Transport for NSW

Mandalong Road Upgrade

Review of Environmental Factors

February 2025

NSW GOVERNMENT

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Acknowledgement of Country

Transport for NSW acknowledges the Awabakal people, the traditional custodians of the land on which the Mandalong Road Upgrade is proposed.

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

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

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

Executive summary

The proposal

Transport for NSW (Transport) proposes to upgrade Mandalong Road between Gimberts Road and Ourimbah Street (the proposal). The proposal is located within the suburb of Morisset in the Lake Macquarie local government area (LGA).

Key features of the proposal include:

- upgrading the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection, including:
  - replacing the existing roundabout with new traffic lights
  - providing additional lanes to all approaches of the intersection
  - providing a central raised median on all approaches to the intersection
- providing active transport connections including:
  - a shared user path along the length of the proposal on Mandalong Road and Dora Street
  - a shared user path on the eastern side of Wyee Road
  - a footpath on the north-eastern corner of Dora Street and Freemans Drive
- providing two new bus stop facilities on Dora Street
- installing and/or relocating fauna connectivity structures, such as glider poles
- full and partial property acquisitions, leases and adjustments, including relocating and adjusting property access and parking, and private utility connections
- relocating and/or adjusting existing public utilities, including electrical, gas, water, sewer and telecommunications
- roadworks, including pavement, line marking, lighting and road furniture (e.g. signs and safety barriers)
- upgrading drainage infrastructure, including culverts, pits, pipes, kerbs and gutters
- temporary ancillary facilities, including site compounds, material storage and laydown areas.

Need for the proposal

Mandalong Road is a State arterial road at the southern end of the B53 Morisset to Wallsend Corridor (B53) that connects the western suburbs of the City of Newcastle and Lake Macquarie to the M1 Pacific Motorway near Morisset. Up to around 17,900 vehicles use Mandalong Road and Dora Street daily, of which around seven per cent is classified as heavy vehicles.

The section of Mandalong Road/Dora Street between the M1 Pacific Motorway and Ourimbah Street is currently undivided with a single lane in each direction and has limited facilities for pedestrians, cyclists and public transport users. The Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout in particular is identified as a critical constraint to traffic in the local area and the broader B53 Morisset to Wallsend Corridor that results in traffic congestion and delays during peak periods.

The NSW Government's *Hunter Regional Plan 2041* identifies Morisset and the surrounding areas of Cooranbong and Wyee as regionally significant growth areas, with the area representing the largest future growth area across the Central Coast and Hunter regions. With the predicted population and employment growth across Morisset and its surrounds, daily traffic volumes are forecast to increase by 56 to 75 per cent over the next 20 years. This growth will put further pressure on the road network, resulting in congestion, delays and reduced road safety for all road users, including pedestrians, cyclists and public transport users.

The proposal would increase road capacity, improve facilities for pedestrians, cyclists and public transport users as well as support planned and future development in the area to help cater for the growing needs of the Lake Macquarie community. As such, the proposal would meet the strategic objectives of a number of government plans, policies and strategies, including the Commonwealth Government's *National Road Safety Strategy 2021–30* and the NSW Government's *State Infrastructure Strategy 2022–2042*, *Future Transport Strategy* and *Hunter Regional Plan 2041*.

Proposal objectives

The objectives of the proposal include:

- provide consistent and reliable travel times on Mandalong Road between the M1 Pacific Motorway and Morisset
- provide safe and connected walking and cycling infrastructure to existing (and future) infrastructure and key destinations within Morisset and the project area
- support future growth of public transport services by improving network performance
- support future development along the Mandalong Road corridor associated with growth in the Morisset area
- provide a high-quality urban design outcome.

Options considered

Alternatives and options were considered through a comprehensive and multi-staged identification and assessment process, including consideration of environmental impacts.

An initial long list of strategic responses was developed to respond to the existing challenges on Mandalong Road. Strategic options considered both non-infrastructure and infrastructure solutions.

Five of the strategic options were shortlisted by evaluating the options against the proposal objectives, traffic modelling performance and environmental and engineering constraints identified within and adjacent to the road corridor. The shortlisted options were also compared against a 'do minimum' scenario (involving minor upgrades).
The 'do nothing' scenario resulted in unacceptable road network performance and was not considered a reasonable or realistic comparative scenario.

The shortlisted infrastructure upgrade option that involved replacing the Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout with traffic lights, as well as providing additional road capacity and active and public transport improvements was determined as the preferred design. This was due to its ability to achieve the proposal objectives while utilising the existing road corridor, thereby minimising property acquisition, environmental impacts and construction impacts.

The community and stakeholders were invited to review and provide feedback on the preferred design between June and August 2024. Transport has used this feedback to refine the proposal design and complete the environmental assessment.

Statutory and planning framework

Section 2.109 of State Environmental Planning Policy (Transport and Infrastructure) 2021 (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.

The proposal involves the upgrade of a road and associated road infrastructure facilities and would be carried out by Transport, which is a public authority. The proposal is not State significant infrastructure or State significant development. Therefore, the proposal can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act), and development consent from Lake Macquarie City Council is not required.

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

The proposal has considered NSW and Commonwealth legislation and regulation, including (but not limited to) the *Biodiversity Conservation Act 2016* (BC Act), *Fisheries Management Act 1994, Heritage Act 1977*, *National Parks and Wildlife Act 1974* and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

A Biodiversity Assessment Report (BAR) has been prepared for the proposal in accordance with the Biodiversity Assessment Method 2020, as required by the BC Act. The assessment found that the proposal is not likely to result in a significant impact on threatened species, populations, ecological communities or their habitats within the meaning of the BC Act. Therefore, a Species Impact Statement is not required under the BC Act to support the proposal.

This REF has determined that 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.

Community and stakeholder consultation

Transport carried out consultation with the community and stakeholders on the preferred design between November 2023 and August 2024. Consultation involved a project update newsletter, a project webpage, a media release, an online survey, social media posts as well as online and face to face meetings with targeted key stakeholders. A dedicated toll-free 1800 telephone number (1800 555 560) and project email address (mandalongrd@transport.nsw.gov.au) have been made available to receive and respond to enquiries from the community and interested stakeholders.

Transport has also consulted with key local and State government agencies and stakeholders, including (but not limited to):

- Lake Macquarie City Council, the NSW State Emergency Services and Subsidence Advisory NSW in accordance with the requirements of the SEPP (Transport and Infrastructure)
- Biraban Local Aboriginal Land Council (LALC) and other stakeholders that may be directly impacted by the proposal, including impacted property owners, adjacent developers and businesses, emergency services and utility providers.

Key issues raised during consultation included concerns and queries about the justification and alternatives considered for the proposal, suggestions, queries and concerns in relation to the proposal design, and concerns about the potential environmental impacts of the proposal during construction and operation.

The issues raised by the community, government agencies and key stakeholders have been considered in the development of the design and environmental assessment for the proposal (this REF). Transport will continue to consult with stakeholders as planning for the proposal progresses, including during detailed design and construction. The community will be kept updated on the proposal on the project web page.

A community consultation report for the preferred design display has been prepared and is published on the project webpage. The consultation report includes a summary of items raised, including feedback on the design, operational and network impacts, environment impacts, project concerns and suggestions, alongside Transport's response.

Environmental impacts

Biodiversity

The design for the proposal has been specifically refined to minimise removal of native vegetation, where possible. The proposal would require the removal of around 0.98 hectares of native vegetation, including 0.39 hectares of vegetation that meets the criteria for a Threatened Ecological Community (TEC) under the BC Act or EPBC Act:

- 0.27 hectares of Swamp Sclerophyll Forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, listed as endangered under the BC Act
- 0.08 hectares of River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, listed as endangered under the BC Act
- 0.04 hectares of Coastal Swamp Sclerophyll Forest of NSW and South East Queensland, listed as endangered under the EPBC Act.

Vegetation communities in the study area provide suitable habitat for nine threatened flora species and 22 threatened fauna species (including birds, microbats and mammals) listed under the BC Act and EPBC Act. As such, direct impacts through loss of potential habitat for threatened flora and fauna species, and loss of three individuals of the threatened flora species *Angophora inopina* (Charmhaven Apple), would occur during construction.

The removal of vegetation and widening of the road corridor would also increase habitat isolation that may impact the movement of threatened arboreal fauna such as the Squirrel Glider, that is known to move through the landscape within the Morisset area.

Assessments of significance have been carried out for threatened species and ecological communities that are likely to occur within the locality of the proposal. The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the BC Act, or nationally-listed biodiversity or any other matters of national environmental significance (MNES) or Commonwealth land within the meaning of the EPBC Act.

No biodiversity offsets are required to offset the impact to native vegetation or threatened species habitat identified for the proposal.

Traffic and transport

The construction of the proposal would be staged to maintain one lane of traffic in each direction and allow Mandalong Road, Freemans Drive, Dora Street and Wyee Road to remain operational throughout construction. Minor delays would be experienced by vehicles travelling along these roads due to additional construction vehicle movements and temporary speed limit restrictions around work areas. Construction work would generally be carried out behind traffic barriers during standard construction working hours. However, some works would be carried out outside of standard construction working hours for short periods to minimise disruption to daily traffic.

