

Picton Road upgrade between Nepean River and Almond Street, Wilton

Review of Environmental Factors

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Transport
for NSW



Acknowledgement of Country

The Picton Road is on Dharawal Country. Transport for NSW recognises and celebrates the diversity of Aboriginal peoples and their ongoing culture, spiritual beliefs and connections to Country.

We acknowledge Aboriginal Elders past and present and thank Aboriginal stakeholders and Registered Aboriginal Parties for your continued communications and consultation during these early stages of development.

As part of planning for the upgrade, Transport has carried out investigations and worked with Dharawal knowledge holders, Registered Aboriginal Parties, Traditional Owners and other Aboriginal stakeholders to understand potential impacts to Aboriginal heritage and cultural values.

These investigations have included workshops, interviews, walks on Country, consultation events and forums to collect information about cultural heritage in the Picton Road area.

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 on 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.



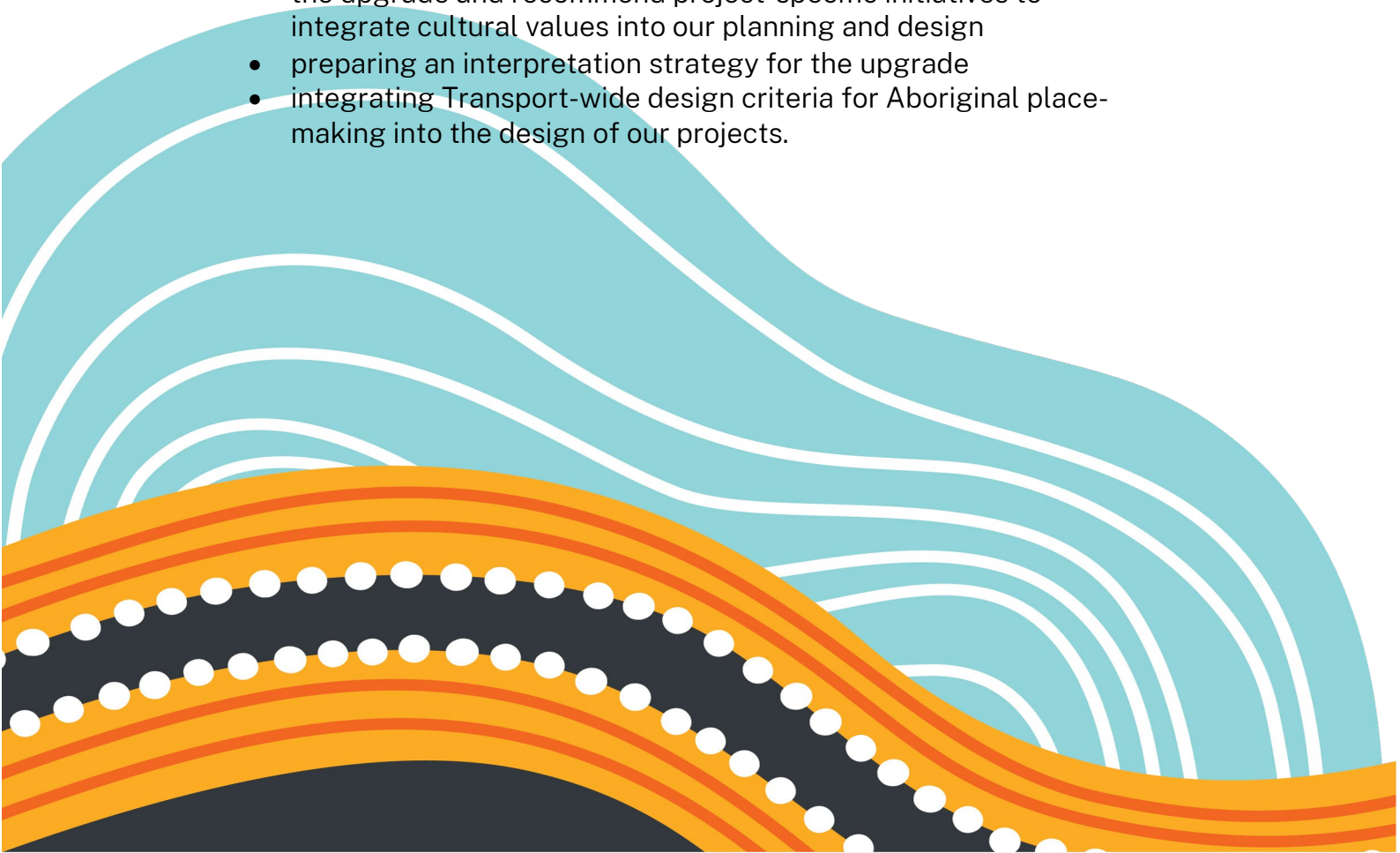
Connecting with Country Statement

Transport is committed to supporting the health and wellbeing of Country through the integration of Aboriginal cultural knowledge into the planning and design of the Picton Road upgrade.

We are doing this by talking to Aboriginal people with connection to Country throughout the development of the project and ensuring there are opportunities for them to co-lead development and design decisions.

Planning with Country for the Picton Road upgrade includes:

- early consultation with Aboriginal people with connection to Country to better understand the cultural values of the area and engage with ideas about how to integrate cultural values into the planning and design of the upgrade
- seeking to avoid negative impacts on known artefacts and places of significance through design and planning
- consulting with Aboriginal knowledge holders about how to represent cultural knowledge publicly
- establishing a Planning with Country working group with Aboriginal knowledge holders to develop a cultural narrative for the upgrade and recommend project-specific initiatives to integrate cultural values into our planning and design
- preparing an interpretation strategy for the upgrade
- integrating Transport-wide design criteria for Aboriginal place-making into the design of our projects.



Executive summary

The proposal

Transport for NSW (Transport) proposes to upgrade Picton Road between the Nepean River and Almond Street in Wilton, New South Wales (NSW) (the proposal). The proposal includes upgrading the section of Picton Road from about 1.3 kilometres east of the bridge over the Nepean River to about 200 metres east of Almond Street, including the M31 Hume Motorway interchange.

The proposal forms the western section of the broader Picton Road upgrade, which involves upgrading about 30 kilometres of Picton Road between the Nepean River and the M1 Princes Motorway.

Key features of the proposal include:

- widening and upgrading Picton Road for a distance of about five kilometres between the Nepean River and Almond Street to provide:
 - a minimum of two 3.5 metre-wide traffic lanes in each direction with a central median, increasing to three traffic lanes in each direction approximately between the Wilton Park Road and Aerodrome Drive intersection and the Pembroke Parade and Greenway Parade intersection
 - three-metre-wide shoulders on the left lane side in each direction
- upgrading the existing Picton Road and M31 Hume Motorway interchange into a diverging diamond layout, including:
 - removing the existing Picton Road bridge and constructing two new bridges over the M31 Hume Motorway
 - upgrading and realigning on and off ramp connections with the M31 Hume Motorway to suit the new interchange layout and to allow free flow of traffic between Picton Road and the M31 Hume Motorway
 - providing a new four-metre-wide shared user path along the southern bridge
 - removing the existing traffic signals on Picton Road and installing new traffic signals with more efficient phasing and more traffic capacity
- new and upgraded shared paths on Picton Road, including underpasses under the southbound on ramp connections to the M31 Hume Motorway and an overpass of the northbound off ramp connection from the M31 Hume Motorway, located:
 - adjacent to the westbound slow lane of the proposal from the western extent to around 420 metres west of Almond Street to connect with planned active transport infrastructure to be delivered as part of the South East Wilton development
 - adjacent to the eastbound slow lane between Aerodrome Drive and the western extent of the proposal and between Pembroke Parade and Almond Street
- reconfiguring the existing Picton Road intersections with Wilton Park Road, Aerodrome Drive, Janderra Lane and Almond Street into left in, left out only (the timing of delivery of the reconfigured Almond Street intersection is subject to confirmation of timeframes for delivery of other road works planned at the intersection)
- integration with new traffic signals and widening roadworks constructed in 2023 at the intersection of Picton Road and Pembroke Parade and Greenway Parade
- adjusting the posted speed from the western extent of the proposal, through the interchange and to the east of Pembroke Parade to 60 kilometres per hour.

Subject to approval and construction funding, works are anticipated to commence between 2026 and 2027, and are estimated to take about three years to complete.

Staging of the proposal and interfaces with other projects

The proposal is located within the Wilton Growth Area. The NSW Government's Wilton Growth Area infrastructure phasing plan identifies critical infrastructure upgrades that are required to be delivered by private developers over the next 20 years to support traffic movement across the Wilton Growth Area and access to Picton Road.

These private developer funded and delivered upgrades do not form part of the proposal; however, the future interface and timing of them has been considered as part of this proposal. Where practical and based on information available to date, the proposal has provided space allowances to assist in delivering future infrastructure upgrades onto and over Picton Road. The intersection arrangements with local roads within the proposal are planned to be superseded by or work in conjunction with upgrades included in the infrastructure phasing plan.

Changes to the current arrangement of Almond Street and Janderra Lane, to left in and left out, have been designed to complement developer-led overpasses and Picton Road connections that would enable existing movements to be maintained at these intersections. The infrastructure phasing plan includes the relocation and upgrade of the Wilton Park Road and Aerodrome Drive intersection to a signalised arrangement west of the existing location. The arrangement for this intersection included in the proposal is considered to be an interim arrangement to maintain safe access to these local roads until the signalised intersection is built by the private developers.

The timing of construction of the developer-led Almond Street intersection upgrade relative to the timing of construction for the proposal is currently unknown. As a result, the proposal may be constructed as a whole or in two stages depending on the timing of the developer-led works at this location:

- Stage 1 – Picton Road upgrade between the Nepean River and about one kilometre east of Pembroke Parade. The existing arrangement of Picton Road east of stage 1 including Almond Street would be maintained.
- Stage 2 – Picton Road upgrade from one kilometre east of Pembroke Parade to about 200 metres east of Almond Street. It is intended that this section of the proposal is not constructed until such time as the developer-led overpass and Picton Road connections are in place at this location.

Need for the proposal

Picton Road is an important transport corridor linking the Illawarra Shoalhaven region with Greater Sydney and the Wilton and Greater Macarthur Growth Areas. It is one of two major east-west links between the M31 Hume Motorway and the M1 Princes Motorway. Identified as a National Key Freight Route, Picton Road provides an important connection linking Port Kembla and the Illawarra Shoalhaven region to the rapidly expanding Western Sydney industrial precincts, the Western Sydney Parklands and Aerotropolis, Western Sydney International Airport, and Moorebank Intermodal Terminal.

Picton Road experiences high traffic volumes, with around 22,000 vehicles per day using the road. Around 23 per cent of this traffic comprises heavy vehicles. Traffic volumes are forecast to substantially increase over the next 20 years, with traffic demand during peak hours at the interchange with the M31 Hume Motorway projected to increase by 70 to 90 per cent by 2046.

As traffic volumes increase over time, existing issues associated with the performance of the interchange with the M31 Hume Motorway are expected to cause further traffic delays and queuing on Picton Road and the M31 Hume Motorway, particularly during peak hours. In its current state, Picton Road would not be able to adequately service forecast increases in traffic and freight demand.

The intersections and Picton Road within the proposal site perform poorly in terms of road safety, with 33 crashes recorded within the five-year period from 2018 to 2022, including 11 serious injury and one fatality crashes.

Picton Road will play a key role in opening up substantial employment and business opportunities in the future, fostering and supporting connectivity and creating great places to live. The proposal would improve safety, accessibility and efficiency for transport customers and residents in new and emerging housing developments, better connecting them to diverse employment opportunities and to retail, health, education and recreation facilities.

Proposal objectives

The objectives of the proposal are to:

- improve safety for users of the corridor
- improve efficiency and access for freight
- increase connectivity and liveability for communities serviced by the corridor, while supporting sustainable transport choices
- enable more reliable and efficient trips between Western Sydney, Wilton New Town and the Illawarra Shoalhaven to support future growth
- provide a resilient transport corridor that seeks to protect cultural heritage and the environmental outcomes, by conserving biological diversity, balancing resource consumption and responding to climate change.

Options considered

Design development has involved a process of identifying and evaluating options and refining the design with consideration of key environmental, land use, community, constructability and design constraints while achieving the proposal objectives.

The options assessment process for the Picton Road interchange with the M31 Hume Motorway carried out between 2011 and 2022 considered 13 interchange options through a multi-criteria shortlisting assessment process. The three options shortlisted in 2021 comprised the following signalised interchange arrangements:

- diverging diamond interchange
- free flow trumpets
- signalised double point diamond with flyover.

The diverging diamond interchange was determined to provide the most improvement in safety, traffic flow and overall efficiency while minimising potential environmental and construction impacts, and delivering better community outcomes.

This unique design provides additional lanes for traffic to cross the interchange under the safety of traffic signals which then allows for free flowing turns when exiting and entering Picton Road onto the M31 Hume Motorway. Right turn movements from Picton Road onto the M31 Hume Motorway would only pass through one set of traffic signals across the whole interchange and the traffic signals would have simplified phasing, providing increased green time. Overall, the diverging diamond interchange would reduce queuing and improve the efficiency and safety of the interchange. Whilst this design is new to NSW drivers, examples from other states and internationally demonstrate it would be easy and safe to navigate.

Options for other key features of the proposal such as the widening of Picton Road and intersections with local roads were also considered taking into account works planned as part of the NSW Government Wilton Growth Area infrastructure phasing plan, safety, traffic demand and environmental constraints. The proposed design provides further benefits such as:

- reducing environmental impacts on areas of high environmental value while providing a more functional and safer roadway that services projected traffic demand
- widening the existing road corridor instead of constructing a new road corridor, minimising impacts on adjacent land uses and properties
- providing safer active transport connectivity for the Wilton Growth Area
- minimising risks, impacts on transport users and property owners during construction.

Statutory and planning framework

The proposal is categorised as development for the purpose of road infrastructure facilities and is to be carried out by or on behalf of a public authority. Under Section 2.109 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) the proposal is permissible without consent. The proposal can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent from Wollondilly Shire 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.

A referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is not required.

Community and stakeholder consultation

Consultation has been carried out with the local community and key stakeholders throughout the development of the overall Picton Road upgrade since 2021.

During the development of the proposal, Transport has sought input on the design and potential impacts of the proposal from the community and key stakeholders, including:

- affected landowners and resident groups such as Bingara Gorge Residents Association and Wilton Action Group
- the Aboriginal community, registered parties and groups including Tharawal Local Aboriginal Land Council
- potentially affected service providers such as emergency services, freight industry businesses and groups, and utility authorities
- local and state government agencies, including Wollondilly Shire Council, WaterNSW and the Department of Planning and Environment.

There is general support for the proposal as it will improve safety and connectivity for all road users and service current and future traffic demand. Key issues raised during consultation and addressed in the REF include:

- cost and environmental impact of the proposal
- traffic impacts during construction
- capacity of the proposal to cater for future growth
- interface with other developments and infrastructure projects
- impacts to private property
- incorporation of public and active transport into the proposal
- incident resilience.

This community and stakeholder consultation has informed, and will continue to inform, further development of the proposal and the environmental assessment.

Environmental impacts

Biodiversity

The proposal has the potential to result in clearing of up to about 11.50 hectares of native vegetation, which includes:

- up to about 4.87 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion / Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, listed as critically endangered under the *Biodiversity Conservation Act 2016* (BC Act) and under the EPBC Act
- up to about 6.63 hectares of Shale Sandstone Transition Forest in the Sydney Basin Bioregion, listed as endangered under the BC Act and critically endangered under the EPBC Act.

In addition to the above, the proposal would potentially impact about 1.6 hectares of land mapped as certified-urban capable land under the Cumberland Plain Conservation Plan (CPCP) that does not require assessment of potential impacts on biodiversity in accordance with the BC Act or the EPBC Act.

The 11.50 hectares of native vegetation potentially impacted comprise:

- up to 1.26 hectares of potentially suitable habitat for the threatened flora species Thick Lip Spider Orchid and Sydney Plains Greenhood, listed as vulnerable and endangered respectively under the EPBC Act. This includes 0.53 hectares of assumed habitat for these species listed as endangered under the BC Act
- up to about 0.52 hectares of potentially suitable habitat for *Hibbertia puberula*, Austral Pillwort and Matted Bush-Pea assumed to be present within the proposal site and listed as endangered under the BC Act
- up to about 10.46 hectares of habitat for eight threatened fauna species including one bird and six bat species listed as vulnerable under the BC Act, with one bat species also listed as vulnerable under the EPBC Act. Habitat for Koalas, listed as endangered under the BC Act and EPBC Act, is also present.
- up to about 144 m² of land mapped as 'avoided land' by the Cumberland Plain Conservation Plan
- up to 2.2 hectares of land mapped as certified-urban capable under the CPCP that require assessment of potential impacts on biodiversity in accordance with the EPBC Act.

The proposal is not likely to significantly impact threatened species, populations or ecological communities or their habitats within the meaning of the BC Act or the EPBC Act. The design of the proposal would continue to be refined to minimise the potential for impacts on biodiversity. A range of safeguards and management measures are proposed to further minimise and mitigate potential impacts, such as through the implementation of a Fauna and Flora Management Plan and a Biodiversity Offset Strategy developed in accordance with Transport's *No Net Loss Guidelines* and *Tree and Hollow Replacement Guidelines*.

Traffic and access

Potential traffic impacts during construction may include increased travel times and temporary traffic diversions, altered intersection arrangements, lane closures outside of peak periods and speed restrictions. During construction, the existing lane capacity, freight access and key turning movements would generally be maintained during peak periods along the M31 Hume Motorway and Picton Road, with capacity increasing as construction progresses. Access to properties adjoining the proposal site would generally be maintained during construction. Where temporary disruption of existing access is unavoidable, alternative access arrangements would be provided in consultation with Wollondilly Shire Council and affected property and business owners.

When operational, the proposal would improve the road network performance with improvements in travel times, journey time reliability and road safety for all road users. The proposal would also improve resilience by providing additional capacity to manage vehicle movements during disruptions and emergencies. Proposed local road access arrangements at Wilton Park Road, Aerodrome Drive and Janderra Lane to left in left out would reduce existing safety issues at these intersections and may result in some longer travel distances until such time as developer works associated with Wilton 2040 are completed.

The active transport infrastructure provided by the proposal would improve active transport connectivity and safety along the route and integrate with the strategic walking and cycling network proposed in Wilton 2040 and the Wollondilly Bike Plan.

Aboriginal cultural heritage

The proposal has the potential to impact six known Aboriginal heritage sites and one potential archaeological deposit (PAD). Two of these sites are culturally-modified trees of high significance. Direct impacts to these trees and the PAD would be avoided through the implementation of management measures such as exclusion zones. However, the proposal would result on direct impacts to three Aboriginal artefact scatters of low significance and one of moderate significance.

The design would continue to be refined to minimise impacts on Aboriginal sites as far as reasonably practicable. Management measures are proposed to further minimise and mitigate residual impacts on Aboriginal cultural heritage, including the implementation of an Aboriginal Cultural Heritage Management Plan developed in consultation with Registered Aboriginal Parties. An Aboriginal Heritage Impact Permit would be sought for the proposal construction footprint in accordance with section 90 of the *National Parks and Wildlife Act 1974*.

Noise and vibration

During construction there would be the potential for noise impacts at locations close to the proposal site. These potential impacts would be greater during time periods where works are undertaken outside of standard working hours. However, no residential receivers are predicted to be 'highly noise affected' (noise level of 75 dBA and over) during works outside of the standard working hours under worst-case scenarios modelled.

Some receivers would be within the minimum working distance for cosmetic damage and the human comfort for the modelled worst-case vibration scenario. Measures in the Transport's Construction Noise and Vibration Guideline (Roads) would be implemented to mitigate construction noise and vibration impacts.

During operation, most receivers would not experience substantial changes in traffic noise levels. However, up to eight existing receivers located immediately adjacent to Picton Road may be eligible for consideration of measures to manage noise impacts in accordance with Transport's Noise Mitigation Guidelines. Up to 18 future receivers with approved subdivisions within new developments may also be eligible for consideration of noise mitigation.

Sections or the whole of the existing noise wall located along Picton Road east to Pembroke Parade may need to be adjusted as part of the proposal. The proposal is not expected to result in noise impacts that would require a change of height of this noise wall.

Property and land use

The proposal has been designed and developed to minimise property acquisitions and has prioritised the use of land owned by the NSW Government, land to be dedicated to Transport under existing voluntary planning agreements, and land zoned for infrastructure such as roads. However, about ten hectares of land not zoned for infrastructure would need to be permanently acquired. Other land would also be required temporarily during construction for ancillary facilities and other construction purposes.

The proposal would permanently impact about 23 private properties, of which:

- two would require total acquisition
- 21 would require partial acquisition or adjustments, typically strips along the boundary with Picton Road and the M31 Hume Motorway.

All acquisitions would be undertaken in consultation with landowners and in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and A Guide to Property Acquisition in NSW.

Socio-economic

The proposal would positively contribute to the sustainability of the local economy during construction through direct employment, increased expenditure at local and regional businesses and provision of construction goods and services. Potential impacts to transport users and local communities during construction would mainly be the result of temporary traffic disruptions, access arrangements and changes to amenity, including due to noise, vibration, dust, traffic and visual changes. Safeguards are proposed to minimise and manage these potential impacts.

Once operational, the proposal would increase the capacity, safety and performance of Picton Road and the interchange with the M31 Hume Motorway. The proposal would contribute to improved connectivity for existing and future residential and commercial areas, active transport infrastructure, accessibility to jobs, goods, services and education opportunities, and links between clusters of growing business activity. This would result in benefits for all road users as well as residents and local communities. When completed, potential adverse amenity impacts may result from changes in noise levels and visual impacts from cleared vegetation.

Climate change and sustainability

A climate change risk pre-screening assessment for the Picton Road upgrade (including the proposal) was undertaken to ensure the proposal considers climate hazards relevant to the region and prioritises resilient design to effectively meet operational objectives and align with community expectations in the face of future climate change.

Transport is committed to ensuring socially and environmentally beneficial outcomes by embedding sustainable initiatives into transport infrastructure. Sustainability requirements and objectives have been embedded in the proposal development consistent with the Transport Sustainability Plan 2021. A range of opportunities and initiatives have been identified and developed for the Picton Road upgrade in line with the eight focus areas of the Transport Sustainability Plan 2021.

Other potential impacts

The proposal has the potential to result in the following positive and negative impacts on other environmental aspects:

- Minor indirect impacts on three heritage-listed items may occur during construction, namely:
 - Upper Canal System/Upper Nepean Scheme (listed on the State Heritage Register, the Section 170 NSW State agency heritage and conservation register, and the Wollondilly Local Environmental Plan 2011 (Wollondilly LEP)) – located about 90 metres below ground level, with an associated airshaft located above ground around 80 metres from the proposal site
 - Cottage (listed on the Wollondilly LEP) – located adjacent to the proposal site
 - St Luke’s Anglican Church (listed on the Wollondilly LEP) – located about 45 metres north-east of the proposal site.
- During operation the proposal would minimise flood hazards for road users under 1 in 200 year flood events. However, acceptable levels to changes in flood depth and extent as defined by Austroads Guide to Road Design may be exceeded at up to two locations along Hornby Street, Wilton. Further investigations would be completed during detailed design to mitigate potential impacts resulting from the proposal on these locations.
- Temporary impacts on surface water quality may occur during construction, in particular during periods of heavy rainfall due to sedimentation and erosion. Safeguards are proposed to manage these potential impacts during construction. Operational water quality treatments and spill containment measures would be implemented as part of the proposal, which are expected to have an overall beneficial effect on water quality compared to the no build scenario.
- Short-term impacts on air quality may be experienced by sensitive receivers directly adjacent to the proposal mainly due to dust generation during construction. Safeguards are proposed to minimise and manage potential adverse impacts.

Justification and conclusion

The implementation of the proposal would improve safety for road, public and active transport users and reduce queuing and delay at the Picton Road interchange with the M31 Hume Motorway. Though environmental impacts would occur, they would be effectively mitigated with the application of safeguards and management measures outlined within this Review of Environmental Factors. The proposal is considered to be in the public interest as it would:

- improve safety for all transport users of Picton Road at Wilton
- support planned growth and increased freight movements in and between the Wilton and Greater Macarthur Growth Areas, Western Sydney and the Illawarra Shoalhaven
- improve capacity and reduce congestion on Picton Road at Wilton
- improve resilience by providing additional capacity to manage vehicle movements during disruptions.

The benefits of the proposal are considered to outweigh the potential impacts on the environment. The environmental impacts of the proposal are not likely to be significant and therefore the preparation of an environmental impact statement and approval from the Minister for Planning under Division 5.2 of the EP&A Act are not required. A referral under the EPBC Act is not required.

Display of the Review of Environmental Factors

This REF is on display for comment between 01 February and 29 February 2024. You can access the documents in the following ways:

Project website

The documents are available as pdf files on the Transport website at [Picton Road upgrade](#).

Printed copies

The documents can be viewed at the following locations:

- Wollondilly Shire Council
- Wollondilly Library

Copies by request

Printed and electronic copies are available by contacting pictonroad@transport.nsw.gov.au or 1800 290 613 noting that there may be a charge for hard copies or USB.

Staffed drop in sessions

- Wollondilly Shire Hall (Menangle Street, Picton) - Saturday 10 February from 10am to 2pm
- Wilton Plaza (1 Greenbridge Drive, Wilton) - Thursday 15 February 4pm to 7pm
- Wilton Recreation Reserve (20 Broughton Street, Wilton) - Wednesday 21 February 2pm to 5pm.

How can I make a submission

To make a submission about this proposal, please visit nswroads.work/pictonupgrade or send your comments to:

- PO Box 477, Wollongong NSW 2520
- pictonroad@transport.nsw.gov.au

Submissions must be received by 5pm on 29 February 2024. Submissions will be managed in accordance with the Transport for NSW Privacy Statement available at: <https://www.transport.nsw.gov.au/privacy-statement> or by contacting 1800 570 562 for a copy.

What happens next

Transport will collate and consider the submissions received during public the display of the Review of Environmental Factors. A submissions report will be released, responding to feedback raised during this period.

After this, 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 engage with the community and stakeholders throughout the proposal's development and during construction.

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Appendices

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Appendix B	Statutory consultation checklists
Appendix C	Biodiversity Assessment Report
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Appendix F	Non-Aboriginal Heritage Assessment
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Appendix L	Socio-economic Impact Assessment
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1 Introduction

This chapter introduces the proposal, provides context for the environmental assessment, and describes the purpose of the report.

1.1 Proposal identification

Transport for NSW (Transport) proposes to upgrade Picton Road between the Nepean River and Almond Street in Wilton, New South Wales (NSW) (the proposal). The proposal includes upgrading the section of Picton Road from about 1.3 kilometres east of the bridge over the Nepean River to about 200 metres east of Almond Street, including the M31 Hume Motorway interchange.

Picton Road is an important transport corridor linking the Illawarra Shoalhaven region with Greater Sydney and the Wilton and Greater Macarthur Growth Areas. It is one of two major east–west links between the M31 Hume Motorway and the M1 Princes Motorway. Identified as a National Key Freight Route, Picton Road provides an important connection between Port Kembla and the Illawarra Shoalhaven region and the rapidly expanding Western Sydney industrial precincts, the Western Sydney Parklands and Aerotropolis, Western Sydney International Airport, and Moorebank Intermodal Terminal (see Figure 1-1).

Picton Road will play a key role in opening up substantial employment and business opportunities in the future, fostering and supporting connectivity and creating great places to live. An upgrade of Picton Road would improve safety, accessibility and efficiency for transport customers and residents in new and emerging housing developments, better connecting them to diverse employment opportunities and to retail, health, education and recreation facilities.

The Picton Road upgrade includes about 30 kilometres of Picton Road, between the Nepean River and the M1 Princes Motorway. The upgrade comprises three key components (see Figure 1-2):

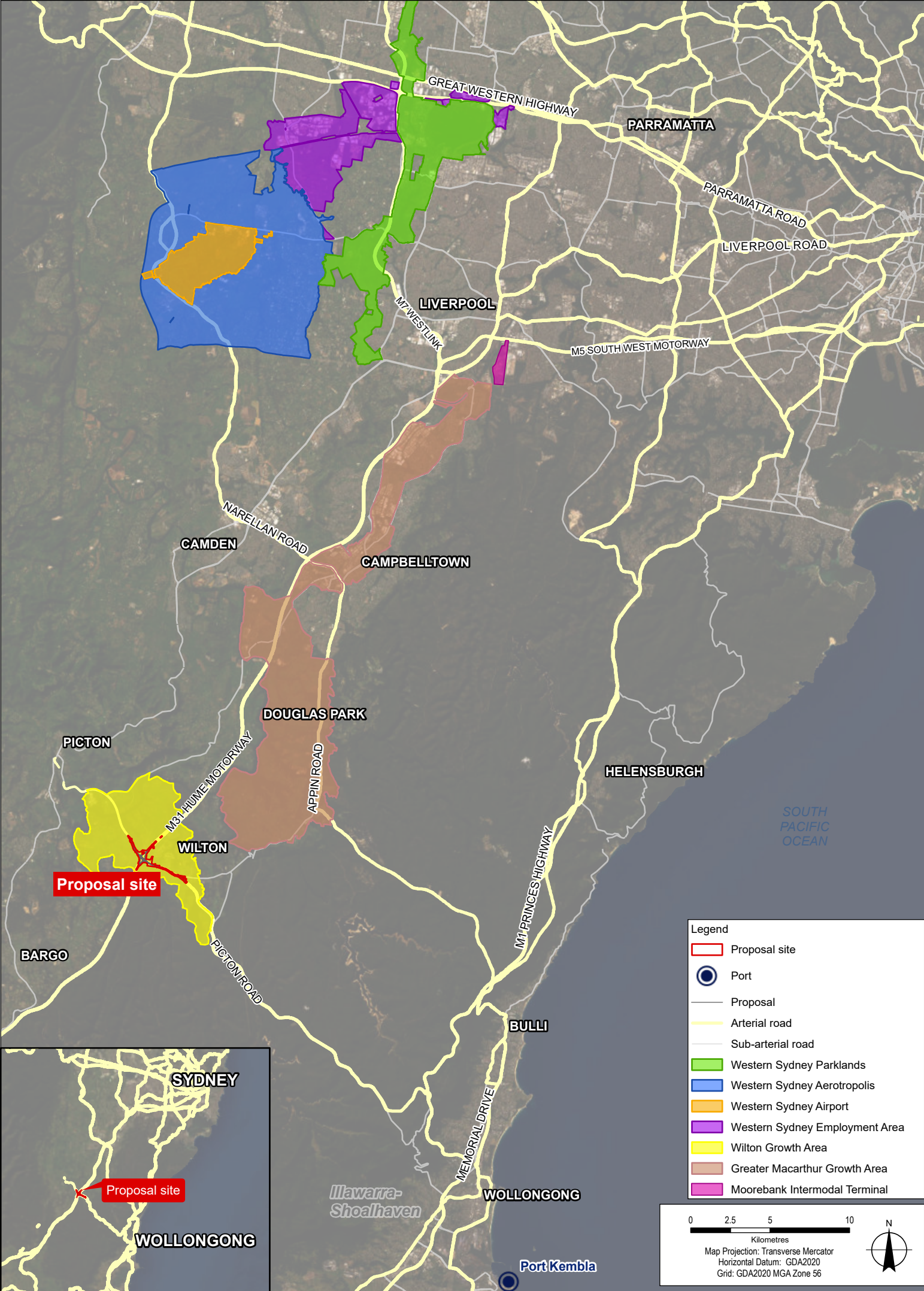
- the western section between the Nepean River and Almond Street, Wilton (the proposal)
- the central section from Almond Street, Wilton to around Mount Kiera Road
- the eastern section, Mount Kiera Road to the M1 Princes Motorway interchange.

The proposal forms the western section of the Picton Road upgrade.

The proposal is subject to assessment by a review of environmental factors (REF) under Division 5.1 of *Environmental Planning and Assessment Act 1979* (EP&A Act). For the purposes of these works, Transport is the proponent and the determining authority under Division 5.1 of the EP&A Act.

1.1.1 Proposal location

The proposal is located in Wilton, in the Wollondilly local government area (LGA). The location of the proposal is shown in Figure 1-1. The proposal site, shown in Figure 1-1 and Figure 1-3, comprises the area that would be required to construct and operate the proposal, including ancillary facilities and operational infrastructure.



Legend

- Proposal site
- Port
- Proposal
- Arterial road
- Sub-arterial road
- Western Sydney Parklands
- Western Sydney Aerotropolis
- Western Sydney Airport
- Western Sydney Employment Area
- Wilton Growth Area
- Greater Macarthur Growth Area
- Moorebank Intermodal Terminal

0 2.5 5 10
Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

Figure 1-1 - Proposal location

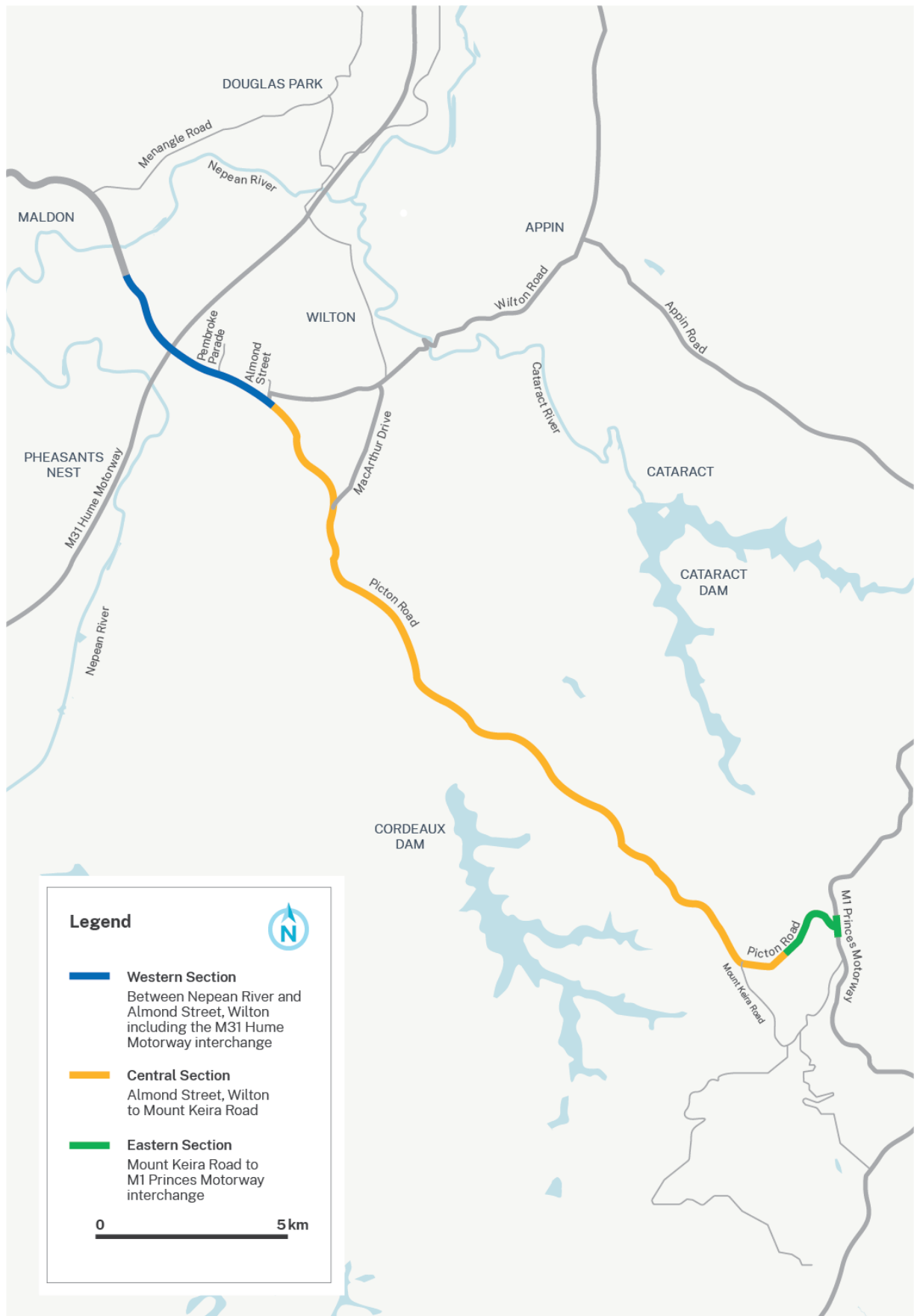


Figure 1-2: Picton Road upgrade sections

1.1.2 Key features of the proposal

A detailed description of the proposal is provided in chapter 3. The key features of the proposal include:

- widening and upgrading Picton Road for a distance of about five kilometres between the Nepean River and Almond Street to provide:
 - a minimum of two 3.5 metre-wide traffic lanes in each direction with a central median, increasing to three traffic lanes in each direction approximately between the Wilton Park Road and Aerodrome Drive intersection and the Pembroke Parade and Greenway Parade intersection
 - three-metre-wide shoulders on the left lane side in each direction
- upgrading the existing Picton Road and M31 Hume Motorway interchange into a diverging diamond layout, including:
 - removing the existing Picton Road bridge and constructing two new bridges over the M31 Hume Motorway
 - upgrading and realigning on and off ramp connections with the M31 Hume Motorway to suit the new interchange layout and to allow free flow of traffic between Picton Road and the M31 Hume Motorway
 - providing a new four-metre-wide shared user path along the southern bridge
 - removing the existing traffic signals on Picton Road and installing new traffic signals with more efficient phasing and more traffic capacity
- new and upgraded shared paths on Picton Road, including underpasses under the southbound on ramp connections to the M31 Hume Motorway and an overpass of the northbound off ramp connection from the M31 Hume Motorway, located:
 - adjacent to the westbound slow lane of the proposal from the western extent to around 420 metres west of Almond Street to connect with planned active transport infrastructure to be delivered as part of the South East Wilton development
 - adjacent to the eastbound slow lane between Aerodrome Drive and the western extent of the proposal and between Pembroke Parade and Almond Street
- reconfiguring the existing Picton Road intersections with Wilton Park Road, Aerodrome Drive, Janderra Lane and Almond Street into left in, left out only (the timing of delivery of the reconfigured Almond Street intersection is subject to confirmation of timeframes for delivery of other road works planned at the intersection as outlined in section 1.1.3 and chapter 3)
- integration with new traffic signals and widening roadworks constructed in 2023 at the intersection of Picton Road and Pembroke Parade and Greenway Parade
- adjusting the posted speed from the western extent of the proposal, through the interchange and to the east of Pembroke Parade to 60 kilometres per hour (km/h).

Ancillary work and construction activities associated with the proposal includes:

- property works including acquisition, adjustment to existing accesses and fencing
- civil earthworks and drainage works
- construction and adjustment of retaining walls, road pavement, and water quality devices
- tie-in work to adjoining sections of Picton Road, M31 Hume Motorway and other local roads
- installing and adjusting roadside furniture and delineation, such as safety barriers, kerb and gutter, fencing, lighting, signage, noise treatment and pavement markings
- installing new intelligent transport systems including, but not limited to, closed circuit television and variable message signs
- protecting, adjusting and relocating existing utilities and associated structures
- landscaping and rehabilitation of disturbed areas

- adjustment and provision of noise treatments, including at-property works and noise mounds, as required
- establishment of temporary ancillary facilities to support construction including compound sites, site offices, stockpiles, access tracks, turning bays, median crossovers on the M31 Hume Motorway, and laydown areas
- site preparation works, including vegetation clearing and grubbing, site fencing, temporary drainage measures, traffic management, and implementation of environmental management measures.

An overview of the proposal is provided in Figure 1-3.

1.1.3 Staging of the proposal and interfaces with other projects

The proposal is located within the Wilton Growth Area. The Wilton Growth Area infrastructure phasing plan (NSW Government, 2020) identifies critical infrastructure upgrades that are required to be delivered by private developers over the next 20 years to support traffic movement across the Wilton Growth Area and access to Picton Road.

These private developer funded and delivered upgrades do not form part of the proposal (as further described in section 3.1.1); however, the future interface and timing has been considered as part of this proposal. Where practical and based on information available to date, the proposal has provided space allowances to assist in delivering the future intersections onto and over Picton Road.

The proposal includes left in and left out configurations at Wilton Park Road, Aerodrome Drive and Janderra Lane that provide access to these existing local roads until such time that they are connected to the internal road network of the Wilton Growth Area. The Wilton Growth Area infrastructure phasing plan includes the relocation and upgrade of the Wilton Park Road and Aerodrome Drive intersection to a signalised arrangement west of the existing location. The arrangement included in the proposal for this intersection is considered to be an interim arrangement to maintain access to these local roads until the signalised intersection is built by the private developers.

In the vicinity of Almond Street, the Wilton Growth Area infrastructure phasing plan includes a future local road overpass of Picton Road with connections onto and off Picton Road that allow for all traffic movements at this location without traffic signals. This future arrangement would replace the existing right in, right out movements at Almond Street. The timing of construction of this ultimate arrangement by private developers relative to the timing of construction for this proposal is currently unknown.

The proposal includes the reconfiguration of the intersection at Almond Street to left in and left out, and removes the existing right in and right out movements. It is intended that this part of the proposal is not constructed until such time as the developer-led overpass and Picton Road connections are in place at this location. As such, during operation of the proposal, all traffic movements, right and left turns would be maintained in the existing intersection layout until the overpass and new connections are constructed. To enable this outcome, the proposal may be constructed as a whole or in the following two stages depending on the timing of the developer-led works:

- Stage 1 – Picton Road upgrade between the Nepean River and about one kilometre east of Pembroke Parade. The existing arrangement of Picton Road east of stage 1 including Almond Street would be maintained.
- Stage 2 – Picton Road upgrade from one kilometre east of Pembroke Parade to about 200 metres east of Almond Street.

Section 3.1.2 provides a more detailed description of this potential delivery approach and interface with other infrastructure upgrades that are not part of the proposal.

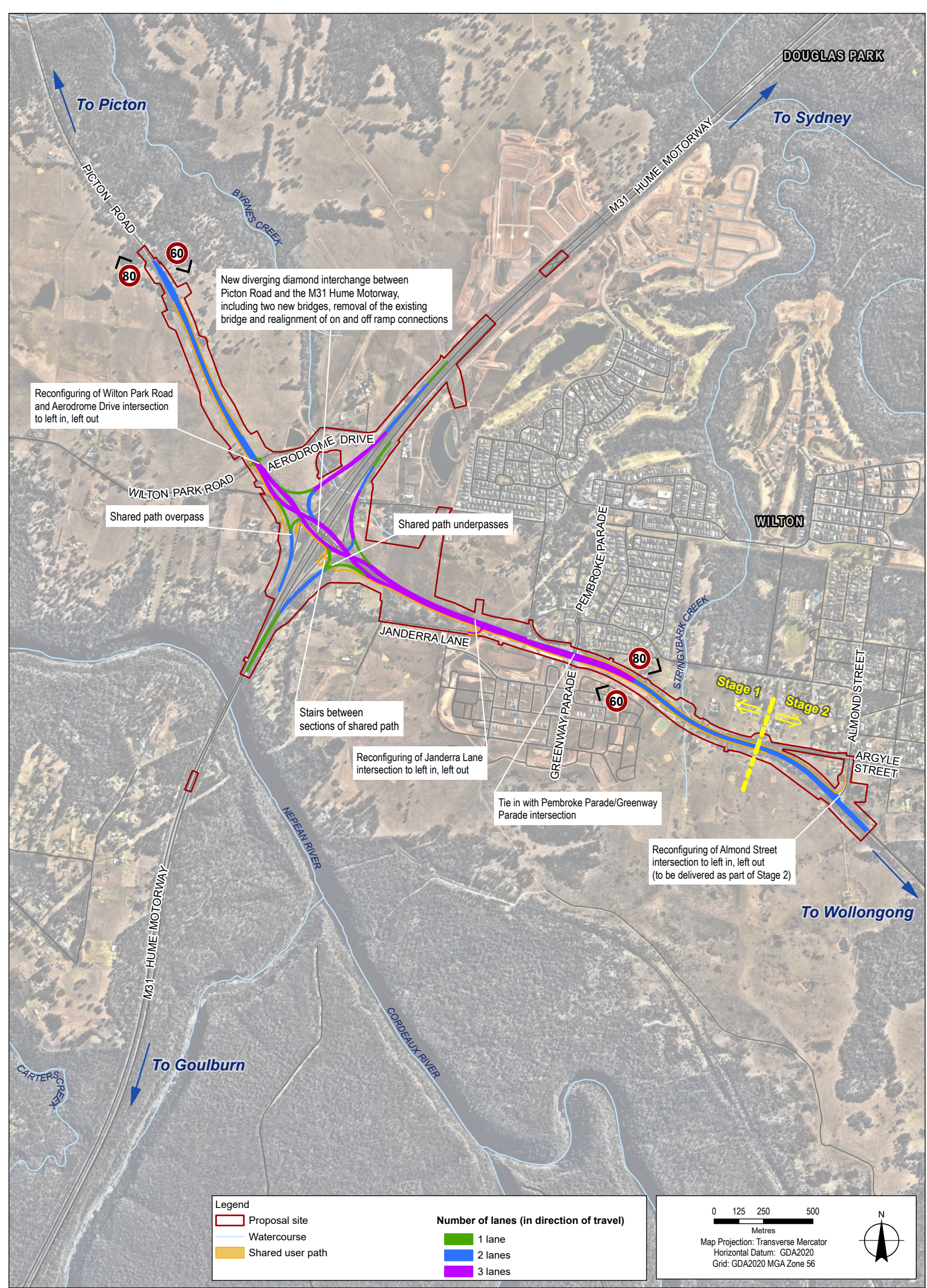


Figure 1-3 - The proposal

Data source: Nearmap WMS Server; NSW SS-SDS. Topographic base data, 2023. Created by: akidea
 N:\AU\Wollongong\Projects\2312560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX017_TheProposal_A4P. Print date: 12 Dec

1.2 Purpose of the report

This REF has been prepared by GHD Pty Ltd on behalf of Transport. For the purposes of these works, Transport is the proponent and determining authority under Division 5.1 of the 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* (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 strategic assessment approval granted by the Australian Government under the EPBC Act in September 2015, with respect to the impacts of Transport's road activities on nationally-listed threatened species, ecological communities and migratory species.

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 and Water 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

2.1.1 Overview

Picton Road is an important transport corridor linking the Illawarra Shoalhaven Region with Greater Sydney and the Wilton and Greater Macarthur Growth Areas. It is one of two major east–west links between the M31 Hume Motorway and the M1 Princes Motorway. Picton Road will play a key role in opening up substantial employment and business opportunities in the future.

Identified as a National Key Freight Route, Picton Road provides an important connection between Port Kembla and the Illawarra Shoalhaven region, and the rapidly expanding Western Sydney industrial precincts and Moorebank Intermodal Terminal. Picton Road plays a significant role in the movement of supplies from key industries including manufacturing, construction, mining and logistics from the region to Melbourne, Canberra, Sydney and broader areas of western NSW.

The Illawarra Shoalhaven is anticipating regionally significant growth in population and employment. It is home to the international trade gateway at Port Kembla, offering a link to domestic and export markets for a large variety of products including coal, steel, agricultural products and imported vehicles. Having safe, reliable and capable transport links to the port is key to continued national economic prosperity. Freight movements are forecast to increase at an annual rate of 1.4 per cent per annum over the next 40 years to reach around 62 million tonnes by 2056, being almost 70 per cent of the total road freight task associated with the region.

In Greater Sydney, the Western Sydney Parklands and Aerotropolis will provide new housing development together with the establishment of new industries associated with the operation of Western Sydney International Airport, creating 200,000 new jobs, and generating greater movement in and out of the region. Leveraging connectivity to these areas will lead to the creation of economic opportunities for the Illawarra Shoalhaven in aerospace and defence, education, advanced manufacturing, visitor economy, freight and logistics, and smart city technology.

Picton Road has a significant role to play in fostering and supporting this connectivity. In its current state, Picton Road would not be able to adequately service forecast increases in residential traffic associated with new development and freight demand. An upgrade of Picton Road would improve safety, accessibility and efficiency for transport customers and residents in new and emerging housing developments, better connecting them to diverse employment opportunities and to retail, health, education and recreation facilities. Improved access will give people more choice in where they work, live, study and visit.

The proposal comprises the upgrade of Picton Road between the Nepean River and Almond Street, Wilton, including the Picton Road interchange with the M31 Hume Motorway. Broadly, the proposal would:

- Improve safety for all users of Picton Road at Wilton. Picton Road has a higher crash rate when compared to similar roads. During the five-year period from 2018 to 2022 there have been 33 crashes along Picton Road within the proposal site. Of these crashes, 23 resulted in injuries, including 11 serious injury crashes and one fatal crash. Walking and cycling opportunities via dedicated infrastructure are also generally restricted to Picton town centre, leaving few safe routes within the proposal site for active transport users as Wilton develops.
- Support planned growth in the Wilton Growth Area, which is expected to grow by 15,000 new homes (40,000 new residents) over the next 20 to 30 years, and in the Greater Macarthur Growth Area, which is expected to grow by 58,000 new homes and 40,000 additional jobs over the next 20 to 30 years.
- Improve capacity and reduce congestion on Picton Road at Wilton. The current Picton Road and M31 Hume Motorway interchange will reach capacity in the near future and congestion is forecast to worsen with increased traffic from the Wilton Growth Area and increased freight demand along the Picton Road corridor.

- Improve resilience by providing additional capacity to manage vehicle movements during disruptions. Full or partial road closures due to emergencies, traffic incidents and planned activities require traffic control or extensive detours. Few alternative routes are available if Picton Road is closed or congested. Some of these are not suitable for all vehicles.

The proposal aligns with the objectives of key strategic transport, infrastructure and land use plans, as described in sections 2.1.2 and 2.1.3.

2.1.2 Consistency with strategic transport and infrastructure planning

Australian Infrastructure Plan and Infrastructure Priority List

The *2021 Australian Infrastructure Plan* (Infrastructure Australia, 2021) provides a road map for reform that prioritises community outcomes and the delivery of affordable, high quality infrastructure services across Australia.

The Infrastructure Priority List, which supports the *2021 Australian Infrastructure Plan*, is a prioritised list of nationally significant investments that provides decision makers with advice and guidance on specific infrastructure investments that will underpin Australia's continued prosperity. The need to address safety and capacity issues on Picton Road was added to the Infrastructure Priority List in February 2019. In February 2021, the timeframe for these works was updated from medium to near term, in recognition that the safety and capacity issues need to be addressed within the next five years.

National Freight and Supply Chain Strategy and Action Plan

The *National Freight and Supply Chain Strategy* (Transport and Infrastructure Council, 2019a) recognises that Australia's freight task is growing and changing. The *National Freight and Supply Chain Strategy* notes that the volume of freight carried is expected to grow by over 35 per cent between 2018 and 2040. The Strategy sets an agenda for government and industry action across all freight modes over the next 20 years and beyond. The Strategy is supported by the *National Action Plan* (Transport and Infrastructure Council, 2019b), which details key actions to be delivered by government to achieve the Strategy's goals and action areas.

The proposal is relevant to the following critical action areas under the Strategy:

- smarter and targeted infrastructure
- better planning, coordination, and regulation.

The proposal would improve access to major freight gateways in Sydney and the Illawarra to support the critical area of smarter and targeted infrastructure investment. The proposal has been designed to accommodate heavy vehicles and improve freight capacity and accessibility on Picton Road.

Future Transport Strategy

The *Future Transport Strategy* (Transport for NSW, 2022a) sets the strategic direction for Transport to achieve world-leading mobility for customers, communities and businesses. The *Future Transport Strategy* is aligned with current work by the NSW Government to develop a new regional plan for the 'Six Cities Region'. The Six Cities Region encompasses the Illawarra-Shoalhaven City, Western Parkland City (of which Wilton forms part and where the proposal is located), Central River City, Eastern Harbour City, Lower Hunter and Greater Newcastle City, and Central Coast City.

The *Future Transport Strategy* provides the direction for Transport in NSW based on three outcomes:

- connecting our customers' whole lives
- successful places for communities
- enabling economic activity.

The *Future Transport Strategy* sets 14 strategic directions to revitalise the Six Cities Region, connect regional communities, encourage thriving local neighbourhoods, and build on the economic success in NSW. The proposal directly aligns with the following strategic directions in the *Future Transport Strategy*:

- C1. Connectivity is improved across NSW.
- C2. Multimodal mobility supports end-to-end journeys.
- C3. Equitable, accessible and secure transport for all.

- C4. Our transport networks are safe.
- P2. Transport infrastructure makes a tangible improvement to places.
- P3. Transport minimises environmental impacts.
- P5. Transport is resilient and adaptable to shocks and stresses.
- E1. Freight networks and supply chains are efficient and reliable.
- E2. Existing infrastructure is optimised.
- E3. Transport supports the visitor economy.

State Infrastructure Strategy and State Infrastructure Plan

Staying Ahead: State Infrastructure Strategy 2022-2042 (Infrastructure NSW, 2022a) (the State Infrastructure Strategy) sets the strategic vision for NSW's infrastructure needs and priorities over the next 20 years. This includes priority transport infrastructure projects and initiatives to ensure the transport system creates opportunities for people and businesses to access the services and support they need.

The proposal would support the key objectives and strategic directions of servicing growing communities, including the delivery of infrastructure to support the Greater Macarthur and Wilton Growth Areas, embed reliability and resilience, and improving freight efficiency and capacity to support NSW's industries and supply chains.

The proposal is also consistent with other strategic directions and recommendations contained within the State Infrastructure Strategy, including:

- Deliver efficient transport networks to support thriving cities, businesses and communities.
- Fund and deliver enabling infrastructure to support approved or pending housing supply.
- Plan and deliver projects to increase the efficiency and reliability of freight networks in regional NSW.
- Support the growing Greater Sydney freight task through investments and initiatives that leverage existing and emerging international gateways.
- Fund and deliver a prioritised active transport infrastructure program to support liveability and 15-minute neighbourhoods.
- Coordinate infrastructure, land use and service planning to meet housing, employment, industry and community needs.
- Adopt a whole-of-system approach to enhance risk identification and assessment.
- Improve transport network response and recovery performance through service continuity planning, investment in evacuation and alternative routes, and infrastructure upgrades, guided by place-based strategies.
- Improve sustainability throughout the infrastructure lifecycle.
- Actively reflect history, culture and heritage in places and infrastructure.

The *2022-23 State Infrastructure Plan* (Infrastructure NSW, 2022b), prepared in accordance with the *Infrastructure NSW Act 2011*, provides a five-year plan of major infrastructure projects in the context of the State Infrastructure Strategy. The NSW Major Projects Pipeline, as defined by the *2022-23 State Infrastructure Plan*, includes the Picton Road upgrade.

Greater Sydney and Regional NSW Services and Infrastructure plans

The *Greater Sydney Services and Infrastructure Plan* (Transport for NSW, 2018a) defines how Transport will develop Greater Sydney's public transport, roads, and freight networks to create vibrant, liveable places and communities over the next 40 years. The *Greater Sydney Services and Infrastructure Plan* sets the strategic vision for transport in Greater Sydney, forming the foundation for further planning of specific corridors and initiatives. It is designed to be flexible as changes in technology and land use impact on the city and the way people and goods move over the next 40 years. The Plan also addresses connections between Greater Sydney and regional NSW.

The *Regional NSW Services and Infrastructure Plan* (Transport for NSW, 2018b) provides the NSW Government's blueprint for transport in regional NSW to 2056. The *Regional NSW Services and Infrastructure Plan* outlines the vision and customer outcomes that the government will use to go about its detailed transport planning in each region and also support its future decision making. The Plan aims to produce a modern multi-modal freight transport network and identifies the need to lift freight productivity above previous results as a key objective. The vision for regional NSW is a safe, efficient and reliable network of transport services and infrastructure that recognises and reinforces the vital role of regional cities as hubs for services, employment and social interaction for their surrounding communities.

The proposal supports the following initiative for investigation (0-10 years) in both plans: 'capacity improvements to Picton Road to support additional freight, public transport, and private vehicle journeys'.

NSW Freight and Ports Plan 2018-2023

The *NSW Freight and Ports Plan 2018-2023* (Transport for NSW, 2018c) (the Freight and Ports Plan) sets the NSW Government's priorities for the freight sector over the next five years. The Freight and Ports Plan aims to provide a network to move goods in an efficient, safe and environmentally sustainable manner, providing successful outcomes for communities and industry.

The proposal supports the Freight and Ports Plan's five objectives:

- Objective 1 Economic growth – Providing confidence and certainty that encourages continued investment in the freight industry to support economic growth.
- Objective 2 Efficiency, connectivity and access – Improving the efficiency of existing infrastructure and ensuring greater connectivity and access along key freight routes.
- Objective 3 Capacity – Maximising infrastructure investment and increasing infrastructure and land use capacity to accommodate growth.
- Objective 4 Safety – Creating a safe freight supply chain, involving safe networks, safe transport, safe speeds and safe people.
- Objective 5 Sustainability – Developing a sustainable supply chain that delivers benefits to our environment and continued operations into the future.

In relation to Objective 3, the Freight and Ports Plan includes a goal of delivering new infrastructure to increase road freight capacity and improve safety. To address this goal several projects and initiatives for investigation were identified. These include improvements to Picton Road to support additional freight, public transport and passenger journeys, and improve liveability and safety.

The Freight and Ports Plan is a continuation of the *NSW Freight and Port Strategy 2013* (Transport for NSW, 2013), which included identifying priority projects to guide investment and enhance freight logistics in NSW. These projects included improvements to the Picton Road and M31 Hume Motorway interchange to address capacity and road safety concerns, and Picton Road safety treatments.

Active Transport Strategy

The *Active Transport Strategy* (Transport for NSW, 2022b) outlines the NSW Government's commitment towards delivering safe and connected walking and cycling outcomes for the people of NSW. The purpose of the *Active Transport Strategy* is to double active transport trips in 20 years. The *Active Transport Strategy* draws on the *Future Transport Strategy* and its vision for walking, bike riding and personal mobility.

The active transport facilities that form part of the proposal (the shared user paths) support the following focus areas defined by the *Active Transport Strategy*:

- Enable 15-minute neighbourhoods.
- Deliver continuous and connected cycling networks.
- Promote walking and cycling and encourage behaviour change.

2026 Road Safety Action Plan

The *2026 Road Safety Action Plan* (Transport for NSW, 2022c) builds on the road safety initiatives delivered through the Road Safety Plan 2021. The 2026 Plan includes new targets to halve road deaths and reduce serious injuries by 30 per cent by 2030.

The proposal would provide the opportunity to reduce crashes and help achieve the targets set by the *2026 Road Safety Action Plan* by improving road safety, upgrading and separating road carriageways, improving pedestrian and cyclist facilities, and increasing capacity to reduce congestion.

Illawarra-Shoalhaven Regional Transport Plan

The *Illawarra-Shoalhaven Regional Transport Plan* (Transport for NSW, 2021a) (the Regional Transport Plan), which was developed in conjunction with the *Illawarra Shoalhaven Regional Plan 2041* (see section 2.1.3), describes the long-term transport vision for the Illawarra Shoalhaven region and outlines the transport policies, initiatives, and infrastructure that will be needed to support its growth and development.

The proposal is relevant to the following objectives of the Regional Transport Plan:

- Maintain reliable north–south, east–west transport spines.
- Roads support the efficient movement of freight to, from and within the region.

The Regional Transport Plan recognises that east–west road connections play a key role in ensuring connectivity between the Illawarra Shoalhaven and neighbouring regions, and that Picton Road (in combination with the M1 Princes Motorway) provides a nationally significant east–west transport link between Wollongong and Western Sydney. The plan states that, by 2056, Picton Road is forecast to carry almost 70 per cent of the total road freight task associated with the region.

The Regional Transport Plan also recognises that Picton Road currently presents challenges in the areas of road safety, road geometry, and freight access, and that demand is anticipated to increase as the Wilton and Greater Macarthur Growth Areas continue to develop.

The proposal would contribute to responding to the future freight and growth demands recognised by the Regional Transport Plan.

2.1.3 Consistency with strategic land use planning

The Greater Sydney Region Plan – A Metropolis of Three Cities

The *Greater Sydney Region Plan – A Metropolis of Three Cities* (Greater Sydney Commission, 2018a) (A Metropolis of Three Cities) sets a 40-year vision (to 2056) and establishes a 20-year plan to manage Greater Sydney’s growth and change. A Metropolis of Three Cities is built on a vision for growing Greater Sydney based on a metropolis of three cities – the Western Parkland City, Central River City and Eastern Harbour City – where most residents live within 30 minutes of jobs, education, health facilities, and other services. The proposal is located in the Western Parkland City.

A Metropolis of Three Cities includes ten directions with related objectives, strategies, and actions for the future of Greater Sydney. The proposal directly aligns with the directions of ‘A city supported by infrastructure’ and ‘A well-connected city’ and the following related objectives:

- Objective 1 – Infrastructure supports the three cities.
- Objective 2 – Infrastructure aligns with forecast growth.
- Objective 3 – Infrastructure adapts to meet future needs.
- Objective 16 – Freight and logistics network is competitive and efficient.
- Objective 17 – Regional connectivity is enhanced.

The proposal would contribute towards people and places in the Macarthur region within the Sydney Western Parkland City being connected by an effective, and safe transport network, which is fundamental to supporting growth – providing access to jobs, housing, education, recreation activities and business interactions.

Western City District Plan

A Metropolis of Three Cities notes that Greater Sydney’s three cities reach across five districts – Western City District, Central City District, Eastern City District, North District and South District. Five district plans have been prepared as a guide to implementing A Metropolis of Three Cities at a district level, providing a bridge between regional and local planning. The purpose of the district plans is to inform local environmental plans, strategic planning (including preparation of housing strategies and community strategic plans), and the assessment of planning proposals.

The proposal is located in the Western City District, which includes the Wollondilly LGA. The *Western City District Plan* (Greater Sydney Commission, 2018b) is a 20-year plan to manage growth in the context of economic, social, and environmental matters to achieve the vision for Greater Sydney defined by A Metropolis of Three Cities.

The proposal is consistent with the following planning priorities in the *Western City District Plan*:

- Planning Priority W1 Planning for a city supported by infrastructure.
- Planning Priority W7 Establishing the land use and transport structure to deliver a liveable, productive and sustainable Western Parkland City.

Illawarra Shoalhaven Regional Plan 2041

The *Illawarra Shoalhaven Regional Plan 2041* (DPIE, 2021) (the Regional Plan) sets the strategic framework for the Illawarra Shoalhaven region, aiming to protect and enhance the region's assets and plan for a sustainable future. The Regional Plan applies to the local government areas of Wollongong, Shellharbour, Kiama, and Shoalhaven. The Regional Plan outlines 30 objectives, guided by the following four themes:

- A productive and innovative region.
- A sustainable and resilient region.
- A region that values its people and places.
- A smart, connected and accessible region.

The proposal aligns with the smart and connected region theme and, by improving access between Wollongong and Western Sydney, supports associated Objective 25 ('Collaborate to leverage opportunities from Western Sydney's growth'). Leveraging connectivity to the Western Sydney Aerotropolis will, in the longer term, create economic opportunities for the Illawarra Shoalhaven in aerospace and defence, education, advanced manufacturing, visitor economy, freight and logistics, and smart city technology.

Objective 27 (Protect major freight networks) is also relevant to the proposal with the Regional Plan highlighting the need for improved and faster connections to Sydney and Western Sydney for passengers and freight.

The Regional Plan identifies Picton Road as a key inter-regional transport link that is critical to the future growth of the Illawarra Shoalhaven Region and highlights the need for future duplication.

Wilton Growth Area and Wilton 2040

The Wilton Growth Area surrounds Picton Road and the M31 Hume Motorway in the vicinity of the proposal. The Department of Planning and Environment (DPE) and Wollondilly Council are planning for Wilton to become a new town providing about 15,000 homes and 15,000 jobs across six precincts, including a town centre (the Wilton Town Centre) adjoining the north-western side of the Picton Road and M31 Hume Motorway interchange.

Wilton 2040 – a Plan for the Wilton Growth Area (DPE, 2018) (Wilton 2040) will guide the growth of the Wilton community over the next 20 years. Wilton 2040 supports the strategic planning undertaken for the Wilton Growth Area since 2011 and provides a high-level planning framework for the Wilton Town Centre, its supporting residential neighbourhoods, infrastructure, and commercial and employment areas.

The intention is that Wilton will develop a strong presence in south-west Sydney, becoming a focal point in the Western Parkland City. It will offer a key location for job opportunities that benefit from direct access to Greater Macarthur, Wollongong, and the new Western Sydney Airport.

Wilton 2040 includes a draft infrastructure list which, relevant to the proposal, identifies the need for:

- capacity improvements to Picton Road within the boundary of the Wilton Growth Area
- capacity improvements at the Picton Road and M31 Hume Motorway interchange
- a cycleway network.

The proposal is aligned with Wilton 2040 as it would provide the above capacity improvements and would, via the provision of the proposed shared user paths, contribute to the active transport connections across the M31 Hume Motorway between development areas to the south-west and south-east of the Picton Road and M31 Hume Motorway interchange.

The NSW Government released an update to Wilton 2040 (the *Wilton Growth Area Update*) in June 2023 (DPE, 2023). The *Wilton Growth Area Update* confirms that significant progress has been made in precinct planning, and notes that DPE and Transport have identified the need to reprioritise transport infrastructure and opportunities for improved transport services in anticipation of the future communities in the Wilton Growth Area.

2.2 Limitations of existing infrastructure

2.2.1 Picton Road

For most of its 35-kilometre-long length, Picton Road is a two-way road with one lane travelling in each direction. At the interchange with the M31 Hume Motorway, Picton Road provides one lane travelling straight through in each direction, with an additional lane providing dedicated right turn access to the M31 Hume Motorway on-ramps.

Picton Road experiences high traffic volumes, with around 22,000 vehicles per day using the road. A high proportion of this traffic (around 23 per cent) comprises heavy vehicles. As described in section 2.1.1, traffic volumes are forecast to increase as the area's population grows and new homes are built in the Wilton and Greater Macarthur Growth Areas.

Strategic traffic modelling suggests that peak hour traffic demand on Picton Road and at the Picton Road and M31 Hume Motorway interchange is expected to increase by about 20 to 25 per cent between 2022 and 2031, and by about 70 to 90 per cent between 2022 and 2046.

The interchange is currently experiencing congestion during peak times, and this is expected to worsen over time as traffic volumes increase. By 2046, this congestion is expected to add around five to 10 minutes additional travel delay in the morning peak and up to 33 minutes of additional travel delay in the afternoon peak. In its current state, Picton Road would not be able to adequately service forecast increases in residential traffic associated with new development and freight demand.

As traffic volumes on Picton Road increase over time, issues associated with the performance of the Picton Road and M31 Hume Motorway interchange (described in the following section) are expected to cause traffic delays and queuing on Picton Road within the proposal site (east and west of the interchange), particularly in the afternoon peak. Queueing from vehicles wanting to access Picton Road from the M31 Hume Motorway is expected to extend to the northbound and southbound off ramps in the morning peak and afternoon peak, respectively. This can cause queues to spill over to the through lanes of Picton Road and the M31 Hume Motorway with associated potential for traffic delays.

The existing Picton Road corridor has a low resilience to natural disasters and road incidents and a poor safety history compared to similar roads (see section 2.1.1). In addition, there is a lack of safe walking and cycling infrastructure along Picton Road within the proposal site.

2.2.2 Picton Road and M31 Hume Motorway interchange

The existing Picton Road and M31 Hume Motorway interchange consists of a bridge over the M31 Hume Motorway with signalised right hand turns and free flow left hand turns between the M31 Hume Motorway and Picton Road. The interchange's current arrangement carries four lanes of traffic, with two lanes in each eastbound and westbound direction separated by a centrally placed raised concrete median island. There is no shared user path or full width shoulders on the existing bridge.

A key limitation is the width of the existing bridge that forms the overpass. The bridge currently has four lanes of traffic. This provides two lanes in each direction, but one of them is for right turns only. This leaves only one lane available for traffic driving straight through the interchange along Picton Road in each direction. In addition, the operation of traffic signals at each end of the interchange has the potential to cause further issues with queues blocking other movements.

The interchange experiences heavy traffic flows during the morning and afternoon peak periods. In particular, the right turns to and from the M31 Hume Motorway driving north, and east-west movements along Picton Road, are a high volume movement. The two sets of traffic lights are currently operating with average delays of around one minute during the peak periods. The delays are expected to increase to unacceptable levels in the future if there is no change to this interchange.

The queuing caused by excessive delays creates flow on effects at either end of the interchange and along Picton Road in both directions during peak periods. Queue spillover on the northbound and southbound off ramps from the M31 Hume Motorway also creates blockages along the through lanes of the M31 Hume Motorway, impacting traffic performance and increasing delay for through traffic.

Structurally, the existing bridge over the M31 Hume Motorway is a four-span bridge composed of steel girders composite with concrete deck and circular concrete piers built in 1979. While having undergone some rehabilitation and strengthening works in 2013 and being assessed in fair condition in 2021, the headstocks and piers of the bridge would require retrofitting and strengthening in the medium term. The bridge also experiences excessive vibration which can cause discomfort to users.

2.2.3 Local road intersections

Other local roads that connect to Picton Road within the proposal site include:

- Wilton Park Road
- Aerodrome Drive
- Janderra Lane
- Pembroke Parade
- Greenway Parade
- Almond Street.

An upgraded four-way signalised intersection was constructed at the intersection with Pembroke Parade and Greenway Parade during 2023 to provide for all traffic movements into and out of the Bingara Gorge and South East Wilton precincts.

The intersection with Wilton Park Road and Aerodrome Drive is an at-grade cross road that allows all traffic movements. The other local road intersections at Almond Street and Janderra Lane are at-grade T-intersections allowing for all left and right turn movements.

The at-grade right turn and crossing movements at the unsignalised intersections create safety risks due to the high potential for vehicle conflicts and crashes with oncoming traffic. This risk is expected to increase in the future due to the projected higher traffic volumes and proportion of heavy vehicles along Picton Road.

Works at these intersections are proposed to be undertaken by private developers. Further information is provided in section 3.1.1.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal are shown in Figure 2-1.

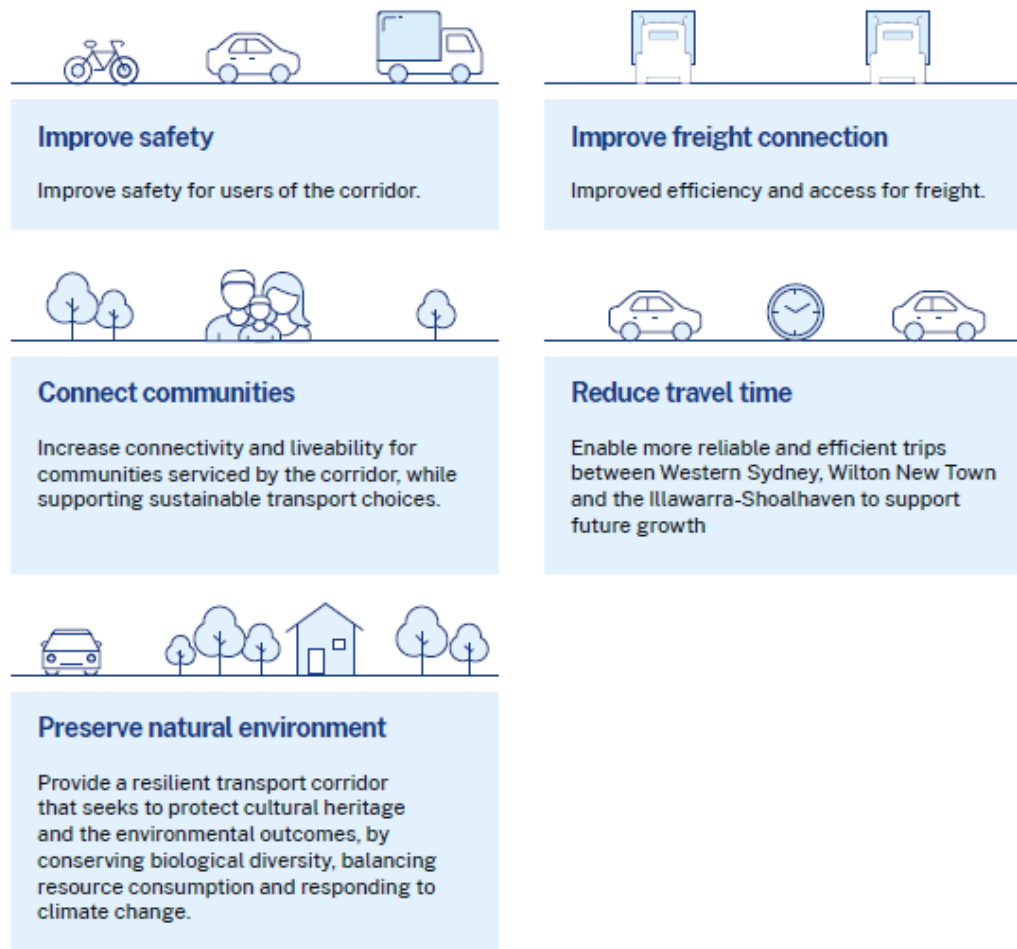


Figure 2-1: Proposal objectives

2.3.2 Development criteria

The development criteria for the proposal include:

- minimise environmental impacts
- increase safety at the Picton Road and M31 Hume Motorway interchange, and reduce potential for queuing onto the M31 Hume Motorway from the interchange ramps
- support residential and employment growth areas to cater for projected traffic growth
- cater for projected freight growth along this section of Picton Road
- improve urban amenity and access for the Wilton Growth Area
- provide safe and ready access along the corridor for incident management and maintenance activities
- contribute to a sustainable transport system across the state road network in line with the *Future Transport Strategy* (Transport for NSW, 2022a), including reducing and accounting for climate change impacts
- maintain the functional operation of the M31 Hume Motorway and Picton Road to traffic and users, including improving the ability to quickly restore operations during traffic incidents

- contribute to enabling people of all ages and abilities to walk and cycle safely
- strengthen connections between Country, people and place through design, planning and delivery
- adopt water quality control measures that meet agreed water quality objectives.

The design criteria for the proposal are provided in section 3.2.

2.3.3 Urban design objectives

Urban design objectives for the proposal include:

- reinforce the existing landscape character along the road alignment to create a distinctive and legible journey
- ensure connectivity along and across the road alignment and integrate these connections with surrounding areas
- provide a unified suite of road and roadside elements that respond to the local setting
- reinforce Picton Road's importance as a connector within the existing and future road hierarchy
- provide a landscape design that is low maintenance and delivers a sustainable solution for the future
- optimise opportunities for placemaking and pedestrian amenity.

2.4 Alternatives and options considered

2.4.1 Options for the Picton Road and M31 Hume Motorway interchange layout

A summary of the process of identifying and evaluating options for the interchange that best met the proposal objectives is provided below. Further information is available via: [Picton Road and M31 Hume Motorway interchange Preferred Option Report](#).

Overview of the approach and methodology

Key steps

Transport carried out a comprehensive options identification and assessment process to determine the preferred option for the interchange between 2011 and 2022. The process of progressively identifying, refining and assessing options is shown in Figure 2-2, with the dots indicating the number of options considered at each stage.

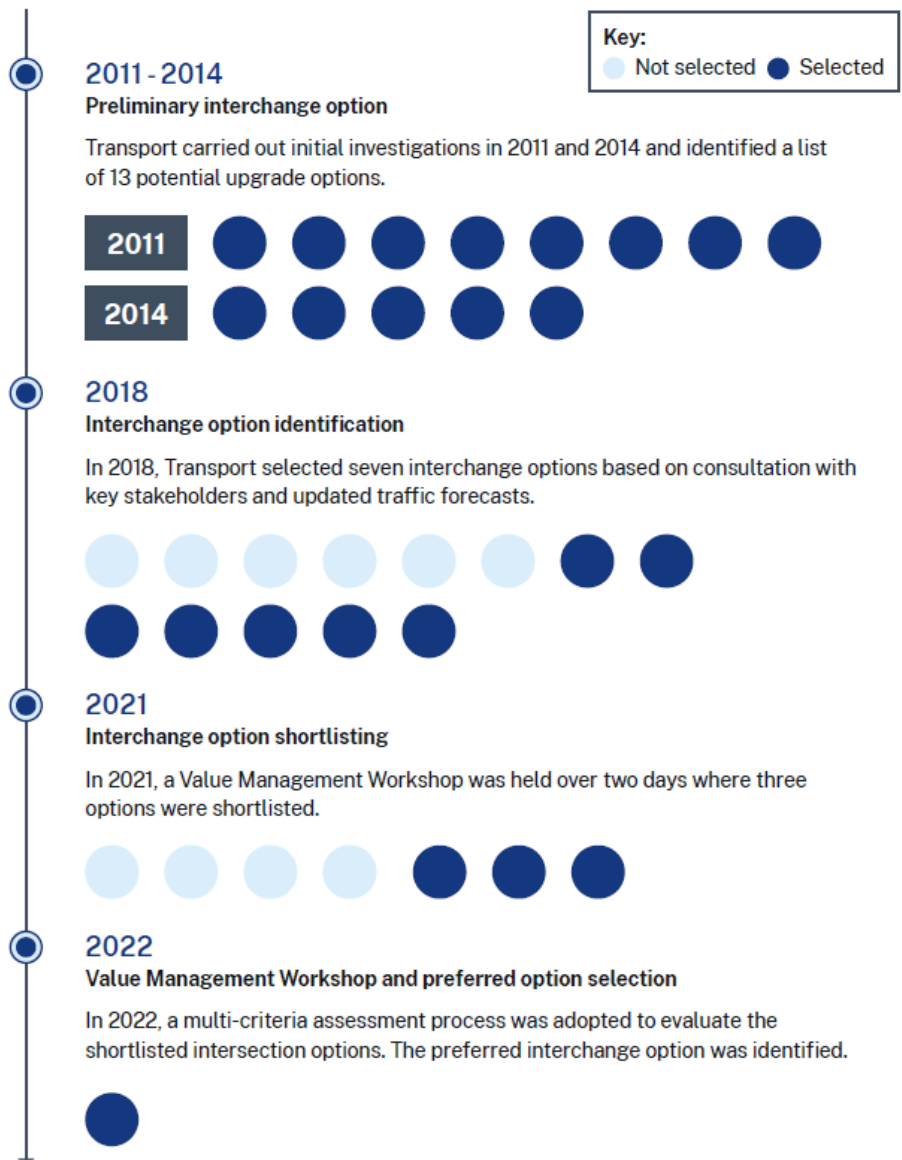


Figure 2-2: Interchange option selection process

Assessment criteria

The assessment criteria and sub-criteria developed to support the proposal objectives and help differentiate the options are listed in Table 2-1.

Table 2-1: Option assessment criteria

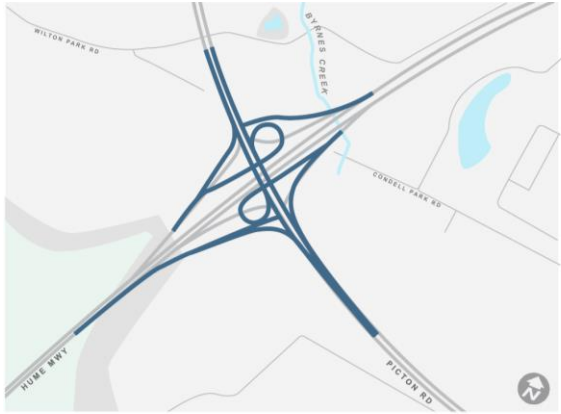
Criteria	Sub-criteria
Safety	<ul style="list-style-type: none"> operational safety for all safety for construction safety for maintenance workers
Transport and performance	<ul style="list-style-type: none"> intersection performance resilience active transport access freight efficiency
Environment and sustainability	<ul style="list-style-type: none"> biodiversity impacts protection of Aboriginal cultural heritage minimisation of amenity impact to surrounding community resource use and energy efficiency of construction and operation
Constructability	<ul style="list-style-type: none"> complexity of construction impact to traffic during construction and duration

Options considered

Shortlisted options

As shown in Figure 2-2, an initial list of 13 potential upgrade options was identified in 2011. Subsequent shortlisting at different stages led to three signalised options (shown in Figure 2-3) being considered further in 2021-2022:

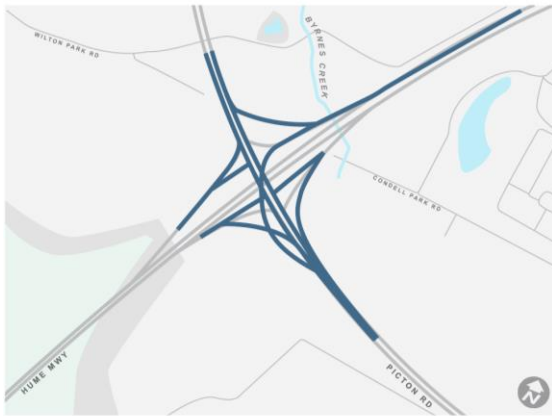
- diverging diamond interchange
- free flow trumpets
- signalised double point diamond with flyover.



Free flow trumpets



Diverging diamond interchange



Signalised double point diamond with flyover

Figure 2-3: Shortlisted options

Assessment outcomes

A multi-criteria assessment approach was adopted to evaluate the three interchange options. Figure 2-4 illustrates the assessed performance of the three shortlisted options against the assessment criteria.

Sub criteria	Free flow trumpets	Diverging diamond interchange	Signalised double point diamond with flyover
Operational safety for all road users	●	●	●
Safety for maintenance workers	●	●	●
Safety for construction workers	●	●	●
Intersection performance	●	●	●
Resilience	●	●	●
Active transport access	●	●	●
Freight efficiency	●	●	●
Biodiversity impacts	●	●	●
Protection of Aboriginal cultural heritage	●	●	●
Minimisation of amenity impact to surrounding community	●	●	●
Resource use and energy efficiency of construction and operation	●	●	●
Complexity of construction	●	●	●
Impact to traffic during construction and duration	●	●	●
Ranking	3	1	2

Key:

● Best fit ● Good fit ● Acceptable fit ● Poor fit

Figure 2-4: Comparative multi-criteria assessment results

Preferred option

Based on the results of the multi-criteria assessment, the diverging diamond interchange was identified as the preferred option as it performed best compared with the other options against the assessment criteria.

Diverging diamond interchanges allow traffic to navigate through the interchange via a crossover arrangement. The crossover of traffic is done under the safety of signalised intersections, which increases traffic efficiency and removes conflicts with opposing vehicles.

The diverging diamond design allows traffic movements to be controlled by traffic lights, with simplified traffic light phasing, providing increased green time within the interchange. The layout also provides an improvement in safety, since right turn movements no longer need to wait for a safe gap or opposing through traffic in order to pass through the interchange.

The design would improve the efficiency of the interchange. By grouping traffic approaches together, there is a significant reduction of signal phases when compared with conventional interchange layouts, reducing the wait time for traffic. Whilst this design is new to NSW drivers, it will be easy and safe to navigate.

The key benefits of a diverging diamond interchange compared to the other options considered include:

- less disruption to traffic with superior traffic performance and adaptability into the future as traffic increases
- reduced environmental impacts as it would have the smallest construction and operation footprints of the shortlisted options
- safer journeys as there would be less conflicts for all four existing right-hand turn movements
- improved freight efficiency now and into the future as traffic increases
- reduced construction impacts and increased safety during construction as majority of construction occurs away from live traffic
- less complex construction staging with fewer traffic stages and minimal interfaces with the M31 Hume Motorway
- better community outcomes with fewer conflicts with the removal of all four right hand turn movements
- better active transport outcomes with the shortest path for active transport access.

2.4.2 Widening options

Following the NSW Government's declaration of the Wilton Growth Area as a Priority Growth Area in July 2016, the Wilton area has been subject to progressive redevelopment and rezoning. Land uses surrounding the road corridor are transitioning from rural to urban. The road corridor and proposal site are constrained by surrounding existing and proposed future development within the various precincts that make up the Wilton Growth Area (see section 4.1.1).

A corridor has been established for the future upgrade of Picton Road through the Wilton Growth Area using land zoning and voluntary planning agreements established between developers and the NSW Government. In addition, infrastructure upgrades proposed by the Wilton Growth Area infrastructure phasing plan (NSW Government, 2020) on Picton Road have been completed or are in various stages of development and approvals.

These upgrades present constraints for the proposal and have influenced the potential options for widening of the existing road corridor. To make construction as simple as possible it is generally preferred to widen an existing road to one side. This is proposed to occur where space allows and is currently the suggested method for the construction of the Almond Street intersection (see section 3.3.1). However, this has not been able to be achieved for the length of Picton Road within the proposal site. As a result, Picton Road is proposed to be widened on both sides in other areas to maximise the use of land zoned for road use. This provides the best balance between potential impacts on land use and constructability, while still achieving the required road design geometry and minimising potential environmental impacts (including impacts to remnant native vegetation).

2.4.3 Proposal extents

Picton Road currently comprises one lane westbound and two lanes eastbound between the existing bridge over the Nepean River and the Picton Road and M31 Hume Motorway interchange.

On the eastern approach to the Nepean River crossing, Picton Road is also located within a large area of remnant Cumberland Plain woodland, which is currently zoned for conservation and is Koala habitat. Any widening works in this location would require substantial excavation and direct impacts to critically endangered ecological communities. Not widening the road through this area would avoid the need to clear remnant vegetation near the Nepean River and reduce costs associated with substantial excavation in rock. As a result, the concept design has limited the proposed widening to Picton Road as far east of the Nepean River as possible, without impacting traffic performance and safety outcomes.

Traffic modelling undertaken for the proposal to determine midblock capacities now, in 2031, and in 2046, showed that no additional lanes would be required to maintain an acceptable level of service with the additional demand created by projected development west of the planned new Wilton Town Centre road. In addition, the existing road geometry west of the intersection with the new road does not present any known safety compliance issues or a substantial crash history.

For the eastern portion of the proposal, traffic modelling was also used to determine the appropriate midblock capacities for future years. The modelling showed that the road needed to be upgraded by one lane in each direction to a maximum of three lanes. The future Almond Street upgrade was determined to be the eastern extent of the proposal as it is the eastern-most access for the South East Wilton precinct and Wilton. No additional access to the Wilton Growth Area from Picton Road is currently proposed further to the east.

2.5 Design refinements

An overview of the key design refinements made during the concept design process is provided in the following sections.

2.5.1 Design of the Picton Road and M31 Hume Motorway interchange

The design originally considered retaining and reusing the existing Picton Road bridge over the M31 Hume Motorway as part of the proposed interchange upgrade, with the existing and a proposed new bridge (constructed as part of the proposal) forming the interchange. During design development of the preferred option for the interchange, which included a structural review of the existing bridge, it was identified that the existing condition of the bridge would require significant upgrading works. These works would be required to rectify the design geometry and widen the structure to carry three lanes of traffic, all travelling in the same eastbound direction, and to provide full width shoulders on either side of the traffic lanes and a four-metre-wide shared user path on the southern side of the bridge. Works would also be required to strengthen the existing structure to accommodate the increased traffic volumes and vehicle loads, meet current design standards, and achieve a design life of 100 years.

The option to retain, upgrade and reuse the existing bridge was considered, assessed and compared to the option to remove and replace it with a second new bridge to the south of the originally proposed new bridge. Constructability risks, construction duration, whole of life costs, and temporary impacts to motorists during construction were considered as part of the assessment.

Upgrading the existing bridge would present constructability risks, add about six to nine months of additional time to the overall construction program, and create additional disruptions to motorists while reducing traffic performance of the interchange. The upgraded bridge would also require significant additional maintenance work over its operational life compared to a new structure built to current design standards.

When considering these issues as part of the construction and maintenance costs estimate for each option, the whole of life costs for both were comparable.

It was determined that, on balance, two new bridges would provide the best outcome for the proposal.

2.5.2 Lane configuration

Throughout the design process the lane arrangement has been tested and modelled to ensure an efficient solution is provided. Using Transport's network wide traffic forecast model, future demands were considered for the proposal's year of opening (2031) and 15 years post opening (2046).

These demands were used to assess the anticipated future volume against the known capacity of the existing configuration. The results of this assessment highlighted locations that required additional capacity, which formed the starting point for iterative traffic modelling and assessment. This work allowed definition of the minimum number of lanes required to meet the forecast demand across the proposal site.

Additionally, during the traffic modelling process, different intersection types and configurations were tested to optimise the design and ensure that delays are within an acceptable range during peak times. Road geometry was tested from a safety perspective to ensure that sufficient lane length is provided to allow appropriate merge times, queue length and stopping times for the nominated speed limit and modelled intersection performance.

This process was able to demonstrate that, to meet projected demand, Picton Road would require:

- widening to three lanes in each direction between the planned intersections of Picton Road with Wilton Park Road and Pembroke Parade
- two lanes in each direction between Pembroke Parade and Almond Street, and between Wilton Park Road and the planned new Wilton Town Centre road.

2.5.3 Active transport connectivity

As described in section 2.3.1, one of the objectives of the proposal is to increase connectivity and liveability for communities serviced by Picton Road, while supporting sustainable transport choices. This includes active transport connectivity for the existing and future community of the Wilton Growth Area, to enable pedestrians and cyclists of all mobility levels to travel safely around their community.

Wilton 2040 provides for active transport connections between the North Wilton precinct, Wilton Town Centre and Bingara Gorge (see Figure 4-1 for precinct locations) through two grade-separated road and active travel crossings of the M31 Hume Motorway (via the upgraded Niloc Bridge and future Condell Park Road connection). In addition, Wilton 2040 provides for north–south connections across Picton Road east of the M31 Hume Motorway via grade-separated crossings at Almond Street and Janderra Lane, and via at-grade crossings at Pembroke Parade and the two future intersections west of the M31 Hume Motorway (infrastructure upgrades to be delivered by private developers are described in section 3.1.1).

The proposal includes a shared user path between the western-most developer-led intersection within the southern Picton Road verge (in the West Wilton precinct) and about 420 metres west of Almond Street (in the South East Wilton precinct) where it would connect to other planned active transport infrastructure. This shared user path provides connectivity between southern areas of the Wilton Growth Area (West Wilton and South East Wilton) via separated crossings of the M31 Hume Motorway and interchange ramps, which increases user safety by minimising or eliminating potential interactions with motorists. It also provides a delay free crossing of the M31 Hume Motorway as users are not required to stop at traffic lights. To provide a shared user path that is suitable for all users, gentle grades are proposed, with ramps and landings provided where needed. Stairs would also be provided on the south-east corner of the interchange to provide a more direct route for pedestrians who may prefer not to use the proposed shared user path ramps.

The shared user path would also connect users to the north–south crossing points described above to provide connectivity to other destinations, including the future Wilton Town Centre. Sections of shared user path are proposed within the northern verge of Picton Road, between Aerodrome Drive and the western extent of the proposal and between Pembroke Parade and Almond Street, to provide connectivity between the north–south crossing locations.

Further information on the proposed shared user paths is provided in section 3.2.3. The relationship between the proposed shared user paths and the active transport connections provided for by Wilton 2040 are shown in Figure 2-5.

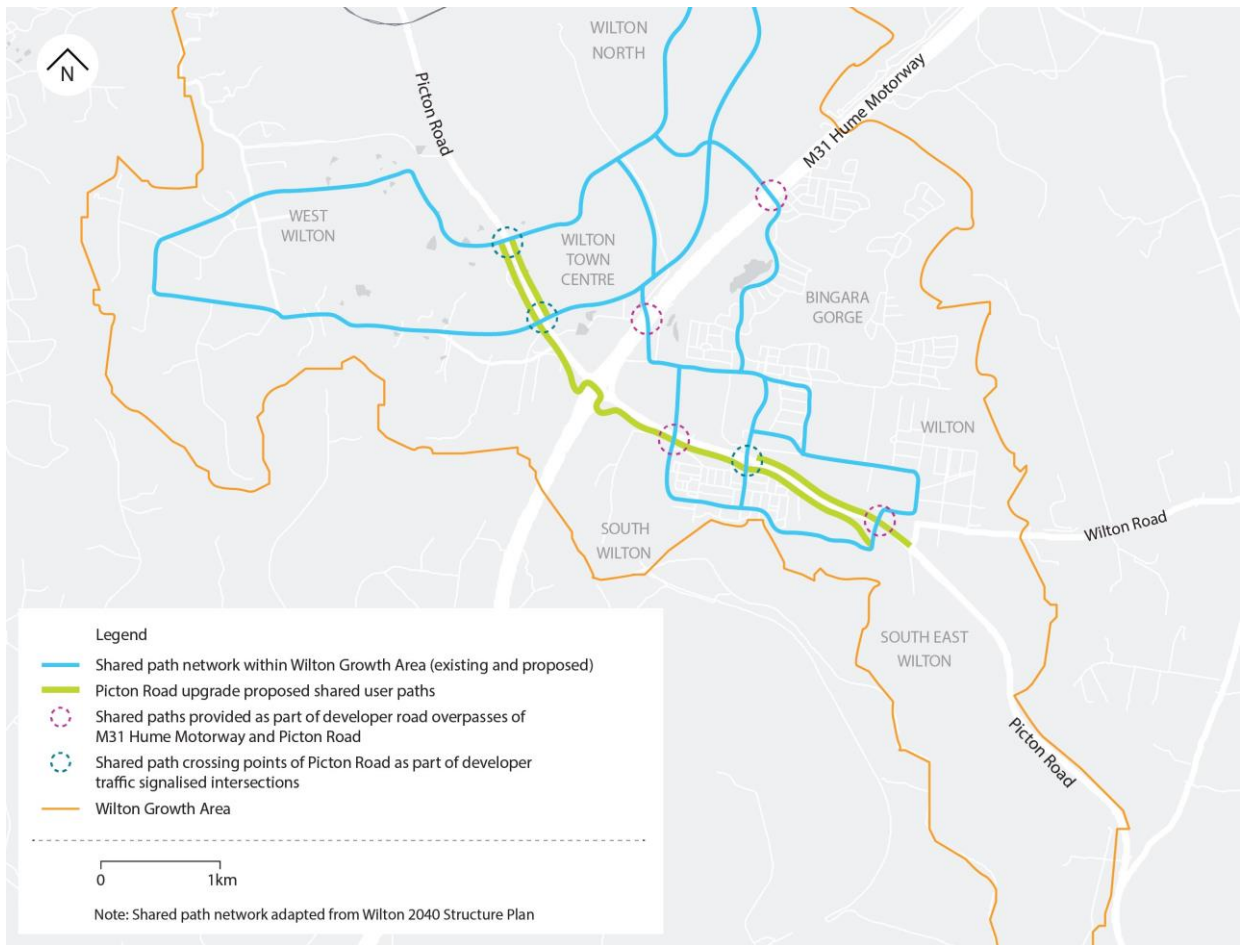


Figure 2-5: Shared user path connections with infrastructure proposed by Wilton 2040

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 proposes to upgrade Picton Road between the Nepean River and Almond Street, Wilton. The proposal forms the western section of the broader Picton Road upgrade that aims to increase safety, improve freight efficiency, increase connectivity and liveability for the existing and emerging Wilton community and provide a resilient road network. The proposal is shown in Figure 3-1 to Figure 3-4.

