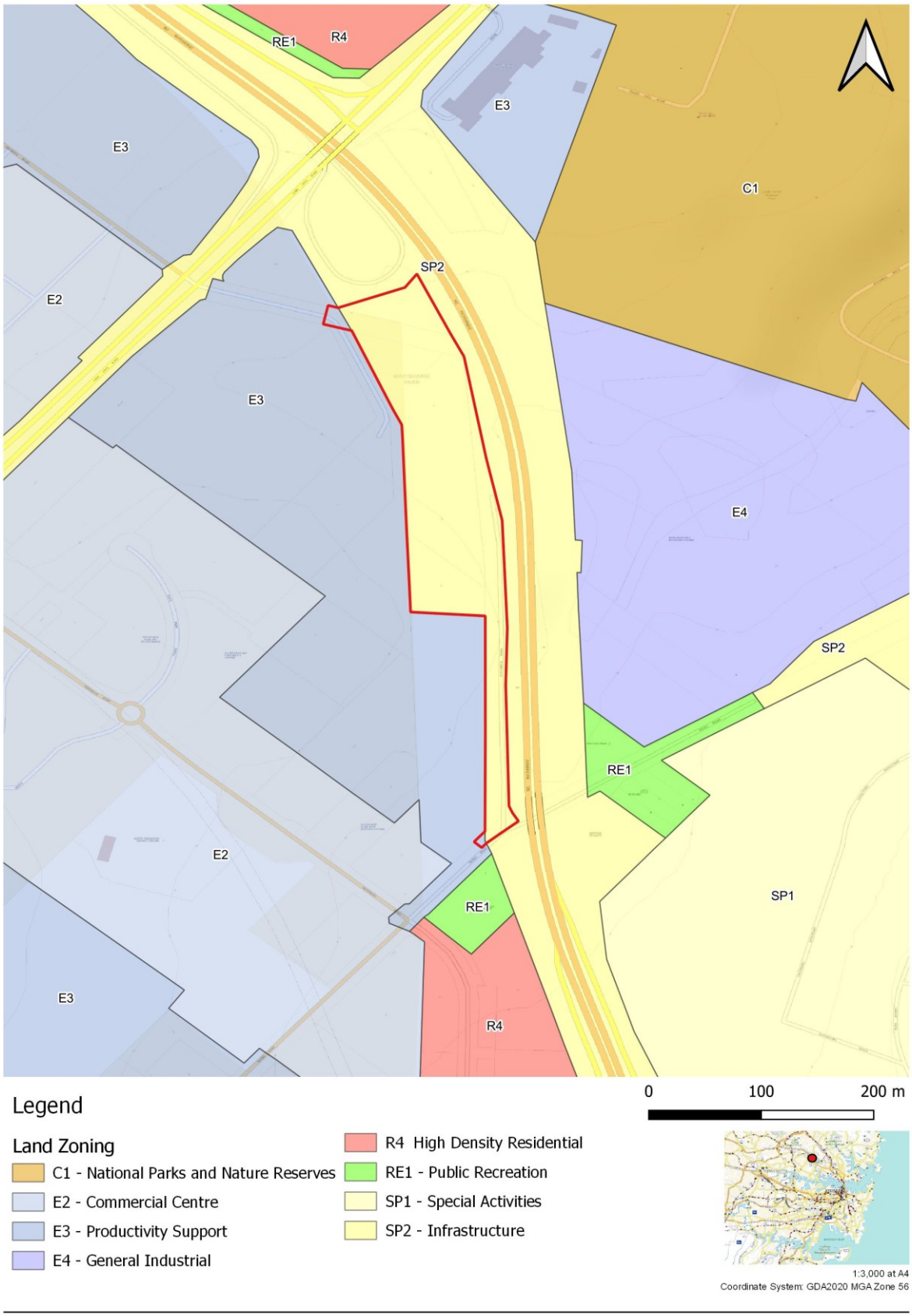


Figure 4-1: Land Use Zoning within and surrounding proposal site

4.2 Other relevant NSW legislation

4.2.1 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) seeks to conserve biological diversity and promote ecologically sustainable development; to prevent extinction and promote recovery of threatened species, populations and ecological communities; and to protect areas of outstanding biodiversity value.

The BC Act provides a listing of threatened species, populations and ecological communities, areas of outstanding biodiversity value, and key threatening processes.

The NSW Biodiversity Offsets Scheme is established under Part 6 of the BC Act and the Biodiversity Assessment Method (BAM) is outlined in Section 6.7 of the BC Act. The purpose of the BAM is to prescribe requirements for the assessment of certain impacts on listed threatened species, populations and ecological communities, areas of outstanding biodiversity value, and key threatening processes.

Part 7 of the BC Act requires that the significance of the impact on threatened species, populations and endangered ecological communities listed under the BC Act or *Fisheries Management Act 1994*, are assessed using a five-part test. Where a significant impact is likely, a Species Impact Statement or Biodiversity Development Assessment Report (BDAR) must be prepared.

The significant impact test applied to threatened species and ecological communities relevant to the proposal is presented in Section 6.1 of the REF and in the Biodiversity Assessment Repot (BAR) in Appendix C. The proposal is unlikely to have a significant impact on any BC Act listed species, populations, or ecological communities.

4.2.2 Biosecurity Act 2015

Under the *Biosecurity Act 2015*, which came into effect on 1 July 2017 and repealed the *Noxious Weeds Act 1993*, '*all plants are regulated with a general biosecurity duty to prevent, eliminate, or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated, or minimised, so far as is reasonably practicable'*.

Biosecurity matters under this Act include weeds and pathogens. Several introduced plant species have been identified in the proposal site which are listed under Schedule 3 of the *NSW Biosecurity Regulation 2017* and as Priority Weeds in the Greater Sydney region (which includes City of Ryde LGA).

Where these weeds occur on site, under the *Biosecurity Act 2105* they must be controlled to result in their suppression. Appropriate biosecurity controls would be put in place prior to the commencement of work to minimise the risk of weed transfer and avoid the further spread of these species. The potential impacts and relevant safeguards are discussed further in Section 6.1 of this REF.

4.2.3 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997 (*CLM Act) establishes a process for investigating, managing and remediating contaminated land and outlines the circumstances in which landowners are required to notify the Environment Protection Authority (EPA), such as certain levels of soil contamination, potential to contaminate neighbouring land, presence of friable asbestos and potential surface and groundwater contamination.

The Detailed Site Investigation (DSI) undertaken for the proposal identified the presence of asbestos on-site. Asbestos containing materials have been identified in soil surfaces and within building materials on-site.

Under Section 60(3)(b) of the CLM Act, notification of asbestos contamination is required where friable asbestos is present in or on soil or the land, where the levels of asbestos are equal to or above the health screening level of friable asbestos in soil, and a person has been, or foreseeably will be, exposed to elevated levels of asbestos fibres by breathing them into their lungs.

The remediation of sites contaminated with asbestos can be regulated under the CLM Act. Appropriate remediation and/or management of the asbestos will be undertaken, under a Remedial Action Plan. This is discussed further in Section 6.11 of this REF.

4.2.4 Protection of the Environment Operations Act 1997

The EPA is the responsible agency for the administration of the *Protection of the Environment Operations Act 1997* (POEO Act) in relation to air, noise, water, pollution, and waste management.

Section 120 of the POEO Act prohibits pollution of waters. In the absence of any EPL licence, to avoid causing pollution and breaches of Section 120, any water discharged from the proposal must be of the same quality, or better, than the quality of the receiving waters (at the time of discharge). The potential impacts and relevant safeguards to ensure compliance with Section 120 of the POEO Act are discussed further in Section 6.3 of this REF.

Section 148 of the Act requires immediate notification of pollution incidents causing or threatening material harm to the environment to each relevant authority. A site-specific emergency spill plan would be prepared by the construction contractor and included as a sub-plan of the Construction Environmental Management Plan (CEMP) for the proposal. This plan would outline measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities. Further details are contained in Section 6.3 of the REF.

Section 144AAB, under Division 3 of the POEO Act, prohibits the reuse and recycling of asbestos waste in any form. Asbestos-contaminated soils can be capped, or contained elsewhere on the same site, however there is a requirement under sections 115 and 116 of the Act that the on-site use must not harm, or be likely to harm, the environment. The potential impacts and relevant safeguards associated with the asbestos identified on site are discussed further in Section 6.11 of this REF.

4.2.5 Roads Act 1993

The Roads Act 1993 (Roads Act) provides for the construction, operation, maintenance, and use of public roads in NSW and regulates the carrying out of activities on these roads.

The proposal requires construction work on Wicks Road, and Talavera Road. Wicks Road, and Talavera Road are all local roads, and Pittwater Road is a private road, which are not classified under the Roads Act.

However, Lane Cove Road is a major classified road and falls under the remit of the Roads Act.

Section 138 of the Roads Act requires that a person must not carry out work in, on or over a public road, dig up or disturb the surface of a public road or remove or interfere with a structure, work or tree on a public road without the prior consent of the appropriate roads authority, which is City of Ryde Council for this proposal.

The work could result in temporary impacts to traffic during construction activities. A Road Occupancy Licence (ROL) is required for any activity likely to impact on traffic flow, even if that activity takes place off-road.

4.3 Commonwealth legislation

4.3.1 Environmental Protection and Biodiversity Conservation Act 1999

Under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix A and Chapter 6 of the REF.

A referral is not required for proposed road activities that may affect nationally-listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Potential impacts to these biodiversity matters are also considered in Section 6.1 of this REF and Appendix A.

Findings - matters of national environmental significance

The assessment of the proposal's impact, on matters of national environmental significance and the environment of Commonwealth land, found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water under the EPBC Act.

4.3.2 Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. The Act covers actions affecting native title and the processes for determining whether native title exists and compensation for actions affective native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register. Under the Act, a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the Native Title Tribunal Native Title Vision website was undertaken by Transport on 20 December 2023, with no Native Title holders/claimants identified (National Native Title Tribunal, 2023).

4.3.3 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* is Commonwealth legislation that can be used by Aboriginal and Torres Strait Islander people to make applications to protect places and objects from injury or desecration. The places or objects in question must be of particular significance in accordance with Aboriginal tradition.

The construction footprint of the proposal does not include any previously identified Aboriginal sites and/or places (refer to Section 6.4)

A safeguard has been included in this REF in the event of unexpected finds, as detailed in Table 6-8 in Section 6.4.4.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of road infrastructure facilities and is being carried out by or on behalf of a public authority. Under section 2.109 of the SEPP (Transport and Infrastructure) the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

Transport is the determining authority for the proposal. This REF fulfils Transport's obligation under Section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5. Consultation

This chapter discusses the consultation undertaken to date for the proposal and the consultation proposed for the future.

5.1 Consultation strategy

Transport's *Zero Emission Buses Communications and Stakeholder Engagement Strategy* (Transport for NSW, 2023) (CSE Strategy) was prepared in June 2023, which will be used to guide the development of communications and stakeholder engagement activities for the proposal.

The CSE Strategy aims to deliver best practice communications and engagement strategies to mitigate and manage impacts to stakeholders and the broader community during the delivery phase. This includes early engagement and ensuring our delivery partners have strategies and tools to optimise community relations and 'be a good neighbour' when working in the community.

All communications and stakeholder engagement undertaken for this proposal will be in accordance with this strategy. An 'involve' approach is to be taken with key stakeholders for delivery approvals and depot design, and an 'inform' and 'consult' approach with surrounding businesses and the local community during the delivery phase.

In accordance with the overarching CSE strategy, a proposal-specific Community Liaison Management Plan (CLMP) will be prepared and implemented. The CLMP will outline specific communication and stakeholder engagement activities, procedures, and protocols for the proposal.

5.2 Community involvement

In accordance with the CSE Strategy, early and ongoing engagement with the community, including businesses, schools and residents around the proposal will be undertaken.

A tailored CLMP will be developed to address local community requirements and variations in delivery planning approach. The CLMP will detail specific community engagement activities which reflect the scope of work and outline relevant messaging and communication channels.

The opportunity for further community involvement is provided in the REF submissions process. The proposal has the potential for some impacts on the community, including construction noise and vibration, socio-economic, and visual impacts. The REF will therefore be publicly displayed for comment in June 2024.

Following the public display of the REF, all comments received would be recorded and addressed in a Submissions Report detailing how each issue raised would be considered in finalising the proposal design. The Submissions Report will be made available to the public on the project webpage on Transport's website.

5.3 Aboriginal community involvement

Where required, Aboriginal community consultation would be undertaken in accordance with the requirements of Transport's Procedure for Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services, 2011) and in consultation with the relevant Aboriginal Cultural Heritage Officer, where required. A summary of Transport's PACHCI stages is outlined in Table 5-1.

Table 5-1: Summary of Transport's Procedure for Aboriginal Cultural Heritage Consultation and Investigation

Stage	Description
Stage 1	Initial assessment by Transport
Stage 2	Site survey and further assessment
Stage 3	Formal consultation and preparation of a cultural heritage assessment report
Stage 4	Implement environmental impact assessment recommendations

A Stage 1 PACHCI for the proposal was undertaken by Transport and an NSW Office of Environment and Heritage's Aboriginal Heritage Information Management System (AHIMS) Basic Search was conducted. The search did not identify any known Aboriginal heritage features within 200 metres of the proposal.

The PACHCI Stage 1 concluded that Aboriginal culture heritage impacts are not expected as a result of the proposal. A Stage 2 PACHCI assessment was therefore not deemed to be required and hence there was no statutory requirement to consult with the Local Aboriginal Land Council. Further details of the Aboriginal cultural heritage assessment are included in Section 6.4.

To inform the Connecting with Country design scope, a Walk on Country at the proposed depot site was undertaken with Aboriginal Elders on 12 December 2023. Feedback received will be considered during detailed design and construction.

5.4 SEPP (Transport and Infrastructure) consultation

City of Ryde Council and the State Emergency Services (SES) will be consulted about the proposal as per the requirements of sections 2.10 (council infrastructure and services), 2.12 and 2.13 (development with impacts on flood liable land) of the SEPP (Transport and Infrastructure).

Appendix B contains a SEPP (Transport and Infrastructure) consultation checklist that documents how SEPP (Transport and Infrastructure) consultation requirements have been considered.

Consultation under SEPP (Transport Infrastructure) will be undertaken with the following stakeholders during the public display period:

- Ryde City Council:
  - Under section 2.10 in relation to traffic impacts on the local road network.
  - Under section 2.12 with regard to potential impacts on flooding
- Notification to the SES under section 2.13 as the proposal is located on flood liable land.

5.5 Consultation to date

Early consultation with the following key stakeholders has been undertaken during the development of the concept design:

- Aboriginal Elders (consultation detailed in Section 5.3)
- Fire Rescue NSW
- Utilities providers, including Ausgrid, Telstra, Jemena
- Future depot operator/maintainer (Busways)
- Transurban.

Discussion with stakeholders has generally focused on input to the concept design and on coordination with neighbours.

5.6 Ongoing or future consultation

This REF will be placed on public display for stakeholder and community comment. All comments received will be considered when finalising the proposal design. The community would be kept informed of any other changes to the proposal resulting from this and any future consultation process.

Following the public display of the REF, Transport will develop a Submissions Report detailing a summary of the feedback received and how it was considered. Community will be notified when the report is publicly available.

Should the proposal receive planning approval, consultation with key stakeholders will remain ongoing as the project progressed into detailed design. The community will continue to be kept informed as the project progresses.

Ongoing communications and notifications may include:

- community/construction updates

- media announcements
- NSW Live Traffic updates and social media updates
- project subscriber emails
- stakeholder meetings (as required)
- web page updates
- work notification letters (as required).

As detailed in Sections 5.1 and 5.2, a CLMP would be prepared and implemented to help provide timely and accurate information to the community during construction. The CLMP would include details and timing of proposed activities that have the potential to affect residents, including changed traffic and access conditions.

During proposal delivery, a dedicated community relations team would implement the CLMP. This would include providing regular community update or construction notifications as required and responsibility for investigating and resolving any feedback or complaints made about construction activities.

6. Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment, potentially impacted upon by the proposal, are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act.
- The factors specified in the Guidelines for Division 5.1 assessments (DPE, 2022) and as required under section 171 of the *Environmental Planning and Assessment Regulation 2021* and the *Roads and Related Facilities EIS Guideline* (DUAP 1996). The factors specified in section 171 of the *Environmental Planning and Assessment Regulation 2021* are also considered in Appendix A.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Biodiversity

This section provides an assessment of the potential impacts of the proposal on biodiversity and identifies safeguards and management measures to avoid or minimise these impacts.

A detailed assessment of biodiversity impacts is provided in a Biodiversity Assessment Report (BAR), prepared by Lesryk. The main findings of the BAR are summarised in this section and the BAR is included in Appendix C.

An Arboricultural Impact Assessment (AIA) to assess the impact on trees within the proposal boundary was undertaken by AllArbor Solutions. The AIA is presented in Appendix H and the findings summarised in this section.

6.1.1 Methodology

The methodology for the biodiversity assessment included a desk-based assessment, field survey and assessment of the potential impacts during construction and operation of the proposal.

The methodology adopted for the desk-based assessment and field surveys is outlined as follows:

Desk-based assessment

Biodiversity databases and previous studies conducted in the region were consulted to identify the diversity of ecological communities, flora and fauna species that have the potential to occur within 10 kilometres of the proposal boundary. The databases and reports that were reviewed and drawn upon are provided in Section 2-2 of the BAR.

In reviewing the flora and fauna databases, particular attention was paid to identifying relevant ecological matters listed, or currently being considered for listing, under the Schedules of the EPBC, BC and/or FM Acts, plants, animals and ecological communities that have been recorded in the region and which may occur within, or in the vicinity of, the proposed work area.

The desk-based assessment included a review of threatened species records under the BC Act, identification of potentially occurring Matters of National Environmental Significance (MNES) under the EPBC Act, Plant Community Types (PCT), all listed threatened species, populations and communities, and any land with high biodiversity value that could be particularly sensitive to the impacts of the proposal.

Field surveys

Diurnal field surveys

Diurnal field surveys were conducted to identify vegetation communities, fauna habitats, plants and animals present within and near the study area that are of State and/or national conservation significance as listed under the Schedules to the EPBC Act, BC Act and/or FM Act.

Field survey methods employed within and proximate to the areas of likely disturbance included:

- The identification of the presence of plants, including any threatened flora species
- The identification of the structure of vegetation communities and fauna habitats present
- The direct observation of fauna species present

- Diurnal call identifications of fauna species present, with all calls being identified in the field
- The identification of any indirect evidence such as tracks, scats, scratchings and diggings that would suggest the presence of a particular fauna species
- Leaf litter and ground debris searches for sheltering reptiles and amphibians
- Inspection of water bodies, culverts, and large logs
- Identification and recording of individual native trees that are required to be removed
- Recording of mature tree that were, or were considered to be, hollow-bearing (potentially used by microbats, birds and arboreal mammals).

In total, 14.5 person hours of active survey has been undertaken within the proposal boundary.

Targeted field surveys

The precautionary principle was adopted where necessary, however based on observations during the diurnal field surveys, including the nature and condition of the site, it was not considered necessary to employ any species-specific targeted surveys. Further justification of this is provided as follows:

- Vegetation survey and classification – based on the PCT identified during the desk-based assessment, plot-based full floristic surveys were not considered to be required.
- Targeted flora surveys – given that the habitats within the study area were observed during the field surveys to be substantially degraded, no threatened flora was considered likely to occur within the study area. As such, targeted flora surveys were not conducted.
- Targeted fauna surveys – based on the observations made during the diurnal field surveys and considering the disturbed and modified nature of the areas investigated and the identification of those habitats present, species-specific fauna surveys, such as nocturnal surveys or echolocation targeting Yangochiroptera (microbats), were not considered to be necessary.
- Aquatic field surveys – upon inspection of the two stagnant water bodies within the proposal boundary, neither appeared to support any significant aquatic habitat, therefore no detailed aquatic surveys were considered necessary.

Tree surveys

Tree surveys to collect data and undertake trees assessments were carried out on 8 and 11 March 2024.

Data was collected for each tree assessed in relation to its height, radial canopy spread, trunk Diameter at Breast Height (DBH) and trunk diameter above root buttress. These physical dimensions were either measured or estimated, where appropriate. The vigour, structure and age class of each tree was also assessed.

Each tree was given a Useful Life Expectancy (ULE) rating was assessed against the Institute of Australian Consulting Arborists (IACA) Significance of a Tree Assessment Rating System (STARS).

6.1.2 Existing environment

Plant community types and vegetation zones

With reference to the NSW State Vegetation Type Map (SVTM) (NSW DCEEEW, 2023), the proposal area is mapped as PCT 0 – Not classified vegetation. In the wider assessment area, three PCTs have been identified comprising Sydney Coastal Shale-Sandstone Forest, Sydney Coastal Enriched Sandstone Forest and Sydney Coastal Sandstone Gully Forest. PCTs are shown in Figure 6-1.

The field investigation found the proposal area, where vegetation occurred, was comprised of a canopy containing native species such as Blackbutt (*Eucalyptus pilularis*), Smooth-barked Apple *(Angophora costata*) and Red Mahogany (*Eucalyptus resinifera*) and exotic White Poplar (*Populus alba*) and Radiata Pines (*Pinus radiata*) up to 25 metres tall. The midstory was comprised of exotic Large-leaved Privet (*Ligustrum lucidum*) and Lantana (*Lantana camara*), with native River She-oak (*Allocasuarina littoralis*) and Oleander (*Nerium oleander*) present. The groundcover was dominated by exotic grasses and climbers including Blackberry (*Rubus fruticosus agg.* Spp.), Rhodes Grass (*Chloris gayana*), Paspalum (*Paspalum dilatatum*), Kikuyu Grass (*Cenchrus clandestinus*) and Asparagus Fern (*Asparagus aethiopicus*).

PCT 3259 – Sydney Coastal Shale-Sandstone Forest and PCT 3262 – Sydney Turpentine Ironbark Forest also occur in proximity to the proposal area. Given these PCTs proximity to the study area, the vegetation within the proposal area was assessed as if mapped as this PCT, to confirm the accuracy of the SVTM.

The level of disturbance and highly modified nature of the site has led to the midstory and groundcover being dominated by invasive weeds and exotics, with no native shrub layer present. Large remnant trees exist scattered and in rows along the northern boundary of the proposal area with River She-oaks present in a row along the western boundary and a small section within the centre of the proposal, which alone, do not conform to a native plant community.

There are no listed derived plant communities associated with the PCT 3259 or PCT 3262 which could have occurred within the proposal area.

The SVTM mapping as PCT 0 – Not Classified was identified to be accurate and the vegetation within the proposal area not to conform to a native vegetation community.

Source: Biodiversity Assessment Report (Lesryk, 2024)

Figure 6-1: Plant community types

Threatened ecological communities

There are no threatened ecological communities (TEC) that occur within the study area.

Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDE) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater.

No terrestrial, aquatic or subterranean GDEs were identified within the proposal boundary. The GDE Atlas (BoM, 2023) identified low to high potential for terrestrial GDE to the northeast of the proposal.

Threatened species

The desk-based assessment identified 71 threatened plants and/or their populations, and 88 threatened fauna species listed under the EPBC, BC and FM Acts that have been previously recorded or are considered to have habitat within 10 kilometres of the proposal. Further details of these species are contained in Appendix A of the BAR. Figure 6-2 shows threatened species previously recorded in the vicinity of the proposal.

No threatened flora or fauna species listed under the EPBC Act or BC Act were detected within the proposal.

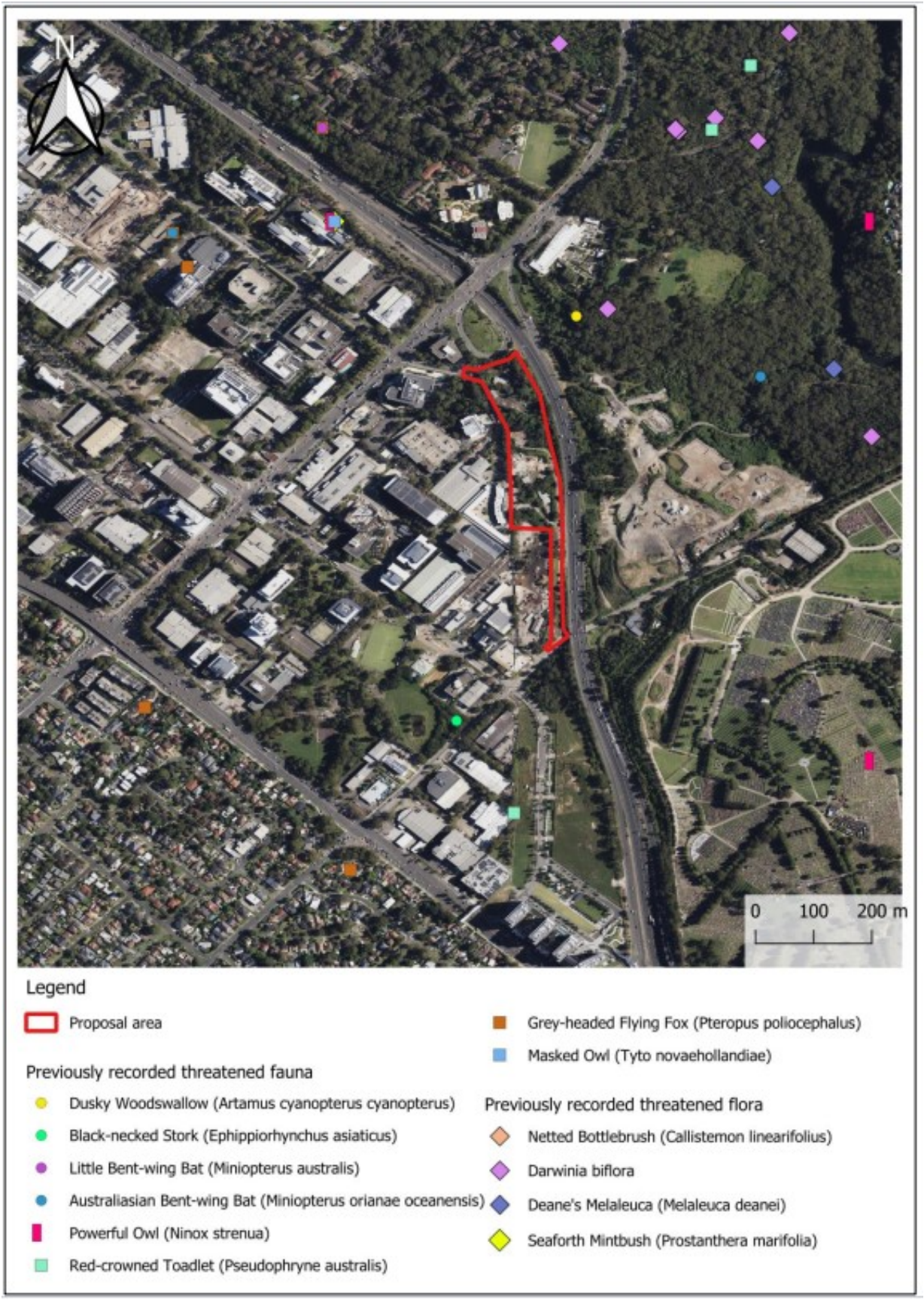
In total, 31 hollow-bearing trees were identified within the study area, which have the potential to provide suitable habitat for the following threatened species listed as 'Vulnerable' under the BC Act:

- Powerful Owl (*Ninox strenua*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Grey-headed Flying-fox (*Pteropus poliocephalus)*
- Yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*)
- Eastern Coastal Free-tailed bat (*Micronomus norfolkensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Southern Myotis (*Myotis macropus*)
- Greater Broad-nosed bat (*Scoteanax rueppellii*).

The Gang-gang Cockatoo and the Grey-headed Flying-fox are also listed under the Commonwealth EPBC Act as Endangered and Vulnerable respectively.

During the field surveys, no other suitable habitat for microbats, such as large stick nests, white-wash accumulations, caves or suitable cave-substitutes were identified. The existing culverts within the site were also inspected and found not to be suitable for occupation by cave-dependent microbats. The presence of spider webs in the culverts indicated that no threatened species were entering or exiting the culverts.

Similarly, no species of threatened bird were observed entering those hollow-bearing trees inspected. Inspections around the base of these did not record any regurgitated owl pellets, preened feathers or similar.



Source: Biodiversity Assessment Report (Lesryk, 2024)

Figure 6-2: Threatened species previously recorded

Areas of outstanding biodiversity value

No gazetted areas of critical habitat or areas of outstanding biodiversity value (AOBV) for any flora or fauna species or communities occurring within the proposal were identified, therefore AOBV were not included in the assessment.

Biodiversity values

The Biodiversity Values Map and Threshold Tool (BVMTT) (NSW Government, 2023) does not identify Biodiversity Values within the proposal boundary, therefore biodiversity values were not included in the assessment.

Aquatic features

No land identified by SEPP Resilience and Hazards 2021 (i.e., coastal wetlands) occurs within, or near to, the proposal.

No aquaculture, commercial or recreational fishing is present within, or near to, the proposed work.

Water features

Water features on-site were identified during the field surveys.

A stormwater drain that crosses the proposal and drains into Porters Creek was observed to be still (i.e., lightly flowing). The water quality was observed to be heavily turbid negating the visual assessment of its depth.

Two stagnant bodies of water were also identified within the proposal, which are about four metres wide and two metres long appear to be fed by overflow stormwater runoff. A layer of biofilm was identified to be present on each water body, along with the presence of urban refuse. There are no reed beds or other habitat features important for aquatic species. Both waterbodies are isolated from any natural or human made drainage lines. Limited inspections of each body did not reveal any tadpoles or aquatic invertebrates. Based on a visual and qualitative assessment it was not considered that either waterbody would be of value for aquatic species particularly those that are intolerant of urban runoff.

Key Fish Habitat

The desk-based assessment did not identify any Kish Fish Habitat (KFH) within the proposal boundary, or any previously recorded threatened fish species listed under the EPBC or FM Acts, or their habitats.

Porters Creek flows approximately 350 metres to the east of the proposal**.** While Porters Creek is not mapped as KFH, it is connected to the Lane Cove River which is identified as KFH.

Wildlife connectivity corridors

The proposal is not identified as being located within Fauna Key Habitats or a Fauna Corridor.

Limited connectivity currently exists between areas of vegetation surrounding the proposal area due to the presence of the M2 Hills Motorway. The motorway also acts as a barrier for ground traversing fauna.

Trees

The AIA identified a total of 281 trees within the proposal boundary.

The site contains patches of dense, inaccessible vegetation. Tree species within these areas predominantly consist of *Ligustrum lucidum* (Broad-leafed Privet), *Ligustrum sinensis* (Small-leafed Privet), *Olea europea subsp cuspidata* (African Olive), self-seeded and/or suckering *Casuarina glauca* (Swamp Sheoak) and *Bamboosa* sp (Bamboo).

Sydney Green Grid

The Greater Sydney Commission has developed a city-wide vision for a Green Grid, which forms an integral part of the Greater Sydney region and district plans. The *Sydney Green Grid – Spatial Framework and Project Opportunities* (Tyrrell Studio, 2017) plan, prepared on behalf of the NSW Department of Planning and Environment, has been developed to deliver an interconnecting network of high-quality open spaces that will enhance biodiversity and ensure ecological resilience.

The Ryde LGA falls within the North District of the Sydney Green Grid. The *Sydney Green Grid - Spatial Framework and Project Opportunities – North District* (Tyrrell Studio, 2017) (North District Plan) maps the hydrological, recreational, and ecological fragments of the city and produces a proposition for a cohesive green infrastructure network for Greater Sydney. It interrogates the vision and objectives of the Sydney Green Grid and uses a combination of mapping and consultation to develop an overview of the green infrastructure needs and character of each district.

The *Green Link* is the City of Ryde's local vision which will provide the regional connection through the provision of the missing local "links" to realise the Green Grid across Sydney. The *Ryde-Eastwood-Macquarie Park (REM) Green Links Masterplan – Context Analysis Report* (McGregor Coxall, 2020), prepared for City of Ryde Council, identifies three interconnected urban green corridors, which function as biodiversity corridors, continuous green transport connectivity (active and mass transport) along activated open spaces, and a platform for cultural engagement and recreation. The three Green Links are collectively referred to as the 'Eastwood to Macquarie Park Open Space Corridor' in the North District Plan.

The proposal is not located in the Eastwood to Macquarie Park Open Space Corridor in the Masterplan and does not fall within any identified green (or blue grid) zones within the Sydney Green Grid plan.

6.1.3 Potential impacts

Construction impacts (direct)

Construction impacts as a result of construction activity associated with the proposal would involve the disturbance and removal of exotic and native vegetation, hollow bearing trees and suitable habitat for threatened hollow-dependant species listed under the EPBC Act and BC Act.

Removal of native and exotic vegetation

Key threatening processes (KTP) associated with this proposal that pose a threat to vegetation include clearing of native vegetation, loss of hollow-bearing trees and removal of dead wood/trees.

It is estimated that the proposed work will result in the disturbance/removal of 2.2 hectares of exotic vegetation and isolated native trees.

In total, 332 trees will require to be removed to accommodate the proposed work. Of the 332 trees to be removed, 31 are hollow-bearing.

At a local scale, vegetation is to be retained beyond the limits of the proposal. Beyond the boundary of the proposed works, stands of similar exotic and native vegetation are present, along with trees and dead wood/trees that could support a range of hollow sizes. Given the presence of this retained vegetation, the loss of native and exotic vegetation, including 332 trees, and the removal of dead wood/trees as a result of the proposal, the BAR concludes that the proposal is not considered to significantly contribute to, or increase the impact of, these KTP.

In line with Transport's *Tree and Hollow Replacement guidelines EMF-BD-GD-0129* (Transport for NSW, 2023) 1140 trees would require planting and 50 artificial hollows would require provision Where this cannot be accommodated for locally [or only partially], Transport will be required to make payment into the Conservation Fund in line with the fund contributions outlined in Transport's *Tree and Hollow Replacement Guidelines*. Transfer of funds must occur prior to commencement of work.

Removal of threatened fauna habitat

Based on the list of threatened species in Appendix A of the BAR, there is potential that numerous highly mobile threatened species with large territorial requirements (e.g., bats, birds) may traverse or occupy the proposal area. Only those that are associated with the habitats identified within the proposal were assessed.

Many of the threatened species identified have specific habitat requirements, as identified in Appendix A of the BAR. The majority of threatened species listed in Appendix A of the BAR were assessed to have an 'unlikely' or 'low' likelihood of occurrence, given the habitat identified to be present during the field surveys, along with the disturbed and heavily modified condition of the proposal.

As discussed previously, 31 hollow-bearing trees are proposed to be removed to accommodate the proposal. Five hollow-dependant microbat species have been previously recorded within the study area, all of which may occupy these trees, due to the diameter of the entrance cavities. The entrance cavities would also permit access to several small to medium-sized birds/arboreal non-flying mammals. All five microbat species forage on insects attracted to plants identified within the proposal. Insect-attracting plants and pollen/nectar producing plants have been identified within the proposal boundary.

The local population of Powerful Owls is considered to be 'confined' to Lane Cove National Park, which forms a well-developed roosting, breeding, and foraging habitat that is regularly utilised to the north and east of the proposal. The proposal will not directly or indirectly affect this conservation reserve. However, given its proximity to the proposal, there is a chance that individual Powerful Owl may use the trees present in the proposal boundary on occasion.

The closest 'nationally important' Grey-headed Flying-Fox camp is located at Gordon, around 4.2 kilometres to the north of the proposal. Within the proximate Lane Cove National Park, which covers an area of 670 hectares, extensive areas of

flowering native plants are present, an important population of this species. Given the proposal's proximity to Lane Cove National Park, individual Grey-headed Flying Fox may forage in the trees present on site, on occasion, when these are in flower.

It was therefore considered appropriate to adopt a precautionary approach to the potential presence of Powerful Owl, Grey-headed Flying-fox, the five microbat species and two bird species listed as 'Vulnerable' under the BC Act. The assessment concluded that the proposed work would not have a significant impact on the potentially occurring Powerful Owl, Grey-headed Flying-fox and hollow-dependent species, or their habitat.

Taking into consideration the heavily disturbed nature of the site, and the extent of suitable natural bushland habitat present within Lane Cove National Park beyond the limits of the proposal, the loss of the trees would not significantly affect the extent of foraging and/or breeding sites available for these species. The removal of these trees would also not limit the extent of insect attracting or pollen producing plants present in this locality. The impact of proposed work on these species is not considered significant.

Overall, the BAR concluded that the development of the proposed ZEB Macquarie Park Bus Depot would not have a significant effect on the potentially occurring hollow-dependent threatened microbats or their habitat.

As such, the preparation of a SIS (or alternatively a BDAR) that further considers the impact of the proposal on hollow-dependent microbats is not required.

Aquatic impacts

Impacts on Porters Creek and Lane Cove River due to the undertaking of the proposed work are considered to be negligible.

The proposal will not affect fish, fish habitat or marine vegetation. No approvals are required under this Act to permit the proposed work. Referral to the relevant Minister responsible for administering this Act would not be required.

Post-work, the aquatic habitat will remain, and it is considered there will be no net loss of Key Fish Habitat.

Injury and mortality

Given the proposal would be conducted within a previously disturbed/modified environment, there is minimal expectation that sheltering animals would be injured during the proposed construction work.

During construction, some rural and semi-urban adaptable, sheltering fauna species (i.e., frogs and ground-traversing mammals) could be present and be subject to injury. Safeguards and management measures have been provided in Section 6.1.4 to address this matter.

Groundwater Dependent Ecosystems

The proposed work would not have any adverse direct or indirect impact on a water source or aquifer structure and no groundwater extraction is proposed.

With the adoption of the safeguards and management measures outlined in Section 6.1.4, the proposed work would not contribute to the off-site movement of sediment.

Trees

The proposal requires extensive cut and fill earthwork to attain finished and/or construction levels, which will directly impact the existing trees within the proposal boundary. In total, the AIA has established that 179 trees are located within the footprint of the work or are significantly impacted, requiring their removal to accommodate the proposal.

It is noted that there is a discrepancy between the number of trees identified to be removed within the AIA and the BAR. This is likely due to differences in survey methods and assumptions made when surveying the site. Offsetting calculations and requirements will be undertaken in line with Transport's *tree and hollow replacement guideline* and confirmed based on the actual number of trees removed from the site. The BAR has assessed all vegetation within the proposal area to be removed, however the tree's marked for retention within the AIA will be retained.

The assumption in the BAR is that all trees within the proposal boundary would be removed, as per the concept design, whereas the AIA has identified that a total of 96 trees would not be impacted by the proposal and could therefore be retained. A further 5 trees would be subject to further investigation to determine whether they could be retained. Retained trees would need to be protected during construction works, to avoid damage or harm. Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) are required to ensure the retained trees' vitality and stability is maintained. Tree protection fencing and signs identifying the TPZ are to be installed at the limits of the TPZ.

Selective pruning work may be required to a number of the retained trees to provide clearances for the retaining wall and/or buses. The removal of live branches is to be kept to a minimum amount required to achieve clearance levels. The removal of significant branches is only to be undertaken where all options to retain the branch have been thoroughly investigated and exhausted. All pruning works are to be undertaken by suitably qualified tree workers (minimum Australian Qualifications Framework (AQF) Level 3 or equivalent) in accordance with Australian Standard AS4373-2007 *Pruning of Amenity Trees and Safe Work Australia's Guide to Managing Risks of Tree Trimming and Removal Works.*

Indirect and operational impacts

Edge effects on adjacent native vegetation and habitat

Weeds are readily spread by existing dispersal factors such as wind, birds, water and the movement of vehicles along roads. Clearing and opening up of new vegetation edges can facilitate the recruitment of these species and provide opportunity for the establishment of other exotic species. These weeds are often able to out-compete native flora and fauna species and reduce the habitat values of these areas.