Access for pedestrians, cyclists and bus users would be maintained for the duration of construction, where possible. However, lane configuration changes and alternative temporary paths around construction areas may be required to maintain safe access. Access to some properties may be temporarily affected during construction of the proposal, however it would be limited to short term closures. Alternative access arrangements would be provided wherever feasible, and residents and businesses would be notified of any changes well in advance. Access would be maintained for the NSW Ambulance Station within the proposal area and other emergency services during construction.

The extension of the central median along Dora Street would modify access to some properties, however, would ensure safer and more reliable access to these properties. U-turn opportunities would remain at the Ourimbah Street roundabout east of the proposal as well as the Gimberts Road roundabout west of the proposal. The proposal would reduce informal parking opportunities along Mandalong Road, Freemans Drive and Dora Street to accommodate road widening and active transport infrastructure improvements. Changes for public transport users include the removal of an existing bus stop on Wyee Road and the provision of two new bus stops along Dora Street.

Noise and vibration

Construction of the proposal would be carried out during standard construction working hours where possible. Some works may need to be completed outside standard working hours (out of hours work) to ensure the safety of construction workers and road users, ensure safe and efficient operation of the road network, maintain critical access to local services and meet the conditions of the Road Occupancy License for the proposal.

Construction noise levels are predicted to exceed noise management levels during standard hours and out of hours work at residential and non-residential receivers surrounding the proposal. During the loudest construction scenario (road pavement construction), up to two residences are predicted to be 'highly noise affected' (experience noise levels of 75 dBA or greater) during standard hours. Some receivers are also predicted to experience sleep disturbance and sleep awakening impacts if road pavement construction is undertaken during the nighttime.

The modelled predicted noise levels assume the worst-case construction noise scenario that all construction machinery and equipment would be used at the same time during each construction scenario close to the receivers. However, the highest noise levels are only likely to occur for relatively short periods when construction work is undertaken near receivers.

The main potential source of vibration during construction would be vibratory rollers, which would be required during road pavement construction. Some receivers would be within the minimum working distance for cosmetic damage and/or the human comfort minimum working distance during the worst-case vibration scenario.

When completed, the proposal would not substantially change road traffic noise levels at sensitive receivers. The change in operational road traffic noise levels would be within 2 dBA of existing noise levels, which is not considered an audible change.

Landscape character and visual impacts

During construction, there would be temporary impacts on visual amenity and landscape character due to construction works, the presence of construction plant and equipment, and operation of the ancillary facilities. This may result in moderate-low impacts for non-residential receivers along Dora Street and Wyee Road and road users, and moderate impacts for one residential receiver along Freemans Drive.

Permanent visual amenity and landscape changes would result from the removal of vegetation, widening of the road corridor, provision of new road infrastructure (including traffic lights) and property acquisition. The proposed upgrades would be in keeping with the existing urban landscape and would result in a minimal visual impact for road users and non-residential receivers.

Socio-economic

The proposal would have both wider regional and local benefits through travel time savings, enhanced travel reliability and improved road safety that would support improved access and connectivity for local and regional communities, business and industry. The benefits of improved access to employment areas will support future growth and development of strategic centres in the Lake Macquarie region. Improved urban design and landscaping provided by the proposal would contribute positively to aesthetic values of the local area. Safer access for pedestrians and cyclists would encourage walking and cycling that would contribute positively to general levels of physical activity and community wellbeing.

During construction, the community and businesses in the area would likely experience temporary changes to local amenity, including temporary traffic delays, access, noise, vibration, air quality and visual amenity impacts. A Community and Stakeholder Engagement Plan has been developed to ensure adequate communication and engagement is undertaken with the community and key stakeholders about potential impacts.

The proposal involves the partial acquisition of five parcels of private and public land, and full acquisition of one private land parcel, which may cause some uncertainty for affected property owners and employees. The private property affected by the proposal would be acquired by Transport prior to construction in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991* and the Land Acquisition Reform 2016 process to ensure acquisition would be undertaken equitably.

The proposal would positively contribute to the local and regional economy during construction through additional employment opportunities, provision of materials and services, as well as an increase in expenditure at local and regional businesses.

Other impacts

The REF also assesses impacts associated with other relevant environmental aspects including Aboriginal and non-Aboriginal heritage, soils and contamination, air quality, sustainability, property and land use, surface water, flooding and groundwater, hazard and risk, waste and resource management, and cumulative impacts. The REF finds that these impacts during construction and operation of the proposal would be managed by implementation of safeguards and management measures outlined in this REF.

How will the impacts be managed?

This REF identifies safeguards and management measures that shall be implemented to avoid, manage, mitigate and monitor impacts during construction and operation of the proposal. A Construction Environmental Management Plan (CEMP) will be prepared before construction to coordinate activities and manage potential impacts during construction. The CEMP will describe the safeguards and management measures identified and provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

Justification and conclusion

The proposal would improve travel efficiency, safety and trip reliability along Mandalong Road, Freemans Drive, Dora Street and Wyee Road, which would improve access and connectivity for local and regional communities, business and industry. This would have long term benefits and support improved access to current and future growth and employment areas in the Lake Macquarie region. As such, the proposal is consistent with the strategic objectives of a number of local, State and Commonwealth plans, policies and strategies, including the National Road Safety Strategy, State Infrastructure Strategy, Future Transport Strategy and Hunter Regional Plan 2041.

Though environmental impacts would occur, they would be effectively mitigated with the implementation of safeguards and management measures outlined within this REF. The benefits of the proposal are considered to outweigh the expected impacts on the environment.

The environmental impacts for the proposal are not likely to be significant and therefore the preparation of an environmental impact statement and approval from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act is not required.

The proposal is not likely to have a significant impact on matters of national environmental significance (under the EPBC Act) or the environment of Commonwealth land. A referral under the EPBC Act is not required.

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Appendices

1. Introduction

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

1.1 Proposal identification

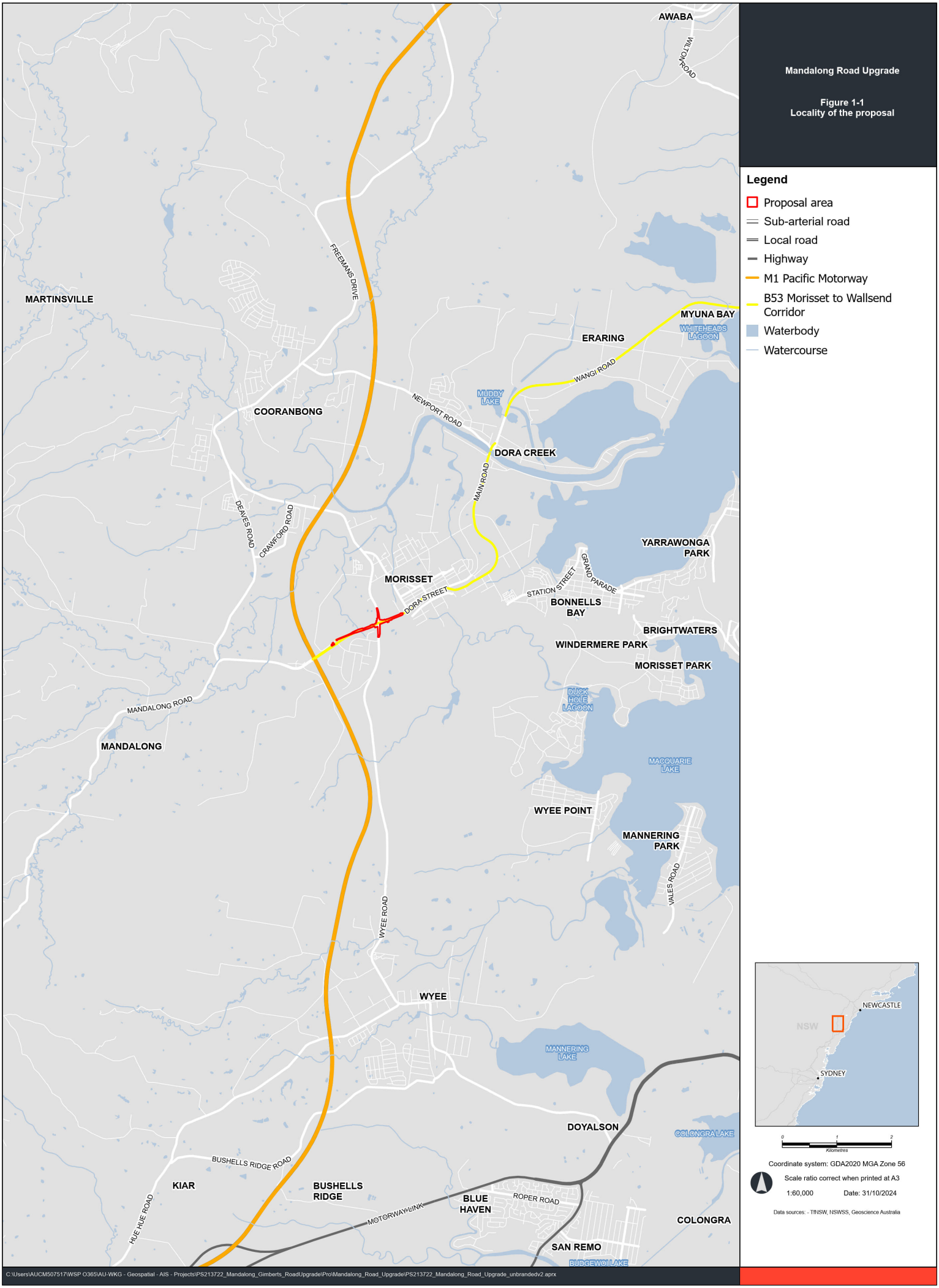
Transport for NSW (Transport) proposes to provide upgrades to Mandalong Road between Gimberts Road and Ourimbah Street (the proposal). The proposal is located within the suburb of Morisset in the Lake Macquarie local government area (LGA). This Review of Environmental Factors (REF) assesses the potential impacts of the proposal on the environment.