The proposal has been developed to a concept design level and has the following key features:

- widening and upgrading Picton Road for a distance of about five kilometres between the Nepean River and Almond Street to provide:
 - a minimum of two 3.5 metre-wide traffic lanes in each direction with a central median, increasing to three traffic lanes in each direction approximately between the Wilton Park Road and Aerodrome Drive intersection and the Pembroke Parade and Greenway Parade intersection
 - three-metre-wide shoulders on the left lane side in each direction
- upgrading the existing Picton Road and M31 Hume Motorway interchange into a diverging diamond layout, including:
 - removing the existing Picton Road bridge and constructing two new bridges over the M31 Hume Motorway
 - upgrading and realigning on and off ramp connections with the M31 Hume Motorway to suit the new interchange layout and to allow free flow of traffic between Picton Road and the M31 Hume Motorway
 - providing a new four-metre-wide shared user path along the southern bridge
 - removing the existing traffic signals on Picton Road and installing new traffic signals with more efficient phasing and more traffic capacity
- new and upgraded shared paths on Picton Road, including underpasses under the southbound on ramp connections to the M31 Hume Motorway and an overpass of the northbound off ramp connection from the M31 Hume Motorway, located:
 - adjacent to the westbound slow lane of the proposal from the western extent to around 420 metres west of Almond Street to connect with planned active transport infrastructure to be delivered as part of the South East Wilton development
 - adjacent to the eastbound slow lane between Aerodrome Drive and the western extent of the proposal and between Pembroke Parade and Almond Street
- reconfiguring the existing Picton Road intersections with Wilton Park Road, Aerodrome Drive, Janderra Lane and Almond Street into left in, left out only (the timing of delivery of the reconfigured Almond Street intersection is subject to confirmation of timeframes for delivery of other road works planned at the intersection as outlined in sections 1.1.3 and 3.1.2)
- integration with new traffic signals and widening roadworks constructed in 2023 at the intersection of Picton Road and Pembroke Parade and Greenway Parade
- adjusting the posted speed from the western extent of the proposal, through the interchange and to the east of Pembroke Parade to 60 km/h.

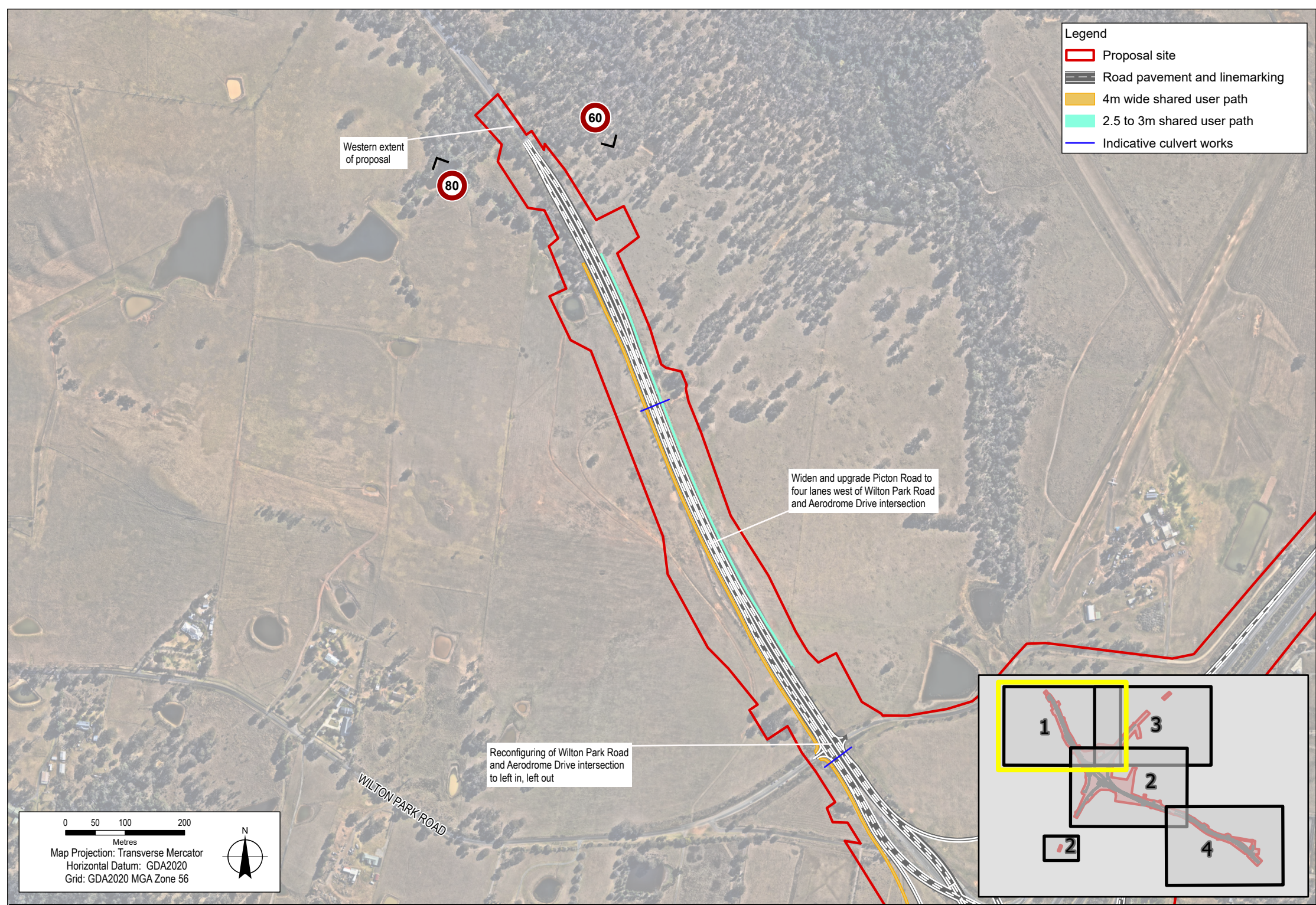


Figure 3-1 Key features of the proposal - map 1

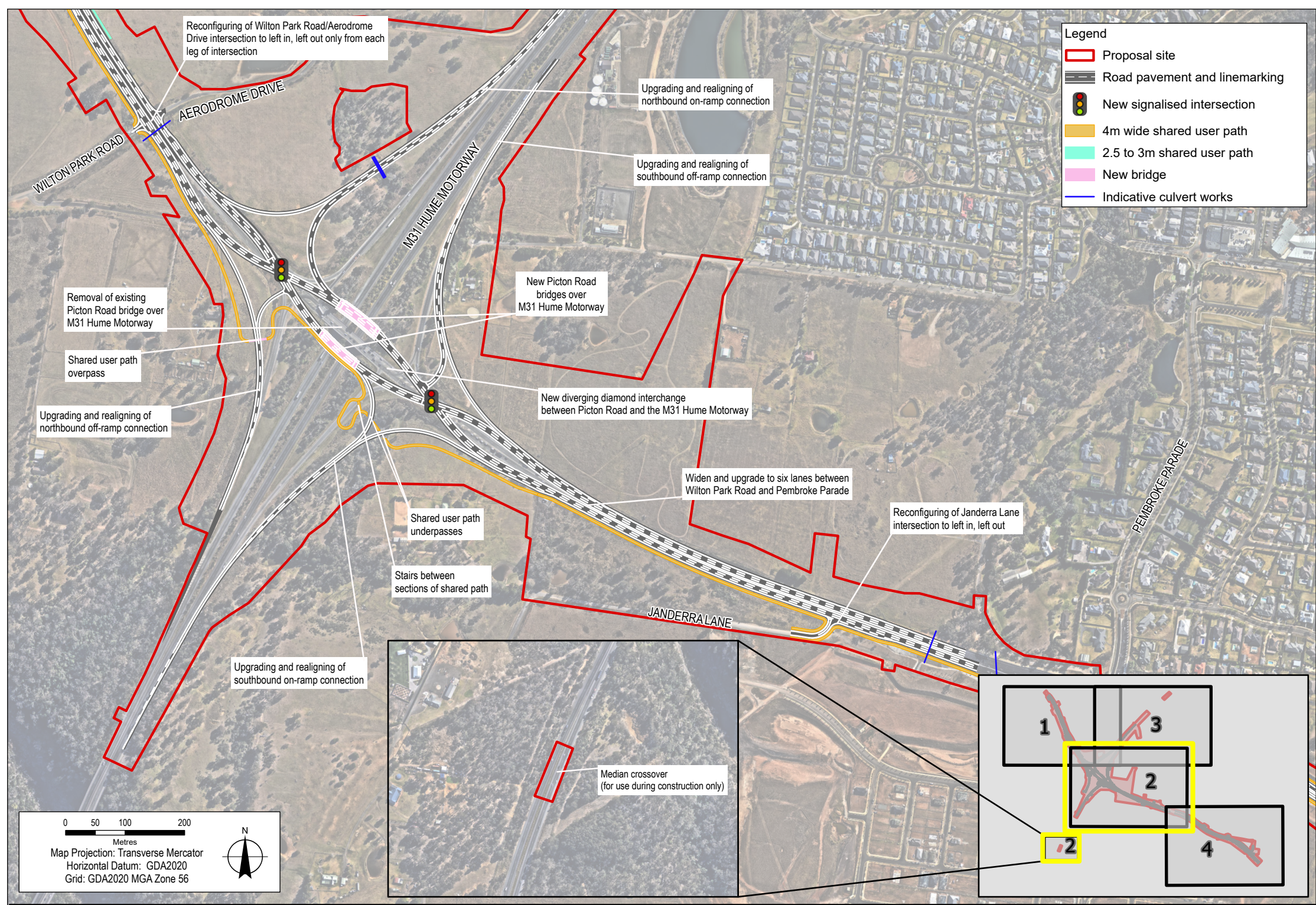


Figure 3-2 Key features of the proposal – map 2

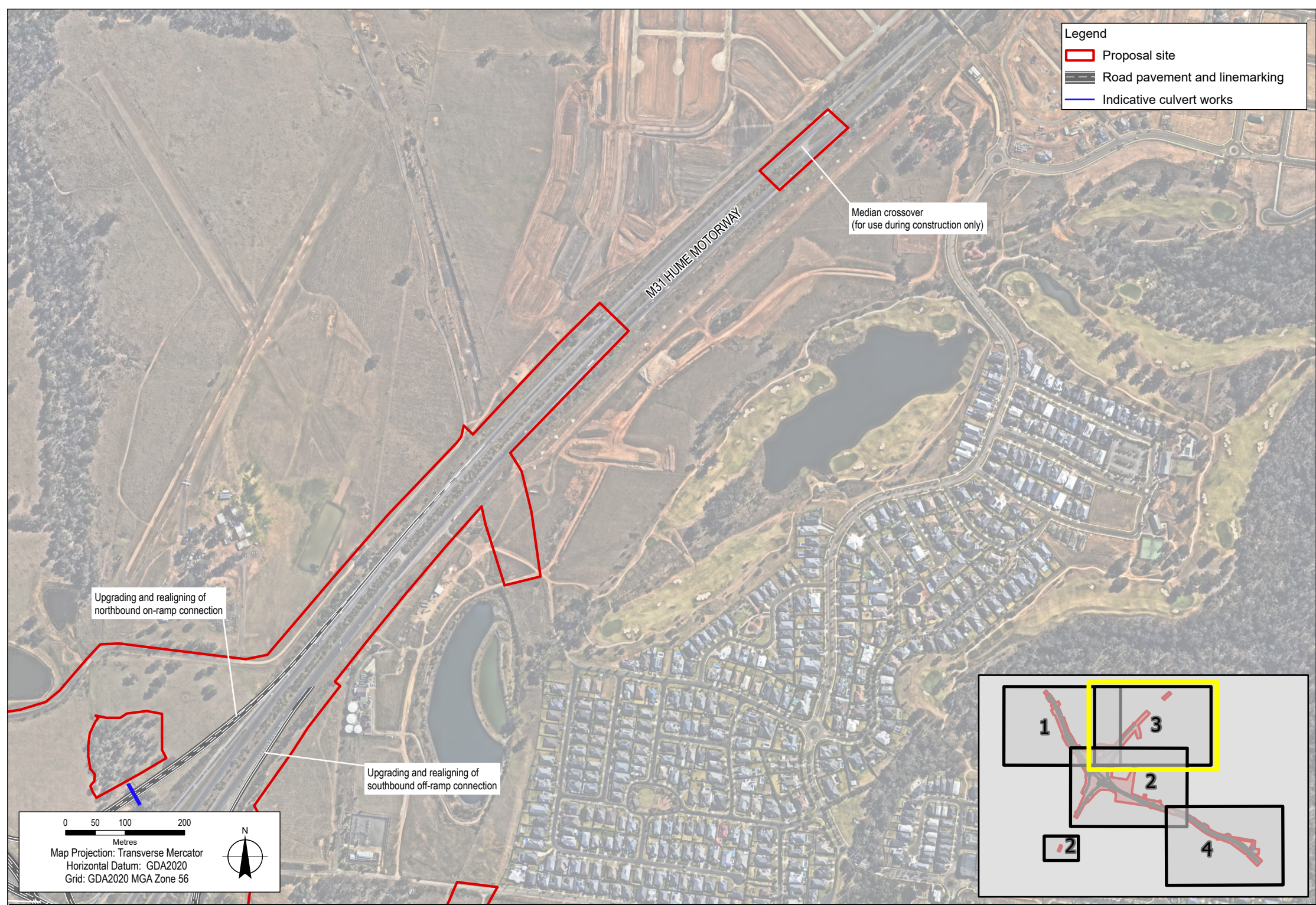


Figure 3-3 Key features of the proposal – map 3

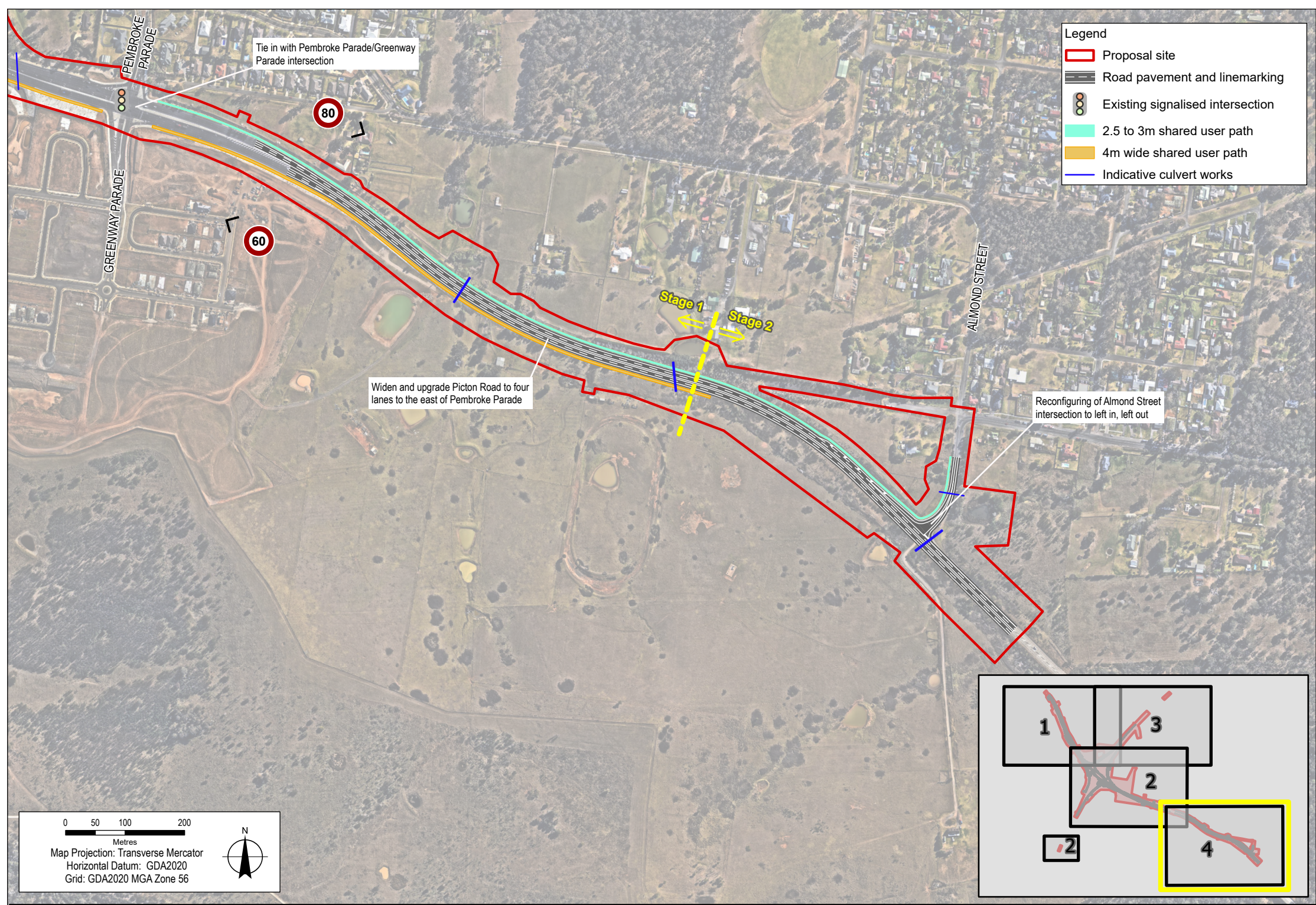


Figure 3-4 - Key features of the proposal – map 4

Ancillary work and construction activities associated with the proposal includes:

- property works including acquisition, adjustment to existing accesses and fencing
- civil earthworks and drainage works
- construction and adjustment of retaining walls, road pavement, and water quality devices
- tie-in work to adjoining sections of Picton Road, M31 Hume Motorway and other local roads
- installing and adjusting roadside furniture and delineation, such as safety barriers, kerb and gutter, fencing, lighting, signage, noise treatment and pavement markings
- installing new intelligent transport systems including, but not limited to, closed circuit television and variable message signs
- protecting, adjusting and relocating existing utilities and associated structures
- landscaping and rehabilitation of disturbed areas
- adjustment and provision of noise treatments, including at-property works and noise mounds, as required
- establishment of temporary ancillary facilities to support construction including compound sites, site offices, stockpiles, access tracks, turning bays, median crossovers on the M31 Hume Motorway, and laydown areas

site preparation works, including vegetation clearing and grubbing, site fencing, temporary drainage measures, traffic management, and implementation of environmental management measures.

3.1.1 Infrastructure upgrades to be delivered by private developers (not part of the proposal)

The Wilton Growth Area infrastructure phasing plan (*Wilton: Building a great new town*) (DPIE, 2020) identifies critical infrastructure upgrades that need to be delivered over the next 20 years to meet the needs of the Wilton Growth Area (see Table 3-1). Timeframes included in this table are based on information provided in the Wilton Growth Area infrastructure phasing plan. These upgrades, which are not part of the proposal but would interface with it, would be funded and delivered by private developers. The approximate locations of the infrastructure upgrades to be delivered by private developers are shown in Figure 3-5.

The timing of the construction of this developer-led infrastructure is dependent on agreements with DPE linked to the rate of development and is unknown at this time. Section 3.1.2 provides further information about how this has been considered in the proposal's planning and design.

The upgrade of the intersection of Picton Road with Pembroke Parade and Greenway Parade, identified in the Wilton Growth Area infrastructure phasing plan, was completed in 2023. Works completed at this intersection included:

- upgrading the intersection to a four-way signalised intersection
- Picton Road eastbound and westbound upgraded to three lanes in each direction
- providing dual lane turning movements for Pembroke Parade onto Picton Road westbound and Picton Road into Greenway Parade
- pedestrian and active travel crossings provided in all directions as part of the traffic signal arrangements
- pedestrian and active travel refuges provided for crossing Picton Road.

Table 3-1: Planned infrastructure upgrades to be delivered by private developers

Infrastructure upgrade	Description of upgrade to be delivered by private developers	Delivery responsibility and approximate timing ¹
Western intersection with planned new Wilton Town Centre road	<ul style="list-style-type: none"> intersection to be upgraded to a four-way signalised intersection with a planned new local road accessing the West Wilton and North Wilton precincts 	Private developer – by 2025
Wilton Park Road realignment and intersection upgrade	<ul style="list-style-type: none"> intersection to be relocated to a new alignment of Wilton Park Road and upgraded to a four-way signalised intersection providing access to the new Wilton Town Centre and West Wilton precinct 	Private developer – by 2030
Town Centre Link Road overbridge over the M31 Hume Motorway	<ul style="list-style-type: none"> a road overbridge for local traffic would be provided over the M31 Hume Motorway (to the north of the Picton Road and M31 Hume Motorway interchange) to provide a direct connection between the Wilton Town Centre and the Bingara Gorge and South Wilton precincts a pedestrian and active travel route would be included as part of the overbridge 	Private developer – by 2025
North Wilton road overbridge over the M31 Hume Motorway, including north facing on and off ramps	<ul style="list-style-type: none"> a grade-separated vehicular crossing would be provided over the M31 Hume Motorway (to the north of the Picton Road and M31 Hume Motorway interchange) to provide a direct connection between the North Wilton and Bingara Gorge precincts a northbound on ramp onto the M31 Hume Motorway and southbound off ramp from the M31 Hume Motorway would be provided a pedestrian and active travel route would be included as part of the overbridge 	Private developer – by 2025
Janderra Lane overpass	<ul style="list-style-type: none"> a grade-separated vehicular crossing would be provided over Picton Road at Janderra Road for local traffic connecting the South East Wilton precinct to the Town Centre Link Road 	Private developer – by 2030
Almond Street intersection upgrade	<ul style="list-style-type: none"> an overbridge over Picton Road and new grade-separated intersection would be constructed for local traffic, providing a direct connection between the South East Wilton, South Wilton and Bingara Gorge precincts westbound and eastbound connections onto Picton Road would be provided for all for movements onto and off Picton Road existing right turn movements at Almond Street would be removed a pedestrian and active travel route would be included as part of the overbridge 	Private developer – by 2030

Note: 1. The timing shown is from the Wilton Growth Area infrastructure phasing plan (DPIE, 2020).

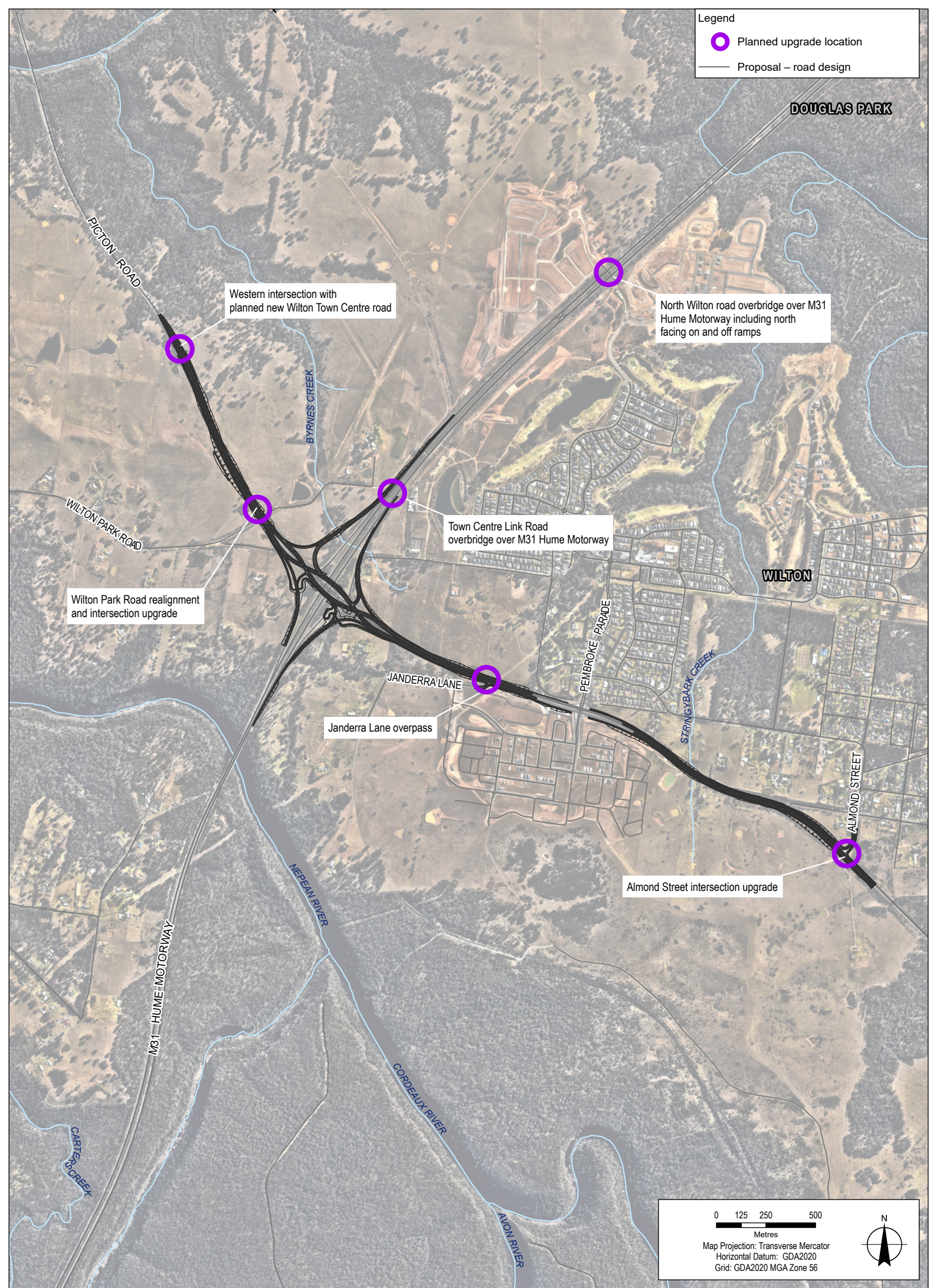


Figure 3-5 - Indicative location of planned infrastructure upgrades to be delivered by private developers

Data source: Nearmap WMS Server; NSW SS-SDS. Topographic base data, 2023. Created by: akidea
 N:\AU\Wollongong\Projects\2312560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX021_PlannedInfrastructureUpgrades_A4P. Print date: 25 Oct

3.1.2 Staged delivery and operation of the proposal

As described in section 3.1.1, the Wilton Growth Area infrastructure phasing plan includes the Almond Street intersection upgrade, which would be delivered by private developer(s) to provide a future local road overpass of Picton Road with connections onto and off Picton Road allowing for all traffic movements at this location without traffic signals. This future arrangement would replace the existing right in, right out movements at Almond Street. The Almond Street intersection upgrade would provide safe and efficient access and egress to the new residential development to the south of Picton Road, as well as into existing residential areas to the north.

The Almond Street intersection upgrade is a critical piece of transport infrastructure required to support the Wilton Growth Area. It is an independent project, separate to the proposal, which will be funded and delivered by private developers under a Voluntary Planning Agreement with DPE, as part of the overall infrastructure required to service the Wilton Growth Area in accordance with Wilton 2040 (see section 2.1.3).

The timing of construction of this ultimate arrangement relative to the timing of construction for the proposal is currently unknown. As a result, the proposal may be delivered and operated in two stages in conjunction with the delivery of the Almond Street upgrade.

For constructability reasons and to minimise disruption to traffic movements on Almond Street and Picton Road, Transport would plan to deliver stage 2 of the proposal at a similar time as the Almond Street intersection upgrade where possible. Transport would seek to collaborate with the developer building the intersection upgrade to minimise impacts on transport users and the local community wherever possible.

If the proposal is delivered in two stages, these are likely to consist of (shown in Figure 3-12):

Stage 1 – Picton Road upgrade between the Nepean River and about one kilometre east of Pembroke Parade

Stage 1 would comprise upgrading Picton Road between the Nepean River and about one kilometre east of the intersection of Picton Road with Pembroke Parade and Greenway Parade (a distance of about four kilometres). Depending on when construction funding is announced, construction of stage 1 would be anticipated to commence between 2026 and 2027, and take about three years to complete prior to opening for operation. During stage 1, the existing arrangement of Picton Road east of stage 1 would be maintained, including the Almond Street intersection.

Stage 2 – Picton Road upgrade from one kilometre east of Pembroke Parade to about 200 metres east of Almond Street

Stage 2 would comprise upgrading Picton Road between about one kilometre east of Pembroke Parade and about 200 metres east of Almond Street (a distance of about 700 metres). This stage of the proposal would include reconfiguring the intersection at Almond Street to left in and left out, removing the existing right in and right out movements on Picton Road. This arrangement has been designed to work in conjunction with the developer-provided overbridge and associated infrastructure upgrade. All traffic movements, including right and left turns, would be maintained in the existing intersection arrangement until the overbridge and new connections are constructed.

3.2 Design

The following sections provide a description of the design criteria, major design features and engineering constraints of the proposal. These features are based on the concept design and would be further refined during detailed design.

The design is being prepared in accordance with Transport's specifications and road and bridge design standards and guidelines, including:

- Austroads Guides to Road Design
- Australian Standards
- Transport supplements to Austroads Guides and Australian Standards
- Transport technical directions and quality alerts
- Transport urban design guidelines
- other current Transport publications
- utility authority design standards.

3.2.1 Design criteria

The design criteria for the proposal are summarised in Table 3-2.

Table 3-2: Design criteria

Design element	Criteria
Carriageway	Dual carriageway, two or three lanes in each direction with sealed shoulders, safety barrier containment and verges
Design speed	70km/h for Picton Road between Pembroke Parade and the western-most future intersection 90km/h for Picton Road outside of the area described above 60km/h for M31 Hume Motorway on- and off-ramps at the interchange 60km/h for side roads
Proposed posted speed	60km/h for Picton Road between Pembroke Parade and the intersection with the planned new Wilton Town Centre road, including ramps 80km/h for Picton Road outside of the area described above 50km/h for side roads
Lane widths	3.5m to 3.9m wide 3.3m to 5.0m wide on ramps
Median	Minimum 2.6m wide for Picton Road
Outside shoulder widths Inside shoulder widths	3m wide for Picton Road 1m wide for Picton Road
Maximum pedestrian crossing length	25m between refuge islands on side roads
Design vehicles for turning at intersections	26m long B-double with the checking vehicle being a 36.5m long A-double
Shared footpath and cycleway	Minimum width of 2.5m
Drainage	One per cent annual exceedance probability (AEP) cross drainage, 10% AEP bridge deck drainage and pavement drainage
Batters	Treated cut batters no steeper than 1.5 horizontal to one vertical Fill batters and untreated cut batters no steeper than two horizontal to one vertical

3.2.2 Engineering constraints

Construction and operation of the proposal has the potential to be affected by a number of engineering, environmental and development constraints. Constraints have been identified through value engineering and constructability workshops and were considered during the concept design process. Table 3-3 summarises the key constraints that were considered and provides an overview of how these have been addressed as part of the design. Further information on the existing environment is provided in chapter 6.

Table 3-3: Summary of key constraints

Key constraint	Summary	How constraints have been addressed
Existing Picton Road bridge	How the existing Picton Road bridge over the M31 Hume Motorway and associated on and off ramps would be maintained operational during construction of the new interchange bridges and removed following transfer of traffic onto the new alignment.	Constructability assessments have been conducted with industry experts to ensure that the existing bridge can be safely and efficiently operated during construction of the new infrastructure and removed once traffic has been switched onto the new alignment (see section 3.3).
Pheasants Nest bridge	The proximity of the existing Pheasants Nest bridge to the southern on and off ramps of the Picton Road and M31 Hume Motorway interchange.	The on and off ramps have been designed to tie into the M31 Hume Motorway north of the Pheasants Nest Bridge at similar locations to the existing ramps.
Aboriginal heritage	Two culturally modified trees are located within the proposal site -one adjacent to the northbound on ramp onto the M31 Hume Motorway, and one on the southern side of Picton Road east of the M31 Hume Motorway.	An arboricultural assessment was completed for these trees to determine the tree protection zone (TPZ) and inform mitigation measures. Direct impacts on these cultural heritage items have been avoided through design refinements, and safeguard measures for their protection during construction are provided in section 6.3.4.
Biodiversity	Native vegetation and threatened fauna habitats, including threatened ecological communities listed under the BC Act and/or the EPBC Act, and avoided land mapped under the Cumberland Plain Conservation Plan, have been identified, particularly near the Nepean River.	The proposal site has been refined to minimise impacts on areas of mapped vegetation, particularly at the western end of the proposal between the interchange and the Nepean River (see section 2.5.2).
Existing road corridor boundary	The proposal would require more space than currently allocated within the existing road reserve while minimising impacts on adjacent properties where practicable.	The proposal site has been refined to minimise impacts on land located outside the existing road reserve that is not land allocated under existing development agreements and land not zoned as SP2 Infrastructure. Water quality basins have been located, combined and shaped to minimise land acquisition requirements wherever possible. Additional space required outside of the existing road corridor, and land allocated under development agreements, located on adjoining property would be negotiated and acquired.
Traffic management	Constructing the works can only be undertaken using certain methodologies otherwise road closures and diversions would be required to facilitate construction. Traffic flows on Picton Road and the M31 Hume Motorway need to be maintained during construction.	Constructability, health and safety in design, and risk assessments have been conducted with industry specialists to ensure proposal elements can be constructed and maintained as safely and efficiently as possible and with minimal disruptions to traffic on Picton Road and the M31 Hume Motorway.

Key constraint	Summary	How constraints have been addressed
		<p>The concept design has also been prepared to allow the space required for safe construction and maintenance traffic flow. Staging plans and strategy have been prepared to ensure that the proposal site includes sufficient space to enable the proposal to be safely constructed and maintained while maintaining traffic flows on Picton Road and the M31 Hume Motorway.</p>
Mine subsidence	<p>There is the potential for mine subsidence impacts within the proposal site if underground coal mining using longwall techniques occur in the future.</p>	<p>A mine subsidence assessment has been completed to ensure the proposal appropriately addresses design requirements.</p> <p>An overview of how the potential for mine subsidence would be managed as part of the design of the proposal is provided in section 3.2.3.</p>
Existing utilities	<p>Existing overhead, above ground and underground utilities within the proposal site could be impacted by the proposal and require protection or relocation, including:</p> <ul style="list-style-type: none"> • natural gas pipelines • major telecommunications infrastructure • overhead and underground electricity lines. 	<p>Consultation with utility providers and site investigations were initiated during concept design development to understand existing and planned utilities located within and adjacent to the proposal site. These activities would continue during detailed design and construction planning (see sections 5.2 and 5.7).</p> <p>The proposal has been designed to minimise utility impacts where possible. Impacted utilities would be protected or relocated.</p> <p>Further information is provided in section 3.5.</p>
Future infrastructure to be delivered	<p>Future adjoining infrastructure is planned to be delivered by others for the Wilton Growth Area in accordance with Wilton 2040.</p>	<p>The proposal considers future infrastructure as far as practicable, based on available information (see sections 2.4.2 and 3.1.1). Consultation with relevant stakeholders would continue during detailed design and construction to enable integration of the proposal during design and delivery.</p> <p>Depending on the timing of construction of the future Almond Street intersection upgrade, the proposal may be delivered in two stages to tie in with this infrastructure (see section 3.1.2).</p>

3.2.3 Major design features

The major features of the proposal are described below.

Upgrade of Picton Road

The proposal would be undertaken between about 1.2 kilometres east of the Nepean River and about 200 metres east of the existing intersection with Almond Street (a total length of about five kilometres). The upgrade would include widening Picton Road to provide additional lanes in each direction with a median barrier, widened shoulders, and shared user paths to provide improved traffic flow and facilities for active travel.

The proposal would generally follow the existing horizontal and vertical alignment of Picton Road. Between Almond Street and Pembroke Parade, the proposal would include mostly widening to the south of the existing road centreline. This would require major widening of the existing cutting on the southern side adjacent to Almond Street, with minor modifications to the cutting on the northern side. The existing concrete pavement between the easternmost limit of works and about 450 metres west of Almond Street (about 700 metres in total) would be replaced with a new flexible pavement for both carriageways on Picton Road.

West of Pembroke Parade, the proposal includes widening to six lanes through the interchange to the future location of the intersection with Wilton Park Road. Widening on both sides of Picton Road would be required for this section of the proposal. Picton Road would then narrow to two lanes in each direction until the intersection with the planned new Wilton Town Centre road (to be delivered by others), with a major widening of the large existing cutting west of Wilton Park Road. After this point the proposal would continue for about 200 metres along the existing road centreline to tie into the existing road configuration.

Typical cross sections are provided at Figure 3-6, Figure 3-7 and Figure 3-8 for the different lane arrangements on either side of the Picton Road and M31 Hume Motorway interchange.



Figure 3-6: Typical cross section of Picton Road west of Wilton Park Road (two lanes in each direction) facing west

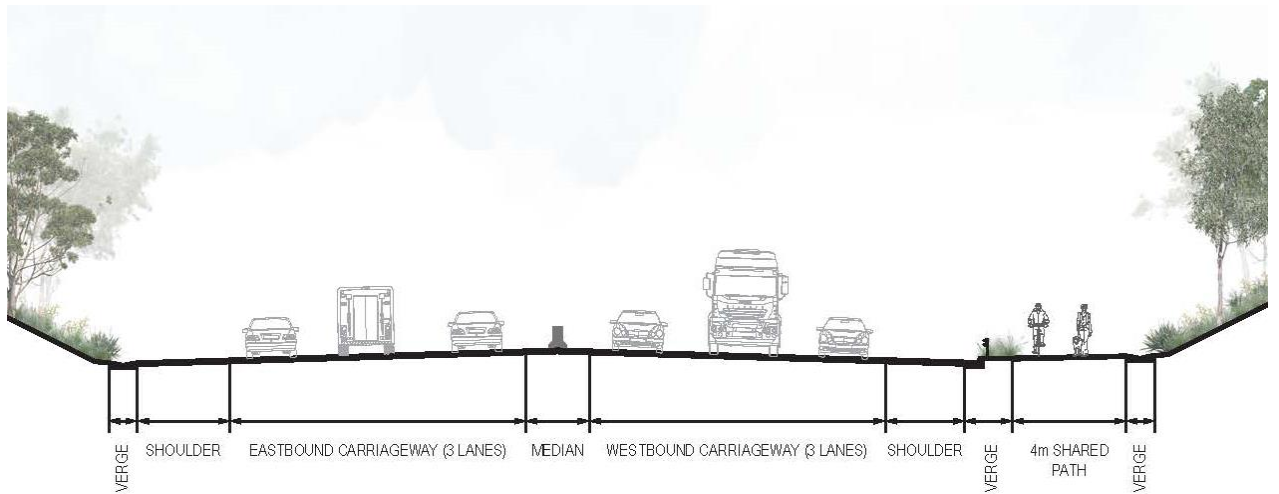


Figure 3-7: Typical cross section of Picton Road between the M31 Hume Motorway and Pembroke Parade (three lanes each direction) facing east

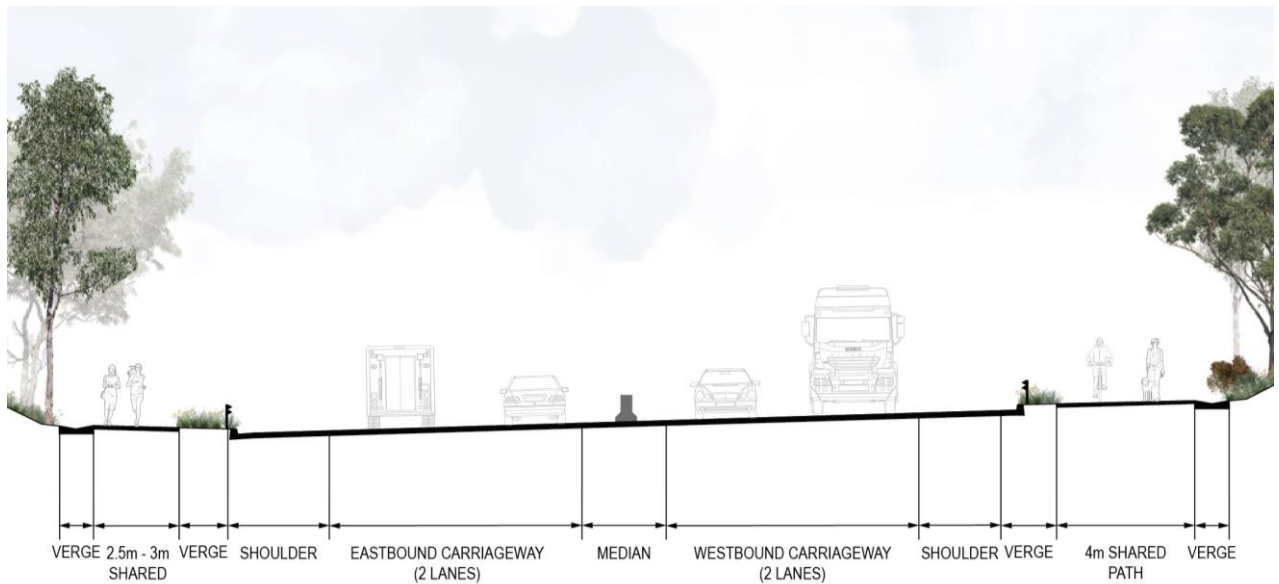


Figure 3-8: Typical cross section of Picton Road east of Pembroke Parade (two lanes each direction) facing east

Picton Road interchange with the M31 Hume Motorway

The proposal includes upgrading the existing interchange at the intersection of Picton Road and the M31 Hume Motorway to a diverging diamond layout as shown in Figure 3-2. A diverging diamond interchange allows traffic to navigate through the interchange via a crossover arrangement under the safety of signalised intersections, which mitigates the risk of conflicts with opposing traffic and improves traffic efficiency.

The diverging diamond interchange design would control movements using a simplified traffic light phasing, providing increased green time within the interchange compared to the existing conventional arrangements. The layout would also improve safety as right turn movements do not have to cross oncoming traffic or pass another set of traffic lights to complete their desired movement.

By grouping traffic approaches together, there would be a significant reduction of signal phases compared with conventional interchange layouts, reducing the wait time for traffic and improving the efficiency of the interchange. While this layout is new to NSW drivers, it would be easy and safe to navigate. Adequate pavement marking and signage would be implemented to ensure ease of use and safety for all transport users.

The interchange would provide for the following movements:

- through movements on Picton Road both eastbound and westbound
- dual right turns coming to and from Sydney, from Picton Road and the M31 Hume Motorway, allowing a B-double truck and a car to turn simultaneously on to or off ramps
- dedicated left turn lanes in each direction for traffic to enter and exit the M31 Hume Motorway
- closed circuit television cameras at the intersection for traffic management
- traffic control signals at the two crossover locations.

The new interchange would include the following key features:

- two new Picton Road bridges over the M31 Hume Motorway
- upgrade and realignment of on and off ramps with the M31 Hume Motorway
- additional lanes on the northbound on ramp and southbound off ramp to improve traffic flows
- an off-road active travel route (shared user path) through the interchange and over the M31 Hume Motorway.

These features are described below.

Provision of new Picton Road bridges over the M31 Hume Motorway

The proposal includes constructing two new bridges on Picton Road either side of the existing bridge. The new bridges would replace the existing bridge and have the following features:

- about 70 metres in length
- up to two spans long with a central median pier as required
- steel and/or concrete superstructure with a concrete deck designed to accommodate the potential for mine subsidence related movements
- a shared user path attached to the southern bridge
- throw screens to prevent debris reaching the M31 Hume Motorway below
- urban design treatments.

Once constructed, the two new Picton Road bridges would form part of the diverging diamond interchange, as shown in Figure 3-2.

The design of the interchange structures would include considerations to minimise the potential impact of predicted mine subsidence movements. The proposal considers flexible abutment types (for example reinforced soil walls), expansion joints and bearings. The bridge decks would allow for vertical and horizontal adjustments, should mine subsidence movements occur beyond the predicted movements.

Realignment of on and off ramps

With the change in geometry of the interchange, the access and egress from Picton Road to the M31 Hume Motorway would change to suit the new arrangement. The new southbound off ramp and northbound off ramp would tie into the M31 Hume Motorway at the same location as the existing ramps, while the southbound on ramp and northbound on ramp would be extended to provide additional space for vehicle acceleration and merging traffic. The connections to Picton Road for each ramp would be realigned to suit the diverging diamond alignment of Picton Road. The proposal would also include the provision of additional lanes to increase capacity.

Interchange shared user path

A four-metre-wide off-road shared user path would be provided through the interchange to provide a connection between the West Wilton and South West Wilton precincts over the M31 Hume Motorway.

To safely separate the shared path from the interchange traffic, it would run under the southbound on ramp lanes, cross the M31 Hume Motorway on the side of the southern bridge, and pass over the northbound off ramp. Based on the concept design, the shared user path would grade down at 4.5 per cent from the point the alignment separates from Picton Road, with landings provided at intervals as refuge. The path then passes under the two southbound M31 Hume Motorway on ramp lanes (prior to where they merge) via underpasses before grading up (at about three per cent) to connect with the southern abutment of the proposed southern bridge over the M31 Hume Motorway.

After crossing the bridge, the path grades up from the northern bridge abutment at three per cent to cross the proposed M31 Hume Motorway northbound off ramp via a shared user bridge. After this crossing the path travels downhill (2.5 per cent grade) to reconnect with the main Picton Road alignment. The level of the grade-separated crossing of the southbound on ramp lanes would be further developed during detailed design.

Shared user path

In addition to the shared user path through the Picton Road interchange with the M31 Hume Motorway (described above), the proposal includes:

- a four-metre-wide shared user path on the southern side of Picton Road from about 420 metres west of Almond Street to the western extent of the proposal
- 2.5 to three-metre-wide shared user paths following the Picton Road alignment:
 - on the northern side of Picton Road between Pembroke Parade and Almond Street
 - on the northern side of Picton Road between Aerodrome Drive and the location of the planned new Wilton Town Centre road.

The shared user paths would cross the intersections with local roads at grade via the existing traffic signals at Greenway Parade and uncontrolled crossings at Janderra Lane and Wilton Park Road. Stub connections to future paths within the Wilton Greens development would be provided.

The Wilton Growth Area infrastructure phasing plan (DPIE, 2020) notes that there will be future northern crossings of the M31 Hume Motorway and Picton Road via new overbridges that will provide active transport connections between the new Wilton Town Centre and the Bingara Gorge, South Wilton and South East Wilton precincts (see section 2.5.3).

Intersections

The proposal has considered the space required to build planned upgrades and new intersections to be delivered by private developers along Picton. The proposal includes changes to the current arrangements of the intersections with the existing Janderra Lane, Wilton Park Road, Aerodrome Drive and Almond Street local roads.

The intersection works that form part of the proposal are described below.

Picton Road and Janderra Lane intersection

The existing at grade right in and right out movements at Janderra Lane would be removed, as the concrete median barrier on Picton Road would be extended through this intersection. Alternate right in and right out access would be provided via the network upgrades to be delivered by others (see section 3.1.1). Alternate median arrangements at this location may be considered further during detailed design.

Picton Road and Almond Street intersection

The at grade right in right out movement at Almond Street would be removed via the continuation of the concrete median barrier on Picton Road extending through this intersection.

Grade-separated right in and right out turns from Picton Road would be provided as part of the planned Almond Street intersection upgrade to be undertaken by private developers (see section 3.1.1).

Picton Road intersection with Wilton Park Road and Aerodrome Drive

The existing at grade right in and right out movements to and from Picton Road from both Wilton Park Road and Aerodrome Drive would be removed as the concrete median barrier on Picton Road would be extended through this intersection. Movements from both roads would be limited to left in left out. Alternate median arrangements at this location may be considered further during detailed design. This is considered to be an interim arrangement to maintain access to these local roads until the signalised intersection is built by the private developers.

Drainage and water quality

The drainage design includes cross and pavement drainage systems as well as water quality treatment elements. Cross drainage would include open channels (such as catch drains, swales, table drains and kerbs and gutters), and culvert structures to convey external surface water through the proposal. Existing cross drainage culverts would be retained and extended or replaced where required, and additional culverts would be provided as needed. The pavement drainage design system would comprise the following:

- Inlet pits would be located along the road shoulder kerb and gutter and at the central median, which control flow along the carriageway and drain to water quality treatment controls via pipes before discharging to watercourses. Where controls cannot be provided immediately downstream of pavement drainage outlets, swales would be provided to capture and convey the water to a suitable location for discharging to the environment.
- Water quality treatment facilities would be designed to provide for spill containment to contain a minimum of 30,000 litres in locations where there may be a risk of accidental spills discharging to the environment.
- Over batter flows with open channels at the bottom of the fill batters would occur around the interchange.
- The road grade, wearing course, and drainage system would be designed to avoid and minimise the risk of aquaplaning.

Scour protection and energy dissipaters may be required for the drainage system, in particular at inlets and outlets, operational basins, and swales, as these locations are susceptible to scouring due to higher water velocities. This would be confirmed during detailed design and could include rock mattress or reinforced concrete flow control structures at outlets.

Drainage infrastructure located along a 500 metre section of the proposal at the western extent may be subject to mine subsidence movements, should underground coal mining using longwall techniques occur in the future. The concept design has considered features to accommodate predicted ground movements at this location, including:

- flexible pipe joints
- increased grades 0.25 per cent above the minimum grade required for hydraulic performance.

Transverse drainage

The proposal includes provision of cross and longitudinal drainage, including:

- upgrades to existing pipes and culverts where the existing pipes and culverts are either too small or would not meet the proposal design life
- new drainage infrastructure for new sections of road
- pit and pipe drainage where kerbs and/or gutters are proposed and against the median barrier
- scour protection.

Drainage outlets for the culverts would discharge to open channels, water quality basins or existing watercourses depending on the quality and source of the runoff. Water that may be polluted from the roadway would generally be directed to water quality basins whilst clean water from upstream would be directed through the culvert and away from the proposal.

The transverse drainage system would convey all storm events up to and including the one per cent AEP storm event. The intention of the system is to ensure that Picton Road would remain open during potential major storm events.

The indicative locations of culverts are shown in Figure 3-1 to Figure 3-4. Culvert locations would be subject to refinement during detailed design.

Water quality

Water quality treatment devices would be provided along the length of the proposal. The concept design includes stormwater basins that incorporate bio-retention media and planting. These basins would be dry basins, which would only contain water following rain events until water has drained away after being treated. Some construction basins, subject to detailed design, may be repurposed as operational basins. The water quality treatment devices, including basins and related infrastructure, would be subject to refinement during detailed design.

Rainwater runoff would be captured by the longitudinal drainage network described above and transported to treatment basins. Water quality treatments would continue to be refined through detailed design as needed while maintaining the water quality objectives for the proposal (see section 6.6).

Batters and retaining walls

The proposal includes cut and fill batters. Fill batters are generally proposed to be a maximum grade of 2:1 horizontal to vertical and would be up to 6.5 metres high. The highest fill batters would be located between the Wilton Park Road intersection and western extent of the proposal. Cut batters are generally proposed to have a maximum grade of 2:1 horizontal to vertical. However, cut batters with suitable geotechnical conditions or with the application of additional treatments may reach maximum grade of 1.5:1 horizontal to vertical where necessary. The highest cutting would be located west of Wilton Park Road and is proposed to be about 15.5 metres high, including a safety bench at 10 metres.

The concept design proposes a short retaining wall to protect vegetation on the southern side of Picton Road to the west of Pembroke Parade. The average height of the proposed retaining wall would be about two metres, with a maximum height of about 2.5 metres.

Safety barriers

Safety barriers would be installed along the majority of the proposal within the median between the eastbound and westbound lanes to separate the directions of travel. The types of barriers to be installed would be considered further during detail design. This would include consideration of alternative arrangements within the median to allow movements for emergency services and maintenance vehicles. The following safety barrier types would be considered within the median:

- concrete safety barriers
- steel safety barriers
- wire rope safety barriers.

The following types of barriers would also be installed at specific locations along the proposal:

- High containment safety barriers would be provided on the bridges over the M31 Hume Motorway, in accordance with Australian bridge design standards.
- Steel rail or wire rope safety barriers or high profile redirective kerbs would be provided at the edge of the carriageway to offer shared user path users protection from out-of-control vehicles and at outside shoulders where a hazard exists for drivers, such as for fill batters that are 3:1 horizontal to vertical or steeper.
- Temporary safety barriers would be used as part of the staging strategy to control access and delineate the construction work area in accordance with staging arrangements.

Noise treatments

The existing 3.6 metre high noise barrier located north of Picton Road and east of Pembroke Parade may need to be relocated north of its existing location in sections where there is insufficient space for the proposed shared user path. The dimensions of the wall, including the height, would remain the same and the extent of any relocation would be finalised during detailed design.

Noise mounds within the proposal site may also be considered during detailed design.

Property access

Picton Road is generally a controlled access road and only a small number of properties have direct access from the road corridor. The proposal would affect current access arrangements for two properties (Lot 16 DP251051 and Lot 2 DP1288665), which would be provided with new accesses, following discussions with the property owners.

Further information about the potential traffic, transport and access impacts of the proposal is provided in section 6.2.

Urban design and landscaping

An urban design and landscape strategy has been developed for the proposal consistent with the urban design objectives provided in section 2.3.3. The strategy provides urban design direction for key elements and structures. Key urban design and landscaping features include:

- The shared user path, including pedestrian/cycle rest stops, provide regular opportunities to stop and for interpretation contributing to a safe and comfortable journey.
- Shared user paths would address crime prevention through environmental design (CPTED) requirements and would provide a safe and legible journey.
- Roadside furniture would support safety during operation. Roadside furniture would be typical of arterial roads environments and located in accordance with respective standards and guidelines.
- The bridges at the interchange would be supported by reinforced soil walls, vegetated embankments, piers and retaining walls.
- Proposed native planting types respond to the local character and conditions and consider local Aboriginal cultural heritage with vehicle safety and ongoing maintenance as a key consideration.
- Interpretive elements based on local Aboriginal and non-Aboriginal cultural heritage along the shared user path, bridge barriers, throw screens and relocated noise wall.
- Interpretive wayfinding and other elements based on local Aboriginal and non-Aboriginal cultural heritage within the interchange between Picton Road and M31 Hume Motorway.

Further information is provided in the Landscape Character and Visual Impact Assessment in Appendix K. An Urban Design and Landscaping Plan will be prepared to support the final detailed design (see section 6.10.4). The Urban Design and Landscaping Plan will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the REF.

Pavement marking

Pavement marking would be provided in accordance with Transport's design specifications. All pavement markings, such as lettering, numerals and symbols, would be large and clear enough to allow it to be read from a suitable distance whilst travelling at the posted speed limit. Pavement markings would include:

- longitudinal linemarking (line parallel to the traffic, such as lanes, edges, turns, continuity and transition lines, and outline markings)
- transverse lines (lines marked at right angle to the traffic, such as stop and give way lines)
- pavement arrows to provide directional guidance
- other markings (diagonal and chevron markings, messages on pavement including symbols, words, and speed limit numerals).

The pavements are expected to comprise two main types, subject to further consideration during detailed design:

- Overlay over existing asphalt comprising layers of asphalt over the existing pavement. Some sections of the existing pavement that have been assessed as being in poor condition would be removed and replaced.
- New areas of pavement would comprise multiple layers of asphalt on a layer of selected material placed over various sub-grade layers. An alternate pavement design has also been developed that replaces some of the asphalt layers with heavily bound subbase. This pavement would only be used in areas where there is minimal mine subsidence potential.

The shared user path would be constructed from either reinforced concrete or asphalt. Maintenance access tracks would be constructed using sealed road base and are designed to blend in with the proposal landscaping.

Road and shared path pavements located along a 500 metre section of the proposal located at the western extent may be subject to mine subsidence movements, should underground coal mining using longwall techniques occur in the future. The concept design in this location has incorporated flexible design considerations to accommodate predicted ground movements, including:

- flexible pavement consisting of full depth asphaltic concrete
- concrete structures (such as kerbs and shared paths) to include regularly spaced movement joints.

Fencing

Fencing would be provided to ensure safety for shared user path users and to secure properties as needed.

Pedestrian fencing would be provided on the outside of shared user paths where required in accordance with Transport and Australian standards and specifications. Property boundary fencing would be adjusted and installed as per agreement with property owners as part of the property acquisition and adjustment process (see sections 3.6 and 6.11).

Any sections of fauna fencing along the M31 Hume Motorway and Picton Road that are impacted by the proposal would be adjusted.

Other infrastructure, such as water quality treatments and some utilities, may require fencing to ensure public safety.

Lighting

Lighting would be provided in accordance with relevant standards in the Australian Standard series *AS/NZS 1158: Lighting for roads and public spaces*, and Transport performance specifications. This includes lighting along Picton Road, at proposed intersection locations and the Picton Road interchange with the M31 Hume Motorway. Separate lighting is proposed where the shared user path is separate from the road carriageways.

Intelligent transport systems (ITS)

Traffic counting loops and control boxes would be installed at various locations along the corridor so that traffic volumes can be monitored. In addition, closed circuit television cameras (CCTV) would be located at various locations to allow remote monitoring of traffic.

Variable message signs would be provided on Picton Road and the ramps with the M31 Hume Motorway to allow travel information to be broadcast to road users.

The various ITS infrastructure would be connected via a communications network laid in conduits along the corridor.

The ultimate location of ITS infrastructure would be determined during detailed design.

Signposting

Signposting would be provided to ensure clear information and direction is available to drivers. Signs would be provided to ensure road rules and regulations are implemented, such as parking and stopping restrictions, posted speed limits and direction of travel.

Picton Road would be signed as Emergency Stopping Lane Only and parking on road shoulders would not be permitted. This would reduce potential obstructions to sight distance and emergency access. Existing heavy vehicle rest/parking demand would be accommodated by existing rest areas located near the proposal site.

Directional signs would be provided to inform key destinations, places of interest and through routes.

Bus facilities

No dedicated bus facilities are proposed to be removed or provided as part of the proposal.

3.3 Construction activities

This section describes the indicative construction methodology, work hours, plant and equipment, and associated activities that would be used to construct the proposal. The construction information described in this section is indicative and based on the current stage of the design. It provides a preliminary construction methodology that retains flexibility for the construction contractor(s) to refine and optimise aspects of the approach. The construction methodology would be refined as the design progresses and once the construction contractor(s) is engaged.

3.3.1 Work methodology

Construction footprint

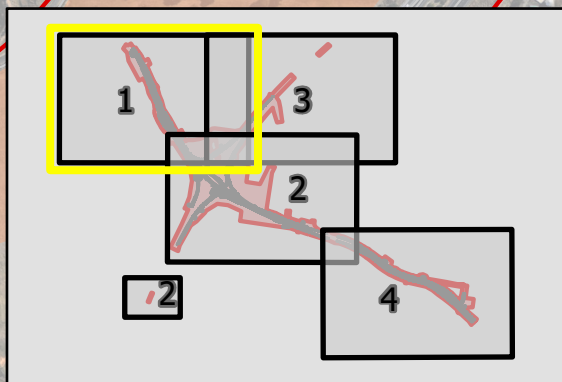
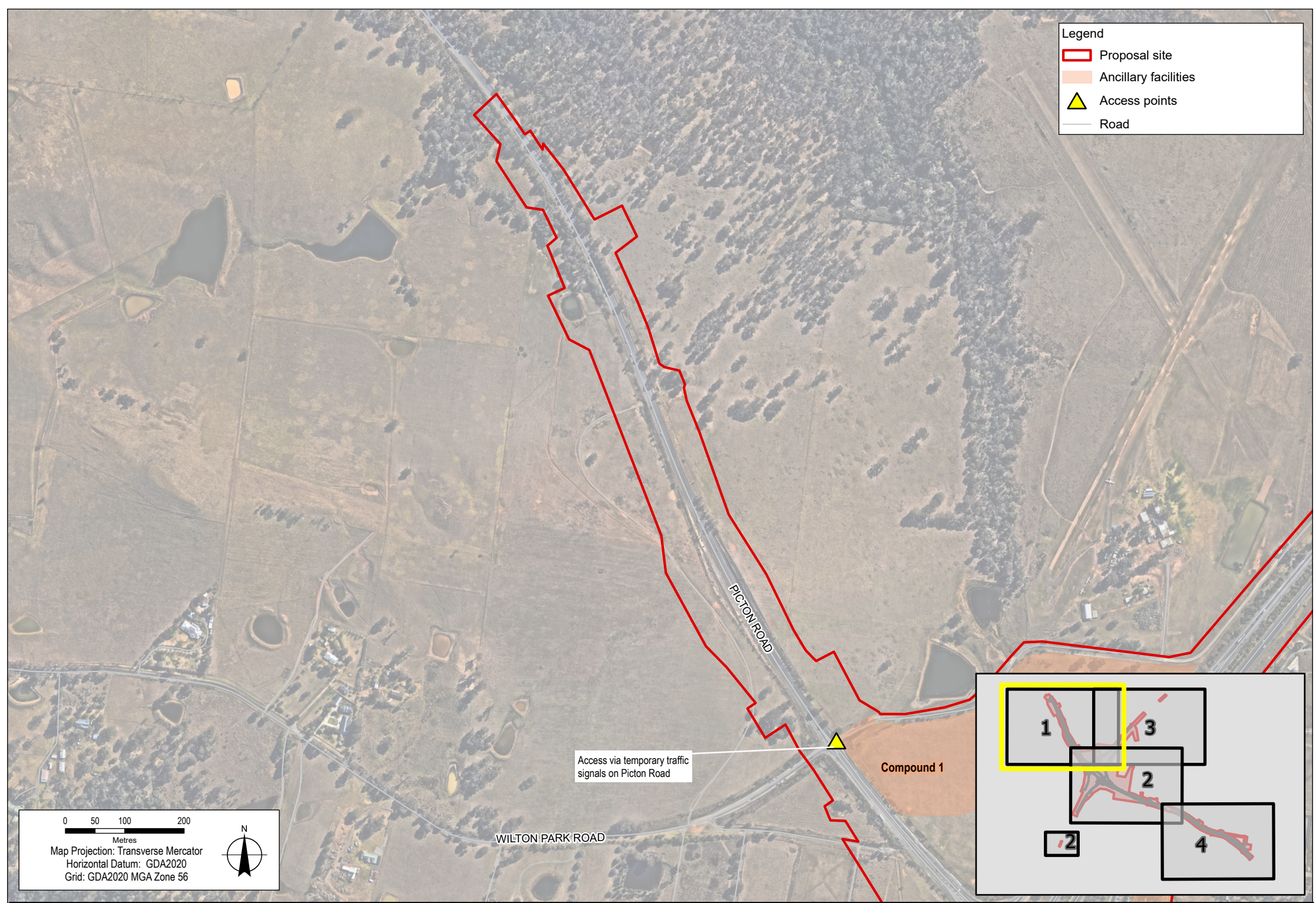
The land required to construct the proposal (the construction footprint) is shown on Figure 3-9 to Figure 3-11. The construction footprint includes areas that may be occupied by the proposed infrastructure (described in sections 3.1 and 3.2) and areas required to construct this infrastructure, including:

- alternative construction compounds and other ancillary facilities (described in section 3.4)
- areas required for construction access
- sufficient space around the road and interchange alignment to provide space to manoeuvre construction plant and equipment, and relocate and protect utilities as required.

The construction footprint has been adopted as the proposal site for the REF to assess the potential impacts of constructing the proposal.

Legend

- Proposal site
- Ancillary facilities
- ▲ Access points
- Road



0 50 100 200
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

Figure 3-9 - Construction footprint - map 1

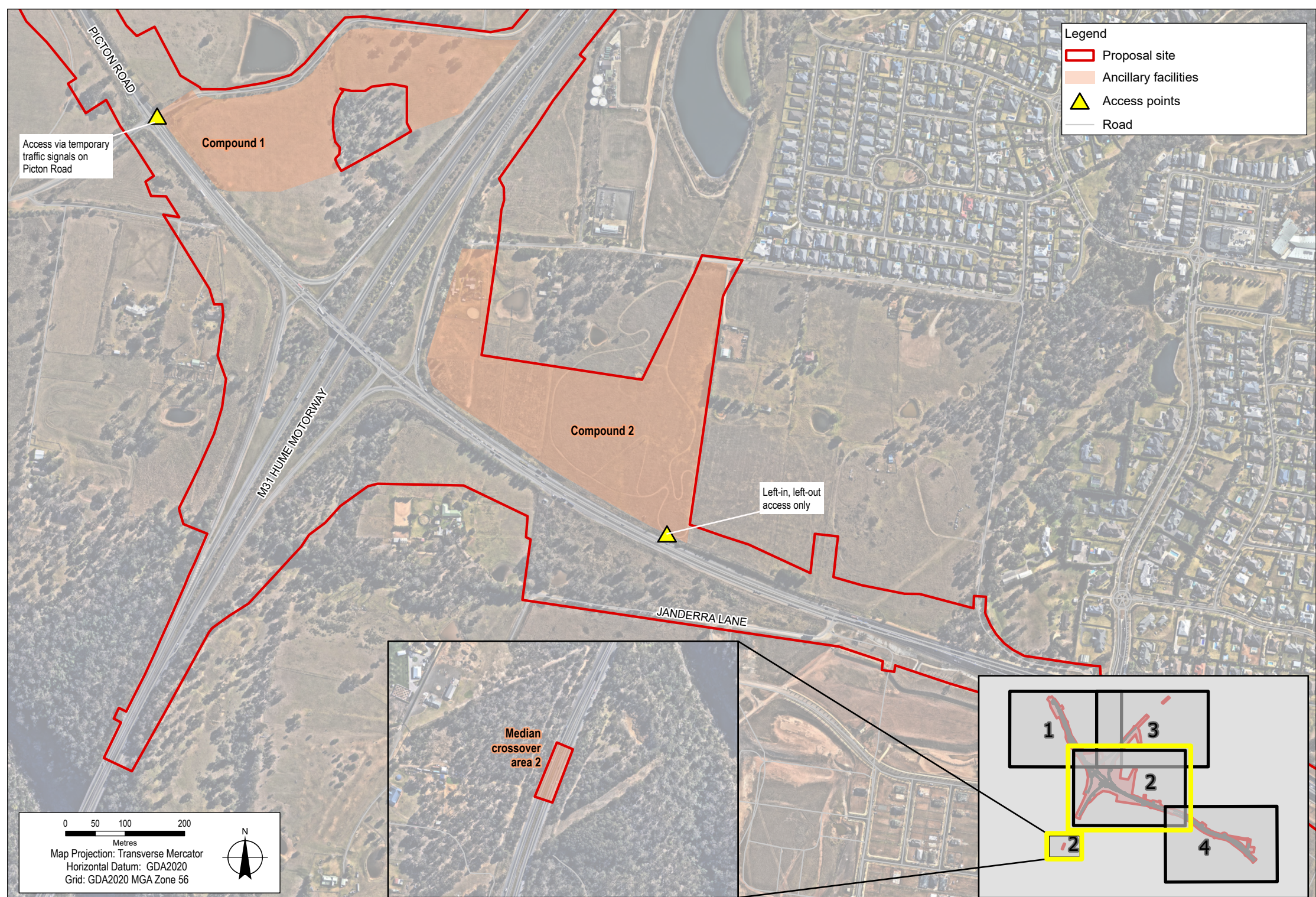
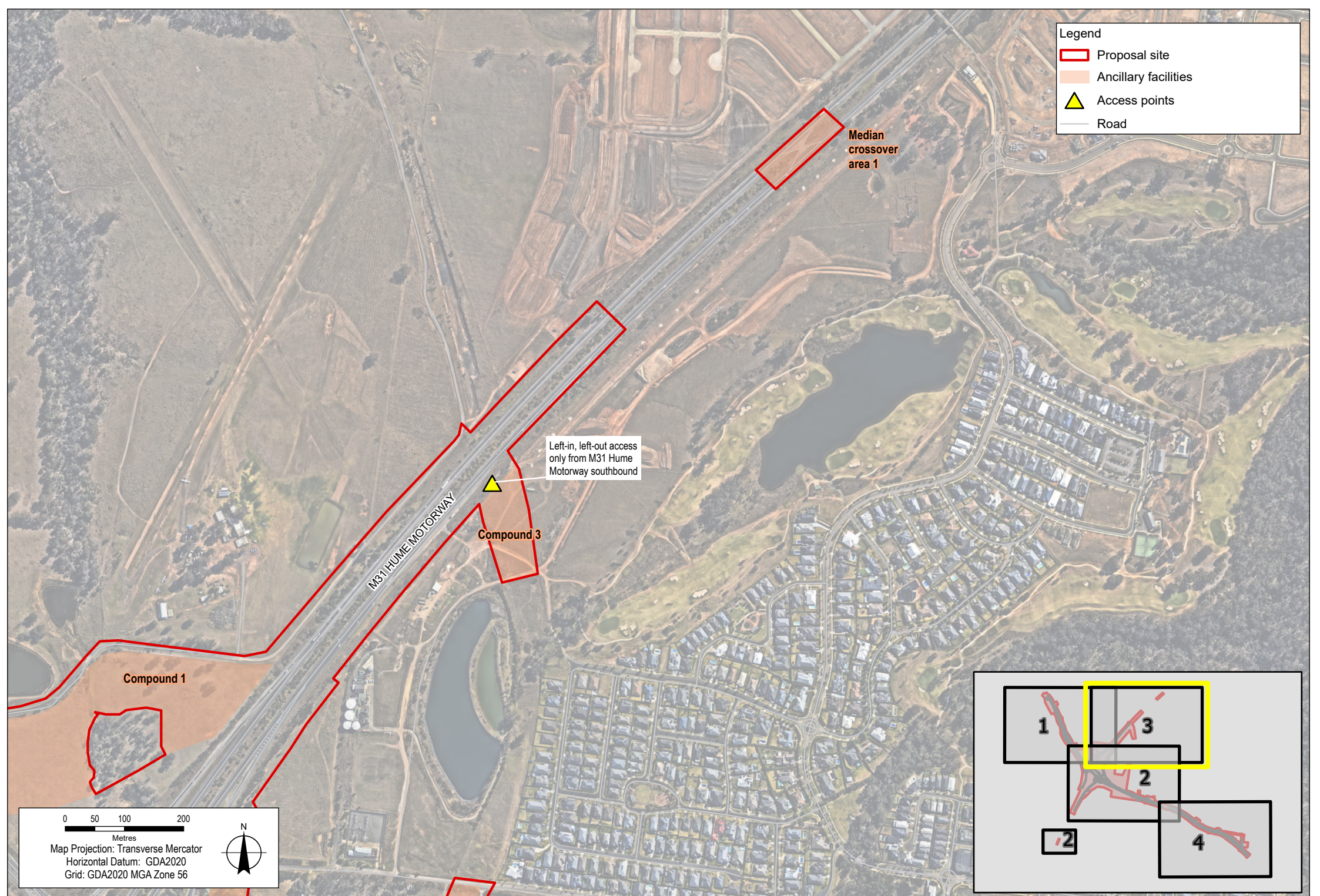


Figure 3-10 - Construction footprint - map 2



Legend

- Proposal site
- Ancillary facilities
- ▲ Access points
- Road

Left-in, left-out access
only from M31 Hume
Motorway southbound

Median
crossover
area 1

Compound 3

Compound 1

M31 HUME MOTORWAY

0 50 100 200
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

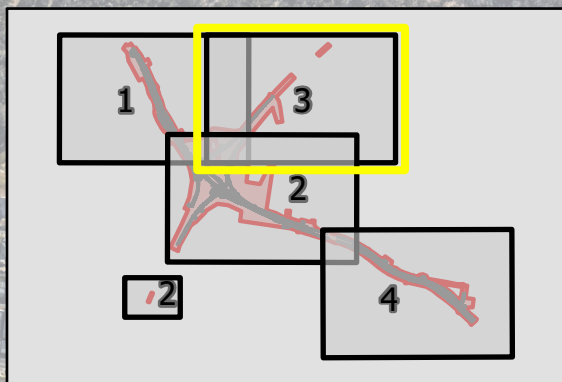
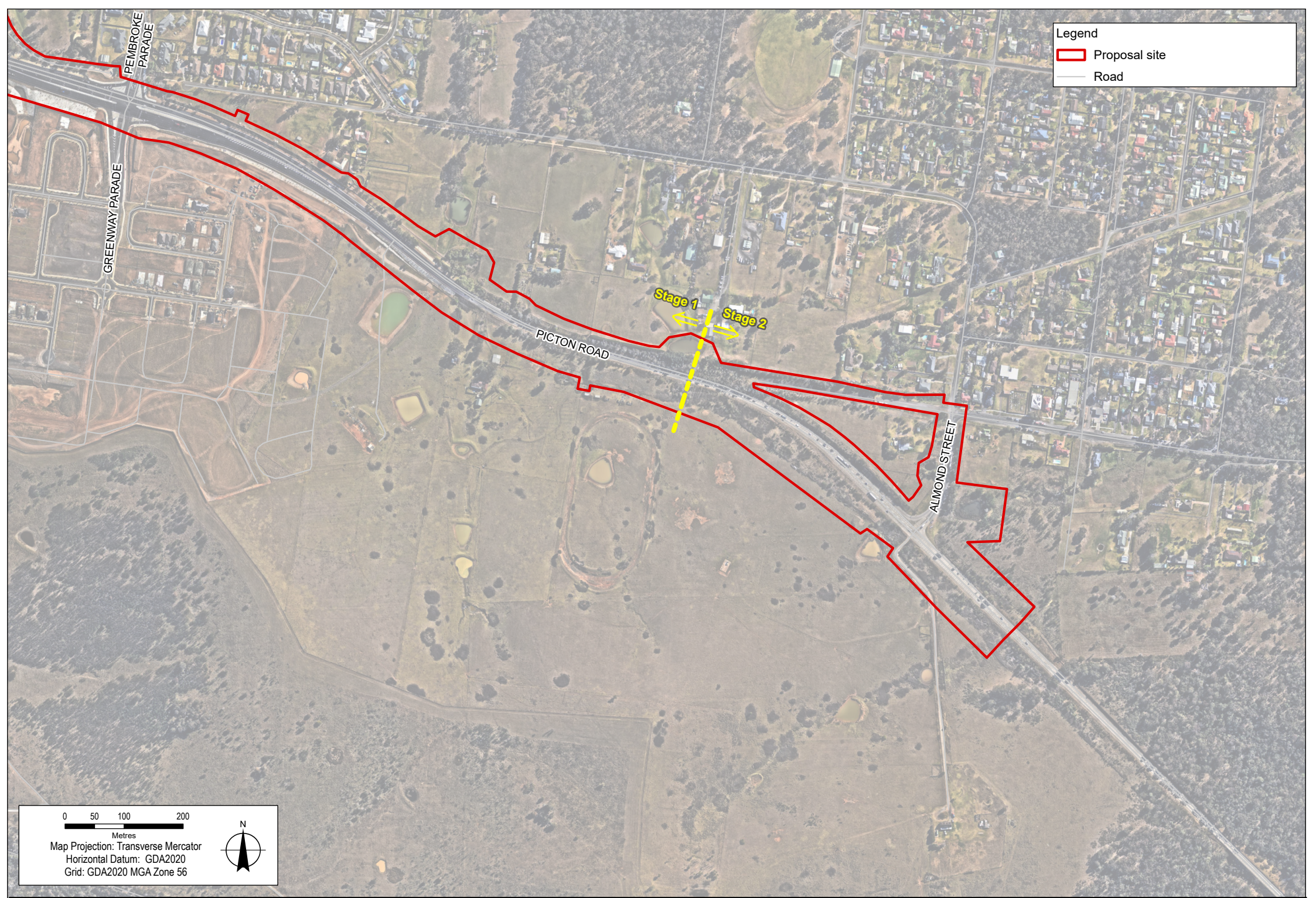


Figure 3-11 - Construction footprint - map 3



Legend

- Proposal site
- Road

0 50 100 200
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

Figure 3-12 - Construction footprint - map 4

Construction staging

The work methodology for the proposal would be refined during detailed design and construction planning. Construction activities would be carried out in accordance with a Construction Environmental Management Plan (CEMP) that would be developed to ensure REF safeguards (provided in section 7.2) and legislative requirements are complied with.

The indicative construction sequencing and work methodology is outlined in Table 3-4 and is based on the concept design.

The ultimate sequencing and methodology would be developed and implemented to minimise disruption for road users and to ensure that work can be conducted safely. A detailed program of work would be determined by the construction contractor, after completion of the detailed design in consultation with Transport.

Table 3-4: Indicative construction sequencing and activities

Construction stage	Indicative duration	Typical element	Typical activities
Stage 0: Pre-construction/ early works, site establishment, utility works	6 months	Site establishment	<ul style="list-style-type: none"> • pre-clearing survey and associated activities, including establishing exclusion zones around environmentally sensitive areas identified in the CEMP (retained trees, heritage items etc) • establish survey control • road and intersection modifications to create construction access • vegetation clearing works and stockpiling of mulch materials • topsoil stripping and stockpiling • construct temporary access roads (haul routes, site access gates) • building removal works for properties subject to acquisition • remove median along Picton Road and replace with road pavement to facilitate later traffic switches • install temporary construction line marking, signage and lighting • fence construction areas and site compounds • relocate sections or the whole of the existing noise wall on Picton Road to the east of Pembroke Parade • construct access entries and routes for earthworks and construction activities • establish site compounds • relocate fauna fences or establish temporary fauna fences • progressive installation of erosion and sedimentation controls, including construction of diversion drains and sedimentation basins • temporary traffic management arrangements • property access adjustment works

Construction stage	Indicative duration	Typical element	Typical activities
Stage 1 Widening to one side, bridge construction, pavement works	8 months	Utilities and service relocations	<ul style="list-style-type: none"> adjust and protect utility infrastructure as required install temporary signals as required <p>It is noted that some of the protection and relocation works may be carried out as pre-construction works if possible. However, some temporary relocation of utilities may be required to enable safe and efficient progression of specific construction activities, followed by permanent relocation once these activities have been completed.</p>
		Traffic	<ul style="list-style-type: none"> traffic control and temporary traffic management arrangements
		Utilities	<ul style="list-style-type: none"> complete remaining utility works install traffic control system, street lighting and intelligent transport system infrastructure
		Drainage and structures	<ul style="list-style-type: none"> earthworks install cross drainage culverts install pavement drainage construct shared user paths construct water quality basins
		Bridge construction	<ul style="list-style-type: none"> earthworks construct the M31 Hume Motorway northbound on ramp and southbound off ramp commence construction of bridges over the M31 Hume Motorway with central pier works construct bridge foundations, retaining structures, bridge abutments and piers
		Pavement works	<ul style="list-style-type: none"> construct temporary pavements construct base and sub-base pavement layers construct pavement drainage, including kerb and gutters as required construct pavements and wearing course construct medians and barriers install construction phase safety barriers
Stage 2: Widening to the other side, bridge construction, pavement works	12 months	Utilities	<ul style="list-style-type: none"> install traffic control system, street lighting and intelligent transport system infrastructure
		Traffic	<ul style="list-style-type: none"> traffic control and temporary traffic management arrangements, including traffic switches to new alignment

Construction stage	Indicative duration	Typical element	Typical activities
		Drainage and structures	<ul style="list-style-type: none"> earthworks, including construction of longitudinal and transverse drainage within cuts and embankments extend existing cross drainage construct subsurface drainage construct road longitudinal and cross drainage including outlets and scour protection construct open drains and catch drains including scour protection work continue shared user paths construction
		Bridge construction	<ul style="list-style-type: none"> install bridge deck superstructures
		Pavement works	<ul style="list-style-type: none"> construct base and sub-base pavement layers construct pavement drainage, including kerb and gutters construct pavements and wearing course construct medians and barriers
Stage 3 Construction of central area	6 months	Traffic	<ul style="list-style-type: none"> traffic control and temporary traffic management arrangements, including traffic switches convert to ultimate phase traffic configuration where possible, maintain two lanes in both directions traffic to be transferred onto new bridge through the interchange
		Bridge works	<ul style="list-style-type: none"> demolish/remove and process the existing bridge structure in accordance with a bridge demolition management plan (processing activities would include steel cutting and concrete hammering) some bridge substructure may be retained under the finished surface where it is deemed not to impact future M31 Hume Motorway upgrade works
		Pavement works	<ul style="list-style-type: none"> complete remaining work on pavement between newly constructed areas install barriers and medians
		Ancillary works	<ul style="list-style-type: none"> complete installation of ITS and street lighting landscaping
Stage 4: Finishing and demobilisation	4 months		<ul style="list-style-type: none"> final pavement works including wearing course and pavement marking install street lighting, signposting, intelligent transport systems and permanent traffic signals install remaining permanent fencing or guardrails landscaping and tree planting remove temporary fencing and erosion and sedimentation controls (some temporary works may remain if required, safe and practicable) remove temporary fauna fences and install permanent fauna fences (if not relocated in stage 0) remove and reinstate site compounds rehabilitation of disturbed areas demobilisation

3.3.2 Construction workforce

The construction workforce is expected to fluctuate, depending on the stage of construction and associated activities. The workforce would be expected to peak at about 100 personnel per day. On either side of this peak period, daily workforce numbers would fluctuate between about 40 and 60 personnel at any given time during the construction period. A total workforce of about 200 personnel is expected to be required, including about 120 construction workers.

The final number of construction workers would be confirmed by the contractor appointed for the proposal.

3.3.3 Construction hours and duration

Indicative construction program

Subject to approval and construction funding, works are anticipated to commence between 2026 and 2027, and are estimated (at this stage of the design process) to take about three years to complete. Early works, such as utility protection and relocation work, boundary adjustments and at-property noise treatments, may be completed prior to commencement of the main construction work.

General work hours

General construction work for the proposal would be carried out during recommended standard working hours (in accordance with the *Interim Construction Noise Guideline* (DECC, 2009)) wherever possible as follows:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sundays and public holidays: no work.

Construction activities that involve impulsive or tonal noise emissions would be limited to the following hours in accordance with the *Construction Noise and Vibration Guideline (Roads)* (Transport for NSW, 2023h):

- Monday to Friday: 8am to 5pm
- Saturday: 9am to 1pm
- Sundays and public holidays: generally no work.

Construction activities that involve blasting would be limited to the following hours in accordance with the *Construction Noise and Vibration Guideline (Roads)* (Transport for NSW, 2023h):

- Monday to Friday: 9am to 5pm
- Saturday: 9am to 1pm
- Sundays and public holidays: generally no work.

Extended working hours

Extended working hours would be considered to reduce the overall construction timeframe of the proposal and to provide relief to the Wilton community. A number of longer-term construction projects (including the proposal) are likely to be carried out in the locality at the same time (see section 3.1.1).

If pursued, extended construction working hours would involve additional work hours Monday to Friday and on Saturday afternoon, and would only be implemented if reasonable and feasible to do so with a benefit to the community. The proposed extended working hours are likely to be:

- Monday to Friday: 6am to 7pm
- Saturday: 8am to 5pm
- Sunday and Public Holidays: no work.

Extended working hours would generally be limited to daylight hours, with potentially shorter working periods throughout winter months. It is expected that all construction work scenarios described in Appendix J and Table 3-4 may be carried out within these extended working hours. As detailed in section 4.2.8, an environment protection licence would be required for the proposal, and any conditions in that licence relating to construction hours would also be adhered to.

The justification for the proposed extended construction hours and for out-of-hours work (night work) is presented in the following section.

Justification for the extended working hours

Transport is aware that there are plans for a large number of construction projects to occur in the Wilton Growth Area over the next 15 years. Because of this, construction of the proposal may generate cumulative impacts such as construction noise, traffic and consultation fatigue to local communities and transport users. Cumulative impacts are further described in section 6.16.

The justification for extended construction hours would primarily be to reduce the overall construction timeframe and, as a result, shorten the duration of potential impacts on the local community, freight industry and travelling public. This would result in a safer work environment, road network benefits of the proposal being more quickly realised, and supporting faster, more efficient and safer haulage routes.

In particular, extending standard working hours by two hours on Mondays to Fridays, and four hours on Saturdays would likely result in the following benefits to the community:

- reduce the volume of traffic on the roads during peak hours due to construction staff and some construction vehicles travelling to and from the work site outside peak traffic periods
- potentially bring forward the opening date for the proposal and minimise overlapping construction timeframes for different Picton Road upgrade projects
- reduce the duration of temporary traffic disruption and potential noise and visual amenity impacts to the community, local business, motorists, pedestrians and cyclists
- provide a safer road and active transport network earlier than planned.

In addition, longer working days would generally result in a direct increase in productivity across the proposal, making maximum and most efficient use of existing equipment and resources.

The impacts and benefits of the proposed extended construction hours would be further assessed during detailed design. Potential impacts would be discussed with the community before construction following the proposed consultation process described in the following section.

Consultation proposed for the extended working hours

Section 2.3 of the *Interim Construction Noise Guideline* (DECC, 2009) (ICNG) indicates construction activities are permissible outside of standard hours for 'public infrastructure works that shorten the length of the project and are supported by the affected community'. Community consultation would be required for extended working hours in line with guidance from the ICNG. This consultation would occur once detailed design and construction methodologies have been further developed.

The community consultation would likely include the following:

- Identification of receivers potentially impacted by construction activities (as identified by the construction noise assessment (see section 6.8)) and potentially a 'shoulder hours' assessment carried out during detailed design. Impacts would be based on predicted noise impacts from the adopted extended working hours. Shoulder hours would likely be defined as Monday to Friday 6am to 7am, and 6pm to 7pm.
- Notification of identified receivers by mail of the proposed hours, including request for comment and feedback. This would include justification for the proposed extended working hours along with the benefits the community can expect.
- Individual interviews or drop in sessions to address any further issues where the community or individual residents request further clarification on the proposed hours. Discussions would be sufficiently detailed to provide a general summary of the expected impacts and an explanation of how the proposed working hours relate to individual receivers.
- Provision of complaints management procedures, which would be in place during construction.

While community consultation for extended construction hours would be ongoing, feedback received during the REF consultation period would inform the final adopted working hours for the proposal.

Night work

Certain work would still need to occur outside these hours (known as night or out-of-hours work) to minimise disruption to traffic and disturbance to surrounding landowners and businesses, and for the safety of the construction workforce. Under the ICNG, there are five categories of work that can be carried out outside the recommended standard hours, as follows:

- delivery of oversized plant or structures, where police or other authorities have determined that special transport arrangements are required
- emergency work, to avoid the loss of life or damage to property, or to prevent environmental harm
- maintenance and repair works, where disruption to essential services and/or safety considerations do not allow work within standard hours
- public infrastructure work that would shorten the duration of a project and are supported by the affected community
- work where a proponent demonstrates and justifies the need to operate outside the standard hours.

The following activities may need to take place outside of standard construction hours:

- utility relocation or protection works
- removal of the existing Picton Road overbridge
- delivery of large construction plant and materials, such as components for the bridge structures (for example bridge girders)
- lifting and installing bridge structure elements such as girders, parapets and throw screens
- installation and adjustment of traffic barriers and signage for construction work areas during each construction stage as part of traffic switches
- intersection and tie-in activities to the existing road network, including paving works and pavement marking
- construction of traffic control systems
- installation of integrated traffic systems
- installation of drainage infrastructure underneath Picton Road
- operation of construction compounds to support the above work
- work within the median or carriageways on the M31 Hume Motorway that requires lane closures or a temporary contraflow arrangement between north and southbound carriageways
- emergency works to avoid the loss of life or damage to property, or to prevent environmental harm.

All construction scenarios relevant to the proposal would involve some night works to facilitate safe working environments or minimise interruptions to the road network. Night works have been assessed in detail by the Noise and Vibration Impact Assessment (Appendix J), and are summarised in section 6.8. Any night work would be undertaken in accordance with the *Construction Noise and Vibration Guideline (Roads)* (Transport for NSW, 2023h).

3.3.4 Plant and equipment

A range of plant and equipment would be used during construction. The plant and equipment listed would be subject to refinement of design and during the construction planning phase upon the engagement of a contractor. An indicative list of plant and equipment is provided below:

- asphalt trucks
- bulldozers
- compactors
- concrete trucks and pumps
- cranes
- vertical drill/boring rigs
- elevated work platform
- excavators
- generators
- concrete saws
- hydraulic jacks
- graders
- directional drilling/boring equipment
- light mobile cranes
- light vehicles
- pavement marking equipment
- loaders
- milling machines
- mobile cranes
- chainsaws and mulchers
- jackhammers
- pilling rigs
- profilers
- rock breakers
- rollers
- scrapers
- trucks/articulated dump trucks
- vibratory rollers
- water carts
- welding, grinding and hot cutting equipment
- self-propelled mobile transporter.

Not all of the above plant and equipment would be in use at any one time, and some would only be used on an intermittent or temporary basis.

3.3.5 Earthworks

The proposal would require bulk earthworks associated with the following activities:

- progressive construction of sedimentation and erosion controls, as required
- stripping topsoil and stockpiling for reuse
- excavation of cuttings including box out of pavement areas
- construction foundation treatments
- construction of embankments
- placement and compaction of selected material
- excavation of unsuitable materials, including blending and/or disposal of surplus material
- re-establishment and rehabilitation of disturbed areas
- encapsulation of contaminated materials (if required).

The majority of earthworks would take place during the box out construction. In total, the proposal is expected to excavate about 190,000 cubic metres (cut) and use about 160,000 cubic metres (fill) within the batters and pavement areas.

Prior to being used as fill, site-won material would be classified in accordance with Transport's *Specification R44 Earthworks*

If suitable for reuse on site or on other projects, excess material would be loaded and hauled to the nominated stockpile location.

Material that is deemed unsuitable for reuse on site or on other projects would be classified in accordance with the *Waste Classification Guidelines* (EPA, 2014) and disposed of at an approved materials recycling or waste disposal facility. The proposal would provide for the ability to encapsulate contaminated material, where suitable, on site within dedicated and contained encapsulation cell/s located within the formation of road embankments, below pavement levels and above groundwater levels.

3.3.6 Source and quantity of materials

Where not available on site due to quantity or quality issues, materials would be sourced from local suppliers and quarries. Some materials may also be sourced from adjacent infrastructure projects or development areas in consultation with the proponent for those projects. Due to the close proximity to Wollongong, Picton and south-west Sydney, it is anticipated that all asphalt and concrete would be sourced locally, and no temporary batching plant would be required.

The typical materials and estimated quantities are provided in Table 3-5. These quantities are indicative only and are subject to detailed design.

Table 3-5: Typical construction materials and approximate quantities

Material	Estimated quantity
Concrete paving	4,000m ³
Concrete kerb	12,000m
Asphalt	45,000m ³

3.3.7 Traffic management and access

Construction vehicle movements

It is anticipated that during recommended standard hours a maximum of about 116 truck movements per day would be required during construction. Outside peak construction phases, an average of about 25 vehicle movements per day are anticipated. Outside of recommended standard hours (6pm and 10pm) it is anticipated that up to 36 heavy vehicle movements per day would be required, while on average this is anticipated to be about eight vehicles per day.

The number of truck movements would increase during the early phases of construction when bulk earthworks would be carried out. The trucks would be used to deliver construction material to the compounds and work areas, and remove material from work areas to temporary stockpile sites or appropriately licensed waste facilities.

It is estimated that the proposal would generate up to 200 light vehicle movements per day, with average movements of about 120 vehicles per day.

Haulage routes

Designated access routes for construction vehicles would be along the arterial road network. Details of routes used for access and haulage during construction would be developed in consultation with the Wollondilly Shire Council should their road network be required to be used for access and haulage. Roads anticipated to be used include:

- Picton Road eastbound and westbound
- the M31 Hume Motorway, northbound and southbound.

Internal haul roads would provide vehicle access between work sites and ancillary facilities. Figure 3-9 to Figure 3-12 show the indicative location of construction entry and exit to the ancillary facilities. The final location of internal haul roads and entry and exit points would be confirmed during further development of the construction methodology, with consideration of the construction contractor's requirements.

Road and lane access/closures

During construction, access would be maintained for residents, property occupants and through traffic. Alternative access provisions would be undertaken in consultation with affected property owners. In the case of properties adjoining the road corridor, temporary driveways would be provided as required. Final driveway configuration would be installed as part of the pavement construction.

Signage

Signage related to the proposal and the long term temporary traffic management and related devices would be installed up to 2.5 kilometres away on the approaches to the proposal site. The sizes of the signage may be above the cross section allowance under Transport’s Routine Minor Works Procedure and may be located outside the typical mowing strip of the road corridor. The exact location and potential impacts of this signage is currently unknown and would be determined during detailed design and pre-construction.

3.4 Ancillary facilities

A number of ancillary facilities would be required to support construction, including:

- site offices
- staff and workforce amenities
- storage, stockpiles and laydown areas
- workshops and maintenance facilities
- workforce parking.

Other ancillary facilities may be required to facilitate traffic movements within the proposal site.

The principles applied to identify potential locations for construction compounds included sites that:

- are located within or directly adjacent to the proposal site
- provide direct access to the interchange construction area
- are located on land owned or to be acquired by NSW Government, where possible
- do not contain significant environmental features that would be impacted by their temporary use, or where these aspects can be protected through the implementation of mitigation measures
- can be leased from private property owners.

Table 3-6 provides details of the proposed alternative compounds and ancillary facilities uses that have been identified as potentially being required to support construction of the proposal. The need for, and use of, these compound and ancillary facilities would be confirmed by the construction contractor and following negotiations with property owners.

The locations of the proposed compounds and ancillary facilities are shown on Figure 3-9 to Figure 3-11.

Table 3-6: Compounds and ancillary facilities available for use

Facility	Location (lot/DP)	Proposed use	Area (m ²)
Compound 1 (north-west)	Lot 2 / DP 253922 (partial)	<ul style="list-style-type: none"> • site offices • staff and workforce amenities • stores, stockpiles and laydown areas • processing of materials • workshops and maintenance facilities • workforce parking 	74,400
Compound 2 (east)	Lot 15 / DP 702024 Lot 16 / DP 702024 Lot 17 / DP 702024 (partial) Lot 210 / DP 735556 (partial) Lot 211 / DP 735556 (partial)	<ul style="list-style-type: none"> • site offices • staff and workforce amenities • stores, stockpiles and laydown areas • processing of materials • workshops and maintenance facilities • workforce parking 	109,300

Facility	Location (lot/DP)	Proposed use	Area (m ²)
Compound 3 (north)	Lot 10 / DP 702024 (partial)	<ul style="list-style-type: none"> stores, stockpiles and laydown areas 	11,200
Median area 1	In the median of the existing carriageway on the M31 Hume motorway, about 1.8km north of the interchange	Facilitation of traffic management under a contraflow arrangement	7,100
Median area 2	In the median of the existing carriageway on the M31 Hume motorway, about 1.4km south of the interchange	Facilitation of traffic management under a contraflow arrangement	3,300

3.5 Public utility adjustment

Table 3-7 provides an overview of the key utilities identified to date within the proposal site, and the proposed treatment of these utilities. Most of these utilities are located underground; however, some have above-ground components. Consultation with service providers has been carried out and is ongoing. The proposal would require the protection and relocation of major optic fibre communications, electricity, and high-pressure natural gas transmission.

Further consideration of the proposed treatment to minimise impacts would continue during design development in consultation with service providers.

Utility works would generally be contained with the proposal site; however, the final treatment could include the requirement for some works (such as connection works, usually within the road reserve or easements) in locations outside the proposal site.

Table 3-7: Indicative utility adjustments

Utility	Utility owner	Location	Proposed treatment
Communications			
Local telecommunications	Telstra	Almond Street	Relocate
	Telstra	Existing bridge	Relocate
	NBN	Near Pembroke Parade	Relocate
Underground fibre optic	Telstra	Interchange	Relocate
	Optus	Interchange	Relocate
	TPG	Interchange	Relocate
	Nextgen	Interchange	Relocate
Electricity			
High voltage electricity transmission	Endeavour Energy	Interchange, between Interchange and Pembroke Parade	Relocate
Overhead electricity lines	Endeavour Energy	Various	Relocate
Gas			
High pressure natural gas pipeline	APA	Janderra Lane	Protect

3.6 Property acquisition

The proposal has been designed and developed to minimise property acquisitions and has prioritised the use of land owned by the NSW Government, land allocated to Transport under existing development agreements, and land zoned for transport infrastructure. Notwithstanding this, some temporary use and permanent acquisition of properties would be required for the proposal. All acquisitions would be conducted in accordance with the NSW Government's property acquisition policy, and compensation would be based on the requirements of the *Land Acquisition (Just Terms) Compensation Act 1991*.