While this is the case, edge effects beyond those that are currently occurring along the investigated area are not expected to be exacerbated as a result of the proposal.

Wildlife connectivity and habitat fragmentation

The proposed work will not have any direct or indirect impact on those fauna corridors that exist beyond the limits of the activity.

The proposal is not considered to isolate or further fragment any habitat areas or erect any additional barriers to the movement and dispersal patterns of fauna species currently negotiating the proposal area. No blocking or degrading of fish passage, habitat tree removal, nor thinning of canopy cover is required for the proposal.

Temporary measures incorporated as part of the proposal (i.e., erosion and sediment controls, exclusion fencing) would be established in accordance with applicable guidelines to prevent direct or indirect impact on fauna.

No migration or dispersal patterns of native fauna would be adversely impacted by the proposal.

No direct or indirect impact to wildlife connectivity would occur as a result of the operational phase of the proposal. It is considered that species currently negotiating the existing road network and surrounding area would continue to do so post-work.

Injury and mortality

Beyond current levels of impact due to the existing presence of the M2 Hills Motorway and the volume of traffic that typically use this road network, the operation phase of the proposal is not expected to significantly increase injury or mortality of fauna within the proposal area.

The proposal is not expected to significantly alter vehicle strikes on those fauna species recorded or potentially occurring than may be currently transpiring. The proposal would not have an adverse impact on the long-term viability of these species or their local populations.

During operation, flying species, and those highly tolerant of traversing both urban infrastructure and bushland environments, would still be able to move across and through the proposal area.

Invasion and spread of weeds

Of the introduced plant species recorded within the proposal area, Lantana (*Lantana camara*), Asparagus Fern (*Asparagus aethiopicus)* and Blackberry (*Rubus fruticosus* sp. Agg.) are listed as Priority Weeds in the Greater Sydney region (NSW Department of Primary Industries, 2023), Under Schedule 3 of the *NSW Biosecurity Regulation 2017* and Weeds of National Significance (Weeds Australia, 2023). Additionally, Pampas Grass (*Cortaderia selloana*) is also listed as a Priority Weed. Where these weeds occur on site, they must be controlled to result in their suppression. This would be done prior to the commencement of work to avoid further spread of these species.

Invasion and spread of pests

Beyond the existing exotic species recorded within the proposal area, the operational phase of the proposal is unlikely to introduce or increase the presence of pest species. The proposal would not benefit any exotic pests at the expense of native species.

Invasion and spread of pathogens and disease

There is a risk that the proposal would introduce, spread or exacerbate the plant diseases caused by the pathogen *Phytophthora cinnamomi*. This is most likely introduced or spread through the importation or movement of soil, water and landscaping materials, either directly or through incidental attachment to machinery.

Although there was no obvious evidence for the presence of *Phytophthora cinnamomi*, Myrtle Rust (*Austropuccinia psidii*) or Chytrid Fungus (*Batrachochytrium dendrobatidis*) in the vegetation of the proposal area, recommendations to disinfect personnel footwear and machinery prior to its use in construction activities have been included in the safeguards and management measures in Section 6.1.4.

Noise, light, dust and vibration

During construction, activities associated with the proposal may cause additional noise and vibration; however, given the presence of the existing road network (and surrounding area), it is not considered that the proposal would result in adverse changes to existing levels of noise, vibration and/or light from this existing source such that there would be a significant impact to native fauna species.

Sydney Green Grid

Whilst the proposal does not fall within the Sydney Green Grid Blue and Green Zones, nor the Green Links (interconnected urban green corridors) identified by the City of Ryde Council, there is a potential opportunity during the detailed design of the proposal to investigate opportunities for species connectivity. The opportunity has been included in Section 6.1.4.

Overall, no significant adverse impacts are expected during the operational phase of the proposal.

Conclusion on significance of impacts

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act, 2016* or *Fisheries Management Act 1994* and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act.

6.1.4 Safeguards and management measures

Table 6-1: Biodiversity safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B1	Removal of Native Vegetation and Threatened Fauna Habitat	Native vegetation removal and threatened fauna habitat removal will be minimised through detailed design, where feasible	Contractor	Detailed design	Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).
B2	Removal of Native Vegetation and Protection of Retained and Adjacent Vegetation and Habitats	Vegetation clearance limits will be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with *Guide 2: Exclusion Zones* in Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024). Exclusion zones will be set up at the limit of clearing in accordance with *Guide 2: Exclusion zones* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024). Fencing etc. will be established at the outer limits of the drip line of any retained trees and the areas marked as 'no-go zones' to avoid direct impact.	Contractor	Pre-construction/ Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B3	Removal of Vegetation	Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* in Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Pre-construction	Additional safeguard
B4	Removal of Trees	A suitably qualified arborist is to participate in pre-clearing site walk-through, to confirm trees to be removed. Prior to tree removal, the arborist will assess and report on any significant roots that require removal. If structural roots are encountered and need to be cut, they shall provide advice on the position and method of removal to minimise impacts. The arborist will assess and report on the need for any further tree removals required within the proposal boundary.	Contractor	Pre-construction	Additional safeguard
B5	Vegetation/ Trees on Third Party Land	Where vegetation/trees are proposed to be removed or trimmed on land not owned by Transport, the contractor shall obtain the landowner's consent prior to these works being undertaken.	Contractor	Pre-construction	Additional safeguard
B6	Removal of Native Vegetation/ Threatened Fauna Habitat	Vegetation removal and threatened fauna habitat removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* in Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024) to minimise disturbance to surrounding flora and fauna habitats.	Contractor	Construction	Additional safeguard
B7	Removal of Native Vegetation	Where feasible, removed native and non-seed-bearing exotic vegetation would be mulched or re-used on-site (e.g., to stabilise disturbed areas).	Contractor	Construction/ Post-construction	Additional safeguard
B8	Removal of Native Vegetation	Vegetation removal work is not to be conducted during periods of high winds.	Contractor	Construction	Additional safeguard
B9	Removal of Native Vegetation	The contractor must submit for review and endorsement by the Transport Senior Manager Environment and Sustainability, a Tree and Hollow Replacement Plan, which prioritises local plantings in accordance with Transport's *Tree and Hollow Replacement guidelines* EMF-BD-GD-0129 (Transport for NSW, 2023). Unless otherwise agreed to by Transport, this plan will be submitted within three months of commencing construction.	Contractor	Pre-construction/ post-construction	Additional safeguard
B10	Unexpected threatened species	The unexpected species find procedure in *Guide 1: Preclearing process* in Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024) is to be followed if threatened ecological communities and threatened fauna or flora not assessed in	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		the biodiversity assessment, are identified in the proposal site.			
B11	Removal of threatened fauna habitat	An ecologist (or similar qualified person) is to be present on-site during the removal of the 31 hollow-bearing trees. The ecologist is to: • develop lines of communication with the tree felling operator • inspect each tree prior to its clearing • inspect the tree once it is on the ground • collect and relocate locally any sheltering fauna • transport to a local veterinarian any animals that require treatment.	Contractor	Construction	Additional safeguard
B12	Removal of threatened fauna habitat	The 31 hollow-bearing trees are to be marked during pre-clearing surveys. Pre-clearing surveys will be undertaken in accordance with *Guide 1: Preclearing process* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024). If possible, all vegetation around the hollow-bearing trees to be removed would be cleared 24 to 48 hours prior to the removal of the hollow-bearing trees. This approach isolates the hollow-bearing trees and reduces their habitat value (particularly for ground-traversing fauna that are exposed topredation).	Contractor	Pre-construction/ Construction	Additional safeguard
B13	Removal of threatened fauna habitat	The hollow-bearing trees should be 'soft-felled' in sections, the cut being about 100 mm below the bottom of the cavity, with hollow-limbs lowered to the ground. Once on the ground, the ecologist, or similar, would inspect the cavities for sheltering species. These should be collected and used locally as habitat as part of the off-setting requirements.	Contractor	Construction	Additional safeguard
B14	Removal of threatened fauna habitat	Fauna will be managed in accordance with *Guide 9: Fauna handling* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Construction	Additional safeguard
B15	Removal of threatened fauna habitat	If an arborist [or similar] is to be employed, they would climb each identified hollow-bearing tree and provide confirmation if the predicted hollows are actual cavities. • Whilst examining the tree, the arborist is to use a hand-held torch to inspect any cavities for sheltering animals. A photographic record of the cavity is to be obtained, this included in a pre-clearing report that is submitted to the appropriate	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		Transport Environmental representative. • If animals are observed sheltering in the cavity, the entrance is to be temporarily plugged through the placement of a breathable material (cloth bag, towel etc.). The limb/branch is then to be roped off; a chainsaw being used to remove this from the main plant (the cut made at least 100 mm beyond the predicted limit of the cavity). The limb is to be gently lowered to the ground, relocated to the edge of the road corridor and the cloth plug removed (if possible, upon dusk). The sheltering animal is to be permitted to naturally disperse from the cavity. • If birds are present, particularly fledglings, these are to be collected and taken to a wildlife carer or veterinarian for assessment. Prior to the trees' removal (if an excavator employed) these would be knocked several times to alert potential sheltering fauna and provide an opportunity for these animals to disperse. The trees would not be felled until approval from the ecologist is given.			
B16	Protection of retained trees	A suitably qualified arborist is to participate in pre-clearing site walk-through, to confirm trees to be retained and the setup of tree protection measures as per the AIA recommendations. Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) for retained trees are to be confirmed by the arborist. Prior to commencement of construction, the arborist will inspect the setup of TPZ, ensuring they meet the requirements of *AS4970(2007) Protection of Trees on Development Sites*. The arborist will undertake regular monitoring/site inspections during construction to monitor tree health, and provide advice and recommendations in relation to: • methods to minimise the extent of encroachment within the TPZ • long-term health of retained trees such as watering regimes, fertiliser application and mulching • additional tree care if there are signs of stress	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• non-destructive digging techniques and when to stop works within TPZ • refinements to the work methodology • the adequacy of site training and induction material regarding TPZ. Where trees are to be retained but pruning is required, the arborist is to prepare a site-specific pruning report when detailed design is confirmed. All pruning works are to be undertaken by suitably qualified tree workers (minimum Australian Qualifications Framework (AQF) Level 3 or equivalent) in accordance with Australian Standard AS4373-2007 *Pruning of Amenity Trees and Safe Work Australia's Guide to Managing Risks of Tree Trimming and Removal Works.*			
B17	Replacement of habitat	Habitat will be replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bushrock*. To replace the loss of one 'occupied' hollow from within the 31 hollow-bearing trees to be removed, 50 artificial hollows as per the *Tree and Hollow Replacement guidelines EMF-BD-GD-0129* (Transport for NSW, 2023) would be established. Artificial hollows would be provided in accordance with *Guide 8: Artificial hollows* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024). Where hollow replacement cannot be accommodated for locally [or only partially], payment of $500 would be made into Transport's Conservation Fund for each hollow replacement required.	Contractor	Construction	Additional safeguard
B18	Injury and mortality of fauna	Checks beneath vehicles/machinery will be undertaken prior to their use for the presence of sheltering fauna species (i.e., frogs and ground-traversing mammals). Fauna will be managed in accordance with *Guide 9: Fauna handling* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Construction	Additional safeguard
B19	Invasion and spread of weeds	In accordance with the *NSW Biosecurity Act 2015*, the weeds identified on-site would be controlled, thereby mitigating impacts on adjoining land to which it could spread. Weed species will be managed in accordance with *Guide 6: Weed management* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Pre-construction/ Construction	Additional safeguard
B20	Invasion and spread of pests	Pest species will be managed within the proposal boundary.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B21	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with *Guide 2: Exclusion zones* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Construction	Additional safeguard
B22	Noise, light, dust and vibration	Shading and artificial light impacts will be minimised through detailed design.	Contractor	Detailed design	Additional safeguard
B23	Greenstar credit	The detailed design is to consider species connectivity.	Contractor	Detailed design	Additional safeguard
B24	Additional vegetation removal/trimming	Where trimming, cutting, pruning or removal of trees or vegetation has not already been identified in the Environmental Impact Assessment, separate approval, in accordance with Transport's *Removal or trimming of vegetation application EMF-EM-TT -0144* is required. The trimming, cutting, pruning or removal of trees or vegetation shall be undertaken in accordance with the conditions of that approval.	Contractor	Detailed design / construction	Additional safeguard

6.1.5 Biodiversity offsets

Any residual biodiversity impact that doesn't require offsets in accordance with Transport's *No Net Loss Guidelines* (Transport for NSW, 2022) is to be assessed against the requirements of Transport's *Tree and hollow replacement guidelines EMF-BD-GD-0129* (Transport for NSW, 2023).

The removal of hollows and trees greater than or equal to 5 centimetres in diameter at breast height (DBH) for this proposal triggers the threshold for biodiversity offsets.

The proposed work will require the removal of 332 trees; 31 of which are hollow-bearing. Transport's *Tree and hollow replacement guidelines* provide a calculation to assess the number of replacement plants required to mitigate loss, as set out in Table 6-2. In accordance with Section 2.4 of the guidelines, where tree replacement cannot be accommodated locally [or only partially], payment must be made to Transport's Conservation Fund as per the rates set out in Table 6-3. For trees with multiple stems/trunks, the replacement/payment required is only calculated for the largest stem DBH.

To replace this loss, as per Transport's *Tree and hollow replacement guidelines*, 1140 trees require replanting within the project boundary or on land adjacent or close to the project with landowner's consent. Additionally, the installation of 50 artificial hollows to offset the removal of 31 hollow-bearing trees is required. Where tree replacement cannot be accommodated locally [or only partially], Transport will be required to make payment into the Conservation Fund in line with the fund contributions outlined in Transport's *Tree and Hollow Replacement Guidelines*. Transfer of funds must occur prior to commencement of work.

Table 6-2: Tree replacement requirements

Tree size	Tree replacement requirements
Small tree (DBH 5 – 20cm)	Plant minimum two trees
Medium tree (DBH 20 – 50cm)	Plant minimum four trees
Large tree (DBH 50 – 100 cm)	Plant minimum eight trees
Very Large tree (DBH > 100 cm)	Plant minimum 16 trees
Hollow replacement requirement	Provide three artificial hollows for every occupied hollow removed

Table 6-3: Conservation Fund contributions

Tree size	Tree replacement requirement
Small tree (DBH 5 – 20cm)	$125
Medium tree (DBH 20 – 50cm)	$500
Large tree (DBH 50 – 100 cm)	$1000
Very Large tree (DBH > 100 cm)	$2500
Hollow replacement requirement	$500

6.2 Hydrology and flooding

This section identifies and assesses the potential hydrology and flooding impacts during construction and operation of the proposal and recommends measures to avoid and mitigate the potential impacts identified.

6.2.1 Methodology

A desktop review and analysis were undertaken of available data and flood studies within the catchment associated with the proposal boundary.

A review of the Ryde LEP and NSW Flood Data Portal (NSW SES and DPE, 2017) was undertaken on 1 November 2023 to identify existing flood mapping and flood studies in the vicinity of the proposal. The review identified the Macquarie Park Floodplain Risk Management Study and Plan (FRMSP) (Bewsher Consulting, 2011), which is of relevance to the proposal.

A detailed flood model has been developed for the proposal using the TUFLOW model for the 2010 Macquarie Park Floodplain Risk Management Study, provided by City of Ryde Council. The existing flood conditions of the site were modelled, and these were used to quantify the proposed drainage solutions for the proposal.

The flooding and drainage design of the proposal has made reference to the following documents:

- Macquarie Park Floodplain Risk Management Study and Plan
- Macquarie Park Floodplain Risk Management Study, 2010, TUFLOW model sourced from the City of Ryde
- City of Ryde Council Development Control Plan and associated guidelines
- City of Ryde Council supplied stormwater drainage plan
- Topographical and feature site survey
- LIDAR topographic data.

Preliminary sizing of perimeter channels and pipe/pit network has been undertaken using the DRAINS model. A drainage strategy was developed using aerial images, site photography and lidar data.

The proposal levels, perimeter drainage and flood storage mitigation were modelled in TUFLOW for the one per cent AEP, 20 per cent Annual Exceedance Probability (AEP) and one per cent AEP climate change max (allowing for 37 per cent increase in rainfall intensity) and difference mapping undertaken to confirm acceptable impacts.

6.2.2 Existing environment

Topography

The areas within the proposal boundary containing hardstand or unsealed compacted areas are typically level or with a gentle slope towards the east. Vegetated areas are typically undulating indicating the likely presence of fill materials. The site is approximately three to four metres lower than Talavera Road and is accessed via a paved entranceway and an estimated slope of 1:1.

The highest elevations are located within the northern area of the site, at 44 metres Australian Height Datum (AHD) and 50 metres AHD in the southern area of the site, whilst lowest elevation is the central area of the site at approximately 32 to 34 metres AHD.

Existing drainage

Existing site drainage features include a stormwater drainage system of pipes and channels from Talavera Road which runs through the site. An existing stormwater culvert is present on the western boundary of the proposal.

A four-metre-wide stormwater drainage line passes through the site in a west to east orientation. And outlets at the existing M2 culvert inlet. This has been observed to generally still (i.e., lightly flowing) though its water quality was heavily turbid negating the visual assessment of its depth.

Surface runoff is expected to flow into the engineered drains via ground contours and infiltration, and flow in an easterly direction where the water is inferred to depart the proposal.

Catchment

The FRMSP divides the Lane Cove River catchment into five sub-catchments, of which the Porters Creek sub-catchment is relevant to the proposal. Porters Creek is a tributary of Lane Cove River, and is the nearest watercourse to the proposal, located around 345 metres to the east. Lane Cove River is located further to the east, around 535 metres from the proposal.

The FRMSP identified that, except for the very downstream end, Porters Creek has only occasional reaches of open channel. The flow path mostly consists of depressions through residential or industrial areas which carry flow whenever the storm runoff exceeds the capacity of the underground conduit system.

Overland flows run from the west of the site and towards Lane Cove River in the east.

Aquifers

Porous, extensive aquifers of low to moderate productivity are located within the proposal.

Hydrogeological landscape

Salinity hazard

According to the eSPADE spatial viewer (v2.2) (NSW DPIE, 2023), the proposal has 'low' land salinity and an overall salinity hazard level of 'very low', therefore the proposal is not located within land known to be naturally saline.

Flood risk

The area has a history of damaging floods, most notably in November 1984, which caused the inundation of many properties including the Macquarie Park Shopping Centre.

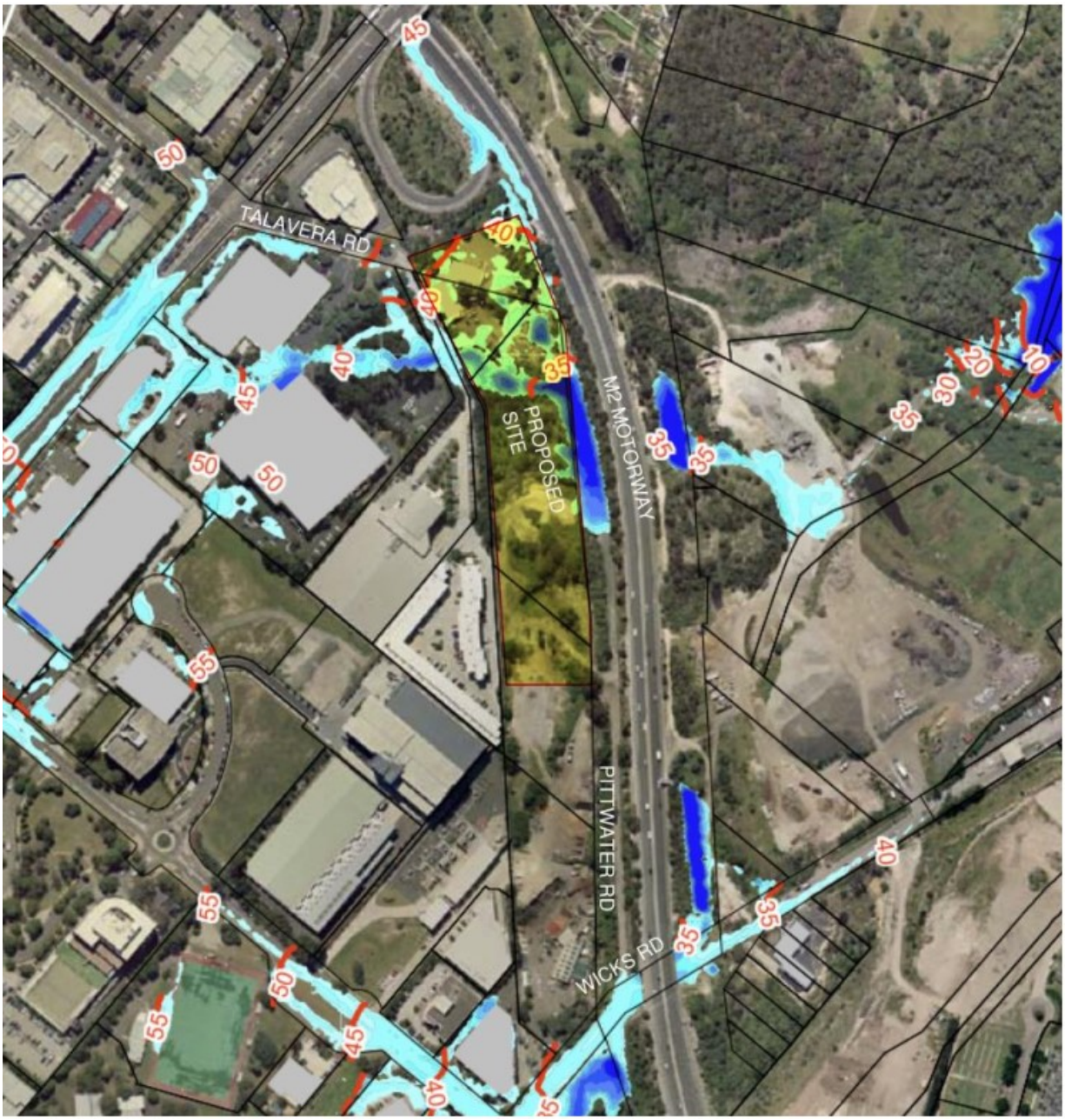
Due to location of the site and topography of the area, the proposal is not within the extents of the Lane Cove River one per cent AEP and therefore is not subject to river flooding in the one per cent AEP flood event.

In conjunction with the FRMSP, flood modelling was undertaken for the 20-year average recurrence interval (ARI), the 100-year ARI and the probable maximum flood (PMF).

The one per cent AEP flood map shows that, in the existing case, the northern part of the proposal is subject to local flooding from the upstream catchments, with the water depth reaching up to two metres. The significant flood level is at 35 metres AHD. The existing flood depths within the proposal for the one per cent AEP flood event are shown in Figure 6-3. The site is subject to moderate inundation in this event. As a result, the proposal is located on flood liable land.

During the PMF, around half the proposal would be susceptible to flooding by water depths greater than two metres. This localised flooding occurs upstream of the existing M2 culvert on the site.

Regional flood mapping also indicates existing one per cent AEP flooding of Talavera Road and Pittwater Road at the Wicks Road intersection.



Source: Macquarie Park Floodplain Risk Management Study and Plan (FRMSP) (Bewsher Consulting, 2011)

Figure 6-3: Existing flood depths for the one per cent AEP flood event

6.2.3 Potential impacts

Construction

Surface water runoff

The proposal would require excavation, removal of vegetation, disturbance of soils and the construction of road surfaces and drains, which may lead to exposed soils, sediment entering waterways and the degradation of water quality.

During the removal of the existing infrastructure and pavement, sediment-laden surface water runoff from disturbed areas has the potential to enter drainage channels on-site and discharge into Porters Creek and Lane Cove River.

Run-off has the potential to cause sedimentation of waterbodies, affecting water quality, and affect flow regimes.

To mitigate the impact of increased surface water volumes/flows, surface water run-off volumes and rates are to be effectively managed during construction.

To minimise water quality impacts on downstream receiving watercourses including Porters Creek and Lane Cove River during construction, surface water will be captured and treated on-site before being discharged, to ensure the water quality outcomes for receiving watercourses are achieved.

The impacts of sedimentation on water quality, as well as pollution from contaminated surface water runoff, are considered in further detail in Section 6.3.

Flood risk

Construction activities taking place within flood-prone areas within the proposal boundary could be subject to local flooding from the upstream catchments. During a flood event, water depths have the potential to reach up to two metres. Construction activities in these areas are therefore at risk of flooding without the implementation of safeguards and management measures.

It is proposed to extend the stormwater infrastructure through the site to connect to the existing downstream infrastructure in the M2 Hills Motorway corridor. The installation of the RCBC could result in faster discharge rates and a greater volume of water. This could result in flooding impacts further downstream on the other side of the M2 Hills Motorway.

Loose material stored in stockpiles also has potential to be mobilised during a flood event, which can become a hazard and may contribute to the partial blocking of the stormwater drainage channel and drainage lines that receive surface water runoff leading to localised flooding upstream, or restricted flow downstream.

In the event of a fire on-site, management of the fire is likely to result in the release of water into the stormwater channel on-site, which has the potential to affect flow regimes.

Safeguards and management measures which would need to be implemented to minimise flood risk during construction are outlined in Section 6.2.4.

Operation

Surface water runoff

The operational depot is proposed to comprise entirely of pavement, resulting in increased impermeable hardstanding areas. The proposal will raise site levels generally in the vicinity of the M2 culverts whilst cutting of some areas will be undertaken in the south of the proposal.

Surface water run-off would be captured during the operation of the proposal. To minimise water quality impacts on the downstream receiving watercourses, water quality treatment, in the form a water treatment unit, has been incorporated as part of the concept design to treat the captured run-off. The incorporation of this high-quality unit can achieve the water quality outcomes for receiving watercourses.

Would be discharged to the same stormwater catchment as existing. The surface water volume and run-off rate would be increased as a result of the proposal, due to the increase in impermeable surface proposed. To mitigate the impact of increased surface water volumes/flows, surface water run-off volumes and rates are to be effectively managed.

Flood risk

The modified profile of the site, as well as the increase in impermeable hardstand surfaces within the proposal has the potential to result in increased overland flows/surface water runoff in existing flood-prone areas during operation, and thereby raise upstream flood levels.

The requirement to raise the profile of site in certain areas to accommodate the proposal will remove a large portion of the existing surface storage upstream of the M2 Hills Motorway, and therefore result in a loss of existing flood storage provision. An estimate of the volume of floodwater provision required to offset the loss of flood storage due to the proposal was calculated.

To ensure that the proposal does not cause unacceptable flood risk, the concept design has incorporated appropriate drainage and flood mitigation for new hardstand areas and infrastructure within the new depot, to minimise the impact of flooding.

Flood mitigation storage would be provided through a tank storage formed by a RCBC traversing the site and discharging to the M2 culvert. All external upstream flows and site flows would be directed to this storage area.

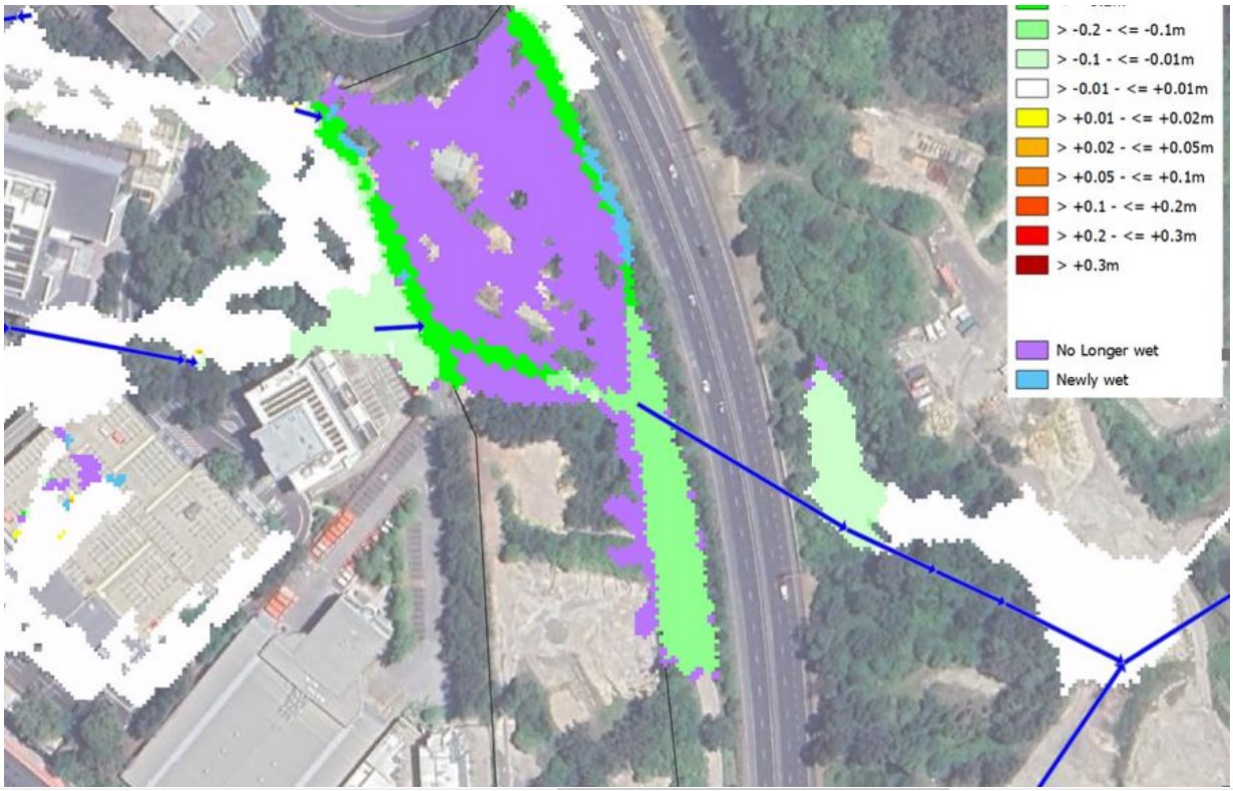
The concept design has incorporated perimeter channels that have been sized for the one per cent AEP event to capture and convey external flows through or around the site to the M2 culvert, as required. The channels take several forms based on

their location but are generally of moderate grading and appropriate linings have been provided for scour protection. Discharge from the Talavera Road cul-de-sac drainage would also be directed into the perimeter channels.

Due to the proposed raising of the profile of the site in certain areas, habitable structures and key infrastructure will be above the one per cent AEP flood level from upstream catchments within areas to be raised. The site would therefore not be subject to local flooding effects of existing one per cent AEP magnitude in these locations. All electrical equipment is proposed on plinths to ensure they are raised above flood levels.

However, the existing one per cent AEP flooding of Talavera Road and Pittwater Road at the Wicks Road intersection has potential to impact site operations, including access and egress of buses to the depot during operation.

The post-development flood risk model outputs, based on the concept design, indicate the suitability of the proposed drainage and flood storage measures incorporated into the design, to minimise flood risk. Whilst the mapping in Figure 6-4 shows there is an increase in flood depth, and a slight increase in extent of flood waters on the western and eastern side of the M2 Hills Motorway, it does not appear that there will be overland flow across the depot site or the M2 Hills Motorway.



Source: Zero Emission Buses Greater Sydney Tranche 1 – Macquarie Park Depot – 80% Concept Design Report (WSP Australia, 2024)

Figure 6-4: Post-development One per cent AEP flood map extract – indicative only, subject to detailed design

6.2.4 Safeguards and management measures

Table 6-4: Hydrology and flooding safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
HF1	Flood risk	Measures incorporated into the detailed design to ensure flood risk is minimised within the site and downstream, are to be implemented.	Contractor	Detailed design/ pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
HF2	Flood risk	Prior to construction commencing, final hydrology and drainage assessments will be undertaken to inform detailed design measures to minimise flood risks to the environment, properties and the proposal, including access and egress. Drainage designs to be inclusive of increase in rainfall intensity to account for climate change.	Contractor	Detailed design/ pre-construction	Additional safeguard
HF3	Flood risk	When flooding is predicted, construction plant and equipment will not be stored in flood prone areas within the site boundary.	Contractor	Construction	Additional safeguard
HF4	Flood risk	Appropriate construction measures to minimise flood risk and drainage impacts will be included in the CEMP and implemented on site.	Contractor	Construction	Additional safeguard
HF5	Changes to hydrology	Changes to existing surface water flows will be minimised through detailed design.	Contractor	Detailed design	Additional safeguard
HF6	Surface water runoff management	Surface water flows will be managed during construction.	Contractor	Construction	Additional safeguard

6.3 Soils and contamination

An assessment was carried out to identify the extent and magnitude of contamination within the proposal area.

The assessment of contamination was informed by the *Macquarie Park Bus Depot Preliminary Site Investigation Report* (PSI) (Stantec Australia Pty Ltd (Cardno), 2022) and the *Detailed Site Investigation – 1B Talavera Road, Macquarie Park* (DSI) (Stantec, 2023).

A summary of the assessment is presented in this section, together with safeguards and management measures to mitigate any adverse impacts.

6.3.1 Methodology

Desk-based study

A desktop study was undertaken, including a review of topographic data, the Sydney 1:100 000 Geological Sheet 9130 (Herbert, 1983), Ryde LEP, NSW EPA public registers including the Contaminated Land Record of Notices (NSW EPA, 2023) and List of Contaminated Sites Notified to the EPA (NSW EPA, 2024).

In addition, consideration was given to the findings of the PSI and DSI, which covers part of the site, including Part Lot 105 DP1001474, Part Lot 27 DP232964, and Part Lot 25 DP232697. Land plots at 1A Talavera Road were inaccessible at the time of this DSI and therefore this assessment includes only those plots included in 1B Talavera Road. A DSI for the 1A Talavera Road land plots is currently being prepared.

Sampling

Sampling of sediment, surface water, groundwater, and sub-surface gas was conducted on 1 August 2023.

Sediment sampling was undertaken across six locations within the proposal boundary utilising a hand auger to collect undisturbed samples.

Surface water samples were obtained from the three water bodies located within the proposal boundary utilising an extendable water scoop.

Groundwater samples were collected from groundwater monitoring wells/boreholes installed on-site. Samples were collected using low-flow sampling techniques (bladder pump). Where there was insufficient water for low-flow sampling, samples were collected with use of bailer.

Groundwater, surface water and sediment samples obtained on-site were subject to laboratory analysis.

The installation of gas monitoring wells was undertaken by a licenced driller. Sub-surface ground gas monitoring was conducted on 1 August 2023 from the installed wells.

Water quality modelling

Water quality modelling has been undertaken using the MUSIC model. A baseline model has been set up for the existing site surface using a combination of urban revegetation, industrial and unsealed road pollutant sources.

6.3.2 Existing environment

Regional geology

A review of geological data identified that the proposal is underlain by Hawkesbury Sandstone, deposited during the Middle Triassic Age. The formation is typified by medium to coarse grained quartz sandstone with minor shale and laminate lenses.

Soils

Soil landscape

A review of the soil data from Australian Soil Resource Information System (ASRIS) (CSIRO, 2023) indicated that the proposal is overlain by the Lucas Heights soil landscape. Typically, the Lucas Heights soil landscape contains gently undulating crests and ridges on plateau surfaces of the Mittagong Formation (alternating bands of shale and fine-grained sandstones). The residual soils are considered to have moderately deep (50 – 150 centimetre), hard setting yellow podzolic soils and yellow soloths. Limitations associated with this soil grouping include localised water erosion, localised shallow soils and stony soils with low soil fertility and low water capacity.

Acid sulfate soils

Acid sulfate soils (ASS) include those where the sulfides in the soils have been exposed to air and acid is being generated (actual ASS), and those which may form ASS when drained or exposed to oxidisation processes (i.e., the exposure of iron sulfate minerals such as pyrite to oxygen). ASS occurs predominantly on coastal lowlands, with elevations generally below five metres above AHD.

A desktop review of available information was conducted to identify potential ASS risk areas. The ASS risk maps in the Ryde LEP were only available for localities containing ASS risk areas within the Ryde LGA. No mapping was available in the Ryde LEP for the area of the proposal. The closest area of identified ASS to the proposal is an area classified as Class 5, located around 485 metres to the east of the proposal.

The NSW acid sulfate soil risk mapping available on the eSPade spatial viewer (v2.2) (NSW DPIE, 2023), reports the proposal site as being 'Unclassified', and the *Atlas of Australian Acid Sulfate Soils* (Fitzpatrick, et al., 2013) classifies the proposal as having an 'Extremely Low' probability of occurrence (1-5% chance in small, localised areas). An area identified as having 'Low' probability of occurrence (6-70% chance) is located around 75 metres to the southwest of the proposal.

Salinity

Salinity is the accumulation of salts in soil and water to levels that impact on people and the environment. Salinity occurs where salt in the landscape is mobilised and redistributed closer to the soil surface and/or into waterways by rising groundwater. Rising groundwater is commonly caused by removal of deep-rooted vegetation such as trees and perennial pasture. It is also caused by changes in soil permeability and structure which restrict groundwater movement. Compaction and cut / fill work can be contributors.

Salinity is not an identified limitation of the Lucas Heights soil landscape. Data for the nearest eSpade survey site records salinity potential within the site as Low to Very Low. The proposal is therefore not located within land known to be naturally saline.

Site observations

Site investigation (SI) was undertaken by Stantec, which included seven boreholes to a maximum depth of 10 metres below ground level (BGL) and 20 test pits to a depth of three metres BGL at accessible areas of the proposal. The SI was limited to the southern portion of the proposal.

The DSI describes soils encountered across the site as generally consisting of gravelly sands (fill material) overlying silty clays (natural material).

The surficial soil/fill profile encountered across the site ranged from 0 to 4.3 metres below ground level (BGL). Fill thickness was deeper within the northern areas of the site. Surficial soils encountered generally consisted of gravelly silty sands/clays, clayey sands with anthropogenic materials consisting of plastics, glass, metal, gravels, concrete/rubble, bricks, tiles, terracotta, timber, ashy material, PVC piping, geofabric and batt insulation (synthetic material fibre). Anthropogenic materials were generally observed between 0 and 1 metre BGL when encountered.

Asbestos containing material (ACM), in the form of fibrous cement sheeting, was observed in surficial soils (between 0 and 0.1 metres BGL) at one sample location (Test Pit 25) in the fill profile in the central eastern portion of the proposal, as shown in Figure 6-5 and Figure 6-6. No further ACM was observed within the proposal.

Sheen, discolouration and staining were not observed on ground surfaces or in excavated materials.

Observation on-site identified no evidence of fuel storage tanks, dangerous goods, land contamination (staining or odours), or groundwater contamination within the proposal.

There are no activities within the proposal that perform a licensed activity under the *POEO Act 1997*.

Source: Macquarie Park DSI (Stantec, 2023)

Figure 6-5: Asbestos Containing Material at Test Pit 25

Source: Macquarie Park DSI (Stantec, 2023)

Figure 6-6: ACM fragment found at Test Pit 25

NSW EPA records

A search of the NSW EPA Contaminated Land Record (NSW EPA, 2023) identified no records of contaminated sites within the proposal.