Mandalong Road is a critical link within the B53 Morisset to Wallsend transport corridor that connects the Morisset town centre and surrounding urban areas to the M1 Pacific Motorway. A key aim of the proposal is to improve traffic flow and road safety for all road users through increasing the capacity of Mandalong Road and provision of active and public transport improvements, which would support future economic and residential growth in the surrounding area.

Key features of the proposal include:

- upgrading the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection, including:
  - replacing the existing roundabout with new traffic lights
  - providing additional through and turning lanes on all approaches of the intersection
  - providing a central raised median on all approaches of the intersection
- providing active transport connections, including:
  - a shared user path along the length of the proposal on Mandalong Road and Dora Street
  - a shared user path on the eastern side of Wyee Road
  - a footpath on the north-eastern corner of Dora Street and Freemans Drive
- providing two new bus stop facilities on Dora Street
- installing and/or relocating fauna connectivity structures, such as glider poles
- full and partial property acquisitions, leases and adjustments, including relocating and adjusting property access and private utility connections
- relocating and/or adjusting existing public utilities, including electrical, gas, water, sewer and telecommunications
- roadworks, including pavement, line marking, lighting and road furniture (e.g. signs and safety barriers)
- upgrading drainage infrastructure, including culverts, pits, pipes, kerbs and gutters
- temporary ancillary facilities, including site compounds, material storage and laydown areas.

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



Mandalong Road Upgrade

Figure 1-1
Locality of the proposal

Legend

- Proposal area
- Sub-arterial road
- Local road
- Highway
- M1 Pacific Motorway
- B53 Morisset to Wallsend Corridor
- Waterbody
- Watercourse

Coordinate system: GDA2020 MGA Zone 56

Scale ratio correct when printed at A3

1:60,000 Date: 31/10/2024

Data sources: - TfNSW, NSWSS, Geoscience Australia

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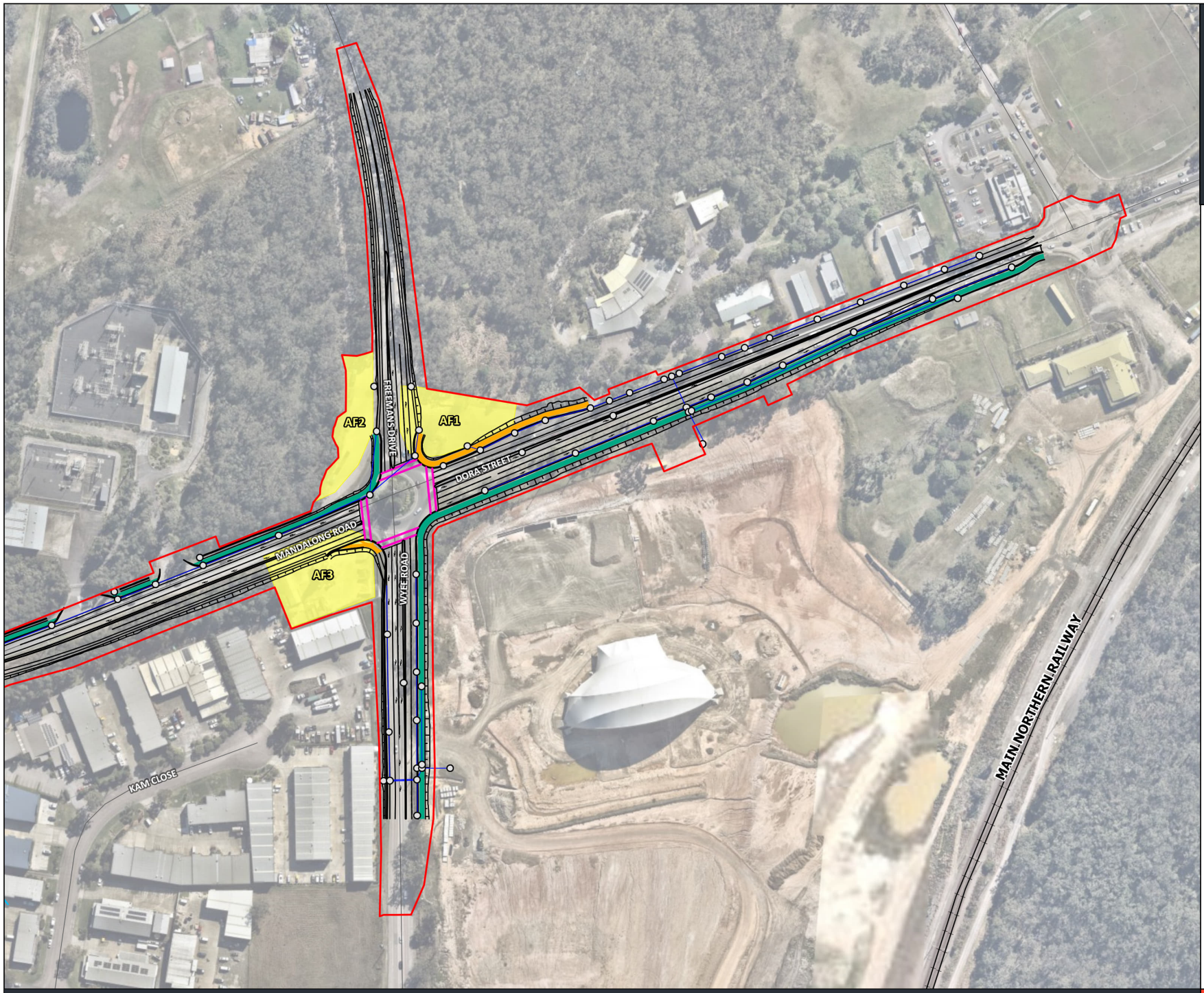


Mandalong Road Upgrade

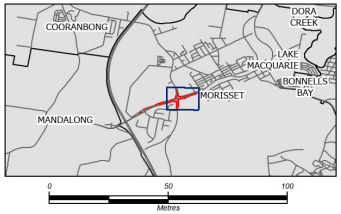
Figure 1-2
Proposal Design

Legend

- Proposal area
- Ancillary facility
- Road
- Railway
- Watercourse

Road design

- Drainage pit
- Road alignment
- Pedestrian crossing
- Drainage pipe
- Footpath
- Shared user path



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Scale ratio correct when printed at A3

1:2,250 Date: 28/11/2024

GDA 2020

Data sources: WSP, Nearmap, NSWSS

Mandalong Road Upgrade

Figure 1-2
Proposal Design

Legend

- Proposal area
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- Road
- Railway
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- Drainage pit
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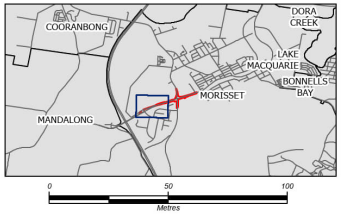


Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

1:2,250 Date: 28/11/2024

GDA 2020

Data sources: WSP, Nearmap, NSWSS

1.2 Purpose of the report

This REF has been prepared by WSP on behalf of Transport, Infrastructure Projects and Engineering. For the purposes of these works, Transport is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act). The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation and management measures to be implemented.

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

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

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

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval sought from the Minister for Planning and Public Spaces 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 (SIS) or a Biodiversity Development Assessment Report (BDAR).
- 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 (MNES) 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 (DCCEEW) for a decision by the Commonwealth Minister for the Environment and Water on whether assessment and approval is required under the EPBC Act.

1.3 Terms and definitions

For the purposes of this REF the following definitions have been used:

- The 'proposal' refers to all activities and the ancillary facilities associated with the road upgrade along Mandalong Road directly east of Gimberts Road extending east to Ourimbah Street.
- The 'proposal area' refers to the area that would be directly impacted by the proposal. This comprises the construction area of the proposal and any other areas that would be temporarily disturbed, including ancillary facilities. The proposal area extends for around 1.3 kilometres along Mandalong Road and comprises an area of around 6.2 hectares. The proposal area is shown in Figure 1-2.
- The 'operational area' refers to the area needed for operation of the proposal. This comprises the upgraded Mandalong Road, Freemans Drive, Dora Street and Wyee Road and ongoing maintenance access areas. The operational area comprise an area of around 3.4 hectares.