The proposal would permanently impact about 29 properties, of which:

- two would require total acquisition
- 27 would require partial acquisition or adjustments.

Of the two properties that require total acquisition one property is zoned SP2 Infrastructure by the Wollondilly Local Environmental Plan 2011 (Wollondilly LEP).

Of the properties that require partial acquisition:

- six properties are owned by the NSW Government
- one property is subject to land allocation clauses under an existing planning agreement between the NSW Government and the developer of Wilton Greens, where the impacted land is allocated for the proposal.

The extent of property impacts would be refined and confirmed during detailed design in consultation with the property owners. For partial acquisitions, property adjustment plans would be developed in consultation with the property owner. Section 6.11 provides a summary of the potential property impacts of the proposal.

Additional areas within the proposal site may require partial temporary lease agreements to allow for the construction of the proposal. A total of four properties (not already owned by the NSW Government) would indicatively be required to establish the proposed ancillary facilities outlined in section 3.4. The need for additional lease areas within the proposal site would be confirmed during detailed design and construction planning. Consultation regarding agreements associated with any leased areas would be undertaken with the identified landowners prior to works commencing.

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

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 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 a road and 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 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 (Planning Systems) 2021 or State Environmental Planning Policy (Precincts – Western Parkland City) 2021.

Sections 2.10 to 2.15 of 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 SEPP (Transport and Infrastructure), is discussed in chapter 5 of this REF. State Environmental Planning Policy (Biodiversity and Conservation) 2011 (SEPP (Biodiversity and Conservation)) outlines the planning principles for development in NSW in relation to the protection and conservation of biodiversity. SEPP (Biodiversity and Conservation) consists of chapters focussing on specific areas, including vegetation in non-rural areas, koala habitat protection, bushland in urban areas, water quality objectives for the Sydney drinking water catchment, and management of the environment along key river systems.

Section 2.163(2) of SEPP (Transport and Infrastructure) requires that development consent must not be granted to development on identified 'affected land' unless the consent authority is satisfied the development is consistent with the *Guideline for Development Adjacent to the Upper Canal and Warragamba Pipeline* (WaterNSW, 2021). Some areas of affected land are located within the proposal site (see Figure 4-4). These areas would have the potential to be disturbed during construction, although works within these areas would not affect the Upper Canal, which is located underground. As the proposal is permissible without consent, the requirements of this section do not apply. However, the associated Guideline has been considered during the design and assessment of the proposal, and will continue to be considered during detailed design and construction planning.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2021 (SEPP (Biodiversity and Conservation)) outlines the planning principles for development in NSW in relation to the protection and conservation of biodiversity. SEPP (Biodiversity and Conservation) consists of chapters focussing on specific areas, including vegetation in non-rural areas, koala habitat protection, bushland in urban areas, water quality objectives for the Sydney drinking water catchment, and management of the environment along key river systems.

Cumberland Plain Conservation Plan

The Cumberland Plain Conservation Plan (CPCP) is a strategic conservation plan prepared under SEPP (Biodiversity and Conservation) that aims to support Western Sydney's growth and the region's native plants and animals. The CPCP maps certified-urban capable land (where development can proceed without further biodiversity approvals) and avoided land (land avoided from development due to high biodiversity values).

Chapter 13 (Strategic Conservation Planning) of SEPP (Biodiversity and Conservation) sets out the planning controls to achieve the development and biodiversity outcomes of the CPCP. There are a number of planning controls that apply to different land categories to support the implementation of biodiversity and development commitments of the CPCP. The land categories are identified as:

- avoided land
- certified-urban capable land
- land in a strategic conservation area.

Chapter 13 of the SEPP Biodiversity and Conservation does not apply to activities subject to Part 5 of the EP&A Act, as such it does not apply to the proposal. However, potential impacts on the identified land categories have been assessed (see section 6.1).

The majority of the proposal site is located on land mapped as excluded land by the CPCP (see Figure 4-1) as it is located within an existing road corridor. Land mapped as excluded land has been excluded from the planning controls under the CPCP. In these areas, the BC Act, the FM Act and, where relevant, the EPBC Act apply.

Land mapped as certified –urban capable land has been identified for future urban development. This land is biodiversity certified under Part 8 of the BC Act, and as such, development under Part 5 of the EP&A Act on biodiversity certified land does not require assessment of the potential impact on biodiversity. Additionally, development in these areas does not require further site-by-site biodiversity assessment or approval under the BC Act, as long as it is consistent with the CPCP and its approvals (including mitigation measures). Some areas of the proposal site are located on land mapped as certified-urban capable land (see Figure 4-1).

Approval under Part 10 of the EPBC Act is yet to be issued by the Australian Government. Assessment under the EPBC Act is still required for development on land mapped as certified –urban capable land.

Land mapped as avoided land has been identified for biodiversity conservation. In these areas, the BC Act, FM Act and, where relevant, the EPBC Act apply. Activities within these areas must also be consistent with Section 3.1.2 of the *Cumberland Plain Conservation Plan Guidelines for Infrastructure Development* (DPIE, 2022) (the CPCP Guidelines for Infrastructure Development). The proposal affects a small area of land mapped as avoided land (see Figure 4-1).

The CPCP Guidelines for Infrastructure Development applies to Part 5 activities under the EP&A Act that are carried out on land identified as avoided land, certified-urban capable land, or a strategic conservation area. The guidelines aim to ensure infrastructure development and activities are consistent with the CPCP's commitments and actions and maintain outcomes consistent with SEPP (Biodiversity and Conservation). The guidelines identify when and how essential infrastructure is covered by the CPCP's strategic assessment approval under Part 10 of the EPBC Act –pending Australian Government approval of the CPCP.

The CPCP Guidelines for Infrastructure Development also set out the requirements to avoid, minimise and mitigate impacts on biodiversity from infrastructure activities carried out under Part 5 of the EP&A Act on land identified as avoided land, certified –urban capable land, and a strategic conservation area. As such, the mitigation and management measures recommended by the Biodiversity Assessment Report (BAR) to manage the potential impacts of the proposal on biodiversity have considered the provisions of the guidelines (see section 6.1.4 for further information).

In accordance with section 201A of the Environmental Planning and Assessment Regulation 2021 (the EP&A Regulation), a determining authority for an activity carried out under SEPP (Transport and Infrastructure) on avoided land must give notice to the Planning Secretary of a decision to carry out the activity within 30 days after a decision has been made.

Further information on the biodiversity impacts of the proposal, including impacts on land certified under the CPCP, is provided in section 6.1.

Vegetation in non-rural areas

Chapter 2 of SEPP (Biodiversity and Conservation) relates to the protection of biodiversity values of trees and other vegetation in non-rural areas of NSW. The proposal is located in Wollondilly Shire, which is not a listed LGA in Section 2.3 of the SEPP.

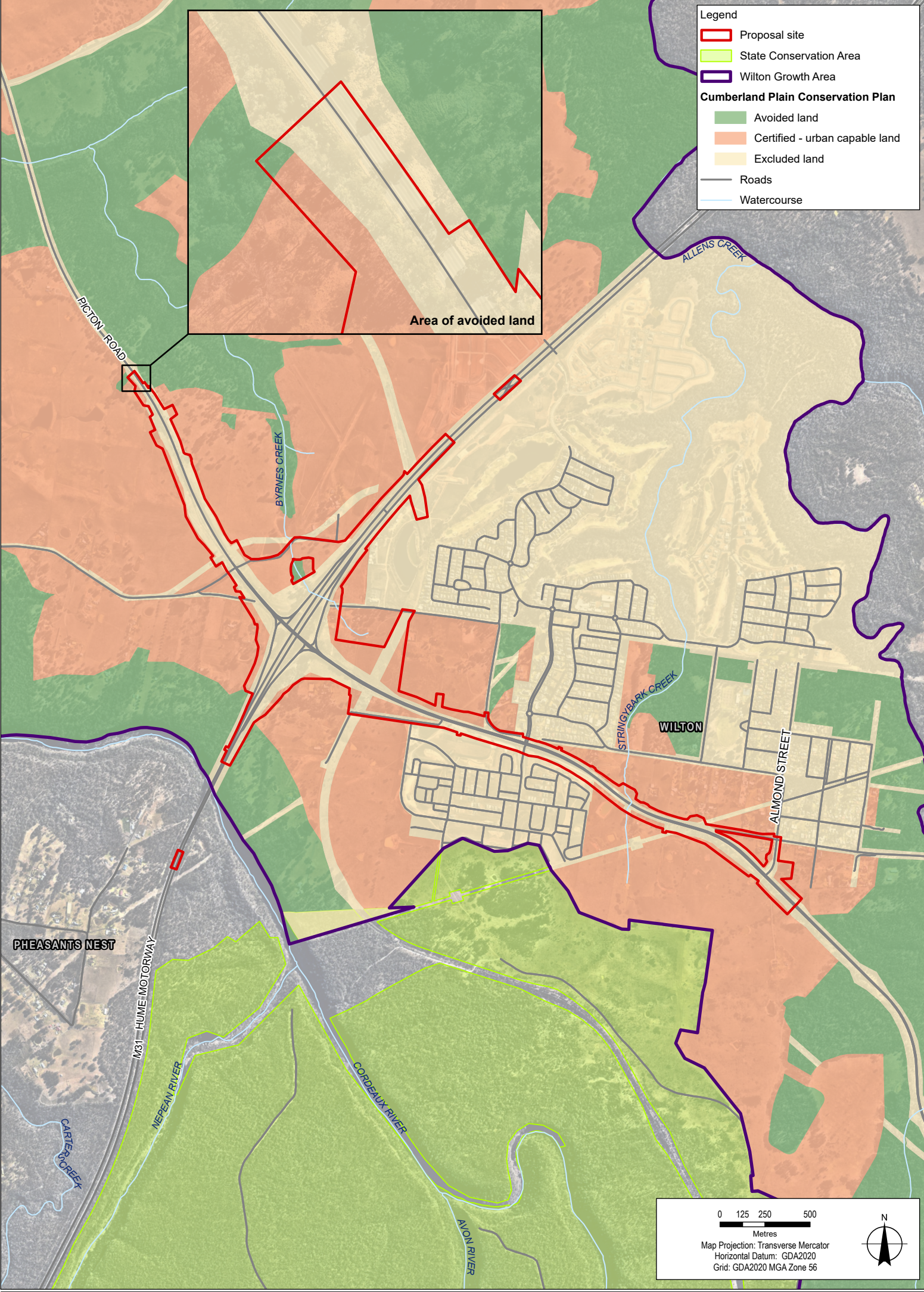


Figure 4-1 - Cumberland Plain Conservation Plan

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023. Created by: kidea
 N:\AU\Wollongong\Projects\23112560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX008_CPCP_A4P. Print date: 25 Oct

Sydney's Drinking Water Catchment

Chapter 6 (Water catchments) of SEPP (Biodiversity and Conservation) sets out the planning controls that relate to Sydney's Drinking Water Catchment (as defined by Section 6.60 of SEPP (Biodiversity and Conservation)).

Section 171A(3) of the EP&A Regulation defines the considerations that a determining authority must take into account when assessing the likely impact of an activity proposed to be carried out in the Sydney Drinking Water Catchment, including whether the activity will have a neutral or beneficial effect on water quality, and whether it is consistent with the Neutral or Beneficial Effect (NorBE) Guideline within the meaning of Part 6.5 of SEPP (Biodiversity and Conservation) 2021.

The proposal site is not located within the Sydney Drinking Water Catchment (see Figure 4-2). However, the catchment is located about 500 metres south of the proposal site at its closest point. The proposal site drains to the Nepean River downstream of the Sydney Drinking Water Catchment. Further information about the potential impacts of the proposal on surface water quality are provided in section 6.6.

Koala habitat protection

Chapter 4 of the SEPP (Biodiversity and Conservation) aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline. Part 4.2 of the SEPP regulates impact on koala habitats as part of the development assessment process. Although the provisions of Chapter 4 of the SEPP do not apply to the proposal (as an activity for the purposes of Division 5.1 of the EP&A Act), the potential impacts on koalas have been considered as part of the BAR (provided in Appendix C). Further information about the potential biodiversity impacts of the proposal is provided in section 6.1.



Figure 4-2 - Sydney's Drinking Water Catchment

Data source: Sydney Drinking water Catchment - WaterNSW 2023, Hawkesbury Nepean Catchment NSWSS 2023, Esri, HERE, Garmin, Earthstar Geographics Created by akildea N: \\AU\Wollongong\Projects\23112560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_REF_B.aprx\12560200_REFX004a_SydneyDrinkingWaterCatchment_AAP.Print date: 25 Oct

State Environmental Planning Policy (Precincts – Western Parkland City) 2021

The State Environmental Planning Policy (Precincts – Western Parkland City) 2021 (SEPP (Western Parkland City)) contains planning provisions for precincts with the Western Parkland City. The policy aims to facilitate the development of these precincts in a co-ordinated and sustainable manner, taking into account the social, economic and environmental aspects of the area.

Permissibility

The proposal site is located within the Wilton Growth Area as defined in State Environmental Planning Policy (Precincts – Western Parkland City) 2021 (SEPP (Western Parkland City)) and shown in Figure 4-3. Chapter 3 (Sydney region growth centres) of SEPP (Western Parkland City) establishes the framework for development of Sydney’s growth centres, including the Wilton Growth Area.

Section 3.24(1) of Chapter 3 provides that development for public utility undertakings (other than electricity generating works or water recycling facilities) may be carried out without consent on land to which the chapter applies. As the proposal is a public utility undertaking (road transport) being undertaken within a growth centre for the purposes of SEPP (Western Parkland City), it is permissible without consent under the SEPP. Section 3.24(2) requires that Transport must give written notice to DPE regarding the proposal and take into consideration any response that is received within 21 days of the notice. A summary of the consultation is provided in section 5.5.

Zoning

SEPP (Western Parkland City) specifies that the Wilton Growth Area consists of six precincts (see Figure 4-3). Three of the precincts identified have been rezoned under the SEPP – South East Wilton (part), Wilton Town Centre and North Wilton, and the SEPP establishes the zoning for the land in these precincts. The other precincts are currently zoned under the Wollondilly LEP) (see section 4.1.2). Land use zoning under the relevant environmental planning instrument is shown on Figure 4-4.

It is noted that the *Wilton Growth Area Update* (DPE, 2023) identifies seven precincts within the Wilton Growth Area, with the South West Wilton precinct (as per the SEPP) split into two precincts in the *Wilton Growth Area Update* based on the land that has been rezoned (see Figure 4-3):

- South East Wilton – consisting of rezoned land under SEPP (Western Parkland City), which coincides with the Wilton Greens development (see section 6.11.3)
- South Wilton – consisting of land within the South East Wilton precinct (under SEPP (Western Parkland City)) that has not yet been rezoned by the SEPP.

Part of the proposal site is located on land zoned under SEPP (Western Parkland City) as SP2 Infrastructure and UD Urban Development (see Figure 4-4). The objectives of these zones and the consistency of the proposal with these objectives is outlined in Table 4-1. The consistency of the proposal with the objectives of land zoned under the Wollondilly LEP is described in section 4.1.2 for zones within the proposal site (see Table 4-2).

Table 4-1: Consistency of proposal with land use objectives under SEPP (Western Parkland City)

Zone	Objectives of zone	Consistency of proposal with objectives
SP2 Infrastructure (Road and Regional Road)	To provide for infrastructure and related uses. To prevent development that is not compatible with or that may detract from the provision of infrastructure.	Zone SP2 covers the existing footprint of the road reserves for Picton Road and the M31 Hume Motorway. The proposal is consistent with the objectives of this zone as it involves upgrading road infrastructure to improve capacity, travel times and safety.
UD Urban Development	To manage the transition of land from non-urban uses to urban uses. To encourage the development of well-planned and well-serviced new urban communities in accordance with the South East Wilton structure plans.	The proposal is consistent with the objectives of zone UD as it would provide upgraded road infrastructure to support urban development. It is noted that permanent impacts on land zoned UD are limited (see section 6.11.4).

Zone	Objectives of zone	Consistency of proposal with objectives
	<p>To ensure a range of uses, and uses located in a way, that are consistent with the strategic planning for the South East Wilton Precinct.</p> <p>To safeguard land used for non-urban purposes from development that could prejudice the use of the land for future urban purposes.</p> <p>To ensure that land adjacent to environmental conservation areas is developed in a way that enhances biodiversity outcomes for the Precinct.</p>	

4.1.2 Local Environmental Plans

Wollondilly Local Environmental Plan 2011

While the proposal site is wholly within the Wilton Growth Area under SEPP (Western Parkland City) (see section 4.1.1), part of the Wilton Growth Area (in the West Wilton, Bingara Gorge and part of the South East Wilton precincts) is zoned under the Wollondilly LEP, as shown on Figure 4-4.

Part of the proposal site is located on land zoned under the Wollondilly LEP (as RU2 Rural Landscape and SP2 Infrastructure (see Figure 4-4)). The objectives of these zones and the consistency of the proposal with these objectives is described in Table 4-2.

The consistency of the proposal with the objectives of land zoned under SEPP (Western Parkland City) is described in section 4.1.1 (see Table 4-1).

Land zoned under SEPP (Western Parkland City) is discussed in Table 4-1.

Table 4-2: Consistency of proposal with land use zone objectives under the Wollondilly LEP

Zone	Objectives of zone	Consistency of proposal with objectives
SP2 Infrastructure	<p>To provide for infrastructure and related uses.</p> <p>To prevent development that is not compatible with or that may detract from the provision of infrastructure.</p>	<p>Zone SP2 covers the existing footprint of the road reserves for Picton Road and the M31 Hume Motorway. The proposal is consistent with the objectives of this zone as it involves upgrading road infrastructure to improve capacity, travel times and safety.</p>
RU2 Rural Landscape	<p>To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.</p> <p>To encourage diversity in primary industry enterprises and systems appropriate for the area.</p> <p>To minimise the fragmentation and alienation of resource lands.</p> <p>To minimise conflict between land uses within this zone and land uses within adjoining zones.</p> <p>To provide for a range of land uses (including tourism-related uses) that support the agriculture industry.</p> <p>To provide areas within which the density of development is limited in order to maintain a separation between urban areas.</p> <p>To support sustainable land management practices and local food production.</p>	<p>The proposal would support local and primary industries by providing improved road connections and road network operation.</p> <p>The proposal is being undertaken along the existing road corridors and would not fragment land within this zone.</p> <p>Although the proposal would result in a small reduction in the availability of land currently zoned as RU2, this land (within the Wilton Growth Area) has been identified for future rezoning for urban development.</p>

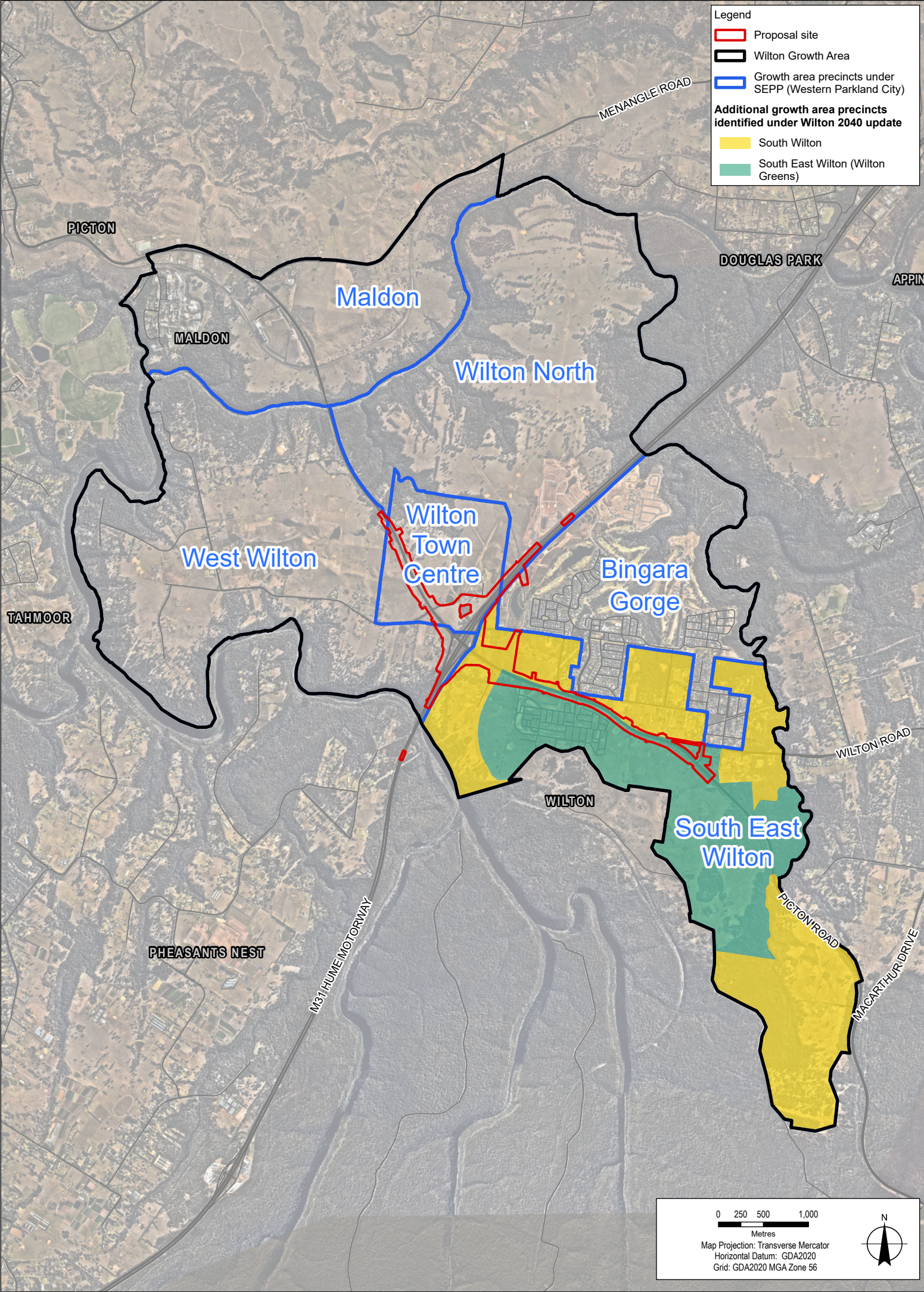


Figure 4-3 - Wilton Growth Area

Data source: Sydney Drinking water Catchment - WaterNSW 2023, Hawkesbury Nepean Catchment NSWSS 2023, Created by akidea N: IAU\Wollongong\Projects\2312560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_REF_B.aprx\12560200_REFX002a_WiltonGrowthArea_A4P.Print date: 25 Oct

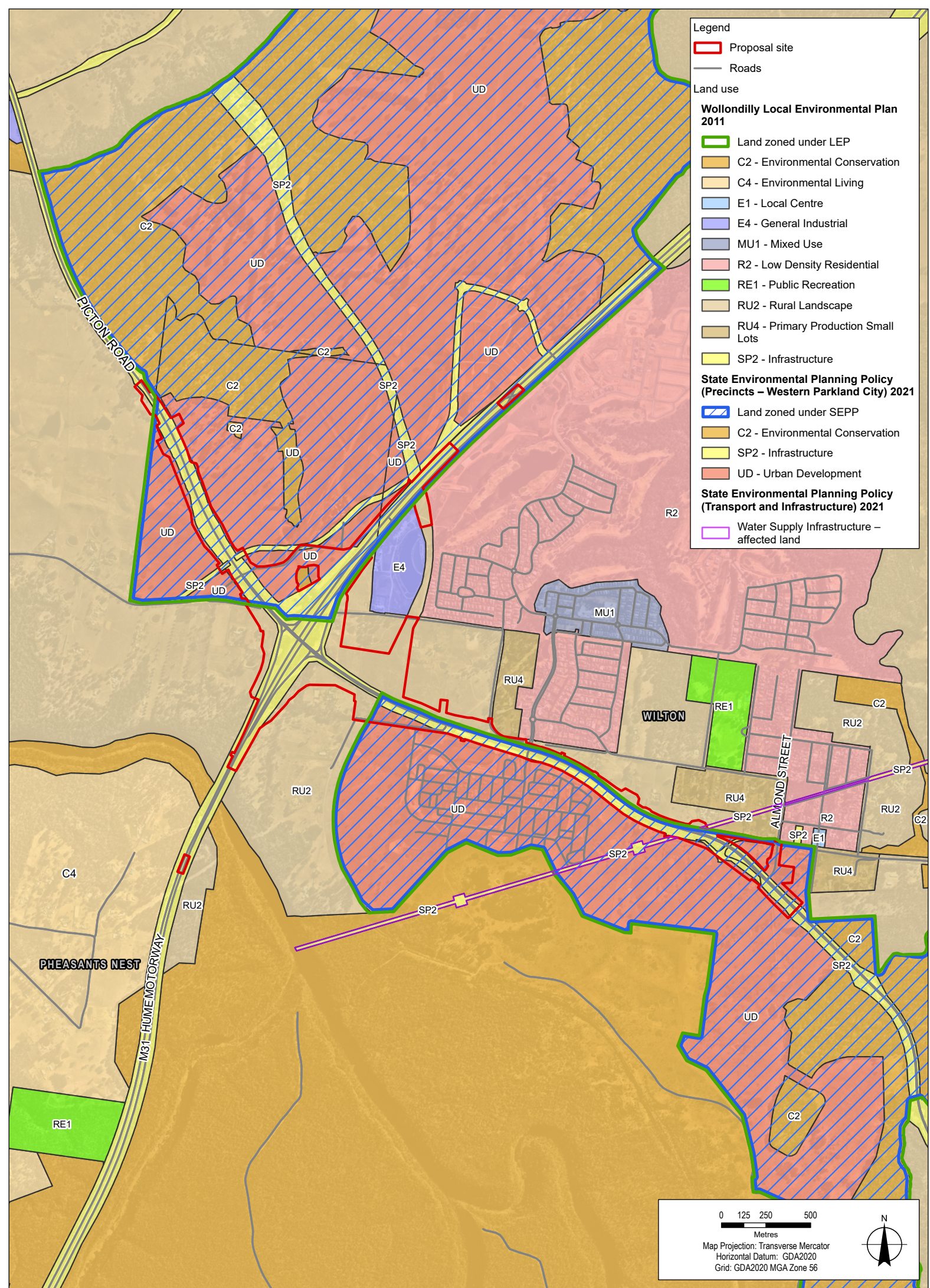


Figure 4-4 - Land use zoning under the relevant environmental planning instrument

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023. Created by: akildea
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 12560200_REFX009_PlanningInstrumentLanduse_A4P.Print date: 25 Oct

Clause 5.12 of the Wollondilly LEP provides that the LEP does not restrict or prohibit the carrying out of any development by or on behalf of a public authority, that is permitted to be carried out with or without development consent under SEPP (Transport and Infrastructure).

As the proposal is permitted without consent under SEPP (Transport and Infrastructure) (see section 4.1.1), the consent requirements of the LEP do not apply.

Further information on land use and the potential impacts of the proposal are provided in section 6.11.

4.2 Other relevant NSW legislation

4.2.1 Biodiversity Conservation Act 2016

The overarching legislation for biodiversity conservation in NSW is the BC Act and the Biodiversity Conservation Regulation 2017 (BC Regulation). The BC Act sets out the assessment framework for threatened species and ecological communities for activities subject to assessment under Part 5 of the EP&A Act (amongst other types of development).

Part 6 of the BC Act establishes the NSW Biodiversity Offsets Scheme (BOS). The BOS is a legislated framework that is required when addressing impacts on terrestrial biodiversity from development and clearing. The *Biodiversity Assessment Method* (DPIE, 2020) (BAM) is part of the BOS and is described in section 6.7 of the BC Act. The BAM outlines how to assess changes in native vegetation, threatened species, populations and ecological communities and their habitats, areas of outstanding biodiversity value, and key threatening processes.

Section 7.3 of the BC Act provides a test for determining whether a proposed development or activity is likely to significantly affect threatened species, populations, ecological communities, or their habitats (known as 'tests of significance'). If an activity assessed under Division 5.1 of the EP&A Act is likely to significantly affect threatened species, a species impact statement (SIS) or a biodiversity development assessment report (BDAR) must be prepared.

A BAR was prepared for the proposal using the BAM. The BAR is provided in Appendix C and summarised in section 6.1. Tests of significance under the BC Act were undertaken for all relevant threatened species or communities recorded or considered to have a moderate or higher likelihood of occurrence within the proposal site.

The BAR found that the proposal is unlikely to have a significant impact on any threatened species, populations or communities under the BC Act should the recommended safeguards and management measures be implemented. Therefore, a SIS or BDAR is not required. Further information about the potential biodiversity impacts and the measures provided to mitigate and manage these impacts is provided in section 6.1.

4.2.2 Biosecurity Act 2015

The *Biosecurity Act 2015* specifies the duties of public and private landholders in relation to the control of priority weeds. Section 22 of the Act requires that any person who deals with a biosecurity matter has a duty to ensure that, in so far as is reasonably practicable, the potential biosecurity risk is prevented, eliminated or minimised.

The BAR identified 11 exotic flora species within the proposal site; five are listed as priority weeds for the Greater Sydney region under the *Biosecurity Act 2015*, nine are considered to be high threat weeds, and six are included on the Commonwealth list of Weeds of National Significance (WoNS). Appropriate management methods would be implemented during construction if declared priority weeds are identified. Relevant management measures are provided in section 6.1.

4.2.3 Coal Mine Subsidence Compensation Act 2017

The *Coal Mine Subsidence Compensation Act 2017* (CMSC Act) provides controls for certain development within mine subsidence districts. Section 21(1) of the CMSC Act provides that a person must not carry out work, or cause work to be done, in connection with the erection or alteration of an improvement within a mine subsidence district, except in accordance with the approval of the Chief Executive.

An improvement is defined in Section 4(1) of the CMSC Act as including any building or work erected or constructed on land, or infrastructure, whether above or below the surface of the land.

The proposal is located within the Wilton subsidence district and constitutes 'improvements' as it is for the purpose of constructing infrastructure pursuant to Section 4(1) of the CMSC Act.

Potential impacts and mitigation measures have been considered as part of the design process in consultation with Subsidence Advisory NSW (SA NSW). Further information is provided in sections 3.2 and 5.4.

4.2.4 Contaminated Lands Management Act 1997

The *Contaminated Lands Management Act 1997* (CLM Act) establishes a process for investigating and remediating land where required. The CLM Act allows the NSW Environmental Protection Authority (EPA) to declare land as significantly contaminated land. The EPA may order a public authority to carry out actions or prepare a plan of management for significantly contaminated land. The CLM Act imposes a duty on landowners to notify the EPA and potentially investigate and remediate land contamination if levels are above EPA guidelines.

A Preliminary Site Investigation was prepared for the proposal (see section 6.7 and Appendix I). There are no registered contaminated sites within the proposal site. The management of potential unregistered contaminated land within the proposal site is described in section 6.7, including measures to manage risks associated with unexpected contamination finds.

4.2.5 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) provides for the protection of threatened fish and marine vegetation. The FM Act aims to conserve, develop and share fishery resources and conserve marine species, habitats and diversity. One of the objectives of the FM Act is to 'conserve key fish habitats'.

Part 2 and Part 7 of the FM Act describe the requirements for permits for dredging and/or reclamation works, to obstruct fish passage and to harm marine vegetation. The tributaries that cross the proposal site are highly degraded, ephemeral streams with no marine vegetation; therefore, the requirements of Part 2 and Part 7 of the FM Act do not apply. Further information on aquatic habitats and species is provided in section 6.1.

4.2.6 Heritage Act 1977

The *Heritage Act 1977* (the Heritage Act) is concerned with all aspects of heritage conservation ranging from basic protection against indiscriminate damage and demolition of buildings and sites, through to restoration and enhancement. This includes items listed under the State Heritage Register (SHR), NSW Government agency Section 170 Heritage and Conservation Registers, LEP heritage schedules, and interim Heritage Orders (IHOs).

Approval under Section 60 of the Heritage Act is required for works to a place, building, work, relic, moveable object, precinct, or land listed on the SHR. Notably, certain activities or works may be exempt from requiring approval, as outlined in Section 57. An excavation permit is required under Sections 139(1) and (2) to disturb or excavate any land containing or likely to contain a relic.

A non-Aboriginal heritage assessment was completed to inform the REF and the assessment report is provided in Appendix F. The results are summarised in section 6.4.

The Upper Canal System/Upper Nepean Scheme, which is listed on the SHR (item 01373), WaterNSW's Section 170 Heritage and Conservation Register (item 4580004), and the Wollondilly LEP (item I16) (see section 6.4.2), passes about 90 metres underground beneath the proposal site. An airshaft associated with the Upper Canal System is located around 80 metres from the proposal site. The proposal has the potential to affect parts of the above ground easement for the listed item, which forms part of its curtilage. An exemption application under Section 57(2) of the Heritage Act would be sought for work within the curtilage.

In addition, two items of local heritage significance are located close to the proposal site. Cottage (item I275) and St Luke's Anglican Church (item I279) are listed on the Wollondilly LEP and are adjacent to the proposal site. The proposal would not directly impact these items or their curtilages, and no approvals or exemptions/exceptions are required under the Heritage Act for these local heritage items.

Further information on the potential non-Aboriginal heritage impacts is provided in section 6.4.

4.2.7 Land Acquisition (Just Terms Compensation) Act 1991

The *Land Acquisition (Just Terms Compensation) Act 1991* (Just Terms Act) applies to the acquisition of land (by agreement or compulsory process) by a public authority authorised to acquire the land by compulsory process. It provides a guarantee that, when a public authority requires the acquisition of land, the amount of compensation would not be less than the market value of the land.

In addition to land held by public authorities, some property acquisition from private landholders would be required for the proposal to accommodate the permanent infrastructure, including the widening of Picton Road and the upgraded Picton Road and M31 Hume Motorway interchange. All land acquisitions would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. Further detail is provided in section 3.6.

4.2.8 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) provides for the establishment, preservation and management of national parks, State reserves, historic sites and certain other areas, and the protection of certain fauna, native plants and Aboriginal heritage in NSW.

There are no reserved lands under the NP&W Act within the proposal site.

Section 86 of the NP&W Act identifies offences relating to the harm of Aboriginal objects or places. An Aboriginal Heritage Impact Permit (AHIP) issued under Section 90 of the NP&W Act is required if impacts to Aboriginal objects and/or places cannot be avoided.

Potential impacts to Aboriginal cultural heritage as a result of the proposal have been assessed in accordance with Transport for NSW's Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime Services, 2011) (PACHCI). Aboriginal cultural heritage assessments have been completed to inform the REF. The results are described in the Aboriginal Cultural Heritage Assessment Working Paper (see Appendix E) and are summarised in section 3.6.

The assessment found that the proposal would have the potential to directly impact several Aboriginal heritage sites. An AHIP would be required prior to any impact or harm to these sites. Further information is provided in section 6.3.

4.2.9 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) aims to protect, restore and enhance the quality of the environment. It prescribes offences mainly regarding pollution of the environment and establishes a regime for the licensing of certain scheduled activities. Under Part 3.2 of the POEO Act an environment protection licence (EPL) is required for scheduled activities or scheduled development work. Activities requiring licences are defined in Part 3.2 and Schedule 1 of the Act.

Section 120 of the POEO Act prohibits the pollution of waters. Potential water quality impacts are discussed in section 6.6. The construction contractor and Transport are obliged to notify the EPA if a pollution incident occurs that causes or threatens material harm to the environment. Sections 124 to 126 require activities to be conducted in a proper and efficient manner to avoid the creation of air pollution. Section 128 requires that all necessary practicable means are used to prevent or minimise air pollution. Potential air quality impacts are discussed in section 6.9.

Controls for the pollution of land and waste are addressed in Part 5.6 of the POEO Act. It is an offence to unlawfully transport waste material (Section 143); to use the premises as a waste facility without the authority to do so (Section 144); or provide misleading information about waste storage, transport and disposal (Section 144AA). The potential impacts of the proposal on waste management are considered in section 6.15.

In accordance with Schedule 1, clause 35, road construction is listed as an activity that may require licensing. Under the POEO Act, road construction includes road widening work and related earthworks and cuttings. Clause 35(3) provides that a licence is required if road construction involves extraction or processing of more than 50,000 tonnes of material in the regulated area (which includes the Greater Sydney Region) or involves a main road of four or more traffic lanes for a continuous length of three or more kilometres.

Based on the concept design and construction methodologies proposed, an EPL would be required as the proposal would involve:

- extraction of more than 50,000 tonnes of material within the regulated area (see section 3.3.5)
- widening about five kilometres of a main road to four or more traffic lanes.

EPL requirements would be confirmed during detailed design. If required, the EPL would be held by the construction contractor.

4.2.10 Protection of the Environment Operations (Waste) Regulations 2014

The Protection of the Environment Operations (Waste) Regulation 2014 sets out provisions to manage waste, including in relation to storage and transportation, and record keeping requirements for waste facilities. Material that requires removal from the proposal site, which is deemed to be of unsuitable condition for use, would be disposed of off site in accordance with the requirements of this regulation. Any such material would first be sorted and classified according to the *NSW Waste Classification Guidelines* (EPA, 2014a) before it is removed off site.

Where it can be demonstrated that a specific type of waste can safely be used for another purpose, rather than being disposed of in accordance with the waste regulations, the Environment Protection Authority (EPA) may grant permission for that waste to be used for the specified purpose, subject to strict conditions. These permissions are known as 'resource recovery exemptions' (clause 93).

Resource recovery exemptions may be used by Transport, without seeking approval from the EPA, provided the generators, processors and consumers fully comply with the conditions of the exemption. The general exemptions currently in force that are relevant to the proposal are:

- virgin excavated natural material
- excavated natural material
- excavated public road materials
- mulch
- reclaimed asphalt pavement
- recovered aggregate
- stormwater.

Potential waste management outcomes for the proposal are discussed in section 6.15.

4.2.11 Roads Act 1993

The objects of the *Roads Act 1993* (Roads Act) are to govern the use and access to public roads, manage opening and closing of public roads, provide classification of roads, and identify the functions of road authorities. The Roads Act states that a road authority (which includes Transport) may carry out road work on any public road for which it is the relevant road authority and on any other land under its control (Division 1, Section 71). If the road is not under the control of the authority undertaking the works, then consent is required.

Section 138 of the Roads Act requires consent to be obtained from the appropriate road authority for works to:

- erect a structure or carry out a work in, on or over a public road
- dig up or disturb the surface of a public road
- remove or interfere with a structure, work or tree on a public road

- pump water into a public road from any land adjoining the road
- connect a road (whether public or private) to a classified road.

The proposal is located on classified roads that are managed by Transport (Picton Road and the M31 Hume Motorway) and would affect local roads that are managed by Wollondilly Shire Council (Pembroke Parade and Almond Street). A Road Occupancy Licence would be required from the relevant road authority prior to any activity likely to impact on traffic flows.

4.2.12 Rural Fires Act 1997

The *Rural Fires Act 1997* (Rural Fires Act) aims to prevent, mitigate and suppress bushfires and protect persons, property, infrastructure and the environment from fire-related damage.

Non-vegetated areas within the proposal site, such as the existing roads, are excluded from being mapped as bush fire prone land. Vegetated areas within the proposal site, located adjacent to existing roads, are located on Vegetation Category 3 medium risk bushfire prone land and bushfire buffer zones.

The proposal is consistent with bush fire management plans, including the *Wilton Growth Area - Bushfire Early Development Areas* (Blackash Bushfire Consulting, 2021) and would not constrain the objectives of protection of life, property and the environment as per the Rural Fires Act. Further information about potential hazards and risks (including bushfire risk) is provided in section 6.15.

4.2.13 Water Management Act 2000 and Water Act 1912

The *Water Management Act 2000* (WM Act) provides for the management of surface water and groundwater in NSW. The proposal is located within the area of the Water Sharing Plan Greater Metropolitan Region Unregulated River Water Sources 2011 and the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011. As such, the proposal is subject to the provisions of the WM Act and Water Management (General) Regulation 2018 (WM Regulation).

A summary of the relevant WM Act approval requirements is provided in Table 4-3.

Table 4-3: Summary of Water Management Act 2000 approvals

Approval requirement	WM Act provision	Application
Water access licence Water use approval	Section 56 Section 89	An exemption applies to roads authorities in relation to water required for road construction and road maintenance under Sections 21, 34 and Schedule 4 of the WM Regulation. As a result, a licence for dewatering during construction is not required. However, this exemption does not include ongoing operational groundwater removal (take) whether passive or intentional. A water access licence is required where the ongoing operation groundwater take exceeds three mega litres per year. The need for a water access licence for operation, particularly where cuttings are proposed, would need to be confirmed during detailed design, once water take (if any) is confirmed. However, at this stage it is considered unlikely that groundwater interception during operation would trigger the need for a water access licence.
Water supply work approval	Section 90	Water supply works not proposed.
Drainage work approval	Section 90	Drainage work not proposed.
Flood work approval	Section 90	Flood work not proposed.
Controlled activity approval	Section 91	An exemption applies to public authorities under Section 41 and Schedule 4 (Part 1(2)) of the WM Regulation in relation to all controlled activities that they carry out in, on or under waterfront land.

Given the information provided in Table 4-3, no approvals are required under the WM Act to construct the proposal, however the need for a water access licence for operation would require confirmation during detailed design.

Further information about the potential impacts to surface water and groundwater, and measures to manage potential impacts, are provided in sections 6.5 and 6.6.

4.2.14 Waste Avoidance and Resource Recovery Act 2001

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) aims to achieve a reduction in waste generation through the efficient use of resources and implementation of the waste management hierarchy principles:

- avoidance of unnecessary resource consumption
- resource recovery including reuse, reprocessing, recycling and energy recovery
- disposal.

The WARR Act facilitates conformance to the POEO Act and associated regulations and promotes extended producer responsibility for the life cycle of a product. Transport encourages the efficient use of resources and the minimisation of environmental harm in accordance with the principles of Ecologically Sustainable Development (ESD). Waste and resource use is discussed in section 6.15.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the 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 C and section 6.1 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 by section 6.1 of the REF and Appendix C.

Findings – matters of national environmental significance

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

Findings -nationally-listed biodiversity matters (where the strategic assessment applies)

The assessment of the proposal's impact on nationally-listed threatened species, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Section 6.1.4 of the REF describes the safeguards and management measures to be applied.

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 affecting 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. Procedural rights to negotiate are provided under the Act to ensure that future acts are carried out validly. Section 24KA provides that a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search conducted by the Native National Title Tribunal listed no Registered Native Title Claims or Registered Indigenous Land Use Agreements within the proposal site.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road and road infrastructure facilities and is being carried out by or on behalf of a public authority. Under Section 2.109 of 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.

The licences, approvals and/or notifications required prior to works commencing as described in this chapter are summarised in section 7.3.

5 Consultation

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

5.1 Consultation strategy

Transport has developed a community and stakeholder strategy to guide communication and consultation activities for the overall Picton Road upgrade (including the proposal). The strategy outlines the use of open communication channels and clear protocols to ensure a responsive approach to community and stakeholder needs. The objectives of the strategy are to:

- inform the community and stakeholders about upcoming engagement opportunities
- provide timely and targeted information throughout the planning and environmental assessment milestones, clearly communicating proposals, the concept design, preferred options, and potential impacts
- incorporate feedback and address concerns of the local community and stakeholders when developing concept designs and methodologies
- manage and promptly respond to community and stakeholder inquiries in a consistent manner
- establish a database of stakeholders and community members for ongoing engagement
- foster collaboration with government agencies and local councils for a comprehensive approach to planning and consistent messaging.

Two key community consultation activities have been carried out commencing in 2021 to seek community and stakeholder views and inform the development of the proposal (see section 5.2).

During public display of this REF, members of the public and stakeholders will have further opportunities to provide feedback on the proposal as described in section 5.7.

5.1.1 Stakeholders and community identification

The strategy outlines the stakeholder groups that have been identified for the Picton Road upgrade. These groups include, but are not limited to:

- road users
- property owners
- local residents and businesses
- community interest groups
- Indigenous groups including Local Aboriginal Land Councils
- emergency services
- freight industry
- utilities
- local government, including Wollondilly Shire Council and Wollongong City Council
- NSW Government and agencies
- Australian Government.

These stakeholder groups have been, and will continue to be, consulted on relevant aspects of the Picton Road upgrade (including the proposal) using a variety of consultation methods and engagement activities.

Summaries of the consultation activities carried out to date and planned ongoing or future consultation activities are provided in the following sections.

5.2 Community involvement

This section summarises the community consultation that has been carried out to date for the proposal.

A summary of the key issues raised by the community during consultation relevant to the proposal and the REF is provided in section 5.2.2.

Have Your Say consultation (August to September 2021)

The NSW Government announced the commencement of planning to upgrade Picton Road between the Nepean River at Wilton and the M1 Princes Motorway at Mount Ousley in November 2020. Between 16 August 2021 and 13 September 2021, Transport engaged with key stakeholders, transport customers, freight operators and the community to gain an understanding of peoples' experiences and concerns when accessing and travelling on Picton Road. 'Have Your Say' consultation was carried out to inform the designs, options assessment and priorities for the Picton Road upgrade.

The feedback gained from the community and key stakeholders was used by Transport to inform the following activities:

- prioritisation of sections within the overall upgrade
- assessment of options for the Picton Road and M31 Hume Motorway interchange
- development of the concept design between Nepean River and Almond Street.
- environmental assessment of the proposal.

Consultation and engagement tools and activities utilised during this period are outlined in Table 5-1.

Transport received a total of 113 comments (by 17 participants) on the interactive map and 324 people completed an online survey. A further 44 people provided feedback and formal submissions via email and a further 292 comments (896 reactions and 106 shares) were received via Facebook.

The *Picton Road Upgrade Community Consultation Report* (Transport for NSW, 2022d) (available at: [Picton Road upgrade Community Consultation Report](#)) and 'Have Your Say' interactive dashboard (available at: [Interactive Dashboard](#)) provides further information about consultation undertaken between August and September 2021, including a description of the consultation approach, activities and results.

Consultation on preferred interchange option (October 2022)

Consultation was completed following the announcement of the preferred option for the Picton Road and M31 Hume Motorway interchange (see section 2.4.1) in October 2022. Consultation activities carried out during this period is outlined in Table 5-1.

Transport received a total of 34 feedback emails. A further 1,238 comments were received via Facebook. The feedback gained from the community and key stakeholders was used to refine the design of the interchange and inform the environmental impact assessment presented in this REF.

Ongoing key stakeholder consultation between 2021 and 2023

In addition to the above, Transport consulted regularly with key stakeholders through meetings and briefings and responded to specific community enquiries via phone calls and written correspondence throughout the development of the project between 2021 and 2023.

5.2.1 Consultation and engagement tools and activities

A summary of the main community and stakeholder consultation and engagement tools and activities used to date during the development of the proposal is provided in Table 5-1.

Table 5-1: Summary of consultation and engagement tools and activities between 2021 and 2023

Activity/tool	Summary
Picton Road upgrade project website	The website (see: Picton Road upgrade) provides information on the overall Picton Road upgrade, including activities underway and undertaken, latest news, frequently asked questions, video and photographs, reports and community contact information.
Toll free community enquiry number	A dedicated toll-free 1800 telephone number (1800 290 613) has been established to receive and respond to enquiries from the community and interested stakeholders.
Project email address	A dedicated email address (pictonroad@transport.nsw.gov.au) has been created to receive and respond to enquiries from the community and interested stakeholders.
Media releases and advertisements	<p>Media releases were issued in August 2021 and October 2022 and published on the Picton Road upgrade project website.</p> <p>Radio advertisements were used to showcase the ‘Have Your Say’ period, with ABC Illawarra, 198FM Illawarra, South West Voice and 2SM radio covering the information.</p> <p>Print and digital advertisements were run during ‘Have Your Say’ consultation between 17 August to 13 September 2021 and during the release of the preferred option between 31 October and 26 November 2022, with publications including:</p> <ul style="list-style-type: none"> • Illawarra Mercury • Bowral Southern Highlands News • Wollondilly Advertiser.
Online survey	An online survey (seven questions) invited community members to submit feedback via questions, accessible via the project website during ‘Have Your Say’ consultation in 2021.
Online interactive map/mapping tool	An interactive map invited community members to submit comments onto a project area map. The map was available during ‘Have Your Say’ consultation in 2021 and accessible via the project website.
Interactive dashboard	An interactive dashboard was created to share feedback from surveys, emails, formal submissions, social media and the interactive mapping tool in a user-friendly way following ‘Have Your Say’ consultation in the second half of 2021.
E-Blast	<p>Emails were sent to project subscribers at project milestones including:</p> <ul style="list-style-type: none"> • ‘Have Your Say’ consultation between 17 August and 13 September 2021 • release of the preferred option for the Picton Road and M31 Hume Motorway interchange between 31 October and 26 November 2022.
Social media	<p>A ‘Have Your Say’ social media campaign ran from Tuesday 17 August until Monday 13 September 2021. A three-part series of Facebook posts was created to encourage people to visit the project website and tell Transport their concerns with Picton Road while suggesting how it could be improved.</p> <p>The interchange preferred option social media campaign ran from 26 October to 23 November 2023. A series of targeted Facebook posts was created to encourage people to view an animation of how the proposed diverging diamond interchange would operate and provide feedback. Targeted posts were shared with community groups, Wollondilly Shire Council and Wollongong City Council.</p>
Postcards	Postcards providing a link to the project website were sent to property owners in Wilton.

Activity/tool	Summary
Project updates	<p>Five project updates have been released via the Picton Road upgrade project website in August 2021, and March, October, November and December 2022. The October 2022 project update was audio recorded and published on the project website to make it more accessible.</p> <p>Three targeted project updates for Aboriginal stakeholders were released in May 2022, October 2022 and April 2023.</p>
Project notifications	<p>Project notifications were issued in 2022 and early 2023 to property owners along the alignment regarding investigation work as part of the REF and concept design process. Prior to this, agreements to access private property were developed with each landowner to assist with the investigations and access.</p>
Briefings and interviews	<p>Project briefings and interviews have been held with key stakeholders, during the development of the project from 2021 until the REF was placed on public display. This includes targeted interviews and meetings with representatives of key stakeholder groups to inform the socio-economic impact assessment (refer to section 6.12 and Appendix L.</p>
Industry/specific consultation	<p>Direct engagement with freight industry stakeholders was undertaken as part of interchange option consultation in November/December 2022. This included round table discussions, phone calls, online meetings, emails and surveys.</p> <p>Direct engagement with emergency services was undertaken in August 2023, which included emails, phone calls and meetings.</p> <p>Direct engagement with utility providers was undertaken throughout 2022 and 2023 to identify services and provider requirements.</p> <p>Direct engagement with the Wilton Airport and Sydney Skydivers was undertaken in September 2023 including emails and phone calls.</p>
Market research	<p>Market research of adult residents living near Picton Road and in the Wollondilly and Wollongong LGAs was undertaken in August 2022 and January/February 2023 to understand the level of support, expectations, concerns, changes in awareness of the project, and preferred methods of communication.</p>
Video/animation	<p>A flyover animation showing the operation of the diverging diamond interchange was developed to support the release of the preferred option and is available on the project website.</p>
Photo gallery	<p>A photo gallery was created for the project website showing key locations (both aerial and roadside) along the length of the Picton Road corridor.</p>
Static displays	<p>Posters targeting road users and industry were placed at the following locations in October and November 2022 following the release of the preferred interchange option:</p> <ul style="list-style-type: none"> • Pheasants Nest Service Centres • Frank Partridge Rest Area.

5.2.2 Summary of issues raised relevant to the proposal

A summary of the key issues raised by the community during consultation relevant to the proposal and the REF is provided in Table 5-2.

Table 5-2: Summary of key issues raised relevant to the proposal and REF

Topic	Issues raised	Response / where addressed in the REF
Consultation on preferred interchange option		
Traffic	Comments about impacts of traffic lights on traffic efficiency of the new interchange and that the traffic lights would not be better than the existing arrangement.	<p>The diverging diamond interchange design allows traffic movements to be controlled by traffic lights, with more lanes and simplified traffic light phasing, providing increased green time within the interchange.</p> <p>The design would improve the efficiency of the interchange. By grouping traffic approaches together, there is a significant reduction of signal phases when compared with conventional interchange layouts, reducing the wait time for traffic.</p> <p>In addition, right turn movements from Picton Road to the M31 Hume Motorway have free flow ramps, which only require traffic to pass through one traffic light instead of the two sets of lights that currently exist.</p> <p>Traffic modelling undertaken for the proposal (including the new interchange) indicates satisfactory network performance in 2046 as a result of increased average speeds and decreased delays (see section 6.2.4).</p>
	Comments that new housing in Wilton will add more traffic and congestion in the future.	Traffic modelling undertaken for the proposal has considered the future traffic growth associated with population and employment growth in the area. The traffic modelling indicates that in 2046 the proposal would achieve satisfactory network performance and cater for the expected growth in demand (see section 6.2.4).
Property	Comments about property owners wanting to know more about land acquisition requirements.	<p>Nearby businesses, owners and tenants of potentially directly affected properties were informed of the preferred option after the announcement in October 2022.</p> <p>The proposal has been refined to minimise impacts on land located outside the existing road reserve and SP2 zoning (see sections 2.4 and 6.11). All acquisitions would be conducted in accordance with the NSW Government's property acquisition policy, and compensation would be based on the requirements of the <i>Land Acquisition (Just Terms) Compensation Act 1991</i>.</p> <p>Property owners and tenants impacted by the proposal's land acquisition requirements have been contacted directly and Transport will continue working closely with people to support them throughout the development of the proposal.</p>
Design	Comments that a fully grade separated interchange with free-flowing ramps in all directions should be selected to maximise traffic efficiency.	<p>The selection of the preferred option considered a range of factors, including safety, traffic and performance, environment and sustainability, and constructability. The diverging diamond interchange was found to have the least impact to the surrounding area while improving safety, reliability and efficient travel when compared to other options (see section 2.4.1). A fully grade-separated interchange with free-flowing ramps at this location would require a much larger footprint with higher impacts on surrounding areas.</p> <p>Traffic modelling undertaken for the proposal (including the new interchange) indicates satisfactory network performance in 2046, as described in section 6.2.4.</p>

Topic	Issues raised	Response / where addressed in the REF
	Comments that the design should include two lanes turning right from Picton Road heading north along the M31 Hume Motorway.	The proposal includes two free flow lanes for traffic on Picton Road turning right onto the M31 Hume Motorway heading towards Sydney. See Figure 1-3 and Figure 3-1 to Figure 3-4 for more information on the number of lanes.
Environment	Comments about reduced air quality during construction and operation.	Potential impacts on air quality during construction and operation are discussed in section 6.9. Potential air quality impacts during construction would be short-term and managed through an Air Quality Management Plan to minimise dust and mitigate the effects of construction on local air quality. During operation, air quality impacts as result of the proposal are not expected for sensitive receptors as described in section 6.9.4.
Other	Comments about funding going towards alternative routes and transport options such as Picton Bypass, Maldon to Dombarton rail line and widening of the M31 Hume Motorway.	Transport has noted this feedback. The funding priority of other infrastructure initiatives is outside the scope of this REF.
	General feedback expressing support for the proposal.	Transport has noted this feedback.
Have your say consultation		
Design	Comments that access onto Picton Road at Almond Street is unsafe and that this intersection should be upgraded.	The proposal includes the reconfiguration of Almond Street to left in and left out and removes the existing right in and right out movements. The right in and right out movements at this location would be provided by a future local road overpass of Picton Road delivered by private developers under the Wilton Growth Area infrastructure phasing plan. See sections 1.1.3 and 3.1.
	Comments that Picton Road should be upgraded to dual carriageway in each direction.	The proposal includes upgrading Picton Road with a minimum of two lanes in each direction, increasing to three lanes in each direction between Pembroke Parade and Wilton Park Road. See section 3.1.
	Comments that the Picton Road and M31 Hume Motorway interchange should be upgraded including comments that the upgrade should be fully grade separated and ramp lengths should be longer.	The proposal includes the upgrade of the Picton Road and M31 Hume Motorway interchange. The proposal involves a diverging diamond interchange designed to current road standards that would improve traffic efficiency and safety. See section 3.2.3.
	Comments that existing traffic lights cause congestion and delays.	The diverging diamond interchange would allow traffic movements to be controlled by traffic lights, with simplified traffic light phasing, providing increased green time within the interchange. Traffic modelling undertaken for the proposal (including the new interchange) indicates satisfactory network performance in 2046, as described in section 6.2.4.

Topic	Issues raised	Response / where addressed in the REF
	<p>Comments that access to and from Wilton Park Road is unsafe and requires upgrading. Unsafe u-turn movements in Wilton Park Road were also noted at this location.</p>	<p>The proposal includes the reconfiguration of Wilton Park Road and Aerodrome Drive to left in and left out and removes the existing right in and right out movements.</p> <p>The Wilton Growth Area infrastructure phasing plan includes the relocation and upgrade of the Wilton Park Road and Aerodrome Drive intersection to a signalised arrangement west of the existing location. The arrangement included in the proposal for this intersection is considered to be an interim arrangement to maintain access to these local roads until the signalised intersection is built by the private developers. See sections 1.1.3 and 3.1.</p>
	<p>Comments that road shoulder parking should be removed in the vicinity of Wilton Park Road.</p>	<p>The proposal includes three metre road shoulders on the left lane side in each direction which would be signposted for emergency stopping only. See section 6.2.5.</p>
	<p>Comments that a carpooling carpark should be provided in the design near Wilton Park Road.</p>	<p>An assessment of existing parking within Picton Road is outlined in section 6.2.3. The proposal would include signposting road shoulders for emergency stopping only as described in section 6.2.5. There are a number of existing rest areas on Picton Road and M31 Hume Motorway in close proximity to the proposal. Additionally, the local network and facilities within the new Wilton town centre and other precincts in the Wilton Growth areas would have safe formal parking areas that could be used for carpooling.</p>
	<p>Comments that access to and from Janderra Lane is unsafe with suggestions to convert to left in left out or connect Janderra Lane into the road network within Wilton Greens.</p>	<p>The proposal includes the reconfiguration of Janderra Lane to left in and left out and removes the existing right in and right out movements. See section 1.1.3.</p>
	<p>Comments about lack of cycling opportunities due to lane constraints and absence of dedicated cycling lanes.</p>	<p>The proposal includes a shared user path along the southern side of Picton Road from the western extent of the proposal to around 420 metres west of Almond Street, and a shared user path on the northern side of Picton Road between Pembroke Parade and Almond Street, and between the future new intersections west of the M31 Hume Motorway.</p> <p>The provision of this infrastructure would improve active transport connectivity and safety, to support the proposed strategic cycle route identified in the Wollondilly Bike Plan, as described in sections 2.5.3 and 6.2.4.</p>
<p>Environment</p>	<p>Comments that the proposal would increase noise from traffic, including decelerating of trucks near residential areas.</p>	<p>Potential noise impacts during operation are discussed in section 6.8.</p> <p>When completed, the proposal would not substantially change traffic noise in most locations. The main potential impacts would be near the signalised intersection at Picton Road and Pembroke Parade, where heavy vehicle braking has the potential to continue to occur. Further information about these potential impacts, and measures to manage these impacts, are provided in sections 6.8.4 and 6.8.5.</p>

Topic	Issues raised	Response / where addressed in the REF
Other	Comments about increased noise during construction.	Potential noise impacts during construction are discussed in section 6.8. Potential noise impacts during construction would be temporary and managed through a Construction Noise and Vibration Management Plan, including location and activity specific measures to minimise and manage noise as far as practicable.
	Comments that the upgrade of Picton Road and intersection upgrades should precede housing developments in the Wilton Growth Area.	Transport is progressing the planning of the upgrade of Picton Road including undertaking this environmental impact assessment. The timing of construction is subject to funding.
Other consultation activities		
Public transport	Comments about integration of the upgrade with public transport.	The upgrade has considered integration with and impacts on existing and currently planned public transport services that use Picton Road within the proposal site (see section 6.2). Although not part of the proposal, Transport is investigating opportunities to provide public transport routes in the future that service the planned new precincts in the Wilton Growth Area. When funded, these would align with the Transport <i>Future Transport Strategy</i> (Transport for NSW, 2022a) vision for connecting our customers whole lives and successful places for communities.
Electric vehicles	Comments about consideration of electric and low-emission vehicles.	The proposal has considered the vision and objectives stated in the NSW Electric Vehicle Strategy (NSW Government, 2021).
Resilience	Comments about resilience of the road network during emergencies such as bushfires.	Health and Safety in Design and risk assessments have been completed to ensure that the proposal provides sufficient capacity to support evacuations during emergencies, considering existing and future development in Wilton. Future design development would be completed to ensure the proposal contributes to transport infrastructure being resilient and adaptable during emergencies and incidents. Additionally, potential climate change impacts have been considered in section 6.13.
Environment	Comments to extend the Koala fencing and incorporate other strategies to minimise the loss for native flora and fauna including wildlife corridors.	Fauna exclusion fencing is currently being installed as part of a separate project along heavily vegetated sections of Picton Road and the M31 Hume Motorway. Any sections of these fences impacted by the proposal would be adjusted and reinstalled as required. See section 6.1 for more information on impacts on biodiversity and mitigation measures proposed by the proposal. Section 2.4.3 provides information about how impacts have been avoided and minimised through design development.

Topic	Issues raised	Response / where addressed in the REF
Freight	Comments about maintaining and improving freight efficiency to key ports and airports, including due to road closures.	The proposal would improve access to major freight gateways in Sydney and the Illawarra Shoalhaven to support the critical area of smarter and targeted infrastructure investment. It provides additional lanes which would improve the capacity to reduce disruption during incidents. The proposal has been designed to accommodate heavy vehicles and increase freight capacity and accessibility on Picton Road through the provision of additional lanes. Impacts and benefits on traffic efficiency during construction and operations are discussed in section 6.2, including safeguards to minimise, mitigate and manage these impacts on all transport customers.
	Comments about further engagement with the freight industry during construction through a reference group.	Additional consultation specific to traffic impacts for freight is proposed to be included as part of the Community and Stakeholder Engagement Management Plan, and measures to maintain freight access are proposed to be included in the Construction Traffic Management Plan. See chapter 7.
Community consultation	Comments about having a variety of formats for consultation.	The proposal's community and stakeholder strategy comprises a mix of face-to-face, written and digital formats for engagement. See sections 5.2 and 5.7.

5.3 Aboriginal community involvement

Throughout the development of the Picton Road upgrade (including the proposal), Transport has actively consulted with the Aboriginal community in accordance with Transport's *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (Roads and Maritime, 2011) (PACHCI) and *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010).

The PACHCI provides a staged process for investigating potential impacts to Aboriginal cultural heritage as a result of Transport's road planning, development, construction and maintenance activities. The four stages of the PACHCI are listed in Table 5-3.

Table 5-3: 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.

Consultation with the Aboriginal community in accordance with Stage 3 of the PACHCI requirements has been undertaken. The purpose of consultation has been to provide the Aboriginal community with an opportunity to have input into the Aboriginal cultural heritage assessment, integration of cultural values into the project planning and the consultation strategy.

5.3.1 Aboriginal community consultation activities

A summary of consultation activities with the Aboriginal community completed during the development of the proposal is provided in in Table 5-4. Additional consultation activities completed to inform the cultural values study are described in section 5 of Appendix E. A series of interviews with knowledge holders who informed the cultural values study were also conducted in September 2023 as part of the development of the Yanmanjang portal as well as to provide feedback on the draft *Planning with Country* strategy for the proposal.

Table 5-4: Summary of Aboriginal community consultation activities between 2021 and 2023

Activity	Summary
Seeking the names of Aboriginal people with cultural knowledge	Letters were sent to 14 government and non-government organisations seeking names of Aboriginal people with cultural knowledge about the area with responses requested between 27 October and 25 November 2021.
Notification of Aboriginal people with cultural knowledge	Letters and emails were sent to 163 groups/individuals. Those who could not be contacted via email were sent letters or called. Registration for consultation as a Registered Aboriginal Party (RAP) has been open since 25 October 2021 when the notices were sent. An advertisement about the consultation process was run in four newspapers and on one website for 14 days starting between 25 October and 3 November 2021. Flyers with the advertisement information were available at seven locations that provide services for the local Aboriginal community from 27 October 2021.
Online survey	An online survey was sent following the forum seeking advice on preferences for engagement tools, frequency and type.
Invitation to attend Aboriginal community engagement events and forums (Aboriginal focus groups in PACHCI)	Calls were made to up to 111 registered groups/individuals and letters sent via email or post to up to 163 groups/individuals inviting them to attend the Aboriginal Community Engagement Forums (online event) and in-person events held between 2021 and 2022.
Consultation on proposed methodologies and investigations results	Transport sent to all RAPs via email or post, as per stated preferred communication method, copies of: <ul style="list-style-type: none"> • Draft Aboriginal Cultural Heritage Survey (ASR) Methodology (Stage 2 PACHCI) (19 January 2021) • Summary of preliminary Aboriginal cultural values mapping (10 May 2022) • Aboriginal cultural heritage assessment methodology for the proposal (Stage 3 PACHCI) (10 May 2022) • Aboriginal cultural heritage survey report (Stage 2 PACHCI) (10 May 2022) • Draft Aboriginal cultural heritage assessment report (13 April 2023) • Arboricultural assessment report (13 April 2023) • Draft Aboriginal cultural values and sensitivity report (13 April 2023). A minimum of 28 days were offered to review and provide feedback each time, with extensions of consultation periods provided following requests from RAPs.
Aboriginal community engagement forums and events	A number of online and in person Aboriginal community engagement events were held to provide an overview of the project, methodologies proposed for investigation, outcomes of investigation to date, proposed consultation approach and management measures. Events held to date include: <ul style="list-style-type: none"> • Three online forums via MS Teams (20 December 2021, 7 June 2022 and 4 May 2023) • Two in-person events (14 May 2022 at McCabe Park, Wollongong and 29 April 2023 at Wilton Community Centre, Wilton). Meeting minutes of each event were sent to 163 Aboriginal stakeholders following these events.

Activity	Summary
Engagement of Aboriginal site officers	Invitations to submit applications to participate in field investigations were sent to RAPs on 19 January and 3 August 2022. A total of 20 Aboriginal Site Officers and seven trainee site officers participated in the surveys and field investigations through a roster. Further details are provided in section 6.3 and Appendix E.

Further information on consultation undertaken with the Aboriginal community is provided in section 2 of the Aboriginal Cultural Heritage Working Paper (see Appendix E). Consultation with the Aboriginal community and the Tharawal Local Aboriginal Land Council will be ongoing as the proposal progresses.

5.3.2 Summary of issues raised relevant to the proposal

A summary of the key issues raised by the Aboriginal community during consultation relevant to the proposal and the REF is provided in Table 5-2. Feedback provided by RAPs and other Aboriginal stakeholders on draft reports has been integrated into the final versions (see section 2.3 of the Aboriginal Cultural Heritage Working Paper in Appendix E).

Table 5-5: Summary of issues raised by the Aboriginal community

Topic	Issue raised	Response / where addressed in REF
Consultation for Aboriginal Cultural Heritage Assessment		
Potential archaeological deposits (PADs)	Comments about minimising impacts on PADs not tested.	The limit of works would be fenced or otherwise delineated to avoid any impacts outside of the proposal site. See section 6.3.4 for other safeguards proposed to minimise potential impacts on PADs.
Artefacts	Comments about avoidance of impacts on Aboriginal cultural heritage artefacts and sites and additional consultation with RAPs for management measures.	Throughout the planning and development of the proposal, Transport has sought to avoid impacts wherever possible on Aboriginal cultural heritage items, places and values. Where impacts cannot be avoided, measures are proposed to minimise, mitigate and manage impacts, including applying for an Aboriginal Heritage Impact Permit (see section 6.3.4). Transport would continue to consult with RAPs and other Aboriginal stakeholders on the management of Aboriginal cultural heritage for the proposal in accordance with the <i>Aboriginal Cultural Heritage Framework</i> (Transport for NSW, 2022j), <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> (DECCW, 2010a), and <i>Stretch Reconciliation Action Plan</i> (Transport for NSW, 2022o).
	Comments about repatriating artefacts found during test excavations.	It is proposed to repatriate artefacts found during the test excavations to a location within the Wilton area where artefacts would be unlikely to be disturbed again by the proposal or other planned works. Discussions with property owners and RAPs are ongoing.
	Comments about not removing artefacts and stones from site.	Transport has noted this feedback. A cultural safety protocol was developed for the field investigations based on consultation with knowledge holders which includes a safeguard for workers to not remove stones from site. However, as per the test excavation methodology consulted on in May 2022, artefacts found during the test excavations had to be removed from site for analysis to meet legislative requirements and temporarily stored in Wollongong. Transport is progressing planning and consultation to repatriate these objects as soon as possible. Due to earthworks, soil material may be removed from site in accordance with the safeguards included in environmental assessment and legislative requirements.

Topic	Issue raised	Response / where addressed in REF
		The development of an updated cultural safety protocol has been included in the recommended safeguards in chapter 7.
Culturally modified trees	Comments about protection of culturally modified trees.	The proposal has been designed to avoid direct impacts on AHIMS registered items, including culturally modified trees. See section 6.3.4 for additional safeguards included to avoid, minimise, mitigate and manage potential impacts on culturally modified trees.
	Comments about companion planting for culturally modified trees.	The proposal includes an Urban Design Strategy which identifies the landscaping strategy for areas within the proposal site that would be disturbed by the proposal (see Appendix K). These areas would be landscaped with native plants that support remaining trees and other vegetation. Local native tree species would be utilised where possible and appropriate. A safeguard has been included in chapter 7 to continue to prepare an Urban Design and Landscaping Plan in consultation with Aboriginal knowledge holders during detailed design.
	Comments about arboricultural assessment completed not considering knowledge from Traditional Owners and avoiding impacts on non-AHIMS registered trees identified during field investigations.	Further consultation with knowledge holders would be completed to gain a better understanding of the cultural values associated with trees identified during field investigations that are not considered to be archaeological sites. Design development would be completed to minimise impacts and where possible avoid the non-AHIMS registered trees identified during the site survey. If impacts cannot be avoided, additional mitigation measures would be identified as part of the Aboriginal Cultural Heritage Management Plan during detailed design and pre-construction planning, informed by consultation with RAPs and Aboriginal cultural knowledge holders. See section 6.3.4 for related safeguards and section 6.1.2 of Appendix E for more details about the assessment.
Interpretation strategy	Comments about heritage interpretation strategy not using sensitive information.	Transport has noted this feedback. Restricted and confidential information would not be included in the heritage interpretation strategy, as this strategy would be made publicly available. Consultation with RAPs and nominated Aboriginal cultural knowledge holders would inform the strategy.
Reports	Comments about the accuracy of information referenced.	Transport has noted this feedback. The reports have been revised to identify that there exist differing views to those expressed by referenced research and to include additional information about literary sources.
	Comments about the lack of Dharawal stories recorded in the reports.	Reports completed for the environmental assessment summarise stories and information provided by Aboriginal cultural knowledge holders to Transport. Knowledge holders may at times decide not to share with Transport stories or information that are considered culturally sensitive or may request they are not shared with the wider community. Consultation with RAPs and nominated Aboriginal cultural knowledge holders would continue to inform the proposal.

Topic	Issue raised	Response / where addressed in REF
	Comments about reporting of cultural objects identified during field surveys.	All newly identified Aboriginal sites and objects within the survey area were recorded in accordance with the Code. Transport would continue to consult with RAPs and Aboriginal cultural knowledge holders to further capture any areas and objects of cultural value that may be impacted by the proposal.
	Comments about consultation being limited to local knowledge holders.	Transport has noted this feedback. The consultation process sought Aboriginal cultural knowledge holders over multiple LGAs and included a public notice in the nationally distributed Koori Mail. The Aboriginal cultural heritage assessment also comprised ethnohistorical research over a substantially larger area than the proposal site, extending east to the coast, west to the Great Dividing Range including Warragamba and the Wollondilly and Cox's River, north to the Georges River, and south to the Shoalhaven River. Consultation with Aboriginal stakeholders, including RAPs and cultural knowledge holders would continue during future phases of design development and construction planning. If further information is received, this would be captured and considered as part of this process.
Other consultation activities		
Cultural practices	Comments about considering the 'living connection' and active cultural practice in the design development.	The cultural values study completed for the proposal (see section 5 of Appendix E) includes areas currently used for resource gathering. This information has been used to integrate the 'living principle', taking into account both current and historic cultural values, and uses of the land for the concept design development and environmental impact assessment. This has been integrated into the Urban Design Strategy (see Appendix K).
Cultural values	Comments about dedicating sufficient time to investigate cultural values, and early identification of Aboriginal cultural heritage items, places and values.	Consultation and field investigations related to Aboriginal cultural heritage for the proposal commenced during early proposal planning and have been ongoing since early 2022. This has included a number of interviews, workshops, on-Country visits, field investigations, events and online forums. See sections 2 and 5 of Appendix E for more details.
	Comments about cultural significance of flora and fauna, and avoiding impacts on biodiversity.	The design and planning for the proposal have sought to minimise impacts on flora and fauna (see section 2.4). Where impacts cannot be avoided, safeguards to minimise, mitigate and manage impacts on biodiversity are proposed in chapter 7.
Reports	Comments about providing sufficient level of details in reports to allow RAPs to provide informed feedback.	Transport has noted this feedback. Reports have been developed in accordance with PACHCI and relevant legislation and state heritage guidelines. Environmental context information has been included in these reports for additional background. Consultation periods for reports and methodologies have been extended to exceed those required under the legislation to allow for more time for review.
Cumulative impacts	Comments about capturing cumulative impacts on Aboriginal cultural heritage.	Cumulative impacts on Aboriginal cultural heritage from the proposal are considered in section 9.1.1 of Appendix E. Section 6.16 considers broader cumulative impacts from the proposal.

Topic	Issue raised	Response / where addressed in REF
Employment opportunities	Comments about creating opportunities for future employment for Aboriginal people, including for younger generations.	<p>Large contracts executed for the proposal during concept design have included a 1.5 per cent targeted Aboriginal Procurement Policy (APP, previously known as Aboriginal Participation in Construction, APiC) expenditure.</p> <p>Indigenous businesses and businesses with Aboriginal employees have been sought and engaged to supply services for events and Aboriginal cultural heritage investigations.</p> <p>The Aboriginal archaeological investigations included an Aboriginal trainee site officer program which provided training and work experience in Aboriginal archaeological test excavations, in addition to the 20 Aboriginal site officers engaged through a roster.</p> <p>A safeguard has been included in chapter 7 to further investigate opportunities for Aboriginal employees and procurement to be prioritised in accordance with the <i>Aboriginal Procurement Policy</i> (NSW Government, 2021) and <i>Aboriginal Participation Strategy</i> (Transport for NSW, 2023).</p>

5.4 SEPP (Transport and Infrastructure) consultation

Wollondilly Shire Council, Subsidence Advisory NSW and Western Parklands City Authority have been consulted about the proposal in accordance with the requirements of sections 2.10, 2.15(2)(f) and 2.15(2)(h) of SEPP (Transport and Infrastructure).

Appendix B contains SEPP consultation checklists that document the consultation requirements and those that are triggered for the proposal.

A summary of the issues raised during statutory consultation in accordance with SEPP (Transport and Infrastructure) is provided in Table 5-6.

Table 5-6: Summary of issues raised during statutory consultation in accordance with SEPP (Transport and Infrastructure)

Issues raised	Response / where addressed in the REF
Wollondilly Shire Council	
Interface of the proposal with planned infrastructure upgrade by others and future precinct development outlined in Wilton 2040, including land allocations in Voluntary Planning Agreements (VPAs).	<p>The proposal is aligned with Wilton 2040 and the interface and timing with planned developments outlined in this plan have been considered as part of the proposal. See sections 2.1.3 and 3.1.1.</p> <p>The proposal site has been refined to minimise impacts on developable land located outside the SP2 zoning. See sections 4.1 and 6.11.</p> <p>Potential impacts on access to local roads and surrounding properties is considered in sections 6.2 and 6.11.</p>
Integration of Connecting with Country principles.	<p>Transport recognises and celebrates the diversity of Aboriginal peoples and their ongoing culture and connections to Country.</p> <p>As part of planning for the upgrade, Transport has carried out investigations and worked with Dharawal knowledge holders, RAPs and other Aboriginal stakeholders to understand potential impacts to Aboriginal heritage and cultural values. See sections 5.3 and 6.3.</p> <p>More information about Planning with Country for the proposal can be found in Yanmanjang portal.</p>

Issues raised	Response / where addressed in the REF
Urban design and landscape character impacts within the context of Wilton 2040.	An urban design, landscape character and visual impact assessment has been completed for the proposal. See section 6.10.
Consistency of traffic modelling for the proposal with modelling completed for the Greater Macarthur Growth Area.	The traffic modelling for the proposal has been developed in close consultation with the South-West Sydney modelling team to ensure consistency across the two models at the time of completion. Further modelling would be completed to inform detailed design based on the latest information available about updated demand and timeframes for the delivery of developments outlined in Wilton 2040. See section 6.2.
Consideration of Wollondilly draft Hazards and Emergency Services Strategy.	<p>Potential impacts on emergency services were considered in the socio-economic impact assessment completed for the proposal (see section 6.12 and Appendix L).</p> <p>Consideration of alternative arrangements within the median to allow movements for emergency services and maintenance vehicles would be considered during detailed design. See section 3.2.3.</p>
Connection to Picton Bypass.	<p>The scope of the proposal has been refined based on traffic modelling results amongst other factors. See section 2.4.3.</p> <p>The connection to the Picton Bypass is outside the scope of this proposal.</p>
Impacts on biodiversity, including areas mapped as avoided land within the Cumberland Plain Conservation Plan and SEPP (Biodiversity and Conservation) 2021, and koala habitat under SEPP Biodiversity and Conservation (Koala habitat protection 2021).	<p>The proposal site has been developed to avoid and minimise impacts on areas of high biodiversity value, including avoided land and Koala habitat.</p> <p>Based on the concept design, the proposal has the potential to impact about 144 m² of avoided land. Further design development and construction planning would aim to minimise the area needed for construction, with a particular focus on avoiding and minimising potential impacts on properties, native vegetation and threatened species habitat, including mature trees and avoided land, sites of Aboriginal and non-Aboriginal heritage significance, and trees with Aboriginal cultural value, as far as reasonably practicable. See sections 2.4, 4.1.1 and 6.1, and Appendix C.</p>
Impacts on stormwater and flooding	A hydrologic model has been developed for the proposal, with consideration of the Wollondilly Shire Flood Study. See section 6.5 and Appendix G.
Consideration of mining leases	Mine subsidence has been considered in the development of the proposal (see section 3.2). Consultation with Subsidence Advisory NSW is ongoing.
Consideration of Wollondilly Shire Council Integrated Water Management Policy and Guidelines	<p>An assessment of potential impacts of the proposal on water quality has been undertaken. See section 6.6.</p> <p>The guidelines have been considered as part of this assessment. See section 2.2.4 of Appendix H.</p>
Request for an infrastructure subsidence impact assessment to be completed and provided to Subsidence Advisory NSW for comments.	<p>An infrastructure subsidence impact assessment (referred to in this REF as mine subsidence assessment) has been completed for the proposal and the report is being finalised. A copy of the report will be provided to Subsidence Advisory NSW for comments.</p> <p>The results of this assessment have informed design development as described in sections 3.2.2 and 3.2.3.</p>

Issues raised	Response / where addressed in the REF
Subsidence Advisory NSW	
Support for proposal as a key road connection for the Wilton Growth Area, improving regional connections and city-shaping infrastructure, and delivering an infrastructure upgrade identified by Wollondilly Shire Council.	Transport has noted this feedback.
Western Parkland City Authority	
DPE noted that it had no objection to the proposal and requested that Transport continues to update the Wilton Project Control Group.	Transport has noted this feedback and will continue to provide updates for the Wilton Project Control Group regarding the proposal.

5.5 SEPP (Precincts – Western Parkland City) consultation

Consultation with DPE was also completed in accordance with the requirements of section 3.24(2) of SEPP (Western Parkland City). Appendix B contains SEPP consultation checklists that document the consultation requirements and those that are triggered for the proposal.

A summary of the issues raised during statutory consultation in accordance with SEPP (Precincts – Western Parkland City) is provided in Table 5-7.

Table 5-7: Summary of issues raised during statutory consultation in accordance with SEPP (Transport and Infrastructure)

Issue raised	Response / where addressed in the REF
DPE noted that it had no objection to the proposal and requested that Transport continues to update the Wilton Project Control Group.	Transport has noted this feedback and will continue to provide updates for the Wilton Project Control Group regarding the proposal.

5.6 Government agency and stakeholder involvement

In addition to the engagement outlined in sections 5.3 to 5.5, various government agencies and stakeholder groups have been consulted about the proposal during its development. Transport has held briefings and provided notifications to the following government agencies and stakeholder groups to inform them of the proposal and seek feedback on the preferred option:

- Bingara Gorge Residents Association
- freight industry businesses
- industry representative groups, including Business Illawarra, NSW Road Freight and the National Road Transport Association (NatRoad)
- Wollondilly Local Emergency Management Committee, which includes representatives of the Department of Communities and Justice, Fire & Rescue NSW, NSW Ambulance, NSW Police, NSW Reconstruction Authority, NSW Rural Fire Service, South Western Sydney Local Health District, Water NSW, and Wollondilly Shire Council
- utility authorities
- WaterNSW
- Wilton Action Group
- Wilton Public School

- Wollondilly Shire Council
- Wollongong City Council.

A summary of the key issues raised during consultation with these agencies and stakeholders relevant to the REF is provided in Table 5-8. More detailed information on the issues raised and responses is provided in Appendix M.

Table 5-8: Summary of key issues relevant to the REF

Issue category	Overview of key issues raised / comments made	Where addressed in the REF
The project		
Project need	Support for the proposal.	Transport thanks stakeholders and the community for their support and interest in the proposal.
	The capacity of the proposal to accommodate growth requirements and manage emergency evacuations.	Sections 2.1 and 2.2
Project design and features	Consideration of alternative options at the Picton Road and M31 Hume Motorway interchange.	Section 2.4
	Capacity of the proposal and traffic modelling.	Sections 6.2.3 and 6.2.4
	Facilitation of safe pedestrian movements through the interchange and at crossings.	Section 6.2.4
	Road safety improvements resulting from the proposal.	Section 6.2.4
	Traffic speed limits through the proposal.	Section 3.2.1
Construction	Potential impacts on existing infrastructure.	Section 3.5
	Staging/timing of the proposal to manage disruption.	Sections 3.1 and 3.3
	Cumulative impact of construction in the area.	Chapter 6
Community engagement	Request for information about engagement with indigenous community.	Section 5.3
	Plans for ongoing consultation with residents and stakeholders during the development and construction of the proposal.	Section 5.2
Potential constraints and impacts		
Biodiversity	How the proposal has considered the Cumberland Plain Conservation Plan and other potential impacts to biodiversity such as Koala habitat.	Sections 3.2.2 and 6.1
Traffic and Transport	Potential cumulative impacts with the Almond Street upgrade.	Sections 1.1.3, 3.1.2 and 6.2.4
	Potential for road closures/disruptions to traffic flow during construction.	Sections 3.3.3 and 6.2.4
	Safe access to and from Picton Road.	Section 6.2
	Potential for queuing at traffic lights at the new M31 Hume Motorway and Picton Road interchange.	Section 6.2
Water	Impact of the proposal on drainage and water quality/water supply.	Section 6.5 to 6.7
Utilities	Management of potential impacts of the proposal on existing utilities.	Section 3.3

5.7 Ongoing or future consultation

Transport will continue to seek feedback from the community and key stakeholders as the proposal progresses, including during detailed design and construction in accordance with the Community and Stakeholder Engagement Plan.

5.7.1 Consultation during public display of the REF

The REF will be placed on public display at the following locations for a period of four weeks:

- Printed versions available at:
 - Wollondilly Shire Council
 - Wollondilly Library
- Staffed drop in sessions:
 - Wollondilly Shire Hall (Menangle Street, Picton)
 - Wilton Recreation Reserve (20 Broughton Street, Wilton)
 - Wilton Plaza (1 Greenbridge Drive, Wilton)
- Digital portals available at [Picton Road upgrade](#).

The community, government agencies and other interested parties are invited to make written submissions on the proposal to Transport during the display of this REF.

Associated consultation activities during the display period would include:

- briefings for stakeholders, local councils and government agencies
- targeted letterbox drops to business owners, residents and property owners who maybe directly impacted by the proposal
- community updates for residents, property owners, businesses and stakeholders
- website updates
- media release
- emails and targeted correspondence
- advertising via social media, print media and radio
- postcards delivered to businesses and residents in the local area
- phone calls and meetings with property owners identified as being subject to partial or full land acquisition
- communication materials
- community information displays
- individual door knocks.

Following public display of the REF, Transport will prepare a submissions report to summarise and provide a response to submissions received. The submissions report will be published on the project website and include a summary of any changes to the proposal in response to the submissions and other feedback received during the display period.

5.7.2 Consultation following REF approval

The community will continue to be informed during the ongoing development and construction of the proposal. Transport will also continue to consult with Wollondilly Shire Council as well as other relevant stakeholders (including potentially impacted property owners) and government agencies as the proposal develops.

The objectives of engagement during this time will be to provide:

- accurate and accessible information about the processes and activities associated with the proposal
- information in a timely manner
- appropriate avenues for providing comment or raising concerns, and to ensure they are aware of the avenues
- a high level of responsiveness to their issues and concerns throughout development and delivery of the proposal.

A Community and Stakeholder Engagement Plan would be developed and implemented by the construction contractor, as detailed in Section 7, to effectively manage consultation during the construction stage of the proposal.

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 *Guideline for Division 5.1 assessments* (DPE, 2022a) 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 summarises the results of the Biodiversity Assessment Report (BAR) prepared as an input to the REF. The full report is provided in Appendix C.

6.1.1 Methodology

The biodiversity assessment has been undertaken, and the BAR prepared, in accordance with the *Biodiversity Assessment Method* (DPIE, 2020) (the BAM), as the key guidance to assessing and managing potential impacts on biodiversity in NSW.

The methodology for the biodiversity assessment included the following key tasks:

- a desktop review and searches were undertaken to identify vegetation, threatened flora and fauna, and threatened ecological communities listed under NSW and Commonwealth legislation with the potential to occur within a 10 kilometre radius of the proposal site (further information is provided below)
- a desktop assessment to determine habitat availability for aquatic flora and fauna within the biodiversity survey area
- vegetation and habitat field investigations, surveys and mapping (described below), including targeted fauna and flora surveys, in accordance with the BAM and relevant threatened biodiversity survey guidelines
- considering the requirements of the CPCP (see section 4.1.1)
- assessing the 'likelihood of occurrence' following the collation of database records and species and community profiles
- assessing the potential impacts of the proposal on biodiversity, including assessments of significance for potential impacts on threatened and migratory species, populations and ecological communities listed in state and federal legislation (see sections 4.2 and 4.3)
- identifying safeguards and management measures to avoid, minimise, mitigate, and manage the identified impacts
- calculating offsets that would be required to compensate for the residual biodiversity impacts under the BC Act in accordance with Transport's *Biodiversity Policy* (Transport for NSW, 2022e) using the BAM calculator
- preparing the BAR.

The survey area for the biodiversity assessment included the proposal site and a buffer of about 100 metres around the proposal site. The biodiversity survey area is shown on Figure 6-1.

As described in section 4.1.1, a portion of the proposal site is located on land mapped as certified –urban capable land under the CPCP, which is biodiversity certified under Part 8 of the BC Act. As such, the potential impacts on biodiversity within land mapped as certified urban capable, as a result of the proposal, do not require biodiversity assessment in accordance with the BC Act. However, the impacts to biodiversity within areas mapped as certified under the CPCP still require assessment under the EPBC Act and have been included in the assessment.

Desktop review

A desktop review of relevant literature, databases, existing vegetation mapping, and relevant reports was undertaken in April 2022, including the following databases and datasets:

- Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (PMST) for matters protected by the EPBC Act
- BioNet – the website for the Atlas of NSW Wildlife and Threatened Biodiversity Data Collection (TBDC)
- BioNet Vegetation Classification database
- Native Vegetation Regulatory map of NSW
- BAM Important Areas maps
- NSW DPI Fisheries Spatial Data Portal
- PlantNET (The Royal Botanic Gardens and Domain Trust)
- BirdLife Australia, the New Atlas of Australian Birds 1998-2015
- SEED Layer Intersection Tool
- Regional vegetation mapping, including the Native vegetation of the Sydney Metropolitan area
- Commonwealth Atlas of Groundwater Dependent Ecosystems Atlas Map: Water Information: Bureau of Meteorology
- National Flying-fox monitoring viewer
- Core Koala Habitat identified by SEPP (Biodiversity and Conservation)
- CPCP.

Reports of previously completed biodiversity survey were also reviewed to provide additional information about flora and fauna within the biodiversity survey area.

Vegetation mapping

Native vegetation was mapped and classified in accordance with the plant community type (PCT) classification system, as described in the BioNet Vegetation Classification Database. Areas of non-native vegetation were also mapped and described as containing vegetation that could not confidently be assigned a PCT due to higher disturbance levels, as they comprised exotic species, or non-indigenous species that would not naturally occur in the vegetation patches.

Vegetation mapping involved recording dominant species, particularly canopy species, and then assigning PCTs to like sections of vegetation. Mapping the extent of native vegetation involved detailed field mapping and collection of GPS point locations using hand-held (uncorrected) tablet units, running the ArcGIS Field Maps application, using the inbuilt GPS, and aerial photo interpretation.

Habitat suitability assessment

A list of predicted species (ecosystem credit species) expected to occur within the proposal site was generated. Potential impacts on these species require assessment; however, targeted surveys are not required as these species are assumed to occur, based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape, and vegetation patch sizes.

Species credit species are threatened species for which (unlike ecosystem credit species) vegetation and/or landscape features alone cannot reliably predict the likelihood of their occurrence and targeted surveys are required to confirm their presence. Alternatively, the species can be assumed to be present, if surveys are not completed during times or conditions advised in relevant survey guidelines.

A habitat suitability assessment was undertaken to determine the likelihood that a threatened species could occur in the survey area. Results from database searches were combined with species credit species and ecosystem credit species lists generated by the BAM calculator based on the PCTs recorded in the survey area. Where background information or detailed survey was insufficient, a 'Moderate' likelihood of occurrence rating was applied to ensure that all threatened entities at risk of being impacted by the proposal were adequately assessed.

Targeted surveys were completed for all species credit species and EPBC Act listed species that were determined to have a moderate or higher likelihood of occurrence during habitat suitability assessments.

Vegetation and habitat field investigations

Surveys were carried out in accordance with the BAM:

- initial site classification and vegetation mapping
- sampling of vegetation integrity plots
- habitat assessments, including hollow-bearing tree assessments
- targeted surveys for threatened flora and fauna.

A summary of the survey effort is provided in Table 6-1.

Table 6-1: Summary of survey effort and timing

Stage	Timing	Survey
Initial fieldwork and vegetation mapping	February to March 2022 and August to December 2022	<ul style="list-style-type: none"> • vegetation mapping • mapping of habitat features, including hollow-bearing trees • habitat assessment
Sampling of vegetation integrity plots	January to February 2023	<ul style="list-style-type: none"> • BAM plots
Targeted flora surveys		
Autumn surveys	February to March 2022	<ul style="list-style-type: none"> • transect surveys
Spring surveys	September 2022 to January 2023	<ul style="list-style-type: none"> • transect surveys
Targeted fauna surveys		
Koala surveys	October 2022	<ul style="list-style-type: none"> • Koala Spot Assessment Technique surveys
Owl surveys	August 2022	<ul style="list-style-type: none"> • spotlighting • call playback
Diurnal bird surveys	August to November 2022	<ul style="list-style-type: none"> • transects • habitat assessment
Frog surveys	November to December 2022	<ul style="list-style-type: none"> • call playback • aural-visual survey • habitat assessment
Mammal surveys	November to December 2022	<ul style="list-style-type: none"> • camera trapping • spotlighting
Reptile surveys	August to September 2022	<ul style="list-style-type: none"> • habitat assessment • opportunistic rock turning
Bat surveys	February to March 2022 and October to December 2022	<ul style="list-style-type: none"> • stag watches • audio monitoring

Stage	Timing	Survey
Snail surveys	February to March 2022 and October 2022	<ul style="list-style-type: none"> point surveys under habitat features

A detailed description of the BAM, including the field survey methodology is provided in section 2 of the BAR (see Appendix C).

6.1.2 Existing environment

The proposal site is located along the existing road corridors of Picton Road and the M31 Hume Motorway. The proposal site is north of the Upper Nepean State Conservation Area, south-east of the Dharawal National Park and west of the Nattai National Park. The Nepean River flows to the south and west of the proposal site.

As described in section 4.1.1, the proposal site is predominantly located within land mapped as excluded land and certified –urban capable land under the CPCP, with a small portion located on avoided land.

The existing biodiversity environment of the proposal site is described below.

Landscape features

The landscape features of the proposal site are summarised in Table 6-2.

Table 6-2: Biodiversity landscape features

Landscape feature	Subject land
Interim Biogeographic Regionalisation of Australia (IBRA) bioregions and subregions	The proposal site is located with the Sydney Basin IBRA bioregion, mainly within the Cumberland IBRA subregion. The Sydney Cataract subregion is located south of the proposal site.
NSW landscape regions (Mitchell landscapes)	The proposal site is located on the Razorback Hills and Upper Nepean Gorges soil landscapes. The vegetation of these landscapes consists of extensively cleared open forest and open woodland, with land used mainly for residential, agricultural, industrial, and recreational purposes. There are no areas of geological significance within the proposal site.
Native vegetation extent surrounding the proposal	The proposal site is predominantly surrounded by cleared land with small patches of remnant vegetation. Vegetation within the proposal site is connected to the riparian corridor of the Nepean River, which is comprised of intact, continuous vegetation.
Rivers and streams	A number of watercourses and waterbodies are located within and in the vicinity of the proposal site, including the Nepean River, creeks and ephemeral watercourses as described in section 6.5.2, and farm dams.
Wetlands	The proposal site does not contain any wetlands.
Connectivity features	Vegetation within the proposal site is generally well connected, including to vegetation outside of the proposal site. Moderate to high quality vegetation is present near the southern, eastern, and western areas of the proposal site, near the Nepean River.
Areas of outstanding biodiversity value	There are no areas of outstanding biodiversity value within or surrounding the proposal site.
Cleared land	Cleared land comprises mostly the road corridor and cleared grassland on rural/rural-residential land, and land cleared for residential development.

Flora

Vegetation within the proposal site

Vegetation in the proposal site consists of:

- 11.50 hectares of native vegetation subject to assessment
- 19.40 hectares of urban native/exotic vegetation
- 50.76 hectares of non-offsetable grassland (including grassed paddocks and roadside vegetation – these are areas of grasslands that do not meet the definition of native vegetation and do not require offsetting under the BAM).