The EPA publishes a list of contaminated land notified under section 60 of the CLM Act. These have been assessed by the EPA as being contaminated but may not always require regulation under the CLM Act.

A search of the NSW EPA List of Notified Sites identified two EPA notified contaminated sites within the study area. Neither site required regulation under the CLM Act. Further details are provided in Table 6-5.

Table 6-5: Contaminated sites notified to the EPA

Site name	Address	Activity	EPA management class	Approximate distance and direction from proposal
Porters Creek Depot – Proposed Operations Centre Site	160 Wicks Road, Macquarie Park	Landfill	Regulation under CLM Act not required	85m east
1-7 Waterloo Road, Macquarie Park	1-7 Waterloo Road, Macquarie Park	Other petroleum	Regulation under CLM Act not required	235m south

Surface water

Surface water features

Three surface waterbodies were identified to be present on-site. The three surface waterbodies are shown in Figure 6-7, Figure 6-8 and Figure 6-9.

The waterbodies are inferred to receive surface water, and potentially groundwater discharges, from waters originating off-site, noting that the dominant land use upgradient to the west is commercial/industrial.

The existing on-site stormwater drain, shown in Figure 6-9, discharges into Porters Creek, a tributary of Lane Cove River. Porters Creek is located around 345 metres to the east of the proposal, and Lane Cove River around 535 metres to the east.

The NSW RCI is a long-term reporting tool for assessing river condition, which uses inputs from a range of indicators, including water quality, to cover all aspects of river health. The NSW RCI classifies Porters Creek and Lane Cove as 'Moderate' water quality in the area surrounding the proposal.

Surface water sampling was conducted on 1 August 2023 with samples obtained from the three surface waterbodies located within the proposal. Samples were collected utilising an extendable water scoop.

The following key surface water observations were identified in the DSI:

- Surface water was generally observed as having a pale grey to grey colour.
- Upon sampling, duck weed and/or vegetation (reeds and leaves) were present in each water body.
- General waste and litter, including plastic and metal (aluminium cans), was observed at surface water sample locations. The presence of litter in these water bodies suggest that surface water from off-site upgradient locations is directed through the site, noting that the existing site is generally disused and on-site generation of litter is negligible.
- Bank erosion was observed, which may be resultant from previous heavy rain events and increased water flow within the water body to downstream receiving environments.

Source: Macquarie Park DSI (Stantec, 2023)

Figure 6-7: Surface water body SW01

Source: Macquarie Park DSI (Stantec, 2023)

Figure 6-8: Surface water body SW02 – general rubbish present within water body as well as a deep erosion on the left hand side of the image

Source: Macquarie Park DSI (Stantec, 2023)

Figure 6-9: Surface water body SW03 – upper creek facing north-west

Groundwater

Groundwater bores

A review of the National Groundwater Information System data for NSW available on the Australian Groundwater Explorer Portal (BOM/WaterNSW, 2017) identified eleven registered groundwater bores within 300 metres of the proposal, as detailed in Table 6-6.

Table 6-6: Groundwater bores

Groundwater bore ID	Primary use	Approximate distance and direction from proposal
GW107998	Standing water level, manufacturing and industry	133m northwest
GW109861	Monitoring	139m south
GW109860	Monitoring	189m south
GW109859	Monitoring	228m south
GW113463	Monitoring	279m south
GW113464	Monitoring	282m south
GW113462	Monitoring	283m south
GW113462	Monitoring	283m south
GW113461	Monitoring	293m south
GW113460	Monitoring	295m south
GW113459	Monitoring	295m south

Site observations

A groundwater assessment was undertaken by Stantec in conjunction with the DSI. The following key on-site groundwater observations were noted:

- Groundwater was generally intercepted within sandstone bedrock fractures between 5 and 8 metre below ground level.
- Perched groundwater was not encountered.
- Measured groundwater standing water level (SWL) ranged between 2.4 and 8.11 metres from the top of casing (TOC).
- Groundwater observations were noted as light grey, cloudy grey to cloudy orange. Indicators of potential contamination were not observed in purged groundwater.

Concentrations of analytes were reported below the adopted human health screening criteria for all samples analysed, however for certain analytes the limit of reporting (LOR) was above the adopted criteria.

Concentrations of analytes were reported below the adopted ecological screening criteria for all samples analysed with exception to metals (copper [dissolved], nickel [dissolved], zinc [dissolved]) and Perfluorooctanesulfonic acid (PFOS).

Due to the absence of significant metals and PFOS concentrations in soil, the contaminants may have migrated on-site from an offsite upgradient location to the west of the proposal, noting that the dominant land use upgradient is commercial / industrial, and the groundwater beneath the site is hypothesised to migrate from the industrial precinct to the west and flowing in an easterly direction towards Lane Cove River, cross gradient to the active Cleanaway Ryde Resource Recovery Centre and area of potential historical landfilling.

Sub-surface ground gas

As outlined within the PSI, a potential source of downgradient ground gas was inferred to exist within approximately 80 metres of the site, to the east. The current landfilling activities undertaken at this nearby site have the potential to generate hazardous ground gases.

Sub-surface gas monitoring within the proposal boundary was undertaken on the 1 August 2023, utilising both ground gas monitoring wells and groundwater monitoring wells with suitable screens above the water table.

Sub-surface ground gas pathways may include the built environment below grade (service pits, drainage networks), natural geology and hydrogeology.

Hazardous bulk ground gases (methane and carbon dioxide) were identified in one gas monitoring well; however, concentrations were reported below the adopted preliminary screening criteria.

6.3.3 Potential impacts

Potential contaminant sources

Based on the desk-based assessment, site investigations and the results of the PSI and DSI, the following potential contaminants sources have been identified as relevant to the proposal:

- fill of unknown origin, quality and quality across the site
- demolition of buildings pre-1990 containing hazardous building materials
- current site buildings and sheds that may contain hazardous building materials
- previous site activities (stockpiling of ACM, disposal of liquid waste into soil pits at the site, storage of discarded paints, batteries, equipment, fluid containers and chemicals)
- historical site activities including possible agricultural land use
- off-site sources (commercial/industrial activities upgradient)
- off-site sources (potential landfill cross-gradient).

Exposure pathways and receptors

These contaminant sources have the potential to impact soil, surface water, groundwater and ground gas within the proposal boundary.

Potential exposure pathways include both human and ecological pathways.

Potential human health pathways include inhalation, direct contact, incidental ingestion, and vapour inhalation. Human receptors comprise individuals undertaking site activities and maintenance under current operations, future site workers including earthwork and construction contractors, and future site occupants and intrusive maintenance workers.

Ecological pathways identified include migration of groundwater to waterbodies, uptake of groundwater from deep-rooted vegetation and biological ingestion. Ecological receptors comprise site vegetation including on-site mature trees, ephemeral stream, and soil invertebrates, as well as off-site receptors that are dependent on groundwater (aquatic ecology within) and terrestrial ecology.

Soils

Potential impacts as a result of disturbance of contaminated fill and soil, without appropriate management and/or remediation may include:

- contaminant exposure risk to construction personnel and the general public
- contaminant exposure to environmental receptors
- cross-contamination associated with the incorrect handling or disposal of spoil/unexpected finds
- contamination of previously clean areas.

Intrusive construction activities on-site that disturb or expose underlying soils, such as earthwork, may uncover contamination as a result of historic land uses or off-site migration.

Any fill materials and/or soils disturbed as part of site construction activities have the potential to become mobilised into stormwater drainage networks during rainfall events if not appropriately managed. As such, there is potential for on-site fill materials and/or soils disturbed as part of construction to migrate and impact off-site receiving environments.

There is potential for the leaching of contaminants from construction activities into the soils on-site, resulting in contamination of soils.

Human health impacts

Human health impacts associated with the disturbance of contaminated soils include inhalation of respirable fibres, and dust during site activities, demolition, and earthwork. There is potential for site users and surrounding land users to be exposed to dust and vapours from these construction activities, as well as encountering contaminated soil, fill and waste.

The fill sample collected at Test Pit 25 was found to exceed the human health criteria commercial/industrial land use due to the presence of ACM. The identified asbestos on-site presents a 'High' exposure risk for future construction workers and potentially for future site users depending on the management and fate of the identified asbestos. No other exceedances were identified in any other sediment and soil samples.

There was considered to be a Low to Medium likelihood of a complete exposure pathway to human health of workers at the site on the basis of the construction lay-down activities known to have occurred at the site that have caused potential contamination to soil, and the identified presence of ACM on soil surfaces and within building materials.

There is also potential for the existing buildings, infrastructure, and waste stockpiles to contain hazardous building materials.

To mitigate the potential human health impact, the ACM and any other identified contaminated soil, must either be disposed of to a landfill licensed to accept asbestos waste, or alternatively safely encapsulated on-site.

Transport's *Asbestos in soils management procedure* (*EMF-LM-PR-0020)* provides guidance on how to manage asbestos in soils, including guidance on when encapsulation versus offsite disposal is warranted. This guidance will be followed to appropriate manage the disposal of asbestos identified on-site. Further details on the management of asbestos waste are included in Section 6.11.

Ecological impacts

All soil and sediment samples were assessed against ecological protection criteria applicable to a commercial/industrial land use and were found to be below the adopted criteria with exception to benzo(a)pyrene which exceeded the adopted ecological screening levels at one location within the proposal. The exceedance of benzo(a)pyrene against applicable ecological criteria was isolated, and therefore the potential for impact to transient receptors, such as fauna, as a result of this exceedance was considered in the DSI to be Low.

There is expected to be minimal impacts following completion of construction once disturbed areas have been stabilised. It is not expected that the proposal would have any ongoing contaminated soil impacts after the completion of construction.

Surface water

Construction activities on-site have the potential to result in leaching of contaminants into surface water on-site.

During operation, the use of the bus wash bay could result in contaminated surface water run-off into the proposed stormwater drainage channel.

The existing and proposed stormwater drainage channels drain into Porters Creek which outlets into Lane Cove River. Contaminated surface water runoff has the potential to impact the water quality of these watercourse.

Metals and PFOS concentrations were reported within surface water on-site. Human and ecological interaction and exposure may occur during construction activities associated with the proposal; however, the likelihood is considered in the DSI to be Low to Moderate.

Human health impacts

The risk to on-site human receptors are considered low due to the absence of elevated contaminants and incomplete source-pathway-receptor linkages.

Ecological impacts

Elevated concentrations of copper (dissolved), zinc (dissolved) and PFOS were identified within the surface water bodies on-site. These may have originated from an upgradient off-site source. Based on current detections, risks to on-site ecological receptors are considered low, noting the current heavily disturbed and industrial setting of the site.

Water quality

Potential water quality impacts would mainly relate to soil loss from erosion of exposed soils and stockpiles, and potential sedimentation of surrounding land and waterways.

To minimise water quality impacts on the downstream receivers, water quality treatment, in the form a water treatment unit, has been incorporated as part of the concept design. The incorporation of this high-quality unit can achieve the water quality outcomes.

The results of the MUSIC modelling demonstrate that the post-development pollutant load reduction targets are met across all pollutant sources except for Gross Pollutants, which is slightly below the target threshold.

The Gross Pollutants target threshold is expected to be met during detailed design as further opportunities are investigated. This would demonstrate a reduction in water quality loading leading to improvements in water quality consistent with the Lane Cover River water quality objectives.

There is expected to be minimal impact on water quality following completion of construction once disturbed areas have been stabilised.

Groundwater

Construction can have an impact on groundwater systems where excavations or structures intersect these systems or dewatering is carried out or caused.

Construction can also impact groundwater quality where contamination from construction activities enters the sub-surface and reaches the groundwater.

The proposal involves activities that may intersect the groundwater table, including excavations, trenching and piling. Should groundwater be encountered during excavations and dewatering be required during construction, water would be tested and managed appropriately.

Once the depot becomes operational, there would be a negligible change in impervious surfaces and therefore no impacts on groundwater levels, flows, recharge, quality, or other values are expected.

Human health impacts

Elevated metals and PFOS concentrations were reported within groundwater. As a result, human and ecological interaction and exposure may occur during construction activities associated with the proposal.

Based on the information, observations and data obtained, the DSI considers that the risk to on-site human receptors are considered to be Low due to the absence of elevated contaminants and incomplete source-pathway-receptor linkages.

Ecological impacts

In the event that groundwater is proposed to be used for irrigation, extracted during construction, utilised during operation and/or dewatering, a complete source receptor pathway linkage may exist to ecological receivers on-site, and further assessment would be necessary in this instance. However, interactions with groundwater are anticipated to be Low.

Sub-surface ground gas

There is potential for the migration of ground gas and leachate from the adjacent landfill to the east of the site, into the proposal boundary.

As Hazardous bulk ground gases (methane and carbon dioxide) were reported below the adopted preliminary screening criteria on-site, and no flow rates were identified, there is considered to be low potential for hazardous ground gas migration.

Based on aerial photography, the results of sub-surface gas monitoring, groundwater monitoring (dissolved methane) and inferred cross-gradient groundwater flow, human and ecological risk of sub-surface gas migration and exposure under the proposed future land-use as a bus depot is considered to be Low.

6.3.4 Safeguards and management measures

Table 6-7: Soils and contamination safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SC1	Contaminated land	A Remedial Action Plan will be prepared in accordance with Transport's *Contaminated land management procedure EMF-LM-PR-0016* (Transport for NSW, 2023) and	Contractor	Detailed design/pre-construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		submitted to Transport for review and endorsement. The plan will include, but not be limited to: capture and management of any surface runoff contaminated by exposure to the contaminated land further investigations required to determine the extent, concentration and type of contamination, as identified in the DSI management of the remediation and subsequent validation of the contaminated land, including any certification required measures to ensure the safety of site personnel and local communities during construction.			
SC2	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport's Environment Manager and/or EPA.	Contractor	Construction	Standard safeguard
SC3	Contamination of soils, surface water and groundwater	A Soil and Water Management Plan (SWMP), forming a sub-plan of the CEMP is to be prepared for the work. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Contractor	Pre-construction / Construction	Standard safeguard
SC4	Soils – Erosion and sediment control	A site-specific Erosion and Sediment Control Plan (ESCP) would be prepared and implement as part of the SWMP. The ESCP will include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather. The plan would incorporate best management erosion and sediment control practices such as those found in the Managing Urban Stormwater, Soils and Construction Guidelines ("the Blue Book") (4th Edition) (Landcom, 2004). The ESCP will be reviewed and updated whenever the construction program, scope of work or work methods change,	Contractor	Pre-construction / construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		or whenever work methods or control measures are found to be ineffective.			
SC5	Soils – Erosion and sediment control	Erosion and sediment controls such as sandbags and drainage covers are to be checked weekly and before/after rainfall event greater than 10 mm in a 24-hour period and maintained on a regular basis.	Contractor	Construction	Additional safeguard
SC6	Soils – Erosion and sediment control	Erosion and sediment control measures are not to be removed until the work is complete, and areas are stabilised.	Contractor	Construction	Additional safeguard
SC7	Soils – Stabilisation	Work areas are to be stabilised progressively during the work.	Contractor	Construction	Additional safeguard
SC8	Soils – Stockpile management	All stockpiles are to be managed in accordance with the *Managing Urban Stormwater, Soils and Construction Guidelines* ("the Blue Book") *(4th Edition)* (Landcom, 2004). Erosion and sediment controls would be implemented in the proposed stockpile area, such as: • stockpiles to be covered with geofabric prior to rain events greater than ten millimetres. • maximum height of stockpile is two metres and no greater than a 2:1 slope • segregation in order to minimise risk of cross-contamination of stockpiles and maximise suitability for reuse or recycling • stockpiles are not to encroach on any local vegetation and be kept five metres away from trees to be retained • mitigation measures to manage tannins leaching from mulch stockpiles into waterways will be included in the CEMP and implemented on site stockpiles will be separated using techniques such as hard barriers or markers • stockpiles are to be labelled according to their classification / material type (e.g., topsoil, capping etc.). Soil stockpiles with visual signs of hydrocarbon contamination or odours should be sampled and classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014) and disposed off-site to a suitably licenced landfill facility.	Contractor	Construction	Standard safeguard
SC9	Contamination of soils	All fuels, chemicals, liquids and hazardous materials will be stored in an secured impervious bunded area a minimum of 50	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		metres away from waterbodies, drainage lines and slopes with a gradient of more than 10%, and disposed of in accordance with NSW DECC's *Storing and Handling Liquids: Environmental Protection Participants Manual* (NSW DECC, 2007). Appropriate on-site signage will be provided to identify the materials stored.			
SC10	Contamination of soils	The Site Supervisor must be notified immediately of any suspected or potentially contaminated ground exposed during construction activities. All work must cease within the vicinity of the actual or suspected contaminated land and the area will be fenced off. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed by a certified contaminated land practitioner and any necessary site-specific controls or further actions identified in consultation with Transport's Environment Manager and/or EPA.	Contractor	Construction	Additional safeguard
SC11	Contaminated land	Further investigations for waste classification will be undertaken.	Contractor	Pre-construction	Additional safeguard
SC12	Management of Asbestos containing material	All ACM identified on-site must be managed in accordance with Transport's *Asbestos in soils management procedure EMF-LM-PR-0020* (Transport for NSW, 2023).	Contractor	Construction	Additional safeguard
SC13	Contamination of surface water	Plant, equipment, and vehicles will be cleaned a minimum of 50 metres from waterways and drainage lines.	Contractor	Construction	Additional safeguard
SC14	Contamination of surface water	Water quality control measures are to be used to prevent any materials such as concrete, grout entering drainage lines and waterways.	Contractor	Construction	Additional safeguard
SC15	Contamination of surface water	All concrete washout will be managed in accordance with Transport's *Concrete washout guideline EMF-EM-GD-0145* (Transport for NSW, 2023). Details of the concrete washout areas are to be included in the CEMP.	Contractor	Construction	Additional safeguard
SC16	Accidental spills – contamination	Construction vehicles and plant/machinery are to be properly maintained and regularly inspected for fluid leaks to minimise the risk of fuel/oil leaks.	Contractor	Construction	Additional safeguard
SC17	Accidental spills	Pollution incident response management measures will be included in the CEMP in accordance with Transport's *Chemical storage and spill response guideline EMF-*	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		EM-GD-0137 (Transport for NSW, 2023) and relevant EPA guidelines. The CEMP will include adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/ equipment), as well as initial response, containment, and notification procedures. All staff to be made aware of the location of the spill kits and trained in how to use them in the event of a spill.			
SC18	Pollution incident	In the event of a pollution incident (e.g., a spill) work would cease in the immediate vicinity and the Contractor would immediately notify Transport's Project Manager and Transport's Senior Manager Environment and Sustainability. Transport's *Environmental Incident Procedure* (Transport for NSW, 2021) is to be followed.	Contractor	Construction	Additional safeguard
SC19	Water	All water captured or encountered on-site will be managed in accordance with the requirements of the Transport's *Water Discharge and Reuse Guideline DMS-SD-024* and the *Discharge or Reuse Water Approval DMS-FT-207*	Contractor	Construction	Additional safeguard

6.4 Aboriginal cultural heritage

This section provides an assessment of the potential impact on Aboriginal cultural heritage as a result of the proposal and identifies environmental management measures to mitigate these impacts.

6.4.1 Methodology

An Aboriginal cultural heritage assessment was undertaken by Transport in accordance with Stage 1 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services, 2011).

The study area assessed by the Aboriginal heritage assessment comprised all land within a 200-metre radius from the proposal. The following heritage searches relevant to the study area were undertaken to identify any previously identified Aboriginal sites within and surrounding the proposal:

- AHIMS basic search
- Native Title Register search
- State Heritage Inventory search
- Australian Heritage Database search.

This assessment identifies and assesses the construction and operational activities that have the potential to disturb or impact Aboriginal cultural heritage.

Where impacts are identified, recommended safeguards and management measures are outlined to manage potential Aboriginal cultural heritage impacts.

6.4.2 Existing environment

A basic search of the AHIMS was conducted for the proposal by Transport on 22 December 2023. The AHIMS search area comprised a buffer of 200 metres from the proposal. The search did not identify any listed Aboriginal objects places within the study area. The results of the AHIMs basic search are included in Appendix E.

Desktop searches of the Native Title register, State Heritage Inventory and Australian Heritage Database conducted by Transport on 22 December 2023 returned no known native title claims, state heritage items or any Australian Heritage items within the vicinity of the proposed work.

During the development of the concept design, a Walk on Country with Aboriginal Elders was undertaken in December 2023, during which items of Aboriginal cultural value within the site were identified and recommendations were made. Further details are included in the Section 5.3.

6.4.3 Potential impacts

Preliminary assessment results based on Stage 1 of the PACHCI assessed the proposal as being unlikely to have an impact on Aboriginal cultural heritage, and therefore there was no requirement to proceed to Stage 2 of the PACHCI.

Advice from Transport's Aboriginal Cultural Heritage Advisor notes the following:

- The proposal is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects* in NSW and the Roads and Maritime Services' procedure.
- The Aboriginal cultural heritage potential of the study area appears to be reduced due to past disturbance.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

During construction, ground disturbing work, such as excavations, required for the proposal may have the potential to impact undiscovered Aboriginal artefacts in the area. However, given the previously disturbed nature of the land for the proposal and ancillary facilities sites, the risk of impacts to Aboriginal heritage items during construction is considered to be low. The proposal would incorporate an appropriate safeguard to manage any unexpected finds of Aboriginal artefacts or items, including the implementation of a stop-work and unexpected finds protocol in accordance with Transport's *Unexpected Heritage Items Procedure* (Transport for NSW, 2024). This safeguard is detailed in Table 6-8.

6.4.4 Safeguards and management measures

Table 6-8: Aboriginal cultural heritage safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AH1	Aboriginal heritage	Transport's *Unexpected Heritage Items Procedure* (Transport for NSW, 2024) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Pre-construction/ construction	Standard safeguard
AH2	Aboriginal heritage	Detailed design will consider the *Connecting to Country Aboriginal Design Principles* (WSP, 2023) and recommendations made by Elders during the on-site Walk on Country.	Contractor	Detailed design	Additional safeguard

6.5 Non-Aboriginal heritage

This section provides an assessment of the potential impact on non-Aboriginal heritage as a result of the proposal and identifies environmental management measures to minimise these impacts.

6.5.1 Methodology

The assessment of impacts to non-Aboriginal heritage is based on a desktop review and database search. A desktop review of non-Aboriginal heritage databases was undertaken to understand the extent of existing recorded sites and places within the vicinity of the proposal. These included:

- Commonwealth Heritage Database (DCCEEW, 2022), which includes items on the:
  - World Heritage List
  - National Heritage List
  - Commonwealth Heritage List established under the EPBC Act
- NSW State Heritage Inventory (DPE, 2022d), which lists:
  - Items on the State Heritage Register, established under the *Heritage Act 1977*
  - Local heritage items under the Ryde LEP 2014
  - Items on the TfNSW (including legacy Roads and Maritime) Section 170 register, established under Section 170 of the *Heritage Act 1977*.

The following non-statutory registers were also searched:

- Register of the National Estate.

6.5.2 Existing environment

The proposal area does not contain a listed heritage item, nor is it adjacent to a heritage item. The desktop assessment identified no heritage features in the Commonwealth Heritage Database or the NSW State Heritage Register within one kilometre of the proposal.

However, one heritage item of local heritage significance, listed in Schedule 5 of the Ryde LEP, has been identified around 120 metres to the southeast of the proposal, as detailed in the following section.

Northern Suburbs Cemetery

The nearest heritage item to the proposal is the Northern Suburbs Cemetery (LEP #I144) located at 2 Delhi Road in North Ryde, 1670. The cemetery changed its name from the Northern Suburbs Cemetery in 2004 to the Macquarie Park Cemetery and Crematorium (which remains its name to date); however, The Northern Suburbs Cemetery is the name of its statutory heritage listing, and is referred to as such throughout this REF.

The cemetery is located to the east of the M2 Hills Motorway and bounded by Wicks Road to the north, as shown in Figure 6-10.This large cemetery occupies a site of 70 hectares and was established in the 1920s. Access to the cemetery is via Plassey Road. The site is divided by a series of avenues and extensive lawns with large plantings giving the site an open parkland character. The cemetery contains three contemporary chapels named Magnolia, Palm and Camellia, each providing seating for 200 persons, a crematorium, burial sites including lawn burial sites and mausoleums, and memorial walls for interment of ashes.

The Northern Suburbs Cemetery is of historical significance as an example of 1920s cemetery design and plantings, and as a direct historical record of local and Northern Suburbs communities. The cemetery is representative of the few general cemeteries that were established around the turn of the 19th Century in the Sydney metropolitan area which are still in operation. These cemeteries represent typical early 20th Century funerary landscapes.

Elements of significance include the parkland character, the road system, the former entry precinct near the corner of Delhi and Plassey Roads which includes the former Caretakers residence and office building, old monumental areas, remnant stands of endemic trees to lawn burial areas, and three small groves of “old growth” trees, and early buildings.

The cemetery also has social significance for its important commemorative function within diverse religious ethnic and other groups.

Figure 6-10: Heritage items in the vicinity of the proposal

6.5.3 Potential impacts

Construction

The Northern Suburbs Cemetery is separated from the proposal by the M2 Hills Motorway and located around 120 metres from the proposal. The proposed construction work is not anticipated to result in any direct or indirect impacts to this heritage item of local significance.

Excavations work required for the proposal may result in the discovery of unexpected heritage items during construction. Unexpected heritage finds may include archaeological relics, which are items of local or state significance which may relate to past domestic, industrial, or agricultural activities in NSW, and can include bottles, remnants of clothing, pottery, building materials and general refuse.

Other historic items that may be encountered during construction include work, structures, buildings or movable objects. Examples of these items include culverts, historic road formations, historic pavements, buried roads, retaining walls, tramlines, cisterns, fences, sheds, buildings, and conduits.

The likelihood of encountering unknown non-Aboriginal heritage items at this urbanised site is low as work would be undertaken in an area that has been subject to historical disturbance associated with past land use. However, in the event that unexpected heritage items are identified during construction, the safeguards and management measures included in section 6.5.4 will be implemented.

Operation

The operation of the proposal would not result in any impacts to any known non-Aboriginal heritage items.

6.5.4 Safeguards and management measures

Table 6-9: Non-Aboriginal heritage safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing	Reference
H1	Unexpected non-Aboriginal heritage finds	Transport's *Unexpected Heritage Items Procedure* (Transport for NSW, 2024) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	Standard safeguard

6.6 Landscape character and visual impact

A landscape character and visual impact assessment was completed for the proposal to assess the potential impacts on the existing landscape character and views in the area surrounding the proposal. The assessment identifies safeguards and management measures to avoid or minimise these impacts.

6.6.1 Methodology

The methodology for the landscape character and visual amenity assessment has been undertaken in accordance with Transport's *Guidelines for Landscape Character and Visual Impact Assessment* (*EIA-N04) v2.3* (Transport for NSW, 2023).

The methodology for the assessment has comprised the following:

- identification and description of the landscape character
- identification of the visual catchment of the proposal, including the identification of a range of representative views to be assessed for change as a result of the proposal
- assessment of the impact of the proposal existing landscape character and the selected views, as a result of the proposal
- identification of landscape character and visual impact safeguards and management measures.

The *Guidelines for Landscape Character and Visual Impact Assessment* establish an assessment process with reference to the sensitivity of an area and magnitude of the proposal. An impact assessment rating matrix has been adopted from the guidelines and is provided in Table 6-10.

Table 6-10: Landscape character and visual impact assessment rating matrix

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Landscape character

To assess the impact on landscape character, the landscape character in the area of the proposed work was identified and described. Firstly, the sensitivity of the identified landscape character area was determined by considering the susceptibility and value of the landscape and its ability to accommodate the proposal. Then, taking into consideration the nature and scale of the proposed work, the magnitude of change to the landscape character as a result of the proposal was ascertained.

Using the Impact Assessment Grading Rating Matrix in Table 6-10, an overall impacting rating on the landscape character was established by identifying the relationship between the sensitivity and magnitude of change determined.

Visual impact

To assess the visual impact, representative viewpoints have been selected in the immediate vicinity of the proposal to represent the public domain views within the visual catchment of the proposal.

The sensitivity of views surrounding the proposal was determined by considering the quality of the existing view and the extent to which the view can absorb the change brought about by the proposal. Sensitivity factors considered include the length of exposure, and whether a view is particular to an identifiable location or representative of a situation which exists across a broader length.

To determine the potential visual impacts of the proposal, the sensitivity of the view to change has been combined with the magnitude of the change, as per the Impact Assessment Rating Matrix in Table 6-10, supported by analysis of evidence and professional judgement.

6.6.2 Existing environment

The area surrounding the proposal is predominantly highly urbanised with commercial centres, light industry and arterial roads. The only highly vegetated area is associated with Lane Cove National Park to the northeast of the proposal, and Macquarie Park has strong links to the National Park and its creeks and riparian corridors.

The character of the surrounding commercial area can be summarised as 3 to 4 storey office buildings interspersed by open space. Fountain Garden is located at 5 Talavera Road to the west of the proposal, comprising a landscape recreational area associated with the commercial area.

A landscape supply business is located immediately to the south of the site. The eastern boundary is adjacent to the vegetated buffer of the M2 Hills Motorway and an existing private access road (Pittwater Road) is parallel to the site. An access driveway exists at the adjacent property (1 Talavera Road) to the west of the proposal, which includes mature trees that provide screening to part of the proposal site.

Beyond the immediate vicinity of the proposal, the Cleanaway Ryde Resource Recovery Centre is located to the east of the M2 Hills Motorway. The Northern Suburbs Cemetery is a sensitive land use also located to the east of the M2 Hills Motorway, around 120 metres from the proposal, occupying an area of around 70 hectares.

The proposal itself predominantly comprises exposed soil with limited patches of dense vegetation. The general slope of the site is declining in elevation towards the east. This gives rise to views of Lane Cove National Park from within the site and from adjoining properties to the west.

The site currently comprises significant level differences, with steep embankments located within the far-western portion and south-eastern areas of the site.

The proposal is not located within any Scenic Protection Land and there are no heritage landscapes within the surrounding area.

Visual character

The site perimeter is generally well vegetated which screens the site from most public viewpoints except for a small extent on the eastern boundary of the M2 Hills Motorway, immediately adjacent to the site and along Talavera Road which leads into the site.

Residential areas to the north of the proposal are currently screened by existing vegetation along the northern boundary of the proposal and Lane Cove Road and the M2 Hills Motorway corridor. Residential areas to the south of the proposal are screened by the Macquarie Park Business Park and the landscape business.

From within the site, Lane Cove National Park is visible from the vegetated hilltop to the southeast of the proposal, as well as the Northern Suburbs Cemetery, a local heritage item. Views towards the site from the cemetery are not currently available, due to existing screening vegetation within the cemetery.

The site is screened from views from the Cleanaway Ryde Resource Recovery centre by the M2 Hills Motorway and the existing vegetation along the boundary of the proposal. For businesses located to the west, the site is mostly screened by vegetation along the proposal boundary.

6.6.3 Potential impacts

Landscape character

Landscape sensitivity

Taking into consideration various factors, such as the urban and commercial nature of the area surrounding the proposal, the landform, landcover, scale and intervisibility of the surrounding landscape and its proximity to Lane Cove National Park, overall, the surrounding landscape character for the proposal is considered to be of 'Moderate' sensitivity.

Construction impacts

The local landscape would experience adverse effects as a result of the proposed construction work. Adverse effects are considered to be changes that are detrimental in terms of reducing the quality of the landscape resource.

The removal of 332 trees and vegetation clearance required to construct the proposal would reduce the existing vegetated amenity of the area and have a detrimental impact on the existing landscape character of the site and surrounds.

The proposed construction work would also result in the addition of new elements into the landscape, including construction plant and equipment (outlined in Section 3.3.4) and the provision of site compounds (detailed in Section 3.4.1) and stockpiles (Section 3.4.2), all of which will impact on the existing character of the landscape. Particularly during Stage 3 of the work, multiple concurrent activities would be occurring across the site comprising both building work and civils work. During this time, the construction workforce is anticipated to be at its peak. Additional elements into the landscape include construction traffic movements and the introduction of temporary infrastructure, such as hoarding.

The removal of trees and vegetation, along with the presence of construction plant, activities and workforce, construction traffic and temporary infrastructure will result in a change in landscape character. Taking into account the scale of the proposed work and temporary nature of the construction period, the overall magnitude of change during construction in relation to landscape character is considered to be 'High'.

Using the Impact Assessment Rating Matrix in Table 6-10, based on the relationship between the sensitivity of the landscape character ('Moderate') and the magnitude of change ('High'), the overall construction impact of the proposal on landscape character is 'High-Moderate'.

Operation impacts

The proposal is located on a parcel of surplus land owned by Transport, which has been used intermittently in the past as compound and laydown areas for construction materials and construction waste (liquid and solid). The operation of the proposal will result in a permanent change in landscape character, resulting from the change in land use from a partly used and vegetated site to a fully operational bus depot, with new permanent infrastructure elements. The intensified land use associated with the operation of the depot will comprise increased traffic, associated with bus and staff vehicle movements, which will impact the landscape character surrounding the proposal.

Earthwork and excavations required to level the site will also permanently change the landform, and therefore the landscape character of the site.

The depot will operate at night-time and new permanent lighting will be installed to illuminate walkways etc. Additional permanent lighting would also impact the existing character of the landscape.

For these reasons, the overall magnitude of change during operation in relation to landscape character is considered to be 'High'.

Using the Impact Assessment Rating Matrix in Table 6-10, based on the relationship between the sensitivity of the landscape character ('Moderate') and the magnitude of change ('High'), the overall operation impact of the proposal on landscape character is 'High-Moderate'.

Safeguards and management measures to minimise landscape character impacts are summarised in Section 6.6.4.

Although the proposal will result in both temporary and permanent landscape character impacts, the proposal is consistent with the relevant NSW Government policies and strategies, including the Macquarie Park Innovation Precinct Place Strategy (August 2022), which sets out an ambition to diversify and create new employment. Further details are provided in Section 2.1.1.

Visual impacts

Visual catchment

The potential visual catchment of the proposal has been determined based on surrounding landform, using Digital Terrain Model data. The potential visual catchment of the proposal is shown in Figure 6-11. The visual catchment does not take into consideration features that may provide screening, such as buildings and trees.

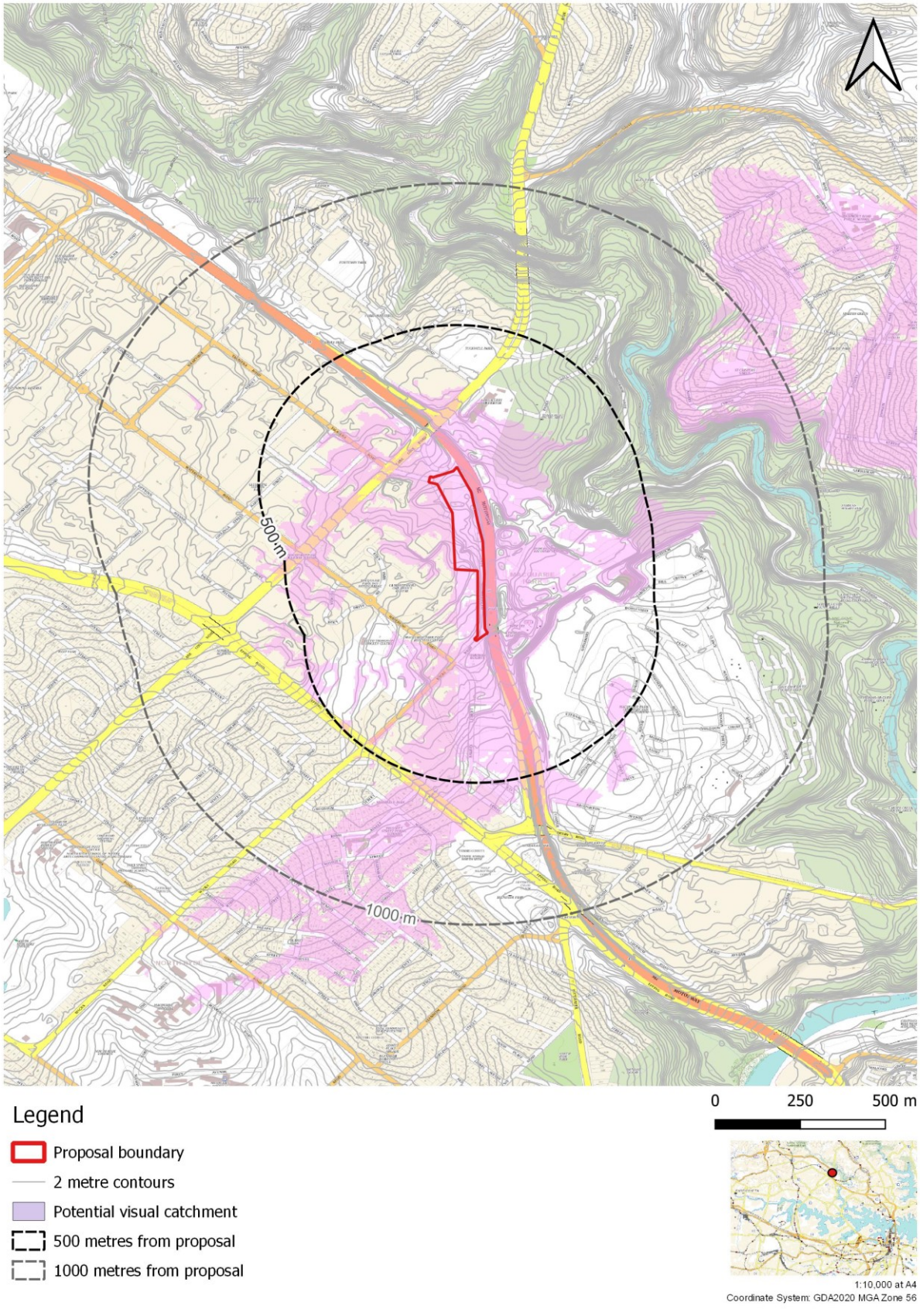


Figure 6-11: Potential visual catchment of the proposal

Viewpoint identification

Figure 6-11 shows that the main visual catchment of the proposal is primarily within 500 metres of the site. Between 500 metres and 1 kilometre of the site, potential views are more limited to areas to the northeast and south-southwest of the proposal. As distances increase, visual detail is increasingly difficult to make out, and the site comprises an increasingly smaller portion of views, therefore is less likely to lead to major changes to existing views.

Representative viewpoints were selected within the visual catchment, capturing a range of representative land uses in adjoining areas for the purpose of the visual impact assessment. Visual sensitivity refers to the quality of the existing views and how sensitive these are to proposed change.

The visual receptors within the visual catchment comprise of the following.

The visual catchment area for the proposal generally comprises an urban setting, containing industrial/commercial buildings. Buildings located within the immediate vicinity of the site would provide some visual screening of the proposal. Interspersed views between existing buildings and infrastructure are likely to be experienced.

The nearest residential receivers to the proposal are located at 1 Fontenoy Road, around 240 metres to the north of the proposal. Only those properties that face onto Lane Cove Road and the M2 Hills Motorway would experience views towards the site. Lane Cove Road and the M2 Hills Motorway already form dominant foreground views from these properties, which reduces their visual sensitivity of existing views.