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

Mandalong Road is identified as a critical link within the B53 Morisset to Wallsend Corridor (B53), which is one of the key strategic routes in the Lake Macquarie region. The B53 connects Wallsend on the outskirts of Greater Newcastle with various suburbs along the western boundary of Lake Macquarie and the M1 Pacific Motorway. It carries significant volumes of local traffic, accessing residential, commercial and recreational areas between Morisset and Wallsend. Mandalong Road is located at the southern end of the B53, and provides an important connection from the M1 Pacific Motorway to Morisset and the southern part of the Lake Macquarie region.

The section of Mandalong Road/Dora Street between Gimberts Road and Ourimbah Street is currently undivided with a single lane in each direction and has limited facilities for pedestrians and cyclists. Traffic modelling indicates that this route is used by up to around 17,900 motorists every day and subject to traffic congestion and delays during peak periods. The Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout is identified as a critical pinch point in the local area and the broader B53 Morisset to Wallsend Corridor.

The NSW Government's Hunter Regional Plan 2041 (NSW DPE, 2022b) identifies Morisset and the surrounding areas of Cooranbong and Wyee as regionally significant growth areas, with the area representing the largest future growth area in the Central Coast and Hunter Region. The wider Morisset area is expected to become a major transport corridor, connecting the Lower Hunter and Greater Newcastle City with the Central Coast City. Morisset itself is earmarked to transform into a regionally significant mixed-use centre, supporting an array of businesses and professional services, as well as providing land use opportunities for more intensive multi-storey commercial, mixed-use and residential development.

The proposal would increase road capacity and improve facilities for pedestrians and cyclists to cater for the growing needs of the Lake Macquarie community. Without the proposal, it is predicted that the growth in traffic volumes over the coming years would progressively worsen congestion and delays for local residents and other road users.

The key benefits of the proposal would include:

- reduced traffic delays and congestion on Mandalong Road, Dora Street, Freemans Drive and Wyee Road
- improved average travel times along this section of the B53 Morisset to Wallsend Corridor for all road users
- improved access, and safer facilities for pedestrians and cyclists
- improved road user safety
- enhanced economic growth and productivity of the surrounding region.

The proposal is consistent with the following key national, state and local government infrastructure priorities, plans and strategies:

- National Road Safety Strategy 2021–30 (Infrastructure and Transport Ministers, 2021)
- State Infrastructure Strategy 2022–2042 (Infrastructure NSW, 2022)
- Future Transport Strategy (Transport for NSW, 2022a)
- Connecting to the Future – 10 Year Blueprint (Transport for NSW, 2019)
- Movement and Place Framework (Transport for NSW, 2022b)
- Road Safety Action Plan 2026 (Transport for NSW, 2022c)
- NSW Freight and Ports Plan 2018–2023 (Transport for NSW, 2018a)
- NSW Heavy Vehicle Access Policy Framework (Transport for NSW, 2018b)

- Regional NSW Services and Infrastructure Plan (Transport for NSW, 2018c)
- Hunter Regional Plan 2041 (NSW DPE, 2022a)
- Draft Hunter Strategic Regional Integrated Transport Plan (Transport for NSW, 2024)
- Lake Mac 2032 Community Strategic Plan 2022–2032 (Lake Macquarie City Council, 2022a)
- Lake Macquarie City Council Walking Cycling and Better Streets Strategy 2031 (Lake Macquarie City Council, 2022b).

These strategies are discussed in further detail below.

2.1.1 National strategies

National Road Safety Strategy 2021–30

The National Road Safety Strategy for the decade 2021–2030 (National Road Safety Strategy) (Infrastructure and Transport Ministers, 2021) recognises that road safety is achieved by three key themes: Safe Roads, Safe Vehicles and Safe Road Use.

The National Road Safety Strategy aims to reduce the rates of death and serious injury from road crashes over the next ten years, and to support the long-term vision of zero road deaths by 2050. One of the goals outlined in the strategy is to improve infrastructure planning and investment. The strategy also seeks to manage vehicle speeds where conflicts with other road users, infrastructure and/or roadside hazards cannot be avoided, with the overall aim of avoiding crashes resulting in death or serious injury. The strategy also seeks to provide safe access for all road users.

The proposal would provide a safer road environment for all road users and reduce congestion-associated crashes at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection and the wider road corridor by replacing the roundabout with traffic signals, extending the central median and improving pedestrian, cycling and bus infrastructure. By improving road safety, the proposal would directly support the aims of the National Road Safety Strategy.

2.1.2 State strategies

State Infrastructure Strategy 2022–2042

The State Infrastructure Strategy 2022–2042 (State Infrastructure Strategy) (Infrastructure NSW, 2022) sets the strategic vision for infrastructure across NSW over 20 years and combined with the Future Transport Strategy (Transport for NSW, 2022a) and the Regional Development Framework (NSW Government, 2018), brings together infrastructure investment and land use planning for cities and regions within NSW.

The State Infrastructure Strategy outlines Infrastructure NSW's recommendations for priority transport infrastructure projects and initiatives for NSW to 2042 to ensure the transport system creates opportunities for people and businesses to access the services and support they need. The State Infrastructure Strategy also identifies and prioritises the delivery of critical public infrastructure to drive productivity and economic growth. The assessment of the State's existing infrastructure capacity against forecasted population growth (which informed the State Infrastructure Strategy) highlighted critical deficiencies in urban road capacity and provides strategic options to meet the challenges of population growth and substantial increases in freight volumes.

The State Infrastructure Strategy is framed around nine objectives to meet future challenges and seize opportunities. Each objective has strategic directions to facilitate meeting the objectives. The proposal is aligned with the following strategic directions:

- Deliver efficient transport networks to support thriving cities, businesses and communities. The proposal would facilitate the growth of retail, commercial, industrial, and recreational developments in the vicinity and facilitate better accessibility to healthcare facilities in Morisset. The proposal would provide shared user paths and/or pedestrian paths along Mandalong Road, Dora Street and Wyee Road, promoting walking and cycling, thereby encouraging a shift to more sustainable modes of travel and establishing connections to other amenities, including Morisset train station.
- Improve freight efficiency, security and capacity to support NSW's industries and supply chains. The proposal would provide additional traffic lanes to increase traffic throughput, operational efficiency and reliability for freight traffic.

- Coordinate infrastructure, land use and service planning to meet future housing, employment, industry and community needs. The proposal would provide additional infrastructure capacity to accommodate the anticipated population and employment growth in the Morisset region reduce road congestion and provide shorter travel times.

Future Transport Strategy

The Future Transport Strategy (Future Transport Strategy) (Transport for NSW, 2022a) underpins and supports the State Infrastructure Strategy and sets strategic directions and outcomes for customer mobility in NSW. It is delivered through a series of supporting plans, including the Regional NSW Services and Infrastructure Plan (Transport for NSW, 2018c).

The strategy is based on three outcomes. To support these outcomes, the strategy has 14 strategic directions to guide achievement of the outcomes. The proposal would support a number of outcomes and strategic directions including:

- Connecting our customers' whole lives – the proposal would support the strategic directions:
  - C1 Connectivity is improved across NSW: The proposal would improve connectivity by improving road capacity and pedestrian and cycling transport networks and decreasing congestion.
  - C2 Multimodal mobility supports end-to-end journeys: The proposal would provide walking and cycling opportunities with new shared user paths and bus stops and improved crossing facilities. Improved travel times would also improve public transport networks within the region, which aligns with this aim.
  - C4 Our transport networks are safe: The proposal would improve road safety for all road users by widening the road, providing new traffic signals, extending the central median and improving pedestrian, cycling and bus infrastructure.
- Successful places for communities – the proposal would support the strategic directions:
  - P2 Transport infrastructure makes a tangible improvement to places: The proposal would support local communities and healthy lifestyles by prioritising walking and cycling through the provision of new shared paths and bus stops. The proposal would improve the amenity of places along State roads by providing an integrated urban design with shared paths, footpaths, traffic lanes, bus stops and pedestrian crossings.
  - P4 Transport minimises environmental impacts: The proposal aligns with this outcome by minimising environmental impacts such as impacts to biodiversity, sensitive receivers and properties. Chapter 6 outlines impacts such as biodiversity (Section 6.1), noise (Section 6.3) and air quality (Section 6.7) and measures to minimise environmental impacts.

Connecting to the Future – Our 10 Year Blueprint

The Connecting to the Future – Our 10 Year Blueprint (Transport for NSW, 2019) was prepared by Transport to set clear priorities and outcomes to deliver the Future Transport Strategy. The Blueprint lays out the desired outcomes, ambitions and strategic priorities for the next 10 years. For each of the four primary outcome groups (for customers, for communities, for the people of NSW, and for the people of Transport), Transport has identified 10 year ambitions and the key measurables that will be used to realise these ambitions. The proposal aligns with the following key ambitions of the Blueprint:

- For customers:
  - Safe, seamless journeys for people and goods: The proposal would generally improve road safety and traffic flow by widening the road, providing new traffic signals, extending the central median and improving pedestrian, cycling and bus infrastructure.
  - New mobility options and experiences: The proposed new shared paths and bus stops would deliver new mobility options and promote more sustainable transport modes.
  - Connecting our customers' whole lives: The proposal would improve public transport through the provision of new bus bays, bus shelters and seating, and improved travel times.