Plant community types

Native vegetation within the proposal site comprises two PCTs (shown on Figure 6-1):

- PCT 849 – Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
- PCT 1395 – Narrow leaved Ironbark - Broadleaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion.

The PCTs are in varying condition. Different vegetation condition classes were identified where obvious differences in structure and quality occurred, resulting in two PCTs and six vegetation conditions (high, moderate, and low conditions, scattered trees, derived native grassland and derived native shrubland). The different vegetation condition classes influence the amount of biodiversity credits that are required to be offset when quantifying potential impacts on vegetation. This is particularly important as lower condition vegetation is considered to have less species abundance/diversity and therefore lower quality habitat for threatened species.

Of the PCTs in the proposal site:

- The majority of PCT 849 consists of moderate condition vegetation (about 70 per cent). There is no high or low condition vegetation present.
- The majority of PCT 1395 consists of low condition vegetation (about 70 per cent). About 0.01 per cent of vegetation present is high condition, and 19 per cent is in moderate condition.

Threatened ecological communities

The two PCTs within the proposal site conform to two threatened ecological communities listed under both the BC Act and EPBC Act, as shown in Table 6-3, with the corresponding PCT identification number and conservation status, and are shown on Figure 6-2.

It is noted that different classification criteria apply under the BC Act and EPBC Act. Therefore, different areas of habitat and vegetation types were recorded for each Act.

Table 6-3: Plant community types within the proposal site

Threatened ecological community (listing name)		Conservation status		Associated PCT	Area within the proposal site subject to assessment	
BC Act	EPBC Act	BC Act	EPBC Act		BC Act	EPBC Act
Cumberland Plain Woodland in the Sydney Basin Bioregion	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ¹	Critically endangered	Critically endangered	849	3.64	4.01
Shale Sandstone Transition Forest in the Sydney Basin Bioregion ²		Endangered	Critically endangered	1395	5.67	6.59
Total in proposal site subject to assessment					9.31	10.60

Notes: 1. moderate condition patches of PCT 849 meet the criteria for the EPBC Act listed TEC
2. high, moderate and low condition patches meet the condition criteria for the EPBC Act listing

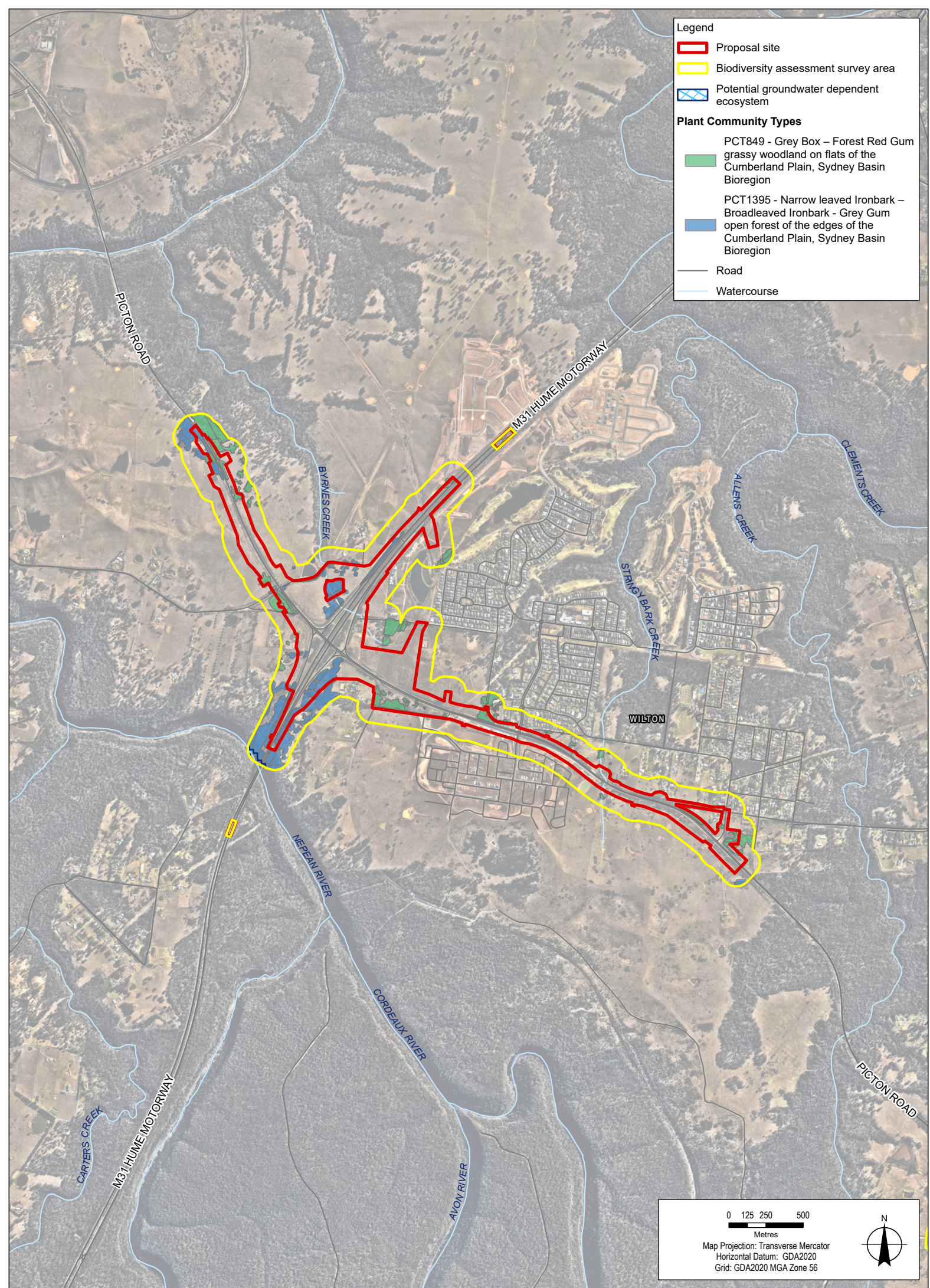


Figure 6-1 - Vegetation communities

Data source: Nearmap WMS Server; NSW SS-SDS. Topographic base data, 2023. Created by: akidea
 N:\AU\Wollongong\Projects\2312560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX014_PCTsAndGDEsInProposalVicinity_A4P. Print date: 25 Oct

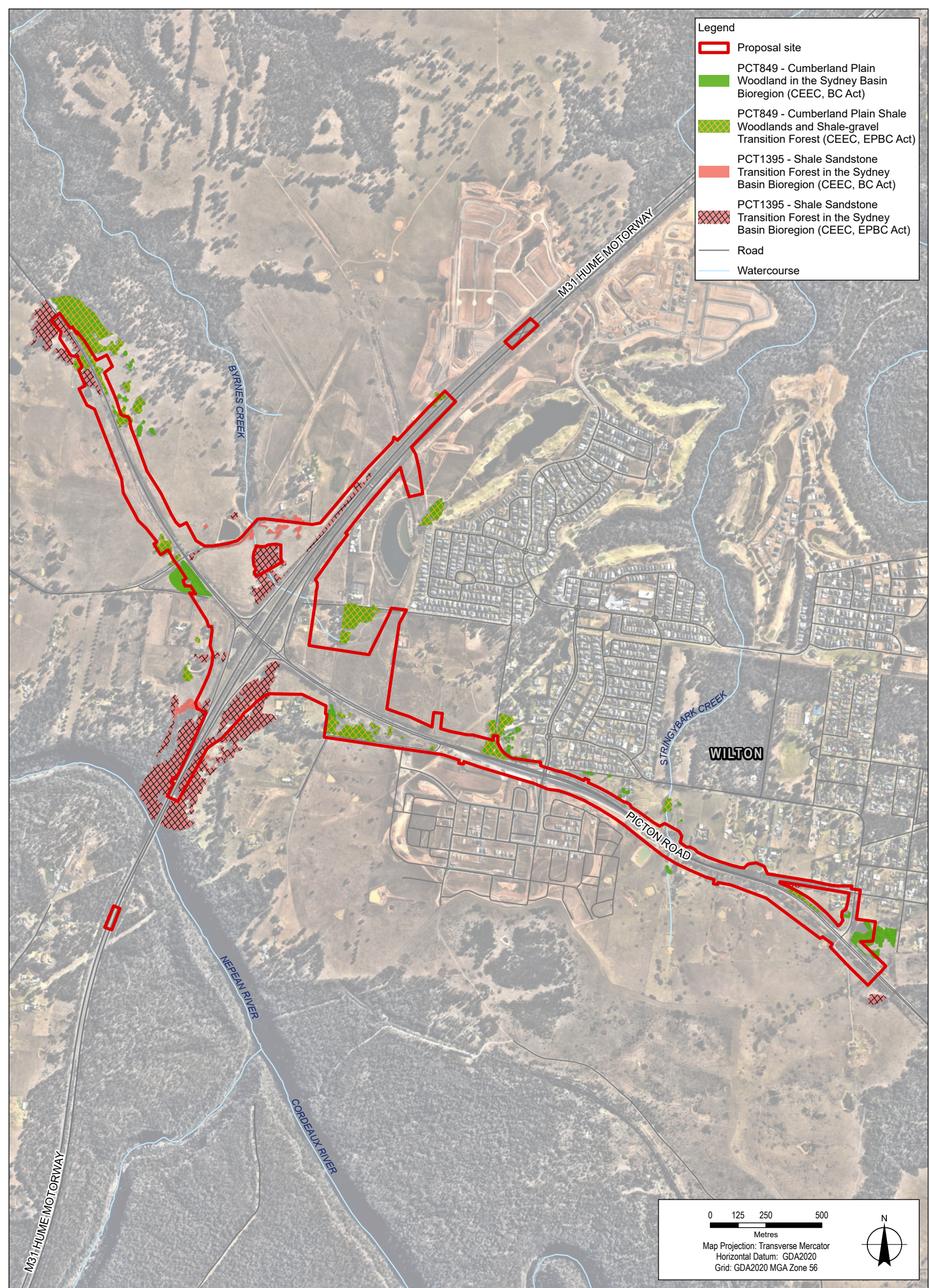


Figure 6-2 - Threatened ecological communities

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023. Created by: akidea
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 12560200_REFX015_TECsIdentifiedInProposalSite_A4P. Print date: 25 Oct

As described in section 4.1.1, some areas of the proposal site are located on land mapped as certified-urban capable land. Development on biodiversity certified land does not require assessment of the potential impact on biodiversity in accordance with the BC Act. The following areas of threatened ecological communities are located on certified-urban capable land within the proposal site:

- Cumberland Plain Woodland in the Sydney Basin Bioregion – 2.13 hectares are located on certified-urban capable land, of which 1.23 hectares are included within area mapped as Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest under the EPBC Act
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion – 1.66 hectares are located on certified-urban capable land, of which 0.97 hectares are included within area mapped as Shale Sandstone Transition Forest in the Sydney Basin Bioregion under the EPBC Act.

Groundwater dependent ecosystems

Groundwater dependent ecosystems are defined as ‘ecosystems that need access to groundwater to meet all or some of their water requirements to maintain their communities of plants and animals, ecological processes and ecosystem services’ (OEH and DPI Fisheries, 2020). Groundwater dependent ecosystems include a broad range of environments and can be highly specialised, possessing unique characteristics that ‘separate’ them from other ecosystems. The dependence of groundwater dependent ecosystems on groundwater varies from seasonal or episodic, to continual.

Vegetation surrounding the riparian corridor of the Nepean River is considered to have a high to moderate likelihood to be a groundwater dependent ecosystem and aligns with PCT 1395. However, PCT 1395 is not entirely dependent on groundwater and is not restricted to locations of groundwater discharge or located within aquifers. As a result, PCT 1395 is likely to be an opportunistic groundwater dependent ecosystem that depends on groundwater in some locations but not in others, particularly where an alternative source of water (such as rainfall) cannot be accessed to maintain ecological function.

Figure 6-1 identifies potential groundwater dependent ecosystems near the proposal site.

Threatened flora species

No threatened flora species were recorded within the survey area during targeted surveys. However, five threatened flora species listed under the BC Act were assumed to be present within the proposal site (see Table 6-4) as their presence could not be confirmed or excluded during surveys in some areas of the proposal site. Two of these species (Thick Lip Spider Orchid and Sydney Plains Greenhood) are also listed under the EPBC Act and classified as matters of national environmental significance. It is assumed that the species could be present in vegetation patches adjacent to the M31 Hume Motorway, south of the interchange with Picton Road.

Table 6-4: Threatened flora species

Species	EPBC Act	BC Act	Identification method (not recorded, assumed, recorded, expert report)	Habitat within the study area	Impacts to be assessed under the BC Act (ha)	Impacts to be assessed under the EPBC Act (ha)
Thick Lip Spider Orchid (<i>Caladenia tessellate</i>)	VU	EN	Assumed present	1.26	0.53	1.26
Sydney Plains Greenhood (<i>Pterostylis saxicola</i>)	EN	EN	Assumed present	1.26	0.53	1.26
<i>Hibbertia puberula</i>	-	EN	Assumed present	0.52	0.52	-
Austral Pillwort (<i>Pilularia novaehollandiae</i>)	-	EN	Assumed present	0.52	0.52	-
Matted Bush-Pea (<i>Pultenaea pedunculata</i>)	-	EN	Assumed present	0.52	0.52	-

Note: VU – Vulnerable, EN – Endangered

Weeds

A total of 11 exotic flora species were identified within the proposal site, of which five are listed as Priority Weeds for the Greater Sydney region under the *Biosecurity Act 2015*. Nine of these species are considered to be high threat weeds under the BAM (DPIE, 2020) and six of these species are also included on the Commonwealth list of Weeds of National Significance (WoNS) (see Table 6-5).

Table 6-5: Summary of exotic flora within the proposal site

Common name	Species name	Priority weed	WoNS	High threat weed
Crofton Weed	<i>Ageratina adenophora</i>	-	-	X
Asparagus Fern	<i>Asparagus aethiopicus</i>	X	X	X
Bridal Creeper	<i>Asparagus asparagoides</i>	X	X	X
Rhodes Grass	<i>Chloris gayana</i>	-	-	X
Lantana	<i>Lantana camara</i>	-	X	X
African Boxthorn	<i>Lycium ferocissimum</i>	X	X	X
African Olive	<i>Olea europaea subsp. cuspidata</i>	X	-	X
Blackberry	<i>Rubus fruticosus</i>	X	X	X
Fireweed	<i>Senecio madagascariensis</i>	-	X	X
Paddy's Lucerne	<i>Sida rhombifolia</i>	-	-	-
Common Sowthistle	<i>Sonchus oleraceus</i>	-	-	-

Fauna

Threatened fauna and habitats

A total of 13 threatened fauna species were recorded within the survey area (see Table 6-6). Habitat for eight threatened species was found within the proposal site. The same patches of native vegetation corresponded with habitat for multiple species.

It is noted that different habitat classification criteria apply under the BC Act and EPBC Act. Therefore, different areas of habitat were recorded for each Act.

Table 6-6: Threatened fauna species identified in surveys

Species	EPBC Act	BC Act	Credit type	Identification method (not recorded, assumed, recorded, expert report)	Habitat within the proposal site (ha)	Impacts to be assessed under the BC Act (ha)	Impacts to be assessed under EPBC Act (ha)
Koala (<i>Phascolarctos cinereus</i>)	EN	EN	Species	Recorded	10.06	7.52	10.06
Little Bent-winged Bat (<i>Miniopterus australis</i>)	-	VU		Recorded. Foraging habitat only.	-	-	-
Glossy Black-Cockatoo (<i>Calyptorhynchus lathami</i>)	VU	VU		Probable record (chewed cones). No records of individuals in the breeding season, no nesting identified	-	-	-
Masked Owl (<i>Tyto novaehollandiae</i>)	-	VU		Incidentally recorded. No breeding/roosting habitat identified	-	-	-
Little Lorikeet (<i>Glossopsitta pusilla</i>)	-	VU	Ecosystem	Recorded	8.40	8.40	-
Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	VU	VU	Species	Recorded (probable acoustic calls)	10.46	8.27	10.46
Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	-	VU	Ecosystem	Recorded (species group acoustic calls)	8.40	8.40	-
Eastern Coastal Freetailed Bat (<i>Micronomus norfolkensis</i>)	-	VU	Ecosystem	Recorded	8.40	8.40	-
Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>)	-	VU	Ecosystem	Recorded	8.40	8.40	-
Large Bentwinged Bat (<i>Miniopterus oriana oceanensis</i>)	-	VU		Recorded (species group acoustic calls). Foraging habitat only	-	-	-
Southern Myotis (<i>Myotis macropus</i>)	-	VU	Species	Recorded (species group acoustic calls)	7.84	7.84	-

Species	EPBC Act	BC Act	Credit type	Identification method (not recorded, assumed, recorded, expert report)	Habitat within the proposal site (ha)	Impacts to be assessed under the BC Act (ha)	Impacts to be assessed under EPBC Act (ha)
Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>)	-	VU	Ecosystem	Recorded (species group acoustic calls)	8.40	8.40	
Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)	VU	VU		Recorded (individuals flying over the proposal site). No breeding/roosting habitat	-	-	-

Thirteen hollow bearing trees were identified within the proposal site during the biodiversity survey. Eight hollows were located in vegetation with moderate condition, three in vegetation with low condition, and two in areas of scattered trees.

The biodiversity survey included searches up to 100 metres from the edge of the proposal site for Grey-headed Flying-fox camps, hollows suitable for use by Masked Owl, and searches for signs of roosting owls (such as presence of pellets, whitewash and prey remains). The proposal site contains suitable foraging habitat for the Grey-headed Flying Fox and the Masked Owl; however, no breeding/roosting habitat for these species were detected within the proposal site during surveys.

Roosting habitat for the Southern Myotis was observed under Pheasants Nest Bridge, south of the proposal site on the Nepean River. The visual inspection in August 2022 identified at least three individual bats roosting in a drain hole of the bridge. Additional bats were considered likely to be present in another drain hole due to the presence of a significant amount of fresh guano and staining around the hole. However, the repeat survey conducted in November 2022 did not detect bats roosting in the accessible drain holes of the bridge, and no bats were seen exiting the fenced area. Additionally, no signs of roosting were observed during surveys within other areas of potential habitat within the proposal site, including bridges.

Exotic fauna

Seven non-native fauna species were recorded within the proposal site. These species included:

- Goat (*Capra hircus*)
- Unidentified deer (*Cervus sp.*)
- Cat (*Felis catus*)
- Rabbit (*Oryctolagus cuniculus*)
- Black Rat (*Rattus rattus*)
- Fox (*Vulpes vulpes*)
- Meridolum sheai.

Wildlife connectivity corridors

Vegetation within the proposal site is well connected to adjacent vegetation. Moderate to high quality vegetation is present to the south and west of the proposal site, where the proposal site approaches the Nepean River, and also east of the proposal site where avoided land under the CPCP has been mapped.

Vegetation directly adjacent to the proposal site is comprised of the same PCTs in similar condition classes (moderate-high) as those located within the proposal site. The well connected, moderate to high quality vegetation occurs in a linear band along the Nepean River gorge, to the south and west of the proposal site. The proposal site is mainly located in previously cleared areas containing minimal native vegetation. At the far eastern extent of the proposal site, vegetation forms the western edge of intact native vegetation associated with the Illawarra Escarpment.

Aquatic habitat and species

No mapped habitat for any threatened fish species listed under the *Fisheries Management Act 1994* (FM Act) or EPBC Act was identified within the proposal site. The nearest mapped habitat was identified south and west of the proposal site in the Nepean River. The Nepean River may provide potential habitat for the following threatened aquatic species listed as endangered under the FM Act and EPBC Act:

- Macquarie Perch (*Macquaria australasica*)
- Sydney Hawk Dragonfly (*Austracordulia leonardi*).

The Nepean River represents the main significant Key Fish Habitat near the proposal site as it is likely to contain significant in-stream habitat. Additionally, as a major waterway, it is likely that the Nepean River would be consistent with a Type 1 (highly sensitive Key Fish Habitat) and Class 1 (major Key Fish Habitat) waterway. However, the proposal site does not extend to the Nepean River or the surrounding gorge.

There are no areas within the proposal site mapped as Key Fish Habitat or considered likely to contain threatened aquatic species listed under the FM Act, as watercourses present are highly degraded first and second order streams. Sections of Byrnes Creek, Stringybark Creek and Allens Creek downstream of the proposal site are mapped as Key Fish Habitat in the Nepean-Hawkesbury catchment, with the closest Key Fish Habitat in these creeks located about 550 metres from the proposal site in Byrnes Creek. Additionally, it is considered unlikely that these waterways provide any habitat for threatened aquatic flora or fauna listed under the FM Act as the waterways are highly degraded from historical clearing and ongoing land management practices.

Critical habitat and Areas of Outstanding Biodiversity Values

No areas containing critical habitat or outstanding biodiversity values were identified within the proposal site.

Matters of National Environmental Significance

Two threatened ecological communities listed under the EPBC Act were identified within the proposal site:

- PCT 849 is associated with the EPBC Act listed threatened ecological community Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (critically endangered).
- PCT 1395 is associated with the EPBC Act listed threatened ecological community Shale Sandstone Transition Forest in the Sydney Basin Bioregion (critically endangered).

Three threatened fauna and two flora species listed under the EPBC Act were assessed as having a moderate or higher likelihood of occurrence within the proposal site, including:

- Koala (Endangered)
- Grey-headed Flying Fox (Vulnerable)
- Large-eared Pied Bat (Vulnerable)
- Thick Lip Spider Orchid (Vulnerable)
- Sydney Plains Greenhood (Endangered).

Detailed mapping of the potential habitat for the threatened fauna and flora species within the proposal site is provided in section 3.10 of the BAR, included as Appendix C to this REF.

No wetlands of international or national importance were identified near the proposal site.

No migratory species are considered likely to occur within the proposal site with any regularity.

Protected areas

There are no protected areas identified within the proposal site. The nearest protected area is the Upper Nepean State Conservation Area, located about 500 metres south-west of the proposal site. The Conservation Area encompasses 25,314 hectares in the upper catchment of the Nepean River.

6.1.3 Potential impacts

Avoidance and minimisation of biodiversity impacts

In accordance with the BAM, the priority should be on avoiding and minimising potential impacts. The approach to design development included a focus on avoiding and/or minimising the potential for impacts during key phases of the design process. As described in chapter 2, the proposal was refined to minimise impacts on biodiversity (and other environmental aspects). The proposal:

- contains the minimum footprint required to provide a more functional and safer roadway
- prioritises the use of cleared and/or disturbed areas over areas of high environmental value, including the location for construction compounds and ancillary facilities
- widens the existing road corridor instead of constructing a new road corridor, and minimises widening where possible
- aims to avoid wherever possible areas of high biodiversity values within land mapped as strategic conservation land, Koala habitat and avoided land under the CPCP.

Construction

Vegetation removal

Vegetation would need to be cleared to construct the proposal. About 85 per cent of vegetation in the proposal site is already disturbed and consists of cleared land containing grassed paddocks and exotic vegetation (see section 6.1.2).

The proposal would require the removal of up to about:

- 11.50 hectares of native vegetation subject to assessment
- 19.40 hectares of urban native/exotic vegetation
- 50.76 hectares of non-offsetable grassland (including grassed paddocks and roadside vegetation).

The proposed vegetation removal may impact up to about 144 m² of avoided land mapped under the CPCP.

Threatened ecological communities

Threatened ecological communities with the potential to be directly impacted by the proposal are listed in Table 6-7.

Table 6-7: Summary of direct impacts on threatened ecological communities

PCT	Condition	Threatened ecological community	Conservation status	Impacts to be assessed under BC Act (ha)	Impacts to be assessed under EPBC Act (ha)	Total impact assessed (ha)
849	Moderate	Cumberland Plain Woodland in the Sydney Basin Bioregion / Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically endangered ecological community under the BC Act	2.78	4.01	4.01
	Scattered trees		Moderate condition patches in the proposal site meet the condition criteria for the critically endangered ecological community listed under the EPBC Act	0.02	-	0.02
	Derived native shrubland			0.39	-	0.39
	Derived native grassland			0.45	-	0.45
Total area of PCT 849 (Cumberland Plain Woodland) impacted				3.64	4.01	4.87

PCT	Condition	Threatened ecological community	Conservation status	Impacts to be assessed under BC Act (ha)	Impacts to be assessed under EPBC Act (ha)	Total impact assessed (ha)
1395	High	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Endangered ecological community under the BC Act High, moderate and low condition patches in the proposal site meet the condition criteria for the critically endangered ecological community listed under the EPBC Act	0.05	0.05	0.05
	Moderate			1.37	1.40	1.40
	Low			4.21	5.14	5.14
	Derived native shrubland			0.04	-	0.04
Total area of PCT 1395 (Shale Sandstone Transition Forest in the Sydney Basin Bioregion) impacted				5.67	6.59	6.63
Total area of impacts				9.31	10.60	11.50

Note: impacts under the BC Act and the EPBC Act cannot be added together as there are overlapping requirements.

The majority of potential direct impacts would affect PCT 1395 (Narrow leaved Ironbark – Broadleaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion). It is estimated that up to about 6.63 hectares of areas subject to assessment of this community may be impacted by the proposal.

PCT 1395 is an endangered ecological community listed under the BC Act, and the high, moderate and low condition patches of the PCT 1395 in the proposal site meet the condition criteria for the critically endangered ecological community listed under the EPBC Act. Significance assessments under both the BC Act and EPBC Act have been undertaken for potentially impacted threatened ecological communities. Potential impacts on threatened ecological communities were not considered significant as the potential vegetation removal is proposed in a linear nature and predominantly affects the roadside edges of larger patches. While disturbances and removal are proposed, the scale of the vegetation removal was not considered substantial when considering the broad context.

Threatened flora

The proposal has the potential to impact habitat for five threatened flora species assumed present within the proposal site (see Table 6-4 for habitat assessed with the proposal site).

- Thick Lip Spider Orchid (Vulnerable, EPBC Act and Endangered, BC Act)
- Sydney Plains Greenhood (Endangered, EPBC Act and BC Act)
- Matted Bush-Pea (Endangered, BC Act)
- *Hibbertia puberula* (Endangered, BC Act)
- Austral Pillwort (Endangered, BC Act).

Assessments of significance were undertaken for the identified threatened flora species and no significant impact was determined.

Threatened fauna habitat and species

The proposal has the potential to impact habitat for eight threatened fauna species (see Table 6-6 for habitat assessed within the proposal site):

- Koala (Endangered, EPBC Act and BC Act)
- Southern Myotis (Vulnerable, BC Act)
- Large-eared Pied Bat (Vulnerable, EPBC Act and BC Act)

- Little Lorikeet (Vulnerable, BC Act)
- Eastern Coastal Free-tailed Bat (Vulnerable, BC Act)
- Yellow-bellied Sheath-tail-bat (Vulnerable, BC Act)
- Greater Broad-nosed Bat (Vulnerable, BC Act)
- Eastern False Pipistrelle (Vulnerable, BC Act).

No significant impacts on these species were determined by the assessments of significance.

Impacts within 100 metres of potential or known breeding habitat of Large-eared Pied Bat (*Chalinolobus dwyerii*) have the potential to trigger a serious and irreversible impact (SAll). Potential breeding habitat for the species occurs along the Nepean River gorge and as such, impacts within 100 metres of the cliff line would require further assessment. However, no impact to breeding habitat is expected as no works associated with the proposal would occur in this location. Preparation of an SAll assessment was not required.

Aquatic habitat

No direct impacts are expected to aquatic habitat providing Key Fish Habitat or wetlands. The most likely potential impact to aquatic habitats would be from sedimentation downstream from construction.

Watercourses crossing the existing Picton Road and the M31 Hume Motorway are already subject to a level of disturbance and the proposal is not expected to significantly change flow regimes, flooding regimes or hydrology (see section 6.5).

Groundwater dependent ecosystems

The proposal is unlikely to impact on the potential groundwater dependent ecosystem identified in section 6.1.2, as the closest patch is located about 80 metres south of the proposal site. Additionally, there is not anticipated to be any appreciable change in groundwater flow or depth during construction.

It should also be noted that PCT 1395 is not entirely groundwater dependent and is more reliant on the collection of rainwater in these locations.

Key threatening processes

The BC Act, FM Act and EPBC Act list a series of key threatening processes. These are defined as a process that threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community. The proposal has the potential to result in the following key threatening processes during construction:

- clearing of native vegetation
- loss of hollow-bearing trees
- competition from increasing weed densities and further invasion.

Although the cumulative impacts of vegetation clearing and tree hollow loss have the potential to increase the impact of the above listed key threatening processes, the vegetation proposed to be removed generally has a low species diversity, high level of weed invasion, and is subject to edge effects. The vegetation to be impacted also generally occurs in proximity to higher quality patches of vegetation adjacent to the proposal site which would be retained.

The localised nature of the proposal and the overall scale of impacts is considered unlikely to significantly trigger or exacerbate any key threatening processes.

Other potential impacts

Injury / mortality

The potential for wildlife injury or death could occur during construction of the proposal, including as a result of:

- clearing of vegetation
- collision/strike by machinery and plant
- collision with construction traffic.

Fauna exclusion fencing is proposed to be erected along heavily vegetated sections of Picton Road and the M31 Hume Motorway prior to commencement of the proposal as part of a separate Transport project. An alternative fauna barrier would be implemented prior to the removal of existing fauna fences.

Indirect impacts

Construction has the potential to result in indirect impacts on biodiversity within the proposal site and surrounding environment. A summary of potential indirect impacts is provided in Table 6-8.

Table 6-8: Summary of indirect impacts of the proposal during construction

Impact	Description
Invasion and spread of weeds	The proposal has the potential to spread weeds during vegetation clearing and through the movement of vehicles and machinery into or out of the proposal site. Weeds are easily transported as seeds and propagules on machinery brought to the proposal site. Equally, they can be carried away to other areas from the site or spread within it. If weeds are not controlled prior to work commencing, then there is the potential for spread throughout the site during and following construction.
Invasion and spread of pests, pathogens and disease	Some construction activities have the potential to increase the spread, introduction and establishment of pest species, diseases and pathogens. These could include plant pathogens (such as Phytophthora and Myrtle Rust) and frog pathogens (Chytrid fungus). The potential for significant or new impacts associated with these pathogens is relatively low, given the existing development and extent of human visitation across the project site and surrounding environment.
Aquatic disturbance	If inadequately managed, construction has the potential to result in sedimentation and erosion within the proposal site. It also has the potential to mobilise contaminated sediments into waterways or result in chemical spills from vehicles or plant. The introduction of pollutants from the proposal into the surrounding environment, if uncontrolled, could impact on water quality further downstream. These potential impacts would be managed by implementing standard best practice construction management measures, including sedimentation and erosion controls (see sections 6.6.4 and 6.7.4).
Noise, light, and vibration	Noise, light and vibration can disturb fauna, including threatened microbats that may be inhabiting nearby hollow-bearing trees or man-made structures. However, the proposal site currently includes a busy road and therefore it is already subject to noise and light pollution. Potential temporary disturbance of wildlife from noise emissions and light spill during construction and night works would be localised to within about 50 to 100 metres of the proposal site and are not likely to have a significant long-term impact on wildlife that may occur within the proposal or surrounding environment.
Dust	If inadequately managed, construction has the potential to generate dust. High dust levels (and any pollutants it may contain) could reduce habitat quality for flora and fauna species by reducing plant and animal health in adjacent areas of vegetation. Dust may affect photosynthesis, respiration and transpiration in plants, and allow the penetration of gaseous pollutants. Dust could also impact fauna health. The potential for dust generation would be managed by implementing standard best practice construction management measures (see section 6.9).

Operation

Wildlife connectivity and habitat fragmentation

Given the connectivity of vegetation through the proposal site and surrounding environment, and the nature of the proposed works being removal of linear areas of vegetation adjacent to existing road infrastructure, the proposal is not expected to result in additional fragmentation of habitat for any species. Existing connectivity within the landscape would be maintained.

Road widening has the potential to result in an increased barrier to dispersal for fauna species. Picton Road and the M31 Hume Motorway are arterial roads, with the M31 Hume Motorway being a high speed road, which provides a collision risk for terrestrial, non-flying species such as Koala. However, the Pheasants Nest bridge (located on the M31 Hume Motorway, over the Nepean River to the south of the proposal site) provides existing passage for fauna, which can pass under these bridges.

Fauna exclusion fencing is proposed to be erected along heavily vegetated sections of Picton Road and the M31 Hume Motorway prior to commencement of the proposal as part of a separate Transport project. The proposal would reinstate any fencing that requires removal to facilitate construction activities prior to completion of the proposal.

Edge effects

Edge effects include increased noise and light or erosion and sedimentation at the interface of intact vegetation and cleared areas. Edge effects may result in impacts such as changes to vegetation type and structure, increased growth of exotic plants, increased predation of native fauna or avoidance of habitat by native fauna.

The proposal would have the potential for indirect impacts on some areas of previously undisturbed native vegetation, mainly due to the creation of new edges in native vegetation adjacent to the widened Picton Road. These impacts may result in edge effects and an increased opportunity for weed encroachment and exposure within the proposal site.

Changes to hydrology

There would be some alteration to the existing surface hydrological conditions within the proposal site; however, this alteration is anticipated to be minor (surface level changes) such that the processes that are currently in place would largely remain. Any small change to hydrology is unlikely to cause a substantial impact to the native vegetation and habitat present in the proposal site or surrounding environment following the completion of construction.

Further information about the potential for hydrology impacts is provided in section 6.5.

Fauna injury and mortality

The proposal would involve the widening of Picton Road to facilitate an improvement in traffic safety, management and flow. As such, the road crossing distance would increase and the proposal has the potential to increase the risk of injury and mortality to susceptible fauna via vehicle strike. However, fauna fences being installed as part of a separate Transport project along Picton Road and the M31 Hume Motorway in areas adjacent to Koala habitat would be relocated as needed to maintain effective separation of terrestrial species.

Conclusion on significance of impacts

Significance assessments under the BC Act and EPBC Act were undertaken for threatened entities recorded or considered to have a moderate or higher likelihood of occurrence within the proposal site. The assessments are detailed in section 5.4 of Appendix C.

No seven part tests under the FM Act were undertaken as the proposal is not expected to impact threatened species protected under the FM Act.

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

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

6.1.4 Safeguards and management measures

The measures described in Table 6-9 will be implemented to, in conjunction with other measures outlined in chapter 7, avoid, minimise, mitigate and manage potential impacts on biodiversity.

Table 6-9: Biodiversity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Transport for NSW's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas fauna management requirements (in accordance with Guide 9: Fauna handling of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011)) requirements set out in the <i>Landscape Design Guideline</i> (Transport for NSW, 2023d) pertinent to construction pre-clearing survey requirements in accordance with the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) procedures for unexpected threatened species finds and fauna handling following Guide 1: Pre-clearing process of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) protocols to manage weeds and pathogens tree protection measures in accordance with Australian Standard <i>AS 4970-2009 Protection of trees on development sites</i> a microbat management sub-plan if microbats are found present during pre-clearance survey or prior to removal of infrastructure. 	Contractor	Detailed design/ pre-construction	Section 4.8 of QA G36 <i>Environment Protection</i> QA G40 <i>Clearing and Grubbing</i>
Habitat removal	Vegetation and habitat removal, including removal of hollow-bearing trees and logs, will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Pre-construction/ construction	Additional safeguard QA G40 <i>Clearing and Grubbing</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
Impacts on trees	A tree inventory will be prepared by a qualified arborist for trees proposed for clearing that do not require offsetting under the <i>No Net Loss Guidelines</i> (Transport for NSW, 2022f). This will include confirming the number of trees and hollows to be removed and replacement ratios in accordance with the <i>Tree and Hollow Replacement Guidelines</i> (Transport for NSW, 2022g).	Contractor	Detailed design/ pre-construction	Additional safeguard
	Prior to commencing vegetation clearing, a tree and hollow replacement plan will be developed outlining the approach to replacing trees and hollows in accordance with the <i>Tree and Hollow Replacement Guidelines</i> (Transport for NSW, 2022g), Guide 5: Re-use of woody debris and bushrock and Guide 8: Nest boxes of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011). This will include considering options for tree and hollow replacement within and in the vicinity of the proposal site in consultation with landowners. Where tree and hollow replacement cannot be accommodated locally or can only be partially accommodated, payment will be made to the Transport of NSW Conservation Fund prior to the commencement of works in accordance with the <i>Tree and Hollow Replacement Guidelines</i> (Transport for NSW, 2022g).	Transport/ contractor	Detailed design/ pre-construction	Additional safeguard
	Trees to be retained will be protected prior to the commencement of construction in accordance with Australian Standard AS 4970-2009 <i>Protection of trees on development sites</i> .	Contractor	Pre-construction/ construction	Additional safeguard
Habitat loss	A Biodiversity Offset Strategy will be developed and implemented to facilitate offsetting of impacts that exceed the thresholds within the <i>No Net Loss Guidelines</i> (Transport for NSW, 2022f). This will include completing additional targeted flora surveys in areas not surveyed due to access constraints (see section 2.4.5 of the Biodiversity Assessment Report) to confirm species presence and the amount of non-statutory offsets required in accordance with the <i>No Net Loss Guidelines</i> .	Transport	Detailed design	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Residual impacts on native flora and fauna (excluding certified land under the CPCP)	<p>Opportunities to replant disturbed areas within the proposal site identified for landscaping will be defined by, and undertaken in accordance with, the Urban Design and Landscaping Plan. The plan will include:</p> <ul style="list-style-type: none"> where possible and appropriate, use of native vegetation of local provenance (commensurate with PCTs 849 and 1395), in accordance with the recommended species planting provided in Appendix F of the Biodiversity Assessment Report (Appendix C). defining revegetation requirements in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011a) and in consultation with a biodiversity specialist identifying ongoing vegetation monitoring and maintenance requirements as needed use of native species with cultural value identified through consultation with Aboriginal stakeholders, where appropriate defining appropriate plants that would contribute to the ongoing health of trees to be retained, including trees with Aboriginal cultural value. 	Transport/ contractor	Detailed design/ construction	Additional safeguard QA R179 Landscape Planting
Fauna fences	Prior to the removal of existing fauna fences, an alternative fauna fence will be implemented.	Transport/ contractor	Pre-construction/ construction	Additional safeguard

6.1.5 Consistency of mitigation with the CPCP infrastructure guidelines

As described in section 4.1.1, the CPCP infrastructure guidelines set out the requirements to avoid, minimise and mitigate impacts on biodiversity from infrastructure activities carried out under Part 5 of the EP&A Act on land identified as certified –urban capable land in the area to which the CPCP applies.

Sections 3.1 and 3.3 of the guidelines details the mitigation requirements for proposed Part 5 activities on avoided land and certified –urban capable land, respectively. The safeguards and management measures for the proposal are considered to adequately address the requirements defined in sections 3.1 and 3.3 of the infrastructure guidelines. A detailed description of the consistency of the proposal with the infrastructure guidelines is provided in section 6 of the BAR (Appendix C of the REF).

6.1.6 Biodiversity offsets

Biodiversity offset requirements under the BC Act

The offsets required to compensate for the residual biodiversity impacts under the BC Act were determined using the BAM calculator. In accordance with the offset rules established by the BC Regulation, offset obligations can be achieved by retiring appropriate biodiversity credits from an established Biodiversity Stewardship Site, monetary payment directly into the Biodiversity Conservation Fund, or funding an approved biodiversity action.

A total of up to 330 ecosystem credits would be required to offset the proposal's potential impacts outlined in section 6.1.3 on native vegetation listed under the BC Act and EPBC Act, consisting of:

- PCT 849 – Cumberland Plain Woodland in the Sydney Basin Bioregion / Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest: 115 ecosystem credits
- PCT 1395 – Shale Sandstone Transition Forest in the Sydney Basin Bioregion: 215 ecosystem credits.

The BC Act requires additional credits for potential impacts to certain species (as listed in the BAM as 'species credit species').

The proposal site is known or assumed to support three species credit species, requiring a total of 839 species credits. Species credits have been calculated for the following species:

- Southern Myotis (*Myotis macropus*): 237 species credits
- Koala (*Phascolarctos cinerus*): 228 species credits
- Large-eared Pied Bat (*Chalinolobus dwyeri*): 374 species credits.

Biodiversity offset strategy/tree and hollow replacement plan

For the vegetation zones where biodiversity offsetting thresholds have not been reached under the *No Net Loss Guidelines* (Transport for NSW, 2022f), offsets or conservation measures are not required. However, the following vegetation zones meet the criteria under the *Tree and Hollow Replacement Guidelines* (Transport for NSW, 2022g) and would require trees to be planted or payment made to the Transport for NSW Conservation Fund prior to the commencement of works to account for vegetation removal:

- PCT 1395 Derived native shrubland (DNS)
- urban native/exotic.

The area of PCT 1395 DNS does not contain any hollows or trees with a diameter at breast height greater than five centimetres. As such, no offsets would be required for this vegetation. Of the remaining vegetation, it is estimated that up to about 399 trees would be required to be planted to offset proposed vegetation removal in eligible vegetation zones. No artificial hollows would be required.

A summary of the estimated number of trees potentially requiring replacement for the proposal is provided in Table 6-10. The actual number of trees requiring offsetting in each zone would be confirmed prior to the commencement of construction in accordance with the safeguards listed in Table 6-9.

Table 6-10: Estimated number of trees requiring replacement

Tree category	Estimate of trees to be removed	Number of trees to plant
Large trees (diameter at breast height between 50 and 100 centimetres)	31	123
Medium trees (diameter at breast height greater than 20 centimetres, but less than 50 centimetres)	62	123
Small trees (diameter at breast height greater than 5 centimetres, but less than 20 centimetres)	77	153
Total estimated trees to plant for offsets		399

A detailed outline of the biodiversity offset calculations is provided in section 7 of Appendix C.

6.2 Traffic and transport

This section summarises the results of the Traffic and Transport Impact Assessment report prepared an input to the REF. The full report is provided in Appendix D.

6.2.1 Methodology

The traffic and transport assessment involved the following main tasks:

- identifying existing and future traffic and transport conditions, including traffic circulation patterns, mode share, public and active transport networks, vehicle parking, and access arrangements
- undertaking travel time surveys, traffic counts and queue length surveys along Picton Road between 2021 and 2022 at 13 intersections within and surrounding the proposal site for the following periods:
 - Picton Road and M31 Hume Motorway interchange – all day (24 hours)
 - other intersections – 5.30am to 9.30am and 3pm to 6pm
- undertaking a desktop movement and place assessment based on a high-level analysis, leveraging the structure planning that as been undertaken for the Wilton Growth Area
- assessing the potential traffic and transport impacts of the proposal during construction including:
 - reviewing construction staging, traffic generation, site access and traffic management arrangements
 - modelling intersection performance using SIDRA Intersection modelling software
 - assessing the potential impacts on road users, including private vehicle traffic, public transport, heavy vehicles, walking and cycling, local traffic access, road safety and parking
- modelling future road network performance using AIMSUN modelling software for the following scenarios:
 - 2022 existing conditions – existing traffic network
 - 2031 without the proposal – future projected traffic network in 2031 without the proposal but including other known planned road network upgrades associated with the study area
 - 2031 with the proposal – future projected traffic network in 2031 with the proposal and other known road network upgrades associated with the study area
 - 2046 without the proposal – future projected traffic network in 2046 without the proposal but including other known planned road network upgrades associated with the study area
 - 2046 with the proposal – future projected traffic network in 2046 with the proposal and other known road network upgrades associated with the study area
- assessing the potential impacts of the proposal on traffic and transport performance during operation
- identifying measures to avoid, minimise and manage the identified impacts.

The study area for the traffic assessment focused on the proposal site with seven key intersections considered as part of the assessment. The study area is shown on Figure 6-3.

Traffic modelling undertaken as part of the operational assessment considered a wider area including a number of additional roads and intersections. The extent of the traffic model (shown in Figure 6-3) covered the Wilton Growth Area, the M31 Hume Motorway between Pheasants Nest in the south and Douglas Park in the north, Picton Road as far west as Maldon, and as far east as the administrative boundary of the suburb of Wilton, including the full length of MacArthur Drive. This ensured that the traffic performance outcomes for the proposal were assessed in the context of future development and traffic growth as well as expected future road network changes in the area surrounding the proposal site.

The initial traffic surveys were undertaken in late 2021 soon after the COVID-19 pandemic travel restrictions had been lifted. Repeated surveys were undertaken in 2022 and a review against historic counts was completed to ensure that the traffic data used to calibrate the model was appropriate and determine whether an adjustment factor needed to be applied in the development of traffic forecasts and traffic modelling for the proposal. Further analysis can be found in section 2.2.3 of Appendix D.

A detailed description of the methodology, including the traffic modelling undertaken, is provided in Appendix D.

6.2.2 Criteria

Network performance

Network-performance statistics generated by the AIMSUN traffic model for the modelled area are shown in Table 6-11.

Table 6-11: AIMSUN network statistics

Indicator	Unit	Description
Traffic demand	vehicles (veh)	Total hourly traffic input into the model
Vehicle kilometres travelled	kilometres (km)	Total distance travelled by vehicles within each evaluation hour
Vehicle hours travelled	hours (h)	Total travel time travelled by vehicles within each hour
Vehicle delay	seconds (sec)	Total delay experienced by all vehicles divided by the number of vehicles
Latent demand	number of vehicles (no.)	Total number of vehicles that could not (yet) enter the network due to congestion at the end of each evaluation hour
Vehicle speed	kilometres per hour (km/h)	Average vehicle speed in the network

Travel time

Average travel times were reported for vehicular travel along Picton Road between the western end of the Nepean River Bridge and the intersection with MacArthur Drive, in both directions. Travel times are inclusive of all sources of delay, including congestion along Picton Road and time spent waiting at intersections and the interchange.

Intersection level of service

Intersection performance was evaluated using average vehicle delay and level of service. Average delay is commonly used to assess the operational performance of intersections, with level of service used as an index. Level of service is measured on a scale from A to F, with A representing optimal operating conditions and F representing the worst operating conditions. When roadway performance falls below a level of service D, the operation of the road is not considered to be at an acceptable level for major roads.

A summary of the intersection level of service and average delay criteria is shown in Table 6-12.

Table 6-12: Level of service criteria for intersections and average delay threshold

Level of service	Average delay per vehicle (sec/veh)	Intersection control	
		Traffic signals, roundabouts	Give way, stop signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity, at signals, incidents will cause excessive delays, roundabouts require other control modes	At capacity, requires other control mode

Level of service	Average delay per vehicle (sec/veh)	Intersection control	
		Traffic signals, roundabouts	Give way, stop signs
F	>70	Over capacity, unstable operation	Over capacity, unstable operation

Source: *Guide to Traffic Generating Developments* (RTA, 2002)

6.2.3 Existing environment

Existing road network

Key roads within and adjacent to the proposal site are summarised in Table 6-13 and shown in Figure 6-3.

Table 6-13: Roads within and adjacent to the proposal site

Road	Description	Road function
M31 Hume Motorway	<p>Provides a highway connection between Sydney and Melbourne with an overall length of about 840km. At the proposal site, the highway consists of two lanes in each direction separated by a wide central median.</p> <p>The M31 Hume Motorway is a National Key Freight Route and an approved heavy vehicle route for 26m B-doubles. It is also approved for over size and/or over mass vehicles subject to travel conditions between the M7 Motorway and Picton Road:</p> <ul style="list-style-type: none"> Over size and/or over mass vehicles are not permitted after 4pm on Sundays or state-wide public holidays. Over size and/or over mass vehicles or combinations exceeding 3.5m wide, or 25m long, are not permitted to travel between 8.30am and sunset on weekends or state-wide public holidays. <p>The section of the M31 Hume Motorway within the proposal site carries about 36,000 vehicles per day including up to 6,000 heavy vehicles per day (or about 17 per cent of the average total daily traffic). Based on traffic counts conducted as part of the assessment, traffic volumes generally begin building up at 4am with no identified peak and generally high traffic volumes from around midday until around 4pm.</p> <p>The posted speed limit within the study area is 110km/h.</p> <p>Further information (including limitations associated with road infrastructure in the proposal site) is provided in section 2.2.</p>	State Road
Picton Road	<p>Picton Road is a 35km long arterial road corridor linking the Illawarra Shoalhaven Region with south-west Sydney and is one of two major east-west links between the M1 Princes Motorway and M31 Hume Motorway.</p> <p>Within the proposal site, Picton Road consists of predominantly two lanes in the eastbound direction and one lane in the westbound direction, with the exceptions of:</p> <ul style="list-style-type: none"> between Wilton Park Road and Pembroke Parade, where both directions provide two travel lanes each between Pembroke Parade and Almond Street (a distance of around 1.5km at the eastern end of the proposal site) where there is one lane in each direction <p>The road forms part of the key freight network in the locality and is an approved heavy vehicle route for 26m B-doubles and over size and/or over mass vehicles.</p> <p>The posted speed limit is 80km/h within the proposal site, transitioning to 100km/h east and west of the proposal site. The 100km/h speed zone west of the proposal is planned to be reduced to 80km/h prior to the opening year of the proposal to meet the updated NSW Speed Zoning Standards and has been assumed as such for the future year traffic models.</p>	State Road

Road	Description	Road function
	Further information (including limitations associated with road infrastructure in the proposal site) is provided in section 2.2.	
MacArthur Drive	Provides a connection between Picton Road and Wilton Road and an alternate access to and from Douglas Park and Appin. The road consists of a single lane in each direction and has a posted speed limit of 80km/h.	Regional Road
Wilton Road / Argyle Street	Provides a connection between Wilton and Appin, between Almond Street, Wilton and the Appin town centre. The road consists of a single lane in each direction and has a posted speed limit of 80km/h .	Regional Road
Wilton Park Road	Provides local access to properties located south of Picton Road west of the M31 Hume Motorway. The road consists of a single lane in each direction and has a posted speed limit of 80km/h.	Local Road
Pembroke Parade	Provides a connection to the Bingara Gorge estate north of Picton Road. The roads mainly consists of a single lane in each direction with a central median separating the two carriageways, with the exception of the section between Picton Road and Oxenbridge Avenue where it is composed of two southbound lanes and one northbound lane. Pembroke Parade has a posted speed limit of 50km/h.	Local Road
Greenway Parade	Provides a connection to the Wilton Greens estate south of Picton Road. The roads mainly consists of a single carriageway lane in each direction with a central median separating the two carriageways, with the exception of the section between Picton Road and Hepper Parkway where it is composed of two southbound lanes and two northbound lanes. Greenway Parade has a speed limit of 50km/h.	Local Road
Oxenbridge Avenue	Provides access off Pembroke Parade into the Bingara Gorge estate and east (as Hornby Street) where it meets Almond Street. The road consists of a single lane in each direction and has a posted speed limit of 50km/h.	Local Road
Almond Street	Provides access into older established residential areas at Wilton north of Picton Road. The road consists of a single lane in each direction. Almond Street has a posted speed limit of 50km/h north of Wilton Road (around the residential areas), and a posted speed limit of 60km/h south of Wilton Road.	Local Road
Janderra Lane	Provides access to a number of private properties south of Picton Road. The road consists of a single lane in each direction and does not provide through access. Janderra Lane has a speed limit of 50km/h.	Local Road
Aerodrome Drive	Provides access to Wilton Airport. The road consists of a single lane in each direction and does not provide through access. Aerodrome Drive has a speed limit of 50km/h.	Local Road
Wilton Park Road	Provides access to a number of private properties west of Picton Road. The road consists of a single lane in each direction and does not provide through access. Wilton Park Road has a posted speed limit of 80km/h.	Local Road

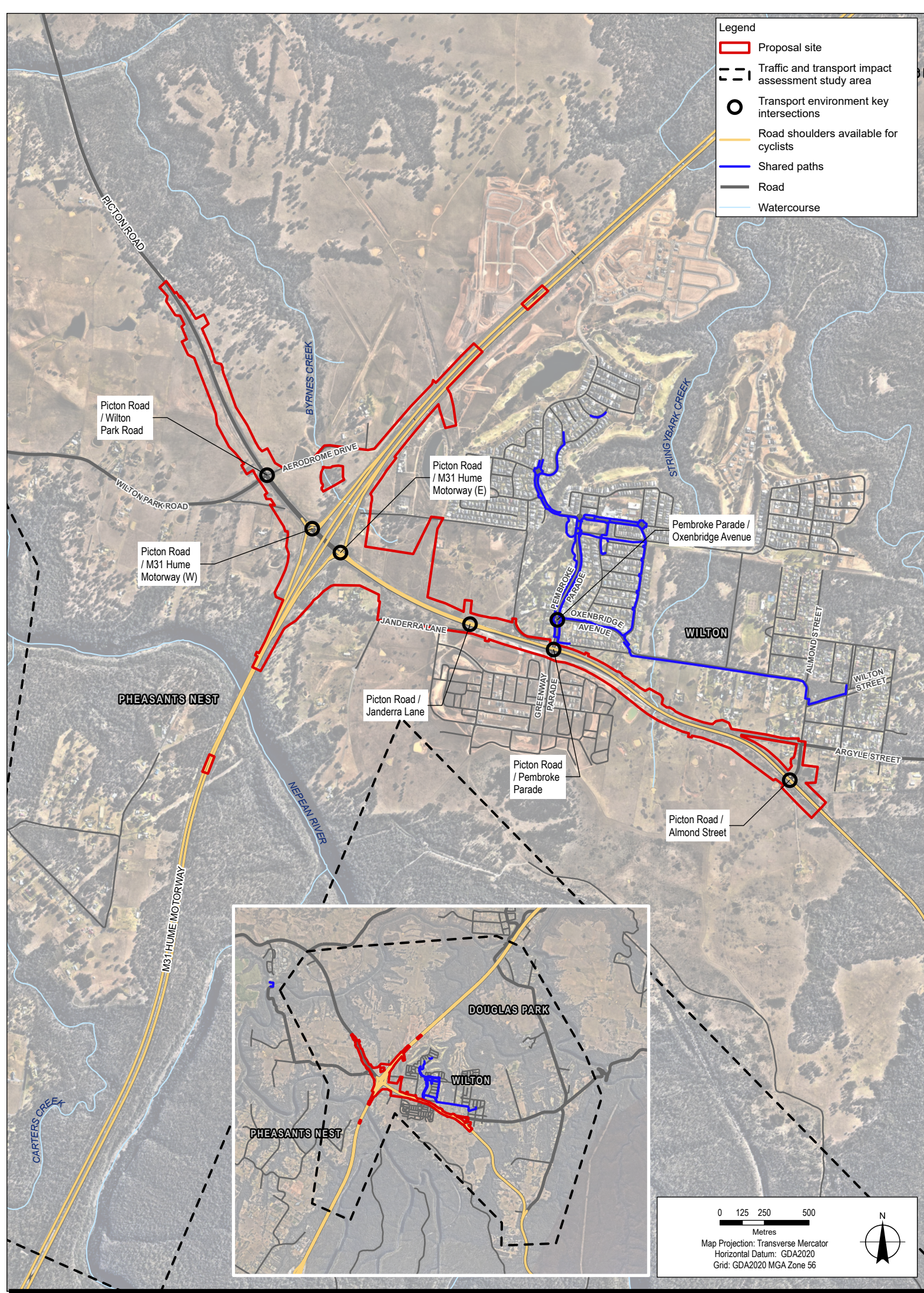


Figure 6-3 - Existing transport environment

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023; Transport network - TRNSW, 2023. Created by:akidea
 N:\AU\Wollongong\Projects\23112560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX010_ExistingTransportEnvironment_A4P. Print date: 25 Oct

Existing traffic volumes

Traffic volume information derived from surveys undertaken for the proposal in 2021 and 2022 is provided in Table 6-14 for the M31 Hume Motorway and in Table 6-15 for Picton Road.

Table 6-14: Existing traffic volume on the M31 Hume Motorway within the proposal site (weekday)

Time	Northbound			Southbound			Two-way combined			Per cent of daily
	Light vehicle	Heavy vehicle	Total	Light vehicle	Heavy vehicle	Total	Light vehicle	Heavy vehicle	Total	
Weekday daily	14,739	3,094	17,833	15,593	2,443	18,036	30,332	5,537	35,869	100
Morning peak (11am to 12pm)	894	164	1,058	1,038	200	1,238	1,932	364	2,296	6.4
Afternoon peak (4pm to 5pm)	1,239	141	1,380	1,350	111	1,461	2,589	252	2,841	7.9

No weekend counts have been conducted for the M31 Hume Motorway in the recent surveys. A review of historical through traffic volume data on the M31 Hume Motorway indicate consistent variation in traffic volumes throughout the week, with a prominent peak on a Friday and Sunday – about 18 per cent and 17 per cent higher (respectively) than weekday through traffic volumes from Monday to Thursday. This is consistent with people going away on Fridays for the weekend and returning on Sundays. Saturday traffic volumes are noted to be comparable to weekday (Monday to Thursday) traffic volumes.

Table 6-15: Existing traffic volume on Picton Road within the proposal site (weekday)

Time	Eastbound			Westbound			Two-way combined			Per cent of daily
	Light vehicle	Heavy vehicle	Total	Light vehicle	Heavy vehicle	Total	Light vehicle	Heavy vehicle	Total	
West of Picton Road and M31 Hume Motorway interchange										
Weekday daily	4,981	1,168	6,149	5,258	1,037	6,295	10,239	2,204	12,443	100
Morning peak (7am to 8am)	443	78	521	356	80	436	799	158	957	7.7
Afternoon peak (4pm to 5pm)	364	48	411	513	69	583	877	117	994	8.0
East of Picton Road and M31 Hume Motorway interchange										
Weekday daily	8,584	2,454	11,040	7,920	2,308	10,228	16,507	4,761	21,268	100
Morning peak (6am to 7am)	572	217	788	684	154	839	1,256	371	1,627	7.6

Time	Eastbound			Westbound			Two-way combined			Per cent of daily
	Light vehicle	Heavy vehicle	Total	Light vehicle	Heavy vehicle	Total	Light vehicle	Heavy vehicle	Total	
Afternoon peak (4pm to 5pm)	833	109	941	602	123	725	1,435	231	1,666	7.8

On weekends, total traffic volumes on Picton Road are about 25 per cent lower than weekdays as shown in Table 6-16. Heavy vehicles also make up a lower proportion of the traffic volume on weekends compared to weekdays.

Table 6-16: Existing traffic volume on Picton Road within the proposal site (weekend)

Time	Eastbound			Westbound			Two-way combined			Per cent of daily
	Light vehicle	Heavy vehicle	Total	Light vehicle	Heavy vehicle	Total	Light vehicle	Heavy vehicle	Total	
West of Picton Road and M31 Hume Motorway interchange										
Weekend daily	3,975	308	4,282	4,393	285	4,677	8,367	592	8,959	100
Morning peak (11am to 12pm)	327	20	346	402	29	431	729	48	777	8.7
Afternoon peak (3pm to 4pm)	329	19	348	325	18	342	654	37	690	7.7
East of Picton Road and M31 Hume Motorway interchange										
Weekend daily	7,536	674	8,210	7,357	532	7,889	14,893	1,206	16,099	100
Morning peak (11am to 12pm)	755	43	798	557	42	599	1,312	84	1,396	8.7
Afternoon peak (12pm to 1pm)	672	38	710	543	35	578	1,215	73	1,288	8.0

Intersection performance

Table 6-17 shows the existing performance of seven key intersections within the study area that may be affected by the proposal. As shown in Table 6-17, the majority of local road intersections currently operate with a good average level of service. The Picton Road and Almond Street intersection is currently operating near capacity during the morning peak with a slight improvement in operations during the afternoon peak.

The Picton Road and M31 Hume Motorway interchange is the greatest constraint within the study area during both peaks. The eastern end of the interchange (comprising the southbound on and off ramps) is considered to operate satisfactorily; however, the western end (comprising the northbound on and off ramps) is effectively at capacity during the morning peak and considered to be nearing capacity in the afternoon peak, resulting in congestion which impacts the operation of the eastern end.

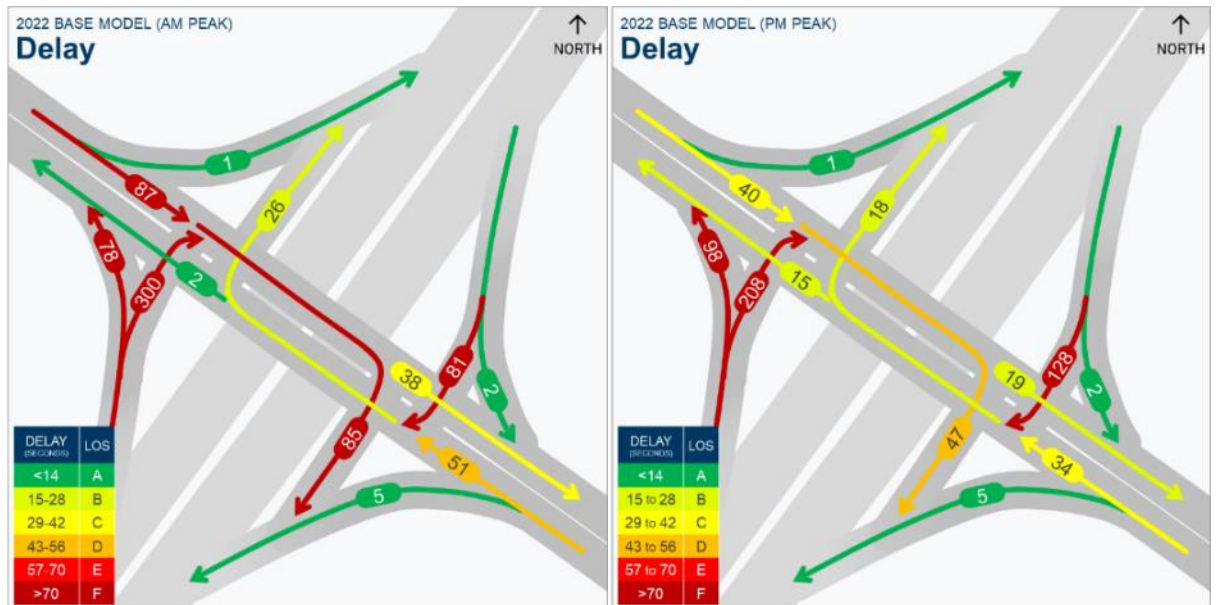
Table 6-17: Existing intersection delay and level of service (2022)

Intersection	Current intersection control	Morning peak		Afternoon peak	
		Avg delay (seconds)	Level of service	Avg delay (seconds)	Level of service
Picton Road and Wilton Park Road	Priority	2	A	3	A
Picton Road and M31 Hume Motorway (northbound on and off ramp)	Signalised	58	E	50	D
Picton Road and M31 Hume Motorway (southbound on and off ramp)	Signalised	35	C	32	C
Picton Road and Janderra Lane	Priority	22	B	8	A
Pembroke Parade and Oxenbridge Avenue	Roundabout	13	A	12	A
Picton Road and Pembroke Parade	Priority	13	A	7	A
Picton Road and Almond Street	Priority	50	D	38	C

Legend: LoS A (Green), LoS B (Light Green), LoS C (Yellow), LoS D (Orange), LoS E (Red), LoS F (Dark Red)

Figure 6-4 indicates the performance of individual movements at the Picton Road and M31 Hume Motorway interchange during the morning and afternoon peaks.

High volumes of westbound traffic turn right from Picton Road into the M31 Hume Motorway northbound lane, making this a critical movement. Traffic signals at the interchange are currently set up to favour this movement, which contributes to delays experienced by conflicting right turn movements (including the southbound off ramp, the northbound off ramp, and the eastbound on ramp). There is also limited queuing space available for right turns, causing queues to spill over and block through lanes on Picton Road and on the M31 Hume Motorway, impacting traffic performance and increasing delays for through movements.



Note: The figure shows the average delay for each movement of the intersection. The average delay for each key intersection in the study area as a whole is detailed in Table 6-17.

Figure 6-4: Existing performance of individual movements at the Picton Road and M31 Hume Motorway interchange

Road safety

Crash incident data was collected from road crash statistics published by the NSW Centre for Road Safety and from data provided by Transport. There were 33 crashes on Picton Road within the proposal site between 2018 and 2022 inclusive, mainly between the Wilton Park Road and Pembroke Parade. Twenty-three of the incidents (70 per cent) resulted in injuries, including 11 serious injury crashes. One fatal crash was also reported in 2021 at the intersection with Wilton Park Road.

Table 6-18: Road crash incidents on Picton Road within the proposal site

Year	Degree of severity (number of incidents)					Total
	Non-casualty (towaway)	Minor/other injury	Moderate injury	Serious injury	Fatal	
2018	3	2	0	2	0	7
2019	0	0	3	1	0	4
2020	1	0	3	1	0	5
2021	2	0	0	2	1	5
2022	3	2	2	5	0	12
Total	9	4	8	11	1	33

Data source: NSW Road Crash Data 2018-2022 (Transport Centre for Road Safety)

Rear end crashes, which is an indicator of traffic queueing, made up around 72 per cent of the crashes, with 19 recorded incidents. Most of the incidents were noted to occur near Janderra Lane and the interchange with the M31 Hume Motorway (seven incidents at each of the locations) and Pembroke Parade (four recorded incidents).

Other crash types include 'right through' (three crashes), head-on (one crash), rollovers (five crashes), vehicle to object (two crashes) and U-turn or manoeuvring (three crashes).

A safe system assessment of the section of Picton Road within the proposal site identified the following key factors that impact road safety in the corridor:

- The Picton Road and M31 Hume Motorway interchange has a posted speed of 80 kilometres per hour, providing errant vehicles little opportunity to correct their movements to avoid crashes.
- The Picton Road and M31 Hume Motorway interchange has very little refuge for occupants of broken-down vehicles.
- This section of road features no pedestrian facilities such as footpaths or crossings, with the exception of the shared user path included at the intersection with Pembroke Parade and Greenway Parade.

Public transport

There are currently no public transport services (rail or bus), stops or other facilities within the study area. However, there are four bus services (coaches) travelling along the M31 Hume Motorway between Campbelltown and Goulburn and one school bus (route 901) operating in the Wilton area, provided by Picton Buslines for local students. This service runs from Douglas Park to Picton via Wilton.

Active transport

There are no dedicated pedestrian facilities provided along Picton Road or the M31 Hume Motorway within the proposal site. Existing walking and cycling networks in the study area include footpaths and shared user paths at the intersection with Pembroke Parade that connect the Wilton and Bingara Gorge residential areas.

Although there are no dedicated cycling facilities provided along Picton Road or the M31 Hume Motorway, cyclists are permitted to ride along the road shoulders on these roads.

Active transport facilities are shown on Figure 6-3.

Parking

Parking within proposal site and adjacent local roads is limited to on-street parking along Pembroke Parade, Oxenbridge Avenue and Almond Street. Picton Road has no formal parking areas within the proposal site however some light and heavy vehicles have been observed to stop along the shoulders of Picton Road just east and west of the Picton Road and M31 Hume Motorway interchange. Around 96 vehicles stop along the road shoulders per day, staying in this location for an average of eight to 10 minutes. On average, only one to two heavy vehicles per day generally use the shoulder to stop for substantially longer periods of time between the M31 Hume Motorway and Pembroke Parade. Similar numbers of light vehicles have been observed to stop on the verge of Picton Road between the M31 Hume Motorway and Aerodrome Drive other than for short stops.

6.2.4 Future road network conditions without the proposal

Understanding future context

The area surrounding the proposal site is subject to urban growth and development as part of the Wilton Growth Area in accordance with the Wilton 2040 strategy (see sections 2.1.3 and 6.11.3). This growth will be associated with an increase in the volume of traffic on the road network, particularly Picton Road as the main access route to and from many of the development precincts within the Wilton Growth Area.

Traffic modelling for the proposal was undertaken having regard to future traffic demand, derived from the Sydney Strategic Traffic Forecasting Model using preliminary 2019 population trends, as well as other transport infrastructure projects within and surrounding the proposal site. A summary of the projects considered in the 'without proposal' assessment is provided in Table 3-1 (see also Table 3-1).

Table 6-19: Planned and recent infrastructure projects in the study area

Infrastructure project	Description of planned projects	Delivery responsibility and approximate timing ¹
Picton Road and Pembroke Parade intersection upgrade	<ul style="list-style-type: none"> intersection upgrade to a four-way signalised intersection with a new local road (Greenway Parade) accessing South East Wilton precinct (Wilton Greens) 	Private developer – Completed in 2023
Western intersection with planned new Wilton Town Centre road	<ul style="list-style-type: none"> intersection to be upgraded to a four-way signalised intersection with a planned new local road accessing the West Wilton and North Wilton precincts 	Private developer – by 2030
Wilton Town Centre road network	<ul style="list-style-type: none"> road upgrades leading to Wilton Town Centre and construction of new proposed internal road network 	Private developer – by 2030
Almond Street intersection upgrade	<ul style="list-style-type: none"> an overbridge over Picton Road and new grade-separated intersection would be constructed for local traffic, providing a direct connection between the South East Wilton, South Wilton and Bingara Gorge precincts westbound and eastbound connections onto Picton Road would be provided for all for movements onto and off Picton Road; removal of existing right turn movements at Almond Street 	Private developer – by 2030
Janderra Lane overpass	<ul style="list-style-type: none"> a grade-separated vehicular crossing would be provided over Picton Road at Janderra Road for local traffic connecting the South East Wilton precinct to the Town Centre Link Road 	Private developer – by 2030
Town Centre Link Road overbridge over the M31 Hume Motorway (Condell Park Road overpass)	<ul style="list-style-type: none"> access to Wilton Town Centre from Condell Park Road via new bridge over the M31 Hume Motorway 	Private developer – by 2030

Infrastructure project	Description of planned projects	Delivery responsibility and approximate timing ¹
North Wilton road overbridge over the M31 Hume Motorway, including north facing on and off ramps (Niloc Bridge Link)	<ul style="list-style-type: none"> sub-arterial road from Niloc Bridge Link to Maldon–Dombarton rail line bridge crossing, including M31 Hume Motorway ramp access from North Wilton 	Private developer – by 2030
Wilton Park Road realignment and intersection upgrade	<ul style="list-style-type: none"> intersection to be relocated to a new alignment of Wilton Park Road and upgraded to a four-way signalised intersection providing access to the new Wilton Town Centre and West Wilton precinct 	Private developer – by 2030

Note: 1. The timing shown is from the Wilton Growth Area infrastructure phasing plan (DPIE, 2020).

Further details regarding the future road network are provided in section A-2 and section 2.3.1 of Appendix D. Traffic modelling for the proposal has also included sensitivity testing for travel zone projections based on final 2022 population and employment forecasts.

Future traffic growth

Modelling of the future road network identified that by 2031, a growth in peak hour traffic demand of about 20 to 25 per cent is expected compared to 2022, while growth between 2022 and 2046 is expected to be about 70 to 90 per cent.

Future road network performance

The forecast growth to 2031 is expected to result in the Picton Road and M31 Hume Motorway interchange being over capacity and this worsening by 2046. Delays and congestion at this interchange are expected to affect traffic along Picton Road and connecting streets, with an increase of travel time of up to 33 minutes predicted in 2046. These delays and congestion are also predicted to result in impacts on the M31 Hume Motorway due to queuing extending beyond the off-ramp into the main traffic lanes.

Further details on the future road network operation, including detailed modelling results, are provided in section 4.3 of Appendix D.

6.2.5 Potential impacts

Construction

Construction would be carried out in stages (as described in section 3.3) and would involve different traffic management arrangements for each construction stage to facilitate safe movements of vehicles within and around the proposal site as well as a safer working environment for construction crews. These arrangements would be refined during detailed design and may involve temporary signal control at intersections, minimising conflict points by changing access to left in left out at some intersections, temporary speed reduction and limiting access to road shoulders.

Construction would generate additional vehicle movements, including light and heavy vehicles. Light vehicles would generally be used by construction workers moving to and from construction work areas and/or compounds. Heavy vehicles would be used to transport materials and spoil to, around, and from the proposal site. Further information on estimated vehicle movements and haul routes is provided in section 3.3.7.

The following sections provide a summary of the key potential impacts of construction on traffic, transport and access in the study area.

Intersection performance

Table 6-20 outlines the predicted performance of key intersections within and in the vicinity of the proposal site for construction stages 1, 2 and 3. During these construction stages (which are described in section 3.3.1), the majority of intersections are predicted to operate at a satisfactory level (that is at a level of service C or better), with the following exceptions:

- Picton Road and M31 Hume Motorway interchange during construction stage 1 – where the interchange is predicted to operate near capacity; however, this level of operation would be similar to that of the modelled existing future network (without proposal), with some efficiencies in performance through optimisation of traffic signal phasing.
- Pembroke Parade intersection:
 - during construction stages 1 and 2 – where the intersection is predicted to be nearing capacity but is still considered to operate at an acceptable level.
 - during construction stage 3 – where the intersection is predicted to be nearing capacity during the morning peak but is still considered to operate at an acceptable level.

Stages 0 and 4 of construction are not included in Table 6-20 as no substantial impacts are expected during these stages. During stage 0, intersections are expected to operate as per the future existing situation (2031), while during construction stage 4, the intersections are expected to operate consistent with the modelled ‘with proposal’ scenario (outlined in the operation section below).

The potential impacts outlined above and shown in Table 6-20 are based on the maximum anticipated construction volumes.

Table 6-20: Intersection performance during construction stages 1, 2 and 3

Intersection name	Delay in seconds (level of service)					
	Stage 1		Stage 2		Stage 3	
	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
Picton Road and Wilton Park Road	9 (A)	7 (A)	9 (A)	8 (A)	9 (A)	8 (A)
Picton Road and M31 Hume Motorway (west)	74 (F)	32 (C)	30 (C)	29 (C)	30 (C)	29 (C)
Picton Road and M31 Hume Motorway (east)	51 (D)	87 (F)	26 (B)	34 (C)	26 (B)	34 (C)
Picton Road and Janderra Lane	23 (B)	10 (A)	23 (B)	10 (A)	23 (B)	10 (A)
Pembroke Parade and Oxenbridge Avenue	23 (B)	9 (A)	9 (A)	9 (A)	9 (A)	9 (A)
Picton Road and Pembroke Parade	44 (D)	44 (D)	48 (D)	48 (D)	42 (C)	38 (C)
Picton Road and Almond Street	24 (B)	13 (A)	31 (C)	12 (A)	12 (A)	8 (A)

Legend: LoS A LoS B LoS C LoS D LoS E LoS F

The provision of temporary traffic signals during construction, together with the speed limit reduction to 60 kilometres per hour along Picton Road, could result in increased journey times along the corridor. However, the potential impacts are expected to be minor, given that the existing number of traffic lanes would be generally maintained throughout the construction period.

SIDRA modelling results for the stage 1 construction scenario (the most critical construction period in terms of traffic performance) showed generally satisfactory performance at most intersections during both the morning and afternoon peak periods, except for the Picton Road and M31 Hume Motorway interchange, which is predicted to operate slightly above capacity. However, the construction arrangements are predicted to have intersection performance comparable to the ‘without proposal’ scenario at the Picton Road and M31 Hume Motorway interchange.

The construction of new bridges at the interchange may necessitate implementation of temporary contraflow arrangements and localised speed reductions along the M31 Hume Motorway to allow construction vehicles safe access to and from the construction site. Assessment of the M31 Hume Motorway traffic volumes and road capacity indicate that the M31 Hume Motorway has enough capacity to accommodate traffic with these temporary traffic arrangements. Works that would involve temporary changes to the M31 Hume Motorway would be carried out during periods of lower traffic activity, between 9pm to 6am, to minimise impacts on other road users.

Freight

Heavy vehicles travelling within the study area would experience a similar traffic performance impact as for general traffic, outlined in the above section (intersection performance). Construction would not include any specific restrictions on the existing movement of heavy vehicles, including over size and/or over mass vehicles, along the M31 Hume Motorway or along Picton Road in either direction. Heavy vehicles travelling within the study area would have the potential to experience similar impacts associated with changes to traffic performance and access as general traffic.

Active transport

There are no pedestrian facilities within the proposal site that would be impacted during construction.

Construction traffic management arrangements would include barriers located a minimum of 0.5 metres from the edge line of the traffic lane, resulting in the removal of the existing shoulder that is currently available for cyclists to use. Cyclists would need to travel within the general traffic lane when riding east and west along Picton Road. It is noted that observed cycling volumes along Picton Road are relatively low, and a speed limit of 60 kilometres per hour would apply to Picton Road during construction, which would improve the general level of safety for cyclists.

Cyclist (and pedestrian) conditions would improve as construction progresses with elements of the shared user path progressively opened providing active transport users a safe and separate path improving safety.

Public transport

Impacts on four bus services along the M31 Hume Motorway are expected to be minor due to no long term lane closures on the M31 Hume Motorway and that any works with the potential to impact would be undertaken at night when bus services do not operate.

Impacts on the school bus services between Picton and Douglas Park would be limited to delays which would be similar to those outlined for general traffic in the above section (intersection performance). It is noted that if new public transport services are added to Picton Road during construction, then these would be subject to the general traffic impacts above.

Local traffic movements and access changes

During construction, access to local roads and properties would be maintained for residents, businesses, and through traffic on Picton Road and the M31 Hume Motorway. Where temporary disruption of existing access is unavoidable, alternative access arrangements would be provided in consultation with relevant stakeholders (including Wollondilly Shire Council, emergency services and affected property owners and occupants). In the case of properties adjoining the road corridor, temporary driveways would be provided if required.

As far as possible, works requiring temporary lane closures would be undertaken as out-of-hours-work or scheduled to occur during off-peak periods to minimise the potential for disruption and delays. Any local road or lane closures are expected to be short-term, and any impacts resulting from these activities, if unavoidable, would be temporary.

Construction would require some changes to the operation of key intersections along Picton Road including Wilton Park Road, Aerodrome Drive, Janderra Lane and Almond Street. Access changes at affected intersections are summarised below:

Wilton Park Road and Aerodrome Drive intersection

- Subject to the use of construction Compound 1, this intersection would be controlled by temporary traffic signals or an equivalent traffic control during construction that allows all movements under safe conditions. As such, there is no requirement for a detour for traffic accessing either Wilton Park Road or Aerodrome Drive for the duration of construction. A number of intersection layout options have been considered, with the temporary signalised intersection arrangement being the most appropriate to cater for the forecast traffic demands and available space. The temporary intersection layout would be confirmed as part of the Construction Traffic Management Plan (CTMP).

Janderra Lane intersection

- Movements at the intersection with Janderra Lane would be restricted to left in and left out for the duration of construction with this arrangement maintained through to operation. This restriction would have the potential to temporarily affect existing users of Janderra Lane until other road works are completed (to be undertaken by private developer/s), including roads within the South East Wilton precinct (Wilton Greens), which would connect Janderra Lane to Pembroke Parade and provide alternative right turn access, as well as the Janderra Lane overpass (described in section 3.1.1).
- Detour routes for vehicles accessing Janderra Lane would be via safe U-turn facilities at the Maldon Bridge Road roundabout (about seven kilometres to the north-west) for outbound movements or the intersection of Pembroke Parade and Oxenbridge Avenue (around 500 metres to the east) for inbound movements. It is expected that about six private properties have the potential to be affected by this arrangement.

Almond Street intersection

- Movements at Almond Street would be maintained; however, all movements including right in and out movements may be undertaken under temporary traffic signal control, with the potential impacts of this arrangement outlined in the intersection performance section above. Upgrades to the Almond Street intersection are not intended to be undertaken until such time as the Almond Street overpass and Picton Road connections are in place at this location with all existing traffic movements maintained (see section 3.1). Once the overbridge and connections are completed, access from Picton Road would be subject to left in left out restrictions.

A CTMP would be developed and implemented to minimise the potential for traffic, transport and access impacts during construction (see section 6.2.6).

Parking

As identified in section 6.2.3, there are no formal parking facilities within the proposal site. Workforce parking would be provided at the identified ancillary facilities (see section 3.4) and designated areas within and adjacent to worksites, which would minimise the potential for impacts on local on-street parking within Wilton. Worksite parking would be established in locations that would not impact traffic flow on public roads.

The proposed construction traffic management arrangements would include the installation of safety barriers, making the road shoulders along Picton Road unavailable for vehicle parking or stopping. It is noted that existing rest areas are available on the M31 Hume Motorway (about four kilometres north of the proposal site and 6.5 kilometres south of the proposal site) and Picton Road (about six kilometres south-east of the proposal site) for this purpose.

Operation

Network performance

Table 6-21 summarises the predicted changes to the network operation following implementation of the proposal (the 'with proposal' scenario) during the morning and afternoon peaks, compared to the future scenario without the proposal.

Table 6-21: Forecast network performance in 2031 and 2046

Indicator (unit)	Without proposal		With proposal (change from 'without proposal')	
	Morning	Afternoon	Morning	Afternoon
2031				
Vehicle kilometres travelled (km)	67,784	67,550	70,742 (+2,958)	68,542 (+992)
Vehicle hours travelled (hours)	1,026	1,191	950 (-76)	1,053 (-138)
Vehicle delay (seconds)	15	24	9 (-6)	15 (-9)
Vehicle speed (km/h)	71	63	77 (+5)	69 (+6)
2046				
Vehicle kilometres travelled (km)	84,173	87,835	90,947 (+6,774)	90,284 (+2,449)
Vehicle hours travelled (hours)	1,615	2,006	1,279 (-336)	1,266 (-740)
Vehicle delay (seconds)	28	41	10 (-18)	10 (-31)
Vehicle speed (km/h)	60	57	72 (+12)	72 (+15)

As shown in Table 6-21, the proposal is predicted to result in an improvement of network performance in both 2031 and 2046 with key indicators showing a beneficial change. Where increased vehicle kilometres travelled and decreased vehicle hours travelled are evident, this indicates improved network performance as a result of increased average speeds and decreased delays. Table 6-22 provides an analysis of the modelling results in Table 6-21. Further detailed information on future network performance is provided in section 7.1.1 of Appendix D.

Table 6-22: Analysis of proposal case outcomes

2031 Proposal Case	2046 Proposal Case
<p>Compared to the 2031 'without proposal' scenario:</p> <ul style="list-style-type: none"> • Average vehicle speed is predicted to increase by up to 5km/h in the morning peak and 6km/h in the afternoon peak. • Overall, the modelling indicates that upgrading the Picton Road and M31 Hume Motorway interchange to a diverging diamond interchange would increase the capacity of the interchange by addressing the critical movements (e.g., right turn to the M31 Hume Motorway ramps) and would consequently improve the performance of the Picton Road corridor. 	<p>Compared to the 2046 'without proposal' scenario:</p> <ul style="list-style-type: none"> • Average vehicle speed is predicted to increase by up to 12km/h in the morning peak and up to 15km/h in the afternoon peak.

Travel time

Table 6-23 summarises the change in travel time along the Picton Road corridor between the northern end of the Nepean River Bridge and MacArthur Drive.

Table 6-23: Forecast travel times in 2031 and 2046

Scenario	Eastbound (minutes)		Westbound (minutes)	
	Morning peak	Afternoon peak	Morning peak	Afternoon peak
2031				
Without proposal	13	10	11	11
With proposal	10	10	10	10
Change	-3	<1	-1	-1
2046				
Without proposal	22	14	13	43
With proposal	10	10	10	10
Change	-12	-4	-3	-33

Travel times with the proposal are predicted to be about 10 minutes for both peaks in each modelled year. The predicted improvement in travel times is about one to three minutes in 2031, cutting morning peak travel time in the eastbound direction by up to a quarter. Greater benefits would be achieved in 2046 where predicted improvements in travel time would be up to 12 minutes in the morning peak (eastbound) and 33 minutes in the afternoon peak (westbound), cutting peak travel by up to 50 per cent and 80 per cent, respectively.

It is noted that a key assumption of the 2031 assessment is that all infrastructure upgrades associated with the Wilton Growth Area (as listed in Table 3-1) have been implemented by private developers and as a result, the performance of the future network without the proposal is improved by such upgrades, which remove some traffic from the Picton Road and M31 Hume Motorway interchange. However, if some of these upgrades are delayed, the performance of the proposal in 2031 (compared to the ‘without proposal’ scenario) would be much greater.

In addition to providing travel time savings, the relatively consistent travel times in each direction facilitated by the proposal indicate a high degree of travel time reliability. This would allow for all road users, including bus and freight operators, to accurately plan their journey and travel times.

Intersection performance

Table 6-24 outlines how the seven key intersections within the study area are predicted to perform with and without the proposal in both the 2031 and 2046 modelling scenarios.

Table 6-24: Forecast intersection performance in 2031 and 2046

Intersection	2031 Delay in seconds (level of service)				2046 Delay in seconds (level of service)			
	Without proposal		With proposal		Without proposal		With proposal	
	AM	PM	AM	PM	AM	PM	AM	PM
Picton Road and Wilton Park Road (including movements with Aerodrome Drive)	26 (B)	24 (B)	21 (B)	20 (B)	71 (E)	31 (C)	20 (B)	25 (B)
Picton Road and M31 Hume Motorway (west)	119 (F)	62 (E)	28 (B)	20 (B)	123 (F)	75 (F)	24 (B)	23 (B)
Picton Road and M31 Hume Motorway (east)	58 (E)	64 (E)	12 (A)	13 (A)	91 (F)	155 (F)	16 (B)	17 (B)
Picton Road and Janderra Lane	21 (B)	16 (B)	1 (A)	1 (A)	123 (F)	549 (F)	26 (B)	14 (A)
Picton Road and Pembroke Parade (including movements with Greenway Parade)	21 (B)	21 (B)	19 (B)	18 (B)	38 (C)	138 (F)	33 (C)	30 (C)
Picton Road and Almond Street	16 (B)	15 (A)	21 (B)	18 (B)	61 (E)	25 (B)	28 (B)	16 (B)

Legend: LoS A LoS B LoS C LoS D LoS E LoS F

As shown in Table 6-24, the proposal is predicted to result in the majority of modelled intersections operating at a level of service of A or B with spare capacity in 2031 and 2046. The exception to this is the intersection with Pembroke Parade and Greenway Parade in 2046, which would operate at a level of service C in both the morning and afternoon peaks. This is still a substantial improvement relative to the ‘without proposal’ scenario and still well within the capacity of the intersection.

It is noted that the resulting 2031 intersection performance for the Pembroke Parade intersection is different for the construction and operational assessments (a level of service C or D during construction and a level of service B during operation for both morning and afternoon peak periods). This is attributable to a reduction in through lanes on Picton Road along the Pembroke Parade intersection to ensure an appropriate construction area is achieved. This is anticipated to result in a reduced level of performance during construction, which is most significant in construction stages 1 and 2.

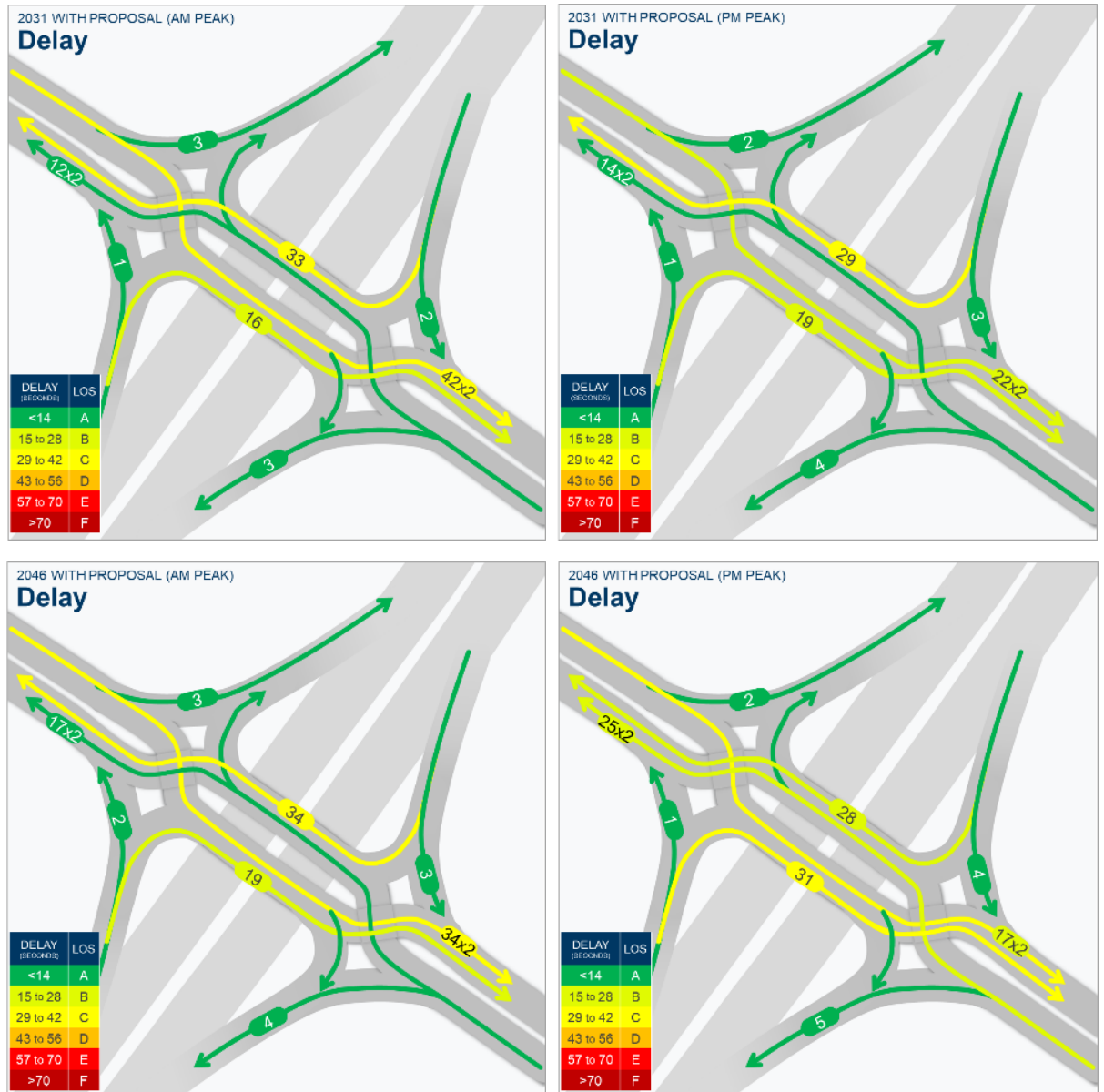
Figure 6-5 indicates the performance of individual movements at the Picton Road and M31 Hume Motorway interchange during the morning and afternoon peaks in 2031 and 2046. As shown, the proposed diverging diamond interchange is expected to address queueing at the interchange ramps, preventing queue build-up and spillover onto the through traffic lanes of Picton Road and the M31 Hume Motorway.

It is further noted that the modelling undertaken has assumed that the widening of the M31 Hume Motorway to three lanes has occurred prior to 2046 and this is therefore included in the ‘without proposal’ and ‘with proposal’ modelling results outlined above. Additional sensitivity testing undertaken using the traffic model indicated that, while there may be some additional queueing back from the M31 Hume Motorway northbound on-ramp, if the widening is not completed, this queueing is not significant enough to impact on the operation of the Picton Road and M31 Hume Motorway interchange.

Further sensitivity assessment around the 2046 scenario using 2022 population trends indicated that there is no material change to the performance of the proposal when using the 2022 projections, compared to the 2019 population projections. The design of the proposal is predicted to produce satisfactory performance at all locations.

Freight

Heavy vehicles using Picton Road would experience the same travel benefits as other road users in terms of delay reduction, improved travel time, and safety benefits. The proposal would also improve resilience by providing additional capacity to manage vehicle movements during disruptions. The proposal would also result in improved accessibility enabling longer combinations of large heavy vehicles and improved over size and/or over mass vehicle access due to the improved road geometry, especially at the interchange.



Note: The figure shows the average delay for each movement of the intersections at the interchange. The average delay for each key intersection in the study area is detailed in Table 6-23.

Figure 6-5: Future performance of individual movements at the Picton Road / M31 Hume Motorway interchange

Active transport

The proposal includes providing a shared user path along the south side of Picton Road between the western extent of the proposal and about 420 metres west of Almond Street, and a shared user path on the northern side of Picton Road between Pembroke Parade and Almond Street, and between two new future intersections west of the M31 Hume Motorway. The new shared user path would connect with planned active transport infrastructure to be delivered as part of the South East Wilton development, providing a total about five kilometres of continuous active transport infrastructure that is completely separated and protected from vehicular traffic.

The provision of this infrastructure would improve east-west connectivity and safety along the active transport route and would also support the proposed strategic cycle routes identified in the Wollondilly Bike Plan and the future Wilton 2040 active transport network Figure 2-5 shows the relationship between the proposed shared user paths and the active transport connections provided for by Wilton 2040.

Public transport

The proposal would improve the performance of the road network, including travel times and reliability of movements along Picton Road, which would benefit existing and potential future public transport services. The improved travel time reliability would enable bus services to arrive on time and with consistent travel time between stops.

Local traffic movements and access changes

The proposal includes reconfiguring the existing Picton Road and Almond Street intersection into left in left out only. As outlined in section 3.1.1, the timing of construction for this part of the proposal may be delivered in a second stage and in conjunction with the delivery of the Almond Street overpass by private developers which would provide right in and right out functionality at this location.

The proposal includes reconfiguring the existing Picton Road intersections with Wilton Park Road, Aerodrome Drive and Janderra Lane into left in left out only. At each of these intersections, there are planned additional infrastructure upgrades to be delivered by private developers and providing future and ultimate access into the adjoining development areas (see section 3.1.1). As such, the reconfigurations as part of the proposal are interim measures until the ultimate access arrangements are provided. The potential impacts of these operational changes are summarised in Table 6-25.

Table 6-25: Operational impacts on local traffic movements

Intersection	Operational impacts on local traffic movements
Wilton Park Road and Aerodrome Drive intersections	<ul style="list-style-type: none"> • About 60 private properties with existing access via Wilton Park Road have the potential to be affected by the interim change to left in left out only. For outbound movements, a safe U-turn is available at the Maldon Bridge Road roundabout (about five kilometres to the west). For inbound movements, U-turns could be undertaken at the intersection of Pembroke Parade and Oxenbridge Avenue (about two kilometres to the south). • For larger vehicles unable to make U-turns (such as semi-trailers), if approaching from the north west, circulation via Picton Road, MacArthur Drive, Wilton Road and Almond Street may be required adding about 17 kilometres of travel. Given the land uses on Wilton Park Road, heavy vehicle movements are likely to be very low. • Although there will be an impact to property access which would result in longer travel distances, this arrangement is expected to be temporary or may not be necessary, subject to the timing of the delivery of a developer-funded signalised intersection at this location.
Janderra Lane intersection	<ul style="list-style-type: none"> • About six private properties with existing access via Janderra Lane have the potential to be affected by the interim change to left in left out only. For outbound movements, safe U-turn is available at the Maldon Bridge Road roundabout (about six kilometres to the west). For inbound movements, U-turns could be undertaken at the intersection of Pembroke Parade and Oxenbridge Avenue (about two kilometres to the south). • This arrangement is expected to be temporary, subject to the timing of the delivery of future planned connections (i.e. South East Wilton precinct road network, Janderra Lane Overbridge).
Almond Street intersection	<ul style="list-style-type: none"> • The potential impact of the proposed changes at Almond Street are considered to be minor as this part of the proposal is intended to not be constructed until such time as the developer-led overpass and Picton Road connections are in place at this location, providing full access arrangements.