Based on the potential indicative catchment in Figure 6-11, views of the proposal from Lane Cove National Park to the east, are limited. Where potential views could be experienced from within the National Park, these areas are dominated by the presence of trees which are likely to limit views towards the proposal. The Cleanaway Ryde Resource Recovery Facility and the M2 Hills Motorway would be present in any views from within the National Park.

An area of residential properties located around 660 metres from the proposal, to the east of Lane Cove River, would potentially experience views towards the proposal. Views from these locations are already intersected by the presence of the M2 Hills Motorway, Cleanaway Ryde Resource Recovery Facility, and commercial/industrial buildings.

The Macquarie Park Cemetery is located around 120 metres southeast from the proposal. Views from the cemetery are blocked by the M2 Hills Motorway and intervening vegetation, including vegetation within the cemetery itself.

Key visual receptors would therefore include occupants of the neighbouring businesses, particularly those immediately to the west of the proposal, users of recreational spaces within the immediate area of the site, and users of the M2 Hills Motorway.

Viewpoints have been selected within the visual catchment to represent these views towards the proposal. The viewpoint locations are detailed in Table 6-11 and shown in Figure 6-12. Table 6-12 to Table 6-15 provide an assessment of each viewpoint.

Table 6-11: Key viewpoint locations

ID	Viewpoint	Representative view	Latitude	Longitude
1	Fountain Garden	Recreation space	-33.78342853	151.1321355
2	Epson Australia	Adjoining land use	-33.78440394	151.1328413
3	Talavera Road	Adjoining public domain	-33.78283117	151.1325054
4	M2 Hills Motorway	Adjoining land use	-33.782906	151.134094

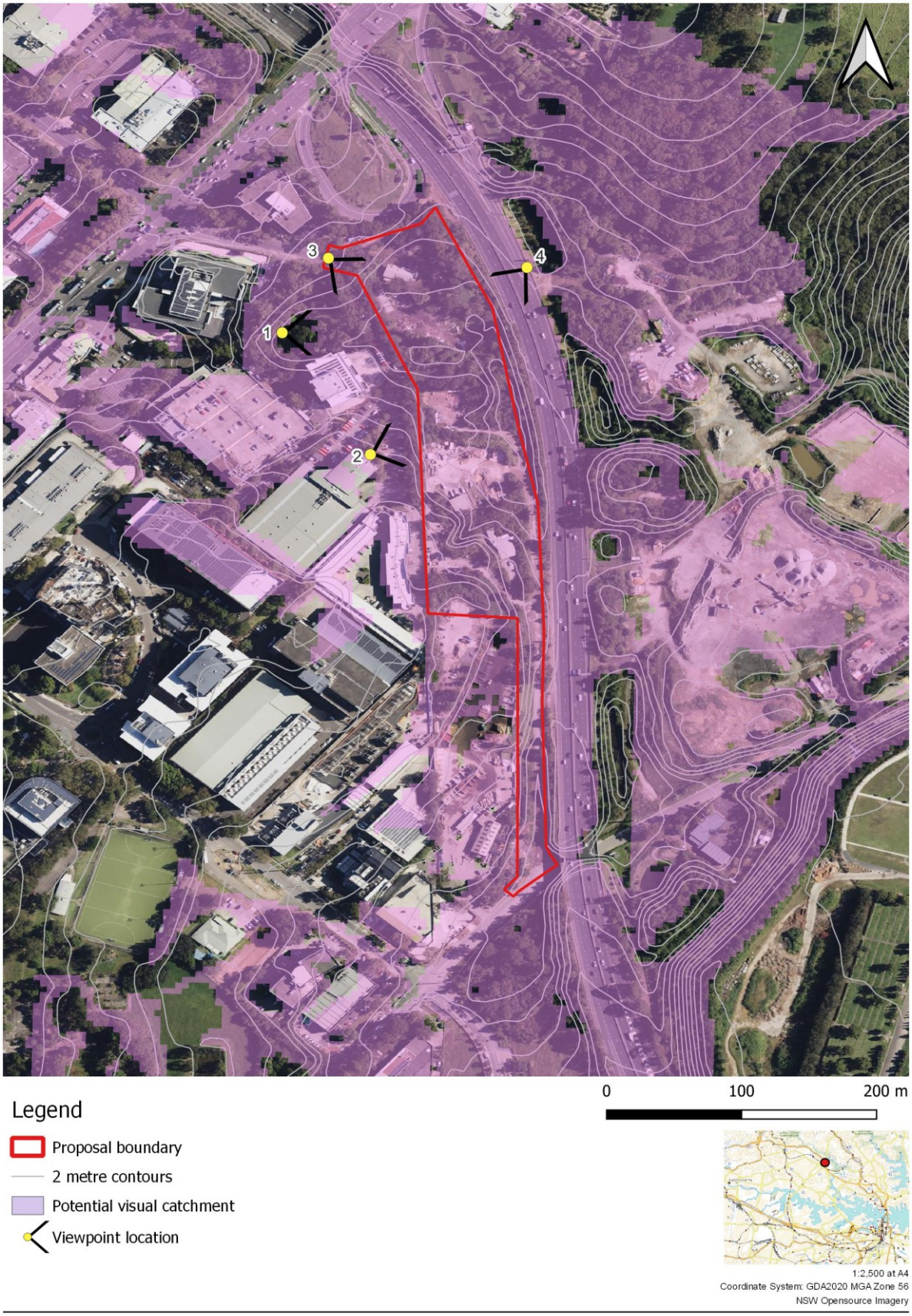


Figure 6-12: Viewpoint locations

Table 6-12: Viewpoint 1 – Fountain Garden

Viewpoint characteristics	Approximately 64 metres to the west of the proposal, the viewpoint is from the western area of a recreational landscaped garden at 5 Talavera Road.
Visual receivers	Recreational users of Fountain Garden
Existing view	The existing view from Fountain Garden comprises a water feature in the foreground, along with a lawned area, vegetation, trees, decking and seating. The adjacent commercial premises is present to the right of the view. Partial views of parked light vehicles are visible in the background of the view.  Source: Transport for NSW Figure 6-13: Viewpoint 1 – view from Fountain Garden at 5 Talavera Road looking East towards proposal
Sensitivity	The sensitivity of the view towards the proposal is rated as **high** as: • it represents an attractive setting with trees, lawns and a water feature
Magnitude of change during construction	The magnitude of change during construction is rated as **low** as: • the foreground and middle ground of the view would remain unchanged during construction of the proposal • removal of mature trees along the proposal boundary may result in glimpses of construction activity in the background of the view • construction activity would be temporary in nature.
Level of visual impact during construction	The high sensitivity ranking, combined with the low magnitude of change, leads to an overall **moderate** level of impact during construction.
Magnitude of change during operation	The magnitude of change during operation is rated as **low** as: • the operational proposal would not intrude upon the character of Fountain Garden • the foreground and middle ground of the view would remain unchanged during operation of the depot; the existing trees within Fountain Garden would continue to provide a leafy, green setting for its users and some screening of the proposal • removal of mature trees along the proposal boundary may result in limited interspersed views of new infrastructure elements associated with the depot in the background of this view, including the administration building and the fill retaining wall along the western boundary.

Level of visual impact during operation	The high sensitivity ranking, combined with the low magnitude of change, leads to an overall **moderate** level of impact during operation.

Table 6-13: Viewpoint 2 – Epson Australia

Viewpoint characteristics	Located approximately 38 metres to the west of the proposal. The viewpoint is located at the entrance to the Epson Australia commercial premises. Representative view for the commercial building.
Visual receivers	Persons utilising the commercial premises
Existing view	The view is indicative of the character of the outlook from commercial premises off Talavera Road looking towards the proposal. The existing view towards the site is dominated by multiple cars parked in a private car park, which forms a prominent feature in the foreground and middle ground. Beyond the car park, dense vegetation provides screening of Talavera Road in the background of the view, beyond which the site is located. Planted amenity trees associated with the landscaping of the commercial premises are visible in the immediate foreground.  Source: Transport for NSW Figure 6-14: Viewpoint 2 – view from Epson Australia looking East towards the proposal
Sensitivity	The sensitivity of the view toward the proposal is rated as **moderate** due to: • vegetation elements would be sensitive to change • commercial tenants higher up in the building would have distance views of the National Park, which would be sensitive to change. • the visual prominence of infrastructure in the form of a car park in the foreground and middle ground of the view, which is not particularly aesthetically appealing • visual receivers are likely to those utilising the commercial premises, including on higher levels.
Magnitude of change during construction	The magnitude of change during construction is rated as **moderate** as: • views of construction activity are anticipated to be prominent for tenants in the higher levels of the buildings • construction activities are temporary in nature.

Level of impact during construction	The moderate sensitivity ranking, combined with the moderate magnitude of change, leads to an overall **moderate** level of impact during construction.
Magnitude of change during operation	The magnitude of change during operation is rated as **moderate** as: • visual receivers are more likely to experience view of the operational depot on higher levels of the building • permanent views of the operational depot from lower levels are likely to be partially screened by vegetation in this location. Any visibility of new infrastructure, such as the fill retaining wall and tall elements such as the administration building, would likely comprise interspersed views between the retained existing vegetation. • there is potential for permanent lighting associated with the operation of the depot at night-time, to result in light spill
Level of impact during operation	The moderate sensitivity ranking, combined with the moderate magnitude of change, leads to an overall **moderate** level of impact during operation.

Table 6-14: Viewpoint 3 – Talavera Road

Viewpoint characteristics	Located within the proposal boundary, to the northwest of the site, immediately adjacent to the proposed staff entrance to the site off Talavera Road.
Visual receivers	Persons accessing local businesses on Talavera Road
Existing view	The existing view towards the site is characterised by a paved access road leading to the commercial premises at 1 Talavera Road. Several business signs are present in the middle ground of the view. In the background, trees and greenery bound the access road, giving the view a somewhat natural look despite its industrial nature. There are limited glimpses of the site between the existing trees.  Source: Transport for NSW Figure 6-15: Viewpoint 3 – view from Talavera Road looking towards the proposal
Sensitivity	The sensitivity of the view toward the proposal is rated as **moderate** as: • mature vegetation comprises a notable portion of the view and would be sensitive to change • the view towards the site is localised and the number of potential visual receivers is likely to be low, limited to persons accessing the local businesses on Talavera Road

	• the foreground and middle ground of the view is dominated by an access road and signage, and overhead lines are present, which represents its urban industrial setting • visual receivers are likely to experience views from this location as they travel along Talavera Road or be located in nearby buildings.
Magnitude of change during construction	The magnitude of change during construction is rated as **high** as: • construction activities, including tall mobile construction plant and equipment and hoarding/fencing would occupy a large proportion of the view and be directly in the line of sight for this view • proposed tree removal to facilitate construction of the proposal would result in a change in view at this location, which would increase the visual exposure of the site and could impact the viewer's perception of the attractiveness of the view. • proposed works on Talavera Road would form a prominent view in the foreground. Works conducted at night would impact fewer visual receivers as the buildings are likely to be in use during standard office hours. • temporary lighting would be required to conduct night work in a safe manner, with the potential for light spill at this location • the presence of construction traffic and intensification of vehicle movements would be noticeable in this location • construction would be temporary in nature.
Level of impact during construction	The moderate sensitivity ranking, combined with the moderate magnitude of change, leads to an overall **high-moderate** level of impact during construction.
Magnitude of change during operation	During operation, the magnitude of change is rated as **high** as: • the operational depot would introduce new permanent built infrastructure elements into the view, including retaining walls and new areas of handstand, along with new buildings, including the administration building. • removal of the trees in the background of the view, to accommodate the proposal, would increase the visual exposure of the site, giving a direct uninterrupted view of the operational depot, and would reduce the visual amenity from the viewpoint. • the proposed fill retaining wall has the potential be a prominent feature within this view • there is potential for permanent lighting associated with the operation of the depot at night-time, to result in light spill. Light spill would impact fewer visual receivers as the buildings are likely to be in use during daylight hours • there is the potential that the operational impacts may be reduced over time through new boundary vegetation as it matures.
Level of impact during operation	The moderate sensitivity ranking, combined with the high magnitude of change, leads to an overall **high-moderate** level of impact during operation.

Table 6-15: Viewpoint 4 – M2 Hills Motorway

Viewpoint characteristics	Located approximately 38 metres to the northeast of the proposal. The viewpoint is from the southbound lane of the M2 Hills Motorway, looking south-west towards to the site.
Visual receivers	Road users travelling via the M2 Hills Motorway.
Existing view	The existing view towards the site from this location comprises a multi-lane motorway which forms a prominent feature in the foreground of the view. The motorway is bordered by a concrete barrier on the right side in the middle ground of the view. A vegetated area, comprising mature trees, exists beyond the concrete barrier, which provides screening of the site. The built skyline is visible in the background of the view.

	 Source: Transport for NSW (Google maps) Figure 6-16: Viewpoint 4 – view from M2 Hills Motorway looking southwest towards the proposal
Sensitivity	The sensitivity of the view toward the proposal is rated as **moderate** as: • existing views of the site from this location are limited due to screening by vegetation • the vegetation and the open skyline are prominent visual elements in the view that would be sensitive to change
Magnitude of change during construction	During construction, the magnitude of change is rated as **low** as: • the existing trees along the boundary of the M2 Hills Motorway would be retained during construction, which would provide some screening of construction activities • views during construction would potentially be limited to the visibility of tall mobile construction plant above the tree line • elements of the construction site could potentially be visible in road user's views as they approach and pass the site, due to the removing of trees within the site, raising of the site levels in some locations and the introduction of new buildings, such as the multi-level administration building. These elements would only comprise a small portion of the view for road users • where night-time construction work is proposed, temporary lighting would be required to conduct work in a safe manner, with the potential for light spill, which could be visible and potentially distract motorists from this location • construction work would be temporary in nature.
Level of impact during construction	The moderate sensitivity ranking, combined with the low magnitude of change, leads to an overall **moderate-low** level of impact during construction.
Magnitude of change during operation	During operation, the magnitude of change is rated as **low** as: • the existing retained trees along the boundary of the M2 Hills Motorway would provide some screening of the operational depot and therefore the operational depot is not anticipated to be visually prominent in the view • elements of the operational depot could potentially be visible in road user's views as they approach and pass the site, due to the removing of trees within the site, raising of the site levels in some locations and the introduction of new buildings, such as the multi-level administration building. These elements would only comprise a small portion of the view for road users • there is potential for permanent lighting associated with the operation of the depot at night-time, to result in light spill.
Level of impact during operation	The low sensitivity ranking, combined with the low magnitude of change, leads to an overall **moderate-low** level of impact during operation.

The assessed impact of the proposal on views during construction and operation is summarised in Table 6-16.

Table 6-16: Assessment of impacts to viewpoints

ID	Viewpoint	Construction			Operation		
		Sensitivity	Magnitude	Impact	Sensitivity	Magnitude	Impact
1	Fountain Garden	High	Low	Moderate	High	Low	Moderate
2	Epson Australia	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
3	Talavera Road	Moderate	High	Moderate-high	Moderate	High	Moderate-high
4	M2 Hills Motorway	Moderate	Low	Moderate-low	Moderate	Low	Moderate-low

Safeguards and management measures to minimise visual impacts are summarised in Section 6.6.4.

6.6.4 Safeguards and management measures

Whilst there will be a change in landscape character, the proposal will make a positive contribution towards achieving the vision for the area. The urban design and landscape plan (UDLP) will be further developed to ensure the proposal maximises fit with surrounding areas and makes a positive contribution to the place, consistent with Transport urban design policies.

Visual impact will also be managed through the UDLP, including careful consideration and resolution of boundary interfaces to avoid adverse impacts on existing views, including through retaining wall design and the inclusion of landscaping, where possible within the site and operational constraints.

The landscape character and visual impact safeguards and management measures are outlined in Table 6-17.

Table 6-17: Landscape character and visual impact safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing	Reference
LVA1	Landscape	The detailed design is to be undertaken in accordance with design principles outlined in the *Zero Emission Buses Urban Design Framework* (Transport for NSW, 2022) and the *Urban Design Report* and *Landscape Design Report* (Taylor Brammer Landscape Architects Pty Ltd, 2024)	Contractor	Detailed design	Additional safeguard
LVA2	Landscape	The Urban Design Report (including detailed urban design drawings and landscape plans) will provide the basis for development of an UDLP to support the final detailed design The UDLP will present an integrated urban design for the proposal, providing further practical detail on the application of design principles.	Contractor	Detailed design	Standard measure
LVA3	Landscape character	Detailed design to take into account the design of existing structures and conform to the landscape character of the locality.	Contractor	Detailed design	Additional safeguard
LVA4	Landscape character and visual impact	Detailed design to minimise tree and vegetation removal within the proposal boundary. Boundary trees to be retained where possible during construction to maintain screening.	Contractor	Detailed design / Construction	Additional safeguard
LVA5	Visual impact	Temporary lighting spill beyond the construction footprint is to be minimised in accordance with *AS4282 Control of the*	Contractor	Construction	Additional safeguard

ID	Impact	Environmental safeguards	Responsibility	Timing	Reference
		obtrusive effects from outdoor lighting. All lighting to be directed away from visual receptors.			
LVA6	Visual impact	Lighting and signage will be installed in accordance with relevant Australian Standards and guidelines, and without reducing the amenity of sensitive receivers where feasible and reasonable.	Contractor	Pre-construction/ construction	Additional safeguard
LVA7	Visual impact	Following completion of the work, plant and equipment to be removed from site and disturbed areas to be rehabilitated/ restored as appropriate.	Contractor	Construction/ Post-construction	Additional safeguard
LVA8	Landscape and visual impact	During detailed design, the contractor will consider the following: • undertake further built form refinement to reduce the bulk of built infrastructure • minimise the height of structures to reduce the bulk of built infrastructure and minimise impacts on views • select materials and finishes to minimise potential for glare • prepare urban design strategies to minimise the bulk and visual impacts resulting from retaining walls investigate additional opportunities to introduce landscaping into the proposal including landscaping on structures e.g., roof gardens.	Contractor	Detailed design	Additional safeguard

6.7 Traffic and transport

The Traffic and Transport Assessment (TTA), prepared by SCT Consulting, outlines the traffic and transport impacts of the proposed ZEB Macquarie Park Bus Depot. The TTA is provided in Appendix E.

This section of the REF summarises the outcome of the TTA for the operational phase, and the construction activities, as well as any proposed traffic and transport solutions to mitigate these impacts.

6.7.1 Methodology

A TTA for the proposal has been prepared by SCT Consulting. The assessment includes the following key tasks:

- review of relevant background documents and information including relevant planning policies, transport planning documents and City of Ryde Council Development Control Plan (DCP).
- analysis of existing conditions, including site location and existing traffic, parking, public transport and active transport facilities and conditions.
- description of depot upgrade proposal, including:
  - proposed construction activities, working hours, size and type of vehicles, access routes and volumes.
  - proposed operations trip generation (increase in bus movements) and distribution to the surrounding road network, vehicle, pedestrian and cyclist access to the depot as well as proposed staff parking.
- analysis of traffic, transport and access impact, including:

  - construction impacts on active transport access, public transport operations, road network performance, property access and parking activities.
  - operations impacts on active transport access, public transport operations, road network performance, property access and parking activities.
- discussion of any mitigation measures that may be required.

Construction traffic impact assessment methodology

The construction traffic impact assessment assesses the impact of the construction activities on vehicular traffic, active transport, public transport, parking, and access.

The proportional impact (based on traffic volume increase) on five intersections in proximity to the site was assessed. Modelling was undertaken only for the Waterloo Road / Halifax Rd / Wicks Road intersection, where the largest impact was identified. All construction (light and heavy) vehicles will travel through this intersection and traffic volume increase could therefore have a measurable impact at this intersection.

The increase at the other four intersections is minimal (0.6 per cent or less) and therefore will have minimal impacts to delays and intersection performance.

Construction impacts of the proposal were assessed, and appropriate mitigation measures outlined to minimise traffic and transport impacts during construction.

Operational traffic impact assessment methodology

The operational traffic impact assessment assesses the impact of the proposal once operational on vehicular traffic, active transport, public transport, parking, and access.

To determine the road network impact for the operational scenario of the proposed bus depot, a traffic microsimulation model (AIMSUN) was developed by WSP on behalf of Transport. The modelling results were presented in *Greenfield Macquarie Park Zero Emission Bus Depot: Traffic Assessment* (WSP, 2023). The results were reviewed as part of the TTA and used to assess the road network performance once the depot is operational.

The AIMSUN models were developed for the AM peak period (7.30 to 9.30am) and PM peak period (4.15 to 5.15pm) along with a 30-minute warm up and cool down period applied either side of the analysis period.

As part of the modelling, the following options were tested:

- **Do Nothing 2031**: Existing conditions road network + background traffic growth
- **Project Case 2031**: Existing conditions road network + background traffic growth + bus access/exit via Pittwater Road only and light vehicle access from Talavera Road only
- **Mitigation Option**: Project case with the replacement of the filter right turn with a right turn arrow phase at the intersection of Wicks Road and Waterloo Road.

Based on the results of the modelling, operational impacts of the proposal were assessed, and appropriate mitigation measures outlined to minimise traffic and transport impacts during operation.

6.7.2 Existing environment

The proposal is located within the Macquarie Park Innovation Precinct, which is the largest non-CBD market in Australia and the fourth largest employment centre in Greater Sydney. It is surrounded by the State Roads: M2 Hills Motorway, Lane Cove Road and Epping Road, as well as Talavera Road and Wicks Road, which is partly regional and partly local.

Journey to Work data shows that people traveling on public transport accounted for about 36 per cent, while car (as driver or passenger) as a mode of transport was 32 per cent. About 17 per cent walked or cycled to work, with only 0.5 per cent of these trips being bicycle users.

The site is surrounded by shared paths, on-road cycle routes and road shoulders (along the M2 Hills Motorway), which provides good cycling access to the regional cycle network and nearby suburbs, such as Chatswood, North Ryde and Epping. A separate bicycle path is also provided along the northern boundary of the site, accessed from Talavera Road and the M2. Some barriers to pedestrian and cycling movements include the heavily trafficked M2 Hills Motorway, Lane Cove Road and Epping Road.

Bus routes run along Lane Cove Road, Waterloo Road and Talavera Road, with about 70 services per hour in the AM and PM peaks, to the City, Lane Cove, Mona Vale, Chatswood, Ryde, Parramatta and Hornsby. The Metro North West line between Chatswood and Tallawong serves Macquarie Park Metro Station, about 500m west of the site, with one train every four minutes in the AM and PM peak and every 10 minutes in the off-peak service the station.

Traffic counts were undertaken at the intersections close to the site on Wednesday 14 September 2022. Based on these traffic counts, the common traffic network peak hours in proximity to the site are between 8.30am and 9.30am and between 4.45pm and 5.45pm during weekdays.

The Waterloo Road / Halifax Road / Wicks Road intersection currently performs at good level with acceptable delays and spare capacity, and with acceptable delays and degree of saturation in both the AM and PM peak hours.

6.7.3 Potential impacts

Construction

As a worst-case scenario for testing construction impacts, it has been assumed that all construction-related vehicles (both light and heavy vehicles) will arrive and leave the site during these traffic network peak hours. In reality, the light vehicles would arrive before 7am (start of shift) and leave after 6pm (end of shift) and the heavy vehicles may arrive and leave outside of the traffic network peak hours.

All construction-related vehicles (heavy and light) are expected to travel through the Waterloo Road / Halifax Road / Wicks Road intersection and enter and exit the site at the Pittwater Road access point only.

The TTA includes the following assumptions regarding the distribution of construction-related vehicles entering and exiting the site:

- The light vehicle routing has been based on current traffic patterns at the surrounding intersections and distributed between the intersections from Lane Cove and Epping Road.
- The heavy vehicle routing has been assumed from the north from the M2 Hills Motorway, right into Lane Cove Road, left into Waterloo Road, left into Wicks Road and left into Pittwater Road. This route would be reversed for exiting heavy vehicles.

Construction activities associated with the proposal are expected to generate 66 vehicle trips in the AM and PM peak hours. As shown in Table 6-18, the number of construction vehicles entering and leaving the site during the AM and PM peak hours are evenly distributed, as a truck entering the site is generally expected to drop off material and then leave within the same hour.

As expected, the number of light vehicles (mainly construction employees) entering the site in the AM peak hour is then reversed in the PM peak hour, when the light vehicles are forecast to leave the site.

Table 6-18: Number of trips (vehicles per hour) generated by construction activities

Type of vehicle	AM Peak Hour		PM Peak Hour	
	In	Out	In	Out
Heavy vehicles	6	6	6	6
Light vehicles	54	0	54	0
Total vehicles (one way)	60	6	6	60
Total vehicles (two ways)	**66**		**66**	

Intersection performance

Intersection performance based on the existing traffic volumes and the additional traffic generated by construction vehicles was assessed for the Waterloo Road / Halifax Road / Wicks Road intersection for the AM and PM peak hours.

Due to the constrained traffic conditions surrounding the site, it is unlikely that any further traffic growth will occur that will impact the Waterloo Road / Wicks Road / Halifax Road intersection during the construction phase. Therefore, no traffic background growth has been applied to the road network.

Intersection performance results indicate that the construction vehicles would have a negligible impact on the Waterloo Road / Halifax Road / Wick Road intersection, which is forecast to still perform at a good level of service with acceptable delays and spare capacity in the AM and PM peak hours.

Work on the surrounding network

Most of the proposed work will be contained within the existing site and will not interface with traffic on public roads. However, some works nearby roads may be required, including:

- Widening and upgrading to the Pittwater Road / Wicks Road intersection to accommodate the increased future volume of bus traffic associated with the proposal.
- Modifications to the existing driveway entrance for 1 Talavera Road, to accommodate the proposed driveway entrance to the underground car park on Talavera Road. This could entail some minor work to the kerb crossing at the existing driveway entrance.
- The removal of the bike lane that runs along the northern boundary of the proposal connecting Talavera Road with the bike lane on the westbound carriageway of the M2 Hills Motorway, as it crosses the into the footprint of the underground car park.

The scope and impact of any service and utility connections has not been determined at this time. Minor trenching work may be required on either Talavera Road or Wicks Road to complete these connections to the existing infrastructure. It is expected that any works could be completed under single-lane shuttle-flow conditions during standard working hours.

The proposed driveway entrance to the underground car park on Talavera Road may require modifications to the existing driveway entrance for 1 Talavera Road, which could entail some minor work to the kerb crossing at the existing driveway entrance. This will likely be completed during standard working hours with minimal disruption to traffic. However, this will depend on access requirements for the tenants of 1 Talavera Road and outside of working hours work may be required to mitigate potential impacts.

Service and utility connections

The scope and impact of any service and utility connections has not been determined at this time. Minor trenching work may be required on either Talavera Road or Wicks Road to complete these connections to the existing infrastructure. It is expected that any work could be completed under single-lane shuttle-flow conditions during standard working hours. However, they could be conducted outside of working hours to mitigate supply disruptions to existing customers.

Active transport impact

The site is surrounded by shared paths, on-road cycle routes and road shoulders (along the M2 Hills Motorway).

Shared paths are provided along sections of Waterloo Road, Epping Road, Talavera Road, Lane Cove Road, and Wicks Road in proximity to the site, providing access (separated from traffic) for cyclists and pedestrians to the site.

A bicycle path (with no access permitted for pedestrians) is also provided along the northern boundary of the site, accessed from the M2 Hills Motorway.

An existing bike path runs along the northern boundary of the site, connecting Talavera Road with the bike lane on the westbound carriageway of the M2 Hills Motorway. The alignment of the bike path crosses into the footprint of the proposed underground car park and the current design includes the removal of this path. The removal of the bike path will impact cyclists that currently use the path and therefore its closure will require management of cyclists that use the path. The installation of appropriate signage is needed, including signage placed at the M2 Hills Motorway on-ramp near Delhi Road and Talavera Road. Alternative routes would also be required to be identified.

Signage may also be required along Wicks Road near Pittwater Road to manage any impact on the pedestrian and cycling network.

Public transport network

Workers should be encouraged to use public transport to travel to and from the site whenever possible, given the proximity of the site to public transport. The public transport services available are expected to be able to cope with the additional demand from construction activities. Any required re-routing of services due to construction activities should however be further considered as part of the Construction Traffic Management Plan (CTMP).

Parking impact

Given the excellent access of the site to public transport, construction workers will be highly encouraged to use public transport to access the site to minimise parking impacts. However, there will still be a need for some trades to bring tools and equipment with them daily, which will require parking on site.

Access impact

The Pittwater Road / Wicks Road intersection may require widening and upgrading to accommodate future two-way bus movements associated with the proposal.

Given the existing road width of Wicks Road, it is expected that any work could be completed under single-lane shuttle-flow conditions during standard working hours.

Some shoulder closures and reduction in overall carriageway widths may be required to remain outside of working hours, but it is expected that two-way two-lane traffic flow could be maintained, subject to the final scope of required work. Wicks Road services the NSW State Emergency Service Ryde Unit and Cleanaway Ryde Resource Recovery Centre, so access for emergency vehicles will always need to be maintained.

A detailed CTMP, which will include a construction traffic control plan, will be prepared prior to construction and in accordance with the *Traffic Control at Work Sites Technical Manual* (2010). The CTMP will address the overall traffic management of the site during the construction phase, including provision for vehicular and pedestrian access, parking for construction vehicles and appropriate wayfinding. The vehicular movements and expected routes to and from the site will also be further quantified and defined.

Operation

Operational modelling results

The bus movement peaks do not align with the traffic network peaks, which limits the impact of the proposal on the surrounding road network. Overall, the impact on the surrounding network is minimal with intersection level of service and congestion hotspots remaining the same as in the Do-Nothing case.

The key findings of the operational assessment are:

- The network along Lane Cove Road and Epping Road is heavily congested in all scenarios. The Waterloo Road / Lane Cove Road intersection performs at capacity in the AM and PM peak hours, with an average delay per vehicle of 70.5 seconds or greater.
- The Epping Road / Wicks Road intersection performs at capacity in the AM peak hour and PM peak hour, with average delays of 56.5 to 70.4 seconds and greater than 70.5 seconds respectively.
- The overall intersection performance for each of the assessed intersections remains at the same performance level for both the Do Nothing and Project Case scenarios in both the AM and PM peak hours.
- The new intersection of the bus depot (at Pittwater Road) with Wicks Road will perform at a level of good operation in all scenarios.
- There are significant queueing and delays at the Lane Cove Road / Talavera Road intersection and along Lane Cove Road, even without the depot in place.
- There is significant queueing at the Wicks Road / Waterloo Road intersection during the PM peak hour. A mitigation scenario was run to test an option to replace the filter right turn from Wicks Road southbound into Waterloo Road with an additional right turn arrow phase.
- The results of the mitigation option to the Wicks Road / Waterloo Road intersection were inconclusive as there was an improvement in the AM peak but a deterioration in the PM peak. This option should be investigated from a road safety perspective during the detailed design phase.

Public transport network impact

Upgrades to the public transport network are not anticipated to be required to accommodate the proposal.

The proposal would generate about 40 and 20 bus trips in the AM and PM peak hours respectively, while about 110 and 50 trips would be made by train (or Metro) in the AM and PM peak hours respectively.

With 24 Metro services in the AM and PM peak hour respectively, the additional demand would result in five and two additional passengers on each train in each peak hour respectively. Because about 70 bus services are provided in the AM and PM peak hours, the additional demand would result in less than one additional bus passenger on each service. The existing public transport provision is expected to be able to cater for this future demand.

Active transport impact

Approximately 70 and 30 walk only trips will be generated in the AM and PM peak hours respectively by the Proposal, while there would only be four and two additional cycling trips generated in the AM and PM peak hours respectively.

The site is well served by both footpaths and shared paths, and the surrounding road network is expected to be able to cater for the additional active transport demand generated by the Proposal. Cycle parking will also be provided within the site, so no patrons are expected to need to park their bike at public facilities.

Parking impact

It is expected that all staff will park off-street and not on the surrounding public road network. Bus parking bays including maintenance bays and bus wash facilities will be provided on-site, so no buses are expected to park on the public road network. The proposal is not expected to have an adverse impact on public parking on the surrounding road network.

6.7.4 Safeguards and management measures

Table 6-19: Traffic, transport and access safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing	Reference
TT1	Traffic and transport	A detailed Construction Traffic Management Plan (CTMP), which will include a Construction Traffic Control Plan, will be prepared in accordance with Transport's *Traffic Control at Work Sites Manual* (Transport, 2022). The CTMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site-specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.	Contractor	Detailed design / Pre-construction	Standard safeguard

ID	Impact	Environmental safeguards	Responsibility	Timing	Reference
TT2	Local community notification	Potentially affected residences are to be notified prior to the commencement of and during work. Consultation should include but not be limited to door knocks, newsletters or letter box drops providing information on the proposal, working hours and a contact name and number for more information or to register complaints.	Contractor	Pre-construction / Construction	Additional safeguard
TT3	Road network	Any minor trenching work required on either Talavera Road or Wicks Road to complete service and utility connection are to be completed under single-lane shuttle-flow conditions during standard working hours.	Contractor	Construction	Additional safeguard
TT4	Road network	Parking for construction workers is to be provided within the proposal boundary.	Contractor	Construction	Additional safeguard
TT5	Active transport network	Appropriate signage to be installed along Wicks Road near Pittwater Road and along Lane Cove Road, near Talavera Road, to manage impacts on the pedestrian and cycling network.	Contractor	Construction	Additional safeguard
TT6	Emergency service vehicles	Traffic management measures must be implemented to ensure emergency services vehicle access is maintained along Wicks Road during construction.	Contractor	Construction	Additional safeguard
TT7	Road safety	A road safety review is to be undertaken of the intersection of Halifax Street and Wicks Road to test the following potential mitigation options to accommodate the additional bus movement: • addition of a green arrow right turn phase from Wicks Road southbound into Waterloo Road. • some terminating bus services will use Halifax Street and turn right at Wicks Road to access the depot. This movement will require a new “Buses Excepted” sign applied to the existing “No Right Turn” sign from Halifax Street to Wicks Road.	Contractor	Detailed design	Additional safeguard
TT8	Active transport	Future cycling access configurations to the site to be considered during detailed design including installation of appropriate signage and alternative routes.	Contractor	Detailed design	Additional safeguard
TT9	Sustainable travel	Construction workers are to be encouraged to use public transport to access the proposal.	Contractor	Construction	Additional safeguard
TT10	Access	Pedestrian and vehicle access to neighbouring and nearby properties and businesses will be maintained throughout the duration of the work, where possible.	Contractor	Construction	Additional safeguard

6.8 Noise and vibration

This section provides an assessment of the potential impacts of the proposal on noise and vibration and identifies safeguards and management measures to avoid or minimise these impacts.

A Noise and Vibration Impact Assessment (NVIA) was undertaken by Pulse White Noise Acoustics (PWNA). The main findings of the NVIA are summarised in this section and the NVIA is included in Appendix F.

6.8.1 Methodology

Background noise monitoring

Background noise logging was undertaken at 1 Fontenoy Road from 8 to 18 December 2023 to determine the existing noise environment at nearby sensitive receiver locations. The location of the noise logger was selected to measure the existing noise environment representative of the nearby receivers. The unattended noise monitoring was performed at the residential boundary of 1 Fontenoy Road, Macquarie Park that is most exposed to the proposed construction area. The noise logger is shown in Figure 6-17 and its location is provided in Figure 6-18.

The noise logging data has been measured, analysed and reported in accordance with *Australian Standard 1055:2018 Acoustics - Description and measurement of environmental noise* (Standards Australia, 2018) and the *Noise Policy for Industry* (NSW EPA, 2017) (NPfI).

The measured background noise levels were used to derive the ambient noise levels and Rating Background Noise Level (RBL). The RBL has been used to determine the Noise Management Levels (NML).

Noise levels have been used throughout the NVIA to determine the existing noise environment and establish appropriate site-specific noise criteria.

Figure 6-17: Noise logger deployment at 1 Fontenoy Road

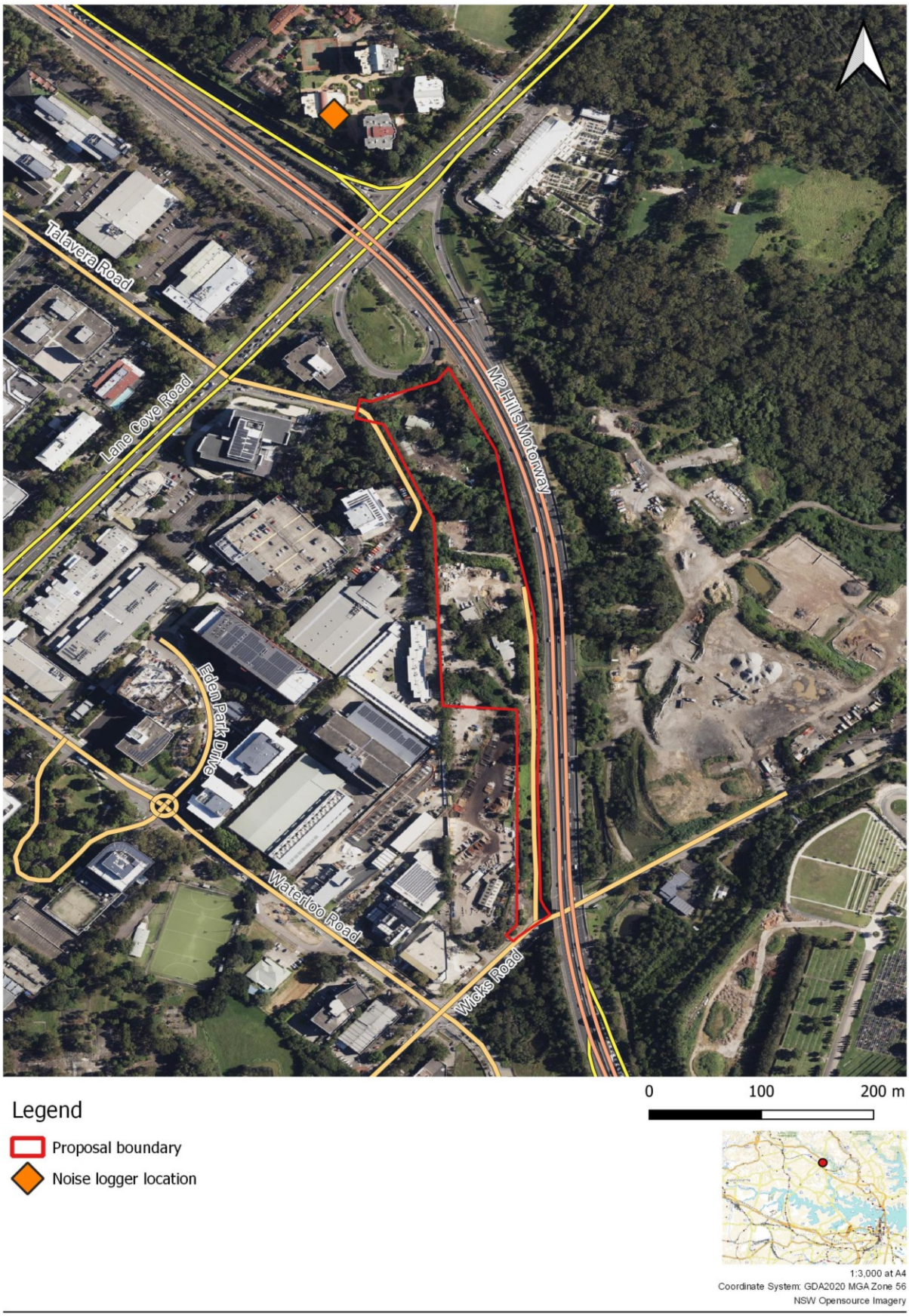


Figure 6-18: Location of noise logger at 1 Fontenoy Road

Noise and Vibration Assessment

The NVIA comprised the following:

- identifying the existing noise sensitive receivers (NSR)
- presenting details about the existing noise environment
- identifying the applicable NSW noise and vibration policies and applicable construction and operational design criteria
- assessing the construction and operational noise and vibration impacts in accordance with the applicable NSW policies
- providing construction and operational noise and vibration mitigation and management measures to comply with the applicable design criteria.