- For communities:
  - Integrated, resilient and accessible transport networks and places: The proposal would provide an integrated urban design with shared user paths, traffic lanes, bus stops and pedestrian crossings that improves access for all customers.
  - Successful places: The proposed landscape design would improve the overall connectivity and comfort of both driver, cyclist and pedestrian users as well as visual amenity.
- For the people of NSW:
  - Transport investments and solutions that serve the people of NSW: The proposal would provide additional infrastructure capacity to better service the increasing travel demand of a growing population.
  - Strong economy and quality of life: The proposal would enable economic growth in the region by improving road capacity and efficiency and public transport infrastructure and travel times.

Movement and Place Framework

The Future Transport Strategy introduced the movement and place framework which aims to balance the movement of people and goods with the amenity and quality of streets as places for people. The framework identifies the need to prioritise different customer groups, depending on which street environment they are travelling. These environments are described in Figure 2-1.

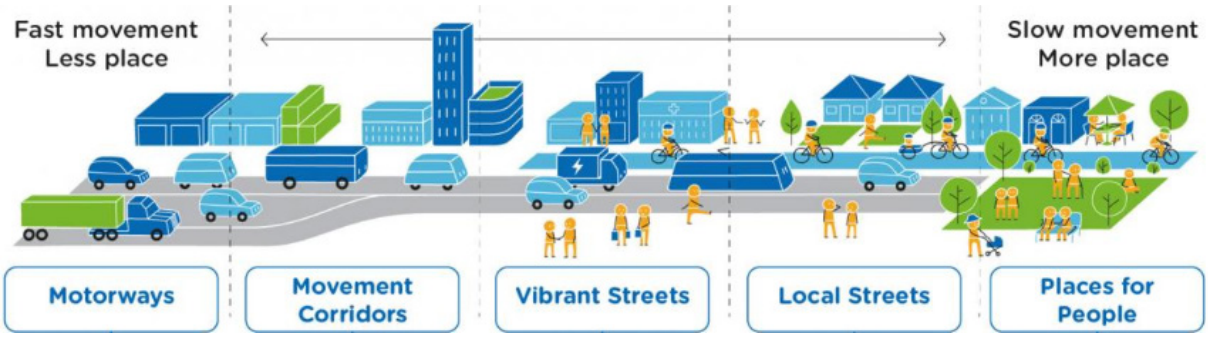


Figure 2-1 Movement and place framework

Under the Movement and Place Framework, faster movements are encouraged on higher speed corridors located far away from key attractors and trip generators, and public transport into town centres may be given priority on these corridors. Within town centres, active transport would be given higher priority.

There is flexibility in the Movement and Place Framework to allow for both effective movement and access to places, noting that the priority on either could vary depending on the time of day. For instance, an arterial road may prioritise movement during peak periods whereas place may be prioritised during other times of the week. The principles of movement and place endeavour to provide priority to the right people, in the right quantity, at the right times. The appropriate balance between movement and place will ultimately depend on the characteristics of each locality.

The proposal is consistent with the objectives of the Movement and Place Framework by:

- providing improved pedestrian, cycling and bus infrastructure to improve access to new commercial spaces and recreational facilities along Mandalong Road and Dora Street
- providing additional traffic lanes to increase traffic throughput, operational efficiency and reliability for bus and freight traffic
- providing flexibility within the proposal area to pursue a broader range of pedestrian-related interventions, such as improved accessibility.

Road Safety Action Plan 2026

The Road Safety Action Plan 2026 (Road Safety Action Plan) (Transport for NSW, 2022c) details the NSW Government's commitment to improving safety on NSW roads. It outlines targets to reduce fatalities by 50 per cent and reduce serious injuries by 30 per cent by 2030 (compared to average annual fatalities and serious injuries over 2018–2020) and aligns with the Towards Zero vision of the National Road Safety Strategy and Future Transport Strategy, which aims to have zero fatalities and serious injuries on NSW roads by 2056.

The proposal is consistent with the goals of the Road Safety Action Plan, as it would provide a safer road environment for all road users and reduce congestion associated crashes within the road corridor through capacity improvements.

NSW Freight and Ports Plan 2018–2023

The NSW Freight and Ports Plan 2018–2023 (Freight and Ports Plan) (Transport for NSW, 2018a) highlights the NSW Government's priorities for the freight sector. As a supporting plan to the Future Transport Strategy, the plan is a collaboration with the freight industry and aims to improve the freight system's efficiency, accessibility, safety, and sustainability. The Freight and Ports Plan notes that freight customers value reliability, efficient travel, and certainty to maximise productivity and reduce costs and energy intensity. Freight volumes are forecasted to increase by almost 50 per cent in Greater Sydney by 2036. Specifically, the highest outbound freight from the Hunter region is coal. The Hunter and Central Coast regions also have the most significant manufacturing activities outside of the Greater Sydney region. The proposed upgrade would:

- enhance the capacity and efficiency of Mandalong Road and Dora Street, which are key freight routes for coal, manufactured materials, construction materials and other goods moving from the Hunter to the Port of Newcastle. This, in turn, reduce costs for NSW consumers and businesses
- improve the reliability and safety of the road, addressing current congestion and delays, which would contribute to more predictable travel times and reduced operational costs for freight operators
- support the anticipated increase in freight volumes by providing modernised infrastructure that can accommodate larger and more efficient vehicles, thereby aligning with the goals of the Freight and Ports Plan to improve overall freight system performance
- reduce energy intensity and environmental impact by facilitating smoother traffic flow and reducing the need for stop-and-go travel, which supports the plan's objectives for sustainability.

The proposal aligns with the following objectives of the Freight and Ports Plan:

- Economic growth: The proposal would enhance productivity by improving freight infrastructure within the proposal area.
- Efficiency, connectivity and access: The proposal would improve travel times and reliability by improving road capacity and traffic flow.
- Capacity: The proposal would improve road network capacity for freight within the proposal area.

NSW Heavy Vehicle Access Policy Framework

The NSW Heavy Vehicle Access Policy Framework (Transport for NSW, 2018b) was established to support the Future Transport Strategy and Freight and Ports Plan. The key objective of the Framework is to improve the efficiency of existing infrastructure and ensuring greater connectivity and access along key freight routes. The Framework aims to:

- achieve safe and efficient freight movements which also address community feedback about local amenity issues, network impacts and infrastructure constraints
- create Performance Based Standards (PBS) networks to improve connectivity across the NSW road network
- foster the take-up of modern and safer PBS vehicles which can carry more freight leading to fewer trucks on the road than would otherwise be the case.

The proposal aligns with the objectives of the NSW Heavy Vehicle Access Policy Framework by enhancing the road's capacity and infrastructure to better accommodate heavy vehicle traffic. The proposed upgrade would improve the efficiency of freight transport along this key route, reducing congestion and delays for both freight and local traffic.

2.1.3 Regional and local strategies

Regional NSW Services and Infrastructure Plan

The Regional NSW Services and Infrastructure Plan (Transport for NSW, 2018c) is the NSW government's blueprint for transport in regional NSW from now until 2056. It outlines the NSW government's vision and customer outcomes that will inform detailed transport planning in each region and support future decision making.

The proposal supports Customer Outcomes 6, 7 and 10 of the plan, as it would enable economic development by increasing the capacity and efficiency of the proposal area while improving road safety, travel times, accessibility, and reliability.

Hunter Regional Plan 2041

The Hunter Regional Plan 2041 (Hunter Regional Plan 2041) (NSW DPE, 2022a) is the NSW government's 20-year blueprint for the Hunter. The plan's vision is to create a leading regional economy in Australia with a vibrant metropolitan city at its heart.

The Hunter Regional Plan 2041 designates Morisset and its neighbouring regions of Cooranbong and Wyee as key growth areas that are projected to be the most significant future expansion regions in the Central Coast and Hunter Region. The broader Morisset area is anticipated to evolve into a key connecting hub, linking the Lower Hunter and Greater Newcastle City with the Central Coast City. The plan highlights numerous employment and residential expansion zones concentrated around Mandalong Road and Dora Street, and the Morisset town centre.

The plan proposes delivery of the vision through the following goals:

- Goal 1 – The leading regional economy in Australia
- Goal 2 – A biodiversity rich natural environment
- Goal 3 – Thriving communities
- Goal 4 – Greater land choice and jobs.

Under these goals, the plan develops 27 directions and associated actions. The most relevant to the proposal:

- Goal 4 – Direction 26 – Deliver infrastructure to support growth and communities.

The proposal supports Goal 4 of the plan, particularly Direction 26, which emphasises the importance of delivering infrastructure to foster growth and enhance community connectivity. The plan specifically notes the need to "Protect existing and planned major infrastructure corridors and sites, including inter-regional transport routes like the M1 Pacific Motorway and the railway, port and airports, to support their intended functions." This proposed road infrastructure upgrade would facilitate improved connectivity to the M1 Pacific Motorway and integration with the regional transport network.