Road safety

The proposal is expected provide a net benefit to road safety in the area generally as a result of the following:

- upgrading the Picton Road and M31 Hume Motorway interchange to a diverging diamond interchange, which would reduce the number of conflict points, improve sight distances, and improve visibility for turning vehicles
- left-in and left-out restrictions at the Janderra Lane, Wilton Park Road, Aerodrome Drive and Almond Street intersections reducing the number of conflict points by removing right turn traffic movements across Picton Road
- reduced posted speed limits along Picton Road between Pembroke Parade and the western extent of the proposal site, which facilitates safer movements and allows road users more time to react to potential road hazards
- widened road shoulders, allowing improved access for emergency vehicles and providing refuge areas for broken-down vehicles
- provision of dedicated active transport infrastructure in the form of shared user paths to provide separation between vehicles, cyclists and pedestrians, and safe and convenient active transport access for existing and future residents of the Wilton Growth Area
- eliminating the use of Picton Road shoulders for informal parking and stopping
- provision of safety barriers to help stop run-off-road crashes and reduce crash severity
- further separation of carriageways (noting some sections already have medians) through provision of medians, which reduces the risk of head-on collisions.

While general safety would be improved, the introduction of additional lanes has the potential to result in predominately side swipe collisions. Such risks are mitigated in the proposal through the provision of sufficient acceleration and deceleration distances, clearly defined manoeuvring lanes, minimised conflict points, and lower speed limits. The proposal would also reduce congestion and queuing, which contribute to rear-end crashes that make up 72 per cent of recorded crashes in the study area. Potential risks associated with providing additional lanes are considered to be relatively low and are outweighed by the other benefits to safety the proposal provides.

Parking

No impacts on formal parking are expected as a result of the proposal as there are no existing parking areas within the proposal site. Picton Road would be signed as Emergency Stopping Lane Only due to the safety issues identified in section 6.2.3 relating to observed vehicle stopping on road shoulders along Picton Road near the interchange. It is noted that there are a number of existing rest areas along the M31 Hume Motorway (located about four kilometres north and about 6.5 kilometres south of the proposal site), as well as on Picton Road (about six kilometres east of the proposal site). Safer opportunities for parking for light vehicles are also available within nearby local roads within Wilton.

6.2.6 Safeguards and management measures

The measures described in Table 6-26 will be implemented to avoid or minimise potential traffic and transport impacts.

Table 6-26: Traffic and transport safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	<p>A Construction Traffic Management Plan (CTMP) will be prepared and implemented as part of the CEMP. The CTMP will be prepared in accordance with Transport for NSW's <i>Traffic Control at Work Sites Manual</i> and Transport's <i>Specification G10 Control of Traffic</i> and with consideration of recommendations included in the Traffic and Transport Impact Assessment. The CTMP will include:</p> <ul style="list-style-type: none"> • confirmation of haulage routes • measures to maintain access to local roads and properties. Where temporary disruption to access cannot be avoided, consultation will be undertaken with the owners, occupants and managers of affected properties and infrastructure, to confirm their access requirements and determine alternative arrangements • site-specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain freight access including over size over mass movements • measures to maintain and manage 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 • measures to manage staging of construction works to ensure that satisfactory capacity and minimum levels of service are maintained 	Contractor	Detailed design/ pre-construction/ construction	Section 4.8 of QA G36 <i>Environment Protection</i> QA G10 <i>Traffic Management</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> measures to manage high risk over size over mass movements monitoring, review and amendment mechanisms Traffic Guidance Schemes updated as the works progress, prepared and implemented by suitably qualified personnel. 			
Impact on local roads	<p>Dilapidation surveys will be completed for all local roads used for construction traffic prior to commencement of construction and following completion of works.</p> <p>Further consultation with Wollondilly Shire Council will be undertaken during pre-construction and construction regarding the use of local roads for construction traffic, including detours and temporary traffic routes detailed in the CTMP.</p>	Transport/ contractor	Pre-construction/ construction	Additional safeguard
Impact on emergency services	<p>Consultation will be undertaken with emergency services prior to and during construction regarding any access arrangement changes, diversions during construction and other operational road network changes.</p>	Contractor	Pre-construction/ construction	Additional safeguard
Traffic and transport	<p>Further traffic modelling will be completed to inform detailed design capturing the latest information on demand forecasts and timing of other network upgrades where required.</p>	Transport	Detailed design	Additional safeguard

6.3 Aboriginal cultural heritage

Assessments of the potential Aboriginal cultural heritage impacts of the proposal and broader Picton Road upgrade have been undertaken in accordance with Stage 3 of Transport's *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (Roads and Maritime, 2011a) (PACHCI). The results of these assessments as they relate to the potential impacts of the proposal are described in the Aboriginal Cultural Heritage Working Paper, which is provided in Appendix E. This section summarises the potential impacts of the proposal on Aboriginal cultural heritage, and the identified measures to manage and mitigate the potential impacts.

6.3.1 Methodology

The methodology for the Aboriginal cultural heritage assessment included the following key tasks:

- a desktop review of the Aboriginal archaeological and historical context, including:
 - a search of the Aboriginal Heritage Information Management System (AHIMS) database for registered Aboriginal sites within 3.5 kilometres of the survey area
 - a review of the landscape features
 - a review of relevant heritage data from previous archaeological assessments
- site surveys undertaken between March 2022 and November 2022 in accordance with Stage 2 of the PACHCI and the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010a)
- Aboriginal consultation undertaken in accordance with Stage 3 of the PACHCI and the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010a) (see section 5.3)
- an arboricultural assessment of identified potential and AHIMS-registered culturally modified trees
- an Aboriginal cultural values assessment
- archaeological test excavations (described below)
- assessing the heritage significance of Aboriginal sites (described below), including their cultural and archaeological values
- assessing the potential impacts of the proposal on Aboriginal cultural heritage and values
- identifying measures to avoid, minimise, mitigate and manage identified impacts.

The Aboriginal cultural heritage assessment included a larger survey area that extended around the proposal site to capture a wider cultural context, shown in Figure 6-6. The assessment of potential impacts was undertaken for the proposal site.

Archaeological test excavations

An archaeological test excavation program was implemented in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010b) to identify and understand the nature, extent and significance of potential archaeological deposits (PADs) within the proposal site. Test excavations were undertaken between August 2022 and June 2023. A total of 152 test pits were excavated across 16 PADs within and in the vicinity of the proposal site.

Assessing heritage significance

The heritage significance of identified Aboriginal sites was assessed, which involved:

- review of the historical, aesthetic, social and scientific significance values of Aboriginal sites in accordance with the *Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (Australia ICOMOS, 2013) (the Burra Charter)
- consultation with members of the Aboriginal community via focus group workshops, community engagement forums, written correspondence, phone calls, walks on Country, archaeological field investigations, and oral history interviews
- an assessment of the values of the Aboriginal sites against heritage assessment criteria outlined in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010), the Burra Charter, and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011).

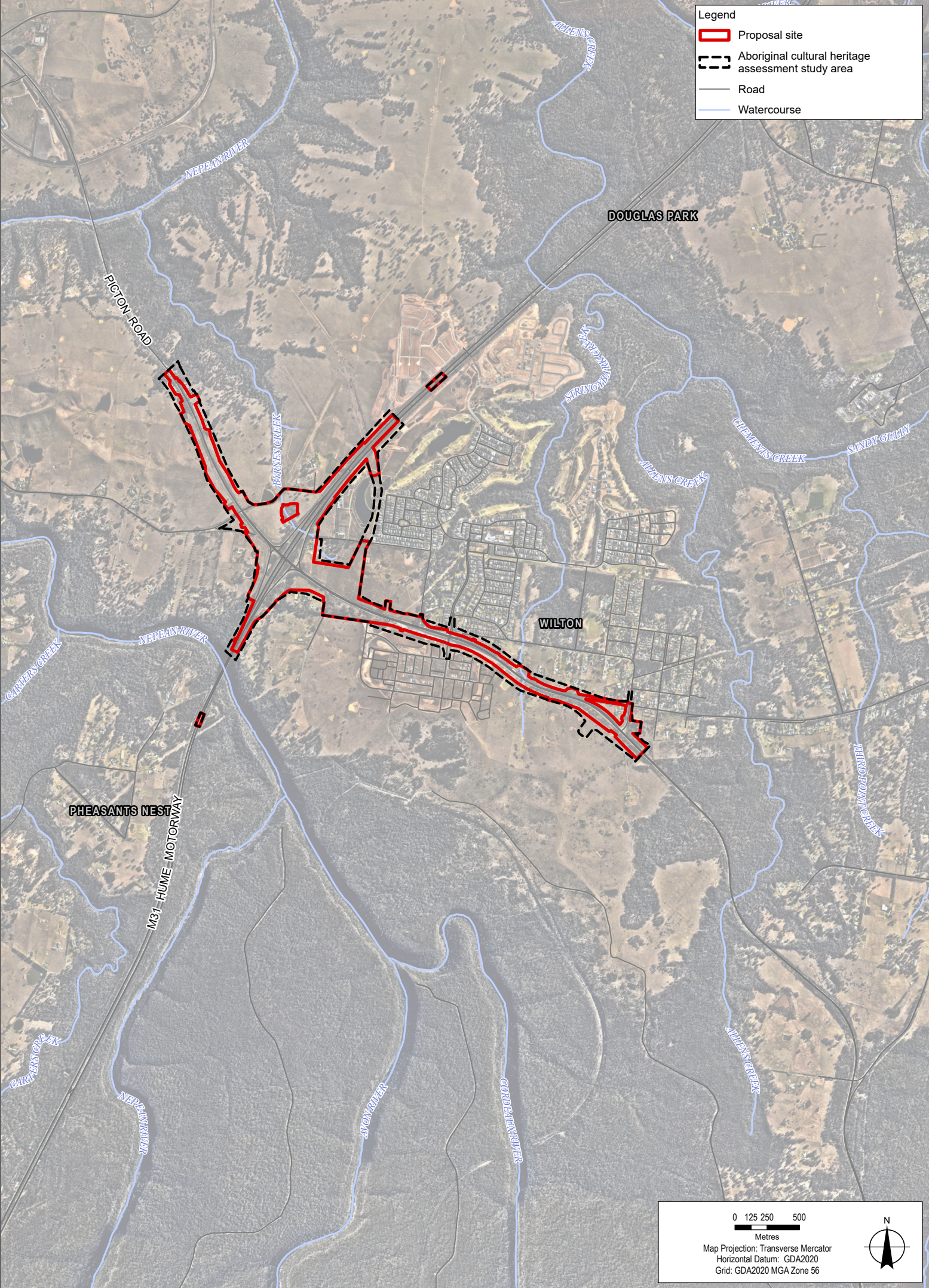


Figure 6-6 - Aboriginal cultural heritage assessment study area

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023; DPIE, Soil Landscapes, 2023. Created by: akidea
 N:\AU\Wollongong\Projects\23112560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX029_AHIMSAssessmentArea_A4P. Print date: 25 Oct

6.3.2 Existing environment

Aboriginal cultural heritage overview

The proposal site is located in the Country of the Dharawal people. Dharawal Country is generally accepted to extend from the southern shores of Botany Bay, along the coast as far south as the Shoalhaven River and inland to the Georges River, Appin and Camden.

Cultural or social significance refers to the spiritual, traditional, historical and/or contemporary associations and values attached to a place or objects by Aboriginal people. Aboriginal cultural heritage is broadly valued by Aboriginal people as it is used to define their identity as both individuals and as part of a group (DECCW, 2010b). It is acknowledged that Aboriginal people are the primary determiners of the cultural significance of Aboriginal cultural heritage.

There are several categories of broad landscape features that occur around the proposal site that members of the Aboriginal community described as being of high cultural value during consultation undertaken for the proposal. The following categories of cultural values associated with landscape features were developed in consultation with Aboriginal knowledge holders:

- spiritual and ceremonial, including sacred sites, Bora grounds, birthing places, initiation places, dangerous/gender-restricted places
- resource gathering, associated with fresh water supplies, hunting, fishing, bush foods or medicines, or places where utilitarian materials like ochre, bark and reeds were gathered
- campsite, including any place Aboriginal people occupied on a semi-permanent or permanent basis
- travel routes, including pathways and other routes where Aboriginal people moved across the land in a transitory manner
- burial, including any place associated with interring the dead
- historic, including places with personal, familial or community significance, or which are documented historical places
- archaeological places, including any place with archaeological material or significance.

Cultural values identified within and adjacent to the proposal site include undisturbed bushland, walking or travelling routes where people moved across the landscape, freshwater creek lines, culturally sensitive trees (such as culturally modified trees), flora and fauna, and archaeological sites. A detailed list of cultural values identified within the survey area by the Aboriginal knowledge holders is provided in Appendix E.

Aboriginal heritage register searches

Two previously registered AHIMS sites (AHIMS 52-5-4079 (WJ-ST-04) and AHIMS 52-2-3590 (Wilton O1)) are located in the proposal site (see Table 6-27). Both sites are of high significance.

Archaeological site survey and test excavation results

In addition to the two previously registered AHIMS sites within the proposal site (noted above and listed in Table 6-27), one possible culturally modified tree and 16 potential archaeological deposits (PADs) were also identified within the proposal site during the PACHCI Stage 2 survey. A total of 152 test pits were excavated across 15 PADs within the proposal site. As a result of these investigations, a total of 29 artefacts were recorded from the sub-surface excavations at four sites (AHIMS 52-2-4885, AHIMS 52-2-4884, AHIMS 52-2-4883 and AHIMS 52-2-4882).

The arboricultural assessment of the possible culturally modified tree concluded that the wound was likely to be the result of mechanical wounding from a surveyor's blaze. This tree is not currently considered to be an archaeological site and therefore has not been registered in AHIMS. However, further consultation with knowledge holders would be completed during detailed design to gain a better understanding of the cultural values associated with this tree and two other trees identified as potentially having cultural value during the field investigations completed in June 2023.

The archaeological assessment (including test excavations) confirmed that there are six confirmed and one potential Aboriginal heritage sites within the proposal site (listed in Table 6-27). These consist of:

- two previously registered AHIMS sites
- four artefact scatters that contained sub-surface artefact scatters (AHIMS 52-2-4885, AHIMS 52-2-4884, AHIMS 52-2-4883 and AHIMS 52-2-4882)
- an area of PAD (PRUP PAD 34) to which potential impacts could be avoided by implementing exclusion zones during construction (as a result, this site was not tested during the test excavation program).

The remaining 11 PADs did not contain artefacts and are therefore not Aboriginal heritage sites.

The identified sites and the assessed significance level is provided in Table 6-27. Details of the specific criteria used to assess the significance are provided in section 6 of Appendix E.

Raw material types from the test excavations were found to be consistent with other assessments in the region with quartz dominating the assemblage. Angular flake fragments were the most commonly recorded artefact type followed by distal flake fragments and complete flakes. The assemblage also contained two pieces of ochre and one tool, a backed artefact.

The low-density artefact scatters throughout the proposal site are most likely remnants of people traversing the area or may represent short-term camping grounds. Disturbance could also be a factor in the low artefact numbers identified during the survey. Vegetation clearance and pastoral activities (such as cattle trampling and removal of trees) would have resulted in spatial, as well as stratigraphical movements of cultural material. Erosion would have most likely been extensive after land clearing and would have caused washing out of artefacts, particularly on slopes.

Table 6-27: Aboriginal archaeological items and significance assessment identified within the proposal site

AHIMS site	Site name	Description	Overall level of significance
Previously identified Aboriginal archaeological sites			
AHIMS 52-5-4079	WJ-ST-04	AHIMS 52-2-4079 is located in the south-eastern corner of PRUP PAD 7 (see below) and consists of a culturally modified tree. The depth of the scar is 15cm and is located 1.25m above the ground. The scar faces south-west and is noted to be weathered, but in good condition.	High
AHIMS 52-2-3590	Wilton 01	This site is a culturally modified tree located south of Picton Road. The tree is about 30m high with a girth of 4.25m. The scar of cultural origin is situated on the southern side of the tree and measures 1.4m by 0.25m. The scar is situated 1.5m from the ground and the dry face has been largely destroyed by termites. Previous archaeological test excavations conducted in association with AHIMS 52-2-3590 by Biosis in 2019 (as part of a separate project) did not identify any artefacts. An AHIP was issued on 10 September 2020 to the proponent of the Wilton South East (Wilton Greens) Stage 1 and Stage 2 residential subdivision, which states that AHIMS 52-2-3590 must not be harmed. There is currently a 10m fenced 'no-go' zone around the site.	High

AHIMS site	Site name	Description	Overall level of significance
Aboriginal archaeological sites identified during the assessment			
AHIMS 52-2-4885	PRUP PAD 4	<p>The site, which measures about 40m by 70m, is located adjacent to a first-order, non-perennial creek line. It has been assessed as having moderate archaeological potential due to its proximity to water and elevated landform, in combination with limited disturbances.</p> <p>The test excavations recovered two artefacts from one test pit, which included one proximal flake fragment and one angular fragment both made from chert.</p> <p>This site type is a common occurrence within the local region and the scientific significance has been assessed as low. The site has moderate aesthetic value and low historical value.</p>	Moderate
AHIMS 52-2-4884	PRUP PAD 6	<p>The site, which measures about 70m by 120m, is located adjacent to Byrnes Creek. It has been assessed as having moderate archaeological potential due to its proximity to water and slightly elevated landform, in combination with the limited ground disturbances.</p> <p>The test excavations recovered two artefacts from two test pits, which included one silcrete distal flake fragment and one quartz angular fragment.</p> <p>This site type is a common occurrence within the local region and the scientific significance of this site has been assessed as low. The site has moderate aesthetic value and low historical value.</p>	Moderate
AHIMS 52-2-4883	PRUP PAD 7	<p>The site, which measures about 70m by 100m, is located near Byrnes Creek. It was assessed as having moderate archaeological potential due to its proximity to water and slightly elevated landform, in combination with the limited ground disturbances.</p> <p>The test excavations recovered 18 artefacts from seven test pits, which included complete flakes, distal and proximal flake fragments, angular flake fragments and a quartz bipolar complete flake.</p> <p>This site type is an occasional occurrence within the local region and the scientific significance has been assessed as moderate. The site has moderate aesthetic value and low historical value.</p>	Moderate
AHIMS 52-2-4882	PRUP PAD 10	<p>The site, which measures about 160m by 330m, is located near a tributary of the Nepean River. It was identified as having moderate archaeological potential due to its proximity to water and slightly elevated landform, in combination with limited disturbances.</p> <p>The test excavations undertaken recovered seven artefacts from six test pits, which included distal and proximal flake fragments, and angular flake fragments. A total of two different raw material types were recorded; however, mudstone dominated the assemblage.</p> <p>This site type is common occurrence within the local region and the scientific significance has been assessed as low. The site has moderate aesthetic value and low historical value.</p>	Low

AHIMS site	Site name	Description	Overall level of significance
n/a	PRUP PAD 34	The site, which measures about 30m by 80m, is located to the south-west of Byrnes Creek on an elevated, flat terrace. The site, which has been subject to extensive vegetation clearance, was not subject to test excavations as it was confirmed that potential impacts could be avoided by implementing exclusion zones during construction.	Unknown

6.3.3 Potential impacts

Avoidance and minimisation of impacts

The approach to design development included a focus on avoiding and/or minimising the potential for impacts during key phases of the design process. As described in chapter 2, the proposal was refined to minimise impacts on Aboriginal cultural heritage and other environmental aspects. The proposal:

- contains the minimum footprint required to provide a more functional and safer roadway
- avoids areas of Aboriginal cultural heritage and value where possible, and includes protection measures to minimise potential indirect impacts
- widens the existing road corridor instead of constructing a new road corridor, and minimises widening where possible
- prioritises the use of cleared and/or disturbed areas over areas of undisturbed bushland, including the location for construction compounds and ancillary facilities.

Construction

Impacts on Aboriginal cultural heritage sites

Construction would involve excavation and other ground disturbing activities that could impact Aboriginal cultural heritage sites within the proposal site. Impacts on Aboriginal cultural heritage have been avoided where possible through the design refinement process as outlined above. However, due to the limited area available for the proposal and presence of Aboriginal sites close to the existing road corridor, not all impacts can be avoided.

Six Aboriginal heritage sites within the proposal site would have the potential to be impacted by the proposal (see Table 6-28). As noted in section 6.3.2, although PRUP PAD 34 is located within the proposal site, it has been determined that this PAD could be avoided during construction and would therefore not be impacted by the proposal.

Table 6-28: Summary of potential impacts on Aboriginal archaeological items

AHIMS site	Site name	Overall significance	Type of potential impact	Degree of harm	Consequence of impact
AHIMS 52-5-4079	WJ-ST-04	High	Indirect	Partial	Partial loss of value
AHIMS 52-2-3590	Wilton 01	High	Indirect	Partial	Partial loss of value
AHIMS 52-2-4885	PRUP PAD 4	Low	Direct	Total	Total loss of value
AHIMS 52-2-4884	PRUP PAD 6	Low	Direct	Total	Total loss of value
AHIMS 52-2-4883	PRUP PAD 7	Moderate	Direct	Total	Total loss of value
AHIMS 52-2-4882	PRUP PAD 10	Low	Direct	Total	Total loss of value

Of the sites with the potential to be impacted, WJ-ST-04 and Wilton 01 are culturally modified trees of high significance and direct impacts on these items would be avoided. As summarised in Table 6-27, Wilton 01 is currently protected under AHIP 4642 and there is a 10 metre fenced 'no-go' zone around the site. Given the location of these items close to the proposal site, there is the potential for indirect impacts, mainly associated with construction vibration during works within the minimum working distance (see section 6.8.4). The vibration management measures provided in section 6.8.5 and chapter 7 would be implemented to minimise the potential for direct and indirect impacts on these trees.

Approaches to further reduce impacts on Aboriginal cultural heritage would be identified during detailed design and construction planning. This would include continuing to refine the design and construction planning to minimise and avoid direct impacts on Aboriginal sites as far as reasonably practicable, including identifying opportunities to avoid impacts on AHIMS 52-2-4883 (due to its association with AHIMS 52-5-4079) (see section 6.3.4).

Transport would apply for an AHIP prior to any impact or harm to sites with the potential to be directly impacted.

Construction may also unexpectedly uncover previously unidentified Aboriginal objects or sites. An unexpected finds procedure (Transport for NSW, 2022p) would be implemented during construction as part of the Aboriginal Cultural Heritage Management Plan to provide a consistent method for managing any unexpected Aboriginal heritage items discovered during construction to minimise the risk of accidental damage to Aboriginal heritage (see section 6.3.4).

Impacts on Aboriginal cultural values

In addition to the archaeological items described above, the following Aboriginal cultural values are located within the proposal site and have the potential to be impacted by the proposal:

- undisturbed bushland
- walking/travelling pathways, including Picton Road
- freshwater creek lines
- culturally modified trees
- flora and fauna.

Undisturbed bushland and freshwater creek lines have the potential to be impacted during construction through vegetation removal, environmental incidents, and the potential for sedimentation and erosion from construction areas. Potential impacts on hydrology, water quality and soils, and measures to avoid and minimise these potential impacts, are provided in sections 6.5 to 6.7.

There are three trees identified as potentially having cultural value within and in close proximity to the proposal site that may be directly or indirectly impacted by the proposal. Detailed design would seek to minimise potential impacts on these trees following additional consultation with Aboriginal knowledge holders.

Construction also has potential to impact flora and fauna, including that considered to have high cultural value to Aboriginal people. Strategies to minimise impacts on native fauna and flora would be implemented as described in section 6.1.4.

Operation

No Aboriginal heritage items or places are likely to be impacted during operation. Landscaping of the proposal site with native species would be undertaken following construction activities to maximise opportunities for revegetation and to provide a vegetated buffer to the culturally modified trees, contributing to the ecological safety of these trees.

The proposal would improve the functionality and efficiency of Picton Road and the Picton Road and M31 Hume Motorway interchange, connecting communities travelling through the area. As such, the proposal has the potential to positively impact the walking and travelling routes/Picton Road by enabling communities to connect. The proposal also has the potential to improve knowledge sharing about existing cultural values and historic context of the region through the implementation of appropriate Aboriginal cultural heritage recognition and interpretation measures.

6.3.4 Safeguards and management measures

The measures described in Table 6-29 will be implemented, in conjunction with other measures outlined in chapter 7, to avoid, minimise, mitigate and manage potential impacts on Aboriginal heritage.

Table 6-29: Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal heritage management	An Aboriginal Cultural Heritage Management Plan (ACHMP) will be prepared in accordance with the <i>Procedure for Aboriginal cultural heritage consultation and investigation</i> (Roads and Maritime Services, 2011a) and the <i>Unexpected Heritage Items Procedure</i> (Transport for NSW, 2022p) and implemented as part of the CEMP. The ACHMP will provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage. The ACHMP will be prepared in consultation with Registered Aboriginal Parties.	Contractor	Detailed design/ pre-construction	Section 4.9 of QA G36 <i>Environment Protection</i>
Aboriginal heritage	Opportunities to minimise impacts on PRUP PAD 7 will be investigated during detailed design and construction planning due to its association with AHIMS 52-5-4079.	Transport/ contractor	Detailed design/ pre-construction	Additional safeguard
	An Arboricultural Impact Assessment report will be prepared during detailed design for the trees with Aboriginal cultural value, including AHIMS registered trees, in accordance with <i>AS 4970-2009 Protection of Trees on Development Sites</i> to inform exclusion zones and other protection measures in the ACHMP. The report will be prepared by a suitably qualified Arborist (minimum AQF level 3 or above) in consultation with Registered Aboriginal Parties. Minimum working distances by types of construction activities and associated management measures will be developed based on the results of the report and included in the relevant CEMP sub-plans.	Transport	Detailed design	Additional safeguard
	Further design development will be completed during detailed design to avoid impacts on trees with Aboriginal cultural value where possible. Impacts on AHIMS-registered trees will be avoided in accordance with <i>AS 4970-2009 Protection of Trees on Development Sites</i> , with effective exclusion zones established prior to construction.	Transport	Detailed design/ pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	The Urban Design and Landscaping Plan will be further developed in consultation with Aboriginal knowledge holders during detailed design. The plan will incorporate measures to integrate appropriate native vegetation around trees with Aboriginal cultural value, including AHIMS-52-2-3590 and AHIMS 52-5-4079.	Transport	Detailed design	Additional safeguard
	An Aboriginal Heritage Impact Permit (AHIP) will be sought under section 90 of the <i>National Parks and Wildlife Act 1974</i> for Aboriginal sites expected to be directly impacted by the proposal. Overlapping impact areas with other existing AHIPs will be resolved as required.	Transport	Detailed design/ pre-construction	Additional safeguard
	If any activities associated with the proposal are required in the exclusion zone of PRUP PAD 34 area, the <i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation</i> (Roads and Maritime Services, 2011a) would be followed prior to any works taking place at this location.	Transport	Detailed design/ pre-construction	Additional safeguard
Aboriginal archaeological material	Aboriginal archaeological material excavated for the preparation of the Aboriginal cultural heritage assessment will be returned to Country and repatriated as soon as practicable in a secure location in accordance with requirements 16b and 26 of the <i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW, 2010b) or an alternative method agreed upon in consultation with the Registered Aboriginal Parties.	Transport	Detailed design/ pre-construction	Additional safeguard
Aboriginal heritage interpretation	An Aboriginal heritage interpretation strategy will be developed to guide incorporation of appropriate interpretation and integration of Aboriginal cultural heritage in the design. The strategy will be prepared and implemented with regard to the following: <ul style="list-style-type: none"> • <i>Interpreting Heritage Places and Items: Guidelines</i> (NSW Heritage Office, 2005a) • <i>Heritage Interpretation Policy</i> (NSW Heritage Office, 2005b) • <i>Connecting with Country Framework</i> (Government Architect, 2023) • <i>Signposting Country Technical Manual</i> (Transport for NSW, 2021d) • <i>Aboriginal Art Strategy</i> (Transport for NSW, 2022i) 	Transport	Detailed design/ pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> • <i>Aboriginal Cultural Heritage Framework</i> (Transport for NSW, 2022j) • <i>Heritage Interpretation Guideline</i> (Transport for NSW, 2016). 			
	<p>The strategy will also:</p> <ul style="list-style-type: none"> • be developed in consultation with relevant stakeholders, including Registered Aboriginal Parties and nominated Aboriginal cultural knowledge holders • be prepared in accordance with the urban design objectives and principles for the proposal • include measures to ensure a meaningful design response to Aboriginal heritage and cultural values. <p>The design will include appropriate interpretation of Aboriginal heritage in accordance with the heritage interpretation strategy.</p>			
Cultural safety	A cultural safety protocol will be developed prior to construction that includes measures recommended by knowledge holders for implementation during pre-construction and construction activities.	Transport/ contractor	Pre- construction/ construction	Additional safeguard
Cultural practices	Options to make culturally significant plant species identified in the <i>Aboriginal Cultural Heritage Working Paper</i> to be cleared available to Aboriginal stakeholders for cultural practices will be investigated during detailed design in consultation with Registered Aboriginal Parties.	Transport/ contractor	Detailed design/ pre-construction	Additional safeguard

6.4 Non-Aboriginal heritage

This section summarises the results of the Non-Aboriginal Heritage Impact Assessment report prepared as an input to the REF. The full report is provided in Appendix F.

6.4.1 Methodology

The methodology for the non-Aboriginal heritage impact assessment included the following key tasks:

- background research on the historical context of the study area and heritage listed items, including reviewing local studies, historical maps, aerial imagery, land titles and relevant conservation/heritage management plans
- searching local, State and Australian heritage lists and databases to confirm listed heritage in the study area
- undertaking a field survey in February 2023 to identify listed and potential unregistered non-Aboriginal heritage items and areas of non-Aboriginal archaeological potential.
- assessing the significance of identified non-Aboriginal heritage items in accordance with *Assessing Heritage Significance* (Heritage Office, 2001)
- assessing the significance of the potential impacts on non-Aboriginal heritage items that may be affected by the proposal in accordance with relevant guidelines including *Statements of Heritage Impact* (Heritage Office, 2002)
- identifying measures to avoid, minimise and manage identified impacts.

Potential impacts were assessed based on impacts to the significance of a heritage item as a result of:

- direct (physical) impacts – caused by removing or altering the item or fabric of heritage significance, or excavating in areas of archaeological potential
- indirect impacts – caused by vibration, removing adjoining structures or changes to the setting or curtilage of heritage items and views.

The study area for the assessment included the proposal site and a one kilometre wide buffer around the proposal site to identify the potential for indirect and visual impacts on heritage items as a result of works undertaken within the proposal site. The study area is shown on Figure 6-9.

A detailed description of the assessment methodology is provided in section 4 of the Non-Aboriginal Heritage Impact Assessment (Appendix F).

6.4.2 Existing environment

Historical background and land use

The earliest land grants in the Wilton district were issued in 1834 to Sir Thomas Mitchell. The development of the Wilton district was likely influenced after 3,800 acres in Douglas Park was issued to Mitchell in 1835, where he established his property and residence. A town plan was surveyed in 1842, and lots sold in 1844. The village of Wilton was officially declared a town in 1855. A public school and post office were built within the town in 1871 and 1872, respectively. However, the school was eventually closed in 1948 due to a lack of student enrolments.

Population growth within the Wilton district was attributed to the influx of workers for the Upper Nepean water supply scheme. This included construction of a tunnel about eight kilometres long which passed underneath Wilton and joined weirs at Pheasant's Nest and Broughton Pass. There are several air vents located within the Wilton area, and these are the only indicators of its existence.

Wilton Park, previously owned by colonial poet Charles Tompson, was purchased in the 1880s by Samuel Hordern, grandson of the founder and the builder of the Palace Emporium, Brickfield Hill, Sydney. A stables group at Wilton Park was established by Hordern in 1891, and soon became the centre for the Hordern's horse breeding, becoming one of the leading horse breeding studs in Australia.

By the early 1900s, land within Wilton had been divided into several smaller lots. These lots are located near Almond and Argyle streets. The subdivision of the land allowed for the construction of St Luke's Anglican Church on Argyle Street in 1902.

Extensive vegetation clearance within and surrounding the proposal site occurred within the 20th century, mainly for agricultural purposes. Historical imagery shows the creation of numerous pastoral dams and installation of shed structures. Historical photographs of the area surrounding the proposal site in 1978 (see Figure 6-7) show the development of Picton Road had commenced. By 2005, Picton Road had been fully established (see Figure 6-8) (the proposal site is shown in orange in both figures).

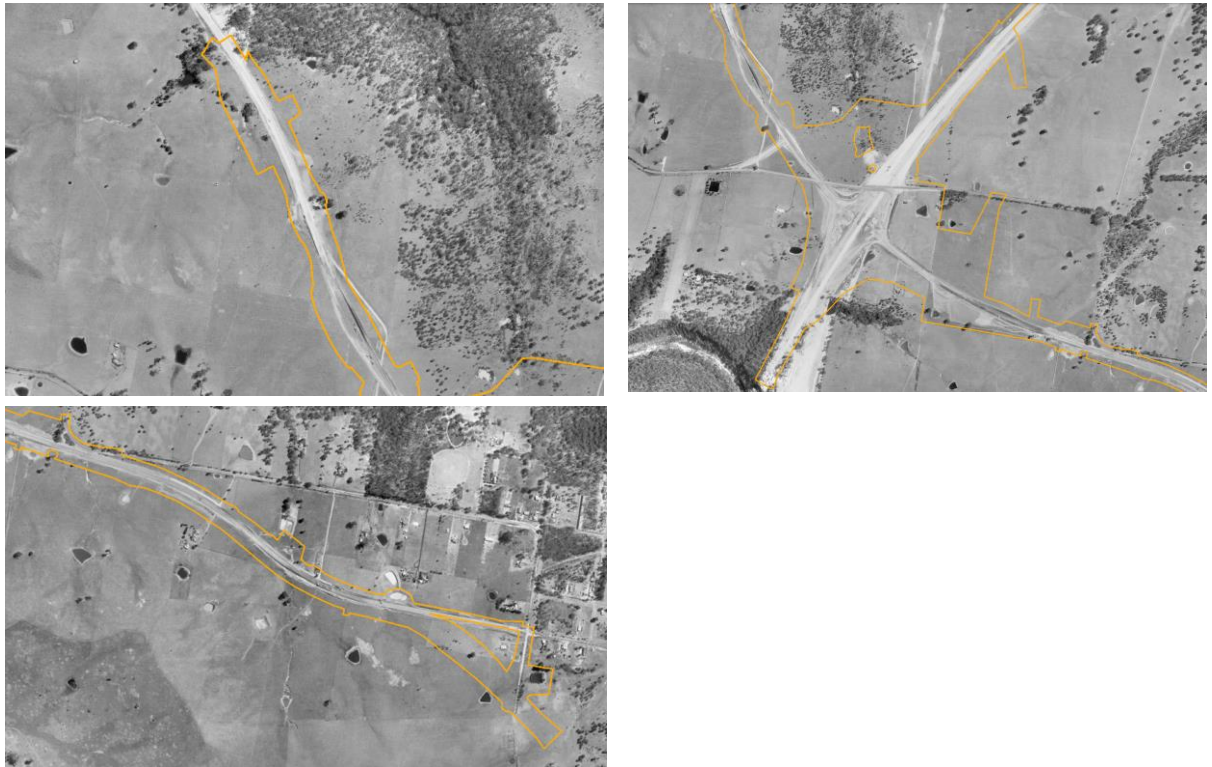
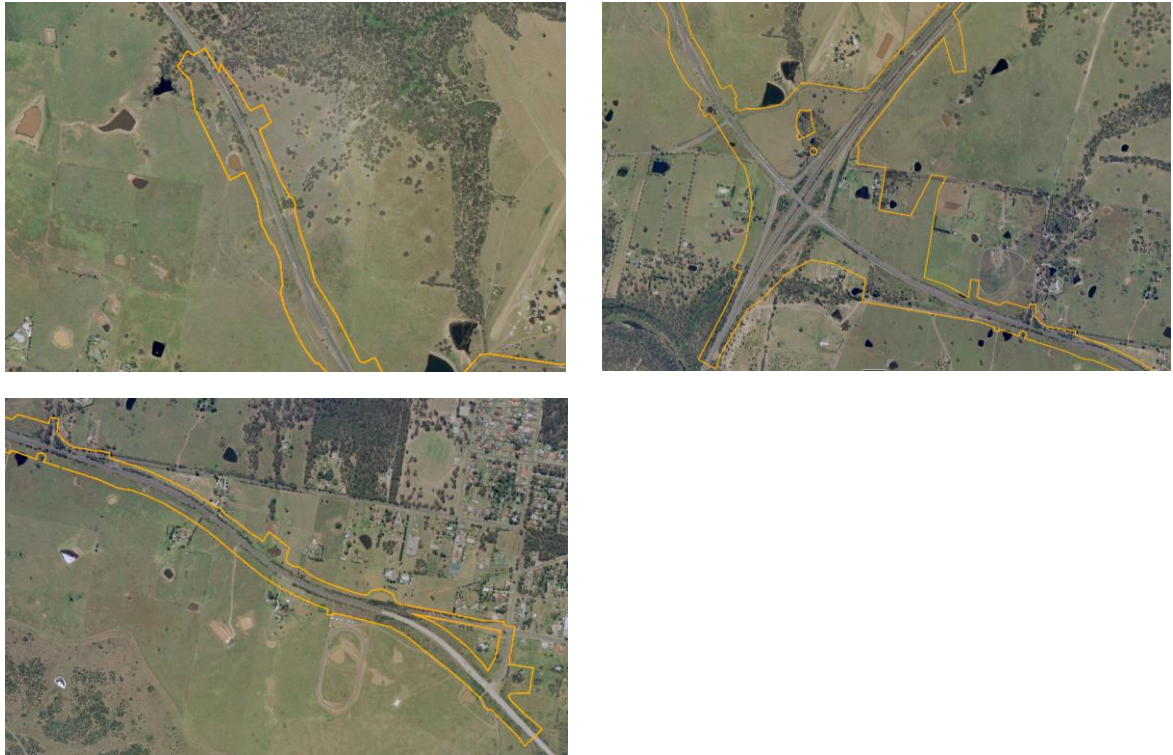


Figure 6-7: Aerial photographs dated to 1978 showing the first developments of Picton Road in Wilton (proposal site shown in orange)



Source: NSW Spatial Services

Figure 6-8: Aerial photographs dated to 2005 showing the completed Picton Road and low density residential areas along Almond Street (proposal site shown in orange)

Listed heritage items

A summary of the heritage listings within the study area is provided in Table 6-30 and the locations of these items are shown on Figure 6-9. As shown in Table 6-30 the following items intersect or are in close proximity to the proposal site:

- One item (Upper Canal System/Upper Nepean Scheme – listed on the State Heritage Register, the Section 170 NSW State agency heritage and conservation register, and the Wollondilly LEP) is located within the proposal site (about 90 metres below ground level). An associated airshaft #9 (part of same listing) is located around 80 metres from the proposal site.
- One item (Cottage – listed on the Wollondilly LEP) is located immediately adjacent to the proposal site.
- One item (St Luke’s Anglican Church – listed on the Wollondilly LEP) is located about 45 metres north-east of the proposal site.

Several other sites are within, or partially within the study area, but are not located in the vicinity of the proposal site.

Table 6-30: Summary of heritage listings within or adjacent to the proposal site

Item	Listing	Listing name and number	Significance	Location in relation to the proposal site
Upper Canal System/Upper Nepean Scheme	State Heritage Register Wollondilly LEP 2011	Upper Canal System (Pheasants Nest Weir to Prospect Reservoir) (01373, I16)	State	Within the proposal site (the curtilage is located at surface level, with the item located about 90m below ground surface). An associated airshaft #9 is located around 80m from the proposal site.
	Section 170 WaterNSW State agency heritage and conservation register	Upper Nepean Scheme (including Upper Canal and Prospect Reservoir) (4580004)	State	
Upper Nepean Scheme - Pheasants Nest Weir	Wollondilly LEP 2011	Upper Nepean Scheme - Pheasants Nest Weir (I278)	Local	Located at the Nepean River, about 1.4km south-west of the proposal site
Cottage	Wollondilly LEP 2011 SEPP (Western Parkland City)	Cottage (I275)	Local	1090 Argyle Street, immediately adjacent to the proposal site and Almond Street
St Luke's Anglican Church	Wollondilly LEP	St Luke's Anglican Church (I276)	Local	1095 Argyle Street, about 45m north-east of the proposal site
Cottage	Wollondilly LEP 2011	Cottage (I279)	Local	180 Wilton Park Road, about 950m west of the proposal site
Aboriginal Shelter Sites	Wollondilly LEP	Aboriginal Shelter Sites (I285)	Local	Fairway Drive, about 615m north-east of the proposal site

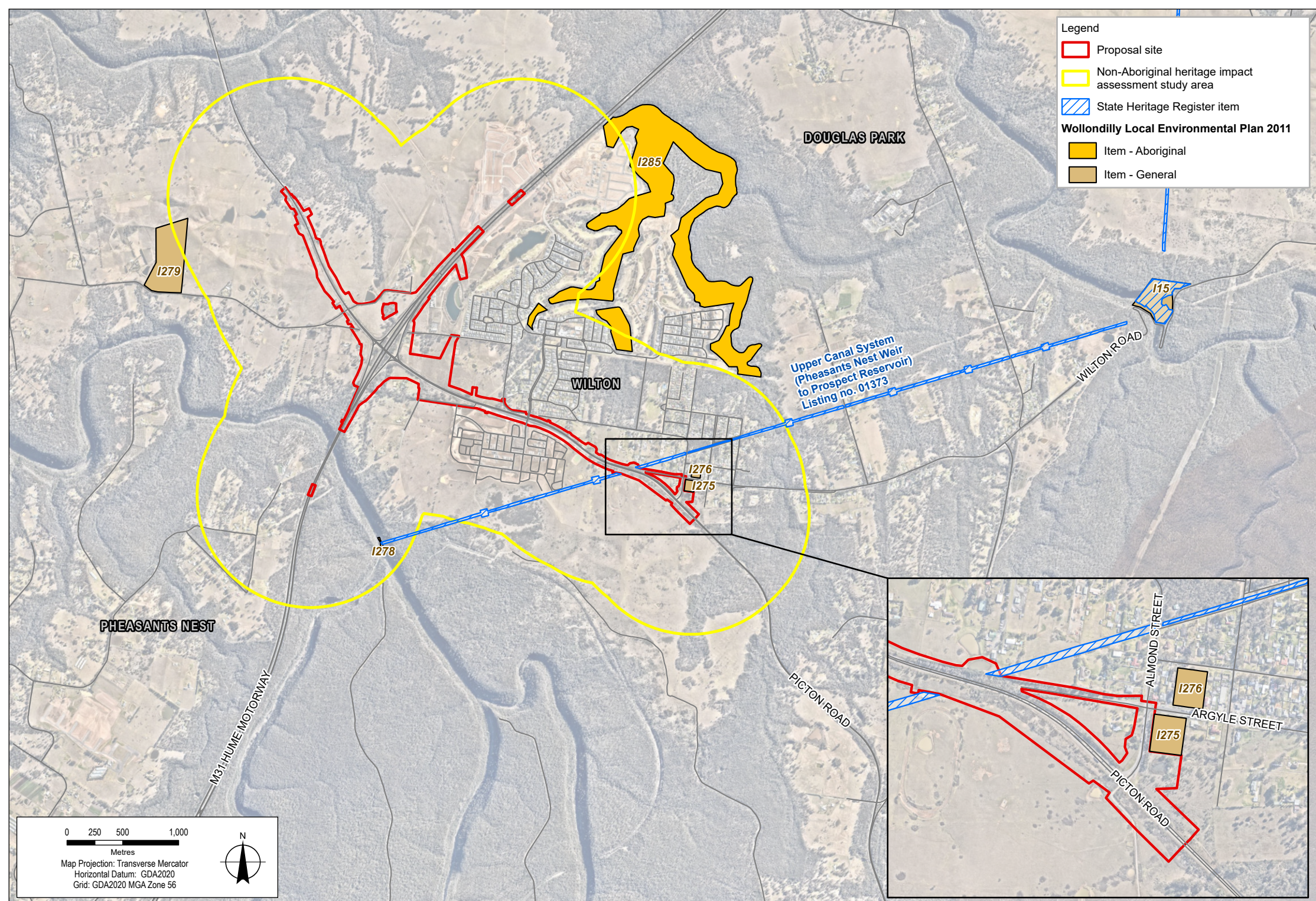


Figure 6-9 - Non-Aboriginal heritage items

Archaeological potential

Non-Aboriginal archaeological potential relates to potential for an area to contain archaeological resources. Non-Aboriginal archaeological potential is influenced by the geographical and topographical location, the level of development, subsequent impacts, levels of fill, and other factors influencing preservation, such as soil type.

A summary of the non-Aboriginal archaeological potential identified within and surrounding the proposal site is provided in Table 6-31 and shown on Figure 6-10.

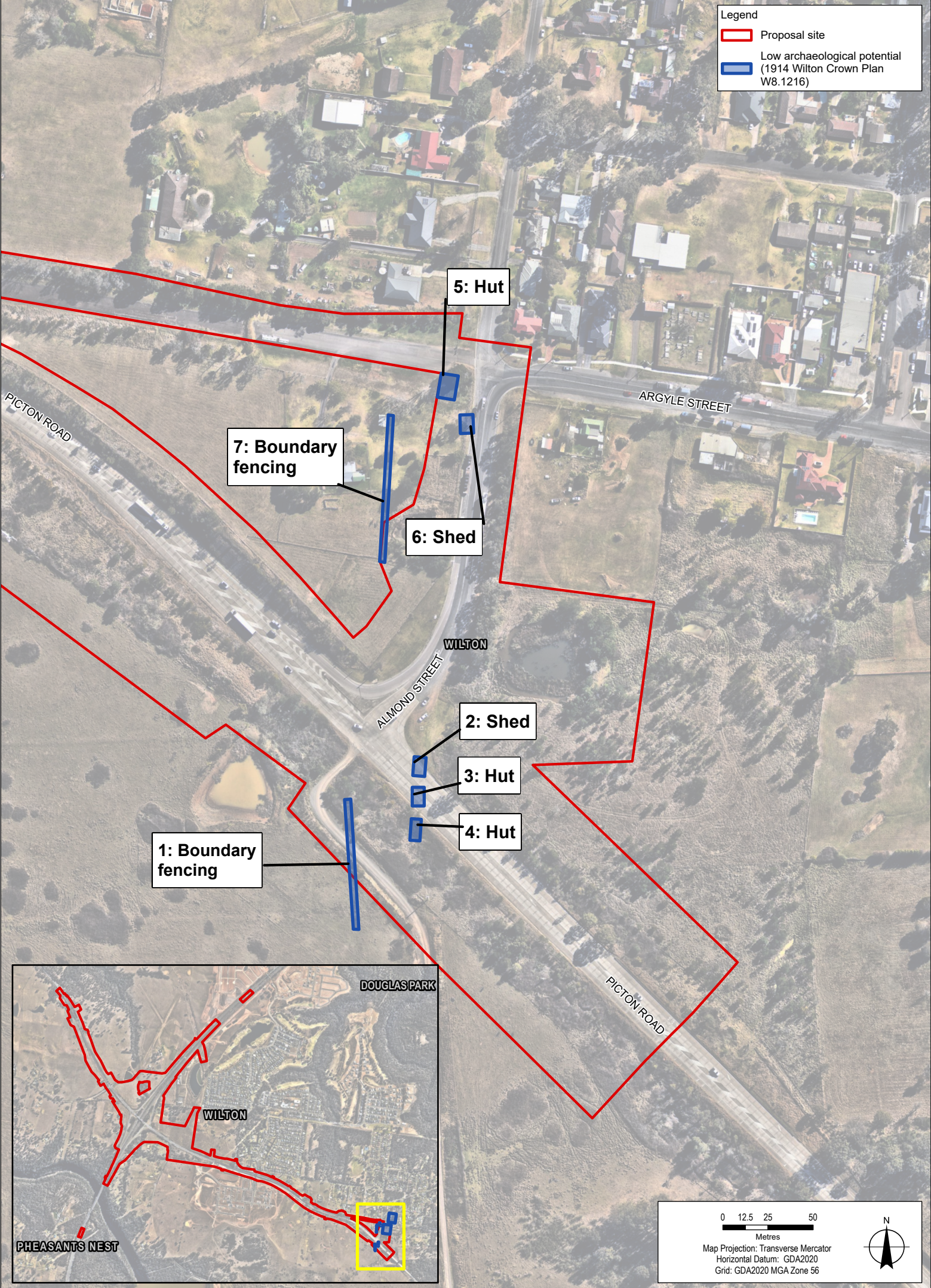
Table 6-31: Assessment of archaeological potential

No.	Site name	Description	Probably feature(s)	Possible construction date / demolition date	Location in relation to the proposal site	Archaeological potential
n/a	Low intensity agricultural land use	Evidence of agricultural or pastoral efforts	Post holes, agricultural marks	Pre-1914	Surrounding proposal site	Low
1.	Boundary fencing	Subdivision fencing separating parish portions	Post holes	Pre-1914 / Pre-1975	Within proposal site, south of intersection of Picton Road and Almond Street	Low
2.	Shed	Single storey shed in south-eastern portion of impact area	Structural postholes and footings, rubbish deposits, floor surfaces and fencing postholes	Pre-1914 / Pre-1975	Within proposal site, south of intersection of Picton Road and Almond Street	Low
3.	Hut	Small structure in south-eastern portion of impact area	Structural postholes, footings and foundations, rubbish deposits, floor surfaces and fencing postholes	Pre-1914 / Pre-1975	Within proposal site, south of intersection of Picton Road and Almond Street	Low
4.	Hut	Small structure in south-eastern portion of impact area	Structural postholes, footings and foundations, rubbish deposits, floor surfaces and fencing postholes	Pre-1914 / Pre-1975	Within proposal site, south of intersection of Picton Road and Almond Street	Low
5.	Hut	Small structure in south-eastern portion of impact area	Structural postholes, footings and foundations, rubbish deposits, floor surfaces and fencing postholes	Pre-1914 / Pre-1975	Within proposal site, west of Almond Street	Low

No.	Site name	Description	Probably feature(s)	Possible construction date / demolition date	Location in relation to the proposal site	Archaeological potential
6.	Shed	Single storey shed in south-eastern portion of impact area	Structural postholes and footings, rubbish deposits, floor surfaces and fencing postholes	Pre-1914 / Pre-1975	Within proposal site, west of Almond Street	Low
7.	Boundary fencing	Wire fencing separating parish portions	Post holes	Pre-1914 / Pre-1975	Within proposal site, west of Almond Street	Low
n/a	Modern (post-1975) development	Single storey brick veneer dwellings with tiled gable roofs, recycling plant, artificial dams, fencing, Picton Road and other small roads, dirt roads	-	Post-1975	Within and surrounding the proposal site	Nil

Legend

- Proposal site
- Low archaeological potential (1914 Wilton Crown Plan W8.1216)



0 12.5 25 50
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

Figure 6-10 - Archaeological potential

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023. Created by: akidea
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12560200_REFX007_Archaeological_Potential_A4P. Print date: 25 Oct

6.4.3 Potential impacts

Construction

Impacts on non-Aboriginal heritage items

Table 6-32 outlines the potential impacts of construction on non-Aboriginal heritage items near the proposal.

During construction, there would be visual changes that may affect the setting of and views to heritage items and their respective curtilages. These visual impacts would mainly be caused by the presence and operation of machinery and light and heavy vehicles surrounding the heritage items, which can influence overall amenity and the setting.

Table 6-32: Potential impacts on the identified heritage items during construction

Item	Listing	Potential impacts	Assessment
Upper Canal System (Pheasants Nest Weir to Prospect Reservoir)	State (Item no. 01373) Local (Item no. I16)	<ul style="list-style-type: none"> no direct impacts on the heritage item itself, which is located 90m below ground level temporary indirect visual impacts on the item's curtilage through the presence of construction plant, machinery and equipment 	The overall impact to this item has been assessed as minor.
Upper Nepean Scheme (including Upper Canal and Prospect Reservoir)	Section 170 register (Item no. 4580004)	<ul style="list-style-type: none"> partially obstructed views to and/or from the item's curtilage during construction no anticipated impacts from vibration due to the distance of the item from the ground surface 	
Upper Nepean Scheme - Pheasants Nest Weir	Local (Item no. I128)	<ul style="list-style-type: none"> no anticipated impacts on airshaft #9, which is located outside the proposal site 	
Cottage	Local (Item no. I275)	<ul style="list-style-type: none"> no direct impacts on the item or its curtilage as the works do not encroach within the curtilage of the heritage item temporary indirect visual impacts on the item through the presence of construction plant, machinery and equipment partially obstructed views to and/or from the heritage item during construction potential for vibration impacts, which would be managed by implementing the measures provided in section 7.2 	The overall impact to this item has been assessed as minor.
St Luke's Anglican Church	Local (Item no. I276)	<ul style="list-style-type: none"> no direct impacts on the item or curtilage due to the distance from the proposal site temporary indirect visual impacts on the item through the presence of construction plant, machinery and equipment partially obstructed views to and/or from the heritage item during construction potential for vibration impacts, which would be managed by implementing the measures provided in section 7.2 	The overall impact to this item has been assessed as minor.

Item	Listing	Potential impacts	Assessment
Cottage	Local (Item no. I279)	<ul style="list-style-type: none"> no direct impacts on the item due to distance from the proposal site temporary indirect visual impacts on the item through the presence of construction plant, machinery and equipment partially obstructed views to and/or from the heritage item during construction no anticipated impacts from construction vibration during construction due to distance from works 	The overall impact to this item has been assessed as negligible.
Aboriginal Shelter Sites	Local (Item no. I285)	<ul style="list-style-type: none"> no direct impacts to the item due to distance from the proposal site temporary indirect visual impacts on the item through the presence of construction plant, machinery and equipment partially obstructed views to and/or from the heritage item during construction no anticipated impacts from construction vibration due to distance from works 	The overall impact to this item has been assessed as negligible.

Impacts on areas of non-Aboriginal archaeological potential

The proposal site does not contain any known, or potentially significant, non-Aboriginal archaeological deposits. Low to nil non-Aboriginal archaeological potential was identified by the assessment. Additionally, the construction and maintenance of Picton Road and associated surface and subsurface infrastructure would have disturbed or removed any non-Aboriginal archaeological deposits present within the proposal site. As such, no impacts on non-Aboriginal archaeological deposits are anticipated during construction.

Operation

No additional direct impacts beyond construction have been identified during operation.

Low potential for indirect visual impacts on the following items was identified as a result of the change in overall site setting and landscape:

- Cottage (item no. I275)
- St Luke's Anglican Church (item no. I276).

As the proposal is visually similar to the existing road alignment, the works are considered to be sympathetic to the heritage items and/or their curtilage.

6.4.4 Safeguards and management measures

The measures described in Table 6-33 will be implemented, in conjunction with other measures outlined in chapter 7, to avoid, minimise, mitigate and manage potential impacts on non-Aboriginal heritage.

Table 6-33: Non-Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Minimising impacts on non-Aboriginal heritage	Cottage (I275), St Luke's Anglican Church (I276) and airshaft #9 associated with the Upper Canal (SHR 01373) will be included in the CEMP environmental sensitive area map.	Contractor	Construction	Additional safeguard

6.5 Hydrology and flooding

This section summarises the results of the hydrology and flooding assessment prepared as an input to the REF. The full Hydrology and Hydraulics Assessment report is provided in Appendix G.

6.5.1 Methodology

The hydrology and flooding assessment involved:

- identifying existing catchments and watercourses with the potential to be impacted by the proposal
- reviewing previous studies relating to the flooding and hydrology of the study area
- reviewing design criteria, applicable design standards, and relevant legislation and policies
- developing flood management objectives based on Guide to Road Design Part 5: Drainage – General and Hydrology Considerations (Austroads 2023)
- completing a qualitative assessment of potential impacts on flooding during construction
- flood modelling in accordance with *Australian Rainfall and Runoff: A Guide to Flood Estimation* (Australian Government and Engineers Australia, 2019) (ARR 2019) using TUFLOW flood modelling software to assess the existing conditions and potential impacts during operation for a range of flood events, ranging from relatively frequent (20 per cent annual exceedance probability (AEP)) to the probable maximum flood (PMF) event
- recommending measures to avoid, minimise, mitigate and manage the identified impacts.

The study area for the hydrology and flooding assessment comprises the proposal site and the surrounding catchment of the tributaries of the Nepean River, which could be directly or indirectly impacted by the proposal.

Further information on the methodology for the assessment is provided in section 2 of Appendix G.

6.5.2 Existing environment

Catchments and watercourses

The proposal is located within the Hawkesbury-Nepean Catchment. The Hawkesbury-Nepean Catchment covers an area of about 22,000 square kilometres. The catchment provides drinking water, recreational opportunities, agriculture and fisheries produce, and tourism resources for the Sydney Metropolitan area.

The key watercourses within and near the proposal site are shown on Figure 6-11. There are nine ephemeral highly degraded watercourses that cross the proposal site (labelled as tributaries 1 to 9 in Figure 6-11). These ephemeral watercourses are tributaries of Byrnes Creek, Stringybark Creek and Allens Creek, which in turn drain to the Nepean River to the west and south of the site. Near the proposal site Byrnes, Stringybark and Allens creeks are ephemeral, steep sided creeks, and have some sections mapped as key fish habitat outside of the proposal site (see section 3.8 of Appendix C)

At its closest point the Nepean River is located about 130 metres south of the proposal site. At this location the Nepean River is perennial, located within a steep sided, narrow valley, and is listed as key fish habitat. This location is about two kilometres downstream of the Metropolitan Special Area in the Greater Sydney Drinking Water Catchment.



Figure 6-11 - Catchments and watercourses

Data source: Sydney Drinking water Catchment - WaterNSW 2023, Hawkesbury Nepean Catchment NSWSS 2023, Earthstar Geographics, Maxar/Created by akidea N: LAU\Wollongong\Projects\23\12560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_REF_B_aprx\12560200_REF\X003_Catchments_and_Watercourses_A4P.Print date: 25 Oct

Drainage infrastructure

There are nine transverse drainage structures at each of the ephemeral watercourses that cross the proposal site. These structures include a three by three metre underpass and pipes ranging in size from 750 to 1,500 millimetres in diameter. A number of structures currently restrict flood flows and result in water ponding upstream of Picton Road, and in some cases, flowing onto and over the road as described below.

Flood behaviour

Detailed mapping of existing flood behaviour for all modelled events is provided in Appendix A of the Hydrology and Hydraulics Assessment (which forms Appendix G of the REF). Key features of the one per cent AEP event are described below and shown on Figure 6-12.

Currently, within the extent of the proposal site, Picton Road generally has one per cent AEP flood immunity under existing conditions, with exceptions at the following locations:

- A section of Picton Road located about 350 metres west of Almond Street experiences diversion of flow from the catchment of Tributary 8 to Tributary 7. At this location water flows onto the road from where it is diverted west along Picton Road to Tributary 7.
- At the western end of the proposal site there is flow across Picton Road where the proposal would tie back into the existing road pavement. This is caused by water flowing along the road in a westerly direction towards a large culvert immediately west of the proposal site. However, this is not a frequent occurrence and there is no historical evidence of any flood damage or disruption at this location.

Downstream of Picton Road, flows are generally confined to the watercourses and immediate overbank areas. However, properties (with buildings) at three locations are within, or in immediate proximity to, the extent of the one per cent AEP event. These properties are located near Hornby Street (at tributaries 7 and 8) and on Condell Park Road just east of the M31 Hume Motorway (at tributary 3). At these locations flood depths (above ground level) are up to about 0.5 (at tributary 8) and 0.1 metres (at tributaries 7 and 3) in the one per cent AEP event.

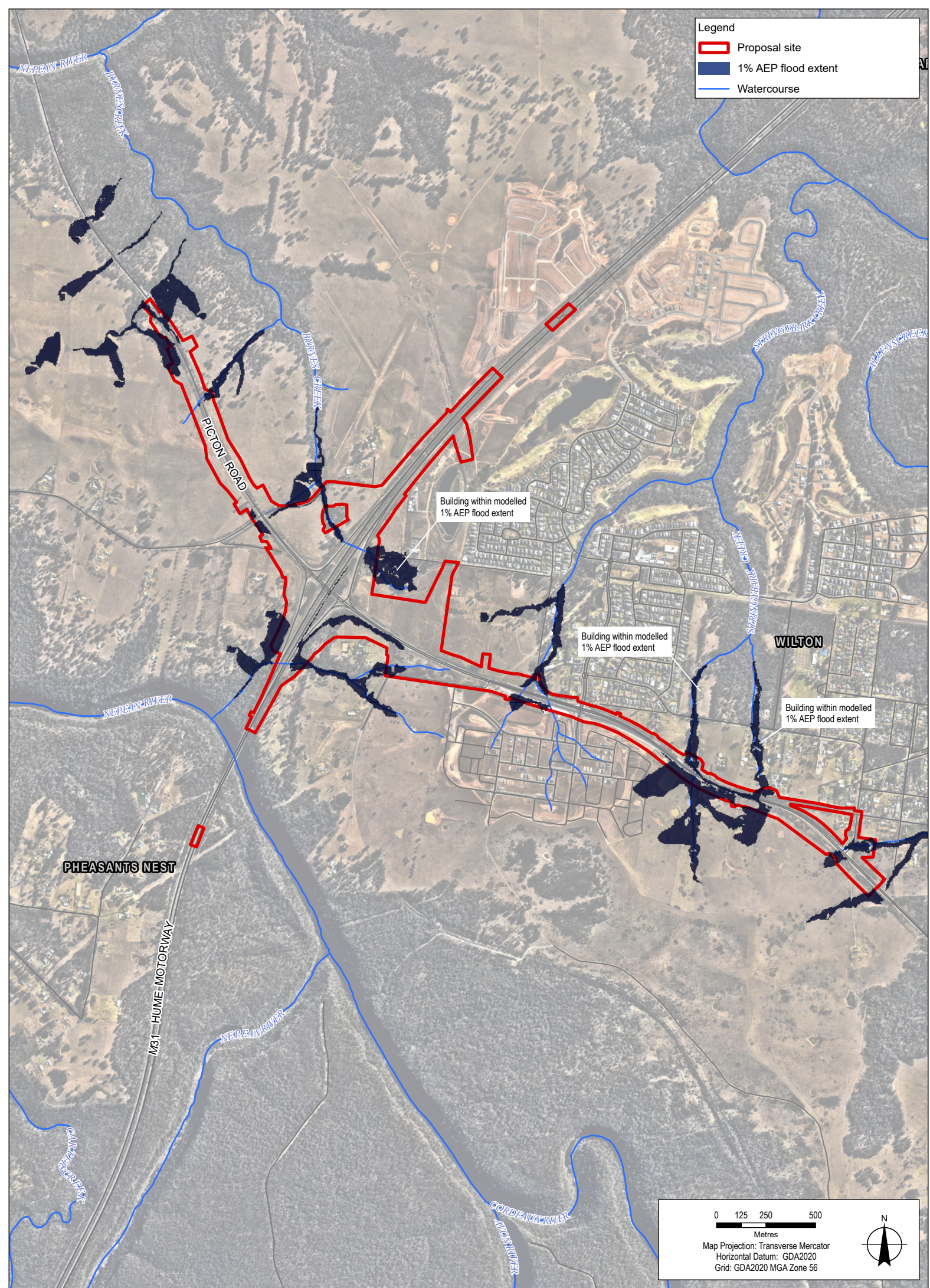
Flow velocities in the tributaries during the one per cent AEP event are generally in the range of 0.5 to one metre per second on the overbank areas, and up to two metres per second in the tributary channels. Velocities in this range are unlikely to result in scour of the watercourses.

6.5.3 Potential impacts

Construction

During construction, activities within watercourses (in particular at tributaries 7 and 8) have the potential to result in increased inundation of surrounding properties due to the temporary blockage and alteration of flows across the proposal site. The design of the proposal has generally offset new culverts from existing culverts to maintain existing flows. Where flow paths would be affected, construction would be staged and where required, temporary diversions provided, to maintain flow connectivity across the proposal site. As such, there would only be minimal potential for flooding impacts, which would be managed by the implementation of measures provided in sections 6.5.4 and 6.6.4.

Ancillary facility temporary buildings and stockpiles would be located outside the extent of the 20 per cent AEP event (see Figure 6-13). Localised catchment diversions would be provided around compounds and stockpiles in accordance with standard construction stormwater management practices, as defined in the CEMP.



Legend

- Proposal site
- 1% AEP flood extent
- Watercourse

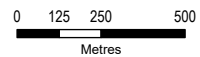
Building within modelled
1% AEP flood extent

Building within modelled
1% AEP flood extent

Building within modelled
1% AEP flood extent

PHEASANTS NEST

WILTON



Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

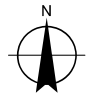
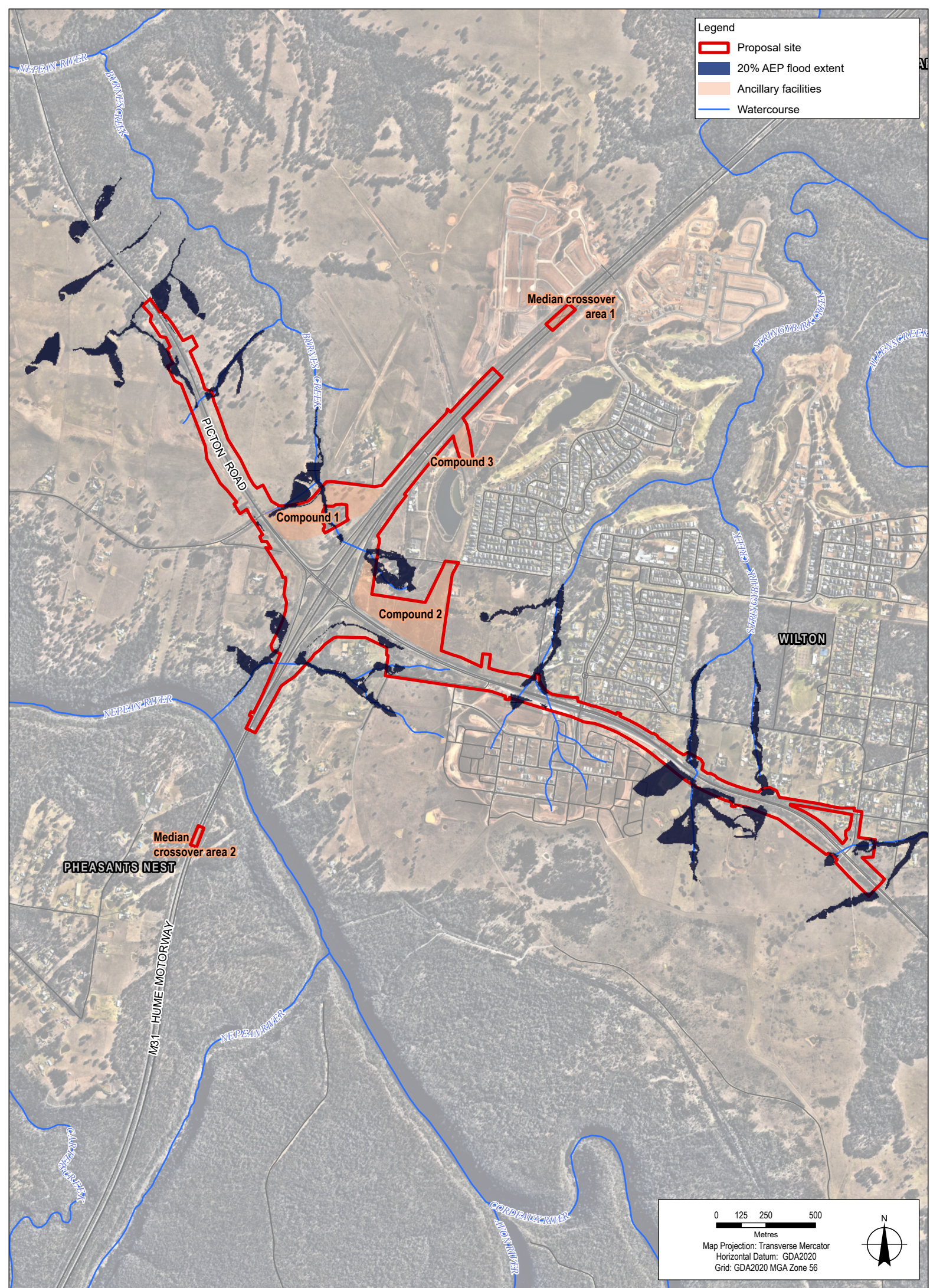


Figure 6-12 - Existing flooding - one per cent AEP

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023; DPIE, Soil Landscapes, 2023. Created by:akidea
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12560200_REFX026_ExistingFlooding1pctAEP_A4P. Print date: 26 Oct



Legend

- Proposal site
- 20% AEP flood extent
- Ancillary facilities
- Watercourse

0 125 250 500
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

Figure 6-13 - Existing flooding - twenty per cent AEP

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023; DPIE, Soil Landscapes, 2023. Created by: akidea
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12560200_REFX027_ExistingFlooding20pctAEP_A4P. Print date: 26 Oct

Operation

Proposed drainage infrastructure

New culverts have been sized to have the capacity to carry the one per cent AEP flow rates under conditions of 50 per cent blockage of the culvert inlets (e.g., by floating material such as vegetation). As a result, culvert sizes have been increased compared to the existing culverts at most of the tributaries. Climate change has been considered for the proposed culvert sizing.

Flood behaviour

Detailed mapping of operational flood behaviour for all modelled events is provided in Appendix A of the Hydrology and Hydraulics Assessment (Appendix G of the REF). Key features of the one per cent AEP event are described below and are shown on Figure 6-14.

Due to the increased culvert sizes described above, Picton Road would no longer be overtopped in the one per cent AEP event within the extent of the proposal site.

The predicted changes to flood depths and extents in surrounding areas would be minor and generally within the adopted flood management objectives detailed in section 2.5.2 of the Hydrology and Hydraulics Assessment with the following exceptions:

- North of Picton Road there is a property on the south side of Hornby Street with a building located within the modelled one per cent AEP flood extent of Tributary 8. The predicted afflux (increase in flood level) is up to 40 millimetres at this location.
- North of Hornby Street there is a property where the modelled one per cent of AEP flood extent in Tributary 7 (Stringybark Creek) is close to an existing roofed structure at the rear of the property. The structure, which appears to be non-habitable, is located close to where the predicted afflux is up to 80 millimetres.

A concept level assessment has been carried out to confirm that there are feasible solutions to mitigate these potential flooding impacts, including provision of detention storage within the proposal site. Further investigation of these buildings would be carried out during detailed design to confirm their use, including (as required) a floor level survey. There would be no change to flood depths at the property in Condell Park Road that is subject to inundation under existing conditions, and no additional properties would be affected.

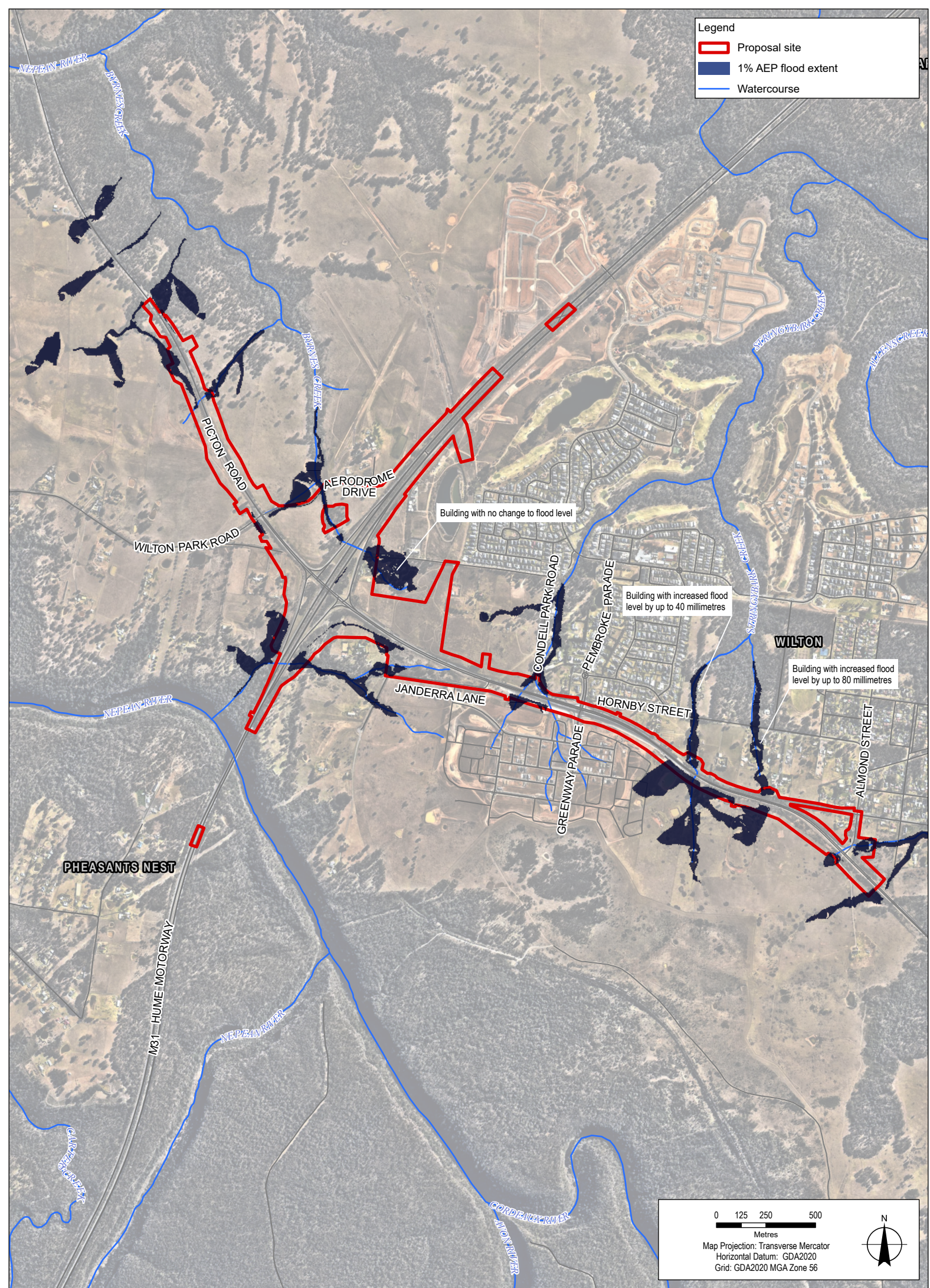
Similarly, flow velocities are predicted to remain consistent with existing conditions. The larger culverts included in the proposal have the potential to locally increase velocities in the downstream tributaries close to the proposal site. Energy dissipators and scour protection have been included in the proposal to mitigate potential scour impacts.

Climate change

A climate change risk assessment has been undertaken as part of the concept design for the proposal. This assessment has considered the risks associated with increased rainfall intensities under future climate emissions scenarios. The associated hazards would include overtopping of the road and scouring of culvert outlets due to more intense storms due to climate change.

The Austroads *Guide to Road Design Part 5: Drainage - General and Hydrology Considerations* (Austroads, 2023) suggests that for road infrastructure projects the design criteria should be met for the Representative Concentration Pathway (RCP) 4.5 scenario (low emissions). The culverts included in the proposal have been designed to convey the one per cent AEP flows under the RCP 4.5 scenario without overtopping of the road.

In the RCP 8.5 (highest emissions) scenario, overtopping may occur at Picton Road immediately west of Pembroke Parade, between Pembroke Parade and Almond Street, and at Almond Street north of the intersection with Picton Road. West of Pembroke Parade, the modelling indicates that flood hazard category is H3, which is unsafe for vehicles and pedestrians. The flood hazard category between Pembroke Parade and Almond Street is H1 and generally safe for vehicles and pedestrians. At Almond Street, north of the intersection with Picton Road, the road would experience a flood hazard category of H2 under this high emissions scenario, which would be unsafe for small vehicles.



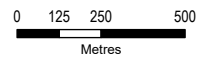
Legend

- Proposal site
- 1% AEP flood extent
- Watercourse

Building with no change to flood level

Building with increased flood level by up to 40 millimetres

Building with increased flood level by up to 80 millimetres



Map Projection: Transverse Mercator
 Horizontal Datum: GDA2020
 Grid: GDA2020 MGA Zone 56



Figure 6-14 - Operational flooding - one per cent AEP

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023; DPIE, Soil Landscapes, 2023. Created by: akidea
 N:\AU\Wollongong\Projects\23112560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX028_OperationalFlooding1pctAEP_A4P. Print date: 26 Oct

6.5.4 Safeguards and management measures

The measures described in Table 6-34 will be implemented, in conjunction with other measures outlined in section 7, to avoid, minimise and manage potential hydrology and flooding impacts.

Table 6-34: Hydrology and flooding safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Flooding impacts	Further flood modelling and investigations will be undertaken to inform detailed design development to mitigate potential impacts resulting from the proposal on properties where flooding impacts exceed acceptable levels as defined by the <i>Guide to Road Design Part 5: Drainage – General and Hydrology Considerations</i> (Austroads, 2023) – Table 6.19 Acceptable impact for major transport infrastructure acceptable levels.	Transport	Detailed design	Additional safeguard
Watercourse and flow path impacts	All ancillary facility temporary buildings and stockpiles will be located above the 20 per cent AEP flood level.	Contractor	Construction	Additional safeguard
	Temporary drainage infrastructure will be constructed and implemented in accordance with <i>Technical Guideline: Temporary stormwater drainage for road construction</i> (Roads and Maritime Services, 2011c).	Contractor	Construction	Additional safeguard

6.6 Surface water and groundwater

This section summarises the results of the Soils, Surface Water and Groundwater Assessment report prepared as an input to the REF, as relevant to surface water and groundwater. The full report is provided in Appendix H. The results of the soils assessment are summarised in section 6.7.

6.6.1 Methodology

Surface water

The surface water quality assessment involved:

- identifying existing water catchments and receiving watercourses with the potential to be impacted by the proposal
- reviewing information and data on baseline water quality, including sampling data from water quality samples collected in March 2023 at the 10 locations shown on Figure 6-15
- identifying appropriate water quality objectives based on the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments (ANZG), 2018) (the Water Quality Guidelines) and the *NSW Water Quality and River Flow Objectives* (DECCW, 2006) (the NSW Water Quality Objectives)
- modelling using the eWater Model for Urban Stormwater Improvement Conceptualisation (MUSICX) to identify existing pollutant loads and those that may be generated by the proposal, including the effect of water quality treatment measures to identify potential reductions that could be achieved for key pollutants (gross pollutants, total suspended solids, total phosphorous and total nitrogen)
- assessing potential impacts on water quality during construction and operation
- recommending measures to avoid, minimise and manage the identified impacts.

Groundwater

The groundwater assessment involved:

- reviewing publicly available information, including geological maps, groundwater monitoring data, groundwater allocations, registered groundwater wells, and climate data
- reviewing the results of groundwater monitoring undertaken as part of the proposal-specific geotechnical and contamination investigations
- assessing the potential impacts of constructing and operating the proposal on groundwater levels and quality, including:
 - a qualitative assessment of the potential for groundwater in flow to proposed cuttings
 - an assessment of potential changes to groundwater levels against the *NSW Aquifer Interference Policy* (DPI, 2012) minimal impact considerations
 - assessment of groundwater quality with reference to relevant state, national and international water quality guidelines
- recommending safeguards and management measures for identified impacts.

The study area for the surface water and groundwater assessment comprised the proposal site and a buffer area of about three kilometres around the proposal site. This area was selected to assess sensitive environmental receptors that could be directly or indirectly impacted by the proposal.

Further information on the methodology for the assessments is provided in section 3 of Appendix H.

Criteria

Construction

Some water may need to be discharged during construction, such as from temporary sediment basins as a result of runoff during construction.

The NSW Water Quality Objectives provide the agreed environmental values and long-term goals for NSW's surface waters. These objectives are consistent with the national framework for assessing water quality set out in the Water Quality Guidelines and include values such as protection of aquatic ecosystems, visual amenity, primary and secondary contact recreation, livestock water supply, irrigation water supply, and aquatic foods (cooked).

While all of these values apply, the majority of them are not relevant to the proposal given the characteristics of the watercourses that cross the proposal site. The watercourses that cross the proposal site are ephemeral and highly degraded (see section 6.5.2). As a result, the value for protection of aquatic ecosystems is most relevant to the proposal.

The water quality objective for aquatic ecosystems is to 'maintain or improve the ecological condition of waterbodies and their riparian zones over the long term', which is relevant to all watercourses. The indicators and criteria (trigger values) based on the Water Quality Guidelines adopted for this objective, which have been applied to the proposal, are provided in Table 6-35.

Table 6-35: Trigger values for protection of aquatic ecosystems

Indicator	Trigger value
Total phosphorus	25 micrograms per litre (µg/L)
Total nitrogen	350µg/L
Chlorophyll-a	5µg/L
Turbidity	125–2200 microsiemens per centimetre (µS/cm)
Salinity (electrical conductivity)	125–2200µS/cm
Dissolved oxygen	85–110 %
pH	6.5–8.5

Trigger values are the numeric criteria that, if exceeded, indicate the potential for harmful environmental effects to occur. If they are not exceeded, a very low risk of environmental damage can be assumed. If they are exceeded, further investigation is 'triggered' for the pollutant concerned.

The Water Quality Guidelines promote the use of local (site specific) data to determine baseline conditions, which is the preferred approach. However, the available water quality data is not sufficient to establish baseline conditions (discussed further in section 6.6.2). As such, the default trigger values noted above would be used as discharge criteria during construction unless otherwise stated in the EPL obtained for the proposal.

Operation

The surface water pollutant reduction targets from the *Water Sensitive Urban Design Guideline* (Roads and Maritime Services, 2017) were adopted for the operational impact assessment (see Table 6-36:) and applied at a sub catchment level for the Nepean River (for the tributary to the south of the proposal site), Byrnes Creek, Allens Creek and Stringybark Creek.

Table 6-36: Pollutant reduction targets

Stormwater pollutant	Pollutant reduction target (%)
Gross pollutants (> 5 mm)	90
Total suspended solids	85
Total phosphorus	65
Total nitrogen	45

6.6.2 Existing environment

Surface water

The proposal is located within the Hawkesbury-Nepean Catchment and drains into the upper Nepean River. Runoff from the proposal site enters local watercourses and tributaries through the stormwater system consisting mostly of roadside swales and as overland flow. Watercourses within the study area are shown in Figure 6-11. The proposal site drains to the Nepean River about two kilometres downstream of the Metropolitan Special Area in the Greater Sydney Drinking Water Catchment. Further information on the existing hydrological and geological environment is provided in sections 6.5.2 and 6.7.2, respectively.

Surface water quality

The quality of surface water entering local watercourses would largely be a function of contaminants on the roads and adjacent areas, including areas of urban development. Typical surface pollutants from the proposal could include:

- oils and hydrocarbons
- heavy metals
- chemicals from spills or inappropriate waste disposal
- sediments
- gross pollutants including litter and debris
- nutrients including nitrogen and phosphorous.

Water quality samples were collected from 10 sampling points shown in Figure 6-15. Sampling results were found to generally be below the nominated trigger values, with some samples showing elevated metals and cations, in particular calcium carbonate. The exceptions were concentrations of total phosphorous and total nitrogen in some samples, which exceeded the nominated trigger values at the majority of locations as shown in Table 6-37. Pesticides and other industrial chemical concentrations were generally reported at levels below the measurement thresholds.

Table 6-37: Summary of analytes exceeding default trigger values

Water quality monitoring location	Total phosphorous results (mg/L) (Default trigger level – 0.025 mg/L)	Total nitrogen results (mg/L) (Default trigger level – 0.35 mg/L)
SW01	1.44	1.9-5.3
SW02	0.17	1.1-2.0
SW03	0.17	1.1-4.9
SW04	Not exceeded	0.4-1.5
SW05	0.46-1.69	3.2-7.4
SW06	0.1-0.11	1.3-2.3
SW07	0.08	1.7-1.8
SW08	0.03	Not exceeded
SW09	Not exceeded	Not exceeded
SW10	0.03	0.5-1.2

Water quality infrastructure

There are currently no purpose-built measures for spill containment or road stormwater quality treatments within the proposal site.

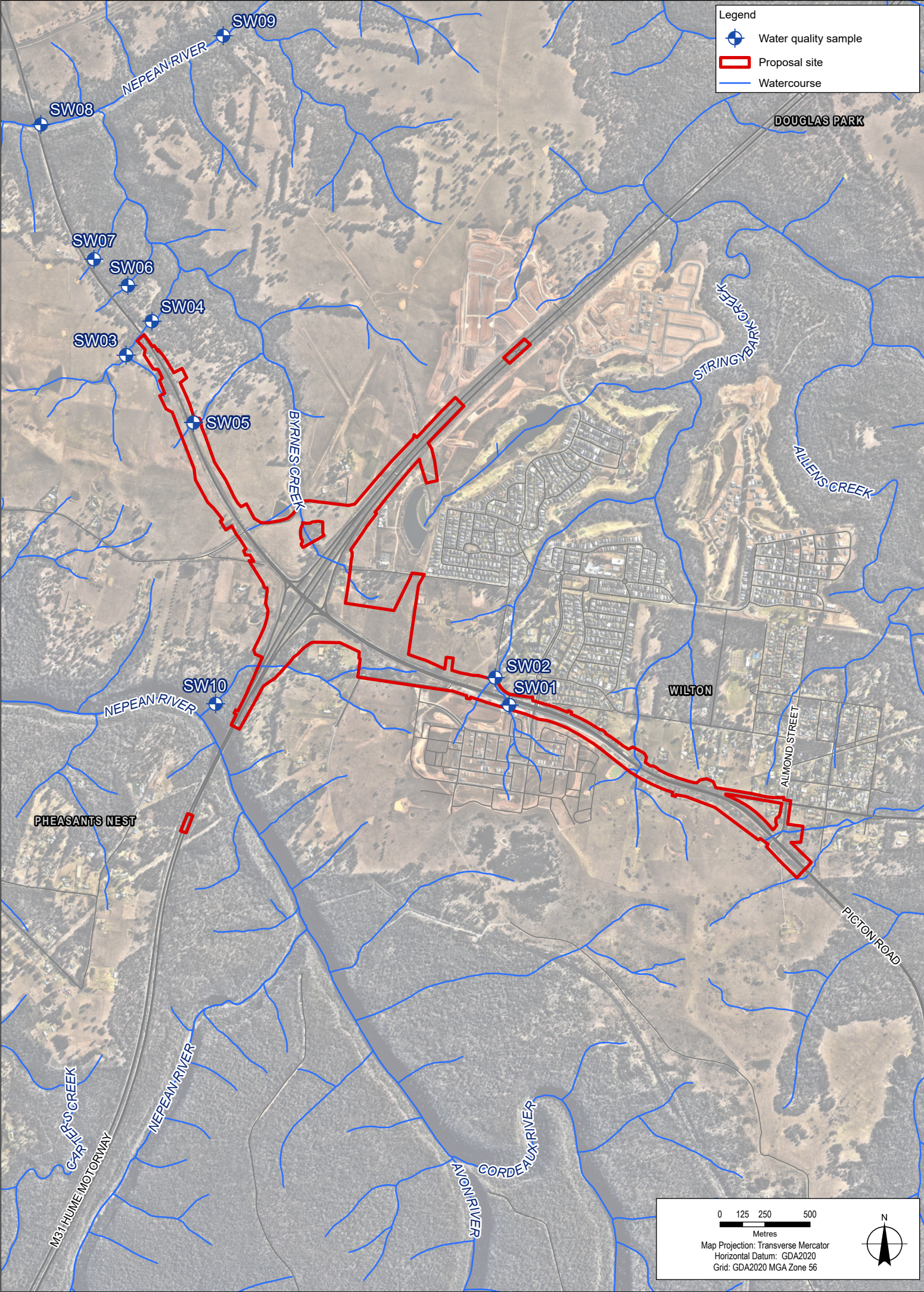


Figure 6-15 - Water quality sampling locations

Groundwater

Groundwater aquifer and bores

Regionally, groundwater is likely to be located deep within the underlying rock. There is the potential that a shallow, perched aquifer could temporarily form following periods of above average rainfall near drainage lines.

A search of the NSW Groundwater Bore Database (WaterNSW, 2023) carried out in February 2023 identified 12 bores within a one kilometre radius of the proposal site. These bores are used for:

- stock, or domestic and stock – three bores
- monitoring – two bores
- irrigation – three bores
- water supply – three bores
- unknown purpose – one bore.

All of the stock, domestic, farming and irrigation bores were found to be installed within the deep rock strata and have very low extraction rates. This indicates that, in the vicinity of the proposal site, there is limited reliance on the fractured rock aquifer and no reliance on the shallow perched aquifer for stock, domestic, farming or irrigation purposes.

No groundwater bores are located within the proposal site.

Groundwater dependent ecosystems

Vegetation surrounding the riparian corridor of the Nepean River is considered to have a high to moderate likelihood to be a groundwater dependent ecosystem and aligns with PCT 1395, which conforms with the threatened ecological community Shale Sandstone Transition Forest in the Sydney Basin Bioregion. However, as described in section 6.1.2, PCT 1395 is likely to be an opportunistic groundwater dependent ecosystem that depends on groundwater in some locations but not in others. Further information is provided in section 6.1.2.

Groundwater monitoring results

Groundwater monitoring was undertaken between November 2022 and April 2023 as part of the geotechnical investigations for the concept design. The results indicated that local groundwater levels within the proposal site are about five to 20 metres below ground level.

Water quality sampling undertaken in February 2023 indicated that water quality in the deep rock aquifer varied from slightly acidic to nearly neutral and varies from fresh to saline. Exceedances with respect to the criteria in the Water Quality Guidelines and, in relation to per- and poly-fluoroalkyl substances (PFAS), the *PFAS National Environmental Management Plan* (HEPA, 2020) were found for chromium, copper, nickel, zinc and PFAS.

6.6.3 Potential impacts

Construction

Surface water

Construction activities, particularly those that disturb the ground surface, have the potential to present a risk to water quality in receiving watercourses if mitigation and management measures are not effectively implemented. Potential sources of water quality impacts include:

- increased sediment loads from exposed soil transported off site during rainfall events and from discharge of sediment-laden water
- increased levels of nutrients, metals and other pollutants from construction near watercourses and stormwater drains, transported in sediments to downstream watercourses or via discharge of wastewater to nearby watercourses
- contamination of watercourses due to runoff from potentially contaminated land

- spills or leaks from construction machinery (including chemicals, oils, grease, and petroleum hydrocarbons), hazardous materials from chemical storage areas and gross pollutants such as litter polluting downstream watercourses
- tannins and other organic leachate from vegetation stockpiles which could enter watercourses via runoff or discharge.

The downstream effects of water quality impacts include:

- reduced hydraulic capacity of the watercourse or drainage system
- increased pollutant loads within the catchment
- increased potential for bioaccumulation of heavy metals in aquatic species
- reduced dissolved oxygen levels that could impact aquatic species
- increased sedimentation smothering aquatic life and affecting aquatic ecosystems
- increased turbidity levels affecting aquatic species and the aesthetics of the water for recreational activities
- changes to water temperature due to reduced light penetration.

Excavations, embankment construction and general construction activities that result in ground disturbance, in particular close to drainage systems and on steeper slopes, could result in water quality impacts through erosion and sedimentation. Runoff from stockpiles has the potential to impact downstream water quality during rainfall if the stockpiles are not managed appropriately. Sediments from the stockpiles have the potential to wash into watercourses, increasing levels of turbidity and resulting in transport of contaminants and impacts as described above.

Stockpiling cleared vegetation creates a risk of tannins leaching into watercourses, resulting in an increased organic load. Discharge of water high in tannins can increase the biological oxygen demand of the receiving environment, which may in turn result in a decrease in available dissolved oxygen. Once discharged to the environment, tannins may also reduce visibility, light penetration, and change the pH of receiving waters.

Sediment loads in watercourses can increase in the vicinity of hard surfaces (such as roads) and compacted areas (such as construction compounds) due to increased surface runoff.

Gross pollutants (such as litter) from construction areas and accidental spills or leaks (including chemicals, oils, grease, and petroleum hydrocarbons) could occur from the use, maintenance or re-fuelling of construction plant and equipment at construction sites. These can affect general water quality including through accumulation of material in watercourses and changes in chemical composition of receiving waters. In addition, these pollutants can be ingested by aquatic fauna and result in dead or sick aquatic life.

The likelihood and magnitude of impact would vary depending on the stage of construction, the area of disturbance and occurrence of high rainfall or wind weather events. With the application of the mitigation measures provided in section 6.6.4, the potential construction impacts on surface water quality are considered minor and manageable.

Groundwater

Construction would include excavation for a number of cuttings. Pavement coring in existing cuttings on Picton Road did not intercept groundwater and it is unlikely that excavations associated with the proposal would intercept groundwater given the depth to the deeper aquifer within the underlying rock, as described in section 6.6.2. As such, the potential for drawdown of the surrounding groundwater aquifer is considered negligible.

There is the potential that a shallow, perched aquifer may temporarily form following periods of above average rainfall. However, a shallow perched aquifer was not intercepted or identified during groundwater monitoring even though rainfall during the monitoring period was above average. If a perched aquifer was to form, any groundwater would be temporary only and would be unlikely to result in sufficient volumes requiring dewatering.

The design for the foundation of the bridges (that would form the proposed interchange) and associated retaining walls adopts shallow foundations on bedrock. It is likely that the foundations would be less than two metres deep. Constructing the proposed shared user bridge would involve piling that would be terminated at a depth of about five metres. Additionally, the foundations of the existing Picton Road overbridge would be likely to only be demolished to a depth of at least one metre below the finished surface level. Based on the groundwater level data, groundwater is about six to eight metres below ground level at the proposed bridge locations. Therefore, excavations for bridge demolition and construction, and associated retaining walls, are not predicted to intercept groundwater.

Potential risks to groundwater quality from changes to surface water include:

- contamination by hydrocarbons from accidental fuel and chemical spills
- contaminants contained in turbid runoff from unpaved surfaces.

Surface water from site runoff may infiltrate and potentially impact groundwater sources. As the infiltration process is generally effective in filtering polluting particles and sediment, the risk of contamination of groundwater from any pollutants bound in particulate form in surface water, such as heavy metals, would generally be low.

Soluble pollutants, such as pH altering solutes, salts and nitrates, as well as soluble hydrocarbons, can infiltrate soils and contaminate the groundwater system. Under certain pH conditions, metals may also become soluble and could infiltrate groundwater.

The mitigation measures provided in section 6.6.4 would be implemented to minimise the potential for groundwater quality impacts.

An assessment of the construction of the proposal against the Level 1 minimal impact considerations in the NSW Aquifer Interference Policy is provided below:

- Water supply works – the proposal would not result in any impacts on water supply works as it is not predicted to intercept groundwater in the deep rock aquifer, where all registered bores were identified.
- High priority culturally significant sites – there are no high priority culturally significant sites listed in the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources.
- Groundwater dependent ecosystems – the proposal is unlikely to result in changes to groundwater flow or depth during construction. The identified groundwater dependent ecosystem in the proposal site (PCT 1395) is not entirely groundwater dependent and is more reliant on the collection of rainwater. This vegetation community type would continue to be able to rely on alternative sources of water (i.e., rainfall). Therefore, the proposal is not predicted to result in impacts on groundwater dependant ecosystems.

Operation

During operation, the road surfaces and landscaped areas would be stabilised, including sealing of all roads. Areas cleared during the construction period (that are not subject to the location of permanent infrastructure) would be rehabilitated and landscaped, with open channel drainage lines stabilised and outlets incorporating scour protection to minimise erosion and scour.