Construction noise assessment methodology

Noise levels resulting from the proposed construction work are based on the plant and equipment which would be used during the proposed work as identified in Section 3.3.4.

Noise modelling scenarios have incorporated the indicative construction staging in Table 3-3. For each noise modelling scenario, the worst-case construction noise impacts have been assessed using the CONCAWE noise propagation algorithm and modelled in SoundPLAN v8.2 software. The algorithm calculates worst case downwind noise propagation and is considered appropriate for construction noise impacts in NSW.

Sound Power Levels (SWL) of construction plant and equipment have also been including in the noise modelling process. Each construction noise modelling scenario comprises a total SWL with typical worst-case assumptions. The overall Sound Power Level is based on the equipment SWLs in Appendix C of *Construction Noise and Vibration Guideline – Public Transport Infrastructure 2023* (Transport for NSW, 2023) (CNVG-PTI 2023).

The construction noise impact assessment has been prepared in accordance with the CNVG-PTI 2023. The nearest residential and non-residential sensitive receives have been identified that are closest to the point at which the noisiest piece of plant or equipment will be operated. The predicted level has then been compared against the NMLs and any exceedances calculated. The potential for both sleep disturbance and awakenings has also been considered in the assessment.

Where noise levels are predicted to exceed the NMLs, reasonable and feasible mitigation and work practices were considered in accordance with Section 7.2.2 of the CNVG-PTI 2023. Safeguards and management measures would need to be implemented to minimise noise impacts, where exceedances are identified.

Operational noise assessment methodology

Operational noise emission criteria have been derived from the background noise logging in accordance with the EPA's Noise Policy for Industry (NPfI) and background noise logging has been undertaken for this proposal. The criteria are outlined in Section 6.8.2.

An operational noise model has been developed using SoundPLAN v8.2. The noise model assessed the dominant noise sources generated from the operation of the site, which includes noise generated from buses entering and leaving the site, the maintenance workshop including the spray booth, bus wash bay, rectifier transformers, and key noise emitting plant, such as air conditioning condenser units for building, car park exhaust and electrical and ventilation fans.

Electric bus idling and passby noise measurements were undertaken at Leichardt bus depot. The noise measurements noted there was an audible hum associated with the acceleration of the vehicles, and air-conditioning dominated the stationary noise. The measured noise levels were consistent with the Acoustic Vehicle Alerting System (AVAS) maximum sound power levels provided by UN Regulation No. 138*, Uniform provisions concerning the approval of Quiet Road Transport Vehicles with regard to their reduced audibility*.

The noise model has assessed the total number of vehicle movements leaving and exiting the site (i.e. arrival and departure movements) to complete a full lap of the site within a 15-minute period. This is considered to be a conservative assumption to ensure that the greatest noise impacts are considered. The workshop, bus wash, and all mechanical services equipment have also been assumed to be operating during all assessment periods.

Site operational noise emissions have been calculated using the CONCAWE algorithm, which was selected to ensure that noise-enhancing weather conditions, such as temperature inversions and downwind conditions have been appropriately

considered, in accordance with NPfI. A worst-case assessment has been completed assessing the adverse weather conditions in all directions.

Noise emissions associated with the operation of the proposal are not considered to generate annoying characteristics of noise, such as tonal, low frequency, and intermittent noise, and therefore penalties have not included in the assessment to account for annoying characteristics of noise. The potential for both sleep disturbance and awakenings has been considered in the assessment.

Three separate assessment scenarios have been considered, daytime, evening, and night-time. Mechanical plant, including the maintenance workshop and wash bay have been assumed to be operating for all scenarios. During the night-time period it has been assumed that air conditioning units would operate in night mode. Vehicle movements have been based on the bus movement timetable provided in the *Greenfield Macquarie Park Zero Emission Bus Depot: Traffic Assessment* (WSP, 2023). Half the number of movements in an hour period have been assumed to occur in a 15-minute period.

6.8.2 Noise and vibration criteria

Construction noise criteria

The assessment of noise impacts from construction work associated with the proposal have been undertaken in accordance with the assessment and management approach outlined in the *Interim Construction Noise Guidelines* (ICNG) (Department of Environment and Climate Change NSW , 2009).

Construction hours

The ICNG defines working hours for which different construction noise assessment procedures apply.

Standard working hours, during which the majority of construction work would occur, are:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm Saturdays
- no work on Sundays or public holidays.

Any work outside of these hours would be classified as out of hours work (OOHW).

Construction noise management levels

The ICNG contains procedures for determining proposal-specific Noise Management Levels (NML) for sensitive receivers based on the existing background noise surrounding the proposal.

NML are set with reference to time of day and the background noise, known as the Rating Background Noise Level (RBL). The RBL for the proposal was based on the noise levels measured during the noise monitoring. These noise levels are used throughout the assessment to determine the existing noise environment and establish appropriate site-specific noise criteria.

The ambient and RBL noise levels measured are summarised in Table 6-20 and the NML for residential receivers, set out in Table 6-21.

Table 6-20: Measured ambient noise levels, dB(A)

ID	Address	Rating background level			Ambient noise level, $L_{Aeq,15min}$		
		Daytime	Evening	Night-time	Daytime	Evening	Night-time
L01	1 Fontenoy Road, Macquarie Park	64	61	57	67	65	63

Table 6-21: ICNG noise criteria for residential land uses

Time of Day	Noise Management Level $L_{Aeq(15\ min)}$	How to apply
Recommended standard hours:	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise.

Time of Day	Noise Management Level $L_{Aeq(15\ min)}$	How to apply
Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm		Where the predicted or measured LA_{eq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
OOHW	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.
Note 1 Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence. Noise levels may be higher at upper floors of the noise affected residence.		

Airborne NML have been established for sensitive land uses including commercial and industrial receivers and are provided in Table 6-22.

Table 6-22: Noise Management Levels for commercial and industrial receivers

Time of Day	Noise Management Level $L_{Aeq(15\ min)}$	Airborne Noise Management Level $L_{Aeq(15min)}$ dB(A)
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm	Noise affected RBL + 10 dB	64 + 10 = 74 dB(A)
	Highly noise affected 75 dB(A)	75 dB(A)
	Noise affected RBL + 5 dB	61 + 5 = 66 dB(A) **Evening OOHW**
		57 + 5 = 62 dB(A) **Night-time OOHW**
Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence. Noise levels may be higher at upper floors of the noise affected residence.		

Specific NML have been established for the proposed work based on the methodology outlined in Table 6-22. Non-mandatory NML for nearby property which are sensitive to noise impacts are presented in Table 6-23.

The values are set to ensure that characteristic activities in each of these land uses would not be impacted by noise. The NML are only applicable when the property is in use, such as classrooms or offices during working hours. When assessing noise levels, measurements are taken at the centre of occupied rooms for internal noise and at the most affected point within 50 metres of the area boundary for external noise.

Table 6-23: Noise Management Levels for other sensitive receivers

Land use	Noise Management Level, $L_{Aeq(15min)}$ (applies when in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dBA
Hospital wards and operating theatres	Internal noise level 45 dBA
Places of worship	Internal noise level 45 dBA
Office, retail outlets	External noise level 70 dBA
Industrial premises	External noise level 75 dBA
Active recreation areas (such as parks and sports grounds or playgrounds)	External noise level 65 dBA
Passive recreation areas (such as outdoor grounds used for teaching, outdoor cafes or restaurants)	External noise level 65 dBA

Other noise-sensitive businesses require separate specific noise goals, and it is suggested in the ICNG that the internal construction noise levels at these premises are to be referenced to the 'maximum' internal levels presented in Australian Standard AS 2107. Recommended 'maximum' internal noise levels from AS 2107 are reproduced in Table 6-24 for other sensitive receiver types.

However, the ICNG and AS 2107 do not provide specific criteria for hotels. Hotels generally have internal and sleep areas. For these commercial receivers, where feasible and reasonable the objective should be to achieve levels for sleeping of 45 dB(A) (consistent with hospital wards/places of worship) and the external noise level objective to be set at 55 dB(A).

Table 6-24: AS 2107 Recommended Maximum Internal Noise Levels

Land Use	Time Period	AS 2107 Classification	Recommended "Maximum" Internal L_{Aeq} (dBA)
Hotel	Daytime and Evening	Bars and Lounges	50 dB(A)
	Night-time	Sleeping Area	40 dB(A)

Operational noise criteria

Noise Policy for Industry

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the NSW EPA.

The EPA's NSW Noise Policy for Industry (NPfI) provides guidance on appropriate noise levels for external noise emissions from fixed facilities on surrounding sensitive receivers. The NPfI criteria for industrial noise sources have two components:

- controlling the intrusive noise impacts for residents and other sensitive receivers in the short term
- maintaining noise level amenity of defined land uses for residents and sensitive receivers in other land uses.

The intrusiveness noise level protects against significant changes in noise, while the amenity noise level seeks to protect against cumulative noise impacts from industry. Together, these levels have been used to assess the potential impact of noise and assess reasonable and feasible noise mitigation measures. Proposal noise trigger levels are developed through this process. They are not used directly as regulatory limits.

The NPfI requires a proposal to take consideration of other industrial noise sources in setting amenity noise objectives. In cases of a new development where there are no existing industrial sources, the NPfI accepts a default of the amenity noise level minus 5 dB to take account of future industrial sources. For this proposal, the default amenity noise level minus 5 dB adjustment has been used to account for cumulative noise sources.

Intrusive noise impacts – residential receivers

The intrusiveness noise level protects against significant changes in noise levels and is applicable to residential receivers only. The criterion is defined by the formula:

$$L_{Aeq,15min} = \textit{rating background noise level} + 5\ dB$$

The RBL is the average background noise level over a measurement period of at least one week. Using the RBL results in the intrusiveness criterion being met for 90% of the time. Adjustments are to be applied to the level of noise produced by the source that is received at the assessment point where the noise source contains annoying characteristics such as tonality or impulsiveness.

A summary of the measured RBL and corresponding intrusiveness level for each time period is provided in Table 6-25.

Table 6-25: Intrusive noise criteria, dB(A)

ID	Rating background level			Intrusive noise level, $L_{Aeq,15min}$		
	Daytime	Evening	Night-time	Daytime	Evening	Night-time
L01	64	61	57	69	66	62

Protecting noise amenity

The amenity noise level seeks to protect against cumulative noise impacts from industry. The NPfI amenity noise levels are included in Table 6-26.

Table 6-26: Noise Policy for Industry Amenity noise levels, dB(A)

Receiver	Noise amenity area	Time of day	Recommended amenity noise level
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day		
School classroom	All	Noisiest 1-hour period	35 internal
Hospital ward	All	Noisiest 1-hour period	35 internal
50 external			
Place of worship	All	When in use	40
Passive recreation	All	When in use	50
Active recreation	All	When in use	55
Commercial	All	When in use	65
Industrial	All	When in use	70
Industrial interface	Add 5 dB(A) to recommended noise amenity area		

To ensure industrial noise levels do not gradually increase with new developments, a minus 5 dB correction is applied to the NPfI's amenity noise levels. The corrections have been included in the amenity noise levels in Table 6-27.

Table 6-27: Noise Policy for Industry Amenity noise levels, dB(A)

NPfI category	Daytime	Evening	Night-time
Urban residential	58	48	43
Hotels	63	53	48
Passive recreation	48 (when in use)		
Commercial	63 (when in use)		
Industrial	68 (when in use)		

Table 2.3 of the NPfI provides a more detailed description of receiver categories.

The residential receivers are zoned within a R4 High Density Residential land zoning category. The NPfI considers R4 to be Urban, which is an area with an acoustical environment that:

- is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources
- has through-traffic with characteristically heavy and continuous traffic flows during peak periods,
- is near commercial districts or industrial districts
- has any combination of the above.

Corrections for annoying noise characteristics

Table C1 of the NPfI provides corrections for tonality, intermittency, irregularity or dominant low-frequency content. These corrections are to be added to the measured or predicted noise levels at the receiver before comparison with the project noise trigger levels. The NPfI also provides adjustments for duration that can increase the project noise criterion for unusual or one-off high-noise level events.

Low frequency noise correction

A difference of 15 dB or more between the C- and A-weighted noise measurements, identifies the potential for an unbalanced spectrum and an increased likelihood of low frequency noise annoyance.

The difference between C- and A-weighted noise levels is typically used as a screening tool to determine if further investigation is required. Where further investigation confirms significant low frequency content, a low frequency noise correction is applied to the predicted or measured noise levels.

The NPfI identifies that the corrections should "reflect external assessment locations", or sensitive receiver locations so the existing noise environment should be considered.

Project-specific noise trigger levels

The project-specific noise trigger levels (PSNTL) for residential receivers are the more stringent of the intrusiveness and amenity noise criteria. For other receivers the PSNTL are the amenity noise criteria. The PSNTL for this proposal are included in Table 6-28.

Table 6-28: Project specific noise trigger levels, dB(A)

Receiver	Time period	RBL	Intrusiveness	Amenity[1]	Overall[2]
Residential	Daytime	64	69	53	53
	Evening	61	66	43	43
	Night-time	57	62	38	38
Hotel	Daytime	Not applicable	Not applicable	58	58
	Evening	Not applicable	Not applicable	48	48
	Night-time	Not applicable	Not applicable	43	43

Receiver	Time period	RBL	Intrusiveness	Amenity[1]	Overall[2]
Commercial	When in use	Not applicable	Not applicable	63	63
Industrial	When in use	Not applicable	Not applicable	68	68

Note 1 - The amenity noise level has been reduced by 5 dB(A) to account for other industrial noise sources and increased by 3 dB(A) to convert from $L_{Aeq,period}$ to $L_{Aeq,15minute}$

Sleep disturbance

Screening criteria for sleep disturbance have been developed based on a review of research provided by the NSW Road Noise Policy (Department of Environment Climate Change and Water NSW, 2011). The sleep disturbance screening noise criteria are:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

Road traffic noise criteria

The NSW Road Noise Policy provides guidance on appropriate noise criteria for road traffic noise. The applicable noise criteria for road traffic on arterial roads which has been considered for the assessment is included in Table 6-29.

Table 6-29: Road generating development noise criteria, dB(A)

Road category	Type of project / land use	Assessment criteria, dB(A)	
		Daytime (7am to 10pm)	Night-time (10pm to 7am)
Freeway /arterial / sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/ sub-arterial roads generated by land use developments.	$L_{Aeq\ (15\ hour)}$ 60 (external)	$L_{Aeq\ (9\ hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments.	$L_{Aeq\ (1\ hour)}$ 55 (external)	$L_{Aeq\ (1\ hour)}$ 50 (external)

Where the predicted noise levels indicate likelihood to exceed the noise criteria presented in Table 6-29, it is considered not reasonable and feasible to provide noise mitigation measures if the proposal does not increase noise by greater than 2.0 dB. A change of 2 dB to 3 dB in road traffic noise is often considered to be indiscernible.

Construction vibration criteria

Impacts from vibration can be considered both in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage). Of these considerations, the human comfort limits are the most stringent. Therefore, for occupied buildings, if compliance with human comfort limits is achieved, compliance would also be achieved for building damage.

Human comfort

Vibration effects relating specifically to the human comfort aspects of the project are taken from *Assessing Vibration – A Technical Guideline* (former Department of Environment and Conservation, 2006), in which vibration impacts are defined based on the nature of the construction work and vibration generated, specifically continuous vibration, impulsive vibration and intermittent vibration.

Specific criteria for each of these vibration impacts are set out in Table 6-30, Table 6-31 and Table 6-32.

Table 6-30: Continuous vibration acceleration criteria 1 Hz-80 Hz

Location	Assessment Period	Preferred values (m/s^2)		Maximum values (m/s^2)	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010

Location	Assessment Period	Preferred values (m/s^2)		Maximum values (m/s^2)	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Offices, schools, educational institutions and places of worship	Daytime or night-time	0.020	0.014	0.040	0.028
Workshops	Daytime or night-time	0.04	0.029	0.080	0.058

Table 6-31: Impulsive vibration acceleration criteria 1 Hz-80 Hz

Location	Assessment Period	Preferred values (m/s^2)		Maximum values (m/s^2)	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Daytime or night-time	0.64	0.46	1.28	0.92
Workshops	Daytime or night-time	0.64	0.46	1.28	0.92

Table 6-32: Intermittent vibration impacts criteria 1 Hz-80 Hz

Location	Assessment Period	Preferred values (m/s^2)	Maximum values (m/s^2)
Residences	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Daytime or night-time	0.40	0.80
Workshops	Daytime or night-time	0.80	0.60

Building contents and structures

The vibration effects on the building are provided by *British Standard BS 7385: Part 2-1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration* (British Standards, 1993) (*BS 7385: Part 2-1993)*. The transient vibration criteria, as per *BS 7385: Part 2-1993,* is included in Table 6-33. The criteria are based on peak particle velocity (PPV) (mm/s) which is to be measured at the base of the building.

Table 6-33: Transient vibration criteria as per standard *BS 7385: Part 2 –1993*

Line in standard	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4Hz – 15Hz	15Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

BS 7385: Part 2-1993 also states that minor damage is possible at vibration magnitudes which are greater than twice the values provided in Table 6-33, and major damage to a building structure may occur at values greater than four times the values.

Fatigue considerations are also addressed in *BS 7385: Part 2-1993* and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the values in Table 6-33 should not be reduced for fatigue considerations.

Proposal vibration criteria

The proposal-specific construction vibration management level proposed to protect all surrounding building structures from structural or architectural damage is 7.5 mm/s.

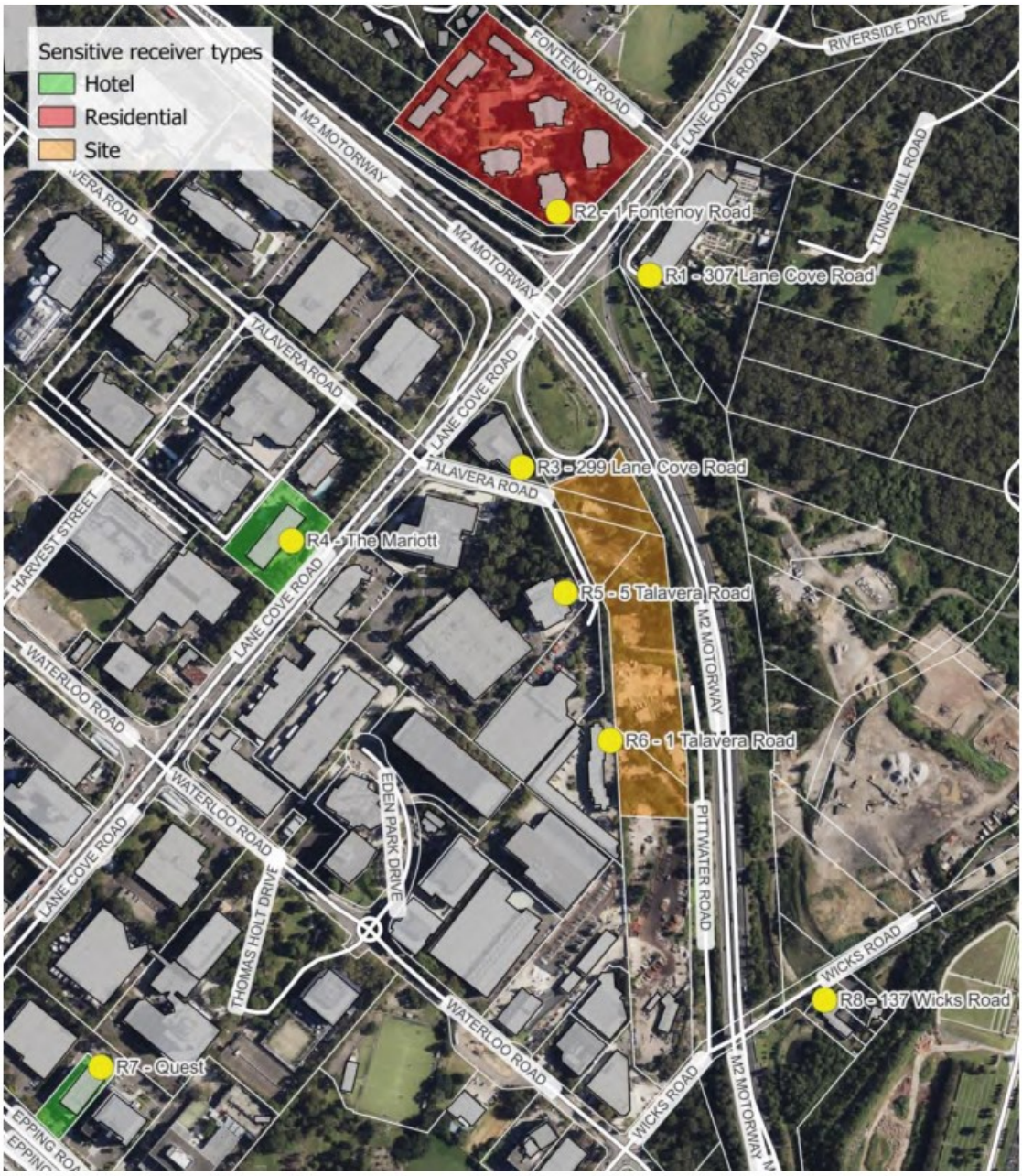
If this vibration criterion is exceeded, further investigation is required, including an assessment of the nature of the vibration and frequency characteristics to determine if the vibration criterion can be relaxed for the specific nature of the work.

6.8.3 Existing environment

The site is located adjacent to the M2 Hills Motorway, to the east of the proposal, and the Macquarie Park commercial precinct to the north, south, and west.

Noise sensitive receivers were identified within proximity to the proposal. These primarily comprised industrial and commercial premises, however one group of residential receivers, located at 1-15 Fontenoy Road, Macquarie Park NSW 2113 are located around 240 metres to the north of the proposal. Other sensitive receivers include the Courtyard by Marriott Sydney-North Ryde Hotel, located at 7-11 Talavera Road, and the Quest Apartment Hotel Macquarie Park at 71 Epping Rd. The noise sensitive receivers included in the assessment are shown in Figure 6-19.

The background noise measurements undertaken at 1 Fontenoy Road identified that the existing noise environment at residential receivers is controlled by significant amounts of road traffic noise from nearby arterial roads, including the M2 Hills Motorway and Lane Cove Road. The noise environment is considered to be Urban due to the high traffic volumes controlling the road traffic noise levels.



Source: Macquarie Park ZEB Terminal Noise and Vibration Impact Assessment (Pulse White Noise Acoustics, 2024)

Figure 6-19: Sensitive receiver locations

Noise catchment areas

The NVIA identified two Noise Catchment Areas (NCA) for the assessment, which reflect land uses and types of receivers within each area.

NCA 1 comprises high density residential receivers, consisting of multi-level residential apartments and residential dwellings, including 1-15 Fontenoy Road, which have the potential to be affected by construction noise.

NCA 2 comprises commercial premises on both sides of Lane Cover Road, including the Courtyard by Marriott Sydney-North Ryde Hotel located at 7-11 Talavera Road.

Existing ambient noise environment

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the 90th percentile of the daily background noise levels during each assessment period, being day, evening and night. The $L_{Aeq,period}$ is the ambient noise level (logarithmically averaged) over the defined period.

The standard measurement periods used in NSW for site noise impacts are:

- Daytime – 7 am to 6 pm
- Evening – 6 pm to 10 pm
- Night-time – 10 pm to 7 am.

Table 6-20 presents a summary of the ambient and RBL noise levels measured over the entire 10-day measurement period. These noise levels are used throughout the assessment to determine the existing noise environment and establish appropriate site-specific noise criteria.

6.8.4 Potential impacts

Construction

Construction noise levels – daytime work

Table 6-34 provides a summary of the worst-case predicted construction noise impacts, based on the plant and equipment outlined in Table 3-4, which would be used during each indicative construction stage, set out in Table 3-3.

The predicted construction noise impacts set out in Table 6-34 identify that exceedances of the NML are unlikely to occur for receivers in NCA1. No sensitive receivers have been identified to be highly noise affected by the work.

Table 6-34: Predicted construction noise levels - daytime

NCA	NML	Construction stage			
		1	2	3 and 4	5
1	74	42 – 59 dB(A)	42 – 60 dB(A)	42 – 61 dB(A)	42 – 54 dB(A)
2	70	69 – 86 dB(A)	69 – 87 dB(A)	69 – 88 dB(A)	67 – 79 dB(A)

Recommended management and mitigation measures, which should be followed to reduce the impacts on the nearby commercial land use, are outlined in Table 6-37.

Construction noise levels – out of hours work

As set out in Section 3.3.3, OOHW are likely to be required for the construction of the driveway for 1 Talavera Road, depending on the access requirements for the tenants. OOHW would be subject to assessment and consideration in accordance with Transport's *Construction noise and vibration guideline – public transport infrastructure*.

Recommended management and mitigation measures, which should be followed to reduce noise impacts during OOHW, are outlined in Section 6.8.5.

Construction traffic noise

The proposal would generate 66 heavy and light vehicle movements per day. These volumes would be small given the high levels of existing traffic on surrounding roads and are not anticipated to result in an increase in road traffic of approximately 60 per cent, that that would generate an approximately two decibels increase in noise.

Noise level increases due to proposal-related construction traffic on arterial roads are therefore expected to be less than two decibels during both daytime and night-time periods.

The potential noise impact of construction traffic is considered barely perceptible, and no further assessment is required, in accordance with the NSW Road Noise Policy.

Construction vibration

An assessment of the potential for vibration generated by construction activities associated with the proposal (including excavation) has been undertaken based on safe working distances, set out in Table 6-35.

Table 6-35: Recommended indicative safe working distances for vibration intensive plant

Plant	Rating/ Description	Safe working distances	
		Cosmetic damage	Human comfort
Vibratory roller	< 50kN (Typically 1 – 2 tonnes)	5	15 – 20
	< 100kN (Typically 2 – 4 tonnes)	6	20
Small hydraulic hammer	300kg, typically 5 – 12 tonnes excavator	2	7
Medium hydraulic hammer	900kg, typically 12 – 18 tonnes excavator	7	23
Large hydraulic hammer	1600kg, typically 18 – 34 tonnes excavator	22	73
Vibratory pile driver	Sheet piles	2 – 20	20
Continuous flight auger (CFA) piling	≤ 800mm	2	< 1m
Jackhammer	Hand-held	1	Avoid contact with structure and steel reinforcements

Dependant on the location of the vibration intensive work and size of the equipment, exceedances of the vibration safe working distances are possible at nearby industrial receivers. Residential receivers are very unlikely to exceed the project vibration criteria. To maintain compliance with the construction vibration criteria, safe working distances for vibration intensive plant included in Table 6-35 are to be maintained.

These indicative safe distances should be validated prior to the start of construction work by undertaking operator-attended measurements of vibration levels generated by construction equipment to be used on site.

An assessment of the potential for vibration generated as a result of construction activities associated with the proposal (including excavation) has been undertaken based on the safe working distances in Table 6-35.

Dependant on the location of the vibration intensive work and size of the equipment, exceedances of the vibration safe working distances are possible at nearby industrial receivers. Compliance can be achieved by adhering to the safeguards and management measures presented in Table 6-37. Residential receivers are very unlikely to exceed the proposal vibration criteria.

Operation

Noise sources generated from the operation of the site would generally be generated from buses entering and exiting the site, the operation of the bus wash bay, rectifier transformers, and key noise emitting plant, such as air conditioning condenser units for building, car park exhaust and electrical and ventilation fans.

The maintenance workshop, including the spray booth, would also generate noise during operation, with potential noise sources including use of hydraulic lifts, panel beating, banging and dropping spanners etc.

Operational noise levels

Table 6-36 presents a summary of the worst-case daytime, evening and night-time noise impacts during operation for each period. The predicted noise levels identified compliance with the applicable noise criteria at all sensitive receiver locations and during all time periods. Additional noise mitigation measures are not required.

Table 6-36: Predicted noise levels during operation, $L_{Aeq,15min}$ dB(A)

ID	Address	Daytime			Evening			Night-time				
										Maximum noise levels		
		Criteria	$L_{Aeq,15min}$ noise level	Exceedance	Criteria	$L_{Aeq,15min}$ noise level	Exceedance	Criteria	$L_{Aeq,15min}$ noise level	Screening criterion	L_{AFmax} noise level	Exceedance
R1	307 Lane Cove Road	63	42	-	63	42	-	63	39	n/a	49	-
R2	1-15 Fontenoy Road, Macquarie Park	53	39	-	48	39	-	43	36	72	48	-
R3	299 Lane Cove Road	63	48	-	63	48	-	63	45	n/a	64	-
R4	Courtyard by Marriott Sydney-North Ryde Hotel, 7-11 Talavera Road	58	39	-	48	39	-	48	37	72	48	-
R5	5 Talavera Road	63	52	-	63	52	-	63	51	n/a	69	-
R6	1 Talavera Road	63	45	-	63	45	-	63	44	n/a	69	-
R7	Quest Apartment Hotel, Macquarie Park	58	33	-	48	33	-	48	31	72	47	-
R8	137 Wicks Road	63	36	-	63	36	-	63	35	n/a	35	-

Maximum noise levels/sleep disturbance

Maximum noise levels have been predicted for the night-time period based on the anticipated noise source levels. Sleep disturbance noise impacts have been assessed against the NPfI screening criterion. The results indicate that due to the existing high levels of background noise around the proposal, and the limited noise generated by the site, sleep disturbance noise impacts are unlikely to be a concern for the proposal. Compliance is achieved at all locations and noise mitigation is therefore not required.

Road traffic

Due to the nature of the proposal, additional vehicles will be added to the surrounding road network during operation of the proposal, which has the potential to increase road traffic noise.

The proposal is in close proximity to major arterial and away from noise sensitive receivers. Arterial roads such as Lane Cove Road and Epping Road have existing high traffic volumes of over 40,000 vehicles a day, and currently exceed the NSW Road Noise Policy noise criteria for the nearest residential receivers.

Buses would access Lane Cove Road from Waterloo Road, and Epping Road from Wicks Road. Based on the access/egress to the site, buses do not pass residential receivers until they have joined the arterial roads.

A conservative screening assessment has been undertaken, assessing all light and heavy vehicles to access Epping Road and Lane Cove Road. The proposal would add an additional 384 bus movements during the daytime, and 136 bus movements during the night-time onto Lane Cove Road and Epping Road, as well an additional 318 light vehicle movements on Lane Cove Road. The additional volumes this proposal will add to the network are comparatively small which typically results in very small changes in noise.

The predicted operational road traffic noise levels identify that road traffic noise levels will continue to exceed the NSW Road Noise Policy noise criteria. The change in noise from the additional movements associated with the proposal is less than 0.1 dB, which is considered to be an indiscernible change in noise. This change in noise is well below 2 dB. It is not considered reasonable, nor feasible to provide noise mitigation to reduce road traffic noise impacts in conjunction with the operation of the proposal.

6.8.5 Safeguards and management measures

Table 6-37: Noise and vibration safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV1	Noise and vibration – general measures	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in *the Construction Noise and Vibration Guideline – Public Transport Infrastructure 2023* (Transport for NSW, 2023) and identify: • all potential significant noise and vibration generating activities associated with the activity • feasible and reasonable mitigation measures to be implemented to avoid and minimise noise impacts • a monitoring program to assess performance against relevant noise and vibration criteria • arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.	Contractor	Detailed design/Pre-construction	*Construction Noise and Vibration Guideline – Public Transport Infrastructure 2023* (Transport for NSW, 2023)

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV2	Noise and vibration – Community Liaison	A Community Liaison Management Plan will be prepared and implemented which will outline specific communication and stakeholder engagement activities, procedures, and protocols for the proposal.	Contractor	Pre-construction	Standard safeguard
NV3	Noise and Vibration - Notification	All sensitive receivers (e.g. local business, residents and schools) likely to be affected will be notified at least five working days prior to commencement of any work associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • the proposal • construction dates • working hours and duration of work being undertaken • types of activities being undertaken and equipment used • any associated impacts and mitigation measures • 24/hr project hotline number.	Contractor	Pre-construction	Standard safeguard
NV4	Noise and vibration – Site inductions	All employees, contractors and subcontractors are to receive an environmental induction which would include consideration of noise and vibration impacts. Regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration.	Contractor	Pre-construction/ Construction/ Operation, or other as required	Standard safeguard
NV5	Construction noise and vibration	Construction work to be undertaken in accordance with Transport's *Construction Noise and Vibration Guideline – Public Transport Infrastructure* (Transport for NSW, 2023)	Contractor	Construction	Standard safeguard
NV6	Construction noise – Work scheduling	The following work scheduling management measures will be adopted to reduce construction noise impacts: • scheduling noise intensive work and respite periods to reduce annoyance • respite periods could include restricting very noisy activities to time periods that least affect the nearby noise sensitive locations • restricting the number of nights that OOHW is conducted near residences or by determining any specific requirements. • work generating high vibration levels should be scheduled during non-sensitive or less sensitive time periods. • optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours. • planning deliveries and access to the site to occur quietly and	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		efficiently and organising parking only within designated areas located away from sensitive receivers • planning construction traffic flow, parking and loading/unloading areas to minimise reversing movements.			
NV7	Construction hours	Work would generally be carried out during standard construction hours (i.e. 7.00 am to 6.00 pm Monday to Friday; 8.00 am to 1.00 pm Saturdays). Any work outside these hours may be undertaken if approved by Transport and the community is notified prior to these works commencing. An Out of Hours Work application form would need to be prepared by the Construction Contractor and submitted to the Transport's Environment Manager for review and approval prior to the works commencing.	Contractor	Construction	Standard safeguard
NV8	Out of Hours Work	OOHW during evening and night-time periods will be managed in accordance with relevant Transport's guidelines and policies for managing construction noise and vibration, to provide respite from construction noise. High noise activities, such as saw cutting and jack hammering will be completed before 11pm.	Contractor	Construction	Standard safeguard
NV9	Construction noise – standard work practices	The following universal work practices are to be adopted during construction: • regular identification of noisy activities and adoption of improvement techniques. • avoiding the use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby sensitive receivers • avoiding the use of equipment that generates impulsive noise, where possible • minimising the need for vehicle reversing for example (particularly at night), by arranging for one-way site traffic routes • minimising the movement of materials and plant and unnecessary metal-on-metal contact • minimising truck movements.	Contractor	Construction	Standard safeguard
NV10	Construction noise and vibration – plant and equipment	The following measures are to be adopted during construction to minimise noise impacts associated with plant and equipment: • the noise levels of plants and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H of the CNVG-PTI	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• selecting quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks, where feasible and reasonable • operating plant and equipment in the quietest and most efficient manner • avoiding simultaneous operation of noisy plant, where feasible • plant used intermittently to be throttled down or shut down • maximising the offset distance between noisy plant and adjacent sensitive receivers • noise-emitting plant to be directed away from sensitive receivers • site-based vehicles and mobile plant used on-site must be fitted with broadband reversing alarms to reduce tonal noise impacts • reducing noise from mobile plant through additional fittings, such as silencers			
NV11	Construction noise – behavioural practices	The following good behavioural practices are to be implemented during construction: • no swearing or unnecessary shouting or loud stereos/radios on site • no dropping of materials from height, throwing of metal items and slamming of doors.	Contractor	Construction	Standard safeguard
NV12	Construction noise – monitoring	The following construction noise monitoring is to be undertaken: • attended noise level measurements of typical demolition and ground work activities should be undertaken at site. • attended construction noise surveys of the site and surrounding impacts on neighbours should be undertaken during the following as a minimum: – start of demolition – commencement of any rock breaking or sawing on the site. – in response to any ongoing complaints received from neighbours • any noise monitoring will be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, familiar with applicable standards and procedures • the statistical parameters to be measured should include the	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		following noise descriptors: L_{Amin}, L_{A90}, L_{A10}, LA1, L_{Amax} and L_{Aeq}. • any unattended noise measurements should be conducted over consecutive 15-minute periods • monitoring methodology and any equipment required should comply with the requirements in Standard AS 1055.1-1997.			
NV13	Vibration – general measures	Vibration mitigation measures will be outlined in the NVMP. The following measures will be included to minimise vibration impacts: • undertaking a plant and vibration assessment to identify potential vibration risks to human comfort and cosmetic and structural damage • where identified as being required, undertake a pre-construction building survey for structures prior to the commencement of activities with the potential to cause property damage • conducting vibration monitoring at high-risk receptors during construction • consideration of feasible alternative construction methodologies or equipment where vibration intensive equipment is expected to exceed the criteria.	Contractor	Pre-construction/ construction	Standard safeguard
NV14	Vibration – safe working distances	The following safe working distance measures are to be adopted: • recommended indicative safe working distances for vibration intensive plant are to be complied with • construction vibration safe distances will be validated prior to the start of construction work by undertaking operator-attended measurements of vibration levels generated by construction equipment to be used on-site.	Contractor	Pre-construction/ construction	Additional safeguard
NV15	Vibration – plant and equipment	The following measures are to be adopted during construction to minimise vibration impacts associated with plant and equipment: • selecting plant and equipment with low vibration generation characteristics • any vibration generating plant and equipment is to be in areas within the site to lower the vibration impacts • using lower vibration generating items of construction plant and equipment; that is, smaller capacity plant	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• undertaking the removal of concrete using saw cutting or pulverising where possible.			
NV16	Vibration – work scheduling	The following work scheduling management measures will be adopted to reduce construction noise impacts: • Work generating high vibration levels should be scheduled during non-sensitive or less sensitive time periods. • Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment. • Minimise conducting vibration generating work consecutively in the same area (if applicable).	Contractor	Pre-construction/ construction	Additional safeguard
NV17	Vibration monitoring	Vibration monitoring is required to confirm vibration magnitudes are within the expected levels. Short-term attended vibration measurements of activities with the potential to generate maximum vibration are required to be undertaken on commencement at the site, including the following: • Measurements to be undertaken at a representative location from the activity being conducted with a similar distance to the potentially affected receiver. • Activities with the potential to generate the greatest magnitudes of vibration include hydraulic hammering of concrete slabs and hydraulic hammering during ground work within rock.	Contractor	Pre-construction	Additional safeguard

6.9 Air quality

This section provides an assessment of the potential impacts of the proposal on air quality and identifies safeguards and management measures to avoid or minimise these impacts.

6.9.1 Methodology

The proposal's impact on air quality has been considered in a qualitative assessment taking into consideration the existing local air quality, the likely extent of emissions during construction and operation of the proposal and the potential changes in local air quality as a result.

A desk-top review was undertaken which involved searches of the following databases to inform the baseline characterisation of the local environment:

- National Pollutant Inventory (NPI)
- Office of Environment and Heritage Air Quality Index (AQI)
- Bureau of Meteorology (BOM) Climate change data.