Draft Hunter Strategic Regional Integrated Transport Plan

The Draft Hunter Strategic Regional Integrated Transport Plan(Transport for NSW, 2024) is a supporting plan for the Future Transport Strategy that presents a transport vision for the Hunter region over the next 20 years. It presents the strategic framework for how Transport will proactively respond to anticipated changes in land use, population and travel demand across the region. It also identifies key objectives and initiatives to achieve the vision for a safer, more efficient, sustainable, resilient and accessible network for all users.

The proposal aligns with Objectives 3, 9 and 12 of the plan by improving active and public transport infrastructure to encourage walking and cycling for local trips and improve transport options for all customers.

Lake Mac 2032 Community Strategic Plan 2022–2032

The Lake Mac 2023 Community Strategic Plan 2022–2032 (Lake Macquarie City Council, 2022a) is a 10-year plan that sets the priorities and strategies that best achieve the community's desired vision and aspirations for the future of Lake Macquarie.

The proposal supports Objectives 3.1 and 3.2 of the plan by providing transport infrastructure that allows safe and easy movement around Morisset, and increase access to active transport. The proposal also aligns with Objective 5.1 and 5.4 of the plan by enhancing community spaces through place-making and urban design and empowering the community to adopt sustainable behaviours.

Lake Macquarie City Council Walking Cycling and Better Streets Strategy 2031

The Lake Macquarie City Council Walking Cycling and Better Streets Strategy 2031 (Lake Macquarie City Council, 2022b) represents Lake Macquarie City Council's vision to create a more connected city and to embed a culture of walking and cycling within the community. It reflects the community's values developed through comprehensive community engagement for the Lake Macquarie City Council's Community Strategic Plan. The strategy guides Lake Macquarie City Council in prioritising future infrastructure to create safer, more enjoyable and convenient experiences.

The proposal area forms part of the Principal Pedestrian Network proposed for Morisset by the study, and supports the design preferences for the Principal Pedestrian Network by providing safe pedestrian crossings and safe, leafy and shaded pedestrian pathways. The proposal area also forms part of the Principle Bicycle Network proposed for the Lake Macquarie region by the study, and aligns with the design preferences for the Principle Bicycle Network by providing safe shared user crossings and direct and convenient, low-stress, family-safe, leafy and shaded shared user paths.

2.2 Limitations of existing infrastructure

2.2.1 Road infrastructure

Mandalong Road and Dora Street

The 1.3 kilometre section of Mandalong Road and Dora Street within the proposal area is located at the southern end of the B53 Morisset to Wallsend State road.

The Mandalong Road/Dora Street road corridor carries significant volumes of local traffic, with an average daily traffic volume of around 17,900 vehicles within the proposal area. Around seven per cent of this traffic consists of heavy vehicles. In the weekday morning peak, the peak travel direction is westbound towards the M1 Pacific Motorway, with a traffic volume of around 910 vehicles per hour. In the weekday afternoon peak, the peak travel direction is eastbound towards Morisset, with a traffic volume of around 980 vehicles per hour.

Within the proposal area, Mandalong Road and Dora Street generally consist of one lane in each direction, divided by line marking or a concrete median (refer to Figure 2-2 and Figure 2-3). The road corridor has an undulating topography, with narrow road shoulders, grass verges of variable widths, and a 60 kilometres per hour speed limit in both directions.

The Mandalong Road/Dora Street road corridor is currently subject to congestion and delays in both the morning and afternoon peak periods, partly due to the single lane configuration of the Gimberts Road/Mandalong Road/ Gateway Boulevard and Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabouts (refer to Intersections discussion below). Road performance is expected to deteriorate further as traffic demand increases with forecasted population and employment growth in the region. Congestion and delays can also have flow on impacts to safety and accessibility for the community and people travelling through the proposal area.

Currently, there are a small number of properties which have direct driveway access to Mandalong Road and Dora Street, mainly on the northern side of the road. Turning movements into and out of these properties from or onto the road are generally unrestricted. This is due to the lack of median islands present to restrict these movements, except for a short section of Dora Street near the Dora Street/Ourimbah Street intersection.

Wyee Road and Freemans Drive

Wyee Road is a regional road that extends south of the Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout for around 13 kilometres to the suburb of Doyalson, where it connects to the A43 Pacific Highway and A49 Central Coast Highway. It carries around 16,500 vehicles per day, with around seven per cent consisting of heavy vehicles. Wyee Road is a key link between Morisset and the northern residential suburbs of the Central Coast.

Freemans Drive is a local road that provides a connection to Cooranbong to the north, and provides an alternate north-south route to both the B53 Main Road and the M1 Pacific Motorway. It carries around 6,600 vehicles per day, with around 11 per cent consisting of heavy vehicles.

Within the proposal area, Wyee Road and Freemans Drive each consists of an undivided carriageway, with one lane in each direction, narrow road shoulders, grass verges of variable widths and a 60 kilometres per hour speed limit (refer to Figure 2-4 and Figure 2-5).

Wyee Road and Freemans Drive are currently subject to congestion and delays in both the morning and afternoon peak periods, mainly due to the single lane configuration of the Gimberts Road/Mandalong Road/Gateway Boulevard and Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabouts (refer to Intersections discussion below).

Figure 2-2 Mandalong Road looking east towards the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road roundabout

Figure 2-3 Dora Street looking west towards the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road roundabout

Figure 2-4 Wyee Road looking north towards the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road roundabout

Figure 2-5 Freemans Drive looking south towards the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road roundabout

Intersections

The Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout has four approaches and a single circulating lane. The single lane configuration of the roundabout is currently resulting in congestion and long delays along all approaches to the intersection, especially along Mandalong Road and Dora Street, and provides a poor level of service (LoS) given the current traffic demand.

2.2.2 Active transport

The road corridor in the proposal area currently provides limited pedestrian and cycling facilities, which poses a safety risk to pedestrians and road users. Walking and cycling opportunities along Mandalong Road between the M1 Pacific Motorway and Freemans Drive are restricted to narrow sealed road shoulders or shared traffic lanes, as there is no active transport infrastructure along, or next to, this section of the road.

East of Freemans Drive, a 300 metre pedestrian footpath is provided along the northern side of Dora Street, starting 100 metres east of the Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout. The footpath extends further east along the northern side of Dora Street to Bakehouse Lane. There are no shared user paths or formal pedestrian crossings within the proposal area. Pedestrian crossing opportunities are limited to a narrow central median along Dora Street at the eastern end of the proposal area and concrete islands on all approaches of the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road roundabout. Current active transport movements indicate pedestrian activity around the proposal area is mainly within the industrial precinct between Mandalong Road and Wyee Road, with some pedestrian activity observed along Wyee Road and Dora Street between the Morisset town centre and the industrial precinct.

Cyclists generally share the road with general traffic. A short section of cycleway is provided within the eastbound lane of Dora Street within the proposal area, extending for around 180 metres west from the Dora Street/Ourimbah Street intersection. Other cycleways and shared user paths within the study area are located further east of the proposal area along Dora Street, east of Doyalson Street.

There is observed cyclist activity on Mandalong Road, Wyee Road, Freemans Drive and Dora Street. Dora Street and Wyee Road forms part of the Principal Bicycle Network in the Lake Macquarie City Council Walking Cycling and Better Streets Strategy (Lake Macquarie City Council, 2022b), representing the expected future increase in active travel demand in the Lake Macquarie LGA. While very limited pedestrian and cycling infrastructure is currently provided, the proposal area provides connection to the 13 kilometre 'Cooranbong to Morisset peninsula via Morisset' walking/cycling route, consisting of shared user paths, on-road cycle paths and pedestrian pathways.

2.2.3 Public transport

Buses are the only form of public transport in the proposal area as the nearest railway station is located around 520 metres east of the proposal area in Morisset. The proposal area is well serviced by buses (four public bus routes and 10 school bus routes) that provide connections to the broader Morisset area, Lake Macquarie, Lake Haven and the Hunter Valley region.

There is only one bus stop within the proposal area, at the northern end of Wyee Road (bus stop ID 2264168). The bus stop has no formal information or waiting facilities for customers.

Current congestion and delays within the proposal area, inconsistent or substandard pedestrian pathways between bus stops and substandard bus stop facilities currently impact the attractiveness, utilisation and reliability of bus services travelling through the proposal area.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- provide consistent and reliable future travel times on Mandalong Road between the M1 Pacific Motorway and Morisset
- provide safe and connected walking and cycling infrastructure to existing (and future) infrastructure and key destinations within Morisset and the project area
- support future growth of public transport services by improving network performance
- support future development along the Mandalong Road corridor associated with growth in the Morisset area
- provide a high-quality urban design outcome.

2.3.2 Development criteria

The development criteria for the proposal are to:

- improve intersection and network performance
- minimise private property impacts
- minimise land use and community impacts
- minimise constructability issues
- minimise impacts on utilities
- minimise other environmental impacts.

2.3.3 Urban design objectives

The urban design objectives for the proposal are derived from the nine urban design principles in the Transport's urban design policy Beyond the Pavement (Transport for NSW, 2020a).

Urban design objectives for the proposal include:

- improve and maintain safety for road users
- improve connectivity and user amenity for road users
- investigate opportunities that seek to integrate the proposed upgrades with the surrounding built form
- investigate opportunities that seek to better integrate the proposal into the existing character of the surrounding landscape
- enhance landscape character through thoughtful selection of landscape and urban design elements
- investigate opportunities to integrate 'Designing with Country' principles
- reduce ongoing maintenance and associated costs of the proposal through the use of resilient materials, finishes and plant species
- integrate the proposed development into the existing natural environment and develop synergies between the proposal and existing flora and fauna communities.