Surface water

During operation, there is potential for surface water quality to be impacted by the following processes and activities:

- erosion of recently disturbed areas resulting in the sedimentation of watercourses
- increase in sediment and pollutant loads in stormwater due to the increase in road surface and associated runoff.

The proposal would increase impervious areas (such as road pavement and shared user paths) that would be exposed to direct rainfall and would increase runoff volume and associated pollutant mobilisation. Runoff from road pavements typically contains pollutants such as sediments, nutrients, oils and greases, petrochemicals and heavy metals, which could potentially impact water quality when discharged into receiving watercourses. The increase in impervious surface areas means that there is potential for higher pollutant loads to be discharged to the receiving environments of the unnamed tributaries that intersect the proposal site.

The proposal would include the installation of water quality treatment devices at a number of locations as described in section 3.2.3. These may consist of water quality basins that incorporate bio-retention media and planting, swales, spill basins and other treatment devices. Water quality treatments would manage runoff from the road surface to mitigate against accidental spills and elevated pollutant discharges, and the associated potential for water quality impacts.

Modelling was carried out as part of the design process to assess the performance of the water quality treatment devices included in the concept design against the targets shown in Table 6-36. The modelling considered flows and runoff at a sub catchment level so the proposed treatment devices would also treat the existing case rather than just the changes in impervious areas associated with the proposal. The modelling results indicate that with the installation of the proposed treatment devices, the adopted pollutant reduction targets would be achieved at a sub catchment level for Nepean River, Byrnes Creek, Stringybark Creek and Allens Creek.

Contamination of watercourses could also occur as a result of uncontrolled spills during vehicle accidents or maintenance activities. While this would not be an impact resulting from the proposal, the proposed water quality treatment devices would cater for spill containment of a minimum volume of 30,000 litres, providing an improvement when compared to the existing conditions.

Further information regarding the water quality treatment devices included in the concept design, including locations, is provided in Appendix C of the Soils, Surface Water and Groundwater Assessment report (Appendix H of the REF). The ultimate location, types and sizing of these treatment devices may be refined as the design progresses to accommodate changes in drainage and other design aspects. However, it is not expected that these changes would impact the water quality outcomes of the proposal as they would be developed and assessed against the same performance targets.

The proposal site is located downstream and not within the Metropolitan Special Area in the Greater Sydney Drinking Water Catchment, and therefore a NorBE assessment is not required under section 171A(3) of the EP&A Regulation (see section 4.1.1) However, a qualitative assessment has been completed using the NorBE tools for comparison purposes only.

The assessment indicated that the proposal would result in greater pollutant loads in stormwater if no treatment measures were incorporated into the design. However, with the installation of the proposed water quality treatment devices (see section 3.2.3) the annual average pollutant load in stormwater runoff from Picton Road would be substantially lower than the annual average pollutant loads under existing conditions. In particular, the pollutant loads from the operation of Picton Road within the proposal site would be between 18 per cent and 79 per cent of the existing loads for the different parameters assessed. As such, the proposal would result in overall beneficial outcomes for the water quality of the receiving environment compared to the existing conditions.

Groundwater

While not identified during groundwater monitoring, there is potential for a shallow, perched aquifer to temporarily form following periods of above average rainfall, which may be intercepted by cuttings within the proposal site. Groundwater inflow is likely to be temporary and would be managed by the proposal's stormwater management system and subsoil drainage. Groundwater inflow would be unlikely to exceed the three mega litres per year that would trigger the need for a water access licence.

It is predicted that any groundwater impacts from operation of the proposal would be less than the Level 1 minimal impact considerations specified in the Aquifer Interference Policy and are therefore considered to be acceptable. The proposal is not predicted to result in any decline in groundwater pressure or groundwater head, and is not predicted to alter the beneficial use of the groundwater at any water supply work, culturally significant sites or high priority groundwater dependant ecosystems.

Increased hardstand areas may result in some localised changes to the rates of rainfall infiltration. The main groundwater receptor is considered to be baseflow to watercourses. Runoff from hardstand areas would continue to flow towards the Nepean River. Therefore, reduction in rainfall infiltration is likely to have a negligible effect in flows available to groundwater receptors in the area, including groundwater dependant ecosystems.

6.6.4 Safeguards and management measures

The measures described in Table 6-38 will be implemented, in conjunction with other measures outlined in chapter 7, to avoid, minimise and manage potential impacts on surface water and groundwater.

Table 6-38: Surface water and groundwater safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Managing potential impacts on surface water and groundwater quality	<p>A Construction Soil and Water Management Plan (CSWMP) will be prepared in accordance with <i>Managing Urban Stormwater: Soils and Construction</i>, Volume 1 and 2D (Landcom, 2004) (the 'Blue Book') and implemented as part of the CEMP. The CSWMP will identify reasonably foreseeable risks relating to soil erosion and surface and groundwater quality and describe how these risks will be addressed during construction, including temporary creek crossings.</p> <p>The CSWMP will be prepared by or reviewed and endorsed by a soil conservationist on the Transport for NSW list of Registered Contractors for Erosion, Sedimentation and Soil Conservation Consultancy Services. The CSWMP will then be revised to address the outcomes of the review.</p>	Contractor	Detailed design/ pre-construction	Section 2.1 of QA G38 <i>Soil and Water Management</i>
	<p>Site-specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the CSWMP. The plan/s will include:</p> <ul style="list-style-type: none"> • 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 • erosion and sediment controls appropriate for dispersive soils • stabilisation measures to control discharge from stormwater outlets to manage erosion and scour • dewatering in accordance with the <i>Technical Guideline - Environmental Management of Construction Site Dewatering</i> (Roads and Maritime, 2011b) • progressive rehabilitation of disturbed sites in accordance with the rehabilitation strategy for exposed surfaces prepared as part of the Construction Air Quality Management Plan (safeguard AQ01). 	Contractor	Detailed design/ pre-construction	Section 2.2 of QA G38 <i>Soil and Water Management</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Stormwater management infrastructure will be designed and implemented to meet proposed operational water quality pollutant reduction targets (90% Gross Pollutant, 85% Total Suspended Solids, 65% Total Phosphorous and 45% Total Nitrogen).	Contractor	Detailed design/ construction	Additional safeguard
Water quality monitoring	<p>A surface water quality monitoring program will be developed and implemented as part of the CSWMP in accordance with the <i>Guidelines for Construction Water Quality Monitoring</i> (RTA, 2003). The program will define:</p> <ul style="list-style-type: none"> • monitoring parameters • monitoring locations • frequency and duration of monitoring. <p>The monitoring program will include monitoring prior to the commencement of and during construction.</p>	Contractor	Pre-construction/ construction	Additional safeguard
Groundwater impacts	<p>Impacts on groundwater during construction will be minimised as far as practicable by:</p> <ul style="list-style-type: none"> • avoiding the need to extract groundwater • minimising groundwater inflows and volumes into excavations • managing any groundwater encountered during excavations in accordance with the <i>Technical Guideline – Environmental Management of Construction Site Dewatering</i> (Roads and Maritime, 2011b). 	Contractor	Pre-construction/ construction	Additional safeguard

6.7 Soils and contamination

This section provides a summary of the assessment of potential soil and contamination impacts during construction and operation and identifies measures to address these impacts. It includes a summary of relevant results of the Stage 1 Preliminary Site Investigation report (provided in Appendix I), soils information from the Soils, Surface Water and Groundwater report (provided in Appendix H), and relevant results of the contamination investigation undertaken as part of geotechnical investigations for the concept design.

6.7.1 Methodology

The soils and contamination assessment involved:

- undertaking a Stage 1 Preliminary Site Investigation in general accordance with the *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020) (see Appendix I), which included:
 - reviewing the the NSW EPA’s register of contaminated sites, list of notified sites and environment protection licence records to identify areas of known and potential contamination
 - reviewing publicly-available data, background information relevant to the study area, survey data, aerial photography and topography
 - site visits to ground truth the findings of the desktop assessment
 - developing a preliminary conceptual site model for the proposal to identify potential contamination sources, receptors and exposure pathways
 - providing recommendations for additional investigation where required
- reviewing the results of the preliminary contamination assessment undertaken as part of geotechnical investigations (see below)
- reviewing geology and soil landscape maps relevant to the study area
- identifying the potential to disturb acid sulfate soils and areas of salinity
- identifying safeguards and management measures.

The study area for the contamination and soils assessment included the proposal site and a 150 metre buffer around the site to account for the potential for off-site impacts. Desktop searches for the Preliminary Site Investigation extended a further one kilometre around the proposal site.

The geotechnical investigations undertaken to inform the concept design included a preliminary contamination assessment, which involved:

- obtaining soil samples from 63 boreholes/test/excavator pit locations within and around the proposal site
- analysis of soil samples for contaminants of potential concern, including heavy metals (arsenic, cadmium, chromium, copper, lead, nickel zinc and mercury), benzene, toluene, ethyl-benzene and xylene (BTEX), total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH), pesticides (organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs)), PFAS, and asbestos
- comparing the analytical results to health and environmental screening criteria.

The potential contaminants of concern for analysis were chosen based on the identification of potential contamination sites or sources as part of the Preliminary Site Investigation. As the contamination sampling was undertaken as part of the geotechnical investigations, sampling locations were selected to target key proposal infrastructure, rather than meet the minimum sampling requirements within the *Sampling Design Part 1-Application Contaminated Land Guidelines* (NSW EPA, 2022). This was considered appropriate given the initial purpose was to identify areas of gross contamination within the proposal site and use this to determine if further assessment or remediation is necessary.

Criteria

The assessment criteria (investigation levels) for the preliminary assessment were taken from the following guideline documents published or endorsed by the NSW EPA:

- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) (NEPM) (NEPC, 2013):
 - Health investigation levels – to assess human health risk via all relevant pathways of exposure. The level adopted for the assessment was D – commercial/industrial use, based on likely exposure scenarios during construction and operational use of the majority of the proposal site as a road corridor.
 - Health screening levels – for hydrocarbon vapour intrusion under different land use scenarios. The level adopted for the assessment was D – commercial/industrial use.
 - Health screening levels – for asbestos contamination in soil. The level adopted for the assessment was D – commercial/industrial use.
 - Ecological investigation levels – for a range of metals and organic substances to assess risk to terrestrial ecosystems. The levels adopted for this assessment were for an urban-residential/public open space land use scenario, noting that this is a conservative criteria given the current and proposed land uses as a road corridor, which would limit ecological receptors.
 - Ecological screening levels – for selected hydrocarbon compounds and total recoverable hydrocarbons to assess risk to terrestrial ecosystems. The levels adopted for this assessment were for an urban-residential/public open space land use scenario for coarse-grained soils.
- *CRC Care Technical Report No. 10 – Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater* (Friebel and Nadebaum, 2011): Health screening levels – for direct contact and intrusive maintenance workers for petroleum hydrocarbons.
- PFAS National Environmental Management Plan 2.0 (HEPA, 2020): for PFAS.
- Health screening levels for a commercial/industrial land use scenario.
- Ecological screening levels for indirect exposure, noting this is a conservative criteria given the current and proposed land uses as a road corridor.

6.7.2 Existing environment

Topography

The topography generally slopes gently upwards from about 160 metres Australian Height Datum in the north-west near the Nepean River, to elevations of about 250 metres Australian Height Datum in the south-east.

Geology

The regional geology underlying the proposal site consists of Triassic-aged Ashfield Shale, Mittagong Formation and Hawkesbury Sandstone, belonging to the Wianamatta Group.

The Ashfield Shale is characterised by weathered black to grey shale, mudstone or siltstone with rare sandy lenses. Individual beds are about one to three metres thick and tend to weather to a medium or high plasticity clay soil that is generally moderately reactive. The shale unit is typically covered by a layer of residual clay.

The Mittagong Formation is commonly referred to as ‘the passage beds’ between Ashfield Shale and the underlying Hawkesbury Sandstone. It consists of interbedded quartz sandstone and black siltstone formation and represents the transition from the fluvial/terrestrial environment of the Hawkesbury Sandstone deposition to the marine delta deposition environment of Ashfield Shale.

The Hawkesbury Sandstone is a medium to coarse-grained quartz, with minor shale and laminate lenses deposited by large, braided rivers during the Middle Triassic.

The subsurface conditions observed during the geotechnical investigations were generally consistent with published geological information, with the exception that fill, consisting of clayey sand, sandy clay/clay or sandy gravel, was encountered to depths of up to 1.5 metres below ground level at the majority of investigation locations.

Soil landscapes

The main soil landscapes within and surrounding the proposal site are summarised in Table 6-39 and shown on Figure 6-16.

Table 6-39: Soil landscapes

Soil landscape	Location	Landscape	Characteristics	Limitations
Blacktown (residual landscape)	Predominant soil landscape across the proposal site.	Broad rounded crests and ridges with gently undulating rises on Wianamatta Group shale.	Predominantly shallow to moderately deep (less than one metre deep) red and brown podzolic soil on crests, inclined sloped and well-drained areas. Deeper soils comprise yellow podzolic soils and soloths (soils formed from saline material), within poorly drained areas and lower slopes.	Moderately reactive, highly plastic subsoils and low soil fertility.
Luddenham (erosional landscape)	Small areas to the west and north of the Picton Road and M31 Hume Motorway interchange.	Undulating to rolling low hills on Wianamatta Group shales, comprising narrow ridges, hillcrests and valleys.	Shallow soils comprising brown podzolic soils and massive earthy clays on crests. Moderately deep (between 0.5-1.5 metres deep) soils comprising red podzolic soils on upper slopes and yellow podzolic soils and prairie soils on low slopes and drainage areas.	Highly erosional soil hazard, localised impermeable plastic, moderately reactive subsoils and potential mass movement hazard.
Lucas Heights (residual landscape)	Small areas at the western and southern extents of the proposal site.	Occurs on gently undulating crests, ridges and plateaus surfaces of the Mittagong Formation.	Moderately deep (between 0.5 and 1.5 metres deep) hardsetting yellow podzolic soils and yellow soloths. Yellow earths on outer edges.	Stoniness, hard setting surfaces and low soil fertility

Soil erodibility

Dispersive soils are prone to erosion through dispersion of fine clay molecules, which may then be transmitted through groundwater flow. Internal erosion can result from the flow of fine materials through groundwater, forming pipes or tunnels within the soil. This internal erosion can pose a risk to earthwork embankments by weakening the internal structure and potentially leading to embankment failure. Dispersive soils are also prone to scour erosion resulting from surface run-off.

Geotechnical investigations confirmed that fill, residual soils and weathered materials derived from Ashfield Shale would have moderate to high dispersion potential across the proposal site.

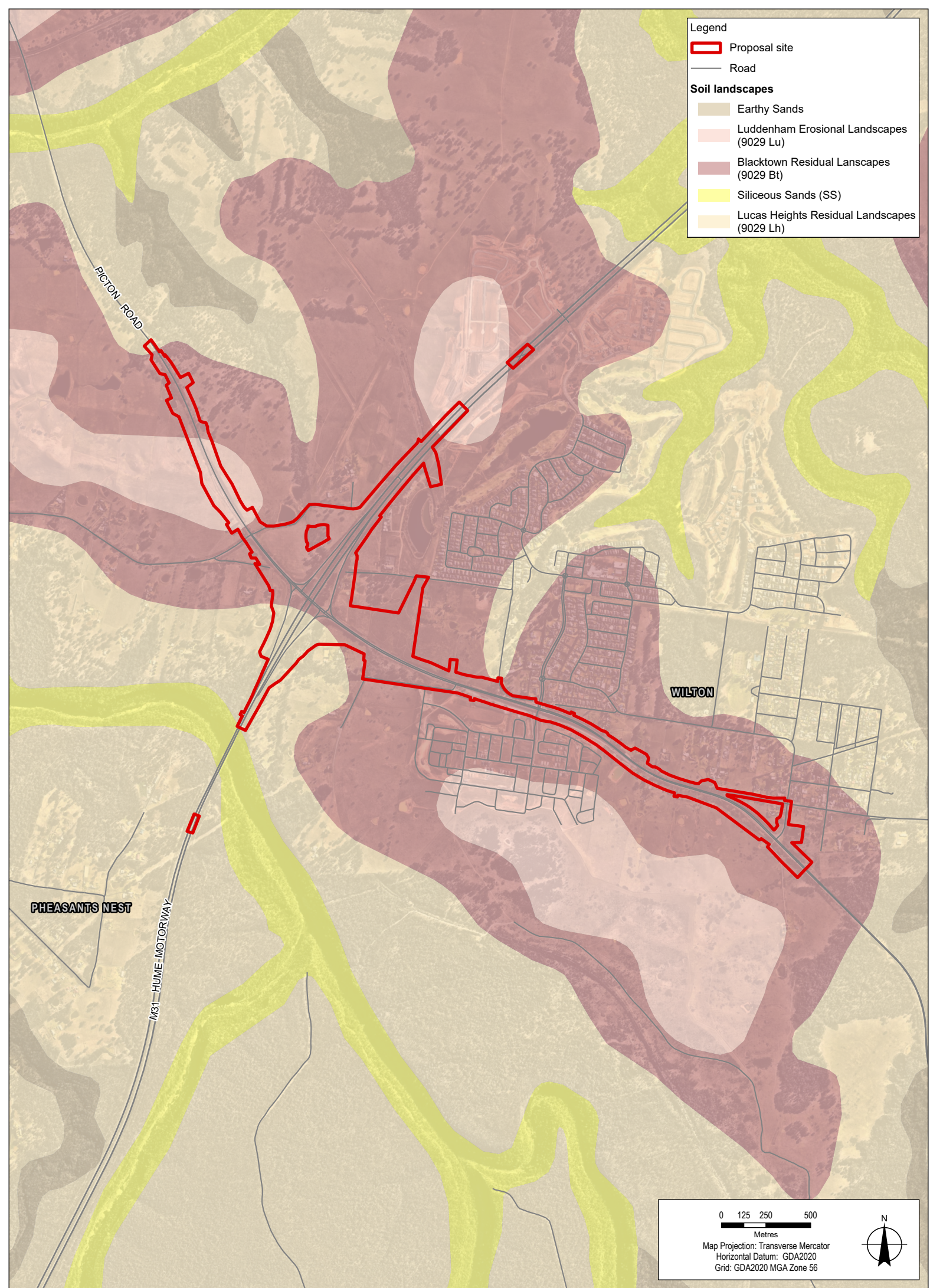


Figure 6-16 - Soil landscapes

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023; DPIE, Soil Landscapes, 2023. Created by:akldea
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12560200_REFX019_SoilLandscapes_A4P. Print date: 25 Oct

Salinity

High salinity soil can reduce or preclude vegetation growth and produce aggressive soil conditions, which may be detrimental to concrete and steel. Impacts may also occur as a result of the erosion and off-site transport of saline sediments, with the potential to impact the receiving environment.

The proposal site is generally classified as having moderate salinity potential. The exception to this is a small area to the north-west of the Picton Road and M31 Hume Motorway interchange, which is mapped as having high salinity potential.

Acid sulfate material

The CSIRO Australian Soil Resource Information System indicates that there is an extremely low probability of occurrence of acid sulfate soils within the proposal site. Therefore, the potential for impacts due to the presence of acid sulfate soils has not been considered further.

There is the potential for acid sulphate rock to be present in the Triassic-aged Ashfield Shale beneath the proposal site in mudstones that contain pyrite. However, acid sulfate rock is only likely to be present within the fresher rock cuts in bedrock and areas above existing groundwater levels, as it is likely that pyrite in weathered rock would have already oxidised.

Contamination

A review of historical aerial photographs identified that the proposal site and surrounds consisted of predominantly cleared rural land until sometime between 1975 and 1990 when Picton Road and the M31 Hume Motorway were constructed. Construction of these roads was associated with residential development, which has increased to the present day, as has supporting infrastructure such as the Wilton Zone substation and the Wilton Recycled Water Treatment Plant. Wilton Airport, located about 50 metres north-west of the proposal site at its closest point, was constructed between 1969 and 1975, but was relocated in 1990 to accommodate construction of the M31 Hume Motorway.

Searches of the NSW EPA's registers identified the following:

- No sites listed on NSW EPA's contaminated land record or NSW EPA's record of notices are located within one kilometre of the proposal site. One site (located about 280 metres south-east of the proposal site) has been notified to the NSW EPA. The site is identified as Condell Park Homestead, located on Fairway Drive in Wilton, and regulation under the *Contaminated Land Management Act 1997* was deemed not required.
- No areas within one kilometre of the proposal site have been investigated as part of the NSW EPA's PFAS investigation program, Defence PFAS investigation program, or Airservices Australia National PFAS management program.
- A review of NSW EPA's environment protection licence records identified seven sites located within one kilometre of the proposal site that currently have, or have previously held environment protection licences. These sites are listed in Table 6-40.

Table 6-40: Sites with current or surrendered environment protection licences

Site name/licence holder	EPL number	Activity	Current	Location in relation to proposal site
Bingara Gorge Onsite Wastewater Scheme- Veolia Water Solutions and Technologies (known as Wilton Recycled Water Treatment Plant)	20335	Sewage treatment processing and small plants	Current	Adjacent to the proposal site
Endeavour Coal – Appin Colliery	2504	Waste disposal by application to land Coal works Mining for coal	Current	Adjacent to the eastern extent

Site name/licence holder	EPL number	Activity	Current	Location in relation to proposal site
Wollondilly Shire Council	4390	Other activities on waterways of Wollondilly Shire Council	Surrendered	Within proposal site
Luhrmann Environment Management Pty Ltd	4653	Other activities – Application of herbicides on waterways throughout NSW	Surrendered	Within proposal site
Robert Orchard	4838	Other activities – Application of herbicides on waterways throughout NSW	Surrendered	Within proposal site
Sydney Weed & Pest Management Pty Ltd	6630	Other activities – Application of herbicides on waterways throughout NSW	Surrendered	Within proposal site
Sydney Water Corporation	20327	Sewage treatment processing by small plants	Surrendered	Within proposal site

Samples collected as part of the preliminary contamination assessment found no visual or olfactory evidence of contamination in any of the boreholes, test pits or excavator pits.

All samples had laboratory results either below the laboratory limit of reporting or below the nominated human health criteria. A number of samples reported results above the nominated ecological criteria for copper, nickel, zinc and TRH. No asbestos was identified in any of the soil samples collected and submitted for asbestos analysis.

Based on the findings of the desktop review, site inspections and preliminary contamination assessment, no evidence of gross or widespread contamination was identified within soils in the proposal site. However, contamination sampling did not specifically target or fully assess the identified areas of environmental concern. Based on the findings of the desktop review, site inspections and preliminary contamination assessment, a number of existing land uses or sites within or near the proposal site have been identified as having a risk of contamination and have been deemed to be areas of environmental concern. These areas of environmental concern are listed in Table 6-41 together with their likelihood of occurrence and their likely depth and extent, based on experience with similar sites and the results of the preliminary investigations undertaken.

Figure 6-17 shows those areas of environmental concern with a likelihood of contamination occurrence of moderate and above.

Table 6-41: Areas of environmental concern

Area of environmental concern (AEC)	Potential contaminants present	Likelihood of contamination occurrence	Likely depth and extent of potential contamination
On site AEC 1: Fill of unknown quality and origin	Heavy metals, hydrocarbons (TRH, BTEX, PAH), polychlorinated biphenyl (PCBs), asbestos, OCPs/, OPPs	High: fly tipping has occurred, illegal filling using waste or use of recycled products Moderate to high: areas of historical ground disturbance which have been filled. Very low: for excavated natural materials, reworked natural materials and imported quarry product.	The depth of contamination will be governed by fill thickness. In the case of stockpiles, if contamination is present within the stockpile, then near surface soils could be impacted. Given the depth to groundwater within and adjacent to the proposal site, impacts on groundwater are unlikely. If contaminated fill is used to fill low lying areas, ephemeral watercourse or drainage lines, surface water impacts are possible.

Area of environmental concern (AEC)	Potential contaminants present	Likelihood of contamination occurrence	Likely depth and extent of potential contamination
<p>On site AEC 2: Filling and possible disposal of waste material in farm dams, trenches and burial of dead livestock</p>	<p>Heavy metals, hydrocarbons (TRH, BTEX, PAH), nutrients, pathogens and asbestos</p>	<p>Moderate to high</p>	<p>Contamination would typically be present within the fill materials used to fill the dam and possibly dam sediments from runoff from upslope areas. Contamination associated with livestock burial areas would be localised. Soil and groundwater could be potentially impacted if contamination was present. The depth of soil impact will be governed by the depth of dam or burial pit.</p>
<p>On site AEC 3: Hazardous building or infrastructure materials from previous or proposed demolition of structures within the proposal site</p>	<p>Heavy metals and asbestos</p>	<p>High</p>	<p>Aerial photographs identified structures present within the proposal site and adjoining areas since the late 1940s. Given the age of some of these structures the use of hazardous building materials, such as asbestos and lead based paints, cannot be precluded. Additionally, the Stage 1 Preliminary Site Investigation noted that the results of a hazardous substance paints analysis conducted on behalf of Transport indicated that the paint system for the Picton Road overbridge contained lead and zinc chromate. Contamination, if present, is likely to occur in shallow soils and be localised. Based on experience with similar projects and the findings of the paints analysis, the likelihood of contamination is assessed as high.</p>
<p>On site AEC 4: Application and storage of pesticides and other small quantities of chemicals</p>	<p>OCPs/OPPs, heavy metals (particularly arsenic)</p>	<p>Low</p>	<p>Contamination, if present, is expected to be localised to areas in the vicinity of former or existing structures and road verges, or where pesticides/herbicides were applied to crop growing areas. Impacts are likely to affect shallow soils. Pesticides can be water soluble and potentially migrate to surface water bodies such as creeks and dams. The likelihood of contamination is low, as pesticides are likely to have degraded and heavy metals potentially associated with older pesticides are not expected to occur at concentrations that would exceed nominated criteria.</p>
<p>On site AEC 5: Sediment quality within farm dams</p>	<p>OCPs/OPPs, heavy metals (particularly arsenic)</p>	<p>Low to moderate</p>	<p>Contamination, if present, is more likely to exist in sediment, and as such would be limited in extent; however, impacts on surface water quality cannot be precluded.</p>

Area of environmental concern (AEC)	Potential contaminants present	Likelihood of contamination occurrence	Likely depth and extent of potential contamination
On site AEC 6: Mining activities	Methane, carbon dioxide	Very low	Contamination, if present, would occur in the vicinity of the gas / exploration wells if not sealed correctly. It is possible that coal seam gas could occur via preferential pathways between the coal seam and the surface such as through rock defects; however, there has been no reports of gas intrusion in the Wilton area.
Off site AEC 7: Shell service station and workshop	Hydrocarbons (TRH, BTEX, PAH and volatile halogenated carbons (VHCs)), heavy metals	Very low	Contamination, if present, can exist at near surface and at depth, potentially impacting soil and groundwater and may cause a vapour intrusion risk. The proposal site is hydraulically upgradient and about 250 metres from the source site. As a result, on-site migration of petroleum hydrocarbons is considered unlikely
Off site AEC 8: Wilton Recycled Water Treatment Plant	Heavy metals, hydrocarbons (TRH, PAH), OCPs/OPPs, PFAS, nutrients, pathogens	Moderate to high: on-site migration via groundwater for potential PFAS impacts due to close proximity to the proposal site. Low: On-site migration via groundwater of other less mobile contaminants Very low: on-site migration of soil and surface water impacts.	PFAS, if present and at significant concentrations, can migrate several hundreds of metres via groundwater. Soil impacts may occur in the vicinity of the treatment ponds, septic tanks, soak away trenches and other treatment infrastructure, impacting nearby soil surrounding and below the ponds, in soak away trenches and below ground infrastructure. Impacts on on-site surface water bodies are unlikely as storage ponds and treatment areas are downgradient and surface water runoff is likely to flow away from the proposal site
Off site AEC 9: Wilton Zone substation	Hydrocarbons (TRH, PAH)	Very low	If contamination were present at the substation it is expected to be localised and near surface, and given the distance to the proposal site, it is considered unlikely to impact the site.
Off site AEC 10: Wilton Airport (including airstrip)	PFAS, hydrocarbons (TRH, BTEX, PAHs, VHCs)	Very low	If PFAS has been used, impacts can occur in the vicinity and downgradient of areas where applied impacting soil, groundwater and surface water. For petroleum hydrocarbons, impacts can occur in soil at near surface and at depth, depending on the source of impacts. The likelihood is very low as the likely source of contamination (if present) is inferred to be hydraulically downgradient of the proposal site.

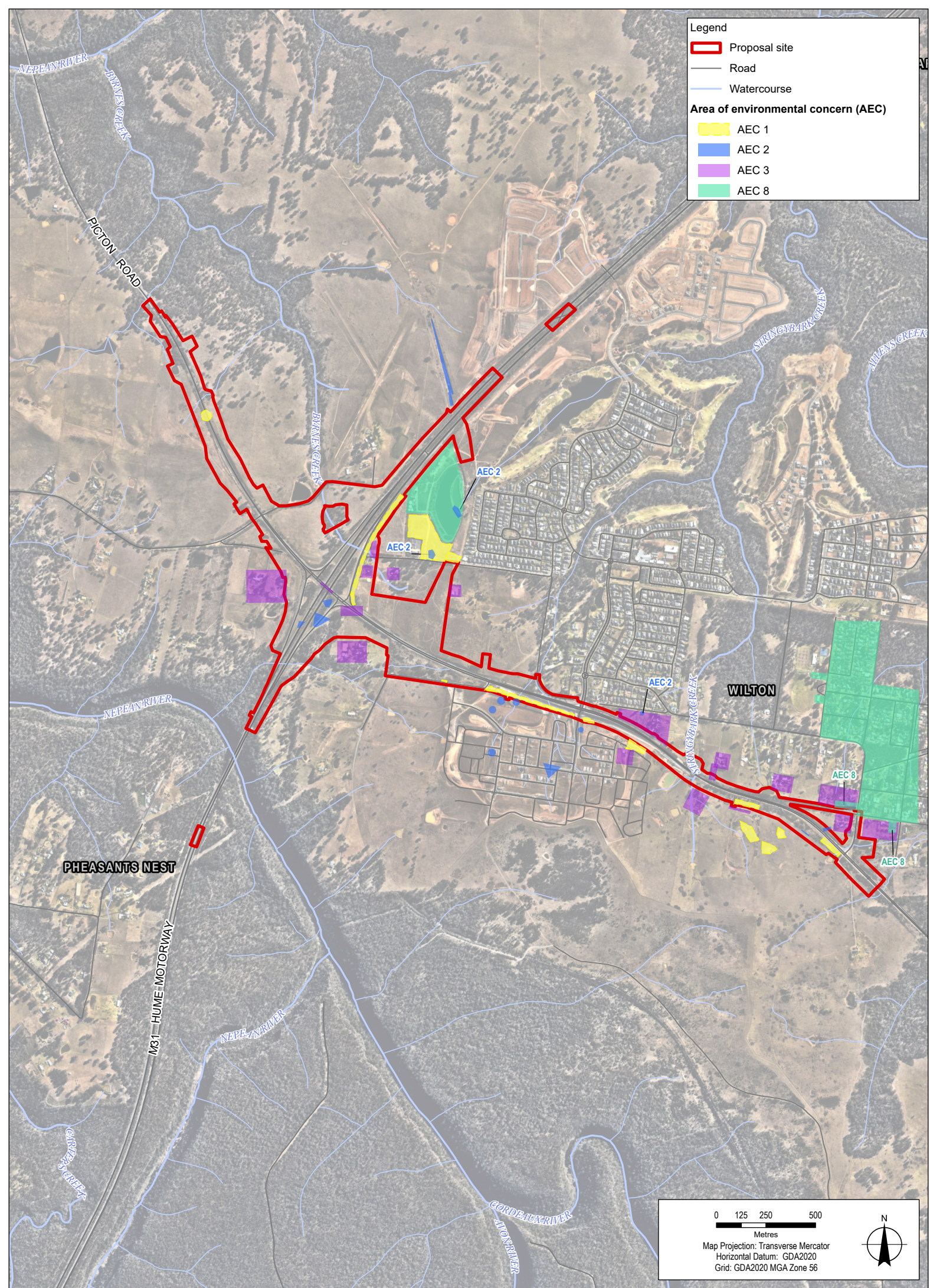


Figure 6-17 - Areas of environmental concern (likelihood of moderate or above contamination occurrence)

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023; DPIE, Soil Landscapes, 2023. Created by:akidea
 N:\AU\Wollongong\Projects\23112560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX025_AreasOfEnvironmentalConcern_A4P. Print date: 25 Oct

6.7.3 Potential impacts

Construction

Erosion and sedimentation

Construction would temporarily expose the natural ground surface and sub-surface through the removal of vegetation, overlying structures (such as areas of existing road and the existing Picton Road bridge) and excavation. The exposure of soil to runoff and wind can increase soil erosion potential, particularly where construction activities are undertaken in soil landscapes characterised by dispersive soils, given their susceptibility to erosion. As noted in section 6.7.2 dispersive soils are potentially present within the majority of the proposal site.

The potential for erosion impacts would be minimised by implementing standard best-practice soil erosion management measures during construction (see sections 6.6.4 and 6.7.4). Additionally, temporary soil stabilisation may be required immediately following construction to prevent potential erosion, topsoil loss or soil migration. This is particularly likely to be required following severe storms. The rehabilitation of disturbed areas will be undertaken progressively as construction stages are completed.

Salinity

Excavation would be undertaken in areas with moderate or high salinity hazard (see section 6.7.2). In addition, construction may disturb soils in areas with unidentified salinity potential.

The potential for impacts due to the presence of saline soils is considered to be low. Any potential impacts would be temporary and managed by implementing standard best-practice erosion and sediment control measures. Soils associated with areas of high salinity potential would be considered during detailed design. Management measures would be developed and implemented as appropriate to minimise impacts associated with salinity.

Acid sulfate material

As noted in section 6.7.2, there is the potential for sulfide-bearing strata (acid sulfate rock) to underly the proposal site. However, this is only an issue if this strata becomes exposed to oxygen (such as within deep cuttings), providing the opportunity for oxidation of sulfate minerals. No excavation or cuttings within bedrock are proposed; therefore, there would be no potential for the exposure to oxygen of acid sulfate rock during construction.

Contamination

As described in section 6.7.2, potentially contaminating land uses are present along and in the vicinity of the proposal site. Exposure or disturbance of contaminants may have the following potential for impacts:

- direct contact and/or inhalation by site workers, users and visitors
- impacts on surrounding environmental receivers (including surrounding ecosystems and flora and fauna, where present)
- mobilisation and migration of surface and subsurface contaminants via leaching, runoff and/or subsurface flow, impacting nearby soils, surface water, and groundwater.

The findings of the desktop assessment and preliminary soil and contamination assessment indicates that generally, where there is the potential for contamination to be present, it would likely be localised or diffuse. As noted in section 6.7.2, no evidence of contamination was reported in soil samples collected as part of the preliminary contamination assessment. Therefore, there is considered to be a low potential for gross contamination within the proposal site. However, the locations of the soil sampling undertaken as part of the preliminary assessment were chosen due to geotechnical investigation requirements, not to specifically target areas of environmental concern.

Hazardous materials, such as asbestos containing material and hazardous metallic paint, would be encountered during the removal of existing structures and utilities (including the existing Picton Road bridge).

Unexpected soil contamination could also be encountered, the evidence of which could include:

- unexpected staining or odours
- potential asbestos containing materials
- unexpected underground storage tanks, buried drums or machinery, etc.

The potential for impacts due to the potential disturbance of contamination would be minimised by implementing the safeguards and management measures in section 6.7.4.

The proposal site provides for the ability to manage potential contaminated material on site in dedicated and contained encapsulation within the formation if required. Encapsulation would be undertaken in accordance with the relevant legislation, regulations, codes of practice and endorsed guidelines, and appropriate measures would be included in the Contaminated Land Management Plan (see section 6.7.4) and implemented during construction.

Construction has the potential to result in the contamination of soil and groundwater due to spills and leaks of fuel, oils and other hazardous materials or from the leaching of tannins from stockpiled vegetation. In addition, there is the potential to introduce contamination to the proposal site through the acceptance of imported fill that has not been properly verified. The risk of these potential impacts occurring would be minimal with the implementation of the safeguards and management measures provided in section 6.7.4.

Operation

Soils

There is potential for recently disturbed soils to be susceptible to erosion, particularly during initial operational periods after landscaping and re-establishment of vegetation. This may occur in areas where planting is proposed, including adjacent to disturbed areas, along batters and in the reinstatement of land occupied by temporary ancillary facilities where topsoil is settling and vegetation is establishing.

Operation is not likely to result in any significant impacts on soils, topography or geology. The risk of soil erosion during operation would be minimal, as all areas impacted during construction would be sealed or rehabilitated and landscaped to prevent soil erosion. Maintenance activities involving ground disturbance would be undertaken in accordance with Transport's standard operating procedures.

As noted in section 6.7.2 the presence of dispersive soils can cause internal erosion to earthwork embankments and can affect the structural integrity of the soils and foundations. The design has considered the potential for embankments constructed as part of the proposal to contain dispersive soils and suitable treatment measures would be incorporated in detailed design. Additionally, the reuse of dispersive soils within the proposal site would only occur if suitable treatment and management is possible, otherwise imported fill would be used.

Contamination

Operation has the potential to contaminate soil and groundwater from leaks and spills of fuel, oils and other hazardous materials during maintenance activities. However, the risk of this potential impact is considered to be low, given the likely scale and duration of maintenance activities. Additionally, as noted in section 6.6.3, the proposed water quality treatment devices would cater for spill containment of a minimum volume of 30,000 litres. This potential impact would be minimised by implementing Transport's existing procedures to handle dangerous goods and hazardous materials and manage spills.

6.7.4 Safeguards and management measures

The measures described in Table 6-42 will be implemented, in conjunction with other measures outlined in chapter 7, to avoid, minimise and manage potential soil and contamination impacts. Further measures to manage the potential impacts associated with erosion and sedimentation are provided in section 6.6.4.

Table 6-42: Soils and contamination safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil erosion and sedimentation	During any construction and maintenance work where soils are exposed, sediment and erosion control devices will be installed in accordance with the CSWMP, <i>Managing Urban Stormwater: Soils and Construction</i> , Volume 1 and 2d (Landcom, 2004) and the Urban Design and Landscaping Plan.	Contractor	Construction/operation	Additional safeguard
Contaminated land	A detailed site investigation (DSI) will be undertaken during detailed design to further assess risks to human health and the environment. The DSI will involve, but not be limited to, the assessment of areas of environmental concern within the proposal site where the likelihood of contamination is moderate to high or high, and hazardous materials associated with bridge demolition and existing infrastructure. The results of the DSI will be assessed against the criteria contained with the <i>National Environment Protection (Assessment of Site Contamination) Measure 1999</i> (NEPC, 2013) to determine the need for any remediation.	Contractor	Detailed design	Additional safeguard
	If contaminated land is found within the proposal site, a Contaminated Land Management Plan (CLMP) will be prepared in accordance with the <i>Guideline for the Management of Contamination</i> (Transport for NSW, 2013) and implemented as part of the CEMP. The plan will include, but not be limited to: <ul style="list-style-type: none"> management of the remediation and subsequent validation of any contaminated land, including any certification required measures to ensure the safety of site personnel and local communities during construction 	Contractor	Detailed design/pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> procedures for managing contamination on site, including unexpected contamination finds (an unexpected finds procedure). The procedure will be incorporated into the CEMP and will outline the process for identification, assessment and management of potentially contaminated material measures that address additional recommendations resulting from the DSI a plan for encapsulating suitable contaminated materials within the formation of road embankments, below pavement levels and above groundwater levels. 			
Removal of infrastructure containing hazardous materials	Prior to disturbing to existing infrastructure potentially containing hazardous material, a hazardous material survey will be undertaken. If hazardous material is identified, it will be managed in accordance with CEMP, CLMP and WMP. The contractor must engage an appropriate licensed hygienist during activities involving hazardous materials to assist with classification and management of materials on site.	Contractor	Detailed design/ pre-construction/ construction	Additional safeguard
Accidental spills	A site-specific emergency spill management plan will be developed and include spill-management measures in accordance with Transport for NSW's <i>Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and NSW EPA). The site-specific emergency spill plan will also identify when notification to WaterNSW is required, in accordance with safeguard GEN7.	Contractor	Detailed design/ pre-construction	Section 4.3 of QA G36 <i>Environment Protection</i> Additional safeguard
Contaminated material	If encapsulation of contaminated material within the formation occurs, a separate operations management plan will be developed.	Transport/ contractor	Construction	Additional safeguard

6.8 Noise and vibration

This section summarises the results of the Noise and Vibration Impact Assessment report prepared as an input to the REF. The full report is provided in Appendix J.

6.8.1 Methodology

The noise and vibration assessment has been undertaken in accordance with the guidelines outlined in Table 6-43.

Table 6-43: Relevant assessment guidelines

Assessment	Guideline
Construction noise	<ul style="list-style-type: none"> • <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2022k) (CNVG)¹ • <i>Interim Construction Noise Guideline</i> (DECC, 2009) (ICNG)
Construction vibration	<ul style="list-style-type: none"> • <i>Assessing Vibration: a technical guideline</i> (DEC, 2006) (AVTG) • <i>BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2</i> (British Standards, 1993) (BS7385) • <i>DIN 4150-3:2016 Vibration in Buildings – Part 3: Effects on structures</i> (German Standards, 2016) (DIN 4150-3)
Construction blasting	<ul style="list-style-type: none"> • <i>Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration</i> (ANZECC, 1990)
Operational road traffic noise	<ul style="list-style-type: none"> • <i>NSW Road Noise Policy</i> (DECCW, 2011) (RNP) • <i>Road Noise Criteria Guideline</i> (Transport for NSW, 2022l) (RNCG)¹ • <i>Road Noise Mitigation Guideline</i> (Transport for NSW, 2022m) (RNMG)¹ • <i>At-receiver Road Noise Treatment Guideline</i> (Transport for NSW, 2022n) (ARNTG)¹ • <i>Noise Model Validation Guideline</i> (Transport for NSW, 2022) (NMVG)

Note: 1. Recent updates have been made to a number of Transport's guidelines. The assessment has been completed in accordance with the guidelines and versions listed in the table; however, any future assessments would be undertaken in accordance with the latest versions of the indicated guidelines.

The noise and vibration assessment also considered other relevant standards and guidelines, including those for industrial noise, future residential receivers near road corridors as part of approved development applications, and the management of construction noise and vibration.

The methodology for the noise and vibration assessment included the following key tasks:

- identifying the noise and vibration assessment study areas (described below) and sensitive receivers, including existing development, approved future development, and proposed future land uses
- measuring the existing noise levels over a period of 14 days at seven noise monitoring locations in October 2022 (see Figure 6-18), and carrying out concurrent traffic counts to calibrate the existing road traffic noise model
- grouping sensitive receivers that are located similar distances from noise generating activities into seven noise catchment areas (NCAs) (see Figure 6-18) and describing the existing noise environment for each NCA defining relevant criteria to assess noise and vibration impacts based on relevant guidelines, standards and results from the noise monitoring (see Table 6-43)
- identifying indicative construction scenarios and representative plant and equipment for each scenario
- assessing predicted construction noise levels using SoundPLAN modelling software (as described below)
- calculating and assessing construction vibration using source vibration levels and minimum working distances in accordance with relevant guidelines
- assessing potential blasting activities in terms of airblast overpressure and ground vibration

- assessing predicted operational road traffic noise levels using SoundPLAN modelling software in accordance with the RNP
- identifying measures to avoid, minimise, mitigate and manage identified impacts.

The construction noise and vibration study area for the noise and vibration assessment was identified as including areas located within 600 metres of the proposal site.

The operational noise and vibration study area for the noise and vibration assessment was identified in accordance with the guidance provided by the RNP and RNCG. The RNP defines the operational noise and vibration study area as '600m from the centre line of the outermost traffic lane on each side of the subject road'.

To assist in determining noise criteria for noise sensitive receivers potentially impacted by the proposal, seven NCAs have been identified within the construction noise and vibration study area. The noise environment within each NCA is considered to be comparable for each receiver. The construction and operational noise and vibration study areas for the assessment and NCA locations are shown in Figure 6-18.

A detailed description of the assessment methodology is provided in section 3 of Appendix J.

Construction noise assessment

Construction noise was modelled within the construction noise and vibration study area to understand potential impacts on existing properties and approved developments (referenced as future residential receivers in this section) that would represent future sensitive receivers in accordance with the ICNG and the CNVG using the SoundPLAN modelling software version 8.2.

The construction working hours used for the noise and vibration assessment are summarised in Table 6-44.

Table 6-44: Construction hours

Activity	Working hours		
	Monday to Friday	Saturday	Sunday and public holidays
Standard construction	7am to 6pm	8am to 1pm	No work
Construction activities that involve impulsive or tonal noise emissions	8am to 5pm	9am to 1pm	No work
Construction activities that involve blasting	9am to 5pm	9am to 1pm	No work
Out-of-hours work	6pm to 10pm (evening) 10pm to 7am (night)	7am to 8am (day) 1pm to 6pm (day) 6pm to 7am (night)	8am to 6pm (day) 6pm to 7am (night)

To assess the potential impacts of construction noise, indicative construction scenarios, equipment and plant that could be used were identified. This information was used to model maximum construction noise levels that may be experienced at each sensitive receiver for each stage of construction. Ground topography, ground absorption and reflection, receivers and construction noise sources were included in the noise model. The two noise walls shown on Figure 6-18 were also assumed to be present during construction of the proposal.

A total of 17 indicative construction scenarios (CS) were developed for the purposes of the impact assessment and assessed for the proposed working hours. The construction scenarios were organised by activity groups (AG) as outlined in Table 6-45.

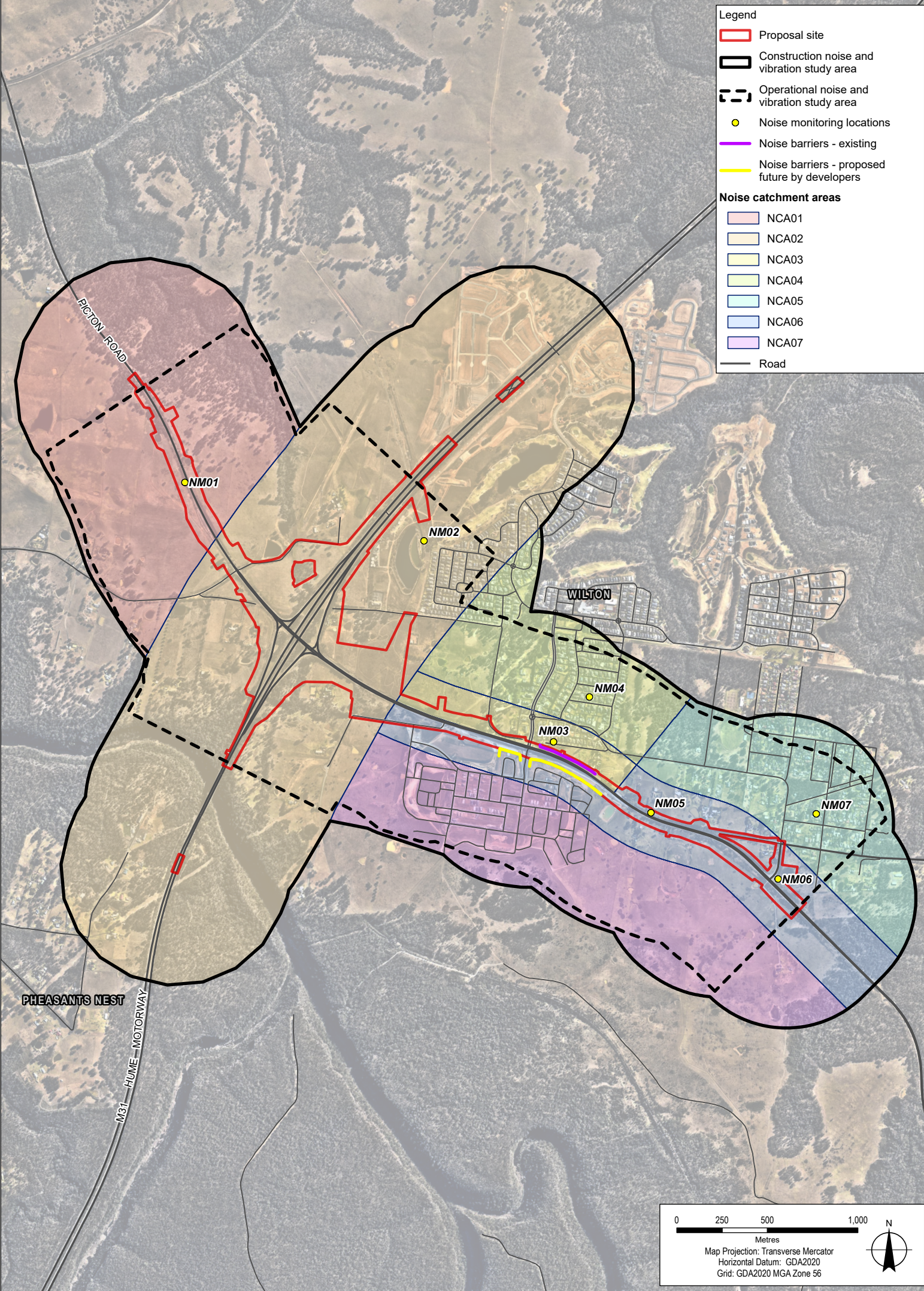


Figure 6-18 - Noise and vibration study area and noise catchment areas

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023. Created by: akidea
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 12560200_REFNV001_NVStudyArea_Catchments_A4P. Print date: 25 Oct

Table 6-45: Construction scenarios and activity groups

Activity group (AG)	Construction scenario ID	Description of activities	Working hours	
			Standard construction	Out-of-hours works
AG1: Site establishment and earthworks	CS01	Site establishment	✓	✓
	CS02	Vegetation clearing, installation of erosion and sedimentation controls	✓	✓
	CS03	Property adjustments and removal of existing infrastructure	✓	✓
	CS04	Earthworks, clearing and topsoil stripping	✓	✓
AG2: Utilities and drainage	CS05	Utilities relocation, traffic control system installations	✓	✓
	CS06	Drainage works	✓	✓
AG3: Bridge works	CS07	Bridge works – drainage and structures construction	✓	✓
	CS08	Bridge works – substructure works	✓	✓
	CS09	Bridge works – Pavement and superstructure works	✓	✓
AG4: Bridge demolition and pavement works	CS10	Demolition of existing bridge	✓	✓
	CS11	Pavement works	✓	✓
AG5: Finishing works	CS12	Pavement marking	✓	✓
	CS13	Roadside furniture installations	✓	✓
CC: Ancillary facilities (construction compounds)	CS14	Haul route turning bay and crossovers	✓	✓
	CS15	Compound 1	✓	✓
	CS16	Compound 2	✓	✓
	CS17	Laydown, materials storage	✓	✓

These indicative construction scenarios represent one possible way that the proposal could be constructed and may not necessarily be the same methodology proposed by the contractor that would be engaged in the future to construct the proposal. The final construction methodology (including the full plant and equipment list) and the expected construction noise levels would be confirmed during detailed design and pre-construction planning.

The assessment considered potential noise impacts resulting from work during standard working hours (as recommended in the ICNG) as well as out-of-hours works for all scenarios.

Further details on the indicative construction scenarios and plant and equipment anticipated to be used is provided in sections 3.2.2 and 3.2.3 of Appendix J.

Plant and equipment for each scenario were assumed to be operating simultaneously using typical sound power levels for the equipment. This provides a 'worst-case' assessment scenario as it is unlikely that all construction equipment would be operating at any one time. The assessment also assumes that works are located at the nearest location between the construction area and each receiver as shown in Figure 6-19. This approach has been used to identify where noise impacts could be a concern and to determine appropriate mitigation measures to be implemented. For the majority of the time, noise levels would be lower than those presented in the noise modelling predictions in section 6.8.4.



Figure 6-19: Worst-case noise levels for the construction footprint

Operational noise assessment

A noise model of the operational noise and vibration study area has been used to predict noise levels from the operation of the proposal to surrounding receivers using SoundPLAN. Various inputs and parameters were applied to the model including local terrain, surrounding buildings, typical vehicle speeds, traffic volumes, vehicle types and road surfaces. Modelling was undertaken for the following assessment scenarios:

- existing road traffic noise levels (2022), with the model validated by the noise monitoring and road traffic surveys conducted during 2022
- future road traffic noise levels for the planned year of opening (2031) and future design year (2041).

Two future road traffic noise level scenarios were assessed for each modelled year, with one assessing the road traffic noise in the modelled years without the proposal (no build) and one with the proposal (build). Modelling these two scenarios in each of the future years and comparing these results for road traffic noise levels allows for the identification of the noise contribution from the proposal.

6.8.2 Existing environment

Sensitive receivers

For the purposes of the assessment, receivers sensitive to noise and vibration have been categorised as

- residential
- non-residential (including commercial, industrial, recreation and places of worship).

Identified sensitive receivers include future residential receivers located within the approved development applications (DAs) for Stage 1 of the Wilton Greens development (located in the South East Wilton precinct – see section 6.11.3) for which development is currently underway. The majority of NCAs consist of residential receivers however NCAs 02 and 05 both contain seven non-residential receivers each. A detailed description of NCAs and sensitive receivers identified is provided in section 3.1.4 and section 4.1 of Appendix J respectively.

Existing noise walls

The proposal site includes a number of existing and proposed noise walls as follows and shown in Figure 6-18:

- existing 3.6 metre high noise wall located east of Pembroke Parade along the northern side of Picton Road
- two future planned 3.6 metres high noise walls to be installed by the developer of Stage 1 of the Wilton Greens development along the southern side of Picton Road either side of Greenway Parade.

Existing noise levels

The existing noise environment is dominated by road traffic noise from vehicles travelling along Picton Road and the M31 Hume Motorway. Noise from local roads and natural sounds such as wind, birds and insects, also contributes to the existing noise environment. Existing noise levels are represented in the model as Rating Background Levels (RBLs) based on the quietest time of the day measured during the noise monitoring surveys, and are measured in A-weighted decibels (dBA). Figure 6-20 provides a comparison of noise levels from common activities and items.

A summary of the monitoring results is provided in Table 6-46 and includes the following:

- RBLs – noise level which is exceeded 90 per cent of the time and is used to establish the construction noise management levels
- Ambient noise levels – the typical noise level of the locality
- Road traffic noise levels – noise levels from existing traffic which is used to assess the changes in road traffic noise levels in accordance with the RNP.

RBLs ranged between 33 dBA (NM04) and 52 dBA (NM05) during the day, which represents the noisiest period for all NCAs, and between 28 dBA (NM04) and 44 dBA (NM06) during the night, which represents the quietest period for all NCAs.

Table 6-46: Summary of noise monitoring results

Monitoring location	Rating background levels (RBL), dBA			Ambient noise levels, dBA			Road traffic noise levels (free field), dBA		Road traffic noise levels (façade corrected), dBA	
	Day ¹	Evening ¹	Night ¹	Day ¹	Evening ¹	Night ¹	Day ²	Night ²	Day ²	Night ²
NM01	45	43	37	64	60	60	64	61	67	63
NM02	43	42	42	52	53	49	53	50	56	52
NM03	48	41	34	56	52	52	56	52	58	54
NM04	33	32	28	54	45	41	53	40	56	43
NM05	52	42	34	65	61	61	65	62	68	64
NM06	51	51	44	65	63	63	65	63	68	66
NM07	37	32	30	53	54	48	53	49	56	51

Notes: 1. Time of day is defined in the *Noise Policy for Industry* (EPA, 2017) as follows: Day – 7am to 6pm Monday to Saturday or 8am-6pm on Sundays and public holidays, Evening – 6pm-10pm, Night – the remaining periods.
2. Time periods are based on the RNP as follows: Day - 7am-10pm, Night – 10pm to 7am.

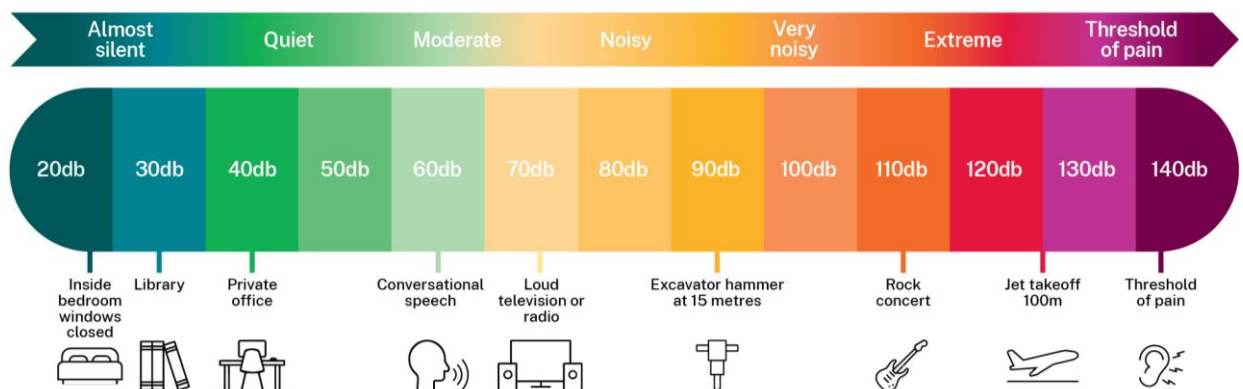


Figure 6-20: Noise level comparisons

6.8.3 Criteria

A summary of the key criteria used to undertake the noise and vibration assessment is provided in this section. Further information on the criteria is provided in sections 5.1 and 6.1 of Appendix J.

Construction noise

Construction noise management levels

The ICNG contains procedures for determining proposal-specific noise management levels for sensitive receivers. Noise management levels are set with reference to the time of day and the RBL (see Table 6-46), and apply at the property boundary most exposed to the construction noise.

The proposal-specific noise management levels for residential and non-residential receivers are shown in Table 6-47 and Table 6-48 respectively. The noise management levels for non-residential receivers only apply when the facilities are in use.

The ICNG states that where construction noise levels are predicted to be above 75 dBA at residential receivers during recommended standard working hours, they are considered 'highly noise affected' and require additional consideration in terms of noise mitigation and management measures.

Table 6-47: Construction noise management levels at residential receivers

NCA	Noise management level, dBA ($L_{Aeq(15min)}$)				
	ICNG recommended standard working hours		Out-of-hours works		
	Noise affected (RBL + 10 dB)	Highly noise affected (≥ 75 dB)	Day (RBL + 5 dB)	Evening (RBL + 5 dB)	Night (RBL + 5 dB)
NCA01	55	75	50	48	42
NCA02	53	75	48	47	47
NCA03	58	75	53	46	39
NCA04	45	75	40	37	35
NCA05	47	75	42	37	35
NCA06	62	75	57	47	39
NCA07	45	75	40	37	35

Table 6-48: Construction noise management levels at non-residential receivers

Type of occupancy/activity	Noise management level, dBA ($L_{Aeq(15min)}$)	
	Internal	External
Commercial	-	70
Industrial	-	75
Places of worship	45	55 ¹
Passive recreation	-	45

Note: 1. External noise levels have been determined by assuming a 10 dBA reduction through a partially open window.

Sleep disturbance

The ICNG recommends an assessment of sleep disturbance where construction work is planned to extend over more than two consecutive nights. The RNP contains a review of research into sleep disturbance which represents NSW EPA advice on the subject of sleep disturbance due to noise events. It concludes that, on the basis of a review of research to date, '*maximum internal noise levels below 50 to 55 dBA are unlikely to cause awakening reactions*'. On the basis that a partially open window typically provides around 10 dB in noise attenuation from outside to inside, external noise levels of 60 to 65 dBA are therefore unlikely to result in awakening reactions. A sleep disturbance criteria for residential receivers of 65 dBA was used in accordance with the CNVG for all receivers.

Construction traffic noise

To assess the potential noise impact of construction traffic in accordance with the RNP, an initial screening test has been carried out by evaluating whether existing road traffic noise levels would increase by more than 2.0 dBA with respect to the no-build scenario for the design year. Where the predicted noise increase is 2.0 dBA or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2.0 dBA, and the predicted road traffic noise level exceeds the road category specific criterion in the RNP (see Table 6-50), then noise mitigation should be considered for those receivers affected. The RNP does not require assessment of noise impact to commercial or industrial receivers.

Construction vibration

Construction vibration impacts have been assessed using the CNVG minimum working distances for human comfort and structural/cosmetic damage, as described below. Minimum working distances within which these types of potential impacts would need to be assessed and mitigated are provided in Table 6-49.

Human comfort

People can sometimes perceive vibration impacts when vibration generating construction work is located close to occupied areas and buildings. *Assessing Vibration: a technical guideline* (DECC, 2006) was used to determine the criteria for intermittent vibration based on the Vibration Dose Value.

In general, vibration criteria for human comfort are more stringent than vibration criteria for structural damage. Building occupants will normally feel vibration readily at levels well below those that may cause a risk of cosmetic or structural damage. However, it may not always be practical to achieve the human comfort criteria.

Cosmetic damage

If vibration from construction works is sufficiently high, it can cause cosmetic damage to structural elements of affected buildings. Industry standard cosmetic damage vibration limits are specified in British Standard *BS 7385:1993 Evaluation and measurement for vibration in buildings - Part 2* (British Standards, 1993) (BS 7385) and *DIN 4150-3:2016 Vibration in Buildings - Part 3: Effects on structures* (German Standards, 2016) (DIN 4150). DIN 4150 states that buildings exposed to higher levels of vibration than the recommended limits would not necessarily result in damage.

Heritage listed buildings and structures should be considered on a case-by-case basis. As noted in BS 7385 they should not be assumed to be more sensitive to vibration, unless structurally unsound. Where a heritage building is deemed to be sensitive, the more stringent DIN 4150 Group 3 guideline value of 2.5 millimetres per second can be applied. The Upper Canal would have a separate limit of three millimetres per second as defined in *Guideline for Development Adjacent to the Upper Canal and Warragamba Pipelines*.

There are no vibration limits and limited research available to quantitatively assess potential construction vibration impacts on trees with heritage significance.

Minimum working distances for vibration intensive work

Minimum working distances for typical vibration intensive construction equipment are provided in the CNVG and are summarised in Table 6-49. Where works are further away from receivers than the quoted minimum distances, then impacts are not considered likely. For the purposes of this assessment, a vibratory roller greater than 18 tonnes (**bolded** in Table 6-49) was used as it has the largest minimum working distance and therefore represents a worst-case approach.

Table 6-49: Construction vibration minimum working distances

Plant	Approximate size	Minimum working distances (metres)		
		Cosmetic damage (BS 7385) Light-framed structures	Cosmetic damage (DIN4150) Heritage and other sensitive structures	Human comfort (EPA's vibration guideline)
Vibratory roller	1-2 tonnes	5	14	15 to 20
	2-4 tonnes	6	16	20
	4-6 tonnes	12	33	40
	7-13 tonnes	15	41	100
	13-18 tonnes	20	54	100
	> 18 tonnes	25	68	100
Small hydraulic hammer	300 kg – 5 to 12 tonne excavator	2	5	7
Medium hydraulic hammer	900 kg – 12 to 18 tonne excavator	7	19	23
Large hydraulic hammer	1600 kg – 18 to 34 tonne excavator	22	60	73
Vibratory pile driver	Sheet piles	2 m to 20 m	50	20
Piling rig – bored	≤ 800 mm	2 m (nominal)	5	4
Jackhammer	Handheld	1 m (nominal)	2	2

Operational noise

Residential land uses

Road traffic noise assessment criteria for residential land uses are defined in the *Road Noise Criteria Guideline* (Transport for NSW, 2022).

Road traffic noise impacts on residential receivers are assessed using criteria that are based on the type of road a residence is affected by. In some instances, residences may be exposed to noise from new and redeveloped roads or different functional classes of roads and the proportion of noise from each road is used to establish 'transition zone' criteria.

In addition to road traffic noise that exceeds the assessment criteria, large increases in the level of noise can change the acoustic environment at a location, particularly for quieter areas. To address large increases in noise levels, additional criteria are used.

A summary of the road traffic noise criteria relevant to the proposal for residential receivers in accordance with the RNCG is provided in Table 6-50.

Table 6-50: Road traffic noise assessment criteria for residential receivers

Type of project/land use	Assessment criteria (dBA)		Area of the proposal where criteria applies
	Day (7am to 10pm)	Night (10pm to 7am)	
Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	L _{Aeq(15 hour)} 55 (external)	L _{Aeq(9 hour)} 50 (external)	M31 Hume Motorway northbound / Picton Road interchange ramps
Existing residences affected by noise from redevelopment of existing 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)	Picton Road M31 Hume Motorway southbound / Picton Road interchange ramps
Existing residences affected by both new roads and redevelopment of existing freeway/ arterial/sub-arterial roads in a Transition Zone ¹	Between L _{Aeq(15 hour)} 55-60 (external)	Between L _{Aeq(9 hour)} 50-55 (external)	Transition zone where impacted by new and redeveloped road

Note: 1. The criteria assigned to a façade depend on the proportion of noise coming from the existing road. Refer to Transport for NSW’s RNCG for further information.

Non-residential land uses

The RNCG also sets criteria for the assessment of road traffic noise on the internal and external areas of non-residential land uses. Road traffic noise criteria for non-residential land uses are provided in Table 6-51.

Table 6-51: Road traffic noise assessment criteria for non-residential receivers

Type of project/land use	Assessment criteria (dBA)	
	Day (7am to 10pm)	Night (10pm to 7am)
Places of worship	L _{Aeq(1 hour)} 40 (internal) L _{Aeq(1 hour)} 50 (external) ¹	L _{Aeq(1 hour)} 40 (internal) L _{Aeq(1 hour)} 50 (external) ¹
Open space (passive use)	L _{Aeq(15 hour)} 55 (external)	-

Note: 1. The external noise criteria has been determined based on a 10 dBA addition to the internal noise criteria. This is based on a typical reduction of 10 dBA through an open window.

The RNMG provides guidance to control road traffic noise and describes the principles to be applied when reviewing noise mitigation for predicted exceedances of the criteria. The RNMG provides three ‘triggers’ where receivers may qualify for consideration of noise mitigation:

- Increase in noise level – the predicted noise level with the proposal exceeds the RNCG controlling criterion (day or night-time L_{Aeq} criteria exceeded by the greatest amount) and the noise level increase due to the proposal (i.e. the noise predictions with the proposal minus without the proposal) is greater than 2 dB.
- Cumulative limit – the predicted noise level with the proposal is 5 dB or more above the RNCG controlling criterion (i.e. exceeds the cumulative limit) and the noise level at the receiver location is significantly influenced by road traffic noise from the proposal, regardless of the incremental increase generated by the proposal.
- Acute – the noise level contribution from the proposal is acute (daytime L_{Aeq(15hour)} 65 dBA or higher, or night-time L_{Aeq(9hour)} 60 dBA or higher) even if noise levels are governed by a non-project road.

Feasible and reasonable noise mitigation measures would be considered for sensitive receives that exceed the noise criteria and where any of the above triggers apply.

6.8.4 Potential impacts

Construction

Construction noise - residential

Table 6-52 defines the perception categories outlined in the CNVG that are used to summarise the impact assessment results in this section. The table outlines the exceedance ranges above the rating background level and noise management levels that apply to each of the perception categories.

Table 6-52: Construction Noise and Vibration Guideline perception categories

Perception category	Abbreviation	Noise level above RBL (dBA)	Noise level above noise management level (dBA)	
			Standard construction hours	Out of hours
Noticeable	N	5 to 10	n/a	1 to 5
Clearly audible	CA	11 to 20	1 to 10	6 to 15
Moderately intrusive	MI	21 to 30	11 to 20	16 to 25
Highly intrusive	HI	> 30	> 20	> 25
Highly noise affected (≥ 75 dBA)	HNA	n/a	n/a	n/a

Standard construction hours

Construction of the proposal is predicted to result in exceedances of the noise management levels in all NCAs except NCA01. Table 6-53 provides the perception category associated with the highest number of potentially affected receivers (existing and future) for each activity group and NCA which is considered to represent the *typical* potential noise impact during construction. Table 6-53 also outlines which construction scenario is predicted to result in this impact.

Noise impacts would generally be either 'noticeable' or 'clearly audible' for all activity groups in all NCAs. Some 'moderately intrusive' impacts are also predicted for some receivers for as a result of the following activity groups:

- AG1 (site establishment and earthworks) at NCA03 and NCA06
- AG4 (bridge demolition and pavement works) at NCA06.

Impacts at NCA06 includes some impacts on future residential receivers which is yet to be constructed within the Wilton Greens development.

The greatest number of receivers would have the potential to be affected by works conducted as part of AG1 (site establishment and earthworks), AG2 (utilities and drainage) and AG4 (bridge demolition and pavement works) in NCA07, which consists of future residential receivers yet to be constructed as part of the Wilton Greens development.

Details of typical construction noise impacts for all activity groups and construction scenarios are provided in Table 5.13 of Appendix J.

Table 6-53: Predicted number of residential receivers impacted by construction noise during standard hours – typical impacts

Activity group	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07
AG1	1 (CS01-03)	121 (CS02)	22 (CS03)	152 (CS02/03)	98 (CS02)	43 (CS03)	472 (CS02)
AG2	1 (CS05)	128 (CS05)	22 (CS06)	173 (CS05)	103 (CS05)	46 (CS06)	463 (CS05)
AG3	0	7 (CS07)	0	14 (CS07)	0	0	117 (CS07)
AG4	1 (CS11)	130 (CS11)	18 (CS11)	170 (CS11)	103 (CS11)	30 (CS11)	468 (CS11)
AG5	0	3 (CS12)	16 (CS13)	53 (CS13)	42 (CS13)	28 (CS13)	217 (CS13)
CC	0	32 (CS17)	0	26 (CS17)	34 (CS14)	2 (CS14)	83 (CS16)

Note: See Table 6-52 for colour code key

Table 6-54 presents the highest perception category for each activity group by NCA based on the highest predicted noise level and is therefore considered to represent the *worst-case* potential noise impact of construction. Table 6-53 also outlines which construction scenario is predicted to result in the worst-case impact. The worst-case impact is considered to be the construction scenario with the highest perception category. Where multiple scenarios have the same perception category, the worst-case is considered to be the scenario with the highest number of receivers impacted.

Table 6-54: Predicted number of residential receivers impacted by construction noise during standard hours – potential worst-case impacts

Activity group	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07
AG1	1 (CS01-03)	11 (CS01)	6 (CS03)	4 (CS03)	6 (CS03)	1 (CS03)	6 (CS03)
AG2	1 (CS05)	2 (CS05)	18 (CS05)	31 (CS05)	4 (CS05)	31 (CS05)	105 (CS05)
AG3	-	2 (CS07)	-	14 (CS07)	-	-	117 (CS07)
AG4	1 (CS11)	2 (CS11)	18 (CS11)	29 (CS11)	4 (CS11)	30 (CS11)	99 (CS11)
AG5	-	1 (CS12/13)	16 (CS13)	19 (CS13)	3 (CS12/13)	28 (CS13)	81 (CS13)
CC	-	3 (CS16)	-	4 (CS16)	8 (CS14)	2 (CS14)	6 (CS16)

Note: See Table 6-52 for colour code key

Construction is predicted to result in exceedances of the noise management levels for some receivers in all NCAs except NCA01. Noise levels for all activity groups in NCA02 are predicted to be 'highly intrusive' for up to 11 existing receivers (for AG1).

AG1 (site establishment and earthworks), AG2 (utilities and drainage) and AG4 (bridge demolition and pavement works) are considered to have similar levels of potential impact with worst-case noise levels being 'highly intrusive' or 'moderately intrusive' for some receivers, which indicates construction noise levels would have the potential to exceed the noise management level by between 11 to 20 dBA.

AG3 (bridge works) noise levels are either inaudible or ‘noticeable’, which indicates construction noise levels would be below the noise management level. However, ‘highly intrusive’ noise levels are predicted for one construction scenario (CS07 (Bridge works – drainage and structures construction)) in NCA02, with the impact predicted at two existing receivers.

For activity group CC (compound operations), the highest noise levels would be considered ‘highly intrusive’ and would only occur at residences located in NCA02, NCA05 and NCA06. These impacts would impact up to eight existing receivers in affected NCAs.

Figure 6-21 shows predicted worst-case noise impacts of the property adjustments and demolition works construction scenario (CS03) (in the AG1 activity group). This scenario has the highest activity sound power level and is predicted to lead to the largest number of exceedances of the construction scenarios. Details for all construction scenarios for the worst-case impacts are provided in Table 5.14 of Appendix J and contour maps for other construction scenario are provided in Appendix B of Appendix J.

Out-of-hours work

Table 6-55 provides the perception category associated with the highest number of potentially affected receivers for each activity group and NCA which is considered to represent the *typical* potential noise impacts during construction. Table 6-55 also outlines which construction scenario is predicted result in this potential impact.

Construction is predicted to result in exceedances of the noise management levels for some receivers in all NCAs. The majority of exceedances would be either ‘noticeable’ or ‘clearly audible’. ‘Highly intrusive’ and ‘moderately intrusive’ noise levels are also predicted in NCAs 03, 06 and 07 for some receivers. Impacts are NCAs 06 and 07 include impacts on some future residential receivers yet to be constructed within the Wilton Greens development.

Details for all construction scenarios for the typical out-of-hours work impacts are outlined in Table 5.15 of Appendix J.

Table 6-55: Predicted number of residential receivers impacted by construction noise during out-of-hours work – typical impacts

Activity group	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07
AG1	9 (CS04)	131 (CS02)	33 (CS03)	158 (CS04)	126 (CS04)	60 (CS03)	381 (CS02)
AG2	6 (CS06)	133 (CS05)	28 (CS05)	168 (CS06)	137 (CS06)	57 (CS05)	448 (CS06)
AG3	4 (CS07)	7 (CS07)	3 (CS07)	110 (CS07)	0	5 (CS07)	308 (CS07)
AG4	6 (CS11)	136 (CS11)	28 (CS11)	129 (CS11)	109 (CS11)	55 (CS11)	381 (CS11)
AG5	0	3 (CS13)	22 (CS12)	96 (CS13)	73 (CS13)	46 (CS12)	289 (CS12)
CC	0	44 (CS17)	2 (CS16)	92 (CS16)	95 (CS14)	7 (CS16)	328 (CS16)

Note: See Table 6-52 for colour code key

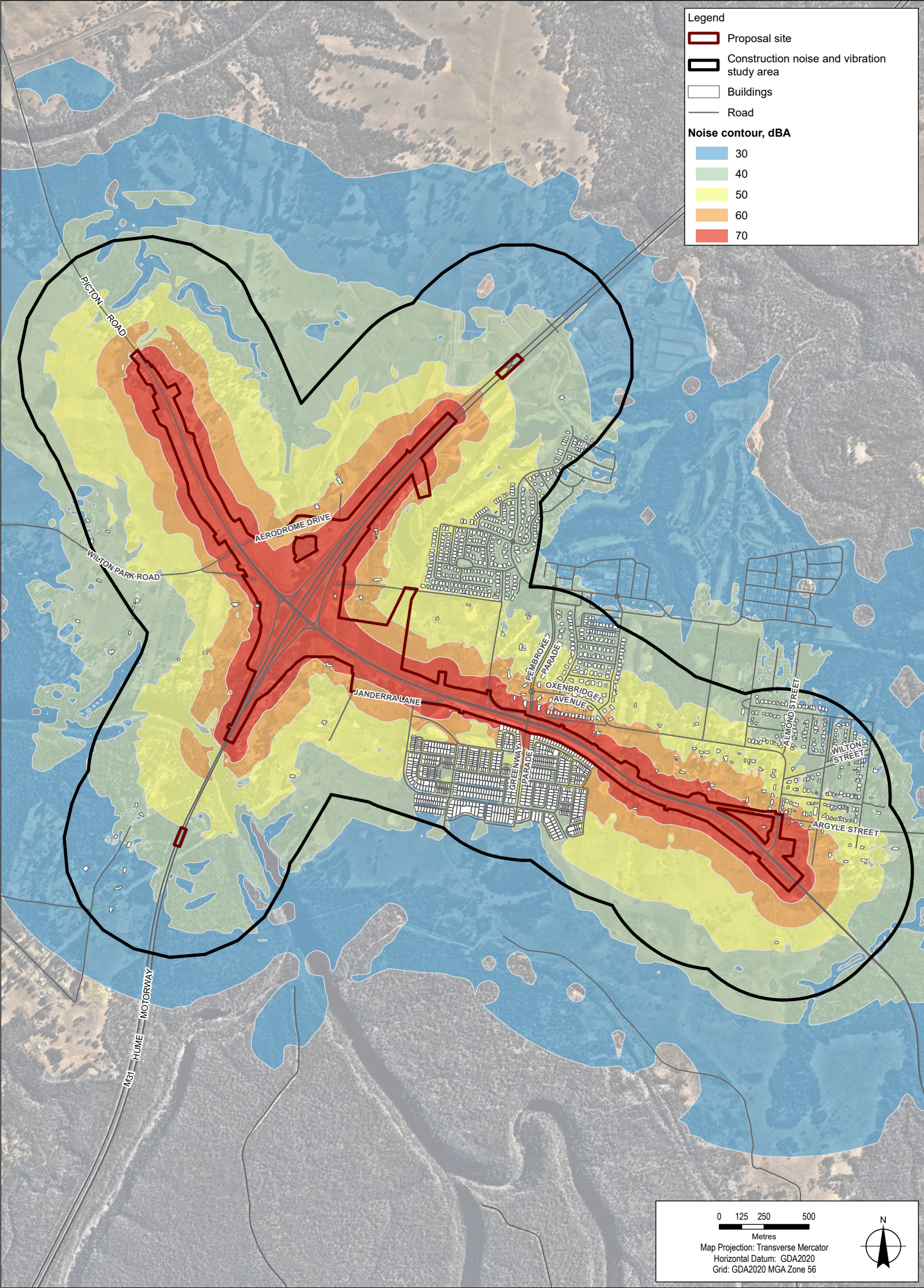


Figure 6-21 - Potential worst-case construction noise impacts – construction scenario 3

Data source: Nearmap WMS Server; NSW SS-SDS; Topographic base data, 2023. Created by: akildea
 N:\AU\Wollongong\Projects\23112560200\GIS\Maps\12560200_PictonRoad_Stage1_ConceptDesign\12560200_REF_B.aprx
 12560200_REFX023_ConstructionNoiseContours_A4P. Print date: 26 Oct

Table 6-56 presents the highest perception category for each activity group by NCA based on the highest predicted noise level and is therefore considered to represent the worst-case potential noise impact of construction. Table 6-56 also outlines which construction scenario is predicted result in the worst-case impact. The worst-case impact is considered to be the construction scenario with the highest perception category. Where multiple scenarios have the same perception category, the worst-case is considered to be the scenario with the highest number of receivers impacted.

Construction is predicted to result in exceedances of the noise management levels for some receivers in all NCAs. Noise levels for all activity groups in NCA02 are predicted to be 'highly intrusive', with up to 13 receivers impacted by construction activities in AG1. Noise levels for most activity groups in NCAs 03, 05 and 06 are also predicted to be 'highly intrusive' for some receivers.

Details for all construction scenarios for each activity group for worst-case impacts are outlined in Table 5.16 of Appendix J.

Table 6-56: Predicted number of residential receivers impacted by construction noise during out-of-hours work – potential worst-case impacts

Activity group	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07
AG1	6 (CS03)	13 (CS01)	33 (CS03)	16 (CS03)	32 (CS03)	60 (CS03)	57 (CS03)
AG2	6 (CS05)	2 (CS05)	28 (CS05)	9 (CS05)	20 (CS05)	57 (CS05)	34 (CS05)
AG3	4 (CS07)	2 (CS07)	3 (CS07)	14 (CS07)	0	5 (CS07)	117 (CS07)
AG4	6 (CS11)	2 (CS11)	28 (CS11)	9 (CS11)	19 (CS11)	55 (CS11)	30 (CS11)
AG5	0	1 (CS12/13)	4 (CS13)	6 (CS13)	14 (CS13)	6 (CS13)	10 (CS13)
CC	0	3 (CS16)	2 (CS16)	26 (CS17)	11 (CS14)	3 (CS14)	89 (CS16)

Note: See Table 6-52 for colour code key

Sleep disturbance

Table 6-57 provides the maximum number of exceedances of the sleep disturbance criteria in each NCA and is considered a worst-case impact. It also highlights the number of construction scenarios where exceedances are predicted.

No exceedances are predicted within NCA01, while all other NCAs have an exceedance during at least one construction scenario. Construction scenario CS03 (Property adjustments and removal of existing infrastructure) is a source of potential exceedances common across the majority of NCAs. The majority of potential impacts from CS06 would be in NCA06 and NCA07 and would consist primarily of future residential receivers located along Picton Road within the Stage 1 Wilton Greens development.

A detailed breakdown of exceedances by NCA and construction scenario are provided in Table 5.13 of Appendix J.

Table 6-57: Sleep disturbance exceedances during construction

Scenario	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07
Maximum number of impacted receivers (future residential receivers)	0 (0)	39 (0)	33 (0)	13 (0)	34 (0)	67 (59)	44 (44)
Construction scenario with the maximum number of exceedances	-	CS01	CS02 CS03 CS04 CS05 CS06	CS03	CS03	CS03	CS03 CS06
Total number of construction scenarios with exceedances (of 17 total)	0	11	9	5	8	10	5

Construction noise – non-residential

Exceedances of the non-residential noise management levels are predicted during works for all activity groups with the exception of AG3 (bridge works) due to the distance from identified non-residential receivers.

The highest noise impacts are predicted during the property adjustments and demolition works construction scenario (CS03).

Table 6-58 provides the predicted worst-case exceedances for non-residential receivers. No exceedances of the noise management levels are predicted at the passive recreation receivers.

Table 6-58: Worst-case exceedances of noise management levels at non-residential receivers

Receiver (address)	Receiver type	Worst-case exceedance	
		Construction scenario	Exceedance (dBA above NML)
R0604 (lot 1 DP 112522)	Commercial	CS03	Up to 5
R0034 and R0036 (lot 302 DP 1184442)	Industrial	CS03	8
R0594 and R0597 (lot 1 DP 1236516)	Place of Worship	CS03	15

The commercial receiver at R0604 is predicted to exceed the construction noise management levels. However, based on a review of street map imagery, this receiver is currently in a dilapidated condition and not inhabited.

Noise wall relocation

As described in section 3.3, the existing 3.6 metre noise barrier located east of Pembroke Parade (see Figure 6-18) may be permanently relocated north of its current location in part or in whole where there is insufficient space for the works associated with the proposal. An assessment was undertaken to determine any increase in operational noise levels that would result from the new location of the wall, noting that the assessment assumes the entire wall being relocated about two metres north of its current location as a worst-case approach. The results indicate that noise levels could increase by up to 0.2 dB when comparing the performance between the existing and potential new location of the wall. This change in noise level would be inaudible at the nearest sensitive receivers.

The extent of the wall that would need to be relocated would be confirmed during detailed design and pre-construction assessments. Relocation works may require the wall to be removed for a period of time, which would depend on the construction methodology and design refinements which are yet to be developed. Further noise modelling would be completed in accordance with safeguards in section 6.8.5 to inform the Construction Noise and Vibration Management Plan (CNVMP).

Construction vibration

Human comfort

Up to 147 residential receivers (including 97 future residential receivers) are located within 100 metres of the proposal site and have the potential to experience human comfort vibration impacts during compaction works using a vibratory roller. These residences are generally located in the following areas:

- Hornby Street West
- Balmoral Rise
- Pembroke Parade
- Argyle Street and Almond Street intersection
- future residential structures within the South-East Wilton Precinct.

Residences located within the minimum working distances for human comfort would be notified of the proposed works and the potential for vibration impacts prior to construction.

Cosmetic damage

The CNVG specifies a minimum working distance of 25 metres for standard structures. This distance is based on the worst-case described in section 6.8.1 (the use of a vibratory roller greater than 18 tonnes). Up to 39 structures have been identified within the minimum working distances for standard structures consisting of:

- nine existing residential structures which include three located within the construction work area
- 30 future residential structures within the South East Wilton precinct.

Details of the structures located within the minimum working distances are shown in Figure 5.31 of Appendix J, while the nine existing residential structure are listed in Table 5.18 of Appendix J.

The CNVG also specifies a minimum working distance of 68 metres for heritage listed or other sensitive structures. Three heritage listed structures are located within the minimum working distance, with these structures listed in Table 6-59 together with the equipment predicted to generate vibration impacts. Further details of the structures outlined in Table 6-59 can be found in section 5.3.1.2 of Appendix J.

Table 6-59: Potential vibration impacts on heritage listed structures

Heritage structure	Equipment with the potential to generate vibration impacts
Cottage (I275)	Vibratory roller greater than 4 tonnes Large hydraulic hammer mounted on excavator greater than 18 tonnes Vibratory pile driver
St Luke's Anglican Church (I276)	Vibratory roller greater than 18 tonnes
Upper Nepean Scheme - Upper Canal (O1373, I16) (including the airshaft located about 80m from the proposal)	None. See section 5.3.1.4 of Appendix J for discussions regarding ground vibration, with this assessment concluding impacts are unlikely.

Two culturally modified trees and three other potentially culturally sensitive trees have been identified within the proposal site (discussed further in section 6.3.2). Due to their location in proximity to construction works areas, there is potential that the trees could be impacted by construction vibration during works within the minimum working distance. As outlined in section 6.3.4, an Arboricultural Impact Assessment of these trees would be undertaken to determine the minimum working distances for vibration intensive equipment around these trees.

Construction traffic noise

Potential construction traffic impacts have been assessed by considering the increase in traffic volumes along each construction access route. The increase in traffic is not expected to result in an increase in noise levels greater than 2.0 dBA, with the maximum increase in noise due to construction traffic predicted to be 0.3 dBA for movements along Picton Road during the day. Therefore, construction traffic noise impacts are not anticipated.

Blasting

Based on geotechnical investigations completed to date, it is expected that blasting would not be required to construct the proposal. However, further geotechnical investigations are required during detailed design that would inform the construction methodology. Potential impacts from blasting, if required, have been assessed at the nearest sensitive receivers to each potential blasting site, with these being:

- Almond Street at a distance of 70 metres
- Wilton Park Road at a distance of 450 metres.

Any potential impacts from blasting would be governed by the airblast overpressure rather than the ground vibration levels. The following outcomes are predicted based on the modelling conducted:

- Almond Street: The airblast overpressure limit (absolute maximum) would be exceeded for all blast charge masses. The ground vibration limit would be exceeded if a charge mass greater than five kilograms is used.
- Wilton Park Road: The airblast overpressure limit (absolute maximum) would be exceeded if a charge mass greater than five kilograms is used. Ground vibration impacts are not anticipated to generate adverse impacts due to the distance between the blast site and the nearest sensitive receiver.

It is noted that the blast design would be the responsibility of the blasting contractor. Once the exact location and details of any blasting is known, the distance to the nearest receiver would be used to estimate the allowable charge mass. Blast monitoring would be carried out to assess compliance, determine the site-specific blast parameters and confirm the impact predictions.

Operation

Road traffic noise

Predicted noise levels at each receiver were assessed against the triggers in the RNMG (see section 6.8.3) to determine whether the receiver would qualify for consideration of mitigation.

The number of residential and non-residential receivers that exceed the RNMG triggers without mitigation are provided in Table 6-60. These receivers are located in NCA02, 03, 05 and 06. There are no receivers considered eligible for noise mitigation in NCAs 01, 04 and 07. It is noted that the relocation of the existing noise wall (see Figure 6-18) is considered to have a negligible impact on receivers north of Picton Road with noise levels predicted to increase by 0.2 dBA and therefore not result in any additional receivers qualifying for consideration of noise mitigation.

Table 6-60: Number of receivers considered for noise mitigation

NCA	Residential buildings	Non-residential buildings
NCA01	0	0
NCA02	3	0
NCA03	2	0
NCA04	0	0
NCA05	0	2
NCA06	21	0
NCA07	0	0
Total	26	2

Of the 26 identified residential receivers that may qualify for consideration of noise mitigation as a result of the potential for noise impacts during operation, 18 are future residential receivers located within the Stage 1 Wilton Greens development. These 18 properties are located in NCA06. However, the approval conditions for the Wilton Greens subdivision DA require a 3.6 metre noise mound/wall be constructed along the northern boundary of the development. Additionally, individual residences will be required to implement acoustic treatments as part dwelling approvals. Council also requires noise monitoring and an acoustic report to be prepared for individual residences prior to the issue of a construction certificate to confirm that the acoustic requirements would be achieved.

If the proposal is determined prior to DAs for individual dwellings, the results of the noise modelling indicate that the recommended acoustic treatment packages for the Stage 1 Wilton Greens subdivision are likely be adequate and, as a result, no additional at-property treatments would be required as part of the proposal.

An operational noise and vibration review (ONVR) would be undertaken during detailed design to review and confirm noise mitigation requirements (see section 6.8.5).

Two non-residential buildings which are part of the Wilton Anglican Church would qualify for consideration of mitigation.

Maximum noise levels

Potential maximum noise level events would occur during heavy vehicle pass-bys and as a result of compression braking. The locations where these events would occur would be on sections of the road where there are high road gradients such as interchange ramps and at signalised intersections. Away from these sections, the frequency of maximum noise level events would be lower as heavy vehicles would generally be travelling at constant speeds.

Table 6-61 outlines the number of receivers where maximum noise levels are predicted to exceed 65 dBA for heavy vehicle pass-bys and due to compression braking for both the existing (2022) and future (2031/2041) scenarios.

Table 6-61: Maximum noise level assessment summary

Source of noise	Number of receivers where maximum noise levels exceed 65 dBA			Change in magnitude of maximum noise levels
	Existing (2022)	Future (2031/2041)	Change	
Compression braking	524	544	+20	-2.1 dB to 7.8 dB
Heavy vehicle pass-by	20	30	+10	-0.7 dB to 7.8 dB

Up to 20 additional receivers are predicted to experience potential maximum noise level impacts as a result of the proposal (compared to those that currently experience exceedances of the maximum noise level). Of these, 17 are future residential receivers.

The range of maximum noise level increase is based on the existing and future predicted noise levels. Locations near the future road alignment with low existing maximum noise levels, such as areas away from existing roads, would experience a higher change in maximum noise levels.

Maximum noise level impacts would be expected at the majority of sensitive receivers located adjacent to the proposal alignment. The main potential impacts would be located in Wilton near the signalised intersection at Picton Road and Pembroke Parade where heavy vehicle braking has the potential to continue to occur. In general, the maximum noise levels are expected to decrease at residences to the north of Picton Road and increase at residences to the south of Picton Road. The additional impacts are generally located beyond the first three rows of residential structures as the residences closer to Picton Road are predicted to experience existing maximum noise level impacts.

6.8.5 Safeguards and management measures

The measures described in Table 6-62 will be implemented to, in conjunction with other measures outlined in chapter 7, avoid, minimise, mitigate and manage potential noise and vibration impacts during construction and operation of the proposal.

Table 6-62: Noise and vibration safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction noise and vibration management	<p>A Construction Noise and Vibration Management Plan (CNVMP) will be prepared and implemented as part of the CEMP. The CNVMP will generally follow the approach outlined in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and the <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h) and identify:</p> <ul style="list-style-type: none"> • all sensitive receivers within 600 metres of the proposal site following a land use review to capture new developments that have not been identified in the REF • all potentially high noise and vibration generating activities associated with the construction of the proposal • standard and additional mitigation measures from the <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h) • 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 • outline requirements for the development and implementation of an out-of-hours work protocol. 	Contractor	Pre-construction	<p>Section 4.6 of QA G36 <i>Environment Protection Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009)</p> <p><i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h)</p>

Impact	Environmental safeguards	Responsibility	Timing	Reference
Community notification	<p>All sensitive receivers (e.g. schools, local residents) likely to be affected by high noise producing activities or out-of-hours work work will be notified in accordance with the <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h) and ICNG at least five working days prior to commencement of the works. The notification will provide details of:</p> <ul style="list-style-type: none"> • the project • the construction period and construction hours • contact information for project management staff • complaint and incident reporting • how to obtain further information. 	Contractor	Pre-construction	Additional safeguard
Construction noise and vibration statement	<p>Location and activity specific construction noise and vibration impact assessments will be undertaken:</p> <ul style="list-style-type: none"> • prior to works with the potential to generate noise levels above 75 dBA at residences • prior to works that need to occur outside recommended standard working hours and are likely to result in noise levels greater than the relevant noise management levels • prior to works with the potential to exceed relevant performance criteria for vibration • prior to works where an alternative construction methodology is proposed that would result in: <ul style="list-style-type: none"> • activity sound power levels higher than those assumed in the assessment; or • use of vibration intensive equipment not assessed previously. <p>The assessments will confirm predicted impacts at relevant receivers in the vicinity of the activities to assist with the selection of appropriate management measures in accordance with the <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h). The measures will be detailed in the CNVMP and implemented for the duration of the activity.</p>	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Vibration impacts	<p>Building condition inspections will be undertaken prior to and after construction works where vibration intensive works that are predicted to exceed the screening criteria for structural damage to buildings or structures and/or would be required within the minimum working distances listed in Table 2 of the <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h) and the Noise and Vibration Impact Assessment.</p> <p>Where required, the vibration management level will be refined based on the type and condition of the structure. The survey will consider the heritage value of the structure in consultation with a structural engineer and heritage specialist for the following listed heritage items:</p> <ul style="list-style-type: none"> • Cottage (I275) • St Luke's Anglican Church (I276) • WaterNSW airshaft #9 associated with the Upper Canal (SHR 01373). 	Contractor	Construction	Additional safeguard
Relocation of noise wall east of Pembroke Parade (north of Picton Road)	Additional noise modelling will be carried out during detailed design to determine whether additional noise mitigation measures are required during the relocation of the existing noise wall. Required mitigation measures will be included in the CNVMP.	Contractor	Detailed design	Additional safeguard
Blasting	In the event that blasting is required, the blast parameters will be designed, and allowable charge mass confirmed, to achieve the airblast overpressure and ground vibration requirements of the <i>Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration</i> (ANZECC, 1990). This will include trial blasting and airblast/vibration monitoring to confirm site-specific constants and to refine the safe blasting distances.	Contractor	Construction	Additional safeguard Section 4.7 of QA G36 <i>Environment Protection</i>
Early implementation of operational treatments	At-property treatments required to mitigate operational noise will be implemented prior to construction noise impacts, where reasonable and feasible.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Operational noise and vibration review	<p>An operational noise and vibration review (ONVR) will be undertaken as part of detailed design to review the potential for operational noise impacts based on the most current information and confirm feasible and reasonable mitigation measures to be incorporated into the design.</p> <p>The identification and implementation of noise mitigation measures will be undertaken in accordance with the <i>Road Noise Mitigation Guideline</i> (Transport for NSW, 2022m) and the <i>At-Receiver Noise Treatment Guideline</i> (Transport for NSW, 2022n).</p>	Contractor	Detailed design	Additional safeguard
Post-construction operational compliance	<p>Post-construction operational compliance noise monitoring using a validated post-construction operational noise model will be undertaken following road opening. This program will be undertaken within 12 months of completion of the proposal and will be completed once traffic flows have stabilised. Noise mitigation measures will be revised at the completion of the monitoring period in accordance with <i>Road Noise Mitigation Guideline</i> (Transport for NSW, 2022m) and the <i>At-Receiver Noise Treatment Guideline</i> (Transport for NSW, 2022n).</p>	Transport	Operation	Additional safeguard

6.9 Air quality

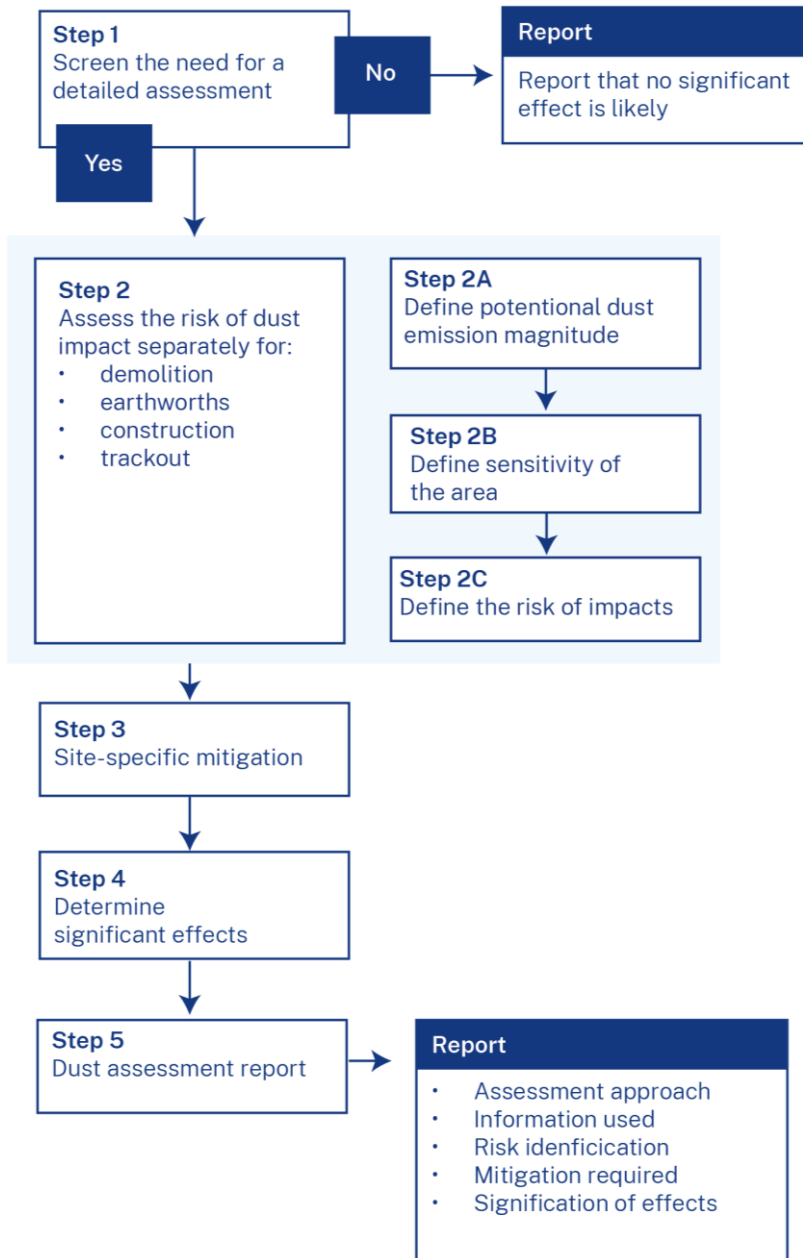
This section provides a summary of the assessment of potential air quality impacts of the proposal and identifies measures to manage these impacts.