Nearby sensitive air quality receivers were identified and assessed, potential pollutants generated were identified, and any available background monitoring data and local meteorological data was reviewed.

Potential impacts were assessed through the identification of potential air emission sources, factors influencing air dispersion of air pollutants and the proximity of sensitive receivers to potential sources.

Where impacts were identified, suitable management measures were outlined for implementation. These are included in Section 6.9.5.

6.9.2 Air quality criteria

Commonwealth legislation

The *National Environment Protection (Ambient Air Quality) Measure* (NEPM) is the Commonwealth legislation that sets national standards and goals for air quality. This measure is implemented in New South Wales (NSW) under the *Protection of the Environment Operations Act 1997* (POEO Act), the *Protection of the Environment Operations (Clean Air) Regulation 2022* and the *Protection of the Environment Operations (General) Regulation 2021*. Annual compliance reporting is required under clause 18 of the NEPM.

Air quality assessment criteria

Relevant air quality assessment criteria are provided in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (NSW EPA, 2022). A summary of the criteria is provided in Table 6-38.

Table 6-38: Air quality impact assessment criteria

Pollutant	Averaging period	Concentration	
		Parts per hundred million (pphm)	Micrograms per cubic metre (μ/m^3)
Sulphur dioxide (SO_2)	10 minutes	25	712
	1 hour	20	570
	24 hours	8	228
Nitrogen dioxide (NO_2)	Annual	2	60
	1 hour	12	246
Photochemical oxidants (as ozone)	Annual	3	62
	1 hour	10	214
$PM_{2.5}$	4 hours	8	171
	24 hours	-	25
PM_{10}	Annual	-	8
	24 hours	-	50
Carbon monoxide (CO)	15 minutes	87	100
	1 hour	25	30
	8 hours	9	10
Deposited dust	Annual	2gm^2/month max increases	4gm^2/month max total

6.9.3 Existing environment

Local climate and meteorological conditions

The proposal is located around 15 kilometres from the coast and generally experiences a moderate climate. The closest Bureau of Meteorology (BOM) Station with long term weather data (1967-present) is Parramatta North (station number 066124), 14 kilometres to the southwest of the proposal.

The station records climate data for a range of meteorological parameters including temperature and rainfall.

Rainfall is relatively evenly distributed throughout the year, with the wettest months being January to March. Severe rainfall events are primarily associated with low pressure systems and troughs, including East Coast Lows, which are more common in Autumn and Winter and severe thunderstorms, which are more frequent from October through to March.

The warmest temperatures occur during the summer months, with the highest maximum temperature of 47°C recorded at Parramatta North BOM station in 2020. July is generally recorded as the coldest month, however temperatures below freezing are exceedingly rare at the proposal location, with only 0.2 days per year below zero.

In terms of wind speeds, no wind data is available from the Parramatta North BOM station. The closest station with maximum wind gust data is Sydney Olympic Park AWS (Archery Station) (Station number: 066212) which has only been operational since 2011. The maximum wind gust was recorded at this location was 91 km/hr in October 2014.

Regional air quality

Air quality in NSW is generally compliant with the national standards, established under the NEPM. However, concentrations of Particulate Matter (PM) and ozone can sometimes exceed national standards, due to pollution events such as bushfires and dust storms.

Local air quality

Existing air quality in and around the proposal is likely to be heavily influenced by emissions from vehicles from the surrounding road network including the adjacent M2 Hills Motorway. Other influences are the prevailing weather and climatic conditions, and any emissions from the surrounding industrial and commercial land uses.

The NPI tracks pollution across Australia and contains data on substances that have been identified as important due to their possible effect on human health and the environment. A review of the NPI database identified facilities within 5 kilometres of the proposal, which could potentially contribute to the existing local air quality. These facilities are summarised in Table 6-39.

Table 6-39: National Pollution Inventory facilities within 5km of the proposal

Facility Name	Location	Primary classification	Main activities	Latest report
Cleanaway Ryde Resource Recovery Centre	Wicks Road, North Ryde	Waste Treatment and Disposal Services	Waste storage, transfer, separating or processing. Composting and related processing or treatment. Hazardous, Industrial or Group A waste generation or storage.	2021-22
Ingredion ANZ PTY Ltd	170 Epping Road, Lane Cove NSW	Grain Mill Product Manufacturing	Modified maize starch manufacturing	2019-20
S.C. Johnson and Son PTY Ltd	160 Epping Road, Lane Cove, NSW	Basic Inorganic Chemical Manufacturing	Chemical industries or work	2010-11

The NSW EPA operates a network of air quality monitoring stations. A search of the air quality data explorer (NSW DPIE, 2023) identified the nearest air quality monitoring station to the proposal is Macquarie Park, located at Macquarie University Sport Fields, Culloden Road, around 2.4 kilometres northwest of the proposal. The station was commissioned in 2017 to monitor the Sydney East Region. This station is considered to be representative in terms of location, land use and activities conducted. Data from this station provides hourly pollutant concentrations, 24-hour summary and air quality category ratings (AQC).

The following air pollutants and meteorological variables are currently measured at Macquarie Park:

- ozone (O_3)
- oxides of nitrogen (NO, NO_2 and NO_x)
- sulphur dioxide (SO_2)
- carbon monoxide (CO)
- visibility using nephelometry
- fine particles as PM_{10}
- fine particles as $PM_{2.5}$

- wind speed, wind direction and sigma theta
- ambient temperature
- relative humidity
- solar radiation
- precipitation.

The NSW Department of Planning, Housing and Infrastructure (formerly DPE) publishes annual air quality compliance reports. The latest report is the *New South Wales Annual Compliance Report 2021* (NSW DPE, 2023) which presents and assesses NSW air quality monitoring data for 2021, against the requirements of the NEPM.

The report identified that the Macquarie Park monitoring station recorded annual means below the annual $PM_{2.5}$ standard (8.0 µg/m3) and therefore met the annual goal. However, recordings comprised one of the highest annual means across the network with a range of 7.9-7.3 µg/m^3.

The report identifies exceedances of national air quality standards at Macquarie Park monitoring station, between 9 and 10 October 2021, with exceedances in ozone, particulates as $PM_{2.5}$ and PM_{10} (24-hour average). The exceedances were attributed to hazard reduction burning, which was deemed an exceptional event in accordance with NEPM.

Sensitive receivers

The *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2022) defines a sensitive receiver as a location where people are likely to work or reside; this includes residential dwellings, schools, hospitals, offices or public recreation areas.

Sensitive receivers identified in the vicinity of the proposal include:

- businesses to the south and west of the proposal
- occupants of residential properties at 1-15 Fontenoy Road to the north of the proposal
- users of the public amenity space at Fountain gardens to the west of the proposal
- cyclists and pedestrians using the local active transport network.

6.9.4 Potential impacts

Construction

Potential impacts associated with the proposal include emissions to air from construction plant and equipment and airborne dust generated during construction activities.

Emissions to air

The use of construction plant and equipment to construct the proposal would emit exhaust fumes associated with the combustion with fossil fuels, releasing emissions which contribute to the local air quality.

In the context of existing air pollution from other local and regional sources, impacts would be localised and temporary in nature for the duration of the construction period. The impact is therefore considered to be minor and short-term.

Construction dust

Dust is a general term used to describe particulate matter in the form of total suspended solids (TSP) or particulate matter (PM) with a smaller aerodynamic diameter less than either 10 microns (PM_{10}) or 2.5 microns ($PM_{2.5}$). When not properly managed, airborne dust has the potential to be inhaled and cause adverse health problems, and cause nuisance effects, such as loss of amenity.

Airborne dust generated from construction activities may cause impacts when located close to sensitive receivers. Dust could be generated from a variety of construction activities associated with the proposal including:

- vegetation clearance
- establishment and operation of site compounds
- earthwork including excavations and profiling

- stripping, stockpiling and managing topsoil
- vehicle and plant movements on unsealed roads
- hard and soft landscaping.

The extent of airborne dust impact generated by the proposal would be influenced by varying factors including the amount and duration of ground disturbance, the on-site soil characteristics, prevailing weather conditions (e.g., wind speed and direction), vehicle speeds, frequency of rain and water spraying, and the type of activities being carried out.

As a result, short-term impacts resulting from airborne dust could be experienced during dust-generating construction activities at nearby sensitive receivers.

Levels of airborne dust would be expected to be low and unlikely to cause concern to nearby sensitive receivers. Through the implementation of safeguards and management measures provided in Section 6.9.5, the mobilisation of dust associated with the proposal is expected to be below nuisance levels. Dust impacts are expected to be confined within the area of the immediate work and would be short-term and minor.

Operation

The operation of the depot may result in localised air quality impacts associated with operations within the maintenance workshop, such as spray painting.

The proposal would not result in substantial changes in traffic volumes or changes to the traffic mix in the locality of the proposal. Long-term adverse impacts on air quality are therefore not expected. Battery electric buses are less contaminating than any other energy-powered buses, such as diesel, compressed natural gas (CNG), and hybrid buses, and they eliminate pollutant gases, including nitrogen oxides (NO_x) and Particulate Matter (PM) PM_{10}, and $PM_{2.5}$. Replacement of the diesel and CNG buses to zero emissions technology would remove a significant source of pollution from the local air quality, and therefore reduced air pollution is a key benefit of the proposal.

Reducing emissions from vehicles can deliver significant health benefits, particularly for people living with, or more susceptible to, cardiovascular and respiratory health conditions like asthma and reduce other secondary health impacts caused by these emissions.

The proposal would therefore result in a positive long-term impact on air quality.

6.9.5 Safeguards and management measures

Table 6-40: Air quality safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AQ1	Air quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as a sub-plan to the CEMP. The AQMP will include, but not be limited to: • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA • mitigation and suppression measures to be implemented • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces. The AQMP will include the following requirements: • plant and equipment will be maintained in good condition and in accordance with manufacturers' specifications • plant and machinery will be turned off when not in use	Contractor	Detailed design/Pre-construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• work activities will be reprogrammed if the management measures are not adequately restricting dust generation • disturbed areas will be minimised in extent and rehabilitated progressively • dust will be suppressed on stockpiles and unsealed or exposed area using methods such as water trucks/hoses, temporary stabilisation methods, soil binders or other appropriate practices • no burning of material on site will be undertaken • visual monitoring of air quality will be undertaken to verify the effectiveness of controls and enable early intervention • vehicles transporting materials and equipment will have their loads covered.			
AQ2	Air quality	Work will be undertaken in accordance with all safeguards included in Transport's *Air Quality Management Guideline EMF-AQ-GD-0063* (Transport for NSW, 2022).	Contractor	Construction	Standard safeguard

6.10 Socio-economic

This section provides an assessment of the potential socio-economic impacts of the proposal and identifies safeguards and management measures to avoid or minimise these impacts.

A socio-economic assessment (SEA) was undertaken by Judith Stubbs and Associates. The main findings of the SEA are summarised in this section and the full SEA is included in Appendix G.

6.10.1 Methodology

The socio-economic impact assessment has been prepared in accordance with NSW's *Socio-economic Assessment EIA Practice Note EIA-N05* (Transport for NSW, 2020) ('the Practice Note'). Using the criteria in Table 1 of the Practice Note, a 'basic' level of assessment has been undertaken, that is the scale of impacts is 'few impacts' or 'very localised impacts'.

This level of assessment was selected as the proposal is in an industrial area on land owned by Transport, with the nearest residents separated from the proposal by the M2 Hills Motorway, and Lane Cove Road; and because access routes largely use existing major roads.

The methodology for the basic socio-economic assessment comprised:

- a review of Australian Bureau of Statistics (ABS) Census data to describe relevant demographic characteristics (i.e., identify groups that may be particularly vulnerable to changes from the proposal)
- identifying basic local community structure and patterns (e.g., pedestrian movements)
- considering key stakeholders and outcomes of previous or basic consultation (i.e., with local Council officers).

Study areas for the socio-economic assessment have been established based on relevant Statistical Area Level 1s (SA1s). SA1 boundaries in Australia are determined through a systematic process that aims to create meaningful and consistent geographic units.

The SA1s that have been identified as relevant to the proposal have been split into three distinct study areas as follows:

- Study Area 1 – immediate SA1s

- Study Area 2 – SA1s within one kilometre of the proposal
- Study Area 3 – Wicks Road SA1s.

6.10.2 Existing environment

General setting

Immediately adjacent land uses to the proposal include:

- the M2 Hills Motorway to the northeast including a northbound on ramp to the northwest of the site
- industrial and commercial development consisting of multiple self-contained units and office buildings at 299 Lane Cove Road and 1,3 and 5 Talavera Road to the northwest
- industrial development consisting of a landscape supply depot and garden centre to the southeast.

The surrounding area is divided by major transport routes, including the M2 Hills Motorway, Lane Cove Road, and Epping Road.

The surrounding area is predominantly light industrial and commercial in nature, with a variety of uses. A small cluster of retail uses are located on Lane Cove Road, including restaurants, takeaway food outlets, and a service station. There is a cluster of high density shop top housing with accompanying retail outlets about 800 metres to the southeast of the proposal at Jervis Circuit. Another cluster of high density residential flat buildings and retail outlets are located about one kilometre to the northwest, across Lane Cove Road.

To the southwest, land use is primarily low-density separate housing, about 650 metres distant across Epping Road.

To the east, across the M2 Hills Motorway, lies Macquarie Park Cemetery and a waste depot. Both of these are accessed by an underpass of the M2 Hills Motorway on Wicks Road. Further to the east is Lane Cove National Park, beyond which (around 800 metres) is a large area of separate housing.

Demography

The social characteristics of the three study areas, along with the Greater Sydney statistics for comparison, are provided in Table 6-41.

Table 6-41: Social characteristics for study areas

Social characteristics	Study Area 1	Study Area 2[1]	Study Area 3[2]	Greater Sydney
Population and demography				
Total Population (URP 2021) (adjusted to align with ERP)	3,144	5,763	2,045	5,261,801
Proportion of people aged 14 years and under	9.1%	13.2%	18.2%	18.4%
Proportion of people aged 65 years and over	2.7%	8.9%	18.2%	15.2%
Aboriginal and Torres Strait Islander population	0.3%	0.3%	0.5%	1.8%
Language other than English spoken at home	77%	64%	43%	40%
Need for assistance				
People with need for assistance	1.5%	2.6%	7.1%	5.5%
Travel to work[3]				
Travel to work by car (as driver or passenger)	20.1%	24.6%	36%	43.2%
Travel to work by public transport	11.9%	10%	4.8%	6.5%
Ferry	0%	0%	0%	0.1%
Bus	2.3%	2.9%	3.2%	1.6%
Train	9.6%	7.1%	1.6%	4.8%

Social characteristics	Study Area 1	Study Area 2[1]	Study Area 3[2]	Greater Sydney
Tram	0%	0%	0%	0.1%
Travel to work by cycle or walking	6.9%	5.3%	1.7%	3.1%

Notes

(1) Estimated resident population (ERP) is not available for small areas. The usual resident population (URP) has been adjusted by a factor of 1.0088 to allow for Census undercounting and other factors using ERP data for Macquarie Park – Marsfield

(2) Estimated resident population is not available for small areas. The URP has been adjusted by a factor of 1.0034 to allow for Census undercounting and other factors using ERP data for North Ryde – East Ryde SA.

(3) Because of COVID restrictions at the time of the Census, typically 60% of people worked from home in the locality, and 45% of people worked from home in Greater Sydney, consequently the mode split will be a significant underestimate of the current mode split.

Source: ABS Census 2021, JSA calculation and analysis

Although there is a relatively large population (3,144) in Study Area 1, in terms of population distribution, there is no resident population in the areas immediately surrounding and including the proposal.

Most of the residents within the wider study area live within significant concentrations of high-density development that are adjacent to commercial and industrial land uses. Study Area 1 has a much lower than average proportion of children, indicating less family households, and a very low rate of people aged 65+ years. There is a relatively low rate of people with severe disability, likely related to the presence of a higher rate of young adults.

Study Area 3, located to the south of the proposal, represents the area around Wicks Road, which has a more established nature of urban development comprising older, low-density residential development. This area comprises a higher-than-average rate of people with a disability, likely related to the above average rate of people aged 65+ years.

Income and employment

Local jobs data was analysed for the Destination Zone (DNZ) within which the proposal is located and DNZ within one kilometre of the proposal. In total, there are around 28,000 local jobs within one kilometre of the proposal.

For people who live within one kilometre of the proposal, median income is lower than average, and the unemployment rate much higher than average, which may be related to a relatively high rate of young, lone person households, as well as non-English speaking people and students.

However, there is a higher-than-average rate of employment of residents in higher paid industries such as Professional and Scientific Services, Information, Media and Telecommunications, and Finance and Insurance, along with a relatively high rate of employment in industries such as Accommodation and Food Services, and Wholesale.

For people who work in the study area, some of whom would live close to these employment areas and some of whom would commute in, median personal incomes are much higher than the Greater Sydney average, indicating engagement in higher paid industries or occupations.

Social infrastructure

There is an existing bike lane along the northern proposal boundary which connects the M2 Hills Motorway bike lane to the Macquarie Park industrial and commercial area at Talavera Road.

Other social infrastructure in the area includes:

- a childcare centre at 16 Waterloo Road
- a hockey field at 18 Waterloo Road
- Macquarie Park Metro Station at the intersection of Waterloo Road and Lane Cove Road.

Business and industry

Businesses immediately adjacent to the proposal include industrial and commercial parks at 299 Lane Cove Road, and 1, 3 and 5 Talavera Road.

In total, there are around 50 separate businesses within the industrial and commercial parks adjacent to the proposal, as well as a landscaping supply business to the south, located at 150 Wicks Road.

The various buildings and industrial and commercial parks are self-contained with internal parking and do not rely on street parking or street frontages for trade.

6.10.3 Potential impacts

Construction

Business and industry

Construction impacts on the adjacent businesses to the west and the landscape supply business to the south, are likely to be limited to noise and traffic associated with the construction of the proposal. These construction impacts are detailed in Section 6.8 and Section 6.7 respectively.

During construction proposed work at 1A Talavera Driveway have the potential to interface with business access at 1 Talavera Road. Existing access and parking would be maintained throughout construction.

Operation

During operation, potential socio-economic impacts are likely to consist of amenity impacts to nearby businesses, and to affected residents on bus access routes.

Residential

Residential properties along Wicks Road comprise largely of separate houses and lower density development. Of these, a relatively small proportion of properties (10 to 15 per cent) have frontages to Wicks Road. The only bus movements proposed in study area 3 along Wicks Road are two school bus movements per day, and as a result there are unlikely to be any significant socio-economic impacts affecting these residential properties.

Income and employment

There are likely to be significant benefits from any improvement to the provision and the sustainability of bus transport in the area, noting that there are around 28,000 local jobs within one kilometres of the proposal, and that a much higher than average proportion of people in the vicinity of the proposal catch public transport.

Social infrastructure

The existing bike lane along the northern boundary of the proposal connecting the M2 Hills Motorway and Talavera Road is proposed to be removed to accommodate the depot.

Data on usage of the bike lane is not currently available, but in 2021, 50 people who worked in the area reporting travelling to work by bicycle and it is likely that some of these use the exit from the M2 Hills Motorway. Loss of this bike lane will result in an adverse social impact.

Other social infrastructure identified, including the childcare centre, hockey field and Metro station are separated from the proposal by distances of between 300 and 500 metres, and by large-scale industrial development, and are therefore unlikely to be impacted.

During operation, the proposal may result in a minor adverse impact on social infrastructure, due to the closure of the bike path exit off the M2 Hills Motorway. Investigations into bike path usage and possible relocation opportunities would be explored to further understand and mitigate this potential impact.

Provided loss of the bike path is mitigated, no significant social or economic impacts have been identified as a result of the proposal.

Business and industry

The configuration of the businesses adjacent to the proposal, as well as access arrangements indicates that there are unlikely to be significant adverse impacts on these businesses during operation of the depot.

Operation impacts are likely to be limited to traffic and noise impacts associated with the operation of the depot. These impacts are detailed in Section 6.7 and Section 6.8 respectively.

6.10.4 Safeguards and management measures

Table 6-42: Socio-economic safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SE1	Socio-economic – Social infrastructure	Conduct a survey of existing bike path usage within the proposal area and explore alternative existing bike routes and possible bike path relocation opportunities	Transport	Detailed design	Additional safeguard
SE2	Socio-economic – Business access	Access to businesses will be maintained during construction. Where temporary changes to access arrangements may be necessary to accommodate work at 1 Talavera Road, prior to any changes in access, consultation will be undertaken with tenants of 1 Talavera Road to determine access requirements and whether out of hours work is required to mitigate the impacts associated with the driveway modifications work at Talavera Road.	Contractor	Pre-construction/ Construction	Additional safeguard

Other safeguards and management measures that would address socio-economic impacts are identified in Section 6.7 (traffic and transport), Section 6.8 (noise and vibration), Section 6.6 (landscape character and visual impact) and Section 6.9 (air quality).

6.11 Waste and resources

This section describes the potential waste that may be generated by construction and operation of the proposal, including a proposed approach to manage waste.

6.11.1 Existing environment

The northern portion of the site is currently being used as a laydown area by Transport's Easing Sydney's Congestion Program. The southern portion of the proposal is currently disused, however was previously utilised as a laydown yard for construction materials and construction waste.

Due to the current land uses, the site does not generally generate a significant amount of waste.

Licenced waste facilities

The EPA's POEO public register (NSW EPA, 2022) was reviewed to identify licences for undertaking certain POEO activities within the area of the proposal. There are no existing licences within the proposal boundary, however four active licences were identified in the area surrounding the proposal, as detailed in Table 6-43.

Table 6-43: Existing licences in area surrounding the proposal

Licence No.	Licence holder	Address	Activity type	Status	Approximate distance and direction from proposal
13044	City of Ryde	160 Wicks Road, Macquarie Park	• Recovery of general waste • Waste storage	Active	80 metres east
4527	Suez Recycling and Recovery Pty Ltd	145 Wicks Road, Macquarie Park	• Non-thermal treatment of general waste • Recovery of general waste • Waste storage: hazardous, restricted	Active	251 metres south-east

Licence No.	Licence holder	Address	Activity type	Status	Approximate distance and direction from proposal
			solid, liquid, clinical and related waste and asbestos waste • Waste storage: tyres • Waste storage: other types of waste		
12208	Sydney Trains	Network features located in vicinity of the proposal	• Railway system activities	Active	258 metres south-west
21247	Metro Trains Sydney Pty Ltd	Network features located in vicinity of the proposal	• Railway system activities	Active	258 metres south-west

Asbestos waste

As detailed in Section 6.3.2, ACM has been identified within the proposal boundary. Any material that contains any amount of asbestos is classified as 'Special waste – asbestos waste'.

6.11.2 Potential impacts

Construction

The following waste streams are likely to be generated during construction:

- asbestos waste
- demolition waste from removal of infrastructure
- general building materials waste such as excess concrete and asphalt, redundant pieces of pipe-fittings, timber, plastic and metals
- excess spoil from excavations (where spoil is not suitable for backfilling)
- green waste generated during vegetation and tree removal and trimming
- packaging materials from items delivered to site, such as pallets, crates, cartons, plastics and wrapping materials
- contaminated or chemical waste
- redundant sediment and erosion controls such as silt fences
- wastewater generated from wash-downs and bunded areas
- waste oils, liquids and fuels from maintenance of construction plant and equipment
- domestic waste including food scraps, aluminium cans, glass bottles, plastic and paper containers, and putrescible waste generated by site construction personnel.

Asbestos waste

The asbestos waste (including asbestos contaminated soil) known to be present on-site cannot be reused or recycled and must either be disposed of to a landfill licensed to accept asbestos waste, or alternatively safely encapsulated on-site.

Transport's *Asbestos in soils management procedure* (*EMF-LM-PR-0020)* provides guidance on how to manage asbestos in soils, including guidance on when encapsulation versus offsite disposal is warranted. This guidance will be followed to appropriate manage the disposal of asbestos identified on-site.

A Remedial Action Plan, incorporating an Asbestos Removal Control Plan (ARCP) would be prepared and implemented, to ensure the effective removal of the asbestos waste.

If disposal off-site is selected, a licensed asbestos removalist must be engaged for handling and removal of asbestos waste. Prior to transporting asbestos to a licensed landfill, any delivery requirements must be checked with the landfill operator in advance.

Approval is required for encapsulating asbestos on-site. The approval must provide safety, financial, environmental, legal, and reputational justification for the proposed encapsulation.

If encapsulating of the asbestos is proposed, the implementation of a Long-term Environment Management Plan (LTEMP) is required. The plan will include mitigation measures and/or monitoring requirements.

Other waste

There is potential for contaminated waste to be uncovered during the work (refer to Section 6.3). Potential impacts from contaminated waste relate to contamination and pollution of the surrounding environment through improper waste handling, storage, transport practices, and disposal. The impact is anticipated to be low, as proposed safeguards and management measures would manage potential impact pathways into the surrounding environment.

The proposal will generate up to 2,000 cubic metres of topsoil, 5,000 cubic metres of unsuitable spoil materials, and currently unknown quantities of contaminated material, all of which is anticipated to require disposal off-site. In addition, unknown quantities of pavement materials may be able to be recycled off-site.

Transport is committed to committed to ensuring the responsible management of unavoidable waste and promotes the reuse of such waste in accordance with the resource management hierarchy principles outlined in the *Waste Avoidance and Resource Recovery Act 2001*. These resource management hierarchy principles, in order of priority are:

- avoid unnecessary resource consumption as a priority
- avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery)
- disposal is undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act* 2001).

By adopting these principles, Transport aims to efficiently reduce resource use, reduce costs, and reduce environmental harm in accordance with the principles of ecologically sustainable development.

Waste generated on-site would be recycled where possible or otherwise disposed of in accordance with EPA guidelines to licenced waste facilities. Resource use on-site during construction would be minimised where possible.

Waste management targets in accordance with Transport's Environmental Management System (EMS) and the SDGs would be developed for the proposal and would include targets for diversion of waste from landfill and optimisation of reuse and recycling.

Sustainability targets, actions, opportunities and initiatives which contribute to a Circular Economy by designing out waste during the detailed design stage, have been identified in the *ZEB Macquarie Park Bus Depot Sustainability Plan* (WSP, 2024). The measures outlined in the Sustainability Plan are included in Section 6.11.3.

Measures for minimising waste will be included in a Waste Management Plan (WMP) to be implemented during construction.

Operation

No long-term waste-related impacts are anticipated during operation of the proposal.

To minimise impacts of operational waste associated with the proposal, during the development of the concept design, the minimum design life of the asset elements of the proposal was maximised.

All proposed lighting for the proposal would use high-efficiency, long-life LED light sources.

6.11.3 Safeguards and management measures

Table 6-44: Waste and resources safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
WR1	Waste management	A Waste Management Plan (WMP) will be prepared and implemented as a sub-plan of the CEMP. The WMP will include but not be limited to:	Contractor	Detailed design/Pre-construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• measures to avoid and minimise waste associated with the proposal • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • management of any lead waste in accordance with Australian Standard *AS4361.1- 1995 Guide to Lead Paint Management* (Standards Australia, 1995) • monitoring, record keeping and reporting The WMP will align with Transport's *Waste Management Guideline* (Transport for NSW, 2023) and relevant Transport Waste fact sheets. The following resource management hierarchy principles will be followed: • avoid unnecessary resource consumption as a priority • avoidance will be followed by resource recovery (including reuse of materials reprocessing and recycling and energy recovery • disposal will be undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*)			
WR2	Waste management	All wastes will be managed in accordance with Transport's *Waste Management Guideline* and the *Protection of the Environment Operations Act 1997*.	Contractor	Pre-construction/ Construction	Additional safeguard
WR3	Asbestos waste management	Asbestos waste identified on-site must either be disposed of to a landfill licensed to accept asbestos waste, or alternatively safely encapsulated on-site. Transport's *Asbestos in soils management procedure EMF-LM-PR-0020* (Transport for NSW, 2023) provides guidance on how to manage asbestos in soils, including guidance on when encapsulation versus off-site disposal is warranted.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
WR4	Asbestos waste management	Approval to be sought from Transport for any encapsulation of asbestos on-site. The approval must provide safety, financial, environmental, legal, and reputational justification for the proposed encapsulation.	Contractor	Pre-construction	Additional safeguard
WR5	Asbestos waste management	If on-site encapsulation of asbestos containing material is proposed, in accordance with Transport's *Asbestos in soils management procedure (EMF-LM-PR-0020)*, a Long-term Environmental Management Plan (LTEMP) containing mitigation measures and/or monitoring requirements will be prepared and implemented. The LTEMP will be submitted to Transport for review and endorsement. The LTEMP will include the following details: • the nature and location of asbestos encapsulations on site • what long-term site management is needed to ensure the ongoing protection of human health and the environment on- and offsite from the encapsulation • a mechanism for legal enforcement of the LTEMP	Contractor	Pre-construction/ Construction	Additional safeguard
WR6	Asbestos waste management	Where asbestos is mixed with other wastes on-site (e.g. in a soil matrix), further waste classification is required by chemical testing	Contractor	Construction	Additional safeguard
WR7	Asbestos waste management	In line with the EPA's requirements: • asbestos waste must be securely packaged at all times • friable asbestos material must be kept in a sealed container • asbestos-contaminated soils (where not securely packaged or sealed) must be wetted down • all asbestos waste must be transported in a covered, leak-proof vehicle • asbestos waste must be disposed of at a landfill site that can lawfully receive this waste.	Contractor	Construction	Additional safeguard
WR8	Asbestos waste management	Records of the following must be kept: • amount and type of asbestos waste generated, stored,	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		treated or disposed of amount and type of asbestos waste transported • name of transporter and transporter's vehicle registration number • date of transportation • name and location of the waste disposal facility			
WR9	Waste management	Targets for diversion of waste from landfill and optimisation of reuse and recycling to be confirmed in accordance with Transport's *Sustainable Design Guidelines v4.0* (Transport for NSW, 2017).	Contractor	Detailed design/Pre-construction	Additional safeguard
WR10	Use of recycled materials	Materials with high recycle content (such as concrete with high Supplementary cementitious materials (SCMs) to be adopted. Recycled aggregates to be used where possible. Maximise recycled materials in road base and bedding material.	Contractor	Detailed design/ Construction	Additional safeguard
WR11	Reuse of materials	Detailed design should consider the beneficial re-use of suitable materials onsite to minimise the quantity of waste disposed to landfill. 100% of usable spoil, by weight, to be re-used on-site. Maximise reused materials in road base and bedding material.	Contractor	Detailed design/Construction	Additional safeguard
WR12	Storage of waste	Detailed design to allow for dedicated and appropriately sized waste segregation and storage areas for at least five waste streams. These areas need to be safe and have efficient access for both occupants and waste and resource collection contractors.	Contractor	Detailed design	Additional safeguard

6.12 Climate risk

This section provides an assessment of the potential impacts of the proposal on climate change due to the release of greenhouse gas emissions, and an assessment of the potential impacts of climate change upon the proposal. It also identifies safeguards and management measures to avoid or minimise these impacts.

6.12.1 Methodology

An initial Climate Risk Assessment (CRA) Pre-Screening was undertaken by Transport to identify and prioritise climate change related risks to the proposal. The initial CRA Pre-Screening identified that the Macquarie Park site would be impacted by bushfire, flooding, and extreme heat risks, amongst other hazards, which would need to be mitigated and or adapted throughout the design and operations.

During the development of the concept design, a CRA has been produced by Transport, which builds upon the CRA Pre-Screening, to further refine the hazards, risks, and potential adaptation measures.

The CRA has been developed to align with *TfNSW Climate Risk Assessment Guidelines V4.1* (Transport for NSW, 2021) and *AS5334 – 2013: Climate change adaptation for settlements and infrastructure – A risk based approach* (Standards Australia, 2013).

The methodology for the CRA involved:

- establishing the proposal context, including current climate risk exposure and relevant climate variables and hazards.
- defining how the climate is projected to change over the design life of the infrastructure.
- identifying, analysing, and evaluating risks to the proposal due to climate change and associated natural hazards, particularly all high and very high risks.
- identifying adaptation measures that may treat the risks identified, including an outline of the feasibility of their implementation. Adaptation measures to be carried forward from concept design to future design stages are still being confirmed through discussions with Transport. The final version of the CRA will include re-assessment of residual risk levels and define roles and responsibilities associated with implementing adaptation responses.
- showing compliance with requirements of Transport's *Sustainable Design Guidelines v4.0 credits: Compulsory Requirement 3 – Climate change risk*.

The likelihood and consequence criteria were drawn from *TfNSW Climate Risk Assessment Guidelines V4.1* (Transport for NSW, 2021) with the combination of these elements used to determine the overall risk, as per Figure 6-20.

Figure 6-20: Likelihood and consequence risk rating matrix

Risk Matrix Evaluation Table

Risk Ratings A – Very High B – High C – Medium D - Low			Consequence					
			Insignificant	Minor	Mode	Major	Severe	Catastrophic
			C6	C5	C4	C3	C2	C1
Likelihood	Almost certain	L1	C	B	B	A	A	A
	Very likely	L2	C	C	B	B	A	A
	Likely	L3	D	C	C	B	B	A
	Unlikely	L4	D	D	C	C	B	B
	Very unlikely	L5	D	D	D	C	C	B
	Almost unprecedented	L6	D	D	D	D	C	C

A multi-disciplinary workshop was held on 15 December 2023 with representatives from the design team and Transport to:

- discuss key climate changes projected to occur at the proposal
- identify proposal elements vulnerable to climate change
- Identify key project design parameters related to climate variables
- identify existing controls already, or expected to be, applied through design and operation
- identity adaptation options to treat climate risks.

This information was used to refine the CRA, evaluate the likelihood of the risk occurring, and the potential consequence(s). The CRA is an iterative process which will continue through design development.

6.12.2 Existing environment

Historical climate conditions

The proposal is located around 15 kilometres from the coast and generally experiences a moderate climate. The closest Bureau of Meteorology (BOM) Station with long term weather data (1967-present) is Parramatta North (station 066124), 14 kilometres to the southwest of the proposal. Key statistics from the monitoring station are shown in Table 6-45.

Table 6-45: Existing climate

Climate variable	Climate metric	Value
Temperature	Record minimum temperature	-1.0°C (12 July 2022)
	Mean number of days below 2°C per year	2.1
	Mean number of days below 0°C per year	0.2
	Record maximum temperature	47°C (4 January 2020)
	Mean number of days over 30°C per year	43.5*
	Mean number of days over 35°C per year	10.9*
	Record maximum number of days over 35°C in summer	23 (2016/17)
	Mean number of days over 40°C per year	1.4*
	Record maximum number of days over 40°C in summer	8 (2016/17)
Rainfall	Highest daily rainfall	293mm (6 August 1986)
	Mean number of days over 25mm	9.5 per year
Wind	Maximum wind gust	91 km/hr (27 October 2014)

*period 1981-2010, not including urban heat island effect
no wind data is available from Parramatta North. Closest station with maximum wind gust data is from Sydney Olympic Park AWS (Archery Station) 066212 which has only been operational since 2011.

Temperature

Temperatures below freezing are exceedingly rare at the proposal location, with only 0.2 days per year below zero. This indicates there are minimal risks arising from low temperatures at the proposal.

Temperatures above 30°C have been experienced in all months of the year, except for May, June, and July. The maximum temperature recorded at the Parramatta North BOM station was 47°C in 2020. In the past decade, a number of heatwave events have occurred which have substantially exceeded previous heat records for particular months or seasons.

Rainfall

Rainfall is relatively evenly distributed throughout the year, with the wettest months being January to March. Historically extreme rainfall events (greater than 90mm of rainfall in a day) have occurred in all months of the year. Severe rainfall events are primarily associated with low pressure systems and troughs, including East Coast Lows, which are more common in Autumn and Winter and severe thunderstorms, which are more frequent from October through to March.

Sydney can also experience heavy rainfall from tropical, ex-tropical and offshore cyclones, such as an un-named cyclone which impacted Sydney in 1950, and offshore tropical cyclone Pam in 1974.

Damaging weather events

Historic damaging weather events in the region have included extreme wind, severe thunderstorms, hail events, East Coast Lows, and bushfires.

Extreme wind data for the proposal site is limited by sparse weather station coverage and a lack of long-term records. However, notable events include a severe storm in 1991 which impacted the proposal area. Extensive damage was reported in the surrounding suburbs of Turramurra, Lindfield, Wahroonga and Parramatta. Wind speeds up to 230km/hr were estimated which resulted in substantial tree fall and 140 kilometres of damaged power lines.

Research into severe thunderstorms in the Sydney basin indicate that the majority of hail events in Sydney occur between the 1pm and 11pm (Australian Institute for Disaster resilience, n.d.). Modelling of hail hazard indicates the proposal is in an area of high to very high hail hazard. Research published in 2023, notes that the annual number of hail-prone days has increased by approximately 40% around Sydney driven by changes in atmospheric instability (Raupach, 2023).

East Coast Lows are low pressure systems, troughs or extra tropical cyclones that occur off the east coast several times a year on average. Whilst they can occur at any time of the year, they are more common during autumn and winter, and most

frequent in the month of June. Whilst they can occur at any time of the year, they are more common during autumn and winter, and most frequent in the month of June. Six out of 10 high inflow events into water catchments in the Sydney Region are attributable to East Coast Lows.

The proposal is located to the west of Lane Cove National Park which has a history of bushfires. Lane Cove National Park. The National Park or adjacent bushland reserves, which contains area of forest classified as category 1 bushfire prone land, have been impacted by bushfires in 1994, 2002, 2008, 2012, 2017 and 2019. Bushfires are attributable to power loss and telecommunications failures, and poor air quality.

Climate change projections

All climate projections were sourced by Transport from the NARCliM 1.5 dataset at 10-kilometre resolution. NARCliM1.5 is an NSW Government initiative with the data providing the most comprehensive and reliable view of future climate for NSW and south-eastern Australia.

Climate projections indicate some damaging weather events may decline, whilst warming temperatures may increase the frequency of others. However, the projections are broadly consistent, indicating the severity of an event will increase.

Temperature

Climate projection data for extreme heat indicate that in the near-future (2030s), roughly two out of three days over summer will have a period in the day where it is uncomfortable for outdoor workers, rising to the majority of days in the mid- to far-future (2050s-2070s).

One out of three days over the summer will have a period in the day when the conditions may pose a risk to outdoor workers health, rising to roughly one out of two days in the far-future (2070s). These risks will be amplified by elevated temperatures associated with the urban heat island effect.

Rainfall

There is high confidence that the intensity of heavy rainfall extremes will increase but the magnitude of projected changes is '*somewhat uncertain because many of the weather systems that generate extreme rainfall are not well resolved by Global Climate Models (such as East Coast Lows, intense frontal systems and severe thunderstorms).*'

Using projected temperatures, rainfall intensity is projected to increase by 19% in 2035, 29% in 2065 and 37% in 2085.

Damaging weather events

Extreme wind data for the proposal is limited by sparse weather station coverage and a lack of long-term records, and therefore projections are difficult to establish.

Increased temperatures are likely to increase the risk of thunderstorms across NSW in the warmer months.

Projections suggest that increasing greenhouse gas concentrations will lead to fewer East Coast Lows, however there is evidence to suggest an increase in the frequency of these events in summer with high (damaging) wind speeds.