Further information, including the urban design principles for the proposal, is provided in Appendix G.

2.4 Alternatives and options considered

This section summarises the options that were considered for the overall proposal and details the justification of why the preferred option was chosen.

2.4.1 Methodology for selection of preferred option

Transport carried out strategic investigations in 2023 which involved a systematic options development process to confirm broad corridor options that would address the proposal objectives. Based on the understanding of the proposal context, challenges and opportunities, Transport developed an initial long list of strategic responses, including both 'build' (material infrastructure) and 'no build' (without infrastructure) solutions. Each strategic response was reviewed against its ability to meet the proposal objectives to determine whether the strategic response should be further assessed. The main findings of the long list evaluation process was that none of the 'no build' initiatives identified were taken forward as they:

- are unlikely to materially address the proposal challenges and opportunities
- are not feasible to be implemented
- could be implemented as part of other relevant projects in the future.

Following the evaluation of the strategic responses, a long list of potential infrastructure solutions across the Gimberts Road/Mandalong Road/Gateway Boulevard and Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersections were developed and placed in various configurations between the two intersections. To evaluate these potential configurations, SIDRA traffic modelling was undertaken to show intersection LoS in the morning (AM) and afternoon (PM) peak periods for 2032 and 2042 at both the Gimberts Road/Mandalong Road/Gateway Boulevard and Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersections. Evaluation of the relative performance of these configurations lead to a short list of five corridor options being selected for further consideration.

2.4.2 Identified options

The five shortlisted options selected for further assessment after the strategic analysis are summarised in Table 2-1. These options were compared against a 'do minimum' scenario as discussed below, as the 'do nothing' scenario resulted in unacceptable road network performance and was not considered a reasonable or realistic comparative scenario.

Do minimum

The 'do minimum' scenario considered the following network upgrades:

- new left in/left out access on Mandalong Road between Gimberts Road and Freemans Drive
- provide a dedicated left turn on the southbound approach of the Gimberts Road/Mandalong Road/ Gateway Boulevard roundabout
- a new dual lane Wyee Road/Alliance Avenue roundabout
- a new single lane Wyee Road/Gateway Boulevard roundabout.

Traffic modelling of the 'do minimum' upgrades indicates there would still be a substantial reduction in performance at the Gimberts Road/Mandalong Road/Gateway Boulevard and Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersections. The lack of alternative routes within this semi-rural area would effectively make travel at peak times untenable for many road users.

Table 2-1 Short list of options

Option	Gimberts Road	Wyee Road	Duplication included
Option A	Capacity upgrades to roundabout	Capacity upgrades to roundabout	No
Option B	Roundabout upgrade	Traffic signals	No
Option C	Existing conditions	Traffic signals	Yes
Option D	Traffic signals	Traffic signals	Yes
Option E	Traffic signals	Traffic signals	Yes

2.4.3 Analysis of options

Further assessment of the shortlisted options and the 'do minimum' scenario was carried out by Transport. Each option was reviewed against the project objectives, environmental and geotechnical constraints, constructability, cost and risk. Initial stakeholder engagement was undertaken with Lake Macquarie City Council, State and Federal Government members, to seek their input on the options.

The 'do minimum' scenario and Option A did not meet the key traffic time and future growth project objectives, and was therefore not considered any further. Option C and D were rated similarly against the project objectives, however traffic modelling indicated that Option C would result in better intersection and road network performance than Option D and minimise potential queuing onto the M1. Option D was therefore not considered any further.

Option B and Option C have similar intersection upgrade configurations at the Gimberts Road/Mandalong Road/ Gateway Boulevard and Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersections, however Option B has a smaller footprint than Option C and would result in less potential environmental, utility infrastructure and property impacts than Option C.

Additional microsimulation modelling via VISSIM was then undertaken for Option B, with Option D modelled as a point of comparison in year 2029 and 2039. Microsimulation modelling is more rigorous than SIDRA modelling, allowing for trip reassignment and a wider coverage undertaken to:

- consider potential traffic impacts and benefits in the surrounding network, including the M1 Mandalong Road entry and exit ramps, Morisset Central Business District (CBD), Gateway Boulevard and Alliance Avenue
- incorporate changes to surrounding land use due to proposed and approved developments which may impact traffic behaviour.

The additional modelling indicated that Option B outperforms Option D in modelled years 2029 and 2039 in the AM and PM peak periods at both of the Gimberts Road/Mandalong Road/Gateway Boulevard and Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersections for the average growth scenario.

Option B was therefore identified as the preferred option to be taken forward for further development.

2.5 Preferred option

Option B has been identified as the preferred option that would best meet the proposal objectives by:

- increasing the capacity of the Mandalong Road/Freemans Drive/Dora Street/Wyee Road and Gimberts Road/ Mandalong Road/Gateway Boulevard intersections and their approaches to improve traffic flow and travel times for all road users including vehicles, buses and cyclists
- improving safety and connectivity for pedestrians and cyclists by providing shared user paths, pedestrian pathways, bollards, safety barriers and improved pedestrian crossings
- improving road network performance and bus infrastructure to support future growth of public transport services
- improving the efficiency and capacity of the road corridor to support predicted population and employment growth in the Morisset region
- improving the place environment of the road corridor through a high quality urban and landscape design.

During the development of the strategic design for the preferred option, targeted consultation was undertaken with Lake Macquarie City Council, impacted property owners and Biraban Local Aboriginal Land Council (LALC) (refer to sections 5.2, 5.3 and 5.5).

The principles of ecologically sustainable development encourage the integration of economic, social development and environmental considerations into the decision-making process for all developments. The development of the proposal is consistent with these principles as demonstrated by the proposal objectives and the alignment of the preferred option with those objectives.

Further information on the preferred option is provided in Chapter 3.

2.6 Design refinements

Several design refinements were made to the strategic design of the proposal to improve traffic performance, road safety and constructability and comply with road design guidelines, including:

- The extent of the road pavement works along Dora Street east of Wyee Road was reduced to account for pavement rehabilitation works (milling and re-sheeting) that have recently been undertaken at this location (in April 2024).
- The existing safety barrier along the westbound traffic lane on Mandalong Road would be replaced as it does not conform to current road design guidelines.
- The bus bay along the eastbound traffic lane on Dora Street east of Freemans Drive has been shifted further east from the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection to conform to Austroads standards.

- The proposal area has been widened along the southern side of Dora Street to provide a sufficient gap between the toe of the batter and the adjacent property (Cedar Mill event site development).
- A road shoulder has been added along the northbound lane of Wyee Road to provide sufficient space for on-road cycling.
- Lane widths and shoulder widths were reduced to minimum widths specified by the design criteria to minimise the width of the road corridor and impacts on vegetation and properties.

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

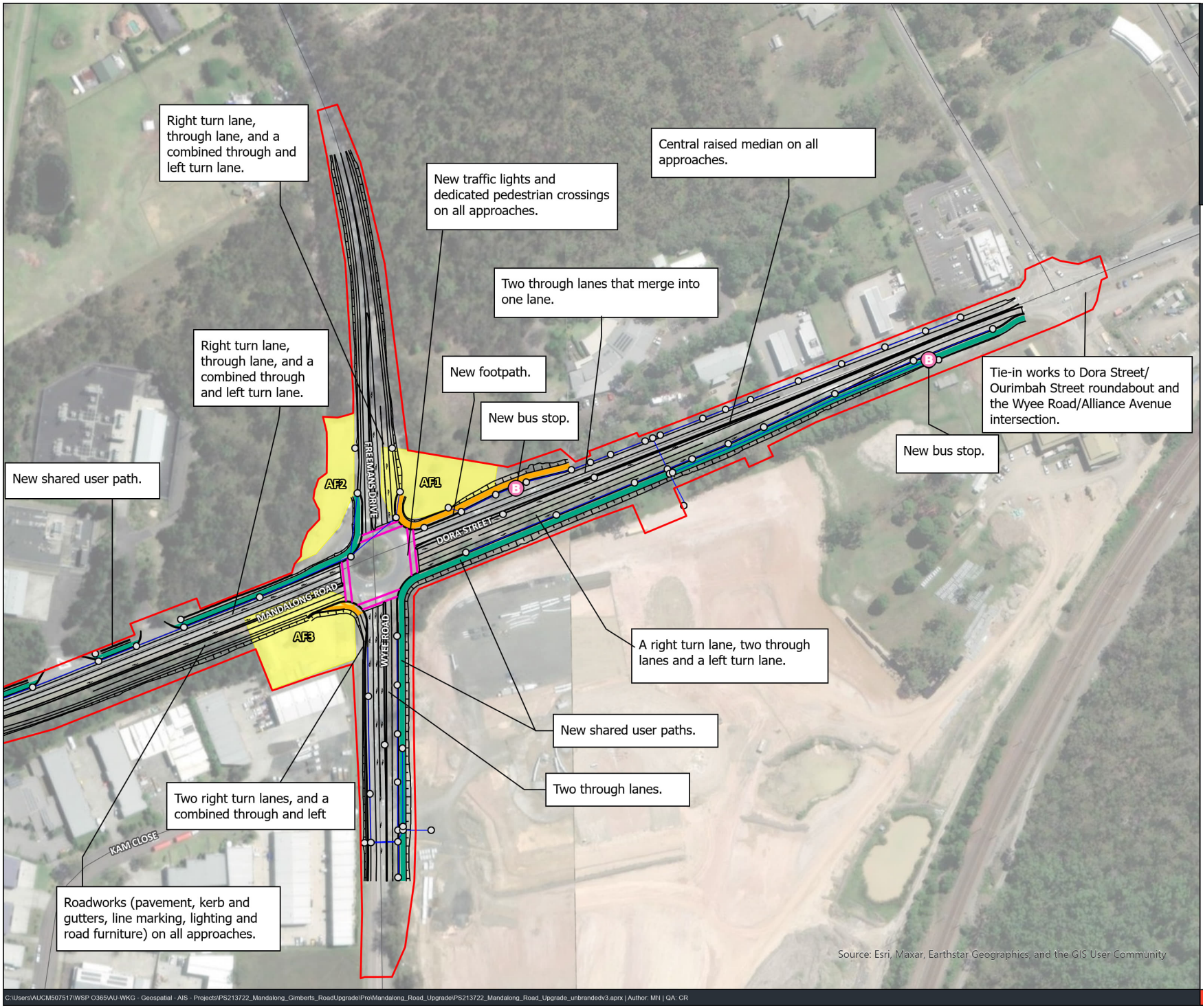
Transport proposes to provide upgrades to Mandalong Road between Gimberts Road and Ourimbah Street (the proposal). The proposal would support expected economic and residential growth in Morisset, Cooranbong and Wyee in the Lake Macquarie region (discussed in Section 2.1). The location of the proposal is shown in Figure 1-1.