6.9.1 Methodology

The air quality assessment involved the following main tasks:

- a desktop review of the background air quality environment, including a review of data from the nearest DPE air quality monitoring stations and meteorological data from the following Bureau of Meteorology (BoM) monitoring stations:
 - Picton Council Depot Automatic Weather Station (BoM ID: 068052) for existing climate data
 - Campbelltown (Mount Annan) Automatic Weather Station (BoM ID: 068527) where there was insufficient meteorological data at the Picton Council Depot station
- identifying existing and future sensitive receptors with the potential to be adversely affected by air quality impacts (future sensitive receptors considered by the assessment are those within planned residential developments with approved development applications in the vicinity of the proposal site)
- establishing proposal-specific assessment criteria
- identifying and assessing potential construction dust impacts using a semi-quantitative, risk-based approach in accordance with *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014) (as shown by Figure 6-22)
- using TRAQ dispersion modelling to predict the potential changes to air quality as a result of the operation of the proposal and comparing the results against the nominated criteria (see Table 6-63) to determine if further detailed air quality assessment is required, with modelling including build and no build scenarios for the proposal's opening year (2031) and design year (2046)
- identifying safeguards and management measures to avoid, minimise, mitigate and manage potential air quality impacts.

Guidance on the assessment of dust from demolition and construction states that a construction air quality assessment would normally be required where there is a receptor within 350 metres of the boundary of a site or within 50 metres of the routes used by construction vehicles up to 500 metres from a site entrance. The study area for the air quality assessment is comprised of the proposal site, and areas within a 600 metre buffer around the proposal site, as shown on Figure 6-23.



Source: Based on Figure 1 of *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014)

Figure 6-22: Steps to perform a dust assessment

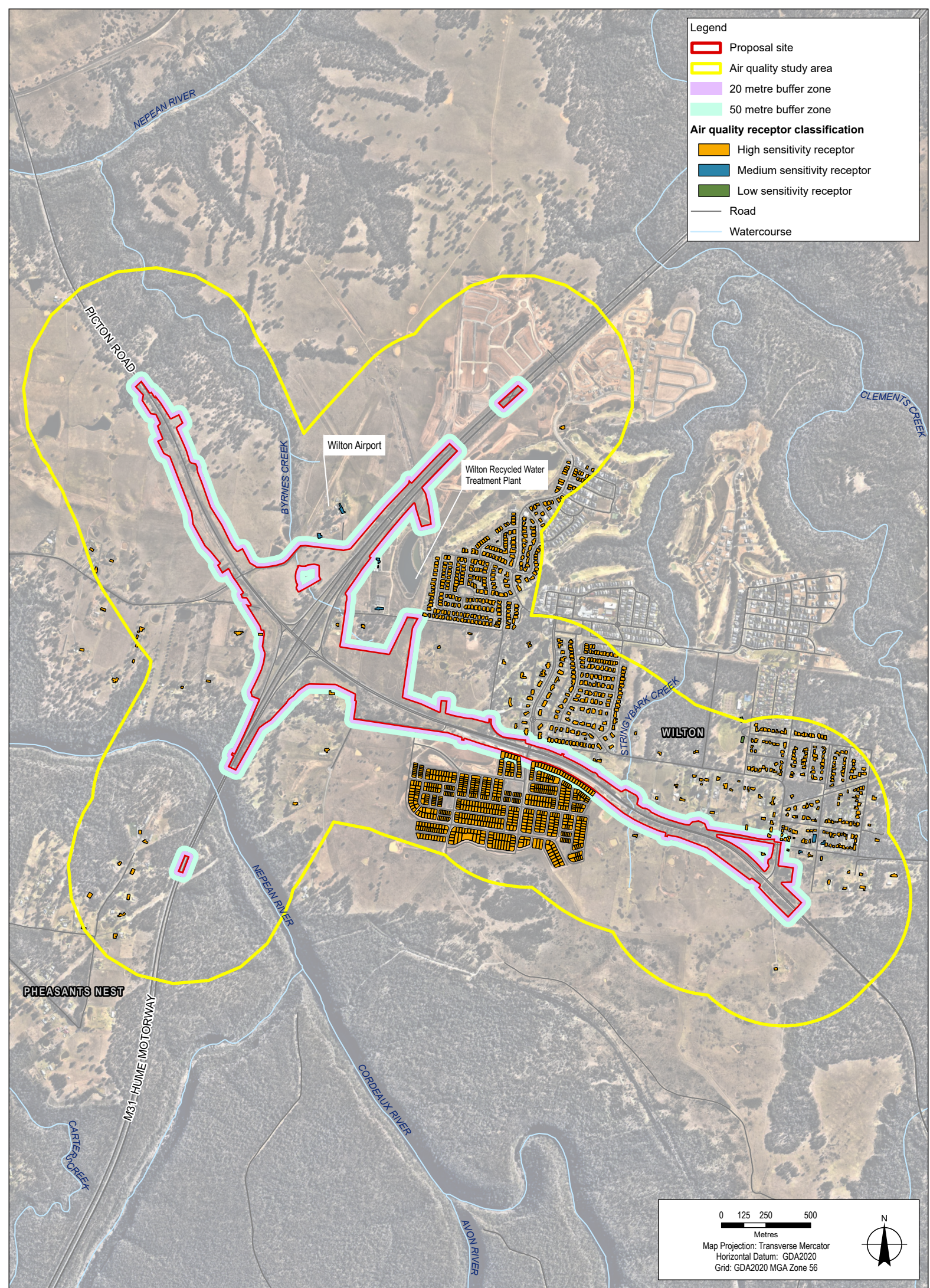


Figure 6-23 - Study area for air quality assessment

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023; DPIE, Soil Landscapes, 2023. Created by: kllidea
 N:\AU\Wollongong\Projects\23112560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX022_AirQuality_A4P. Print date: 25 Oct

6.9.2 Criteria

No specific criteria were applied for construction air quality impacts. This is due to the difficulty in quantifying dust emissions from construction activities and the ready ability to mitigate impacts through the implementation of standard best-practice construction environmental management measures. As described in section 6.9.1, a semi-quantitative, risk-based approach was used for the construction air quality assessment.

Relevant assessment criteria from the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2016) (the Approved Methods) and the National Environment Protection (Ambient Air Quality) Measure (the Air NEPM) were used to assess the potential air quality impacts of the proposal during operation. The criteria used are provided in Table 6-63.

Table 6-63: Air quality impact assessment criteria

Pollutant	Averaging period	Criteria/goals ($\mu\text{g}/\text{m}^3$)		Adopted assessment criteria
		Approved Methods criteria (for comparison purposes only)	Ambient Air Quality NEPM	
Particulate matter less than 10 microns in diameter (PM_{10})	24 hours	50	50	50
	Annual	25	25	25
Particulate matter less than 2.5 microns in diameter ($\text{PM}_{2.5}$) ¹	24 hours	25	20	20
	Annual	8	7	7
Nitrogen dioxide (NO_2)	1 hour	164	164	164
	Annual	31	31	31
Carbon monoxide (CO)	1 hours	30,000	-	30,000
	8 hours	10,000	10,000	10,000

Note: 1. Air NEPM goals for $\text{PM}_{2.5}$ are those presented in Table 2 'Goal for Particles as $\text{PM}_{2.5}$ from 2025' which become active from 2025. For the purpose of this assessment, it is assumed that construction works would commence between 2026 and 2027, and the proposal would be operational by 2031. As a result, use of the 2025 goals was considered appropriate.

6.9.3 Existing environment

Background air quality

The proposal site is located within an outer urban area with a mix of rural, residential and associated land uses. Ongoing urban development is underway as part of the Wilton Growth Area. Further information about existing land uses is provided in section 6.11.

The air quality in the study area would be heavily influenced by emissions from motor vehicles using Picton Road and the M31 Hume Motorway. Other local sources of air pollutant emissions include Wilton Recycled Water Treatment Plant (adjacent to the proposal site), Wilton Airport (about 40 metres west of the proposal site at the nearest point), and nearby rural, residential and commercial land uses.

A review of the National Pollutant Inventory database (undertaken on 20 March 2023) and aerial imagery of the study area was undertaken and did not identify any significant emitters of air pollutants.

DPE has established a network of monitoring stations across NSW to understand current air quality conditions and impacts, and to help identify programs to improve air quality. The closest air quality monitoring stations to the proposal site are:

- Bargo air quality monitoring station, located about 11 kilometres south-west of the proposal site
- Campbelltown West air quality monitoring station, located about 21 kilometres north-east of the proposal site

- Oakdale air quality monitoring station, located about 26 kilometres north-west of the proposal site.

Data from these stations over a five-year period (2018 to 2022) was examined and compared to the assessment criteria in Table 6-63. A summary of this data can be found in Appendix N. Data from 2022 (the most recent full calendar year) was excluded from use due to abnormally high rainfall that was not considered typical of the period.

The review noted that:

- 24 hour average PM10 and PM2.5 concentrations exceeded the ambient air quality goals of 50 µg/m³ and 20 µg/m³ respectively on occasion; however, exceedances increased significantly between 2019 and 2020 (maximum of 35 days at the Campbelltown West station in 2019), due to bushfires
- annual PM2.5 concentrations exceeded the adopted criteria of 7 µg/m³ on multiple occasions between 2018 and 2022
- measured NO₂ and CO concentrations have been consistently below the adopted assessment criteria.

Table 6-64 shows the adopted background levels that apply in the vicinity of the proposal site. Background data was adopted from the nearest air quality monitoring station with sufficient data (being the Bargo air quality monitoring station for PM₁₀, PM_{2.5} and NO₂, and the Campbelltown West air quality monitoring station for CO) for the 2021 calendar year.

Table 6-64: Adopted background air quality data

Pollutant	Averaging period	Adopted background concentration (µg/m ³)
PM ₁₀	24 hour 90 th percentile	18.9
	Annual average	11.8
PM _{2.5}	24 hour 90 th percentile	7.8
	Annual average	5.3
NO ₂	1 hour average	108.7
	Annual average	14.1
CO	1 hour average	3,250
	8 hours average	2,375

Local meteorological conditions

A wind rose summarises the meteorological wind conditions at a location by showing the frequency of occurrence of wind speed and direction, as well as the percentage of calm winds (speeds of less than 0.5 metres per second to five metres per second) and average wind speed. The five-year wind rose from the Campbelltown (Mount Annan) weather station for the period between 2018 and 2022 (see Figure 6-24) shows:

- the mean wind speed is two metres per second
- calm winds occur 17.2 per cent of the time
- the predominant wind direction is from the south south-west.

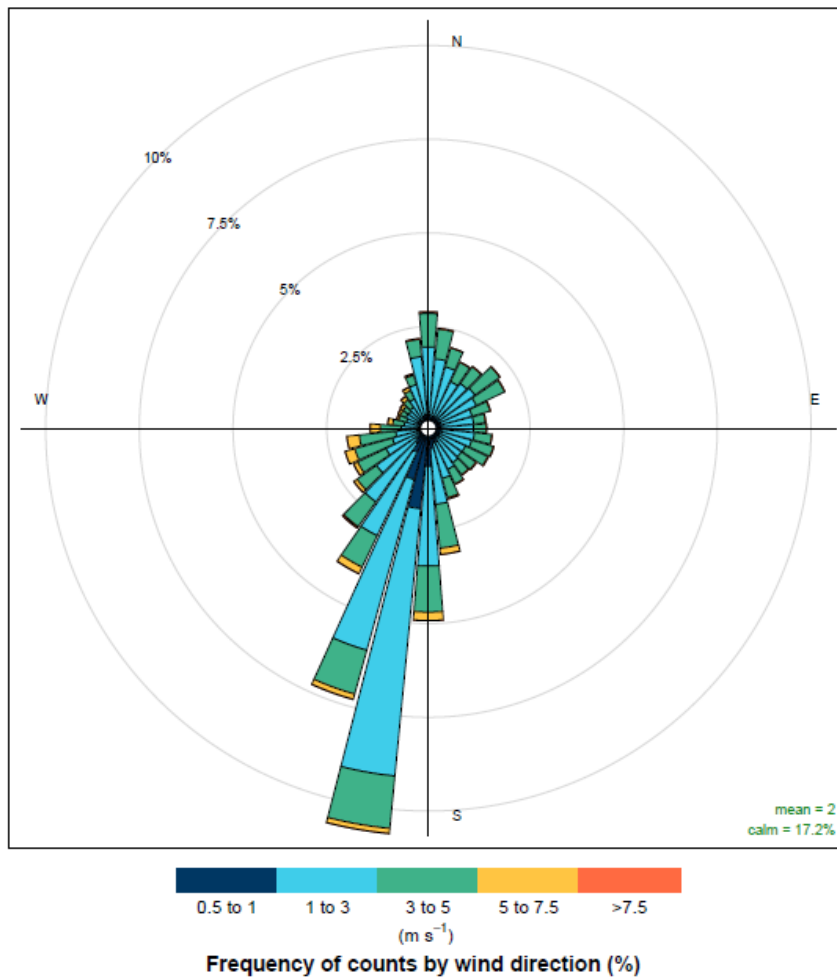


Figure 6-24: Five-year wind rose (BoM Campbelltown (Mount Annan) Automatic Weather Station, 2018-2022)

Long term climate data collected from the Picton Council Depot Automatic Weather Station indicated that:

- Annual mean maximum and minimum temperatures are 23.4 degrees Celsius (°C) and 8.8°C respectively.
- January experiences the hottest temperatures with a mean maximum and minimum temperature of 29.3°C and 15.2°C respectively, while the coolest temperatures are experienced in July with a mean maximum and minimum temperature of 16.8°C and 1.7°C respectively.
- The area receives an annual mean rainfall of 797.7 millimetres per year.
- February is the wettest month receiving 91.0 millimetres of rain, while September is the driest month receiving 43.5 millimetres of rainfall.

Sensitive receptors

Sensitive receptors are locations where people live and work that could be sensitive to changes in air quality for reasons of human health or amenity. Some environmental features such as wetlands may also be considered sensitive to changes in air quality, particularly dust.

Residences, schools, sports grounds, hospitals, aged care centres, offices and public recreation areas are considered to be sensitive receptors in relation to the potential health and amenity impacts of dust.

Land uses surrounding the proposal site are mainly rural and residential (see section 6.11.2 for further information). The majority of existing sensitive receptors are located more than 50 metres away from the proposal site. The nearest existing sensitive receptors to the proposal site are:

- residential properties along Condell Park Road, Pembroke Parade, Oxenbridge Avenue, Hornby Street West, Hornby Street and Almond Street, located between about 40 and 300 metres north of the

proposal site along Picton Road, the nearest of which is located about 60 metres from the kerb of Picton Road

- residential properties along Condell Park Road, Balmoral Rise, Bundanoon Road and Sutton Crescent, located between about 20 and 300 metres east of the proposal site, along the M31 Hume Motorway, the nearest of which is located about 40 metres from the kerb of the M31 Hume Motorway
- a residential property along Janderra Lane, located about 60 metres south of the proposal site, or about 100 metres from the kerb of Picton Road
- residential properties along Berwick Park Road, located about 15 metres west of the proposal site, or about 100 metres from the kerb of Picton Road.

The assessment also considers future sensitive receptors (including those along Greenway Parade) within planned residential developments with approved development applications in the vicinity of the proposal site (see section 6.11.3).

6.9.4 Potential impacts

Construction

During construction, the primary risk to local air quality would be the generation of dust. Airborne particulate matter has the potential to cause adverse health or nuisance impacts if not properly managed.

Key construction activities that have the potential for dust generation include:

- removal/demolition – any activity that involves the removal of existing buildings or redundant structures
- earthworks – ground disturbance activities, such as soil stripping, ground levelling, excavation and landscaping, which involve the excavation, stockpiling, transport and/or disposal of materials
- construction works – any activity including materials processing that involves providing new structures or modifying existing structures, including roadways, bridges and buildings
- vehicle track out – the movement of dust and dirt by construction vehicles from the proposal site onto the public road network.

The risk of dust arising in sufficient quantities to cause annoyance and/or the potential for health impacts was determined for each activity type by considering the scale and nature of the works and the sensitivity of the area in accordance with the *Guidance on the assessment of dust from demolition and construction*. Potential dust emission magnitudes for the proposal (based on the proposal site shown in Figure 6-23) were estimated based on the indicative construction work methodology provided in section 3.3. Potential dust generating activities and the estimated associated emission magnitude are provided in Table 6-65.

Table 6-65: Dust emissions magnitude

Activity	Overview of activity for the proposal	Size and scale of emission magnitude
Demolition/ structure removal	<ul style="list-style-type: none"> The existing Picton Road bridge over the M31 Hume Motorway would be removed as would other infrastructure, such as existing telecommunications and drainage infrastructure, and concrete pavement. 	Medium (volume of 20,000 to 50,000 m ³)
Earthworks	<ul style="list-style-type: none"> Large scale earthworks would be required, with the majority of earthworks associated with excavation for new road areas and filling for embankments and bridge abutments. The estimated quantities of materials associated with the earthworks are provided in section 3.3.5. Other earthworks would be associated with utility adjustment or relocation. Stockpiling of materials would be undertaken at the locations described in section 3.4. Heavy earthmoving vehicles would be required as described in section 3.3.4. 	Large (greater than 10,000 m ³ is considered large)
General construction	<ul style="list-style-type: none"> The construction footprint is described in section 3.3.1. Construction activities are described in section 3.3. A number of ancillary facilities would potentially be used, including construction compounds and laydown/stockpiling areas as described in section 3.4. A number of dust generating materials would be required for construction, including aggregates, sand, concrete and fly ash. A range of plant and equipment would be used during construction. An indicative list of plant and equipment is provided in section 3.3.4. A number of dust generating activities would be required, including materials processing for reuse/repurposing such as rock removed from cuttings, existing concrete pavements and culverts, and existing bridge components. 	Large (volume greater than 100,000 m ³)
Track out	<ul style="list-style-type: none"> Construction would generate light and heavy vehicle movements. Estimated heavy vehicle movements are provided in section 3.3.7. Construction vehicle activities include the movement of construction workers, delivery of construction materials, spoil movement and waste removal, and delivery of construction equipment and machinery. Vehicle movements would occur primarily along paved roads; however, vehicles may travel on unsealed surfaces at times. 	Large (more than 50 heavy vehicle movements per day is considered large)

The sensitivity of the surrounding environment is determined by the number of high, medium and low risk receptors within a certain proximity of the construction footprint. High sensitivity receptors include dwellings, educational institutions, and medical facilities. Medium sensitivity receptors include commercial, and industrial premises. Low sensitivity receptors include farmland, recreational parklands, and other public spaces. The sensitivity is determined for three areas of concern, which are the sensitivities of:

- people to the effects of dust soiling and the build-up of deposited dust on surfaces
- people to the health effects of PM₁₀
- ecological receptors to impacts from dust emissions.

The sensitivities of areas surrounding the proposal site for the above three sensitivity concerns are outlined in Table 6-66.

Table 6-66: Sensitivity of areas of concern for construction activities

Sensitive	Sensitivity of surrounding areas	Justification
Sensitivities of people to dust soiling effects	High	<ul style="list-style-type: none"> About 35 residential (highly sensitive) receptors (five existing and 30 future residential dwellings) are located within 20 m of the construction footprint.
Sensitivities of people to the health effects of PM ₁₀	Low	<ul style="list-style-type: none"> The annual average PM₁₀ concentrations for the past five years from the air quality monitoring stations described in section 6.9.3 were less than 24 µg/m³, which is below the nominated assessment criteria. About 35 residential (highly sensitive) receptors (five existing and 30 future residential dwellings) are located within 20 m of the construction footprint.
Sensitivities of receptors to ecological effects	Low	<ul style="list-style-type: none"> No high or medium sensitive ecological features were identified within 50 m of the construction footprint.

As per the approach described in the *Guidance on the assessment of dust from demolition and construction*, the dust emission magnitude outlined in Table 6-65 was combined with the sensitivity of the area outlined in Table 6-66 to determine the risk of impacts with no mitigation applied. As a result, the following key risks during construction were identified:

- medium risk of dust soiling on close receptors from demolition
- high risk of dust soiling on close receptors from earthworks, construction and track out
- low risk of impacts on human health from all construction activities
- low risk of impacts on areas of ecological environment from all construction activities.

Air quality impacts as a result of dust generation are considered to be minor as they would be limited to the construction phase only and would be minimised by implementing best-practice construction management measures defined by the Construction Air Quality Management Plan (CAQMP) prepared and implemented as part of the CEMP (see section 6.9.5).

Minor vehicle exhaust emissions are also expected during construction. However, vehicle emissions would be intermittent and transient in nature and limited to the construction phase. Therefore, any potential impacts are considered to be minor.

Odours may be generated during the application of asphalt and line marking. However, the construction phase for these works would likely be a maximum of about 12 months in total and is not expected to result in long term odour impacts for nearby receptors.

Overall, potential air quality impacts during construction would be short term in nature and managed by the implementation of management measures defined by the AQMP to minimise dust and mitigate the effects of construction on local air quality.

Operation

During operation, air pollution would be primarily from vehicle emissions, which does not differ from the no build scenario. The proposal would move some vehicle emission sources closer to sensitive receptors; however, the overall changes in air quality would be negligible.

A qualitative assessment using the Transport TRAQ tool was undertaken to determine the potential operational impacts of the proposal. TRAQ assesses the potential impacts on air quality from vehicles using a new or existing road. It is a preliminary screening calculation to estimate pollutant emission rates due to road traffic and subsequently, pollutant ground level concentrations at a selected distance from the road. The results of this analysis are summarised below and the detailed assessment results, including the inputs and assumptions used for the modelling analysis, are provided in Appendix N.

The air quality modelling did not identify any exceedances of the nominated criteria for NO, CO or PM₁₀ beyond the kerb of the road. However, the following exceedances of the cumulative annual PM_{2.5} criteria of 7 µg/m³ were predicted:

- up to 10 metres from the kerb of Picton Road during the design year (2046) for both the no build and build scenarios
- up to 20 metres from the kerb of the M31 Hume Motorway during the opening year (2031) and design year (2046) for both the no build and build scenarios.

As identified in section 6.9.3 the nearest existing or approved future sensitive receptors to the kerbs of Picton Road and the M31 Hume Motorway are about 60 and 40 metres respectively. Air quality impacts as a result of the proposal are not expected for any existing sensitive receptors.

With regards to future receptors, the Wilton Growth Area Development Control Plan 2021 provides that the following minimum separation distances would apply:

- Picton Road – 20 metres for residential development and 80 metres for childcare facilities, hospitals, aged care facilities, and schools.
- M31 Hume Motorway – 30 metres for residential development and 80 metres for childcare facilities, hospitals, aged care facilities, and schools.

These separation distances are greater than the potential distances to exceedances of the criteria, as predicted by the air quality modelling. Therefore, air quality impacts as a result of the proposal are not expected for any future sensitive receptors.

The proposal also incorporates a shared user path along Picton Road, which would provide a healthy and non-polluting means of local transport.

6.9.5 Safeguards and management measures

The measures described in Table 6-67 will be implemented, in conjunction with other measures provided in section 7.2, to avoid, minimise, mitigate or manage potential air quality impacts.

Table 6-67: Air quality safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality	<p>A Construction Air Quality Management Plan (CAQMP) will be prepared and implemented as part of the CEMP. The plan will detail processes, responsibilities and measures to manage air quality and minimise the potential for impacts during construction.</p> <p>The CAQMP will include, but not be limited to:</p> <ul style="list-style-type: none"> • a map identifying locations of sensitive receptors • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA guidelines • mitigation and suppression measures to be implemented, including measures to manage potential silica emissions from concrete processing, cutting and grinding if required. • methods to manage work during strong winds or other adverse weather conditions 	Contractor	Detailed design/ pre-construction/ construction	Section 4.4 of QA G36 <i>Environment Protection</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none">• a process for monitoring dust on-site and weather conditions• a progressive rehabilitation strategy for exposed surfaces.			

6.10 Landscape character and visual impacts

This section summarises the results of the landscape character and visual impact assessment prepared as an input to the REF. The full assessment results are provided in Urban Design, Landscape Character and Visual Impact Assessment report in Appendix K.

6.10.1 Methodology

The landscape character and visual impact assessment was undertaken in accordance with the *Guidelines for landscape character and visual impact assessment* (Transport for NSW, 2020a) and involved the following main tasks:

- desktop analysis, including analysing aerial photographs and topographic maps
- site visit and analysis to understand the existing landscape and visual context
- identifying landscape character zones (LCZs) and their sensitivity to change
- identifying representative viewpoints and their sensitivity to change
- understanding the key visual features of construction and operation
- assessing the potential for landscape character and visual impacts during construction and operation (see summaries below)
- determining the potential significance of impacts through a combined assessment of sensitivity and magnitude
- recommending mitigation and management measures.

The study area for the landscape character and visual impact assessment consists of the proposal site and a buffer of up to three kilometres around the proposal site. The study area is shown on Figure 6-26.

Landscape character impact assessment

Landscape character impacts refer to the relative capacity of the landscape to accommodate changes to the physical landscape through the introduction of new features or loss/modification of existing features.

The potential landscape character impacts were determined based on the sensitivity of the identified LCZs and the magnitude of the potential impact. Sensitivity refers to how sensitive the existing character of the area is to the proposed change, and the ability of the landscape to absorb changes. Magnitude refers to the physical size and scale of the impact at this location. The combination of sensitivity and magnitude determines the landscape character impact, which is rated from negligible to high as shown in Figure 6-25.

Rezoning of land around the proposal site to more urban land uses (including residential subdivisions and development of the Wilton Town Centre) would gradually transform the character of the study area from that of a semi-rural character to suburban over time. The landscape character impact assessment considered potential impacts based on the sensitivity of the existing environment and the magnitude of the changes that would result from the proposal during construction and once completed.

The landscape character assessment is focused on the potential impacts of the proposal during operation, as a result of the permanent changes to LCZs.

Visual impact assessment

The area from where the proposal could be visible is referred to as the visual catchment or visual envelope. This is largely defined by the landform of the study area. Viewpoints were selected to illustrate the visual influence of the proposal both within and outside the proposal site. These generally represent publicly accessible views and vistas from a range of locations and viewing situations. A total of 12 viewpoints were selected for the visual impact assessment, and these are shown in Figure 6-31.

The potential visual impacts were determined based on the sensitivity of the viewpoint and the magnitude of the change. Sensitivity refers to the quality and value of the view and how it would be affected by the proposal. Magnitude refers to the nature, size and scale of the change in views resulting from the proposal and the proximity relative to the viewer. The combination of sensitivity and magnitude determines the visual impact, from negligible to high as shown in Figure 6-25.

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High impact	High to moderate impact	Moderate impact	Negligible impact
	Moderate	High to moderate impact	Moderate impact	Moderate to low impact	Negligible impact
	Low	Moderate impact	Moderate to low impact	Low impact	Negligible impact
	Negligible	Negligible impact	Negligible impact	Negligible impact	Negligible impact

Figure 6-25: Landscape character and visual impact rating matrix

6.10.2 Existing environment

The study area is located within the Hawkesbury-Nepean catchment, which generally consists of mountainous terrain, interspersed with areas originally cleared for agricultural uses. Remnant native vegetation near the proposal site is generally located at the eastern, western and southern extents of the study area associated with the Nepean River, Byrnes Creek, Allens Creek and Stringybark Creek.

The landscape and visual environment of the proposal site is currently characterised by its rural/rural-residential nature, particularly to the west and south. Features contributing to the visual appearance include rural land interspersed with scattered development, dwellings, buildings and sheds, existing native vegetation and scattered trees, and road infrastructure.

New residential developments at Bingara Gorge to the north-east of the Picton Road and M31 Hume Motorway interchange represent the first stages of the transformation of the Wilton Growth Area. Large areas of planned development in accordance with the Wilton 2040 strategy are located north and south of Picton Road on both sides of the M31 Hume Motorway, including the new Wilton Town Centre, which would be located north-west of the proposal site.



Landscape character zones

Four LCZs were identified as described in Table 6-68 and shown on Figure 6-26. Representative views of each zone are provided in Figure 6-27 to Figure 6-30. The assessed sensitivity of the LCZs is provided in Table 6-68.





Table 6-68: Landscape character zones

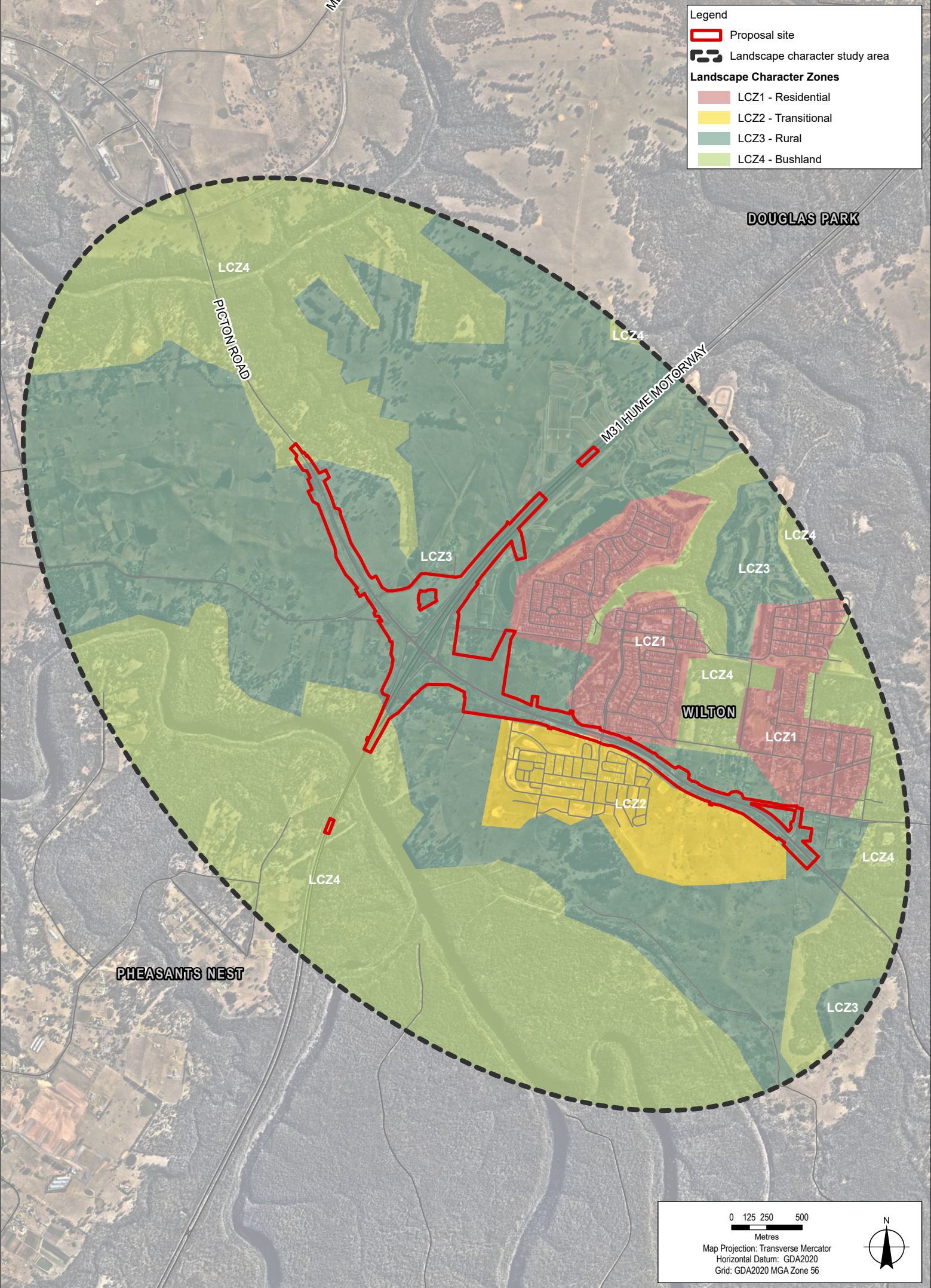
LCZ	Description	Sensitivity
1-Residential	<ul style="list-style-type: none"> residential areas north of Picton Road and east of the M31 Hume Motorway, including older established areas to the east surrounding Almond Street and newer developments that form part of Bingara Gorge suburban, low density residential development, with a small neighbourhood shopping centre and community facilities, such as parks, sporting grounds and associated buildings vegetation present within residential properties, open space areas and street tree plantings (both native and exotic) semi-open areas with partial views of surrounding hills and associated bushland, framed by dwellings and street trees 	Low
2-Transitional	<ul style="list-style-type: none"> located south of Picton Road, east of the Picton Road and M31 Hume Motorway interchange new residential development currently under construction, includes streets, footpaths, road signs and street lighting minimal trees and vegetation, mostly cleared land for development apart from scattered trees and grasses 	Low
3-Rural	<ul style="list-style-type: none"> scattered dwellings along Picton Road and the M31 Hume Motorway and surrounding area a recommended Scenic Protection Area is located west of the M31 Hume Motorway open rural landscape with views of surrounding hills, farm dams and grassland patches of remnant native vegetation, with dense bushland and the Razorback Range providing a backdrop to the north and west mostly one and two storey, large lot, rural residences with rural fences, and paved and unpaved access roads Wilton Airport is located west of the M31 Hume Motorway with vehicle access from Picton Road via Aerodrome Drive 	Moderate
4-Bushland	<ul style="list-style-type: none"> located at or near the southern, western and northern extents of the proposal site near the Nepean River, Byrnes Creek, and Stringybark Creek respectively steep cliffs, overhangs and rocky embankments falling steeply towards the Nepean River heavily vegetated bushland, and high quality natural environment with high scenic and ecological value vehicle bridge crossings over the Nepean River located west and south of the proposal site 	High

Legend

-  Proposal site
-  Landscape character study area

Landscape Character Zones

-  LCZ1 - Residential
-  LCZ2 - Transitional
-  LCZ3 - Rural
-  LCZ4 - Bushland



0 125 250 500
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56




Figure 6-26 - Landscape character zones

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023. Created by: akidea
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12560200_REFX012_LandscapeCharacterZones_A4P. Print date: 25 Oct



Figure 6-27: Landscape character zone 1 – Residential



Figure 6-28: Landscape character zone 2 – Transitional



Figure 6-29: Landscape character zone 3 – Rural







Figure 6-30: Landscape character zone 4 – Bushland





Viewpoints





Based on the analysis of sensitive visual receivers and the existing landscape and visual environment, 12 viewpoints for the landscape character and visual impact assessment were identified.

A summary of the viewpoints together with representative views is provided in Table 6-69. The location of the viewpoints is shown on Figure 6-31.

Table 6-69: Viewpoints identified for the proposal

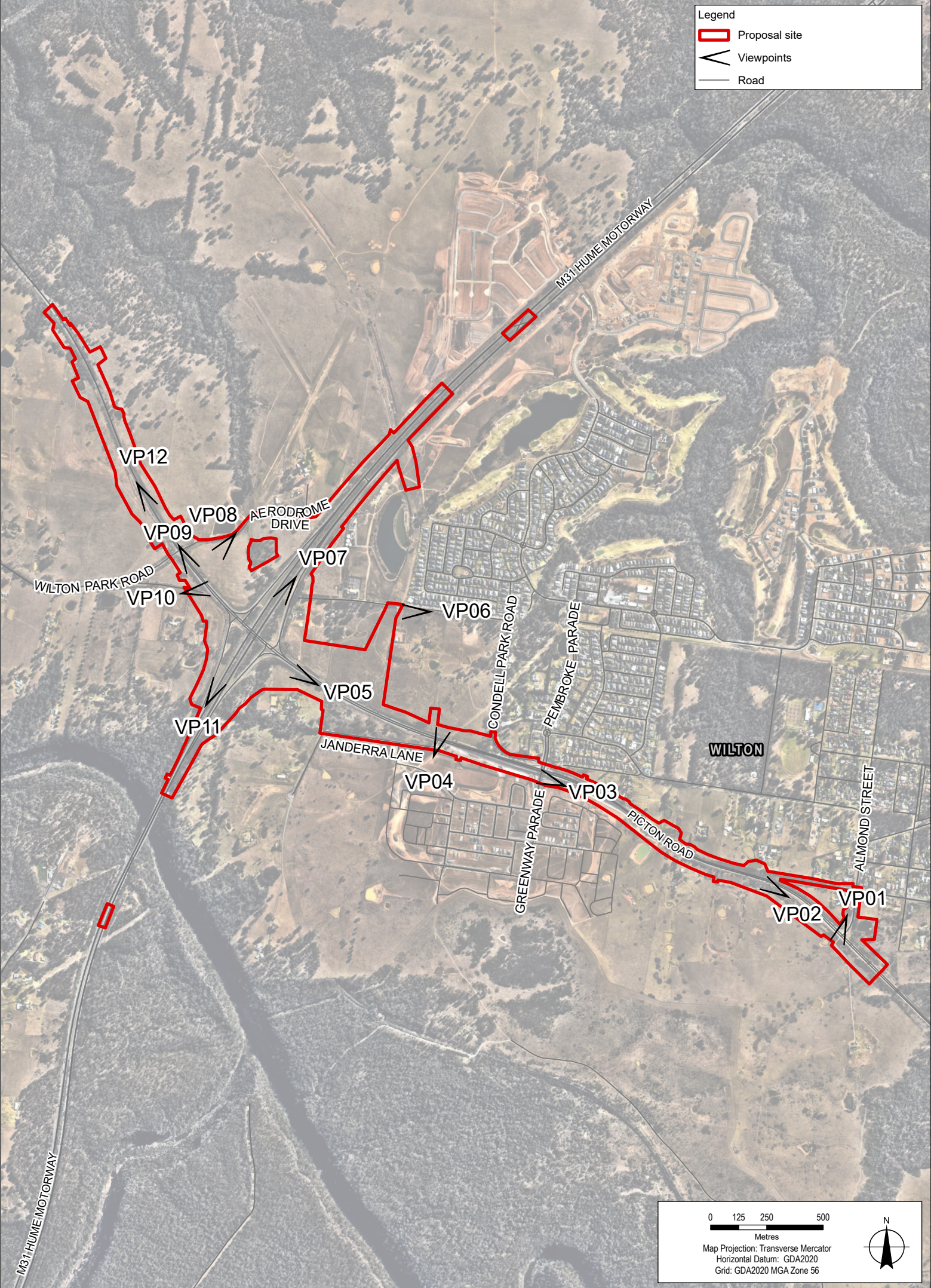
Viewpoint	LCZ	Description	Sensitivity	Existing view
01 – Almond Street residential area	3	<ul style="list-style-type: none"> includes the Almond Street intersection (from Almond Street facing south towards Picton Road), a turfed verge with trees and low vegetation screen visible overhead powerlines and rural wire fence on timber posts future views potentially include new development as part of Wilton Greens and the developer-led Almond Street intersection upgrade 	Low	
02 – Picton Road westbound carriageway	3	<ul style="list-style-type: none"> the view shows Picton Road gently rising and curving to the west steep, vegetated batters frame the road on both sides with scattered trees, vegetation and grasses dense vegetation screens the road 	Negligible	
03 – Pembroke Parade at Bingara Gorge development area entry	1 and 2	<ul style="list-style-type: none"> the view shows the Picton Road and Pembroke Parade intersection with two westbound lanes, a right turning lane into Pembroke Parade and left slip lane into Greenway Parade cleared land and signage is visible as part of the Wilton Greens development the Razorback Range are visible in the distance forming the horizon future views will include new suburban development to the south and north 	Low	
04 – Wilton Greens future employment lands	2 and 3	<ul style="list-style-type: none"> view from Janderra Lane as it slopes down to meet Picton Road the view is representative of future views from Wilton Greens future views potentially include the developer-led Janderra Lane overpass 	Negligible	

Viewpoint	LCZ	Description	Sensitivity	Existing view
05 – Picton Road and M31 Hume Motorway interchange (eastern approach)	3	<ul style="list-style-type: none"> the view shows the Picton Road carriageways and the entry ramp onto the M31 Hume Motorway southbound vegetation on either side of the road frames a view of Razorback Range in the distance suburban development may appear over time on the low hill near Wilton Park Road 	Moderate-low	
06 – Wilton residential area	1	<ul style="list-style-type: none"> the view includes expansive open views over the landscape to the Razorback Range in the distance with grasslands and tree canopy in the foreground potential views of Picton Road from second storeys or partial views from ground level may be available from some locations 	Moderate	
07 – Picton Road and M31 Hume Motorway interchange (northern approach)	3	<ul style="list-style-type: none"> the view shows the two southbound lanes of the M31 Hume Motorway as it curves to the east the Picton Road overbridge is visible where it crosses the M31 Hume Motorway although the planted central median provides screening of the bridge 	Low	
08 – Wilton Airport and the future Wilton Town Centre	3	<ul style="list-style-type: none"> the view shows Aerodrome Drive at the Wilton Airport airfield, facing south towards the intersection with Picton Road the development of the Wilton Town Centre will gradually change the views from this location considerably, with views likely to be from taller, multi-storey buildings with varying perspectives of the interchange 	Low	

Viewpoint	LCZ	Description	Sensitivity	Existing view
09 – Picton Road and M31 Hume Motorway interchange (western approach)	3	<ul style="list-style-type: none"> the view shows the Picton Road eastbound carriageway approaching the M31 Hume Motorway interchange and northbound entry ramp suburban development may appear over time as part of land releases south of Picton Road resulting in a more urban environment 	Low	
10 – Existing rural residential	3	<ul style="list-style-type: none"> the view shows the rural landscape from Berwick Park Road south-west of the proposal site. the proposal is likely to be seen from viewpoint where planted screening is not present 	Moderate	
11 – Picton Road and M31 Hume Motorway interchange (southern approach)	3	<ul style="list-style-type: none"> the view shows the two northbound lanes of the M31 Hume Motorway as it curves to the east the Picton Road overbridge is visible where it crosses the M31 Hume Motorway although the planted central median provides screening of the bridge 	Low	
12 – Picton Road eastbound carriageway	3	<ul style="list-style-type: none"> the view shows Picton Road eastbound, about 800 m west of the interchange this section of Picton Road is in a cutting, with the embankments and scattered trees containing the view to the road corridor on either side 	Low	

Legend

- Proposal site
- Viewpoints
- Road



0 125 250 500
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

Figure 6-31 - Viewpoints

Data source: Nearmap WMS Server; NSW SS-SDS. Topographic base data, 2023. Created by: akidea
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12560200_REFX011_Viewpoints_A4P. Print date: 25 Oct

6.10.3 Potential impacts

Construction

Construction would have the potential to result in temporary impacts on landscape character and visual amenity within and surrounding the proposal site. These impacts would include views of:

- construction plant and equipment
- construction activities
- hoarding and/or fencing around work areas
- stored materials and stockpiles
- activities in and around compound sites and ancillary facilities
- vegetation clearing, including mature tree removal
- excavation and earthworks.

Construction may require lighting at ancillary facilities and work areas, particularly during out-of-hours works (see section 3.3.3 for a description of the proposed work hours). Construction lighting has the potential to result in temporary visual impacts at night, primarily from light spill.

The potential impacts at each viewpoint during construction were assessed. Potential impacts ranged from negligible to high-moderate, depending on the sensitivity of the view and the magnitude of visible construction activities. These impacts would be experienced by sensitive receivers (including residents, pedestrians, cyclists, motorists, and local workers) in the vicinity of work areas and from the identified viewpoints to differing degrees.

Potential construction impacts on landscape and visual character are assessed as having the potential to be negligible to moderate-low. The assessment concluded that there would be potential for moderate impacts at viewpoints 09 and 10, and high-moderate impacts at viewpoint 06. Potential impacts at these viewpoints are generally a result of:

- earthworks, mature tree removal, and use of temporary fencing and construction machinery
- the removal of vegetation screening, which would temporarily open up views of sensitive receivers to construction works
- temporary compound sites located in areas that may be visible by sensitive residential receivers.

A summary of the assessed level of significance of potential impacts on viewpoints is provided in Table 6-70. Further information about the ratings and detailed assessment results for each key viewpoints is provided in section 6 of the Urban Design, Landscape Character and Visual Impact Assessment report (Appendix K).

Table 6-70: Summary of overall potential impacts on viewpoints during construction

Visual impact	Viewpoints
Negligible	01, 02 and 04
Low	03, 08 and 12
Moderate-low	05, 07, and 11
Moderate	09 and 10
High-moderate	06
High	Nil

Safeguards and management measures have been identified for construction works to minimise the potential for landscape and visual impacts as far as practicable (see section 6.10.4).

Operation

Landscape character impacts

The proposal has the potential to result in permanent landscape character impacts across the four LCZs. The potential impacts would range from negligible to moderate-low, as summarised in Table 6-71.

Table 6-71: Potential landscape impacts during operation

LCZ	Key changes in zone from the proposal	Sensitivity	Magnitude	Impact rating	Impact summary
1	<ul style="list-style-type: none"> widening of Picton Road to up to three lanes in each direction vegetation removal and replacement plantings tie-ins into existing shared user paths relocation of noise wall along Pembroke Parade new/upgraded roadside furniture (such as safety infrastructure, fences, lighting, and roadside furniture) and minor drainage 	Low	Negligible	Negligible	There would be a negligible impact during operation as this zone is subject to minimal direct effects from the proposal. Potential impacts would generally be confined to the road corridor and are consistent with the existing landscape character.
2	<ul style="list-style-type: none"> widening of Picton Road to up to three lanes in each direction vegetation removal and replacement plantings new shared user path new/upgraded roadside furniture (such as safety infrastructure, fences, lighting, and roadside furniture) 	Low	Negligible	Negligible	There would be a negligible impact during operation as the zone is subject to ongoing development. Changes associated with the proposal would be consistent with the existing landscape character. The zone also has the capacity to absorb changes from the proposal as part of the overall change to the landscape.
3	<ul style="list-style-type: none"> new Picton Road and M31 Hume Motorway interchange widening of Picton Road to up to three lanes in each direction shared user path, including under and overpasses paved medians noise treatments vegetation removal and replacement plantings new/upgraded roadside furniture (such as safety infrastructure, fences, lighting and roadside furniture) 	Moderate	Low	Moderate-low	The landscape value is considered generally low given the eroded side slopes and watercourses and intermittent vegetation within this zone. However, the proposal would result in changes that have the potential to adversely affect the rural landscape character from a more natural appearance to one increasingly defined by a transport corridor.

LCZ	Key changes in zone from the proposal	Sensitivity	Magnitude	Impact rating	Impact summary
4	<ul style="list-style-type: none"> minor drainage works tie-ins to existing M31 Hume Motorway 	High	Negligible	Negligible	While the bushland has a high sensitivity rating, there would be little to no discernible changes to this zone from the proposal.

Visual impacts

The proposal has the potential to result in visual impacts across the proposal site. The potential impacts, which would range from negligible to moderate, are summarised in Table 6-72. In summary:

- four viewpoints would experience negligible impacts (viewpoints 01, 04, 06 and 08)
- four would experience low impacts (viewpoints 02, 03, 07 and 11)
- three would experience moderate to low impacts (05, 09 and 12)
- one would experience moderate impacts (10).

The potential operational visual impact at each viewpoint is summarised in Table 6-72. Visual representations of the proposal once operational at viewpoints 03, 05, 07, 11 and 12 are shown on Figure 6-32 to Figure 6-36.

Generally, visual impacts would occur due to the presence of proposal infrastructure (including new road infrastructure, shared user paths, interchange road bridges, roadside furniture and street lighting), removal of vegetation followed by landscaping and widening of Picton Road.

Table 6-72: Potential visual impacts during operation

View-point	Anticipated change	Sensitivity	Magnitude	Impact rating	Impact summary
01	<ul style="list-style-type: none"> widened carriageway with a new shared user path on the northern side of Picton Road revegetation within the road reserves water quality controls 	Low	Negligible	Negligible	Some loss of amenity is expected from tree and vegetation removal. However, the scale of the changes would be consistent with the existing intersection.
02	<ul style="list-style-type: none"> widened carriageway with new shared user paths on southern and northern sides of Picton Road new roadside furniture revegetation within the road reserves 	Low	Low	Low	The scale and character of the change would be consistent with the existing setting, with a low degree of contrast.
03	<ul style="list-style-type: none"> widened carriageway in the background of the view with a new shared user path along the southern side of Picton Road new roadside furniture revegetation within the road reserves 	Low	Low	Low	The view is seen within the context of a major road corridor and controlled intersection. Views are of short duration and the scale and character of the change would be consistent with the existing road setting.

View-point	Anticipated change	Sensitivity	Magnitude	Impact rating	Impact summary
04	<ul style="list-style-type: none"> widened carriageway with a new shared user path along Picton Road on both sides of Janderra Lane new roadside furniture revegetated batters on both sides of Picton Road 	Negligible	Low	Negligible	<p>The proposal involves upgrading an existing intersection with the main visual receivers comprising a low to moderate number of motorists.</p> <p>The view is temporary, and therefore the visual scale of the change would be low. The view would also be a consistent visual fit with the landscape.</p>
05	<ul style="list-style-type: none"> new interchange widened carriageway with ramp realignments new shared user path new roadside furniture and street lighting planting in road verges and central median 	Moderate-low	Moderate	Moderate-low	<p>The proposal would result in the loss of mature trees, although replanting would be undertaken.</p> <p>The quality of the existing view is considered low with temporary views of the interchange and associated road infrastructure.</p>
06	<ul style="list-style-type: none"> new off ramp from the M31 Hume Motorway to Picton Road in the background 	Moderate	Negligible	Negligible	<p>Changes would generally not be visible or would be limited for most views.</p> <p>Where there are views, the landscape has the capacity to absorb the relatively minor changes, which are consistent with the existing view.</p>
07	<ul style="list-style-type: none"> new bridges over the M31 Hume Motorway safety features, roadside furniture, and support structure of the new bridges 	Low	Low	Low	<p>Changes would be consistent with the existing view. The high quality design outcome would result in an improved interchange within a vegetated setting.</p>
08	<ul style="list-style-type: none"> landscape changes on Picton Road 	Low	Negligible	Negligible	<p>The works would be visually consistent with the existing setting. The changes would be considered minimal and easily absorbed within the landscape.</p>
09	<ul style="list-style-type: none"> new interchange widened carriageway with ramp realignments new shared user path new traffic lights, roadside furniture and street lighting planting in road verges and central median 	Low	Moderate	Moderate-low	<p>The proposal would result in the loss of trees, although replanting would be undertaken.</p> <p>However, the proposal would be consistent with the existing view and there would be no visible structures.</p>

View-point	Anticipated change	Sensitivity	Magnitude	Impact rating	Impact summary
10	<ul style="list-style-type: none"> realigned northbound exit ramp and new shared user path bridge over the exit ramp new shared user path on southern side of Picton Road planting in road verges and central median 	Moderate	Moderate	Moderate	There are partial views of the road that would be more open from removal of screening vegetation. However, the proposal would be consistent with the existing view.
11	<ul style="list-style-type: none"> new overbridge safety features, roadside furniture, lighting, and support structures for the new bridge portions of the shared user path 	Low	Low	Low	The changes would be consistent with the existing view. The high quality design outcome would result in an improved interchange within a vegetated setting.
12	<ul style="list-style-type: none"> widening of Picton Road new paved shoulders, safety infrastructure, and roadside furniture new shared user path on southern and northern side of Picton Road new revegetated embankment cuttings 	Low	Moderate	Moderate-low	The proposal would increase the visual presence of the road corridor. However, this change would be consistent with the existing environment. The cuttings would be increased but would be in proportion with the widened road corridor.



Figure 6-32: Visual representation of the proposal at viewpoint 03 – Pembroke Parade at Bingara Gorge entry (eastern approach)



Figure 6-33: Visual representation of the proposal at viewpoint 05 – Picton Road and M31 Hume Motorway interchange (eastern approach)



Figure 6-34: Visual representation of the proposal at viewpoint 07 – Picton Road and M31 Hume Motorway interchange (northern approach)



Figure 6-35: Visual representation of the proposal at viewpoint 11 – Picton Road and M31 Hume Motorway interchange (southern approach)



Figure 6-36: Visual representation of the proposal at viewpoint 12 – Picton Road eastbound carriageway (western approach towards the Picton Road and M31 Hume Motorway interchange)

6.10.4 Safeguards and management measures

The measures described in Table 6-73 will be implemented to avoid or minimise potential landscape and visual impacts.

Table 6-73: Landscape character and visual safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual impact	<p>An Urban Design and Landscaping Plan will be prepared to support the final detailed project design and implemented as part of the CEMP.</p> <p>The Urban Design and Landscaping Plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for:</p> <ul style="list-style-type: none"> location and identification of existing vegetation and proposed landscaped areas, including species to be used built elements including retaining walls, bridges and noise walls pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings fixtures such as seating, lighting, fencing and signs details of the staging of landscape work including early vegetation establishment, taking account of related environmental controls such as erosion and sedimentation controls and drainage procedures for monitoring and maintaining landscaped or rehabilitated areas consideration of buffer planting to screen views for dwellings located adjacent to the Picton Road and M31 Hume Motorway interchange maximising opportunities for revegetation with native species of local provenance to complement and integrate with existing remnant vegetation, where appropriate batters, which will be vegetated as far as practicable rounding of batters to integrate into the existing landform and create a more natural appearance. <p>The Urban Design and Landscaping Plan will be prepared in accordance with the heritage interpretation strategy and relevant guidelines, including:</p> <ul style="list-style-type: none"> <i>Connecting with Country</i> (Government Architect NSW, 2023) <i>Biodiversity Policy</i> (Transport for NSW, 2022e) 	Transport/ contractor	Detailed design/ pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> • <i>Water Sensitive Urban Design Guideline</i> (Transport for NSW, 2023a) • <i>Beyond the Pavement urban design policy, process and principles</i> (Transport for NSW, 2023c) • <i>Landscape Design Guideline</i> (Transport for NSW, 2023d) • <i>Bridge Aesthetics</i> (Transport for NSW, 2023e) • <i>Noise Wall Design Guidelines</i> (Transport for NSW, 2023f) • <i>Shotcrete Design Guideline</i> (Transport for NSW, 2023g) • <i>Pedestrian Underpass Design Guideline</i> (Transport for NSW, 2023i). 			
	Lighting will be designed and sited to minimise glare and light spill into adjoining areas in accordance with Australian/New Zealand Standard AS/NZS 4282 <i>Control of the obtrusive effects of outdoor lighting</i> and relevant standards in the series AS/NZS 1158 <i>Lighting for roads and public spaces</i> .	Transport	Detailed design	Additional safeguard
Visual impacts of construction work areas	Any construction ancillary facilities with hoarding and fencing will be designed, erected and maintained to minimise visual impacts. This will include: <ul style="list-style-type: none"> • erecting hoarding/fencing as early as possible in the site establishment phase to provide visual screening • featuring graphics, artwork or project information in accordance with Transport guidelines and specifications • maintaining hoarding/fencing regularly, including the prompt removal of graffiti. 	Contractor	Pre-construction/ construction	Additional safeguard
Site restoration and rehabilitation	All temporary infrastructure will be removed at the completion of construction, unless otherwise agreed with relevant stakeholders.	Contractor	Construction	Additional safeguard
Planning with Country	Options will be investigated to integrate planning and designing with Country elements in the urban design and other aspects of the proposal in consultation with Aboriginal stakeholders.	Transport	Detailed design	Additional safeguard

6.11 Property and land use

This section provides an assessment of the potential impacts of the proposal on property and land use. It describes the existing land use environment, assesses the potential impacts of construction and operation, and provides measures to avoid and minimise the identified impacts.

6.11.1 Methodology

The assessment methodology included the following key tasks:

- confirming land use and planning controls (land use zones) in the study area, involving a review of:
 - land use zoning maps under the Wollondilly LEP and SEPP (Western Parkland City), which apply to different areas of the proposal site
 - aerial imagery
- reviewing key strategic plans and development applications relevant to the study area to identify future land use and development plans and priorities, including searching development application registers, the NSW major project tracking system, and the Joint Regional Planning Panels development and planning register
- identifying the presence of any Native Title or Aboriginal Land Rights claims over land within the proposal site.
- identifying properties located within the proposal site
- assessing the potential impacts of construction and operation, including temporary and permanent land use changes, and impacts on properties
- identifying measures to avoid, minimise and manage the potential impacts identified.

The study area for the property and land use assessment is the proposal site and immediate surrounds.

6.11.2 Existing environment

Property

The proposal site is generally comprised of the existing road corridor and some adjacent land. The proposal site also includes land within about 29 properties which would be permanently required (see section 6.11.4), of which:

- 23 are privately owned
- six are owned by the NSW Government.

For the majority of these properties the proposal site is only located on part of the property.

In addition to the properties within the proposal site required permanently, four properties not already owned by the NSW Government are being considered for use during construction (see section 6.11.4).

Land use

Historically the study area has been dominated by rural land uses surrounded by bushland areas. The main areas of residential land uses were associated with the village of Wilton located north of Picton Road around Almond Street.

Following the NSW Government's declaration of the Wilton Growth Area as a Priority Growth Area in July 2016, the Wilton area has been subject to progressive redevelopment and rezoning to deliver 15,000 new homes and a new town centre in accordance with Wilton 2040 (see section 2.1.3). This has included the Bingara Gorge development, located north of Picton Road to the north-west of the Wilton village (see Figure 6-37), which has been occurring in stages since 2008.

Land uses in the study area include (Figure 6-37):

- rural (around edges of urban areas)
- residential (including rural residential and low density residential in Wilton village and Bingara Gorge)

- commercial (mainly at Wilton Plaza)
- education (Wilton Public School and Bingara Gorge Community Preschool)
- recreation and open space (including Pulse Facilities and Bingara Gorge Golf Course, Highlands Park, Pembroke Pocket Park, Hannaford Oval)
- infrastructure and transport (including Wilton Recycled Water Treatment Plant, Wilton Zone Substation, Wilton Airport, Picton Road, M31 Hume Motorway and local roads)
- other community uses (including Wilton Community Centre, Wilton Rural Fire Brigade, and St Luke's Anglican Church).

The Wilton Greens development area is located east of the M31 Hume Motorway and south of Picton Road in the South East Wilton precinct (the precincts in the Wilton Growth Area are described in section 4.1.1). Stage 1 of the Wilton Greens development is underway (see Figure 6-38), with residential development within the completed subdivision recently commenced.

Further information on future development in the vicinity of the proposal site is provided in section 6.11.3.

In terms of the proposal site itself, the majority of the land is used for transport infrastructure purposes (zoned SP2 Infrastructure). Smaller areas are subject to rural and future residential uses (zoned RU2 Rural Landscape or UD Urban Development). The WaterNSW Upper Canal, which forms part of Sydney's water supply system, passes underground beneath the proposal site, with small sections of the pipeline easement (at ground surface) located within the proposal site (see Figure 4-4).

Land zoning

As described in section 4.1, land within the proposal site and surrounds is zoned by either the Wollondilly LEP or SEPP (Western Parkland City). Further detail on the split between the LEP and SEPP is provided in section 4.1 and Figure 4-4.

The main land uses zones within and close to the proposal site for land zoned by the Wollondilly LEP are (see Figure 6-37):

- R2 Low Density Residential
- RU2 Rural Landscape
- SP2 Infrastructure (road, water supply and place of public worship uses)
- RU4 Rural Small Holdings
- C2 Environmental Conservation.

The main land uses zones within and close to the proposal site for land zoned by SEPP (Western Parkland City) are (see Figure 6-37):

- UD Urban Development
- C2 Environmental Conservation
- SP2 Infrastructure.

Native Title and Aboriginal land claims

A search of the Office of the Registrar, *Aboriginal Land Rights Act 1983* land claim register listed no Aboriginal Owners with land or claims within the proposal site. A search of the National Native Title Tribunal database listed no registered Native Title Claims or Registered Indigenous Land Use Agreements within the proposal site. The nearest claim is by the South Coast People (NC2017/003) located to the south-east of the proposal site. The boundary of the application does not extend into the proposal site.

There is no Crown land or Crown roads within the proposal site.

6.11.3 Future environment

As described in section 2.1.3, DPE and Wollondilly Council are planning for the Wilton Growth Area to provide about 15,000 homes and 15,000 jobs across six precincts, including a new town centre.

Planning for the development of the Wilton Growth Area commenced in 2016, and the Wilton 2040 strategy was released in 2018. The *Wilton Growth Area Update* (DPE, 2023) notes that significant progress has been made in precinct planning in the Wilton Growth Area, including the NSW Government led precinct rezoning of the North Wilton and Wilton Town Centre precincts. The update also notes that further precinct planning and the potential future rezoning of the West Wilton, South Wilton, and Maldon precincts will be undertaken through collaboration between Wollondilly Shire Council and DPE.

Table 6-74 outlines the status of development and rezoning for the Wilton Growth Area precincts surrounding the proposal site as of August 2023. Further information about the Wilton Growth Area is available at: [Wilton | Planning \(nsw.gov.au\)](https://www.wilton.nsw.gov.au/planning).

Table 6-74: Proposed future development within Wilton Growth Area

Wilton Growth Area precinct (see Figure 4.1)	Rezoning	Development/planning
Bingara Gorge	Rezoned by Wollondilly Shire Council (was rezoned in Wollondilly LEP when gazetted)	Development largely completed or subject to development applications outlined in Table 6-75.
South East Wilton	Rezoned under the now repealed SEPP (Sydney Region Growth Centres) 2006 in 2018 and now included in SEPP (Western Parkland City)	Development has commenced with stage 1 of the Wilton Greens Development (see Table 6-75). Development within the remainder of the precinct would be consistent with the <i>South East Wilton Precinct Structure Plan</i> (DPE, 2022b) and would mainly consist of residential development.
North Wilton	Rezoned under the now repealed SEPP (Sydney Region Growth Centres) 2006 in 2018 and now included in SEPP (Western Parkland City)	Stages 1-3 of the Panorama development either approved or awaiting approval (see Table 6-75). Development within the remainder of the precinct would be consistent with the <i>North Wilton Precinct Structure Plan</i> (DPE, 2022c) and would mainly consist of residential development.
Wilton Town Centre	Rezoned under SEPP (Western Parkland City) in June 2023	Wollondilly Shire Council has begun work on a master plan for the precinct.
South Wilton	Yet to be rezoned	Precinct planning to be undertaken by Wollondilly Shire Council.
West Wilton	Yet to be rezoned	Precinct planning to be undertaken by Wollondilly Shire Council.

Table 6-75 summarises the approved developments as at August 2023 located in the vicinity of the proposal site that would result in a change in land use (for example new subdivisions). Figure 6-38 shows the location of the proposed developments listed in Table 6-75 with respect to the proposal site.

Table 6-75: Future developments in the vicinity of the proposal site

ID	DA number	Development name (applicant)	Description	Approval date	Status of development
1	2018/339	Wilton Green (Walker Corporation Pty Limited)	Stage 1 of development consisting of 696 residential lots	8 October 2019	Subdivision complete and development commencing
2	2018/641	Bingara Gorge (Bingara Development Pty Ltd)	Stage 1 of Fairways North precinct consisting of 384 residential lots	4 December 2020	Subdivision complete and development commencing
3	2018/706	Bingara Gorge (Bingara Development Pty Ltd)	Stage 1 of Fairways West precinct consisting of 104 residential lots Stage 2 of Fairways North precinct consisting of 133 residential lots	4 December 2020	Subdivision complete and development commencing
4	2019/617	Panorama (Landcom)	Stage 1 of development consisting of 199 residential lots	30 September 2022	Subdivision construction underway with registration of subdivision expected in second quarter 2024, with development to follow
5	2022/1279	Panorama (Landcom)	Stages 2 and 3 of development consisting of 318 residential lots	Not yet approved (with Sydney Western City Planning Panel)	Awaiting approval
6	2023/225	Bingara Gorge (Bingara Development Pty Ltd)	Stage 2 of Fairways West precinct consisting of 104 residential lots	Not yet approved	Awaiting approval

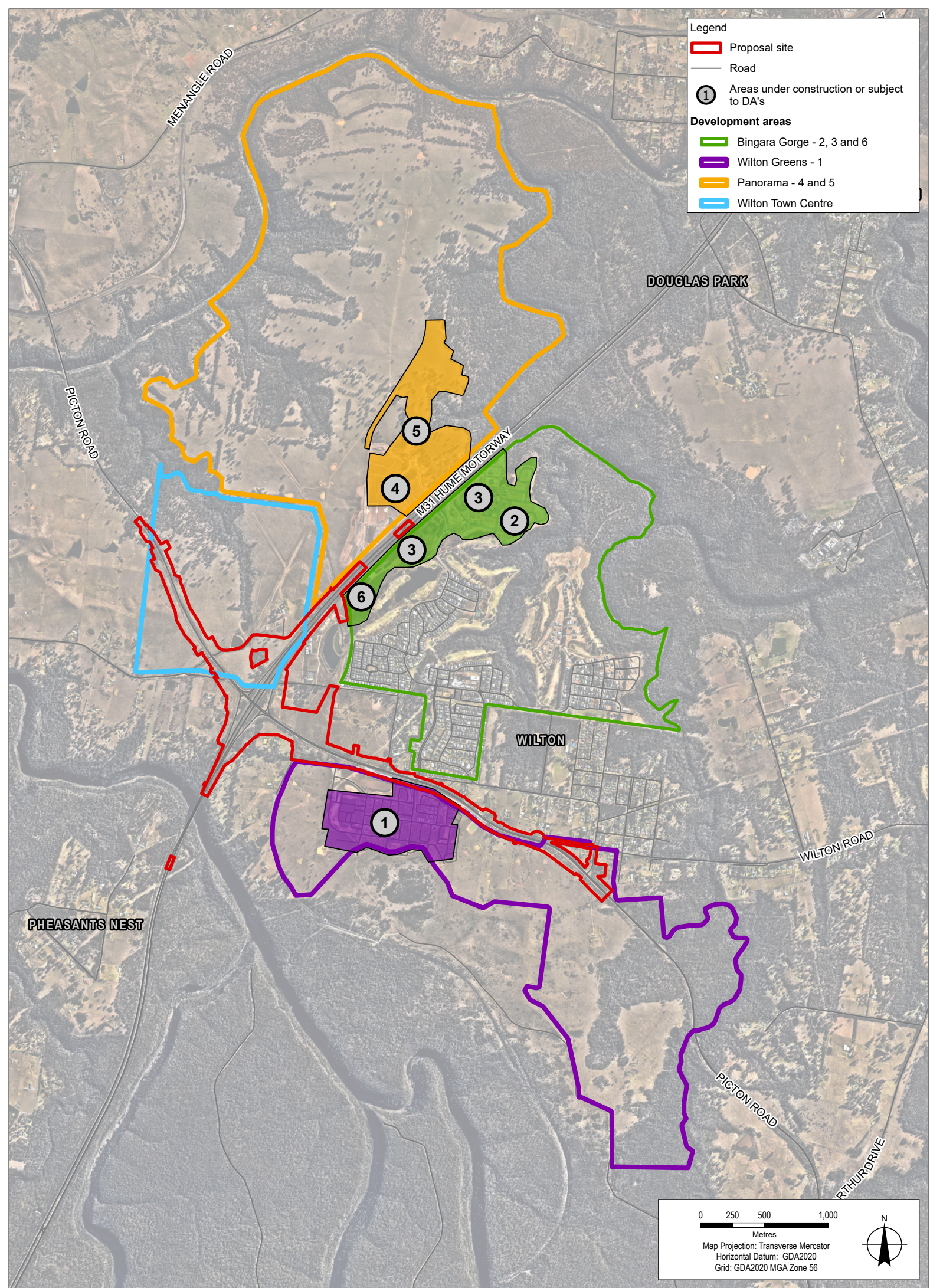


Figure 6-38 - Future development

Data source: Nearmap WMS Server; NSW SS-SDS, Topographic base data, 2023. Created by: akidea
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6.11.4 Potential impacts

Construction

The proposal would require the use of land both temporarily and permanently. While the permanent land requirements would be long-term and are related to the proposal's operational infrastructure, these impacts would commence during construction as properties are acquired and are discussed below.

Property

The proposal's operational footprint consists of the land that would be permanently required for the proposal's operational infrastructure (described in section 3.2). As described in section 3.6, the proposal would permanently impact about 29 properties, of which:

- two would require total acquisition
- 27 would require partial acquisition or adjustments.

Potential property impacts have been estimated using the proposal's operational footprint (based on the concept design) and cadastral overlay. This would be subject to further refinement during detailed design, which may alter final acquisition requirements and estimates.

Both of the properties subject to total acquisition are privately owned. One property is zoned SP2 Infrastructure by the Wollondilly LEP.

Of the 27 properties subject to partial acquisition or adjustment:

- 21 are privately owned (two of which are subject to an existing planning agreement between the NSW Government and the developer of Wilton Greens, where the impacted land is allocated for the proposal)
- six are owned by the NSW Government.

All acquisitions from private property owners would be carried out in consultation with landowners and in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (see section 6.11.5). The property acquisition process would commence once funding has been approved. Land held by the NSW Government (Transport Asset Holding Entity (TAHE)) would be subject to a vesting process. Land subject to existing planning agreements would be transferred under an executed development approval. Property adjustment plans for partial acquisitions would be developed in consultation with the property owner.

As described in section 3.2.3, permanent changes to property access arrangements may be required for two properties to accommodate the proposal's infrastructure. Further information about potential access impacts, and the proposed approach to managing these impacts, is provided in section 6.2.

Four properties (not already owned by the NSW Government) are currently being considered for use as construction ancillary facilities. The final use of these properties during construction would be confirmed by the construction contractor. Additional areas within the proposal site may require partial temporary lease agreements (in addition to the permanent land requirements) and temporary access arrangements to facilitate construction. The need for additional lease areas within the proposal site would be confirmed by the contractor.

Consultation regarding agreements associated with any leased areas would be undertaken with the landowners prior to works commencing.

Partial acquisition and/or temporary use of properties during construction could require adjustments to property infrastructure and improvements, such as fencing, driveways, landscaping, letter boxes, utility connections and other structures that could be impacted by the proposal. Any adjustments would be carried out in consultation with the property owner.

Land use

During construction, land use within the proposal site would change from the uses described in section 6.11.2 to a construction site, with land used for work areas and construction compounds/ancillary facilities. Public access to this land (where it is currently available) would potentially be restricted for the duration of its use as a construction site.

This land would be temporarily required to:

- establish ancillary facilities required to facilitate construction as outlined in section 3.4
- provide access to construction work areas
- facilitate manoeuvring of construction plant and machinery.

Three potential locations for construction compounds have been identified in section 3.4. The use of these areas would be confirmed by the construction contractor. Following the use of the compound, land would be rehabilitated to the existing condition (or a pre-agreed condition as agreed with the landowner).

Potential impacts on the use of community facilities during construction are considered in section 6.12.3.

Operation

Property

The main direct property impacts would be associated with the proposal's permanent land requirements, which are described above.

The land required for the proposal's permanent infrastructure (as outlined above) is located within land zoned for either SP2 Infrastructure, RU2 Rural Landscape and UD Urban Development and is not expected to impact the long-term development potential of individual lots based on a review of the minimum lot sizes applying to potentially impacted properties. The majority of the existing lots are currently below the minimum lot size and subdivisions would not be possible within the individual lot without the consolidation of lots. The proposal would not impact land zoned under SEPP (Western Parkland City) where there is a minimum lot size identified by the SEPP.

Land use

Direct impacts on land use during operation would result from the proposal's permanent land requirements and the presence of operational infrastructure. Where land is permanently required outside the existing road reserve, there would be a change in land use from the existing use (described in section 6.11.2) to transport infrastructure. Table 6-76 outlines the potential impacts on each land use zone located within the proposal site that would occur on completion of the proposal, including land within road reserves.

Table 6-76: Estimate of impacts on zoned land following completion of the proposal

Land use	Zoning under the relevant environmental planning instrument	Estimate of area potentially affected (hectares)	Main location/s of potential impact
Rural	RU2 Rural Landscape ¹	8.0	Adjacent to Picton Road and M31 Hume Motorway interchange, except to the north of the interchange Along the northern side of Picton Road east of the interchange
Rural (future urban) development	UD Urban Development ²	1.8	Adjacent to Picton Road and M31 Motorway interchange to the north Southern side of Picton Road west of Picton Road and M31 Motorway interchange Southern side of Picton Road east of Picton Road and M31 Motorway interchange North of Picton Road near Almond Street
Infrastructure	SP2 Infrastructure ^{1,2}	56.7	The proposal would not impact the use of this land, as it is already subject to transport uses (zoned for road infrastructure).

Notes: 1. Land zoned by Wollondilly Local Environmental Plan 2011
2. Land zoned by under SEPP (Western Parkland City)

The proposal would have the potential to impact land use in two zones where the introduction of road infrastructure would represent a change in land use. The potential impact on about eight hectares of rural zoned land would represent a reduction in the availability of land currently zoned for rural uses. However, this potential impact is considered to be minimal as:

- rural zoned land with the potential to be affected by the proposal is expected to be subject to future rezoning (to non-rural land zones) to allow ongoing development of the Wilton Growth Area
- this potential impact represents a very small proportion of the total amount of land zoned for rural uses in the Wollondilly LGA.

The potential impacts on about two hectares of land zoned for urban development would result in a minimal reduction in the availability of such land within the Wilton Growth Area, representing about 0.2 per cent of land currently zoned for this purpose within the growth area. It is also noted that areas that are yet to be rezoned (in the West Wilton and Maldon precincts, and parts of the South East Wilton precinct), are likely to include additional land zoned for urban development. This potential impact would not reduce the development potential of the growth area by any noticeable amount. The recognised need for, and benefits of, the proposal for the Wilton Growth Area and the broader community (see section 2.1) would outweigh the potential impacts of a small reduction of land available for future development.

6.11.5 Safeguards and management measures

The measures described in Table 6-77 will be implemented to avoid or minimise potential property and land use impacts.

Table 6-77: Property and land use safeguards and land use

Impact	Environmental safeguards	Responsibility	Timing	Reference
Property acquisition	Property owners and occupants affected by acquisition will be consulted, and acquisition will be undertaken, in accordance with the: <ul style="list-style-type: none"> • <i>Land Acquisition (Just Terms Compensation) Act 1991</i> • <i>A Guide to Property Acquisition in NSW (NSW Government, 2022)</i> 	Transport	Pre-construction/ construction	Additional safeguard
Impacts on land use and property	To support the property acquisition process, Property Adjustment Plans will be developed and agreed to with impacted land owners.	Transport	Detailed design/ pre-construction/ construction	Additional safeguard
Temporary leased land	Areas of land leased for the purposes of construction will be reinstated at the end of the lease to at least equivalent standard or as agreed with the landowner. Reinstatement works will be undertaken as soon as practicable following completion of construction works on the land.	Contractor	Construction	Sections 4.15 and 4.16 of QA G36 <i>Environment Protection</i>

6.12 Socio-economic

This section summarises the results of the Socio-economic Impact Assessment report prepared as an input to the REF. The full report is provided in Appendix L.

6.12.1 Methodology

The socio-economic impact assessment was undertaken in accordance with the *Environmental Impact Assessment Practice Note: Socio-economic assessment* (Transport for NSW, 2020c) (the Practice Note). It also considered the *Social Impact Assessment Guideline* (DPE 2023b). The assessment involved the following main tasks:

- scoping potential social issues by completing the Practice Note scoping checklist
- identifying the socio-economic study area by reviewing local and regional communities around the proposal site
- establishing the existing socio-economic environment (baseline), which includes a profile of relevant demographic indicators and data from the Australian Bureau of Statistics (ABS), and reviewing relevant local, regional and State policies and plans, and the outcomes of consultation carried out for the proposal (described in chapter 5)
- stakeholder consultation to validate and gather additional information for the socio-economic baseline, assist in the identification of potential socio-economic impacts, and develop safeguards and management measures
- identifying and assessing the potential socio-economic impacts of constructing and operating the proposal
- recommending measures to avoid, minimise and manage potential socio-economic impacts.

The socio-economic impact assessment was consistent with a ‘moderate’ level of assessment in accordance with the Practice Note.

The study area for the socio-economic impact assessment includes the proposal site and surrounding communities that are the most likely to experience socio-economic impacts and benefits of the proposal. The socio-economic study area includes a local and regional study area, which correspond with relevant ABS Census areas as listed in Table 6-78 and shown in Figure 6-39.

Table 6-78: Socio-economic study area

Study area	Area (ABS Census area)
Local study area	Wilton Suburb and Locality (SAL)
Regional study area	Wollondilly LGA
	Douglas Park/Appin Region Statistical Area 2 (SA2)
	Sydney –Outer South-West Region Statistical Area 4 (SA4)

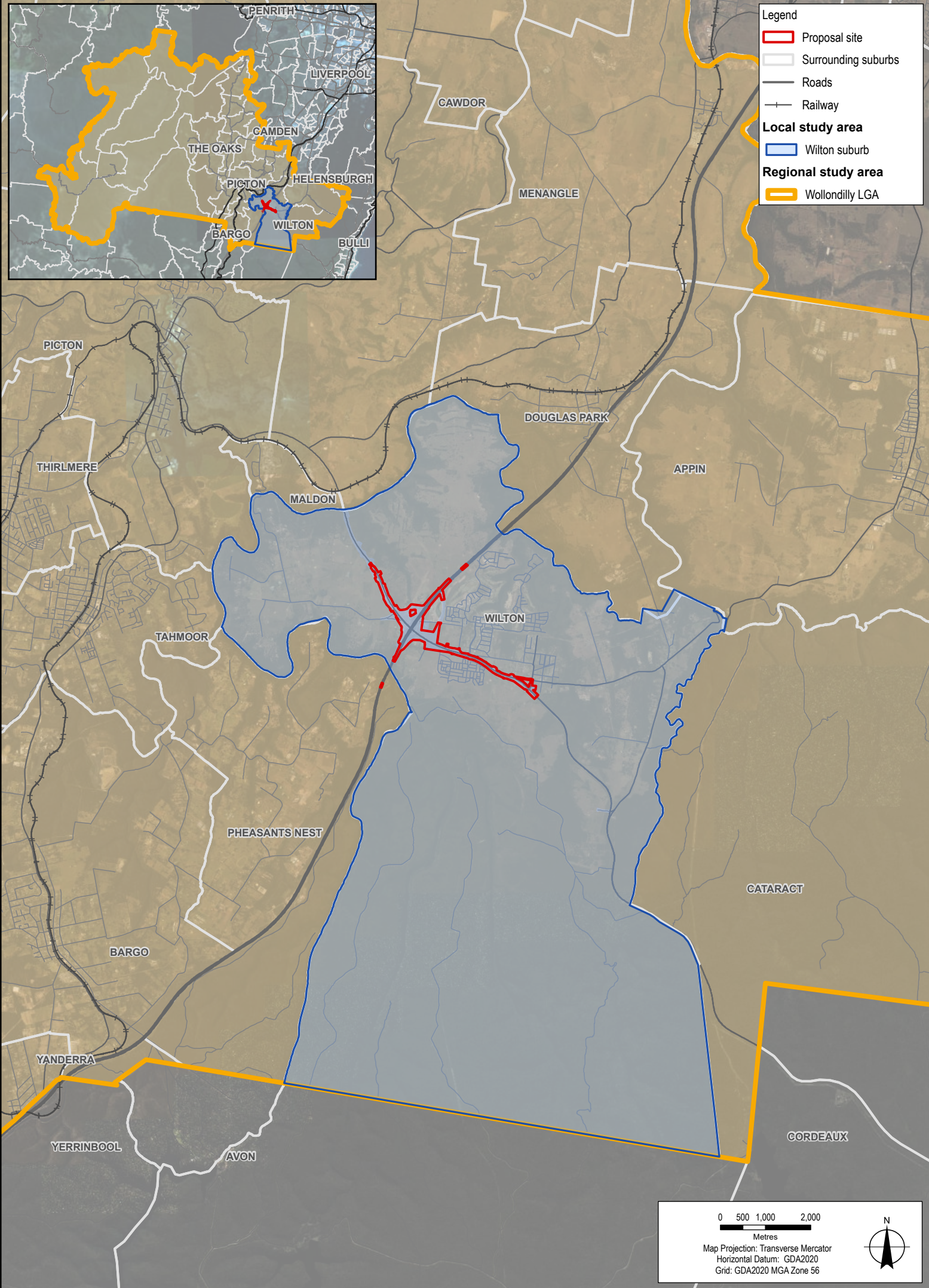


Figure 6-39 - Socio-economic Impact Assessment study area

Data source: public_NSW_Imagery, © Department of Customer Service 2020NSW SS-SDS, Topographic base data, 2023. Created by:akldea
 N:\AU\Wollongong\Projects\231\12560200\GIS\Maps\12560200_PictonRoad_Stage1_Concept\Design\12560200_REF_B.aprx
 12560200_REFX030_SEIAStudyArea_A4P. Print date: 25 Oct

6.12.2 Existing environment

Population and demography

A summary of key socio-economic indicators is provided in Table 6-79.

Table 6-79: Wilton demographic summary (ABS, 2021)

Data type	Key statistics
Population	<p>In 2021, the total population of Wilton and the Wollondilly LGA was 3,767 and 54,039 people respectively.</p> <p>The population is expected to grow significantly as the area develops, with a total population of 392,393 people estimated to live across the regional study area by 2040.</p> <p>Wilton is characterised by a lower proportion of Aboriginal/Torres Strait Islander residents (2.2 per cent) compared with the Wollondilly LGA (4.4 per cent).</p>
Age profile	<p>Wilton has a younger age profile, with a median age of 34 years, compared with 37 years for the Wollondilly LGA.</p> <p>In 2021, the proportion of children under 18 years was greater in Wilton (31.8 per cent) than Wollondilly LGA (25.9 per cent).</p>
Cultural diversity	<p>At the time of the 2021 Census, there was a higher proportion of people born in Australia living in Wilton (84.5 per cent) compared with NSW (64.5 per cent).</p> <p>Within Wilton, the most common languages other than English spoken at home are Spanish (0.7 per cent), Italian (0.5 per cent), Mandarin (0.4 per cent), Macedonian (0.4 per cent) and Afrikaans (0.4 per cent); 90.6 per cent of households only speak English at home.</p>
Households and families	<p>Wilton is predominantly comprised of family households (89.8 per cent), which is higher than the Wollondilly LGA (81.7 per cent); 87.3 per cent of Wilton residents own their home.</p>
Employment	<p>The labour force participation rate in Wilton is 72 per cent, which is higher than that of the Wollondilly LGA (64.5 per cent). Of those in the labour force in Wilton, two per cent were unemployed, representing a lower unemployment rate compared with Wollondilly LGA (2.9 per cent).</p> <p>For both Wilton and the Wollondilly LGA, construction was the largest industry of employment, representing 15 per cent and 16.7 per cent of the labour force respectively. This was followed by education and training in Wilton (11.3 per cent) and health care and social assistance for Wollondilly (11.1 per cent).</p>
Advantage/disadvantage	<p>In 2021, Wilton had a lower level of socio-economic disadvantage, with an Index of Relative Socio-Economic Advantage/Disadvantage (IRSAD) decile of 10, compared with eight for the Wollondilly LGA.</p>
Private vehicle ownership and public transport	<p>Residents are typically reliant on private vehicles. In 2021, only one per cent of households in Wilton did not own a private vehicle, compared with 2.5 per cent in the Wollondilly LGA. Only 0.8 per cent of residents within Wilton travelled to work using public transport</p>

Access and connectivity

As described in section 2.1, Picton Road is an important transport corridor linking the Illawarra Shoalhaven Region with Greater Sydney and the Wilton and Greater Macarthur Growth Areas. Picton Road is also a National Key Freight Route, that provides an important connection between Port Kembla and the Illawarra Shoalhaven region, and the rapidly expanding Western Sydney industrial precincts and Moorebank Intermodal Terminal.

Wilton is mainly accessed from Picton Road via Almond Street and Pembroke Parade, the intersections with which are located within the proposal site. During consultation, stakeholders noted that most residents are employed outside of the region and are required to travel along Picton Road and the M31 Hume Motorway to access their place of work.

There are currently no public transport services available within Wilton, with the exception of bus services travelling along the M31 Hume Motorway. There is one school bus service that runs from Douglas Park to Picton, via Wilton with stops at Wilton Plaza, Wilton Public School, and the Bingara Estate Sales Centre. Regionally, train services operate along the Southern Highlands Line, which connects Picton to the Southern Highlands towns of Tahmoor, Bargo, Hill Top, Mittagong, Bowral, and Moss Vale, and on to Goulburn in the south.

Stakeholders noted during consultation that a community concern is the lack of public transport, with residents dependent on private cars for transport.

As discussed in section 6.2, there is no formal parking within the proposal site. However, light and heavy vehicles have been observed to stop along the shoulders of Picton Road between Aerodrome Drive and Pembroke Parade. On average, only one to two heavy vehicles per day generally use the shoulder to stop for substantially longer periods of time between the M31 Hume Motorway and Pembroke Parade. Similar numbers of light vehicles have been observed to stop on the verge of Picton Road between the M31 Hume Motorway and Aerodrome Drive other than for short stops. There is on-street parking within Bingara Gorge and Wilton village as well as rest stops on the M31 Hume Motorway and Picton Road.

Community facilities and services

Community facilities and services in the local study area are outlined in Table 6-80 and shown on Figure 6-37.

Table 6-80: Community facilities and services in Wilton

Facility type	Facility name	Approximate distance from the proposal site (metres)
Public recreation (open space/parks/reserves)	Bingara Gorge Park	950
	Hannaford Oval	480
	Pembroke Pocket Park	610
	Highlands Park	285
	Wilton Community Playground	630
Private recreation	Pulse Facilities / Bingara Gorge Golf Course	785
Education/child care	Wilton Public School	820
	Bingara Gorge Community Preschool	750
Other	Wilton Community Centre	630
	Wilton Rural Fire Brigade	255

Economy and business

A small neighbourhood shopping centre (Wilton Plaza) is located in Wilton, about 770 metres north of Picton Road. There are also several businesses located along Argyle Street and Camden Street, including a service station and medical centre, as well as several small businesses operating from homes in the Wilton area.

Wollondilly LGA has a diverse economy, ranging from good and household services, mining, agriculture, forestry, and fishing. The mining industry generated the largest proportion of the LGA's total output (25.3 per cent), while the construction industry employed the most workers of the LGA workforce (16.7 per cent) and was the second largest output (21.5 per cent).

According to the *Economic Development Strategy* (Wollondilly Shire Council, 2020b), 15,000 jobs need to be created by 2040 for the Wollondilly LGA to support its growing population.

Community values

Wollondilly LGA is known for its natural beauty and rural pastures, and natural landscapes of great environmental and heritage value. The community values the 'laid-back' quality of life and environment, as well as the opportunity for sustainable growth (Wollondilly Shire Council, 2022a).

The growth and development of areas across Wollondilly and surrounds, including in the Wilton Growth Area and Greater Macarthur Growth Area, is identified as an opportunity for the LGA (Wollondilly Shire Council, 2020a). The location of the LGA and surrounds as a rural setting close to other regions and metropolitan centres is also highlighted as an opportunity for sectors such as agriculture, tourism, and mining (Wollondilly Shire Council, 2020a). However, some Wollondilly community members have expressed concerns about the expected development.

Consultation for the socio-economic impact assessment indicated that many residents value the connection to key metropolitan and regional hubs such as south-west Sydney, the Southern Highlands, Wollongong, and the Blue Mountains. Consultation also found that many residents had chosen Wilton as a place to live to avoid environments of urban sprawl and high density living.

Wilton was described during consultation as an area where 'everyone knows each other'. Some stakeholders also indicated there is community sentiment that overdevelopment would impact the existing character of Wilton.

Aboriginal community values

Aboriginal archaeological and cultural heritage assessments undertaken for the Picton Road upgrade and the proposal included undertaking a cultural values assessment and preparing an Aboriginal Cultural Heritage Sensitivities and Values Mapping Report. A range of Aboriginal cultural values across the study area relevant to the Picton Road upgrade as a whole were identified in consultation with Aboriginal stakeholders. Key cultural values relevant to the proposal are described in section 6.3.2.

6.12.3 Potential impacts

Construction

Social impacts of property acquisition requirements

As described in sections 3.6 and 6.11.4, the proposal would require the partial or total acquisition of a number of private properties, and associated property adjustments. Land within some properties would also be temporarily leased for ancillary facilities and construction work.

The potential socio-economic impacts of property acquisition would occur prior to and during construction as property is acquired.

Property acquisition and lease negotiations may create demands on time for affected landholders, disrupting daily life, and result in stress and anxiety potentially impacting individuals' health, wellbeing and quality of life.

Residents living in properties adjacent to those that are fully acquired may feel a sense of exposure to the road and associated infrastructure, which may reduce feelings of privacy and security.

Partial property acquisition can lead to construction activities and road infrastructure moving closer to private yards or residences and businesses. Residents and businesses may experience reduced enjoyment or pride in their properties due to decreased amenity (e.g., as a result of increased noise and views of construction activities and road infrastructure during operation).

The severity of these impacts would vary depending on the individuals and their circumstances, noting that vulnerable households may be more sensitive to potential impacts and could experience these impacts at a higher level of intensity.

The significance of these potential impacts was assessed as moderate-low.

All private property acquisitions would be carried out in consultation with landowners and in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (see section 6.11.5).

Details of property acquisition would be confirmed during detailed design. Consultation has been carried out with directly affected residents and property owners about potential impacts and the property acquisition process. Transport would continue to consult with affected property owners and residents.

Access and connectivity

Members of the community living within or travelling through the study area would have the potential to experience changes to local access and connectivity during construction. Potential traffic, transport and access impacts during construction are described in section 6.2.5.

Key potential socio-economic impacts associated with changes to access and connectivity include:

- increased travel time could cause delays in getting home, to work, school, or other commitments, which could also result in a higher proportion of road users using alternate routes, adding pressure to the local road network and reducing actual or perceived safety on these roads
- delays to travel times could affect emergency response times in some cases
- disruptions to active transport (informal cycling and walking routes) and potential safety impacts
- increased traffic leading to a perception of decreased road safety for some local communities and road users, particularly along Picton Road
- overflow construction vehicle parking from construction activities during peak periods of works, which could reduce local on-street parking availability, and cause inconvenience for some residents
- changes to access to properties may be inconvenient for some residents and cause frustration.

The significance of these potential impacts on access and connectivity was assessed as low to moderate.

These potential impacts would be temporary and would be minimised as far as practicable by implementing the construction traffic and transport safeguards and management measures provided in section 6.2.6.

Consultation with potentially affected community members and information provision would assist in reducing uncertainty and the potential impacts of changes to access and connectivity. Ongoing engagement will be undertaken in accordance with the Community and Stakeholder Engagement Strategy for the proposal (see chapter 5), and the Community and Stakeholder Engagement Plan that would be prepared and implemented as part of the CEMP (see section 6.12.4).

Amenity and character

Amenity refers to the pleasant or normally satisfactory aspects of a location that contribute to its overall character and enjoyment. Construction could result in changes to community amenity, including as a result of:

- increased noise and vibration levels as a result of works and the movement of construction plant, equipment and traffic
- changes to the visual outlook near compounds and construction work areas, including as a result of vegetation clearance
- increased dust.

These potential construction impacts, and measures to manage the impacts identified, are considered in sections 6.8 (noise and vibration), 6.9 (air quality), and 6.10 (visual impacts).

The significance of these potential impacts was assessed as low to moderate-low.

Community facilities and services

Amenity impacts may also affect the use and enjoyment of community facilities close to the project site. Changes to amenity may temporarily affect the use and enjoyment of outdoor areas and may deter some users from using facilities located close to work areas.

The proposal has the potential to result in reduced amenity impacts for recreational users of the Bingara Gorge Golf Course due to proximity of construction activities at the Picton Road and M31 Hume Motorway interchange. This has the potential to reduce enjoyment for golfers when they are using parts of the course close to the M31 Hume Motorway. The proposal is not expected to impact other community facilities and services near the proposal site. Measures to manage potential amenity impacts are considered as described above.

Economy, business and employment

Construction has the potential to result in benefits to the community. As described in section 3.3.2, the proposal is expected to require up to about 100 workers during construction, which may result in direct employment opportunities for skilled and unskilled workers from the surrounding region.