Based on bushfire metrics from NARCliM 1.5 data, the Highest Fire Index is projected to increase, along with the number of days with a Hire Fire Index rating (greater than 25). The indicative length of the fire season is expected to increase by 16 per cent in 2030, 26 per cent in 2050 and 29 per cent in 2070 (CSIRO, 2023).

Climate risks

Based on the historical and projected climate data recorded in the area of the proposal, and the results of the CRA Pre-Screening Assessment, climate risks facing the proposal primarily arise from the following:

- weather events
- extreme heat
- flooding
- extreme storm events, including hail and storms
- bushfires.

6.12.3 Potential impacts

Climate change

Overall, the CRA identified no very high risks for the climate variables identified as relevant to the proposal. In total, five high risks were identified for the near-future (2030s) and nine high risks in the mid-future (2050s) and far-future (2070s).

The key climate risks facing the proposal are:

- extreme weather events resulting in power outages and the ability to charge buses, resulting in disruption to operations
- high heat and/or high humidity resulting in heat-related illnesses for workers in the maintenance depot, leading to reduced productivity, staff injuries and/or workers compensation
- high heat leading to heat-related illnesses for maintenance, cleaning or other staff working in the bus stacking area, leading to reduced productivity, staff injuries and/or workers compensation
- high external temperatures resulting in the accelerated degradation or failure of battery electric bus fleet electrical equipment, including batteries and air-conditioning, disrupting services and increasing maintenance costs
- bushfires (ember attack) affecting the site resulting in the loss of life and/or loss or damage to buildings or fleet.

Adaptation measures implemented in the concept design have resulted in a reduction in some high and medium risks.

6.12.4 Safeguards and management measures

Flood risk impacts and safeguards have been included in section 6.2, and bushfire impacts and safeguards have been included in Section 6.14.

Table 6-46: Climate change risk safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
CC1	Climate change risks	The CRA will be updated during detailed design. Detailed design will consider suitable adaptation measures to address all high and very high risks identified in the CRA, which may include flood hazard, power outages, ember attack, heat hazard, thermal performance, solar reflectivity, and future proofing.	Contractor	Detailed design	Additional safeguard
CC2	Staff and asset protection	Detailed design to consider provision of cool spaces for staff to work/rest to avoid heat stress.	Contractor	Detailed design	Additional safeguard
CC3	Energy network resilience	Energy supply resilience and redundancy measures to be applied to reduce the likelihood of power outages on site.	Contractor	Construction/ Operation	Additional safeguards

6.13 Greenhouse gas emissions

6.13.1 Existing environment

The *Australian National Greenhouse Gas Accounts National Inventory Report 2018* (Australian Government Department of Industry, Science, Energy and Resources, 2020) and *State and Territory Greenhouse Gas Inventories 2018* (Australian Government Department of Industry, Science, Energy and Resources, 2020) provides an overview of the latest available estimates of greenhouse gas emissions at a national and state level.

Australia's total greenhouse gas emissions were estimated to be 537.4 million tonnes of carbon dioxide equivalent (Mt CO2-e) in 2018. NSW accounted for 24.5 per cent (131.7 Mt CO2-e) of these emissions. The transport sector accounted for 18.8 per cent (100.8 Mt CO2-e) of total greenhouse gas emissions nationally and about 21.8 per cent (28.7 Mt CO2-e) of total greenhouse emissions in NSW. About 85 per cent of the Australian transport sector and 85 per cent of the NSW transport sector was attributable to road transportation in 2018.

Greenhouse gas emissions at the proposal would also be mostly attributed to the transport sector due to the extensive road and rail networks in the vicinity.

6.13.2 Potential impacts

Construction

The following construction activities would result in the release of greenhouse gases:

- fossil fuel combustion relating to use of plant, equipment, and vehicles
- electricity use
- embodied emissions from manufacture and delivery of materials.

An increase in greenhouse gas emissions, primarily carbon dioxide, would be expected during construction of the proposal due to exhaust emissions from construction machinery and vehicles transporting materials and personnel to and from site. Greenhouse gas emissions resulting from the construction activities of the proposal would be short-term and temporary. Greenhouse gas emissions generated during construction would be kept to a minimum through the implementation of the standard mitigation measures detailed in Section 6.13.3.

To minimise the greenhouse gas emissions associated with the proposal, the detailed design process would undertake greenhouse gas emissions modelling using the Transport Carbon Tool. The Transport Carbon Tool would to be used to inform decision making in design and construction, and ongoing operation of the proposal.

Materials used in construction of the proposal would be selected on the basis of the sustainability principles and objectives included in the *ZEB Macquarie Park Bus Depot Sustainability Plan* (Transport for NSW, 2024), in particular low embodied carbon and use of recycled materials to minimise generation of greenhouse gases.

Similarly, during detailed design, the design, materials, fixtures, and fittings will be selected to optimise the operational energy efficiency of the proposal to reduce the project's lifecycle carbon impacts.

Operation

Once the proposal is operational, the depot would support the transition from diesel and CNG buses, which emit greenhouse gases, to zero emissions technology which emit no greenhouse gases. This will result in a major long-term positive impact on greenhouse gas emissions in NSW.

Although the majority of the vehicle movements will be associated with battery electric buses, the proposal is likely to result in minor greenhouse gas emissions associated with staff vehicle movements when accessing/egressing the depot. To help minimise this operational impact, staff will be encouraged to use public transport to access the site, which may reduce the amount of fuel consumed by private motor vehicles, with a corresponding relative reduction in associated greenhouse gas emissions in the local area.

The proposal would include renewable energy generation through the introduction of solar panels to the roof space of the maintenance and administration buildings , which would also reduce greenhouse gas emissions associated with fossil fuel production.

Other greenhouse gas management measures were identified for the operation and maintenance phases. These measures will be adopted by the depot operator during the operation of the depot. Further details are included in Section 6.13.3.

Overall, the operation of the depot is anticipated to have a major long-term positive impact on greenhouse gas emissions.

6.13.3 Safeguards and management measures

Table 6-47: Greenhouse gas emissions safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GG1	Greenhouse gas emissions	Measures to demonstrate energy efficient construction and operations from Green Star Buildings and Transport's SDGs will be implemented.	Contractor	Detailed design/Construction	Additional safeguard
GG2	Greenhouse gas emissions	The procurement strategy developed for the construction phase will demonstrate	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		value for money and consideration for opportunities to procure goods and services: • from local suppliers • that are energy efficient and have low embodied carbon • that minimise generation of waste • that make use of recycled materials			
GG3	Greenhouse gas emissions	Greenhouse Gas emissions modelling and reporting using the Transport Carbon Tool. Achieve a minimum 15% reduction in construction greenhouse gas emissions.	Contractor	Detailed design/ Construction	Additional safeguard
GG4	Greenhouse gas emissions	Utilise renewable energy to ensure net zero emissions during operations.	Transport/ Contractor	Detailed design/ Operations	Additional safeguard
GG5	Greenhouse gas emissions	Measures included in the ZEB Macquarie Park Bus Depot Sustainability Plan to be implemented.	Contractor	Detailed design/ Construction	Additional safeguard
GG6	Greenhouse gas emissions	Building design to incorporate Environmental Sustainable Design measures and utilise passive building design to reduce energy demand associated with heating and cooling.	Contractor	Detailed design/ Construction	Additional safeguard

6.14 Other impacts

6.14.1 Existing environment and potential impacts

Table 6-48: Other potential impacts

Environmental factor	Existing environment	Potential impacts
Utilities	Various existing utility assets which cross and surround the proposal were identified. Where existing utilities require relocation or modification, the relevant service providers will be consulted. Utilities that are proposed to be adjusted are detailed in Section 3.5.	Adjustments to utilities has been considered in the concept design. Further development of utilities adjustments will be undertaken during detailed design in consultation with the relevant utilities providers. New utilities and service connections will be required to be undertaken during out of hours, which could result in noise impacts to nearby sensitive receivers. Noise impacts and appropriate safeguard and management measures are addressed in Section 6.8. Any disused utilities would either be abandoned, or grout filled and concrete capped. This would be confirmed for each utility during detailed design.
Hazards and risks	The proposed battery electric buses would be powered by lithium-ion batteries. Lithium ion-batteries are hazardous materials because of their potential to cause fire hazards. Hazards associated with these lithium-ion batteries related to fires are detailed in the *Zero*	Hazards and risks associated with the construction of the proposal would potentially include: • carrying out work within or adjacent to a public road • carrying out work near existing services and utilities (e.g. power lines and gas mains) • the use and storage of hazardous materials • the use of heavy machinery • unexpected excavation of contaminated land

Environmental factor	Existing environment	Potential impacts
	Emission Buses Greater Sydney Tranche 1 – Macquarie Park Asset Fire Life Safety Strategy Report (WSP Australia Pty Ltd, 2024).	• sparks and/or hot work causing fire, particularly during dry, hot periods • unauthorised access to the construction work site Construction hazards and risks are manageable through the application of standard mitigation measures, which would be developed by the construction contractor prior to construction. Hazards or risks associated with the operation of the proposal would include the risk of fire associated with the use of lithium-ion batteries in electric buses. Essential fire services have been incorporated into the concept design and will be considered further during detailed design. Fire risk associated with the operation of the proposal would be managed in accordance with the *Zero Emission Buses Greater Sydney Tranche 1 – Macquarie Park Asset Fire Life Safety Strategy Report* (WSP Australia Pty Ltd, 2024) and in consultation with Fire and Rescue NSW.
Bushfires	Bushfire mapping indicates that the proposal is not located within a bushfire prone area or within a 100-metre buffer zone of a bushfire risk area. There have been five fires in Lane Cove National Park since 2002. The future climate change projections may result in longer, more severe fire seasons, and more widespread fires. The number of High Fire Index days is anticipated to double by 2065.	Potential risks associated with bushfires include road closures during operation, ember attack and poor air quality. This could result in EV battery fires, redundancy in fleet and long-lead in for replacements. Ember attack or consequential fires from fires that have the potential to occur in nearby bushfire risk areas, could result in an EV battery fire risk. To minimise the risks associated with bushfires non-combustible materials have been incorporated into the concept design and leaf litter removal would be undertaken on-site. Bushfires may also lead to road closures in the local area, impacting the operational access to the depot. In this event, suitable diversion routes would be utilised to minimise impact on bus operations. Fires or hazard reduction burns in the local area may result in poor air quality. Potential adaptation measures include dual air intakes on heating, ventilation, and air conditioning; outdoor activities will be limited during operation; air quality will be monitored, and alerts will be subscribed to.

6.14.2 Safeguards and management measures

Table 6-49: Other impacts safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
OI1	Utilities	Utility adjustments required to accommodate the proposal will be refined during detailed design in consultation with the relevant utilities providers.	Contractor	Detailed design/ Pre-construction	Additional safeguard
OI2	Hazards and Risks	A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to: • details of hazards and risks associated with the activity (including consideration of bushfire) • measures to be implemented during construction to minimise these risks • record keeping arrangements, including information on the	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials • a monitoring program to assess performance in managing the identified risks • contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations. The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice and EPA publications.			
OI3	Hazards and Risks – Fire risk during operation	Fire risk associated with the operation of the proposal will be managed in accordance with the *Zero Emission Buses Greater Sydney Tranche 1 – Macquarie Park Asset Fire Life Safety Strategy Report* (WSP Australia Pty Ltd, 2024) and in consultation with Fire and Rescue NSW.	Transport	Operation	Additional safeguard
OI4	Bushfires	To minimise risks associated with bushfires non-combustible materials are to be incorporated into the detailed design.	Contractor	Detailed design	Additional safeguard
OI5	Bushfires	A maintenance regime is required to reduce the build-up of debris and rubbish on-site during construction and operation to minimise bushfire risk.	Contractor/ Transport	Construction/ Operation	Additional safeguard
OI6	Bushfires	In the event of a bushfire impacting the operation of the depot, suitable diversion routes are to be identified and utilised to minimise impact on bus operations.	Transport	Detailed design/ Operation	Additional safeguard
OI7	Bushfires – ember attack	During detailed design, the requirements of Bushfire Attack Level (BAL) BAL-12.5 are to be followed to mitigate the risk from ember attack. This would include the use of non-combustible materials, such as steel and concrete, which is already envisaged for many of the built elements.	Contractor	Detailed design	Additional safeguard

6.15 Cumulative impacts

A cumulative impact occurs when two or more projects are carried out concurrently and near to one another. The impacts may be caused by both construction and operational activities and can result in a greater impact to the surrounding area than would be expected if each project was carried out in isolation.

When considered in isolation, specific project impacts may be considered minor. These minor impacts may be more substantial, however, when the impact of multiple projects on the same receivers is considered. Consequently, the extent to which the proposal contributes to the cumulative impacts of existing and planned developments or activities on the environment has been assessed in this section.

6.15.1 Methodology

Other projects that are currently underway, or planned, within proximity to the proposal boundary and their associated impacts have been considered and identified in Table 6-50.

The assessment of the cumulative impacts was prepared based on information provided by Transport in March 2024, based on a search of the Department of Planning, Housing and Infrastructure's planning portal for the suburb of Macquarie Park and the City of Ryde Council's development application tracking site.

6.15.2 Other projects and development

Projects with the potential to contribute to cumulative impacts in combination with the proposal are listed in Table 6-50.

Table 6-50: Other projects and developments

Project	Construction impacts	Operational impacts
Macquarie Park Bus Priority and Capacity Improvement Stage 2 Project Following the completion of Stage 1 of the project, Stage 2 involves road and intersection upgrades to provide long-term improvements for buses, general traffic, and pedestrians. The project is currently in the planning stage.	Construction work is unlikely to overlap unless delays to the project's program. No construction impacts anticipated.	• improved integration of transport infrastructure in Macquarie Park.
Telstra Project The project involves running a Telstra service around the proposal, along Pittwater Road. The work is planned for completion in 2024.	Construction work is unlikely to overlap unless delays to the project's program. If, however, construction programs do overlap there is potential for the following construction impacts: • construction noise and vibration • volumes of construction traffic utilising the local road network and Pittwater Road. • visual impact.	None
Macquarie Park Precinct and Bus Interchange Upgrade Project The project is located at the opposite end of Talavera Road (the proposed layover) and the existing bus interchange between Macquarie University and Macquarie Park Shopping Centre on Herring Road. Work is planned to commence in 2024, with full construction during 2025.	• volumes of construction traffic using local road network.	• improved integration of transport infrastructure in Macquarie Park.
35 Waterloo Road, Macquarie Park This State Significant Development (SSD) involves demolition and construction of a new Build-to-Rent (BTR) development consisting of 46,314m2 of GFA encompassing 513 units across 4 buildings ranging between 7-20 storeys, with retail, community uses and recreation areas at ground floor level and basement parking. The SSD application has been submitted and is currently at Submissions stage.	• construction noise and vibration • volumes of construction traffic using local road network.	• additional traffic volumes on bus routes • increased public transport demand.
63-71 Waterloo Road, Macquarie Park This SSD construction of mixed-use development compromising two towers located 350 west of the proposal. The SSD application has been determined.	• volumes of construction traffic on local road network.	• additional traffic volumes on bus routes • increased public transport demand.

6.15.3 Potential impacts

Multiple projects undertaken at a similar time/similar location may lead to construction fatigue, particularly around noise, traffic and air quality impacts, if not appropriately managed.

Cumulative impacts may occur as a result of construction activities occurring simultaneous with the projects that are currently underway, or determined development applications, listed in Table 6-50.

Projects proposed within proximity to the proposal have the potential to result in the following cumulative construction impacts:

- increased traffic on the surrounding roads and associated delays for road users, including the use of similar roads by construction vehicles
- increased construction noise and vibration where projects are in close proximity to one another and have similar approved construction hours
- reduced visual amenity for visual receivers during construction, for example where multiple active construction sites are located in proximity
- multiple projects which introduce new visual elements to the environment could result in an overall cumulative increase in visual impacts.

Specific details of construction timeframes and impacts for surrounding cumulative developments are subject to ongoing consultation with relevant stakeholders and landowners. There is also the potential for new developments to be approved and commence construction during the construction timeframe for the proposal.

The potential cumulative impacts associated with the proposal would be further considered during the detailed design for the proposal, and as further information regarding the location and timing of surrounding potential developments is released.

Cumulative impacts would be minimised and managed through the application of environmental safeguards and management measures in Section 6.15.4.

6.15.4 Safeguards and management measures

Table 6-51: Cumulative effects safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
CI1	Cumulative impacts	Current and upcoming projects with the potential to interact with the proposal will be monitored, as further information regarding the location and timing of surrounding potential developments is released. Where potential cumulative impacts are identified, the scheduling of work will be coordinated with interacting projects where feasible to minimise potential impacts. This will include: • scheduling work to allow suitable respite periods for construction noise. • scheduling of work to minimise consecutive construction noise impacts, where feasible • coordinating lane closures and pedestrian/cyclist diversions to minimise the overall number of occasions where disruption occurs.	Contractor	Detailed design/ Pre-construction	Additional safeguard

7. Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts during detailed design, construction and operation. A framework for managing potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are listed.

7.1 Environmental management plans (or system)

Safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by Transport's Environment Manager, prior to the commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed work on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN1	General – minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of Transport's Senior Manager Environment and Sustainability prior to commencement of the activity. As a minimum, the CEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor	Detailed design / Pre-construction	Additional safeguard
GEN2	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk.	Contractor	Construction	Additional safeguard
GEN3	General – environmental compliance	A Construction Environmental Compliance Report (CECR) for the Project shall be prepared which addresses the following matters: a) compliance with the CEMP and the Submissions Report safeguards b) compliance with any approvals or licences issued by relevant authorities for the construction of the Project c) implementation and effectiveness of environmental controls (the assessment of effectiveness should be based on a	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		comparison of actual impacts against performance criteria identified in the CEMP) d) environmental monitoring results, presented as a results summary and analysis e) number and details of any complaints, including summary of main areas of complaint, actions taken, responses given and intended strategies to reduce recurring complaints (subject to privacy protection) f) details of any review and amendments to the CEMP resulting from construction during the reporting period g) any other matter as requested by Transport. The CECR shall be submitted to Transport for review and approval. The first CECR shall report on the first three months of construction and be submitted within four weeks of expiry of that period (or at any other time interval agreed to by Transport). CECRs shall be submitted no later than six months after the date of submission of the preceding CECR (or at other such periods as requested by the Transport) for the duration of construction. The final CECR shall detail compliance with all safeguards, licences and permits required to be obtained under any other legislation for the Project.			
GEN4	General - minimise environmental impacts during construction	An environmental control map (ECM) will be prepared in accordance with Transport's environmental control map guideline EMF-EM-GD-0148 and submitted to Transport for review and approval prior to works commencing. The ECM will be regularly updated throughout construction to reflect changing site conditions and submitted to Transport for acceptance.	Contractor	Construction	Additional safeguard
GEN5	General – Project modifications	Any modification to the Project will be subject to further environmental assessment. The assessment will be subject to approval under delegated authority under Transport. The contractor will comply with any additional requirements from the assessment.	Contractor	Pre-construction/ Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B1	Removal of Native Vegetation and Threatened Fauna Habitat	Native vegetation removal and threatened fauna habitat removal will be minimised through detailed design, where feasible.	Contractor	Detailed design	Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).
B2	Removal of Native Vegetation and Protection of Retained Vegetation	Vegetation clearance limits will be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with *Guide 2: Exclusion Zones* in Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024). Exclusion zones will be set up at the limit of clearing in accordance with *Guide 2: Exclusion zones* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024). Fencing etc. will be established at the outer limits of the drip line of any retained trees and the areas marked as 'no-go zones' to avoid direct impact.	Contractor	Pre-construction/ Construction	Additional safeguard
B3	Removal of Vegetation	Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* in Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Pre-construction	Additional safeguard
B4	Removal of Trees	A suitably qualified arborist is to participate in pre-clearing site walk-through, to confirm trees to be removed. Prior to tree removal, the arborist will assess and report on any significant roots that require removal. If structural roots are encountered and need to be cut, they shall provide advice on the position and method of removal to minimise impacts. The arborist will assess and report on the need for any further tree removals required within the proposal boundary.	Contractor	Pre-construction	Additional safeguard
B5	Vegetation/Trees on Third Party Land	Where vegetation/trees are proposed to be removed or trimmed on land not owned by Transport, the contractor shall obtain the landowner's consent prior to these works being undertaken.	Contractor	Pre-construction	Additional safeguard
B6	Removal of Native Vegetation/Threatened Fauna Habitat	Vegetation removal and threatened fauna habitat removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* in Transport's *Biodiversity*	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		Management Guideline (Transport for NSW, 2024) to minimise disturbance to surrounding flora and fauna habitats.			
B7	Removal of Native Vegetation	Where feasible, removed native and non-seed-bearing exotic vegetation would be mulched or re-used on-site (e.g., to stabilise disturbed areas).	Contractor	Construction/Post-construction	Additional safeguard
B8	Removal of Native Vegetation	Vegetation removal work is not to be conducted during periods of high winds.	Contractor	Construction	Additional safeguard
B9	Removal of Native Vegetation	The contractor must submit for review and endorsement by the Transport Senior Manager Environment and Sustainability, a Tree and Hollow Replacement Plan, which prioritises local plantings in accordance with Transport's *Tree and Hollow Replacement guidelines* EMF-BD-GD-0129 (Transport for NSW, 2023). Unless otherwise agreed to by Transport, this plan will be submitted within three months of commencing construction.	Contractor	Pre-construction/post-construction	Additional safeguard
B10	Unexpected threatened species	The unexpected species find procedure in *Guide 1: Preclearing process* in Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024) is to be followed if threatened ecological communities and threatened fauna or flora not assessed in the biodiversity assessment, are identified in the proposal boundary.	Contractor	Construction	Additional safeguard
B11	Removal of threatened fauna habitat	An ecologist (or similar qualified person) is to be present on-site during the removal of the 31 hollow-bearing trees. The ecologist is to: • develop lines of communication with the tree felling operator • inspect each tree prior to its clearing • inspect the tree once it is on the ground • collect and relocate locally any sheltering fauna • transport to a local veterinarian any animals that require treatment.	Contractor	Construction	Additional safeguard
B12	Removal of threatened fauna habitat	The 31 hollow-bearing trees are to be marked during pre-clearing surveys. Pre-clearing surveys will be undertaken in	Contractor	Pre-construction/ Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		accordance with *Guide 1: Preclearing process* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024). If possible, all vegetation around the hollow-bearing trees to be removed would be cleared 24 to 48 hours prior to the removal of the hollow-bearing trees. This approach isolates the hollow-bearing trees and reduces their habitat value (particularly for ground-traversing fauna that are exposed to predation).			
B13	Removal of threatened fauna habitat	The hollow-bearing trees should be 'soft- felled' in sections, the cut being about 100 mm below the bottom of the cavity, with hollow-limbs lowered to the ground. Once on the ground, the ecologist, or similar, would inspect the cavities for sheltering species. These should be collected and used locally as habitat as part of the off-setting requirements.	Contractor	Construction	Additional safeguard
B14	Removal of threatened fauna habitat	Fauna will be managed in accordance with *Guide 9: Fauna handling* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Construction	Additional safeguard
B15	Removal of threatened fauna habitat	If an arborist [or similar] is to be employed, they would climb each identified hollow-bearing tree and provide confirmation if the predicted hollows are actual cavities. • Whilst examining the tree, the arborist is to use a hand-held torch to inspect any cavities for sheltering animals. A photographic record of the cavity is to be obtained, this included in a pre-clearing report that is submitted to the appropriate Transport Environmental representative. • If animals are observed sheltering in the cavity, the entrance is to be temporarily plugged through the placement of a breathable material (cloth bag, towel etc.). The limb/branch is then to be roped off; a chainsaw being used to remove this from the main plant (the cut made at least 100 mm beyond the predicted limit of the cavity). The limb is to be gently lowered to the ground, relocated to the edge of the road corridor and the cloth plug removed (if possible, upon dusk). The sheltering animal is to be permitted to naturally disperse from the cavity.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• If birds are present, particularly fledglings, these are to be collected and taken to a wildlife carer or veterinarian for assessment. Prior to the trees' removal (if an excavator employed) these would be knocked several times to alert potential sheltering fauna and provide an opportunity for these animals to disperse. The trees would not be felled until approval from the ecologist is given.			
B16	Protection of retained trees	A suitably qualified arborist is to participate in pre-clearing site walk-through, to confirm trees to be retained and the setup of tree protection measures as per the AIA recommendations. Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) for retained trees are to be confirmed by the arborist. Prior to commencement of construction, the arborist will inspect the setup of TPZ, ensuring they meet the requirements of *AS4970(2007) Protection of Trees on Development Sites*. The arborist will undertake regular monitoring/site inspections during construction to monitor tree health, and provide advice and recommendations in relation to: • methods to minimise the extent of encroachment within the TPZ • long-term health of retained trees such as watering regimes, fertiliser application and mulching • additional tree care if there are signs of stress • non-destructive digging techniques and when to stop works within TPZ • refinements to the work methodology • the adequacy of site training and induction material regarding TPZ. Where trees are to be retained but pruning is required, the arborist is to prepare a site-specific pruning report when detailed design is confirmed. All pruning works are to be undertaken by suitably qualified tree workers (minimum Australian Qualifications Framework (AQF) Level 3 or equivalent) in accordance with Australian Standard AS4373-2007 *Pruning of Amenity Trees and Safe Work Australia's Guide to Managing Risks of Tree Trimming and Removal Works.*	Contractor	Pre-construction/construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B17	Replacement of habitat	Habitat will be replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bushrock*. To replace the loss of one 'occupied' hollow from within the 31 hollow-bearing trees to be removed, 50 artificial hollows as per the *Tree and Hollow Replacement guidelines EMF-BD-GD-0129* (Transport for NSW, 2023) would be established. Artificial hollows would be provided in accordance with *Guide 8: Artificial hollows* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024). Where hollow replacement cannot be accommodated for locally [or only partially], payment of $500 would be made into Transport's Conservation Fund for each hollow replacement required.	Contractor	Construction	Additional safeguard
B18	Injury and mortality of fauna	Checks beneath vehicles/machinery will be undertaken prior to their use for the presence of sheltering fauna species (i.e., frogs and ground-traversing mammals). Fauna will be managed in accordance with *Guide 9: Fauna handling* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Construction	Additional safeguard
B19	Invasion and spread of weeds	In accordance with the *NSW Biosecurity Act 2015*, the weeds identified on-site would be controlled, thereby mitigating impacts on adjoining land to which it could spread. Weed species will be managed in accordance with *Guide 6: Weed management* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Pre-construction/ Construction	Additional safeguard
B20	Invasion and spread of pests	Pest species will be managed within the proposal boundary.	Contractor	Construction	Additional safeguard
B21	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with *Guide 2: Exclusion zones* of Transport's *Biodiversity Management Guideline* (Transport for NSW, 2024).	Contractor	Construction	Additional safeguard
B22	Noise, light, dust and vibration	Shading and artificial light impacts will be minimised through detailed design.	Contractor	Detailed design	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B23	Greenstar credit	The detailed design is to consider species connectivity.	Contractor	Detailed design	Additional safeguard
B24	Additional vegetation removal/trimming	Where trimming, cutting, pruning or removal of trees or vegetation has not already been identified in the Environmental Impact Assessment, separate approval, in accordance with Transport's *Removal or trimming of vegetation application EMF-EM-TT -0144* is required. The trimming, cutting, pruning or removal of trees or vegetation shall be undertaken in accordance with the conditions of that approval.	Contractor	Detailed design / construction	Additional safeguard
HF1	Flood risk	Measures incorporated into the detailed design to ensure flood risk is minimised within the site and downstream, are to be implemented.	Contractor	Detailed design/ pre-construction	Additional safeguard
HF2	Flood risk	Prior to construction commencing, final hydrology and drainage assessments will be undertaken to inform detailed design measures to minimise flood risks to the environment, properties and the proposal, including access and egress. Drainage designs to be inclusive of increase in rainfall intensity to account for climate change.	Contractor	Detailed design/ pre-construction	Additional safeguard
HF3	Flood risk	When flooding is predicted, construction plant and equipment will not be stored in flood prone areas within the site boundary.	Contractor	Construction	Additional safeguard
HF4	Flood risk	Appropriate construction measures to minimise flood risk and drainage impacts will be included in the CEMP and implemented on site.	Contractor	Construction	Additional safeguard
HF5	Changes to hydrology	Changes to existing surface water flows will be minimised through detailed design.	Contractor	Detailed design	Additional safeguard
HF6	Surface water runoff management	Surface water flows will be managed during construction.	Contractor	Construction	Additional safeguard
SC1	Contaminated land	A Remedial Action Plan will be prepared in accordance with Transport's *Contaminated land management procedure EMF-LM-PR-0016* (Transport for NSW, 2023) and submitted to Transport for review and endorsement.	Contractor	Detailed design/pre-construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		The plan will include, but not be limited to: • capture and management of any surface runoff contaminated by exposure to the contaminated land • further investigations required to determine the extent, concentration and type of contamination, as identified in the DSI • management of the remediation and subsequent validation of the contaminated land, including any certification required • measures to ensure the safety of site personnel and local communities during construction.			
SC2	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport's Environment Manager and/or EPA.	Contractor	Construction	Standard safeguard
SC3	Contamination of soils, surface water and groundwater	A Soil and Water Management Plan (SWMP), forming a sub-plan of the CEMP, will to be prepared for the work. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Contractor	Pre-construction / Construction	Standard safeguard
SC4	Soils – Erosion and sediment control	A site-specific Erosion and Sediment Control Plan (ESCP) would be prepared and implement as part of the SWMP. The ESCP will include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather. The plan would incorporate best management erosion and sediment control practices such as those found in the *Managing Urban Stormwater, Soils and Construction Guidelines* ("the Blue Book") *(4th Edition*) (Landcom, 2004).	Contractor	Pre-construction / construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		The ESCP will be reviewed and updated whenever the construction program, scope of work or work methods change, or whenever work methods or control measures are found to be ineffective.			
SC5	Soils – Erosion and sediment control	Erosion and sediment controls such as sandbags and drainage covers are to be checked weekly and before/after rainfall event greater than 10 mm in a 24-hour period and maintained on a regular basis.	Contractor	Construction	Additional safeguard
SC6	Soils – Erosion and sediment control	Erosion and sediment control measures are not to be removed until the work is complete, and areas are stabilised	Contractor	Construction	Additional safeguard
SC7	Soils – Stabilisation	Work areas are to be stabilised progressively during the work.	Contractor	Construction	Additional safeguard
SC8	Soils – Stockpile management	All stockpiles are to be managed in accordance with the *Managing Urban Stormwater, Soils and Construction Guidelines* ("the Blue Book") *(4th Edition*) (Landcom, 2004). Erosion and sediment controls would be implemented in the proposed stockpile area, such as: • stockpiles to be covered with geofabric prior to rain events greater than ten millimetres. • maximum height of stockpile is two metres and no greater than a 2:1 slope • segregation in order to minimise risk of cross-contamination of stockpiles and maximise suitability for reuse or recycling • stockpiles are not to encroach on any local vegetation and be kept five metres away from trees to be retained • mitigation measures to manage tannins leaching from mulch stockpiles into waterways will be included in the CEMP and implemented on site stockpiles will be separated using techniques such as hard barriers or markers • stockpiles are to be labelled according to their classification / material type (e.g., topsoil, capping etc)	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		Soil stockpiles with visual signs of hydrocarbon contamination or odours should be sampled and classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014) and disposed off-site to a suitably licenced landfill facility.			
SC9	Contamination of soils	All fuels, chemicals, liquids and hazardous materials will be stored in an secured impervious bunded area a minimum of 50 metres away from waterbodies, drainage lines and slopes with a gradient of more than 10%, and disposed of in accordance with NSW DECC's *Storing and Handling Liquids: Environmental Protection Participants Manual* (NSW DECC, 2007). Appropriate on-site signage will be provided to identify the materials stored.	Contractor	Construction	Additional safeguard
SC10	Contamination of soils	The Site Supervisor must be notified immediately of any suspected or potentially contaminated ground exposed during construction activities. All work must cease within the vicinity of the actual or suspected contaminated land and the area will be fenced off. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed by a certified contaminated land practitioner and any necessary site-specific controls or further actions identified in consultation with Transport's Environment Manager and/or EPA.	Contractor	Construction	Additional safeguard
SC11	Contaminated land	Further investigations for waste classification will be undertaken.	Contractor	Pre-construction	Additional safeguard
SC12	Management of Asbestos containing material	All ACM identified on-site must be managed in accordance with Transport's *Asbestos in soils management procedure EMF-LM-PR-0020* (Transport for NSW, 2023).	Contractor	Construction	Additional safeguard
SC13	Contamination of surface water	Plant, equipment and vehicles will be cleaned a minimum of 50 metres from waterways and drainage lines.	Contractor	Construction	Additional safeguard
SC14	Contamination of surface water	Water quality control measures are to be used to prevent any materials such as concrete, grout entering drainage lines and waterways.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SC15	Contamination of surface water	All concrete washout will be managed in accordance with Transport's *Concrete washout guideline EMF-EM-GD-0145* (Transport for NSW, 2023). Details of the concrete washout areas are to be included in the CEMP.	Contractor	Construction	Additional safeguard
SC16	Accidental spills – contamination	Construction vehicles and plant/machinery are to be properly maintained and regularly inspected for fluid leaks to minimise the risk of fuel/oil leaks.	Contractor	Construction	Additional safeguard
SC17	Accidental spills	Pollution incident response management measures will be included in the CEMP in accordance with Transport's *Chemical storage and spill response guideline EMF-EM-GD-0137* (Transport for NSW, 2023) and relevant EPA guidelines. The CEMP will include adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/ equipment), as well as initial response, containment, and notification procedures. All staff to be made aware of the location of the spill kits and trained in how to use them in the event of a spill.	Contractor	Construction	Additional safeguard
SC18	Pollution incident	In the event of a pollution incident (e.g., a spill) work would cease in the immediate vicinity and the Contractor would immediately notify Transport's Project Manager and Transport's Senior Manager Environment and Sustainability. Transport's *Environmental Incident Procedure* (Transport for NSW, 2021) is to be followed.	Contractor	Construction	Additional safeguard
SC19	Water	All water captured or encountered on-site will be managed in accordance with the requirements of the Transport's *Water Discharge and Reuse Guideline DMS-SD-024* and the *Discharge or Reuse Water Approval DMS-FT-207*	Contractor	Construction	Additional safeguard
AH1	Aboriginal heritage	Transport's *Unexpected Heritage Items Procedure* (Transport for NSW, 2024) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport does not have approval to disturb the object/s or where a specific	Contractor	Pre-construction/ construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.			
AH2	Aboriginal heritage	Detailed design will consider the *Connecting to Country Aboriginal Design Principles* (WSP, 2023) and recommendations made by Elders during the on-site Walk on Country.	Contractor	Detailed design	Additional safeguard
H1	Unexpected non-Aboriginal heritage finds	Transport's *Unexpected Heritage Items Procedure* (Transport for NSW, 2024) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	Standard safeguard
LVA1	Landscape	The detailed design is to be undertaken in accordance with design principles outlined *Zero Emission Buses Urban Design Framework* (Transport for NSW, 2022) and the *Urban Design Report* including the *Landscape Design Report* (Taylor Brammer Landscape Architects Pty Ltd, 2024).	Contractor	Detailed design	Additional safeguard
LVA2	Landscape	The Urban Design Report (including detailed urban design drawings and landscape plans) will provide the basis for development of an UDLP to support the final detailed design. The UDLP will present an integrated urban design for the proposal, providing further practical detail on the application of design principles.	Contractor	Detailed design	Standard measure
LVA3	Landscape character	Detailed design to take into account the design of existing structures and conform to the landscape character of the locality.	Contractor	Detailed design	Additional safeguard
LVA4	Landscape character and visual impact	Detailed design to minimise tree and vegetation removal within the proposal boundary. Boundary trees to be retained where possible during construction to maintain screening.	Contractor	Detailed design/ Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
LVA5	Visual impact	Temporary lighting spill beyond the construction footprint is to be minimised in accordance with *AS4282 Control of the obtrusive effects from outdoor lighting*. All lighting to be directed away from visual receptors.	Contractor	Construction	Additional safeguard
LVA6	Visual impact	Lighting and signage will be installed in accordance with relevant Australian Standards and guidelines, and without reducing the amenity of sensitive receivers where feasible and reasonable.	Contractor	Pre-construction/ construction	Additional safeguard
LVA7	Visual impact	Following completion of the work, plant and equipment to be removed from site and disturbed areas to be rehabilitated/restored as appropriate.	Contractor	Construction/ Post-construction	Additional safeguard
TT1	Traffic and transport	A detailed Construction Traffic Management Plan (CTMP), which will include a Construction Traffic Control Plan, will be prepared in accordance with Transport's *Traffic Control at Work Sites Manual* (Transport, 2022). The CTMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site-specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.	Contractor	Detailed design / Pre-construction	Standard safeguard
TT2	Local community notification	Potentially affected residences are to be notified prior to the commencement of and during work. Consultation should	Contractor	Pre-construction/ Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		include but not be limited to door knocks, newsletters or letter box drops providing information on the proposal, working hours and a contact name and number for more information or to register complaints.			
TT3	Road network	Any minor trenching work required on either Talavera Road or Wicks Road to complete service and utility connection are to be completed under single-lane shuttle-flow conditions during standard working hours.	Contractor	Construction	Additional safeguard
TT4	Road network	Parking for construction workers is to be provided within the proposal boundary.	Contractor	Construction	Additional safeguard
TT5	Active transport network	Appropriate signage to be installed along Wicks Road near Pittwater Road and along Lane Cove Road, near Talavera Road, to manage impacts on the pedestrian and cycling network.	Contractor	Construction	Additional safeguard
TT6	Emergency service vehicles	Traffic management measures must be implemented to ensure emergency services vehicle access is maintained along Wicks Road during construction.	Contractor	Construction	Additional safeguard
TT7	Road safety	A road safety review is to be undertaken of the intersection of Halifax Street and Wicks Road to test the following potential mitigation options to accommodate the additional bus movement: • Addition of a green arrow right turn phase from Wicks Road southbound into Waterloo Road. Some terminating bus services will use Halifax Street and turn right at Wicks Road to access the depot. This movement will require a new “Buses Excepted” sign applied to the existing “No Right Turn” sign from Halifax Street to Wicks Road.	Contractor	Detailed design	Additional safeguard
TT8	Active transport	Future cycling access configurations to the site to be considered during detailed design including installation of appropriate signage and alternative routes.	Contractor	Detailed design	Additional safeguard
TT9	Sustainable travel	Construction workers are to be encouraged to use public transport to access the proposal.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
TT10	Access	Pedestrian and vehicle access to neighbouring and nearby properties and businesses will be maintained throughout the duration of the work, where possible.	Contractor	Construction	Additional safeguard
NV1	Noise and vibration – general measures	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in *the Construction Noise and Vibration Guideline – Public Transport Infrastructure 2023* (Transport for NSW, 2023) and identify: • all potential significant noise and vibration generating activities associated with the activity • feasible and reasonable mitigation measures to be implemented to avoid and minimise noise impacts • a monitoring program to assess performance against relevant noise and vibration criteria • arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.	Contractor	Detailed design / Pre-construction	*Construction Noise and Vibration Guideline – Public Transport Infrastructure 2023* (Transport for NSW, 2023)
NV2	Noise and vibration – Community Liaison	A Community Liaison Management Plan will be prepared and implemented which will outline specific communication and stakeholder engagement activities, procedures, and protocols for the proposal.	Contractor	Pre-construction	Standard safeguard
NV3	Noise and Vibration - Notification	All sensitive receivers (e.g. local business, residents and schools) likely to be affected will be notified at least five working days prior to commencement of any work associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • the proposal • construction dates • working hours and duration of work being undertaken • types of activities being undertaken and equipment used • any associated impacts and mitigation measures	Contractor	Pre-construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• 24/hr project hotline number.			
NV4	Noise and vibration – Site inductions	All employees, contractors and subcontractors are to receive an environmental induction which would include consideration of noise and vibration impacts. Regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration.	Contractor	Pre-construction, construction, operation or other as required	Standard safeguard
NV5	Construction noise and vibration	Construction work to be undertaken in accordance with Transport's *Construction Noise and Vibration Guideline – Public Transport Infrastructure* (Transport for NSW, 2023)	Contractor	Construction	Standard safeguard
NV6	Construction noise – Work scheduling	The following work scheduling management measures will be adopted to reduce construction noise impacts: • scheduling noise intensive work and respite periods to reduce annoyance • respite periods could include restricting very noisy activities to time periods that least affect the nearby noise sensitive locations • restricting the number of nights that OOHW is conducted near residences or by determining any specific requirements • work generating high vibration levels should be scheduled during non-sensitive or less sensitive time periods • optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours • planning deliveries and access to the site to occur quietly and efficiently and organising parking only within designated areas located away from sensitive receivers • planning construction traffic flow, parking and loading/unloading areas to minimise reversing movements.	Contractor	Construction	Standard safeguard
NV7	Construction hours	Work would generally be carried out during standard construction hours (i.e. 7.00 am to 6.00 pm Monday to Friday; 8.00 am to 1.00 pm Saturdays). Any work outside these hours may be undertaken if approved by Transport and the	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		community is notified prior to these works commencing. An Out of Hours Work application form would need to be prepared by the Construction Contractor and submitted to the Transport's Environment Manager for review and approval prior to the works commencing.			
NV8	Out of Hours Work	OOHW during evening and night-time periods will be managed in accordance with relevant Transport's guidelines and policies for managing construction noise and vibration, to provide respite from construction noise. High noise activities, such as saw cutting and jack hammering will be completed before 11pm.	Contractor	Construction	Standard safeguard
NV9	Construction noise – standard work practices	The following universal work practices are to be adopted during construction: • regular identification of noisy activities and adoption of improvement techniques. • avoiding the use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby sensitive receivers • avoiding the use of equipment that generates impulsive noise, where possible • minimising the need for vehicle reversing for example (particularly at night), by arranging for one-way site traffic routes • minimising the movement of materials and plant and unnecessary metal-on-metal contact • minimising truck movements.	Contractor	Construction	Standard safeguard
NV10	Construction noise and vibration – plant and equipment	The following measures are to be adopted during construction to minimise noise impacts associated with plant and equipment: • the noise levels of plants and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H of the CNVG-PTI	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• selecting quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks, where feasible and reasonable • operating plant and equipment in the quietest and most efficient manner • avoiding simultaneous operation of noisy plant, where feasible • plant used intermittently to be throttled down or shut down • maximising the offset distance between noisy plant and adjacent sensitive receivers • noise-emitting plant to be directed away from sensitive receivers • site-based vehicles and mobile plant used on-site must be fitted with broadband reversing alarms to reduce tonal noise impacts • reducing noise from mobile plant through additional fittings, such as silencers			
NV11	Construction noise – behavioural practices	The following good behavioural practices are to be implemented during construction: • no swearing or unnecessary shouting or loud stereos/radios on site • no dropping of materials from height, throwing of metal items and slamming of doors.	Contractor	Construction	Standard safeguard
NV12	Construction noise – monitoring	The following construction noise monitoring is to be undertaken: • attended noise level measurements of typical demolition and ground work activities should be undertaken at site. • attended construction noise surveys of the site and surrounding impacts on neighbours should be undertaken during the following as a minimum: – start of demolition – commencement of any rock breaking or sawing on the site.	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		– in response to any ongoing complaints received from neighbours • any noise monitoring will be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, familiar with applicable standards and procedures the statistical parameters to be measured should include the following noise descriptors: L_{Amin}, L_{A90}, L_{A10}, LA1, L_{Amax} and L_{Aeq}. • any unattended noise measurements should be conducted over consecutive 15-minute periods • monitoring methodology and any equipment required should comply with the requirements in Standard AS 1055.1-1997.			
NV13	Vibration – general measures	Vibration mitigation measures will be outlined in the NVMP. The following measures will be included to minimise vibration impacts: • Undertaking a plant and vibration assessment to identify potential vibration risks to human comfort and cosmetic and structural damage • Where identified as being required, undertake a pre-construction building survey for structures prior to the commencement of activities with the potential to cause property damage • Conducting vibration monitoring at high-risk receptors during construction • Consideration of feasible alternative construction methodologies or equipment where vibration intensive equipment is expected to exceed the criteria.	Contractor	Pre-construction/ construction	Standard safeguard
NV14	Vibration – safe working distances	The following safe working distance measures are to be adopted: • recommended indicative safe working distances for vibration intensive plant are to be complied with • construction vibration safe distances will be validated prior to the start of construction work by undertaking operator-attended measurements of vibration levels	Contractor	Pre-construction/ construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		generated by construction equipment to be used on-site.			
NV15	Vibration – plant and equipment	The following measures are to be adopted during construction to minimise vibration impacts associated with plant and equipment: • selecting plant and equipment with low vibration generation characteristics • any vibration generating plant and equipment is to be in areas within the site to lower the vibration impacts • using lower vibration generating items of construction plant and equipment; that is, smaller capacity plant • undertaking the removal of concrete using saw cutting or pulverising where possible.	Contractor	Construction	Additional safeguard
NV16	Vibration – work scheduling	The following work scheduling management measures will be adopted to reduce construction noise impacts: • Work generating high vibration levels should be scheduled during non-sensitive or less sensitive time periods Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment Minimise conducting vibration generating work consecutively in the same area (if applicable).	Contractor	Pre-construction/ construction	Additional safeguard
NV17	Vibration monitoring	Vibration monitoring is required to confirm vibration magnitudes are within the expected levels. Short-term attended vibration measurements of activities with the potential to generate maximum vibration are required to be undertaken on commencement at the site, including the following: • Measurements to be undertaken at a representative location from the activity being conducted with a similar distance to the potentially affected receiver. Activities with the potential to generate the greatest magnitudes of vibration include hydraulic hammering of concrete slabs and hydraulic hammering during ground works within rock.	Contractor	Pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AQ1	Air quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as a sub-plan to the CEMP. The AQMP will include, but not be limited to: • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA guidelines • mitigation and suppression measures to be implemented • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces. The AQMP will include the following requirements: • plant and equipment will be maintained in good condition and in accordance with manufacturers' specifications • plant and machinery will be turned off when not in use • work activities will be reprogrammed if the management measures are not adequately restricting dust generation • disturbed areas will be minimised in extent and rehabilitated progressively • dust will be suppressed on stockpiles and unsealed or exposed area using methods such as water trucks/hoses, temporary stabilisation methods, soil binders or other appropriate practices • no burning of material on site will be undertaken • visual monitoring of air quality will be undertaken to verify the effectiveness of controls and enable early intervention • vehicles transporting materials and equipment will have their loads covered.	Contractor	Detailed design / Pre-construction	Standard safeguard
AQ2	Air quality	Work will be undertaken in accordance with all safeguards included in Transport's *Air Quality Management Guideline EMF-AQ-GD-0063* (Transport for NSW, 2022).	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SE1	Socio-economic - Social infrastructure	Conduct a survey of existing bike path usage within the proposal area and explore alternative existing bike routes and possible bike path relocation opportunities.	Transport	Detailed design	Additional safeguard
SE2	Socio-economic – Business access	Access to businesses will be maintained during construction. Where temporary changes to access arrangements may be necessary to accommodate work at 1 Talavera Road, prior to any changes in access, consultation will be undertaken with tenants of 1 Talavera Road to determine access requirements and whether out of hours work is required to mitigate the impacts associated with the driveway modifications work at Talavera Road.	Contractor	Pre-construction/ Construction	Additional safeguard
WR1	Waste management	A Waste Management Plan (WMP) will be prepared and implemented as a sub-plan of the CEMP. The WMP will include but not be limited to: • measures to avoid and minimise waste associated with the proposal • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • management of any lead waste in accordance with Australian Standard *AS4361.1- 1995 Guide to Lead Paint Management* (Standards Australia, 1995) • monitoring, record keeping and reporting The WMP will align with Transport's *Waste Management Guideline* (Transport for NSW, 2023) and relevant Transport Waste fact sheets. The following resource management hierarchy principles will be followed: • avoid unnecessary resource consumption as a priority • avoidance will be followed by resource recovery (including reuse of materials reprocessing and recycling and energy recovery	Contractor	Detailed design/ Pre-construction/Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		Disposal will be undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*)			
WR2	Waste management	All wastes will be managed in accordance with Transport's *Waste Management Guideline* and the *Protection of the Environment Operations Act 1997*.	Contractor	Pre-construction/ Construction	Additional safeguard
WR3	Asbestos waste management	Asbestos waste identified on-site must either be disposed of to a landfill licensed to accept asbestos waste, or alternatively safely encapsulated on-site. Transport's *Asbestos in soils management procedure EMF-LM-PR-0020* (Transport for NSW, 2023) provides guidance on how to manage asbestos in soils, including guidance on when encapsulation versus off-site disposal is warranted.	Contractor	Construction	Additional safeguard
WR4	Asbestos waste management	Approval to be sought from Transport for any encapsulation of asbestos on-site. The approval must provide safety, financial, environmental, legal, and reputational justification for the proposed encapsulation.	Contractor	Pre-construction	Additional safeguard
WR5	Asbestos waste management	If on-site encapsulation of asbestos containing material is proposed, a Long-term Environmental Management Plan (LTEMP) containing mitigation measures and/or monitoring requirements will be prepared and implemented. The LTEMP will be submitted to Transport for review and endorsement. The LTEMP will include the following details: • the nature and location of asbestos encapsulations on site • what long-term site management is needed to ensure the ongoing protection of human health and the environment on- and offsite from the encapsulation • a mechanism for legal enforcement of the LTEMP	Contractor	Pre-construction/ Construction	Additional safeguard
WR6	Waste classification	Preliminary waste classification of materials on-site to be undertaken prior to construction. Where asbestos is mixed with other wastes on-site (e.g. in a soil matrix), further waste classification is required by chemical testing.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
WR7	Asbestos waste management	In line with the EPA's requirements: • asbestos waste must be securely packaged at all times • friable asbestos material must be kept in a sealed container • asbestos-contaminated soils (where not securely packaged or sealed) must be wetted down • all asbestos waste must be transported in a covered, leak-proof vehicle • asbestos waste must be disposed of at a landfill site that can lawfully receive this waste.	Contractor	Construction	Additional safeguard
WR8	Asbestos waste management	Records of the following must be kept: • amount and type of asbestos waste generated, stored, treated or disposed of amount and type of asbestos waste transported • name of transporter and transporter's vehicle registration number • date of transportation • name and location of the waste disposal facility	Contractor	Construction	Additional safeguard
WR9	Waste management	Targets for diversion of waste from landfill and optimisation of reuse and recycling to be confirmed in accordance with Transport's *Sustainable Design Guidelines v4.0* (Transport for NSW, 2017).	Contractor	Detailed design/ Pre-construction	Additional safeguard
WR10	Use of recycled materials	Materials with high recycle content (such as concrete with high Supplementary cementitious materials (SCMs) to be adopted. Recycled aggregates to be used where possible. Maximise recycled materials in road base and bedding material.	Contractor	Detailed design/ Construction	Additional safeguard
WR11	Reuse of materials	Detailed design should consider the beneficial re-use of suitable materials onsite to minimise the quantity of waste disposed to landfill. 100% of usable spoil, by weight, to be re-used on-site. Maximise reused materials in road base and bedding material.	Contractor	Detailed design/Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
WR12	Storage of waste	Detailed design to allow for dedicated and appropriately sized waste segregation and storage areas for at least five waste streams. These areas need to be safe and have efficient access for both occupants and waste and resource collection contractors.	Contractor	Detailed design	Additional safeguard
CC1	Climate change risks	The CRA will be updated during detailed design. Detailed design will consider suitable adaptation measures to address all high and very high risks identified in the CRA, which may include flood hazard, power outages, ember attack, heat hazard, thermal performance, solar reflectivity, and future proofing.	Contractor	Detailed design	Additional safeguard
CC2	Staff and asset protection	Detailed design to consider provision of cool spaces for staff to work/rest to avoid heat stress.	Contractor	Detailed design	Additional safeguards
CC3	Energy network resilience	Energy supply resilience and redundancy measures to be applied to reduce the likelihood of power outages on site.	Contractor	Construction/ Operation	Additional safeguards
GG1	Greenhouse gas emissions	Measures to demonstrate energy efficient construction and operations from Green Star Buildings and Transport's SDGs to be implemented.	Contractor	Detailed design/Pre-construction	Additional safeguard
GG2	Greenhouse gas emissions	The procurement strategy developed for the construction phase will demonstrate value for money and consideration for opportunities to procure goods and services: • from local suppliers • that are energy efficient and have low embodied carbon • that minimise generation of waste • that make use of recycled materials	Contractor	Construction	Additional safeguard
GG3	Greenhouse gas emissions	Greenhouse Gas emissions modelling and reporting using the Transport Carbon Tool. Achieve target of 15% reduction in construction greenhouse gas emissions.	Contractor	Detailed design/Construction	Additional safeguard
GG4	Greenhouse gas emissions	Utilise renewable energy to ensure net zero emissions during operations.	Transport / Contractor	Detailed design/Operations	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GG5	Greenhouse gas emissions	Measures included in the *ZEB Macquarie Park Bus Depot Sustainability Plan* to be implemented.	Contractor	Construction	Additional safeguard
GG6	Greenhouse gas emissions	Building design to incorporate Environmental Sustainable Design measures and utilise passive building design to reduce energy demand associated with heating and cooling.	Contractor	Detailed design / Construction	Additional safeguard
OI1	Utilities	Utility adjustments required to accommodate the proposal will be refined during detailed design in consultation with the relevant utilities providers.	Contractor	Detailed design / Pre-construction	Additional safeguard
OI2	Hazards and Risks	A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to • details of hazards and risks associated with the activity (including consideration of bushfire) • measures to be implemented during construction to minimise these risks • record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials • a monitoring program to assess performance in managing the identified risks • contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations. The HRMP will be prepared in accordance withrelevant guidelines and standards, including relevant Safe Work Australia Codes of Practice and EPA publications.	Contractor	Construction	Additional safeguard
OI3	Hazards and Risks - Fire risk during operation	Fire risk associated with the operation of the proposal would be managed in accordance with the *Zero Emission Buses Greater Sydney Tranche 1 - Macquarie Park Asset Fire Life Safety Strategy Report* (WSP Australia Pty Ltd, 2024) and in consultation with Fire and Rescue NSW.	Transport	Operation	Additional safeguard
OI4	Bushfires	To minimise risks associated with bushfires non-combustible materials are to be incorporated into the detailed design.	Contractor	Detailed design	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
OI5	Bushfires	A maintenance regime is required to reduce the build-up of debris and rubbish on-site during construction and operation to minimise bushfire risk	Contractor/Transport	Construction/Operation	Additional safeguard
OI6	Bushfires	In the event of a bushfire impacting the operation of the depot, suitable diversion routes are to be identified and utilised to minimise impact on bus operations.	Transport	Detailed design/Operation	Additional safeguard
OI7	Bushfires – ember attack	During detailed design, the requirements of Bushfire Attack Level (BAL) BAL-12.5 are to be followed to mitigate the risk from ember attack. This would include the use of non-combustible materials, such as steel and concrete, which is already envisaged for many of the built elements.	Contractor	Detailed design	Additional safeguard
CI1	Cumulative impacts	Current and upcoming projects with the potential to interact with the proposal will be monitored, as further information regarding the location and timing of surrounding potential developments is released. Where potential cumulative impacts are identified, the scheduling of work will be coordinated with interacting projects where feasible to minimise potential impacts. This will include: • scheduling work to allow suitable respite periods for construction noise • scheduling of work to minimise consecutive construction noise impacts, where feasible • coordinating lane closures and pedestrian/cyclist diversions to minimise the overall number of occasions where disruption occurs.	Contractor	Detailed design / pre-construction	Additional safeguard