The proposal has the potential to provide increased opportunities for local businesses to supply goods and services for construction activities and to support the construction workforce. These opportunities may include retail, food and beverage shops and services located within the local and regional area.

Construction works, construction traffic management, and reductions in speed along Picton Road may have the potential to cause localised delays for freight haulage operators, which may impact freight company efficiency. Potential impacts on freight transport are considered in section 6.2.5.

The edge of the site occupied by Wilton Airport/Sydney Skydivers is located within the proposal site. During construction, there is the potential for some temporary changes to access to this site. This may be an inconvenience to employees and customers; however, it is anticipated that access to the site would be maintained throughout the construction period.

The significance of these potential impacts was assessed as low to moderate.

Community values

Changes to local amenity (described above) may decrease some resident's enjoyment of their local area; however, potential impacts would be temporary and would be managed by implementing the safeguards and management measures provided in the sections noted above. The significance of these potential impacts was assessed as low.

Construction has the potential to impact Aboriginal cultural values, including archaeological items, freshwater creek lines, culturally-modified trees, and flora and fauna. Further information in relation to these potential impacts is provided in section 6.3.3.

The significance of the potential impacts on Aboriginal cultural heritage was assessed as moderate.

Operation

Access and connectivity

The proposal would increase the capacity of the Picton Road and M31 Hume Motorway interchange and would improve the performance of the Picton Road corridor. This would improve travel times and reliability in the road network. As such, the proposal would benefit local and regional road users. Further information on the traffic and transport impacts and benefits of the proposal during operation are provided in section 6.2.4.

Operation of the proposal would contribute to improved connectivity for existing and future residential and commercial areas, improving accessibility to jobs, goods, services and education opportunities, and providing better links between clusters of growing business activity. This would result in positive direct impacts for road users as well as residents and local communities.

The proposal would result in new and improved active transport facilities. The new shared user paths would increase accessibility and opportunities for active transport throughout the local area. The new shared user paths would improve connectivity between existing and future communities, including to the future Wilton Town Centre.

The significance of these potential impacts benefits was assessed as low to high-moderate.

Amenity and character

The proposal would have the potential to change the amenity of the local area, including as a result of visual changes, traffic and noise impacts. These changes are likely to impact residents who value the existing rural character of the local area as they can be more sensitive to changes to their surrounds. However, these changes would be experienced in the context of the overall changes associated with ongoing development of the Wilton Growth Areas.

These potential operation impacts, and measures to manage the impacts identified, are considered in sections 6.2 (traffic and transport), 6.8 (noise and vibration), 6.9 (air quality), and 6.10 (visual impacts).

The significance of these potential impacts was assessed as low.

Community facilities and services

The proposal would improve access and connectivity through Wilton, improving how the community might access community facilities and services via the key links of Picton Road and the M31 Hume Motorway.

The direct long term positive impacts of the proposal were assessed as moderate-low.

Economy, business and employment

Picton Road is a key freight link between western Sydney and the Illawarra Shoalhaven (including Port Kembla). Heavy vehicles using the road would experience travel benefits in terms of delay reduction, improved travel time, and safety benefits. The proposal, as part of the broader upgrade of Picton Road, would improve freight efficiency for heavy vehicles through improvements to traffic lane capacity and intersection upgrades. Freight companies are expected to benefit from improved efficiency on Picton Road.

The direct long term positive impacts of the proposal were assessed as moderate.

Community values

During operation, combined improvements to travel times, reliability in the road network, safety and the addition of active transport connections has the potential to address community concerns about traffic conditions and safety in the local area raised during consultation and may improve overall community connectivity within the local and regional area.

The direct long term positive impacts of the proposal were assessed as low to moderate to low.

6.12.4 Safeguards and management measures

The measures described in Table 6-81 will be implemented to avoid or minimise potential socio-economic impacts in addition to the measures provided in sections 6.2.6, 6.3.4, 6.8.5, 6.9.5, 6.10.4 and 6.11.5.

Table 6-81: Socio-economic safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Socio-economic impacts	<p>A Community and Stakeholder Engagement Plan (CSEP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CSEP will include (as a minimum):</p> <ul style="list-style-type: none"> mechanisms to provide details and timing of proposed activities to affected stakeholders, including changed traffic and access conditions additional consultation specific to traffic impacts for freight and emergency service providers, including frequency and method for notices toll free number and email address for enquiries and complaints how the project webpage will be maintained for the duration of the proposal a complaint's handling procedure consultation activities to be carried out. 	Contractor	Detailed design/pre-construction	Additional safeguard QA G36 <i>Environment Protection</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<p>Transport will continue to consult with the community until completion of the proposal. This will include:</p> <ul style="list-style-type: none"> engaging with landowners, landholders and businesses in close proximity to the proposal to notify them about the proposal design, construction activities and timing of construction works identifying and engaging with vulnerable persons that might be affected by the proposal. 	Transport	Pre-construction/ construction	Additional safeguard
	<p>Opportunities for Aboriginal employees and procurement will be prioritised in accordance with the <i>Aboriginal Procurement Policy</i> (NSW Government, 2021b) and <i>Aboriginal Participation Strategy</i> (Transport for NSW, 2023j).</p>	Transport/ contractor	Detailed design/ pre-construction/ construction	Additional safeguard

6.13 Climate change

This section identifies potential climate change risks that could affect the proposal, and how these risks have been, and would continue to be, managed. This section also considers potential impacts on greenhouse gas emissions.

6.13.1 Methodology

Climate change risk

A climate change risk pre-screening assessment for the Picton Road upgrade (including the proposal) was undertaken to ensure the proposal considers climate hazards relevant to the region and prioritises resilient design to effectively meet operational objectives and align with community expectations in the face of future climate change. The assessment was undertaken in accordance with the following:

- Transport for NSW Climate Risk Assessment Guidelines (version 4.1) (Transport for NSW, 2021c)
- The risk management approach set out in AS/NZ 31000:2009 Risk Management – Principles and Guidelines
- Australian Standard AS 5334–2013 Climate change adaption for settlements and infrastructure – A risk based approach (Standards Australia, 2013) (AS 5334)
- Climate Change Impacts and Risk Management – A Guide for Business and Government (DEH, 2006).

Transport’s climate risk tools were used to obtain climate projection data and assess climate change risks.

A qualitative assessment of potential impacts on greenhouse gas emissions was completed for construction and operation of the proposal.

6.13.2 Existing environment

Existing climate

The risk assessment reviewed observations of climate change in Australia, and how key attributes have changed over time. The observations of changes in temperate, rainfall and fire weather across Australia, which provide the context for regional observations, are summarised in Table 6-82.

Table 6-82: Observed climate change in Australia

Attribute	Observation
Temperature	Australia’s climate has warmed on average by $1.47 \pm 0.24^{\circ}\text{C}$ since national records began in 1910, leading to an observed increase in the frequency of extreme heat events (BoM, 2022). Australia’s warmest year on record was 2019, and the seven years from 2013 to 2019 all rank in the nine warmest years on record (BoM, 2022).
Rainfall	Rainfall in Australia has increased in the central north-west since the 1970s. In contrast, rainfall has decreased along the eastern half of Australia during this same period.
Fire weather	Since the 1950s, Australia has experienced a surge in extreme fire weather seasons, strongly linked to El Nino events (BoM, 2022a). This has been primarily attributed to increased average and extreme temperatures, decreased average rainfall in some regions, and a change in wind patterns.

Historic climate records indicate that the climate of the region in which Wilton is located is a sub-tropical to temperate climate. The proximity to the coast means the region is subject to the effects of east coast lows and heavy rainfall events, as well as being exposed to a large area of highly bushfire prone land.

The region experiences mild to cool winters (average July temperature is 17 degrees Celsius) and warm, hot summers (average January temperature is 29 degrees Celsius). Rainfall is typically spread evenly throughout the year with between about 150 and 250 millimetres per season (about 800 millimetres annually) (Bureau of Meteorology, 2021).

The region has also been experiencing more regular heatwaves. The hottest temperature recorded was 45.6 degrees Celsius in the summer of 2020, and the frequency of days above 40 degrees Celsius has increased more recently, suggesting that changing weather patterns are now leading to heat events outside the traditional summer months. Severe storms are also more prevalent, with the severity and potential impact on infrastructure increasing.

The likelihood of more extremes in weather makes the proposal vulnerable to potential climate change impacts.

Climate change projections

A descriptive picture of future climate is helpful for those assessing climate risk to consider the broad differences between current conditions and what is projected to occur under a climate projection scenario of little or insufficient global response to mitigate climate change. Qualitative projections developed for the study area are summarised in Table 6-83, considering climate projection scenarios for:

- 2021 to 2050
- 2051 to 2080
- 2071 to 2100.

In addition, a climate change assessment was undertaken as part of the hydrology assessment (see section 2.6.5 of Appendix G).

Table 6-83: Summary of climate projections

Attribute	Climate projections
Temperature	<ul style="list-style-type: none"> • average temperatures would continue to increase in all seasons • more hot days and warm spells are projected • maximum temperatures are projected to increase by 2 °C by 2050 and by 4 °C by 2090 • the number of days per with year with a temperature of over 35 °C is predicted to increase from the baseline by up to six days by 2050 and by up to 13 days by 2090 • the number of days per year with a temperature of over 40 °C is predicted to increase from the baseline by up to one day by 2050 and by up to two days by 2090
Rainfall	<ul style="list-style-type: none"> • natural climate variability would remain the major driver of rainfall changes in the next few decades • the intensity of heavy rainfall events would increase • the average monthly projected rainfall would increase by up to 7 mm by 2090
Fire weather	<ul style="list-style-type: none"> • intensifying droughts and increased temperatures are projected to increase bushfire risk • the total days per year with a forest fire danger index of high or above is projected to increase from a historic average of 29 days to 57 days by 2050, and 76 days by 2090
Other	<ul style="list-style-type: none"> • the frequency, duration and intensity of droughts would increase • little change in mean surface wind speed is projected • intense low pressure systems off the eastern coast of Australia (east coast lows) may become more severe, generating an increase in heavy widespread rainfall, heavy hail and strong winds that can damage infrastructure

Climate change variables

The following climate variables were identified to quantify climate risks to the proposal:

- rainfall – annual average rainfall, extreme rainfall (flooding) and drought
- temperature – annual average temperature, extreme temperature events
- wind – gales and extreme wind events, storms (snow, hail, dust, lightning)

- average humidity
- bushfire risk – fire danger index
- soil moisture.

6.13.3 Potential impacts

Construction

Climate change

Climate change is already affecting transport infrastructure within Australia through increased heat and increased intensity of rainfall. However, the long-term nature of the effects of climate change means that potential impacts in the short-term can be relatively minor or less frequent in comparison to long-term effects. Therefore, the focus of the climate change assessment is on the potential risks over the operational life of the project and not construction phase risks.

Potential climate change risks during construction would mainly be associated with:

- heavy rainfall during construction leading to overflow of sediment traps resulting in pollution of local catchments
- increased frequency and severity of rainfall events placing increased pressure on drainage infrastructure and/or resulting in flooding of the proposal site and surrounding environment or increased contaminated runoff into the surrounding environment.

Risks associated with climatic conditions would be minimised during construction through the implementation of Transport's standard risk management controls.

Greenhouse gas emissions

Construction would result in the generation of greenhouse gas emissions through:

- vegetation removal reducing the carbon sequestration capacity of the local environment
- decomposition of green waste and mulch, releasing carbon dioxide
- direct emissions of carbon dioxide, methane and nitrous oxide from the use of construction plant, vehicles and equipment emitting exhaust fumes
- usage of electricity from fossil fuels
- use of materials that have high embodied energy content such as concrete.

The removal of vegetation, use of plant and equipment, and construction materials would contribute most to emissions generated during construction. However, the potential increase in greenhouse gas emissions during construction would be relatively minor when compared to current emissions from traffic across the network. Transport would also investigate the feasibility of using alternative materials with low embodied carbon and energy efficient or low-emission plant and equipment during construction (see Table 6-86).

As described in chapter 2 and section 6.1.3, the proposal has been, and would continue to be, refined to minimise vegetation clearing required for construction (in accordance with the safeguards provided in section 7.2).

Operation

Climate change

The risk assessment identified 62 climate risks for the proposal. Of these, 49 of the proposal's climate risks were rated as low, with the remaining 13 risks identified as medium. No high or very high rated risks were identified at any timescale.

A summary of the total climate change risk ratings for the three climate projection scenarios is provided in Table 6-84.

Table 6-84: Number of risks and rating identified across each climate projection scenario

Risk rating	Risks 2021-2050	Risks 2051-2080	Risks 2071-2100
Very high	0	0	0
High	0	0	0
Medium	13	12	11
Low	49	38	29
Total	62	50	40

The key climate risks identified in Table 6-84 were related to the following climate hazards:

- increased rainfall intensity and flooding
- increased frequency of bushfire weather
- increased intensity of extreme wind.

Potential climate change risks specific to operation would mainly be associated with:

- heavy rainfall leading to overflow of water quality treatment devices resulting in temporary increases in pollutant loads within the local catchments and the need for additional repairs
- increased frequency and severity of rainfall events placing increased pressure on drainage infrastructure and/or resulting in flooding of the proposal site and surrounding environment
- increased frequency of intense rainfall events leading to reduced surface friction and visibility for road users and potentially resulting in more frequent dangerous driving conditions
- more rapid deterioration of road surfaces and other infrastructure, which may result in higher operational and maintenance costs
- bushfire events occurring adjacent or near to the proposal site, leading to bushfire damage to structures, roadside furniture, road closures, hampering evacuation routes and emergency services, affecting evacuation of local communities during bushfire events.

The proposal is not within a coastal location and would not be directly affected by sea level changes. However, in the long-term, localised flooding of watercourses may result in drainage and stormwater impacts and potential erosion impacts. Potential flooding impacts under low and high emissions climate change scenarios are described in section 6.5.3.

The proposal is not likely to be any more susceptible to climate change risks than that of the existing road network. Further consideration of the potential for climate change impacts and adaptation measures would be carried out during detailed design.

The proposal would also provide an additional capacity in evacuation routes for the Wilton Town Centre and Picton during emergencies that may be linked to climate change, therefore increasing the adaptive capacity and resilience of local communities.

Greenhouse gas emissions

During operation, the proposal may alleviate vehicle emissions through increased efficiency of the road network, reducing congestion and travel times. Although traffic growth in the region may result in an increase in vehicle emissions, this trend would not be a consequence of the operation of the proposal.

The improved efficiency of the road network as a result of the proposal would also improve the resilience of the road network during extreme events, such as extreme heat, intense rainfall and flooding, or bushfire events.

Street lighting used during operation would result in emissions from power generation used to supply electricity to the street lights. Energy efficient LED light bulbs would be used for street lighting to reduce these emissions. A proposal-specific sustainability implementation management plan would be developed and implemented during detailed design and construction which would outline initiatives to reduce greenhouse gas emissions (see section 6.14.4).

While the proposal would result in the removal of some vegetation within the proposal site, Transport would fulfil relevant biodiversity and tree offset requirements to compensate for residual impacts. The biodiversity offsets, and landscaping proposed to rehabilitate disturbed areas during operation, would also work to reduce greenhouse gas emissions associated with the operation of the proposal.

There would be minimal emissions generated during maintenance activities along the proposal.

6.13.4 Safeguards and management measures

Measures that will be implemented to manage the potential for climate change risks are listed in Table 6-85.

Table 6-85: Climate change safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Climate change	The climate change risk assessment review will be completed at each design stage in accordance with Australian Standard AS 5334-2013 <i>Climate change adaptation for settlements and infrastructure – A risk based approach</i> and the <i>Transport for NSW Climate Risk Assessment Guidelines</i> (Transport for NSW, 2021c). This review will also confirm that adopting the RCP 4.5 scenario as the culvert design criteria appropriately addresses the risks and consequences of future climate change on the operation of the proposal.	Transport	Detailed design	Additional safeguard
	Hazards and risks associated with climate change in the surrounding environment will be further considered during detailed design development.	Transport	Detailed design	Additional safeguard

6.14 Sustainability

6.14.1 Sustainability policy context

NSW Government

The NSW Government is committed to delivering sustainability (social, economic, and environmental) outcomes for the NSW community through a series of actions and objectives as set forth in various government acts, frameworks, strategies, and policies.



Figure 6-40: Sustainability policy drivers

Sustainability at Transport

Transport is committed to ensuring socially and environmentally beneficial transport outcomes by embedding sustainable initiatives into transport infrastructure. Figure 2-1 outlines the policy drivers for sustainability at Transport.

Sustainability requirements and objectives have been embedded in the proposal development consistent with Transport Sustainability Plan 2021 focus areas and goals (Figure 6-41). As a result, key sustainability risks and opportunities have been identified throughout the development of detailed design based on strategic feasibility assessments.

A range of opportunities and initiatives have been identified and developed for the Picton Road upgrade in line with the eight focus areas of the Transport Sustainability Plan 2021 and are discussed in section 6.14.3.



Figure 6-41: Transport Sustainability Plan 2021 focus areas and goals

6.14.2 Sustainability assurance and governance

Transport is committed to delivering sustainable outcomes across the asset lifecycle of the proposal. Transport implements a Sustainability Assurance Requirements Standard (T MU EN 00008 ST) across all projects to integrate sustainability within the Infrastructure NSW and configuration management gates at each asset life cycle stage. To support in achieving these outcomes, a series of sustainability requirements and internal and external rating tools are available to provide sustainability assurance to the proposal.

Transport uses robust sustainability assurance processes to embed sustainability within Infrastructure projects. Sustainability ratings pathways include rating tools which provide an increased level of sustainability assurance for Transport projects by ensuring a minimum level of sustainability performance is achieved against Transport's eight sustainability focus areas and provide a mechanism to drive continual improvement in sustainability.

There are currently two sustainability pathways that are likely to be applied to the proposal: Transport for NSW Sustainable Design Guidelines (SDGs), and Transport for NSW Baseline Sustainability Requirements (BSRs). Each pathway is described in the following sections.

Transport Baseline Sustainability Requirements

The BSRs are minimum sustainability performance expectations across all modes of Transport. They cover a range of sustainability disciplines in alignment with the sustainability focus areas and subcategories and are applied to delivery contracts where applicable (detailed design and construction). The BSRs comprise both quantifiable targets and process requirements which are applied where fit-for-purpose in relation to the scope of the contract or application. The BSRs comprise of baseline and stretch targets that allow for minimum compliance aligned to Transport SDGs, with ability to set ambitious targets to allow for innovation.

Transport Sustainable Design Guidelines

The SDGs are an internal sustainability rating tool and aim to deliver sustainable development practices by embedding sustainability initiatives into the planning, design, construction, operations, and maintenance of transport infrastructure projects. The SDGs were specifically developed by Transport to translate the strategic directions into a range of practical project level initiatives. These are intended to be applied at a project level depending on the capital cost of the project and the design development stage. The SDGs are supported by several additional Transport guidelines. These include the Carbon Estimate and Reporting Tool Manual and the Climate Risk Assessment Guidelines and the Tree and Hollow Replacement Guidelines.

6.14.3 Sustainability initiatives

Sustainability initiatives relevant to the various stages of the proposal are identified in Table 6-86.

Table 6-86: Sustainability initiatives by focus area

Sustainability focus area	Sustainability initiatives	Proposal stage			
		Development (REF stage)	Detailed design	Procurement	Construction
Respond to climate change	Review embodied emissions associated with materials use both in construction and maintenance and investigate where they can be reduced through a Whole of Life analysis.	-	✓	✓	✓
	Investigate renewable energy options and set targets for the reduction of construction and operational emissions.	-	✓	✓	✓
	Develop energy efficiency initiatives to ensure construction and operational emissions are minimised.	-	✓	✓	✓
	Undertake a project level Climate Risk Assessment and consider adaptation measures for all climate change risks with an original risk rating of moderate or above during detailed design and construction.	✓ See section 6.13	✓	-	✓
	Climate Risk Assessment mitigation and adaption strategies implemented.	-	✓	✓	✓
Protect and enhance biodiversity	Undertake detailed biodiversity assessment.	✓ See section 6.1	-	-	-
	Develop a Threatened Species Management Plan and Flora and Fauna Management Plan to identify detailed site-specific and species-specific mitigation measures, and management protocols to be implemented before, during and after all construction activities to further avoid or reduce impacts on threatened biodiversity.	-	✓	✓	✓
	Develop a biodiversity offset strategy in accordance with Transport's Biodiversity Policy and No Net Loss Guidelines.	✓ See section 6.1	-	✓	✓

Sustainability focus area	Sustainability initiatives	Proposal stage			
		Development (REF stage)	Detailed design	Procurement	Construction
Improve environmental outcomes	Develop a spoil management plan and a waste management plan.	-	✓		✓
	Substitute non-renewable materials with recycled or reused materials where they are fit for purpose and cost effective.	-	-	-	✓
	Manage waste to minimise transport related impacts.	-	-	-	✓
	Deliver strategies to minimise impacts on air quality and reduce noise and vibration during construction and operations.	✓ See sections 6.8 and 6.9	✓	-	✓
	Foster a proactive reporting culture that promotes transparency in managing and reporting incidents internally and with regulators so that lessons are learnt and repeat incidents avoided.	-	-	-	✓
	Use materials and products with Environmental Product Declarations.	-	-	✓	✓
Procure responsibly	Develop and implement a sustainable procurement strategy for the proposal	-	✓	✓	✓
	Develop and implement a Social Procurement and Workforce Development Strategy, including minimum and stretch targets for underrepresented demographics.	✓ A trainee program was implemented for Aboriginal cultural heritage investigations. Social enterprises and Aboriginal businesses have been engaged where possible to provide services.	✓	✓	✓
	Set a minimum and stretch target for Aboriginal Participation and Procurement.	✓ APP targets have been embedded in major contracts.	-	✓	✓

Sustainability focus area	Sustainability initiatives	Proposal stage			
		Development (REF stage)	Detailed design	Procurement	Construction
Partner with communities	Implement best practice urban design principles and design review.	✓ See section 3.2.3 of REF	✓	-	✓
	Apply the Movement and Place framework to the proposal.	✓ See Appendix A of the Traffic and Transport Impact Assessment (Appendix D)	✓	-	✓
	Deliver better connectivity for the community with both car travel and active transport options.	✓ See Appendix A of the Traffic and Transport Impact Assessment (Appendix D)	✓	-	✓
	Develop and implement a Community and Stakeholder engagement strategy.	✓ See chapter 5	✓	✓	✓
	Investigate through the Community and Stakeholder Engagement Plan opportunities to involve the community during the development, design, delivery, and operation of the proposal.	✓ See chapter 5	✓	✓	✓
Respect heritage and culture	Develop and implement an Aboriginal Community Engagement Strategy.	✓ An Aboriginal community and stakeholder engagement strategy was developed for the proposal during strategic design phase. Its implementation has been reviewed and updated annually.	✓	✓	✓
	Avoid or minimise impacts to heritage sites and culturally key areas.	✓ See sections 6.3 and 6.4	-	✓	✓

Sustainability focus area	Sustainability initiatives	Proposal stage			
		Development (REF stage)	Detailed design	Procurement	Construction
	Undertake heritage studies and implement management plans.	✓ See the Aboriginal Cultural Heritage Working Paper (Appendix E) and the Non-Aboriginal Heritage Assessment (Appendix F).	-	✓	✓
	Avoid or minimise impacts to Aboriginal heritage items and culturally sensitive sites.	✓ See section 6.3	✓	-	✓
Align spend and impact	Key material sustainability initiatives or optioneering / decisions are considered through a whole of life costing approach (in accordance with ASA Standard 'T MU AM 01001 ST Life Cycle Costing), including capital costs, operational costs, environmental and social benefit as well as benefits and risks in relation to the proposal objectives.	✓ See section 2.4	✓	✓	✓
Empower customers to make sustainable choices	Investigate opportunities for active transport connectivity / links as part of the proposal delivery to improve social connectivity	✓ See section 2.5	✓	✓	✓

6.14.4 Safeguards and management measures

Measures that would be implemented to embed sustainability outcomes in the proposal are provided in Table 6-87.

Table 6-87: Sustainability safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Sustainability	A project-specific sustainability implementation management plan will be developed and implemented during detailed design and construction. The plan will investigate further opportunities to embed sustainable outcomes and outline an implementation plan for those that are feasible and practicable, including reduction of greenhouse gas emissions during construction and operation. Measures in the plan will be implemented during construction.	Transport/ contractor	Detailed design/ construction	Additional safeguard

6.15 Other impacts

This section considers other potential impacts of the proposal.

6.15.1 Existing environment and potential impacts

Table 6-88: Other potential impacts

Environmental factor	Existing environment	Potential impacts
Waste and resource use	The proposal site consists of an existing road corridor, road infrastructure and adjacent land. Waste may occur along the proposal site due to littering or dumping by the public or passing vehicles, or from maintenance of the road infrastructure.	<p>The largest waste generating activity by volume would be earthworks. This activity (see section 3.3.5) would generate spoil. Spoil is any material (such as soil, rock or dirt) excavated and removed from its original location.</p> <p>Spoil is the largest waste stream expected to be generated during construction. As described in section 3.3.5, it is estimated that about 30,000 cubic metres of spoil would be generated.</p> <p>Other construction activities described in section 3.3 would generate waste, and waste sources may include:</p> <ul style="list-style-type: none"> residual road and building materials, including concrete, steel, asphalt and aggregate environmental control and screening products, such as geofabric, sandbags, sediment fences, flagging, and hoarding packing materials, including pallets, crates, plastics domestic garbage, including food waste and general site waste and litter wastewater from facilities, vehicle wash down and dust suppression residual chemicals, including oils, lubricants, waste fuels and batteries green waste, including timber, vegetation and weeds hazardous waste, including asbestos, oils, lubricants, waste fuels and batteries. <p>Inappropriately managed waste has the potential to impact to air quality, human health, water quality, soils, and visual amenity.</p> <p>Section 3.3 describes the resources that would be needed to build the proposal. These resources are common materials, and their use would not result in a resource supply shortage in the region.</p> <p>Potential impacts associated with waste and resource use during operation would be negligible and largely consistent with the existing operation of the road network.</p>
Utilities	Existing utilities within the construction footprint, including communications, gas and electrical infrastructure, have been identified and located as part of the concept design (see section 3.5).	<p>Construction has the potential to impact existing utilities within the proposal site.</p> <p>Above ground and underground utilities would be relocated or protected as required (in consultation with the utility owner/operator) to minimise impacts on the utilities.</p> <p>The protection and relocation of utilities may result in potential air quality, noise and vibration impacts to sensitive receivers in the surrounding area. However, these impacts would be temporary and restricted to utilities works.</p> <p>There would be no impacts to utilities during operation.</p>

Environmental factor	Existing environment	Potential impacts
<p>Hazard and risk management</p>	<p>The presence of hazardous materials and dangerous goods in and surrounding the proposal site is limited due to lack of industrial land use in the area.</p> <p>Key potential hazards and risks would arise from the presence of utilities and the surrounding community.</p>	<p>The following hazards and risks may arise during construction:</p> <ul style="list-style-type: none"> • spills or leakage of contaminants such as fuels, chemicals and hazardous substances entering surface and groundwater or contaminating soils • discharge of turbid or contaminated run-off, resulting in pollution of waterways • encountering unexpected utilities or potential rupture of underground utilities • encountering contaminated material during earthworks • spread of noxious weeds • construction failures or incidents resulting in flooding, inundation or excavation collapse • flooding during extreme rain events • changed traffic conditions leading to incidents. <p>Potential hazards and risks during construction would be managed by the Hazard and Risk Management Plan (see section 6.15.2) and the measures provided in other relevant sections, including 6.1.4 (biodiversity), 6.2.6 (traffic and transport), 6.5.4 (hydrology and flooding), 6.6.4 (surface water and groundwater), and 6.7.4 (soils and contamination).</p> <p>Potential hazards and risks during operation would be largely consistent with the existing operation of the road network and managed in accordance with Transport's standard management practices.</p>
<p>Bushfire risk</p>	<p>The proposal site is predominantly surrounded by Vegetation Category 3 medium risk bushfire prone land and bushfire buffer zones. Non-vegetated areas within the proposal site, such as the existing roads, are excluded from being mapped as bush fire prone land.</p>	<p>Activities that may increase bushfire risk during construction include mulch stockpiling, hot work such as welding, fuel/chemical storage, and plant operation near vegetated areas.</p> <p>Any disruption to access along Picton Road and the M31 Hume Motorway during construction could impact the safety of the community who might need to evacuate during a bushfire emergency. However, the road would remain operational during construction. During a bushfire emergency, work would stop, which would further reduce the potential delays due to construction work experienced by residents evacuating along the road corridor.</p>

6.15.2 Safeguards and management measures

Safeguards and management measures for other impacts are provided in Table 6-89.

Table 6-89: Other impacts safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste management	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> 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 on- and off-site waste, or application of any relevant resource recovery exemptions procedures for storage, transport and disposal monitoring, record keeping and reporting. <p>The WMP will align with the <i>Waste Management Guideline</i> (Transport for NSW, 2023k), the <i>Waste Classification Guidelines</i> (NSW EPA, 2014), and relevant Transport waste fact sheets, and will adopt the circular economy principles and the waste hierarchy contained in the <i>Waste Avoidance and Resource Recovery Act 2001</i>.</p>	Contractor	Detailed design/ pre-construction	<p>Section 4.2 of QA G36 <i>Environment Protection</i></p> <p>Section 4.11 of QA G36 <i>Environment Protection</i></p>
Utilities	The location of existing utilities and relocation details will be confirmed following consultation with affected utility owners, including searches of Before You Dig Australia and utility locators prior to commencement of construction works.	Contractor	Detailed design/ pre-construction	Additional safeguard
Hazards and risk management	<p>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:</p> <ul style="list-style-type: none"> details of hazards and risks associated with construction measures to be implemented during construction to minimise and manage these risks record keeping for materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials 	Contractor	Detailed design/ pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> • a monitoring program to assess performance in managing identified risks • consultation and notifications requirements for different hazard scenarios • contingency measures to be implemented in the event of unexpected hazards, risks arising and emergency situations. <p>The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work NSW Codes of Practice, and NSW EPA and DPE publications.</p>			

6.16 Cumulative impacts

This section considers the potential cumulative impacts that may arise as a result of the construction and operation of the proposal and the potential for combined impacts with other projects.

6.16.1 Study area

The cumulative impact assessment has considered other projects and developments in the Wilton Growth Area. It has considered projects that could be under construction at the same time as, or close to, the proposal. Projects were identified by a review of relevant Wilton 2040 documents, DPE's Major Projects website and Wollondilly Shire Council's DA Tracker.

6.16.2 Broader program of work

The proposal is part of the broader Picton Road upgrade, which involves three key components:

- the western section of Picton Road between Nepean River and Almond Street, Wilton (this proposal)
- the central section of Picton Road from Almond Street, Wilton to around Mount Kiera Road
- the eastern section of Picton Road from Mount Kiera Road to M1 Princes Motorway interchange.

The proposed broader Picton Road upgrade is shown on Figure 1-1.

6.16.3 Other projects and developments

The development of the Wilton Growth Area represents the largest contributor to potential cumulative impacts due to the number of projects that are currently proposed or could occur in the future as land is released and subdivisions are approved.

Section 6.11.3 provides an overview of future development in the Wilton Growth Area, including the status of development/rezoning for the precincts surrounding the proposal site and a summary of approved developments and larger projects in the vicinity of the proposal site. In addition to residential developments, a range of infrastructure upgrades would also be delivered by private developers as described in section 3.1.1.

These developments would all be associated with a range of potential construction related impacts, which would generally occur in stages for each development. Where subdivisions are not yet established, construction impacts such as noise, air quality and traffic would be expected as a result of the bulk earthworks associated with construction. Where subdivisions are already complete or have been constructed similar construction impacts would be experienced, albeit at lower levels, due to the construction of housing and other structures within each of the subdivisions.

These projects would also result in a change to the landscape in the vicinity of the proposal, resulting in potential impacts such as land use, biodiversity and visual amenity changes. These potential impacts have been, and would continue to be considered, as part of the development of the Wilton Growth Area as part of rezoning, subdivision and development applications. The presence of these developments and the interactions with the proposal have also been important considerations in the design of the proposal.

6.16.4 Potential impacts

The potential for cumulative impacts as a result of the interaction between the above projects and the proposal are considered below for the key environmental factors considered by the REF.

Biodiversity

The main potential for cumulative impacts would be during construction. There is the potential for cumulative impacts to biodiversity associated with the impacts of the proposal together with the impacts of other projects. Potential impacts include:

- vegetation removal
- removal of threatened fauna and flora habitat and TECs, and impacts to avoided land mapped by the CPCP

- increased risk of fauna injury and mortality due to the continued presence of construction plant and equipment
- increased noise, vibration, light and dust disturbances to fauna.

As described in section 6.1.3, the proposal has the potential to impact:

- up to about 4.87 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion / Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, listed as critically endangered under the BC Act and/or under the EPBC Act
- up to about 6.63 hectares of Shale Sandstone Transition Forest in the Sydney Basin Bioregion, listed as endangered under the BC Act and/or critically endangered under the EPBC Act.

This would have the potential to contribute to cumulative loss of these communities in the study area.

The proposal is also part of a program of works to upgrade Picton Road and as such would have the potential to contribute to vegetation removal along the Picton Road corridor.

Biodiversity offsets, as described in section 6.1.5, would be required to mitigate vegetation removal as a result of the proposal. Adjacent projects would also be subject to biodiversity offset requirements in accordance with the approval requirements for those projects, and relevant Transport policies and guidelines (for Transport projects).

Traffic and transport

The proposal would have the potential to contribute to cumulative traffic impacts along Picton Road, the M31 Hume Motorway and the local road network during construction. Potential cumulative construction traffic impacts include:

- an increase in trucks and other construction-related vehicles on Picton Road and the M31 Hume Motorway
- an increase in traffic congestion on Picton Road and at the Picton Road and M31 Hume Motorway interchange
- traffic diversions and disruptions
- traffic delays as a result of diversions or congestion.

Cumulative impacts from construction traffic across multiple projects in the Wilton Growth Area may contribute to additional pressure on the local road network. This may include additional light and heavy vehicles travelling to and from surrounding construction areas, resulting in traffic delays within the local road network.

During construction planning for the proposal, the contractor would determine (in consultation with the proponents of adjoining projects and Wollondilly Shire Council) appropriate measures to ensure that cumulative impacts on traffic, transport and access are satisfactorily mitigated and managed. These measures would be defined in the Traffic Management Plan for the proposal. As described in section 6.2.5, the Traffic Management Plan would include 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.

Traffic modelling, undertaken as part of the design of the proposal to identify how much traffic would use the road network in 2031 and 2046, included consideration of expected development of the Wilton Growth Area. These traffic figures were used to confirm the lane configuration for Picton Road and the M31 Hume Motorway on and off ramps (see section 2.5.2).

Once completed, the proposal (together with other infrastructure) would positively contribute to improved traffic and transport outcomes along Picton Road and the M31 Hume Motorway and to the overall traffic efficiency of the Wilton Growth Area improvements led by others. The proposal would contribute to the following cumulative traffic benefits during operation:

- improved network performance, with an increase in average speeds and decrease in delays
- improved travel times
- greater travel time reliability

- improved intersection performance for majority of modelled intersections
- new and upgraded active transport infrastructure, enabling greater active transport connectivity
- improved road safety
- improved resilience of the road corridor with greater operational flexibility to respond to planned and unplanned incidents
- improved freight accessibility including over size and over mass movements.

Aboriginal and non-Aboriginal heritage

The main potential for cumulative impacts would occur during construction. Cumulative impacts could include reduction of registered Aboriginal heritage sites in the area, changes to the visual environment surrounding heritage items, and potential vibration impacts if construction of the proposal and other projects occur at the same time close to listed non-Aboriginal heritage items and to the listed culturally modified trees. However, with implementation of the proposed management measures, described in section 7.2, the potential for cumulative impacts during construction are considered to be appropriately managed.

Flooding and water quality

The proposal is expected to have minimal impacts on water resources with implementation of the proposed design features, safeguards and management measures.

Cumulative impacts on hydrology and flood behaviour could occur as a result of the increase in impervious surfaces and changes in flow regimes. The hydrological modelling undertaken as part of the design process incorporated calculations of the potential amount of runoff from subdivisions under construction. Based on discussions with Council it is understood that future subdivisions will be required to restrict flows leaving their sites to below pre-development flows.

Cumulative impacts on water quality are generally related to the movement of soil and water across project boundaries. The approval conditions for the projects described in section 6.16.3 include measures to ensure that effective soils and surface water management procedures are implemented to prevent adverse impacts on receiving watercourses. Together with the implementation of measures in sections 6.6.4 and 6.7.4, minimal cumulative surface water impacts are anticipated.

Noise

Potential cumulative impacts include exceedances of the noise and vibration criteria for residences close to Picton Road from the cumulative impacts of multiple construction activities. The proposal could also contribute to noise impacts being experienced over a longer duration of time for sensitive receivers due to the nature and scale of the existing and proposed development surrounding Picton Road. This can contribute to construction fatigue in the surrounding community.

The safeguards and management measures provided in section 6.8.5 would reduce the potential for cumulative and consecutive impacts on sensitive receivers. More specific measures would be developed as the design and construction planning progresses and impacts from other projects are known. The location and activity specific construction noise and vibration assessments that would be prepared (see Table 6-54) would consider the potential for cumulative impacts with other projects, and appropriate measures would be defined in the Noise and Vibration Management Plan.

The design and assessment for the proposal has included modelling of the potential for noise and vibration impacts on adjoining developments that are underway. It has been assumed that future developments would include noise mitigation. The potential for some additional impacts has been identified and management measures developed as described in sections 6.8.4 and 6.8.5.

Air quality

Cumulative impacts are generally due to emissions of particulate matter when projects are under construction in the same area at the same time or a project is being constructed adjacent to a facility with existing emissions. Guidance on the assessment of dust from demolition and construction (IAQM, 2014), notes that projects or facilities within 350 metres of a project have the potential to result in cumulative impacts.

With the application of the proposed safeguards and management measures (see section 6.9.5), the potential for cumulative air quality impacts during construction would be substantially minimised and well managed.

Landscape character and visual amenity

The Wilton Growth Area is undergoing changes to the landscape as development proceeds. Potential cumulative impacts during construction of the proposal include extended periods of visual impacts from:

- exposed, temporarily cleared areas from vegetation removal and earthworks
- temporary hoardings and fencing
- increased construction traffic, lighting, plant and equipment.

These visual impacts have the potential to contribute to ongoing disruptions to the landscape character affecting perceptions of the locality and visual amenity. However, due to the nature and scale of the existing and planned construction activities for current and future developments, the cumulative visual impacts associated with the proposal are considered minor. The proposal is located within an existing road corridor and involves constructing new and upgraded road infrastructure that is similar to existing infrastructure. While some vegetation would have been removed during construction, the proposal site would be landscaped in accordance with the Urban Design and Landscaping Plan (see sections 3.2.3 and 6.10.4). Landscape treatments implemented for the proposal would reduce the potential visual impacts during operation.

As the study area is undergoing significant change, operation of the proposal is unlikely to contribute to cumulative visual impacts.

Land use

During construction, land use within the proposal site would change from existing uses to a construction site, with land used for work areas and construction compounds. The proposal would contribute to a reduction of available land for existing uses in the study area during this time.

The main potential for cumulative impacts would be associated with longer term changes in land use. As described in section 6.11.4, direct impacts on land use during operation would result from the proposal's permanent land requirements and the presence of operational infrastructure. Where land is permanently required outside the existing road reserve, there would be a change in land use from the existing use (see section 6.11.2) to transport infrastructure. This has the potential to contribute to cumulative changes in land use.

The potential impacts of the proposal on about 1.8 hectares of urban development zoned land under SEPP (Western Parkland City) would result in a small reduction (about 0.2 per cent of the land zoned for this purpose) in the availability of such land within the Wilton Growth Area. The recognised need for, and benefits of, the proposal for the Wilton Growth Area and the broader community (see sections 2.1 and 8.1) would outweigh the impacts of any potential cumulative reduction of land for future development.

Socio-economic

During construction, there would be the potential for cumulative amenity impacts and impacts associated with traffic and access disruptions for road users. This is most likely to occur for residents located close to Picton Road, particularly where other adjacent developments are proposed or under construction. These impacts would be managed by implementing the safeguards and management measures provided in sections 6.2.6 (traffic and transport), 6.8.5 (noise and vibration), 6.9.5 (air quality) and 6.10.4 (visual impacts).

The proposal would contribute to improved road safety, travel times, connectivity, reliability and resilience in the road network from overall traffic flow improvements. The various improvement projects along Picton Road, which includes the proposed intersection upgrades to be undertaken by private developers together with the intersection upgrades that form part of the proposal, would improve efficiency for traffic flow, including efficiency for heavy freight vehicles. This would have the potential for cumulative benefits for the local Wilton and broader regional community. There would be long term access and connectivity benefits for local and regional communities, business and industry.

In addition, the proposed shared user path locations have been adopted to facilitate future connectivity, together with the active transport links proposed part of the Wilton 2040 strategy, as described in section 2.5.3. This would be a cumulative benefit of the proposal.

6.16.5 Safeguards and management measures

Measures that will be implemented to, in conjunction with other measures outlined in chapter 7, avoid, minimise, mitigate and manage the potential cumulative impacts are listed in Table 6-90.

Table 6-90: Cumulative impacts safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative impacts	Ongoing coordination and consultation will be undertaken with the proponents of nearby projects to identify the potential for cumulative impacts to occur.	Transport/ contractor	Pre-construction/ construction	Additional safeguard
	The CEMP will be revised to consider potential construction cumulative impacts from surrounding projects, including measures to manage these impacts, as they become known.	Contractor	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 the Transport for NSW Environment and Sustainability Officer, Southern Region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP and Project Environmental Management Plan (PEMP) would be developed in accordance with the specifications set out in *QA Specification G36 - Environmental Protection (Management System)*.

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 works 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
General					
GEN1	General – minimise environmental impacts during construction	<p>A Construction Environment Management Plan (CEMP) will be prepared and submitted for review and endorsement of the Transport for NSW Senior Environment and Sustainability Officer prior to commencement of the activity. As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> any requirements associated with statutory approvals details of how the proposal will implement the identified safeguards outlined in determined environmental impact assessments 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 and record-keeping requirements procedures for emergency and incident management unexpected finds procedures for issues such as heritage and contamination. These will be prepared in accordance with the relevant guidelines (e.g. <i>Unexpected Heritage Items Guidelines</i> (Transport for NSW, 2023)) an environmental sensitive areas map procedures for audit and review. <p>The endorsed CEMP will be implemented during construction.</p>	Transport/ contractor	Pre-construction/ construction	Section 3.1 of QA <i>G36 Environment Protection</i>
GEN2	General – notification	Local businesses, residents and other key stakeholders (e.g. schools, local councils and community groups) affected by disruptions, amenity impacts or access to properties and local roads will be notified at least five working days prior to commencement of the activity.	Transport/ contractor	Pre-construction/ construction	Section 3.7 QA <i>G36 Environment Protection</i>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN3	General – environmental awareness	<p>All personnel working on site will receive training to ensure awareness of environment protection requirements and the project cultural safety protocol to be implemented during construction. This will include up-front site induction and regular ‘toolbox’ style briefings.</p> <p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include:</p> <ul style="list-style-type: none"> • areas of Aboriginal cultural heritage and value as identified in the Aboriginal Cultural Heritage Working Paper and non-Aboriginal heritage as identified in the Non-Aboriginal Heritage Impact Assessment • threatened species habitat • adjoining residential areas requiring particular noise management measures • erosion and sediment controls. 	Transport/ contractor	Pre-construction/ construction	QA G36 <i>Environment Protection</i>
GEN4	General – minimise construction footprint	<p>Further design development and construction planning will aim to minimise the area needed for construction, with a particular focus on avoiding and minimising potential impacts on properties, native vegetation and threatened species habitat including mature trees, sites of Aboriginal and non-Aboriginal heritage significance, and trees with Aboriginal cultural value, as far as reasonably practicable.</p> <p>This process will include an assessment of native vegetation and threatened species habitat, including trees with cultural value and surrounding vegetation, within the proposal site that can be retained through careful consideration of design, construction ancillary facilities layout, access and fencing, and construction methods.</p>	Transport/ contractor	Pre-construction/ detailed design	Additional safeguard
GEN5	General – limit of works and exclusion zones	The limit of works will be delineated. Exclusion zones would be installed around sensitive areas as identified in the CEMP. Extent of exclusion zones will be dependent on the feature and associated licences and approvals.	Contractor	Pre-construction/ construction	Additional safeguard
GEN6	General – Bulk Water Supply	WaterNSW's <i>Guideline for Development Adjacent to the Upper Canal and Warragamba Pipelines</i> (WaterNSW, 2021) will be considered during detailed design and construction planning. WaterNSW will be consulted if any interactions with bulk water supply infrastructure are anticipated such as ground disturbance near airshaft #9, potential impacts on access to WaterNSW assets, and changes to drainage or water quality impacts that could impact the bulk water supply infrastructure.	Transport/ contractor	Detailed design/ construction	Additional safeguard
GEN7	General – Incident notification	WaterNSW will be notified as soon as practicable via the Incident Notification Number 1800 061 069 in the event of any incidents occurring during construction that may affect bulk water supply infrastructure.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity					
BI01	Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Transport for NSW's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas fauna management requirements (in accordance with Guide 9: Fauna handling of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011)) requirements set out in the <i>Landscape Design Guideline</i> (Transport for NSW, 2023d) pertinent to construction pre-clearing survey requirements in accordance with the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) procedures for unexpected threatened species finds and fauna handling following Guide 1: Pre-clearing process of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) protocols to manage weeds and pathogens tree protection measures in accordance with Australian Standard AS 4970–2009 <i>Protection of trees on development sites</i> a microbat management sub-plan if microbats are found present during pre-clearance survey or prior to removal of infrastructure. 	Contractor	Detailed design/ pre-construction	Section 4.8 of QA G36 <i>Environment Protection</i> QA G40 <i>Clearing and Grubbing</i>
BI02	Habitat removal	Vegetation and habitat removal, including removal of hollow-bearing trees and logs, will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Pre-construction/ construction	Additional safeguard QA G40 <i>Clearing and Grubbing</i>
BI03	Impacts on trees	A tree inventory will be prepared by a qualified arborist for trees proposed for clearing that do not require offsetting under the <i>No Net Loss Guidelines</i> (Transport for NSW, 2022f). This will include confirming the number of trees and hollows to be removed and replacement ratios in accordance with the <i>Tree and Hollow Replacement Guidelines</i> (Transport for NSW, 2022g).	Contractor	Detailed design/ pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BI04		<p>Prior to commencing vegetation clearing, a tree and hollow replacement plan will be developed outlining the approach to replacing trees and hollows in accordance with the <i>Tree and Hollow Replacement Guidelines</i> (Transport for NSW, 2022g), Guide 5: Re-use of woody debris and bushrock and Guide 8: Nest boxes of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011). This will include considering options for tree and hollow replacement within and in the vicinity of the proposal site in consultation with landowners.</p> <p>Where tree and hollow replacement cannot be accommodated locally or can only be partially accommodated, payment will be made to the Transport of NSW Conservation Fund prior to the commencement of works in accordance with the <i>Tree and Hollow Replacement Guidelines</i> (Transport for NSW, 2022g).</p>	Transport/ contractor	Detailed design/ pre-construction	Additional safeguard
BI05		Trees to be retained will be protected prior to the commencement of construction in accordance with Australian Standard AS 4970–2009 <i>Protection of trees on development sites</i> .	Contractor	Pre-construction/ construction	Additional safeguard
BI06	Habitat loss	<p>A biodiversity offset strategy will be developed and implemented to facilitate offsetting of impacts that exceed the thresholds within the <i>No Net Loss Guidelines</i> (Transport for NSW, 2022f).</p> <p>Where possible, this will include completing additional targeted flora surveys in areas not surveyed due to access constraints (see section 2.4.5 of the Biodiversity Assessment Report) to confirm species presence and the amount of non-statutory of biodiversity offset credits required in accordance with the <i>No Net Loss Guidelines</i>.</p>	Transport	Detailed design	Additional safeguard
BI07	Residual impacts on native flora and fauna (excluding certified land under the CPCP)	<p>Opportunities to replant disturbed areas within the proposal site identified for landscaping will be defined by, and undertaken in accordance with, the Urban Design and Landscaping Plan. The plan will include:</p> <ul style="list-style-type: none"> • where possible and appropriate, use of native vegetation of local provenance (commensurate with PCTs 849 and 1395), in accordance with the recommended species planting provided in Appendix F of the Biodiversity Assessment Report (Appendix C) • defining revegetation requirements in accordance with Guide 3: Re-establishment of native vegetation of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011a) and in consultation with a biodiversity specialist • identifying ongoing vegetation monitoring and maintenance requirements as needed • use of native species with cultural value identified through consultation with Aboriginal stakeholders, where appropriate • defining appropriate plants that would contribute to the ongoing health of trees to be retained, including trees with Aboriginal cultural value. 	Transport/ contractor	Detailed design/ construction	Additional safeguard QA <i>R179 Landscape Planting</i>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BI08	Fauna fences	Prior to the removal of existing fauna fences, an alternative fauna barrier will be implemented.	Transport/ contractor	Pre-construction/ construction	Additional safeguard
Traffic and transport					
TT01	Traffic and transport	<p>A Construction Traffic Management Plan (CTMP) will be prepared and implemented as part of the CEMP. The CTMP will be prepared in accordance with Transport for NSW's <i>Traffic Control at Work Sites Manual</i> and Transport's <i>Specification G10 Control of Traffic</i> and with consideration of recommendations included in the Traffic and Transport Impact Assessment. The CTMP will include:</p> <ul style="list-style-type: none"> • confirmation of haulage routes • measures to maintain access to local roads and properties. Where temporary disruption to access cannot be avoided, consultation will be undertaken with the owners, occupants and managers of affected properties and infrastructure, to confirm their access requirements and determine alternative arrangements • site-specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain freight access including over size over mass movements • measures to maintain and manage 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 • measures to manage staging of construction works to ensure that satisfactory capacity and minimum levels of service are maintained • measures to manage high risk over size over mass movements • monitoring, review and amendment mechanisms • Traffic Guidance Schemes updated as the works progress, prepared and implemented by suitably qualified personnel. 	Contractor	Detailed design/ pre-construction/ construction	Section 4.8 of QA <i>G36 Environment Protection</i> QA <i>G10 Traffic Management</i>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
TT02	Impact on local roads	Dilapidation surveys will be completed for all local roads used for construction traffic prior to commencement of construction and following completion of works. Further consultation with Wollondilly Shire Council will be undertaken during pre-construction and construction regarding the use of local roads for construction traffic, including detours and temporary traffic routes detailed in the CTMP.	Contractor/ Transport	Pre-construction/ construction	Additional safeguard
TT03	Impact on emergency services	Consultation will be undertaken with emergency services prior to and during construction regarding any access arrangement changes, diversions during construction and other operational road network changes.	Contractor	Pre-construction/ construction	Additional safeguard
TT04	Traffic and transport	Further traffic modelling will be completed to inform detailed design capturing the latest information on demand forecasts and timing of other network upgrades where required.	Transport	Detailed design	Additional safeguard
Aboriginal heritage					
AH01	Aboriginal heritage management	An Aboriginal Cultural Heritage Management Plan (ACHMP) will be prepared in accordance with the <i>Procedure for Aboriginal cultural heritage consultation and investigation</i> (Roads and Maritime Services, 2011a) and the <i>Unexpected Heritage Items Procedure</i> (Transport for NSW, 2022p) and implemented as part of the CEMP. The ACHMP will provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage. The ACHMP will be prepared in consultation with Registered Aboriginal Parties.	Contractor	Detailed design/ pre-construction	Section 4.9 of QA G36 <i>Environment Protection</i>
AH02	Aboriginal heritage	Opportunities to minimise impacts on PRUP PAD 7 will be investigated during detailed design and construction planning due to its association with AHIMS 52-5-4079.	Transport/ contractor	Detailed design/ pre-construction	Additional safeguard
AH03		An Arboricultural Impact Assessment report will be prepared during detailed design for the trees with Aboriginal cultural value, including AHIMS registered trees, in accordance with AS 4970-2009 <i>Protection of Trees on Development Sites</i> to inform exclusion zones and other protection measures in the ACHMP. The report will be prepared by a suitably qualified Arborist (minimum AQF level 3 or above) in consultation with Registered Aboriginal Parties. Minimum working distances by types of construction activities and associated management measures will be developed based on the results of the report and included in the relevant CEMP sub-plans.	Transport	Detailed design	Additional safeguard
AH04		Further design development will be completed during detailed design to avoid impacts on trees with Aboriginal cultural value where possible. Impacts on AHIMS-registered trees will be avoided in accordance with AS 4970-2009 <i>Protection of Trees on Development Sites</i> , with effective exclusion zones established prior to construction.	Transport	Detailed design/ pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AH05		The Urban Design and Landscaping Plan will be further developed in consultation with Aboriginal knowledge holders during detailed design. The plan will incorporate measures to integrate appropriate native vegetation around trees with Aboriginal cultural value, including AHIMS-52-2-3590 and AHIMS 52-5-4079.	Transport	Detailed design	Additional safeguard
AH06		An Aboriginal Heritage Impact Permit (AHIP) will be sought under section 90 of the <i>National Parks and Wildlife Act 1974</i> for Aboriginal sites expected to be directly impacted by the proposal. Overlapping impact areas with other existing AHIPs will be resolved as required.	Transport	Detailed design/ pre-construction	Additional safeguard <i>QA G36 Environment Protection</i>
AH07		If any activities associated with the proposal are required in the exclusion zone of PRUP PAD 34 area, the <i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation</i> (Roads and Maritime Services, 2011a) would be followed prior to any works taking place at this location.	Transport	Detailed design/ pre-construction	Additional safeguard
AH08	Aboriginal archaeological material	Aboriginal archaeological material excavated for the preparation of the Aboriginal cultural heritage assessment will be returned to Country and repatriated as soon as practicable in a secure location in accordance with requirements 16b and 26 of the <i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW, 2010b) or an alternative method agreed upon in consultation with the Registered Aboriginal Parties.	Transport	Detailed design/ pre-construction	Additional safeguard
AH09	Aboriginal heritage interpretation	An Aboriginal heritage interpretation strategy will be developed to guide incorporation of appropriate interpretation and integration of Aboriginal cultural heritage in the design. The strategy will be prepared and implemented with regard to the following: <ul style="list-style-type: none"> • <i>Interpreting Heritage Places and Items: Guidelines</i> (NSW Heritage Office, 2005a) • <i>Heritage Interpretation Policy</i> (NSW Heritage Office, 2005b) • <i>Connecting with Country Framework</i> (Government Architect, 2023) • <i>Signposting Country Technical Manual</i> (Transport for NSW, 2021d) • <i>Aboriginal Art Strategy</i> (Transport for NSW, 2022i) • <i>Aboriginal Cultural Heritage Framework</i> (Transport for NSW, 2022j) • <i>Heritage Interpretation Guideline</i> (Transport for NSW, 2016). The strategy will also: <ul style="list-style-type: none"> • be developed in consultation with relevant stakeholders, including Registered Aboriginal Parties and nominated Aboriginal cultural knowledge holders • be prepared in accordance with the urban design objectives and principles for the proposal 	Transport	Detailed design/ pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> include measures to ensure a meaningful design response to Aboriginal heritage and cultural values. <p>The design will include appropriate interpretation of Aboriginal heritage in accordance with the heritage interpretation strategy.</p>			
AH10	Cultural safety	A cultural safety protocol will be developed prior to construction that includes measures recommended by knowledge holders for implementation during pre-construction and construction activities.	Transport/ contractor	Pre-construction/ construction	Additional safeguard
AH11	Cultural practices	Options to make culturally significant plant species identified in the Aboriginal Cultural Heritage Working Paper to be cleared available to Aboriginal stakeholders for cultural practices will be investigated during detailed design in consultation with Registered Aboriginal Parties.	Transport/ contractor	Detailed design/ pre-construction	Additional safeguard
Non-Aboriginal heritage					
NH01	Minimising impacts on non-Aboriginal heritage	Cottage (I275), St Luke's Anglican Church (I276) and airshaft #9 associated with Upper Canal (SHR 01373) will be included in the CEMP environmental sensitive area map.	Contractor	Pre-construction	Additional safeguard
Hydrology and flooding					
HF01	Flooding impacts	Further flood modelling and investigations will be undertaken to inform detailed design development to mitigate potential impacts resulting from the proposal on properties where flooding impacts exceed acceptable levels as defined by the <i>Guide to Road Design Part 5 : Drainage – General and Hydrology Considerations</i> (Austroads, 2023) – Table 6.19 Acceptable impact for major transport infrastructure acceptable levels.	Transport	Detailed design	Additional safeguard
HF02	Watercourse and flow path impacts	All ancillary facility temporary buildings and stockpiles will be located above the 20 per cent AEP flood level.	Contractor	Construction	Additional safeguard
HF03		Temporary drainage infrastructure will be constructed and implemented in accordance with <i>Technical Guideline: Temporary stormwater drainage for road construction</i> (Roads and Maritime Services, 2011c).	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
Surface water and groundwater					
SW01	Managing potential impacts on surface water and groundwater quality	<p>A Construction Soil and Water Management Plan (CSWMP) will be prepared in accordance with <i>Managing Urban Stormwater: Soils and Construction</i>, Volume 1 and 2D (Landcom, 2004) (the 'Blue Book') and implemented as part of the CEMP. The CSWMP will identify reasonably foreseeable risks relating to soil erosion and surface and groundwater quality and describe how these risks will be addressed during construction, including temporary creek crossings.</p> <p>The CSWMP will be prepared by or reviewed and endorsed by a soil conservationist on the Transport for NSW list of Registered Contractors for Erosion, Sedimentation and Soil Conservation Consultancy Services. The CSWMP will then be revised to address the outcomes of the review.</p>	Contractor	Detailed design/ pre-construction	Section 2.1 of QA G38 <i>Soil and Water Management</i>
SW02		<p>Site-specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the CSWMP. The plan/s will include:</p> <ul style="list-style-type: none"> • 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 • erosion and sediment controls appropriate for dispersive soils • stabilisation measures to control discharge from stormwater outlets to manage erosion and scour • dewatering in accordance with the <i>Technical Guideline - Environmental Management of Construction Site Dewatering</i> (Roads and Maritime, 2011b) • progressive rehabilitation of disturbed sites in accordance with the rehabilitation strategy for exposed surfaces prepared as part of the Construction Air Quality Management Plan (safeguard AQ01). 	Contractor	Detailed design/ pre-construction	Section 2.2 of QA G38 <i>Soil and Water Management</i>
SW03		Stormwater management infrastructure will be designed and implemented to meet proposed operational water quality pollutant reduction targets (90% Gross Pollutant, 85% Total Suspended Solids, 65% Total Phosphorous and 45% Total Nitrogen).	Contractor	Detailed design/ construction	Additional safeguard
SW04	Water quality monitoring	<p>A surface water quality monitoring program will be developed and implemented as part of the CSWMP in accordance with the <i>Guidelines for Construction Water Quality Monitoring</i> (RTA, 2003). The program will define:</p> <ul style="list-style-type: none"> • monitoring parameters • monitoring locations • frequency and duration of monitoring. <p>The monitoring program will include monitoring prior to the commencement of and during construction.</p>	Contractor	Pre-construction/ construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GW01	Groundwater impacts	Impacts on groundwater during construction will be minimised as far as practicable by: <ul style="list-style-type: none"> • avoiding the need to extract groundwater • minimising groundwater inflows and volumes into excavations • managing any groundwater encountered during excavations in accordance with the <i>Technical Guideline – Environmental Management of Construction Site Dewatering</i> (Roads and Maritime, 2011b). 	Contractor	Construction	Additional safeguard
Soils and contamination					
SC01	Soil erosion and sedimentation	During any construction and maintenance work where soils are exposed, sediment and erosion control devices will be installed in accordance with the CSWMP, <i>Managing Urban Stormwater: Soils and Construction</i> , Volume 1 and 2d (Landcom, 2004) and the Urban Design and Landscaping Plan.	Contractor	Construction/ operation	Additional safeguard
SC02	Contaminated land	A detailed site investigation (DSI) will be undertaken during detailed design to further assess risks to human health and the environment. The DSI will involve, but not be limited to, the assessment of areas of environmental concern within the proposal site where the likelihood of contamination is moderate to high or high, and hazardous materials associated with bridge demolition and existing infrastructure. The results of the DSI will be assessed against the criteria contained with the <i>National Environment Protection (Assessment of Site Contamination) Measure 1999</i> (NEPC, 2013) to determine the need for any remediation.	Contractor	Detailed design/ pre-construction	Additional safeguard
SC03		If contaminated land is found within the proposal site, a Contaminated Land Management Plan (CLMP) will be prepared in accordance with the <i>Guideline for the Management of Contamination</i> (Transport for NSW, 2013) and implemented as part of the CEMP. The plan will include, but not be limited to: <ul style="list-style-type: none"> • management of the remediation and subsequent validation of any contaminated land, including any certification required • measures to ensure the safety of site personnel and local communities during construction • procedures for managing contamination on site, including unexpected contamination finds (an unexpected finds procedure). The procedure will be incorporated into the CEMP and will outline the process for identification, assessment and management of potentially contaminated material • measures that address additional recommendations resulting from the DSI • a plan for encapsulating suitable contaminated materials within the formation of road embankments, below pavement levels and above groundwater levels. 	Contractor	Detailed design/ pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SC04	Removal of infrastructure containing hazardous materials	Prior to disturbing to existing infrastructure potentially containing hazardous material, a hazardous material survey will be undertaken. If hazardous material is identified, it will be managed in accordance with CEMP, CLMP and WMP. The contractor must engage an appropriate licensed hygienist during activities involving hazardous materials to assist with classification and management of materials on site.	Contractor	Detailed design/ pre-construction/ construction	Additional safeguard
SC05	Accidental spills	A site-specific emergency spill management plan will be developed and include spill-management measures in accordance with Transport for NSW's <i>Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and NSW EPA). The site-specific emergency spill plan will also identify when notification to WaterNSW is required, in accordance with safeguard GEN7.	Contractor	Detailed design/ pre-construction	Section 4.3 of <i>QA G36 Environment Protection</i> Additional safeguard
SC06	Contaminated material	If encapsulation of contaminated material within the formation occurs, a separate operations management plan will be developed.	Transport/ contractor	Construction	Additional safeguard
Noise and vibration					
NV01	Construction noise and vibration management	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared and implemented as part of the CEMP. The CNVMP will generally follow the approach outlined in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and the <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h) and identify: <ul style="list-style-type: none"> • all sensitive receivers within 600 metres of the proposal site following a land use review to capture new developments that have not been identified in the REF • all potentially high noise and vibration generating activities associated with the construction of the proposal • standard and additional mitigation measures from the <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h) • 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 • outline requirements for the development and implementation of an out-of-hours work protocol. 	Contractor	Pre-construction	Section 4.6 of <i>QA G36 Environment Protection Interim Construction Noise Guideline (ICNG)</i> (DECC, 2009) <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h)

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV02	Community notification	<p>All sensitive receivers (e.g. schools, local residents) likely to be affected by high noise producing activities or out-of-hours work work will be notified in accordance with the <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h) and ICNG at least five working days prior to commencement of the works. The notification will provide details of:</p> <ul style="list-style-type: none"> • the project • the construction period and construction hours • contact information for project management staff • complaint and incident reporting • how to obtain further information. 	Contractor	Pre-construction	Additional safeguard
NV03	Construction noise and vibration statement	<p>Location and activity specific construction noise and vibration impact assessments will be undertaken:</p> <ul style="list-style-type: none"> • prior to works with the potential to generate noise levels above 75 dBA at residences • prior to works that need to occur outside recommended standard working hours and are likely to result in noise levels greater than the relevant noise management levels • prior to works with the potential to exceed relevant performance criteria for vibration • prior to works where an alternative construction methodology is proposed that would result in: <ul style="list-style-type: none"> – activity sound power levels higher than those assumed in the assessment; or – use of vibration intensive equipment not assessed previously. <p>The assessments will confirm predicted impacts at relevant receivers in the vicinity of the activities to assist with the selection of appropriate management measures in accordance with the <i>Construction Noise and Vibration Guideline (Roads)</i> (Transport for NSW, 2023h). The measures will be detailed in the CNVMP and implemented for the duration of the activity.</p>	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV04	Vibration impacts	<p>Building condition inspections will be undertaken prior to and after construction works that are predicted to exceed the screening criteria for structural damage to buildings or structures and/or would be required within the minimum working distances listed in Table 2 of the <i>Construction Noise and Vibration Guideline</i> (Transport for NSW, 2023h) and the Noise and Vibration Impact Assessment.</p> <p>Where required, the vibration management level will be refined based on the type and condition of the structure. The survey will consider the heritage value of the structure in consultation with a structural engineer and heritage specialist for the following listed heritage items:</p> <ul style="list-style-type: none"> • Cottage (I275) • St Luke's Anglican Church (I276) • WaterNSW airshaft #9 associated with the Upper Canal (SHR 01373). 	Contractor	Construction	Additional safeguard
NV05	Relocation of noise wall east of Pembroke Parade (north of Picton Road)	Additional noise modelling will be carried out during detailed design to determine whether additional noise mitigation measures are required during the relocation of the existing noise wall. Required mitigation measures will be included in the CNVMP.	Contractor	Detailed design	Additional safeguard
NV06	Blasting	In the event that blasting is required, the blast parameters will be designed, and allowable charge mass confirmed, to achieve the airblast overpressure and ground vibration requirements of the <i>Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration</i> (ANZECC, 1990). This will include trial blasting and airblast/vibration monitoring to confirm site-specific constants and to refine the safe blasting distances.	Contractor	Construction	Additional safeguard Section 4.7 of QA G36 <i>Environmental Protection</i>
NV07	Early implementation of operational treatments	At-property treatments required to mitigate operational noise will be implemented prior to construction noise impacts, where reasonable and feasible.	Contractor	Pre-construction/ construction	Additional safeguard
NV08	Operational noise and vibration review	<p>An operational noise and vibration review (ONVR) will be undertaken as part of detailed design to review the potential for operational noise impacts based on the most current information and confirm feasible and reasonable mitigation measures to be incorporated into the design.</p> <p>The identification and implementation of noise mitigation measures will be undertaken in accordance with the <i>Road Noise Mitigation Guideline</i> (Transport for NSW, 2022m) and the <i>At-Receiver Noise Treatment Guideline</i> (Transport for NSW, 2022n).</p>	Contractor	Detailed design	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV09	Post-construction operational compliance	Post-construction operational compliance noise monitoring using a validated post-construction operational noise model will be undertaken following road opening. This program will be undertaken within 12 months of completion of the proposal and will be completed once traffic flows have stabilised. Noise mitigation measures will be revised at the completion of the monitoring period in accordance with <i>Road Noise Mitigation Guideline</i> (Transport for NSW, 2022m) and the <i>At-Receiver Noise Treatment Guideline</i> (Transport for NSW, 2022n).	Transport	Operation	Additional safeguard
Air quality					
AQ01	Air quality	<p>A Construction Air Quality Management Plan (CAQMP) will be prepared and implemented as part of the CEMP. The plan will detail processes, responsibilities and measures to manage air quality and minimise the potential for impacts during construction.</p> <p>The CAQMP will include, but not be limited to:</p> <ul style="list-style-type: none"> • a map identifying locations of sensitive receptors • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA guidelines • mitigation and suppression measures to be implemented, including measures to manage potential silica emissions from concrete processing, cutting and grinding if required. • methods to manage work during strong winds or other adverse weather conditions • a process for monitoring dust on-site and weather conditions • a progressive rehabilitation strategy for exposed surfaces. 	Contractor	Detailed design/ pre-construction/ construction	Section 4.4 of QA G36 <i>Environment Protection</i>
Landscape character and visual impacts					
LV01	Landscape character and visual impacts	<p>An Urban Design and Landscaping Plan will be prepared to support the final detailed project design and implemented as part of the CEMP.</p> <p>The Urban Design and Landscaping Plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for:</p> <ul style="list-style-type: none"> • location and identification of existing vegetation and proposed landscaped areas, including species to be used • built elements including retaining walls, bridges and noise walls • pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • fixtures such as seating, lighting, fencing and signs 	Transport/ contractor	Detailed design/ pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
LV02		<ul style="list-style-type: none"> • details of the staging of landscape work including early vegetation establishment, taking account of related environmental controls such as erosion and sedimentation controls and drainage • procedures for monitoring and maintaining landscaped or rehabilitated areas • consideration of buffer planting to screen views for dwellings located adjacent to the Picton Road and M31 Hume Motorway interchange • maximising opportunities for revegetation with native species of local provenance to complement and integrate with existing remnant vegetation, where appropriate • batters, which will be vegetated as far as practicable • rounding of batters to integrate into the existing landform and create a more natural appearance. <p>The Urban Design and Landscaping Plan will be prepared in accordance with the heritage interpretation strategy and relevant guidelines, including:</p> <ul style="list-style-type: none"> • <i>Connecting with Country</i> (Government Architect NSW, 2023) • <i>Biodiversity Policy</i> (Transport for NSW, 2022e) • <i>Water Sensitive Urban Design Guideline</i> (Transport for NSW, 2023a) • <i>Beyond the Pavement urban design policy, process and principles</i> (Transport for NSW, 2023c) • <i>Landscape Design Guideline</i> (Transport for NSW, 2023d) • <i>Bridge Aesthetics</i> (Transport for NSW, 2023e) • <i>Noise Wall Design Guidelines</i> (Transport for NSW, 2023f) • <i>Shotcrete Design Guideline</i> (Transport for NSW, 2023g) • <i>Pedestrian Underpass Design Guideline</i> (Transport for NSW, 2023i). 			
		<p>Lighting will be designed and sited to minimise glare and light spill into adjoining areas in accordance with Australian/New Zealand Standard AS/NZS 4282 <i>Control of the obtrusive effects of outdoor lighting</i> and relevant standards in the series AS/NZS 1158 <i>Lighting for roads and public spaces</i>.</p>			
LV03	Visual impacts of construction work area	<p>Any construction ancillary facilities with hoarding and fencing will be designed, erected and maintained to minimise visual impacts. This will include:</p> <ul style="list-style-type: none"> • erecting hoarding/fencing as early as possible in the site establishment phase to provide visual screening • featuring graphics, artwork or project information in accordance with Transport guidelines and specifications • maintaining hoarding/fencing regularly, including the prompt removal of graffiti. 	Contractor	Pre-construction/ construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
LV04	Site restoration and rehabilitation	All temporary infrastructure will be removed at the completion of construction, unless otherwise agreed with relevant stakeholders.	Contractor	Construction	Additional safeguard
LV05	Planning with Country	Options will be investigated to integrate planning and designing with Country elements in the urban design and other aspects of the proposal in consultation with Aboriginal stakeholders.	Transport	Detailed design	Additional safeguard
Property and land use					
PL01	Property acquisition	Property owners and occupants affected by acquisition will be consulted, and acquisition will be undertaken, in accordance with the: <ul style="list-style-type: none"> • <i>Land Acquisition (Just Terms Compensation) Act 1991</i> • <u><i>A Guide to Property Acquisition in NSW (NSW Government, 2022)</i></u> 	Transport	Pre-construction/ construction	Additional safeguard
PL02	Impacts on land use and property	To support the property acquisition process, Property Adjustment Plans will be developed and agreed to with impacted land owners.	Transport	Detailed design/ pre-construction/ construction	Additional safeguard
PL03	Temporary leased land	Areas of land leased for the purposes of construction will be reinstated at the end of the lease to at least equivalent standard or as agreed with the landowner. Reinstatement works will be undertaken as soon as practicable following completion of construction works on the land.	Contractor	Construction	Sections 4.15 and 4.16 of QA G36 <i>Environment Protection</i>
Socio-economic impacts					
SE01	Socio-economic impacts	A Community and Stakeholder Engagement Plan (CSEP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CSEP will include (as a minimum): <ul style="list-style-type: none"> • mechanisms to provide details and timing of proposed activities to affected stakeholders, including changed traffic and access conditions • additional consultation specific to traffic impacts for freight and emergency service providers, including frequency and method for notices • toll free number and email address for enquiries and complaints • how the project webpage will be maintained for the duration of the proposal • a complaint's handling procedure • consultation activities to be carried out. 	Contractor	Detailed design/ construction	Additional safeguard QA G36 <i>Environment Protection</i>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SE02		<p>Transport will continue to consult with the community until completion of the proposal. This will include:</p> <ul style="list-style-type: none"> engaging with landowners, landholders and businesses in close proximity to the proposal to notify them about the proposal design, construction activities and timing of construction works identifying and engaging with vulnerable persons that might be affected by the proposal. 	Transport	Pre-construction/ construction	Additional safeguard
SE03		<p>Opportunities for Aboriginal employees and procurement will be prioritised in accordance with the <i>Aboriginal Procurement Policy</i> (NSW Government, 2021b) and <i>Aboriginal Participation Strategy</i> (Transport for NSW, 2023j).</p>	Transport/ contractor	Detailed design/ pre-construction/ construction	Additional safeguard
Climate change and sustainability					
CC01	Climate change	<p>The climate change risk assessment review will be completed at each design stage in accordance with Australian Standard AS 5334-2013 <i>Climate change adaptation for settlements and infrastructure – A risk based approach</i> and the <i>Transport for NSW Climate Risk Assessment Guidelines</i> (Transport for NSW, 2021c).</p> <p>This review will also confirm that adopting the RCP 4.5 scenario as the culvert design criteria appropriately addresses the risks and consequences of future climate change on the operation of the proposal.</p>	Transport	Detailed design	Additional safeguard
CC02		<p>Hazards and risks associated with climate change in the surrounding environment will be further considered during detailed design development.</p>	Transport	Detailed design	Additional safeguard
CC03	Sustainability	<p>A project-specific sustainability implementation management plan will be developed and implemented during detailed design and construction. The plan will investigate further opportunities to embed sustainable outcomes and outline an implementation plan for those that are feasible and practicable, including reduction of greenhouse gas emissions during construction and operation. Measures in the plan will be implemented during construction.</p>	Contractor/ Transport	Detailed design/ Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
Other impacts					
OI01	Waste management	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> • 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 on-and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting. <p>The WMP will align with the <i>Waste Management Guideline</i> (Transport for NSW, 2023k), the <i>Waste Classification Guidelines</i> (NSW EPA, 2014), and relevant Transport waste fact sheets, and will adopt the circular economy principles and the waste hierarchy contained in the <i>Waste Avoidance and Resource Recovery Act 2001</i>.</p>	Contractor	Detailed design/ pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i> Section 4.11 of QA G36 <i>Environment Protection</i>
OI02	Utilities	The location of existing utilities and relocation details will be confirmed following consultation with affected utility owners, including searches of Before You Dig Australia and utility locators prior to commencement of construction works.	Contractor	Detailed design/ pre-construction	Additional safeguard
OI03	Hazards and risk management	<p>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:</p> <ul style="list-style-type: none"> • details of hazards and risks associated with construction • measures to be implemented during construction to minimise and manage these risks • record keeping for 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 identified risks • consultation and notifications requirements for different hazard scenarios • contingency measures to be implemented in the event of unexpected hazards, risks arising and emergency situations. <p>The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work NSW Codes of Practice, and NSW EPA and DPE publications.</p>	Contractor	Detailed design/ pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative impacts					
CI01	Cumulative impacts	Ongoing coordination and consultation will be undertaken with the proponents of nearby projects to identify the potential for cumulative impacts to occur.	Transport/ contractor	Pre-construction/ construction	Additional safeguard
CI02		The CEMP will be revised to consider potential construction cumulative impacts from surrounding projects, including measures to manage these impacts, as they become known.	Contractor	Construction	Additional safeguard

7.3 Licensing and approvals

Table 7.2 identifies the permits, licences and notifications that would be required to construct the proposal.

Table 7.2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Protection of the Environment Operations Act 1997 (s43)</i>	Environment protection licence for scheduled activities (road construction).	Prior to start of the activity.
<i>Heritage Act 1977 (s57)</i>	Exemption notification for works to an item on the State Heritage Register.	Prior to start of the activity.
<i>National Parks and Wildlife Act 1974 (s90)</i>	Aboriginal heritage impact permit.	Prior to start of the activity.
<i>Roads Act 1993 (s138)</i>	Road occupancy licence under Section 138.	Prior to start of the activity.
Environmental Planning and Assessment Regulation 2021 (s201)	Notification about works affecting avoided land to the Planning Secretary	30 days after a decision has been made

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 EP&A Regulation.

8.1 Justification

Picton Road is an important transport corridor linking the Illawarra Shoalhaven Region with Greater Sydney and the Wilton and Greater Macarthur Growth Areas. It is one of two major east-west links between the M31 Hume Motorway and the M1 Princes Motorway. Identified as a National Key Freight Route, Picton Road provides an important connection between Port Kembla and the Illawarra Shoalhaven region and the rapidly expanding Western Sydney industrial precincts, the Western Sydney Parklands and Aerotropolis, Western Sydney International Airport, and Moorebank Intermodal Terminal.

Picton Road will play a key role in opening up substantial employment and business opportunities in the future, fostering and supporting connectivity and creating great places to live. An upgrade of Picton Road would improve safety, accessibility and efficiency for transport customers and residents in new and emerging housing developments, better connecting them to diverse employment opportunities and to retail, health, education and recreation facilities.

The proposal comprises the upgrade of the section of Picton Road from about 1.3 kilometres east of the bridge over the Nepean River to about 200 metres east of Almond Street, Wilton, including the M31 Hume Motorway interchange. The proposal aligns with the objectives of key strategic transport, infrastructure and land use plans (described in sections 2.1.2 and 2.1.3), including:

- Future Transport Strategy
- 2022-23 State Infrastructure Plan
- Active Transport Strategy
- 2026 Road Safety Action Plan
- Greater Sydney Region Plan – A Metropolis of Three Cities
- Wilton 2040 – a Plan for the Wilton Growth Area
- Illawarra Shoalhaven Regional Plan 2041.

Overall, the proposal is justified on the basis that the potential adverse impacts would be outweighed by the long-term beneficial impacts of improved traffic flow, reduced congestion, improved connectivity, and improved safety for local and regional road users, including Wilton residents.

8.1.1 Social factors

The proposal would result in benefits during operation by providing improved safety, capacity and connectivity, including active transport connectivity. These safety and capacity improvements would address local community concerns relating to congestion and safety, and respond to the needs of the broader community to access jobs and services in west and south-west Sydney.

While the proposal has been designed to minimise impacts on traffic on Picton Road and the M31 Hume Motorway, there would be the potential for some short-term localised disruptions to traffic during construction. This could result in traffic delays and inconvenience to the local community. To minimise this potential disruption, further consultation with key stakeholders and the community would be carried out, and traffic changes would be managed in accordance with the Construction Traffic Management Plan.

Construction noise and vibration may also temporarily impact the amenity of local residents. These potential noise impacts would be minimised and managed in accordance with the Construction Noise and Vibration Management Plan.

The proposal would be constructed in an area with Aboriginal and non-Aboriginal heritage values, which are of importance to the local community. Potential impacts on heritage items and values would be avoided and minimised, mitigated and managed in accordance with the safeguards and management measures, and a heritage interpretation strategy would be developed and implemented.

Some landholders and landowners adjoining the proposal site facing changes associated with property acquisition may experience stress and anxiety about these changes, potentially affecting the health and wellbeing of some individuals. Transport has and will continue to consult with affected landholders and landowners about the proposal's land requirements and potential property impacts.

8.1.2 Biophysical factors

An important consideration during design development has been to minimise potential impacts on biodiversity, particularly native vegetation, including listed threatened ecological communities and avoided land under the CPCP. As a result of the design refinement process described in section 2.5, the potential impacts on native vegetation have been minimised wherever possible.

The proposal would result in the removal of up to about 11.50 hectares of native vegetation consisting of the following threatened ecological community types:

- up to about 4.87 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion / Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, listed as critically endangered under the BC Act and/or under the EPBC Act
- up to about 6.63 hectares of Shale Sandstone Transition Forest in the Sydney Basin Bioregion, listed as endangered under the BC Act and/or critically endangered under the EPBC Act.

The proposal would impact on up to about 144 m² of land mapped as 'avoided land' by the CPCP.

There may also be a risk of fauna injury and mortality from construction movements. However, most of the vegetation likely to be affected by the proposal is located adjacent to the road and has been subject to historic clearing and edge effects. Potential impacts on native vegetation would be further reduced by implementing the safeguards and management measures, including continuing to refine the design to minimise vegetation clearing where feasible and reasonable, and preparing and implementing a Flora and Fauna Management Plan, and biodiversity offset strategy.

Overall, the proposal is not likely to significantly impact threatened species, populations, ecological communities or their habitats.

The proposal would require excavation, removal of vegetation, disturbance of soil, and the construction of road infrastructure, which may lead to exposed soils, sediment entering watercourses and potential impacts on water quality. Water quality treatment facilities and scour would be provided as part of the proposal to minimise the potential for impacts.

The proposal has the potential for some biophysical impacts that would be managed by implementing the safeguards and management proposed in section 7.2. However, these impacts would be outweighed by long-term transport, connectivity and safety benefits once the proposal is operational.

8.1.3 Economic factors

The proposal would be constructed largely within the existing road corridor. Whilst some acquisition would be required it would generally involve acquisition of small portions of lots.

Locally, the proposal would improve road safety and accessibility, including through reduced congestion, travel time savings and improved travel reliability. This would impact positively on local and regional businesses, including the freight industry. As part of the broader Picton Road upgrade, the proposal would improve transport along this key road link for freight, commuters, and the local and regional community, and contribute to opening up employment and business opportunities in the future, fostering and supporting connectivity.

The proposal would provide employment opportunities during construction, requiring a workforce of up to about 100 people.

8.1.4 Public interest

The proposal is considered to be in the public interest as it would:

- improve safety for all transport users of Picton Road at Wilton
- support planned growth in the Wilton and Greater Macarthur Growth Areas
- improve capacity and reduce congestion on Picton Road at Wilton
- improve resilience by providing additional capacity to manage vehicle movements during disruptions.

Whilst the community would have the potential to experience some negative impacts as a result of the proposal, most would be temporary and would be minimised by implementing the safeguards and management measures provided in section 7.2.

8.2 Objects of the Environmental Planning and Assessment Act 1979

The consistency of the proposal with the objects of the EP&A Act is considered in Table 8.1.

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.	Design development of the proposal has considered potential impacts on environmental resources. Wherever possible, the design has been refined and developed to avoid and minimise potential impacts and Transport commits to implementing the safeguards provided in section 7.2 to further reduce, mitigate and manage potential impacts on the environment. The proposal would contribute to the overall upgrade of Picton Road, delivering benefits to local residents and the broader community and economy.
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 proposal is consistent with the objective of ecologically sustainable development as outlined in section 8.2.1.
1.3(c) To promote the orderly and economic use and development of land.	The proposal, as part of the broader upgrade of Picton Road, is required to support the efficient movement of people and freight between the Illawarra Shoalhaven Region, Greater Sydney, and the Wilton and Greater Macarthur Growth Areas. The proposal is also identified as one of the key infrastructure upgrades required to deliver the future development of the Wilton Growth Area in accordance with Wilton 2040 (DPE, 2018) and the Wilton Growth Area infrastructure phasing plan (NSW Government, 2020).
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.	Impacts on native animals and plants, including threatened species, populations and ecological communities and their habitats, are considered in section 6.1. Assessments of significance have been carried out for the threatened species and ecological communities that are likely to occur in the proposal site. The assessments found that the proposal is unlikely to have a significant impact on all matters listed under the BC Act and EPBC Act. As described in section 8.1.2, Transport commits to implementing the safeguards and management measures provided in section 7.2 to avoid, minimise, mitigate and manage the identified impacts.

Instrument	Requirement
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	An assessment of potential impacts on Aboriginal and non-Aboriginal cultural heritage is provided in sections 6.3 and 6.4 respectively. Measures are provided to avoid, minimise, mitigate and manage impacts as a result of the proposal to promote the sustainable management of built and cultural heritage.
1.3(g) To promote good design and amenity of the built environment.	As described in section 3.2.1, the design is being prepared in accordance with Transport’s project specifications and road and bridge design standards and guidelines to promote good design and amenity, including Austroads Guides to Road Design, Australian Standards, Transport technical directions and urban design guidelines. Design development has included urban design as a key consideration. An Urban Design and Landscaping Plan will be prepared to present an integrated urban design for the proposal, providing practical detail on the application of the identified design principles and objectives, and design treatments.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant to this proposal
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 with the community and relevant government agencies was carried out during the development of the proposal. There would be further opportunities for the public to comment on the proposal during the exhibition of the REF as described in chapter 5.

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 below.

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 mitigation measures.

This REF has been prepared using a conservative and precautionary approach, including investigating and considering potential worst-case outcomes where relevant. The purpose of this is to ensure that potential environmental and social impacts are considered, and adequate consideration is given to avoiding, minimising, managing, and mitigating impacts that could cause temporary or permanent environmental degradation or adverse social impacts.

Assessment of the potential impacts of the proposal has been undertaken in a way that is consistent with the precautionary principle and with accepted scientific and assessment methodologies, and relevant guidelines. Assessments have applied a conservative approach to consideration and modelling of construction and operational arrangements.

The proposal has been designed and refined to avoid and minimise impacts as far as practicable, and to reflect the findings of the assessments undertaken, particularly in relation to potential impacts on biodiversity, noise and vibration, traffic and transport, and Aboriginal and non-Aboriginal heritage. Safeguards and management measures have been proposed to minimise potential impacts, and these measures would be implemented during construction and operation.

Lack of full scientific certainty has not been used as a reason to postpone or avoid identification and adoption of design or management measures to avoid or minimise environmental degradation. No threat of serious or irreversible damage to the environment arising from the proposal has been identified.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Intergenerational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

Key proposal objectives (see section 2.3.1) include improving safety, connecting communities and reducing travel time. While the proposal would result in some environmental and social impacts, economic expenditure, and use of materials to construct and operate the proposal, the net benefit to the community over the proposal's design life would be positive.

Construction of road infrastructure has the potential for environmental and social disturbance. However, the area affected and the extent of these potential impacts for the proposal are considered to be relatively small and justified by the proposal's social and economic benefits. Transport commits to implementing the measures listed in section 7.2 to avoid and manage these potential impacts as far as possible.

The safety, accessibility and efficiency benefits of the proposal are considered to be consistent with the principle of intergenerational equity. Should the proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower road condition that could involve substantial increases in travel times in the context of future development of the Wilton Growth Area.

Conservation of biological diversity and ecological integrity

As described in sections 2.5 and 8.1.2, the design has been subject to refinement to limit the removal of native vegetation and threatened ecological communities as far as practicable. A comprehensive assessment of biodiversity was undertaken to identify and manage the potential impacts of the proposal on biodiversity. It is acknowledged that the proposal would result in impacts on biodiversity, including the removal of native vegetation. The BAR determined that the proposal is unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitats.

The design and construction methodology would continue to be refined to further minimise vegetation removal. A tree management plan and biodiversity offset strategy would be developed to mitigate the proposal's residual impacts.

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.

This REF has assessed the potential environmental consequences of the proposal and identified safeguards and management measures to respond to the identified potential impacts. Implementation of these measures would increase the capital costs of the proposal. This shows that environmental resources were valued in economic terms during the concept design process. In addition, the concept design was developed with an objective of minimising potential impacts on the surrounding environment, to minimise the costs to the environment where practicable.

In summary, the proposal is generally in accord with the principles of ESD. The proposal would improve connectivity, safety and transport efficiency, and would provide a sustainable balance between environmental and economic objectives. It would also provide better facilities for pedestrians, cyclists and vehicles.

8.3 Conclusion

The proposed Picton Road upgrade between the Nepean River and Almond Street at Wilton 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 NPW Act, 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 on 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, heritage and socio-economic factors during construction. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve safety, support planned growth in the Wilton Growth Area, improve capacity and reduce congestion on Picton Road at Wilton, and improve resilience of the local and regional transport network. 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 BDAR or SIS is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from 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 EPBC Act. 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: Amanda Raleigh
Position: Technical Director – Environmental Planning
Company name: GHD Pty Ltd
Date: February 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.

Name: Adriana Sanchez
Position: Project Development Manager
Transport region/program: Transport for NSW
Date: February 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
AAER	Aboriginal Archaeological Excavation Report
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHSVR	Aboriginal Cultural Heritage Sensitivities and Values Mapping Report
Alignment	The vertical and horizontal location of the road
ABS	Australian Bureau of Statistics
Aboriginal object	Defined by the <i>National Parks and Wildlife Act 1974</i> (NSW) as: 'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'.
Aboriginal place	Any place declared to be an Aboriginal place under section 94 of the <i>National Parks and Wildlife Act 1974</i> .
Aboriginal stakeholders	Members of a local Aboriginal land council, Aboriginal groups or other Aboriginal people who have registered their interest to be consulted about a proposed Transport project or activity.
AEP	Annual exceedance probability - the chance of a flood of a nominated size occurring in a particular year. The chance of the flood occurring is expressed as a percentage and, for large floods, is the reciprocal of the ARI. For example, the one per cent AEP flood event is equivalent to the 100-year ARI flood event.
AHD	Australian Height Datum - The standard reference level used to express the relative height of various features. A height given in metres AHD is essentially the height above sea level. Mean sea level is set as zero elevation.
AHIMS	Aboriginal Heritage Information Management System
AHMP	Aboriginal Heritage Management Plan
AQMP	Air Quality Management Plan
BAM	Biodiversity Assessment Method - outlines how an accredited person assesses impacts on biodiversity at development sites and stewardship sites.
BC Act	<i>Biodiversity Conservation Act 2016</i> (NSW)
BDAR	Biodiversity Development Assessment Report
Biodiversity offsets	Measures that benefit biodiversity by compensating for the adverse impacts elsewhere of an action, such as clearing for development. Biodiversity offsets work by protecting and managing biodiversity values in one area in exchange for impacts on biodiversity values in another.
BoM	Bureau of Meteorology
BTEX	Benzene, toluene, ethyl-benzene and xylene
CBD	Central business district
CEMP	Construction Environmental Management Plan
CEEC	Critically endangered ecological community
Classified road	A road that meets the definition of a classified road and is listed as such under the <i>Roads Act 1993</i> (NSW) includes main roads, highways, motorways, etc.
CLM Act	<i>Contaminated Land Management Act 1997</i> (NSW)
CMSC Act	<i>Coal Mine Subsidence Compensation Act 2017</i> (NSW)
Concept design	Initial functional layout design for a road or road system, to establish feasibility, to provide a basis for estimating, and to determine further investigations needed for detailed design.

Term / Acronym	Description
CNVMP	Construction Noise and Vibration Management Plan
Construction	Includes all physical work required to construct the proposal.
Construction compound	An area used as the base for construction activities, usually for the storage of plant, equipment and materials and/or construction site offices and worker facilities.
CO	Carbon monoxide
CP	Communication Plan
CPCP	Cumberland Plain Conservation Plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts than a single impact assessed on its own.
dB	Decibels
dBA	Used as a measure of A-frequency weighed sound levels. A-weighting is applied to instrument-measured sound levels in effort to account for the relative loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies.
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DPE	Department of Planning and Environment (current name at time REF was prepared, to become Department of Planning, Housing and Infrastructure and Department of Climate Change, Energy, the Environment and Water effective 1 January 2024)
Dispersive soils	Soils that are structurally unstable, prone to erosion and disperse in water into basic particles i.e. sand, silt and clay.
EEC	Endangered ecological communities
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW.
EPA	Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (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.
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
Heritage Act	<i>Heritage Act 1977</i> (NSW)
Heritage listed	An item, building or place included on statutory heritage lists maintained by local, State and/or the Australian Government.
HMP	Heritage Management Plan
HRMP	Hazard and Risk Management Plan
Hydrology	The study of rainfall and surface water runoff processes.
IAQM	Institute of Air Quality Management
Impact	Influence or effect exerted by a proposal or other activity on the natural, built and community environment.
INCG	Interim Construction Noise Guideline
IRSAD	Index of Relative Socio-Economic Advantage/ Disadvantage
Just Terms Act	<i>Land Acquisition (Just Terms Compensation) Act 1991</i> (NSW)
km	kilometre

Term / Acronym	Description
L _{Aeq}	Equivalent continuous sound level
LALC	Local Aboriginal Land Council
L _{Amax}	A-weighted maximum sound level
Landscape	The overall character and function of a place and includes all elements within the public realm, and the interrelationship between these elements and the people who use it.
LCZ	Landscape character zone
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local government area
LoS	Level of service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
MNES	Matters of national environmental significance under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
NC	Native Claim
NCA	Noise catchment area
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999
NorBE	Neutral or Beneficial Effect
NO ₂	Nitrogen dioxide
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
PACHI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PAD	Potential archaeological deposit
PAH	Polycyclic aromatic hydrocarbons
PCBs	Phenols, polychlorinated biphenyls
PCD	Picton Council Depot
PEMP	Project Environmental Management Plan
PFAS	Pesticides, per-and polyfluoroalkyl substances
PM	Particulate matter
POEO Act	<i>Protection of the Environment Operations Act 1997</i> (NSW)
Proposal	Construction and operation of the Picton Road upgrade between Nepean River and Almond Street, Wilton.
Proposal site	The area that would be directly affected by construction works (also known as the construction footprint). It includes the location of proposal infrastructure, the area that would be directly disturbed by the movement of construction plant and machinery, and the location of the storage areas, compounds sites, etc., that would be used to construct that infrastructure.
QA Specifications	Specifications developed by Transport for use with road work and bridge work contracts let by Transport.
Rating background level	The underlying level of noise present in an area once transient and short-term noise events are filtered out.
REF	Review of Environmental Factors
RCP	Representative Concentration Pathway
RMS	NSW Roads and Maritime Services, now Transport for NSW
Road reserve	A legally defined area of land within which facilities such as roads, footpaths and associated features may be constructed for public travel.

Term / Acronym	Description
Regional Plan	Illawarra Shoalhaven Regional Plan 2041
SAL	Suburb and Locality
SA	Statistical Area
SEPP (Biodiversity and Conservation)	State Environmental Planning Policy (Biodiversity and Conservation) 2021
SEPP (Planning Systems)	State Environmental Planning Policy (Planning Systems) 2021
SEPP (Precincts – Western Parkland City)	State Environmental Planning Policy (Precincts – Western Parkland City) 2021
SEPP (Transport and Infrastructure)	State Environmental Planning Policy (Transport and Infrastructure) 2021
SHR	State Heritage Register
SIS	Species Impact Statement
Study area	The study area is defined as the wider area including and surrounding the proposal site, with the potential to be directly or indirectly affected by the proposal (e.g. by noise and vibration, visual or traffic impacts). The actual size and extent of the study area varies according to the nature and requirements of each impact assessment technical report.
SWMP	Soil and Water Management Plan
Transport	Transport for NSW
TMP	Traffic Management Plan
TRH	Total recoverable hydrocarbons
UNFCCC	United Nation Framework Convention on Climate Change
Waste	Includes any matter (whether liquid, solid, gaseous or radioactive) that is discharged, emitted or deposited in the environment in such volume, constituency, or manner as to cause an alteration to the environment.
WM Act	<i>Water Management Act 2000</i> (NSW)
WMP	Weed Management Plan
Work area	Individual areas within the proposal site that are subject to construction at any one time.