7.3 Licensing and approvals

Table 7-2 provides a summary of the licences and approvals required to construct and operate the proposal.

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
EP&A Act	Determination under Division 5.1 of the EP&A Act	Prior to start of the activity.
Roads Act 1993 (Section 138)	Road occupancy licence to carry out work that would impact on the operational efficiency of the road network.	Prior to work on public roads.

8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in section 193 of the Environmental Planning and Assessment Regulation 2021.

8.1 Justification

While the proposal would result in some environmental impacts, including biodiversity, visual impact, traffic and transport, noise and vibration, and socio-economic impacts, these potential impacts have been minimised through appropriate design measures and site-specific mitigation measures and safeguards.

The 'do nothing' option does not address the need to transition to battery electric buses, and the Macquarie Park site was the only suitable site that met the development criteria for a new battery electric bus depot able to accommodate the transition to zero emissions technology.

The proposal is consistent with a number of strategic plans and policy documents and has been developed to address the need to achieve future sustainable transport in NSW, and the NSW Government's net zero emissions targets.

The proposal would result in long-term benefits which would outweigh the identified impacts and risks associated with this proposal.

8.1.1 Social factors

The proposal would result in some temporary negative social factors, resulting from disturbance during construction activities, generally attributed to construction noise and vibration, dust, bike lane closure, increased vehicle/traffic movements, and reduced visual amenity due to the removal of trees and vegetation, along with the presence of construction plant and equipment.

However, in the long-term, transitioning the NSW public bus fleet from diesel and CNG to zero emissions technology and generating renewable energy within the depot, will result in permanent positive social factors during operation of the proposal, including reductions in operational greenhouse gas emissions, bus noise and air pollution, which would in turn provide public health and amenity benefits. This is in alignment with government policy.

8.1.2 Biophysical factors

The proposal would result in clearance of 2.2 hectares of vegetation and the removal of 332 trees within the proposal boundary; however, the loss would be offset through replanting and artificial hollow replacement in line with Transport's *Tree and Hollow Replacement Guidelines*, or alternatively via a calculated contribution to Transport's Conservation Fund.

Assessments of Significance have been carried out for threatened species that may be impacted by the proposal. The assessments found that the proposal is not likely to significantly impact threatened species or ecological communities, or migratory species, or their habitats within the meaning of the BC Act and EPBC Act. Therefore, a Statement of Significance or BDAR is not required, and a Commonwealth referral under the provisions of the EPBC Act is also not required.

The proposal would require excavation, removal of vegetation, disturbance of soils and the construction of road surfaces and drains, which may lead to exposed soils, sediment entering waterways and the degradation of water quality. These potential impacts would be minimised through the implementation of standard sediment and erosion control measures.

A Detailed Site Investigation was undertaken within the proposal boundary, which identified potential sources of contamination on-site, particularly the presence of asbestos containing material. Contamination risks could lead to impacts on human health and ecological receptors within the vicinity of the proposal. Appropriate safeguards and management measures have been identified to remediate and minimise these contamination risks.

8.1.3 Economic factors

Transitioning to battery electric buses will offer several economic benefits that contribute to a more sustainable and efficient public transport system, including reduced operating costs, improved fuel security and cost certainty.

Quieter, more comfortable, and environmentally friendly buses could also encourage more people to use public transport instead of private cars, which would generate additional revenue and contribute to the overall economic viability of the proposal.

The proposal would result in increased efficiencies in bus operations and maintenance and would also create increased opportunities for local investment including in manufacturing, assembly, training and education.

8.1.4 Public interest

The proposal represents a cost-efficient investment in public infrastructure that would maximise the long-term environmental, social, and economic benefits, while minimising the long-term negative impacts on communities and the environment.

The proposal would improve local transport infrastructure through improved passenger experience.

8.2 Objects of the EP&A Act

Table 8-1: Objects of the Environmental Planning and Assessment Act 1979

Instrument	Requirement
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal would improve the social and economic welfare of the community during operation. However, during construction, the community and businesses in the area of the proposal would be likely to experience noise, vibration, air quality, and visual impact associated with construction activities. The proposal design, impact, safeguards, and management measures detailed in this REF allow for the proper management, development, and conservation of natural and artificial resources.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The principles of ecologically sustainable development are considered in Section 8.2.1. Chapter 6 of this REF has considered relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.
1.3(c) To promote the orderly and economic use and development of land.	The proposal is consistent with plans for the future development at Macquarie Park.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposal.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The proposal would have some impact on the natural environment, as detailed in Section 6.1. Safeguards and management measures have been proposed in Section 6.6.4 to mitigate any impacts.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposal is not expected to impact Aboriginal cultural heritage or non-Aboriginal heritage items.
1.3(g) To promote good design and amenity of the built environment.	Urban design principles from *Beyond the Pavement 2020* have been incorporated into the concept design. The proposal will be undertaken in accordance with the urban design vision and objectives in Section 2.3.3. These will ensure good design and amenity of the built environment.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Health and safety considerations will be incorporated into the detailed design for the buildings proposed on-site. Climate resilience measures will be implemented to protect workers from heat and ensure their safety.

Instrument	Requirement
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the proposal.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Consultation undertaken to date and proposed future consultation is outlined in Chapter 5. There would be opportunities for the public to comment on the proposal during the public display of the REF.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed as follows.

The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during options development (refer to Chapter 2). The precautionary principle has guided the assessment of environmental impacts for this REF and the development of safeguards and management measures (Chapter 7).

Specialist studies were incorporated to gain a detailed understanding of the existing environment, and issues that may cause serious or irreversible environmental damage as a result of the proposal have been identified. Conservative 'worst case' scenarios were considered while assessing environmental impact.

Safeguards have been developed to minimise potential impacts and would be implemented during construction and operation of the proposal. In particular, a CEMP would be prepared prior to construction to ensure the proposal achieves a high level of environmental performance.

Intergenerational equity

Intergenerational equity refers to the principle that the present generation should ensure that the health, diversity, and productivity of the environment is maintained or enhanced for the benefit of future generations.

The proposal may have some adverse impact on the current generation, generally through temporary construction impacts. However, these impacts are not considered to be of a nature or extent that would be likely to adversely impact on the health, diversity, or productivity of the environment for future generations.

The proposal would have major positive long-term benefits for future generations by supporting the transition from diesel and CNG buses to zero emissions technology, which would reduce operational greenhouse gas emissions, improve air quality which would in turn result in public health and amenity benefits. Should the proposal not proceed, future generations would not experience these long-term benefits.

Conservation of biological diversity and ecological integrity

This principle states: "*the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival*".

An assessment of the existing local environment has been carried out to identify and manage any potential impact of the proposal on local biodiversity. The proposal is located in an area that has previously been modified or disturbed as a result of urban development.

The proposal would result in the clearance of 2.2 hectares of vegetation and the removal of 332 trees from within the proposal boundary. Of these, 31 are hollow-bearing and suitable for occupation by fauna. The loss would be offset through replanting and artificial hollow replacement in line with Transport's *Tree and Hollow Replacement Guidelines*, or alternatively via a calculated contribution to Transport's Conservation Fund.

The Assessments of Significance, carried out for threatened species that have the potential to be impacted by the proposal, found that the proposal is not likely to significantly impact threatened species or ecological communities, or migratory species, or their habitats within the meaning of the BC Act and EPBC Act.

The concept design has been developed in accordance with urban design principles. A draft Urban Landscape Plan, which forms part of the Urban Design Report, has been developed as part of the concept design and includes replacement planting to offset the loss. A UDLP will be developed and refined during the detailed design process.

Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources that may be affected by the carrying out of a project, including air, water, land and living things.

Transport recognises the value of environmental resources and aims to minimise the impacts of its activities by ensuring that appropriate safeguards and management measures are implemented for all aspects of the proposal. Economic and social issues were considered in the rationale for the proposal and consideration of design options.

8.3 Conclusion

The proposed battery electric bus depot at 1A and 1B Talavera Road, Macquarie Park is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the *National Parks and Wildlife Act 1974* (NSW), biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats, and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal, as described in the REF, best meets the proposal objectives but would still result in some impacts on biodiversity, noise and vibration, socio-economic and visual impact. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts.

However, in the long-term, transitioning the NSW public bus fleet from diesel and CNG to zero emissions technology and generating renewable energy within the depot, will result in permanent positive social factors during operation of the proposal, including reductions in operational greenhouse gas emissions, bus noise and air pollution, which would in turn provide public health and amenity benefits.

On balance, the proposal is considered justified, and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared nor approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from City of Ryde Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance nor the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999 (*Commonwealth). A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

9. Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.

Name:	[redacted]
Position:	Principal Environmental Consultant
Company name:	AtkinsRéalis
Date:	21 May 2024

I certify that I have reviewed and endorsed the contents of this REF and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under Section 170 of the EP&A Regulation, and the information is neither false nor misleading. I accept it on behalf of Transport for NSW.

[redacted]

Name:	[redacted]
Position:	Senior Manager Environment and Sustainability
Transport program:	Zero Emission Buses
Date:	24 May 2024

[redacted]

Name:	[redacted]
Position:	Project Manager
Transport program:	Zero Emission Buses
Date:	29 May 2024

10. EP&A Regulation publication requirement

Table 10-1: EP&A Regulation publication requirement

Requirement	Yes/No
Does this REF need to be published under section 171(4) of the EP&A Regulation?	Yes

11. References

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Terms and acronyms used in this REF

Table 11-1: Terms and acronyms used in this REF

Term / Acronym	Description
µ/m³	Micrograms per cubic metre
ABS	Australian Bureau of Statistics
ACM	Asbestos containing material
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AIA	Arboricultural Impact Assessment
AOBV	Area of outstanding biodiversity value
AQC	Air quality category rating
AQF	Australian Qualifications Framework
AQMP	Air Quality Management Plan
ARI	Average Recurrence Interval represents flood magnitude and potential likelihood
ASRIS	Australian Soil Resource Information System
ASS	Acid sulfate soils
BAL	Bushfire Attack Level
BC Act	*Biodiversity Conservation Act 2016 (NSW)*
BDAR	Biodiversity Development Assessment Report
BEB	Battery electric bus
BGL	Below Ground Level
BOM	Bureau of Meteorology
BSRs	Baseline Sustainability Requirements
BTR	Build-to-Rent
BVMTT	Biodiversity Values Map and Threshold Tool
BYDA	Before You Dig Australia
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CFA	Continuous flight auger
CLM Act	*Contaminated Land Management Act 1997*
CLMP	Community Liaison Management Plan
CNG	Compressed Natural Gas
CNVG-PTI	*Construction Noise and Vibration Guideline – Public Transport Infrastructure 2023*
CO	Carbon monoxide
CRA	Climate Risk Assessment
CTMP	Construction Traffic Management Plan
DA	Development Application
dB(A)	A-weighted decibel
DBH	Diameter at Breast Height

Term / Acronym	Description
DC	Direct current
DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DO	Dissolved Oxygen
DP	Deposited Plan
DPE	Former Department of Planning and Environment
DPHI	Department of Planning, Housing and Infrastructure
DPIE	Former Department of Planning, Industry and Environment
DSI	Detailed Site Investigation
DUAP	Department of Urban Affairs and Planning
EC	Electrical Conductivity
ECM	Environmental control map
EPL	Environment Protection Licence
ERP	Estimated resident population
EV	Electric Vehicle
EP&A Act	*Environmental Planning and Assessment Act 1979 (NSW).* Provides the legislative framework for land use planning and development assessment in NSW
EP&A Regulation	*Environment Planning and Assessment Regulation 2021*. Prescribes the minimum environmental factors which must be considered when determining if an activity assessed under Division 5.1 of the EP&A Act has or is likely to have a significant effect on the environment.
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*. Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
ESCP	Erosion and Sediment Control Plan
EVCU	Electric vehicle charging units
FM Act	*Fisheries Management Act 1994 (NSW)*
FRMSP	Floodplain Risk Management Study and Plan
GDE	Groundwater dependent ecosystems
GREP	Government Resource Efficiency Policy
GTFS	General Transit Feed Specification
HRMP	Hazard and Risk Management Plan
HV	High voltage
Hz	Hertz
IACA	Institute of Australian Consulting Arborists
ICNG	NSW Interim Construction Noise Guidelines
IOF	IOF facility
JRCP	Jointed reinforced concrete pavement

Term / Acronym	Description
KFH	Key Fish Habitat
kg	Kilograms
kN	Kilonewton
kPa	Kilopascals. A unit of pressure.
KTP	Key threatening processes
kV	Kilovolt
kW	Kilowatts
LED	Light emitting diode
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area
LOR	Limit of reporting
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
LPR	Licence Plate Recognition
LSPS	Local Strategic Planning Statement
LTEMP	Long-term Environmental Management Plan
LV	Low voltage
mm	millimetres
MNES	Matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).*
Mt CO2-e	Million tonnes of carbon dioxide equivalent
MVA	Megavolt amp
NABERS	National Australian Built Environment Rating System
NCA	Noise Catchment Area
NEPM	National Environment Protection Measure
NML	Noise management level
NpfI	Noise Policy for Industry
NPI	National Pollution Inventory
NVIA	Noise and Vibration Impact Assessment
NVMP	Noise and Vibration Management Plan
OEH	Office of Environment and Heritage within the Department of Planning and Environment.
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PCT	Plant Community Type
PFOS	Perfluorooctane sulfonic acid
PMF	Probable Maximum Flood
POEO Act	*Protection of the Environment Operations Act 1997*
PMST	Protected Matters Search Tool
pphm	Parts per hundred million
PPV	Peak Particle Velocity
PSI	Preliminary Site Investigation

Term / Acronym	Description
PSNTL	Project-specific noise trigger levels
QA Specifications	Specifications developed by Transport for use with road work and bridge work contracts let by Transport.
RBL	Rated Background Level
RCBC	Reinforced Concrete Box Culvert
RFS	Rural Fire Service
RSW	Reinforced soil wall
REF	Review of Environmental Factors
Roads Act	*The Roads Act 1993*
SA1s	Statistical Area Level 1
SCM	Supplementary Cementitious Materials
SDG	Sustainable Design Guidelines
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SIS	Species Impact Statement
SRZ	Structural Root Zone
SSR	Site storage requirements
ST	Steel Tube
STARS	Significance of a Tree Assessment Rating System
SWL	Sound Power Level
SWL	Standing water level
SWMP	Soil and Water Management Plan
SVTM	State Vegetation Type Map
TEC	Threatened ecological communities
TERM	Transport Enterprise Risk Management
TOC	Top of casing
TPZ	Tree protection zone
Transport	Transport for NSW
UDLP	Urban design and landscape plan
ULE	Useful Life Expectancy
URP	Usual resident population
VC	Vitrified clay
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
WMP	Waste Management Plan
WSUD	Water sensitive urban design
ZEB	Zero Emission Bus

Appendix A – Consideration of section 171 factors and matters of national environmental significance and Commonwealth land

Section 171 Factors

In addition to the requirements of the Guideline for Division 5.1 assessments (DPE 2022) and the Roads and Related Facilities EIS Guideline (DUAP 1996) as detailed in the REF, the following factors, listed in section 171 of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor		Impact
a	Any environmental impact on a community? The proposal would have adverse community impacts during construction (noise and vibration, socio-economic and visual amenity) but the transition to ZEB and operation of the proposal would provide positive benefits over the long-term.	Short-term negative Long-term positive
b	Any transformation of a locality? The proposal area would undergo temporary transformation during construction due to the removal of trees and vegetation and earthwork required to level the site. The proposal would result in a permanent change in level differences of the site, as well as introduced bus movement activity to/from and within the ZEB depot.	Short-term minor negative
c	Any environmental impact on the ecosystems of the locality? The proposal would result in impacts to native animals and plants, ecological communities and their habitats, including the clearance of 2.2 hectares of vegetation and the removal of 332 trees from within the proposal boundary. However, the loss would be offset through replanting and artificial hollow replacement in line with Transport's *Tree and Hollow Replacement Guidelines*, or alternatively via a calculated contribution to Transport's Conservation Fund. Impacts to threatened species have been assessed as not significant with appropriate safeguards and management measures to protect flora and fauna in place. These measures are detailed in Section 6.1.4.	Short-term negative
d	Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? During construction, the proposal would have the potential to result in a reduction in the existing aesthetic quality of the proposal, due to dust, noise generation and visual impacts. Temporary visual impacts during construction would be exacerbated by vegetation clearance and tree removal. The presence of placement/movement of construction vehicles within the proposal, reducing the existing vegetated amenity in the vicinity of the proposal. Permanent visual impacts of the new depot would be experienced by neighbouring visual receptors during operation. Permanent impacts would reduce over time as any tree planting and landscaping becomes established.	Short-term negative Long-term negative
e	Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The proposal is not expected to affect Aboriginal or non-Aboriginal heritage. No impacts on heritage items have been identified. Safeguards have been proposed to address the potential for unexpected finds.	Negligible
f	Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? The proposal would result in the clearance of 2.2 hectares of vegetation and the removal of 332 trees within the proposal boundary. Of these, 31 are hollow-bearing and suitable for occupation by fauna.	Short-term negative

Factor		Impact
	The biodiversity assessment concluded that the proposal would not have a significant biodiversity impact on any species protected under the EPBC Act or BC Act. Impacts would be minimised through the implementation of a range of safeguards outlined in Chapter 6 of this REF.	
g	Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal is unlikely to endanger any species of flora or fauna, with the proposed safeguards and management measures in Chapter 6 of this REF.	Nil
h	Any long-term effects on the environment? The removal of 332 trees would have a long-term negative impact on the existing environment. However, the loss would be offset through replanting and artificial hollow replacement in line with Transport's Tree and Hollow Replacement Guidelines, or alternatively via a calculated contribution to Transport's Conservation Fun The proposal would provide positive benefits over the long-term. The operation of ZEB would result in reductions in operational greenhouse gas emissions and air pollution, which would in turn provide public health and amenity benefits.	Short-term negative Long-term, major, positive
i	Any degradation of the quality of the environment? During construction, water quality could be reduced by pollutants such as sediment, soil nutrients, waste, and spilt fuels and chemicals entering drainage lines and creeks. The visual amenity of nearby sensitive receivers may be impacted by the loss of tree screening and the presence of construction activities, plant and equipment.	Short-term, minor, negative
j	Any risk to the safety of the environment? The battery electric buses contain lithium-ion batteries, which have potential to be a fire risk. Fire protection infrastructure has been incorporated into the design to minimise the risk of fires.	Long-term, negative
k	Any reduction in the range of beneficial uses of the environment? The proposal would not reduce the range of beneficial uses of the environment	Nil
l	Any pollution of the environment? The proposal would have the potential to result in some minor, negative short-term pollution risks resulting from sedimentation, waste, and spilt fuels and chemicals. Short-term noise and air quality impacts are expected during construction from plant and machinery and the generation of dust. With the implementation of the proposed safeguards and mitigation measures outlined in Chapter 6 of this REF, no pollution of the environment is expected.	Short-term negative
m	Any environmental problems associated with the disposal of waste? Asbestos waste identified on site would either be removed from site and disposed of at a licenced facility that accepts asbestos waste, or alternatively safely encapsulated on-site. Other waste generated during construction would be removed from the site and disposed of legally.	Short-term negative
n	Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposal would not increase demand for resources, which are, or are likely to become, in short supply.	Nil

Factor		Impact
o	Any cumulative environmental effect with other existing or likely future activities? There are potential cumulative construction noise, traffic and visual impacts associated with other planned developments in the area. This can be adequately addressed through the proposed safeguards and management measures, including coordination with other projects where required.	Short-term negative
p	Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposal is not within the coastal zone and would not influence coastal processes and/or coastal hazards	Nil
q	Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1, The relevant regional strategic plan is the *Greater Sydney Region Plan: A Metropolis of Three Cities* (Greater Sydney Commission, 2018) The relevant district plan is the *North District Plan* (Greater Sydney Commission, 2018). The relevant local strategic planning statement is *Planning Ryde Local Strategic Planning Statement 2020* (City of Ryde Council, 2020). The consistency of the proposal with these documents is considered in Section 2.1 of the REF.	Consistent
r	Other relevant environmental factors. The proposal would not impact on any other environmental factors.	In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Chapter 6 of this assessment.

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Department of Climate Change, Energy, the Environment and Water.

A referral is not required for proposed actions that may affect nationally-listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor		Impact
a	Any impact on a World Heritage property? The proposal would not have any impact on a World Heritage property.	Nil
b	Any impact on a National Heritage place? The proposal would not have any impact on a National Heritage place.	Nil
c	Any impact on a wetland of international importance? The proposal would not impact on a wetland of international importance.	Nil
d	Any impact on a listed threatened species or communities? The proposal would not impact on any threatened species or communities. Safeguards to manage impacts on threatened species are detailed in section 6.1.4.	Nil
e	Any impacts on listed migratory species? The proposal would not impact on any listed migratory species.	Nil
f	Any impact on a Commonwealth marine area? The proposal would not impact on a Commonwealth marine area.	Nil

Factor		Impact
g	Does the proposal involve a nuclear action (including uranium mining)? The proposal would not involve a nuclear action.	Nil
h	Additionally, any impact (direct or indirect) on the environment of Commonwealth land? The proposal would not impact (either directly or indirectly) on Commonwealth land.	Nil

Appendix B – Statutory consultation checklists

Transport and Infrastructure SEPP

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No		Section 2.112
Bus Depots	Does the project propose a bus depot?	Yes	City of Ryde Council and the occupiers of adjoining land	Section 2.112
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No		Section 2.112

Development within the Coastal Zone

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No		Section 2.14

Note: See interactive map at ***Planning Portal NSW spatial viewer - find a property***. Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program.

Council related infrastructure or services

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	No		Section 2.10
Traffic	Are the works likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area?	No		Section 2.10
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will	No		Section 2.10

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
	this connection have a *substantial* impact on the capacity of any part of the system?			
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No		Section 2.10
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	No		Section 2.10
Road & footpath excavation	Will the works involve more than *minor* or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	City of Ryde Council as the relevant Roads Authority	Section 2.10

Local heritage items

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	No		Section 2.11

Flood liable land

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	Yes	City of Ryde Council	Section 2.12
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance?	Yes	State Emergency Services Email: rra@ses.nsw.gov.au	Section 2.13

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government.

Public authorities other than councils

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	No	Environment and Heritage Group, DPHI	Section 2.15
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Environment and Heritage Group, DPHI	Section 2.15
Navigable waters	Do the works include a fixed or floating structure in or over navigable waters?	No	Transport for NSW - Maritime	Section 2.15
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service (RFS) [Refer to the NSW RFS publication: *Planning for Bush Fire Protection (2006)*]	Section 2.15
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	Section 2.15
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in section 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	Secretary of the Commonwealth Department of Defence	Section 2.15
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	Mine Subsidence Board	Section 2.15

Appendix C – Biodiversity Assessment Report

Appendix D – AHIMS search result

Appendix E – Traffic and Transport Assessment

Appendix F – Noise and Vibration Impact Assessment

Appendix G – Socio-economic Assessment

Appendix H – Arboricultural Impact Assessment

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