Key features of the proposal include:

- upgrading the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection to replace the existing roundabout with new traffic lights, including:
  - providing a central raised median on all approaches of the intersection, extending for around 290 metres along Mandalong Road, around 70 metres along Freemans Drive and around 290 metres along Wyee Road, and up to Ourimbah Street along Dora Street
  - Mandalong Road eastbound approach: providing a right turn lane, through lane, and combined through and left turn lane
  - Mandalong Road westbound departure: providing two through lanes that merge into one lane
  - Dora Street westbound approach: providing a right turn lane, two through lanes and a left turn lane
  - Dora Street eastbound departure: providing two through lanes that merge into one lane
  - Freemans Drive southbound approach: providing a right turn lane, through lane, and combined through and left turn lane
  - Freemans Drive northbound departure: providing one through lane
  - Wyee Road northbound approach: providing two right turn lanes, and a combined through and left turn lane
  - Wyee Road southbound departure: providing two through lanes.
- providing shared user paths:
  - along the northern side of Mandalong Road, extending west from the Mandalong Road/Freemans Drive intersection for around 710 metres
  - along the western side of Freemans Drive, extending north from the Mandalong Road/Freemans Drive intersection for around 30 metres
  - along the southern side of Dora Street, extending between Wyee Road and Ourimbah Street
  - along the eastern side of Wyee Road, extending south from the Dora Street/Wyee Road intersection for around 180 metres
- providing a footpath on the north-eastern corner of Dora Street and Freemans Drive, extending east from the Freemans Drive/Dora Street intersection for around 100 metres, and extending north along the eastern side of Freemans Drive for around 20 metres
- providing two new bus stop facilities along Dora Street
- installing and/or relocating fauna connectivity structures, such as glider poles
- full and partial property acquisitions, leases and adjustments, including relocating and adjusting property access and private utility connections

- ancillary work for the proposal including, but not limited to, vegetation clearing, earthworks, landscaping and tie-in works
- relocating and/or adjusting public utilities, including electrical, gas, water, sewer and telecommunications. This includes adjustments to existing utility connections into private property where these are affected by the proposal, and may include short adjustments outside the limit of works to allow for connection back to existing utility alignments
- roadworks, including pavement, line marking, lighting and road furniture (e.g. signs and safety barriers)
- upgrading drainage infrastructure, including culverts, pits, pipes, kerbs and gutters
- temporary ancillary facilities, including site compounds, material storage and laydown areas.

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



Mandalong Road Upgrade

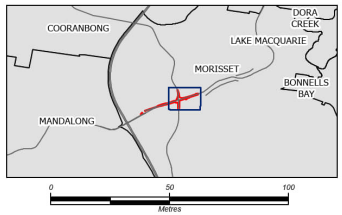
Figure 3-1
Key features of the proposal

Legend

- Proposal area
- Ancillary facility
- Road

Road design

- Drainage pit
- Road alignment
- Pedestrian crossing
- Drainage pipe
- Footpath
- Shared user path
- Bus stop



Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

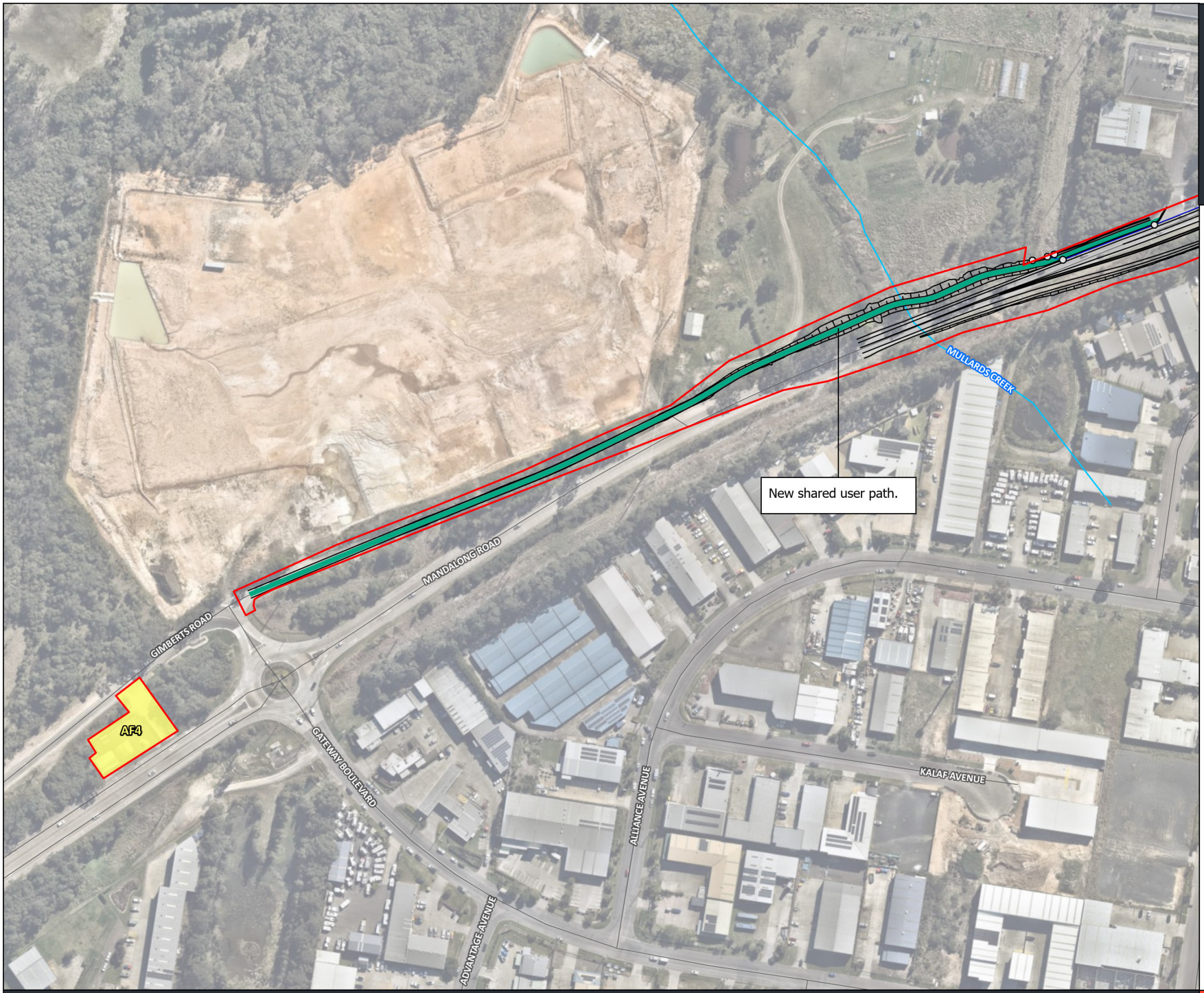
1:2,250 Date: 13/12/2024

GDA 2020

Data sources: WSP, Nearmap, NSWSS

Mandalong Road Upgrade

Figure 3-1
Key features of the proposal

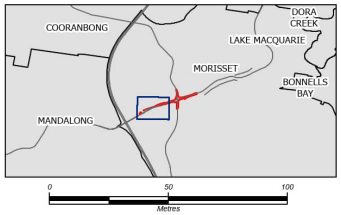


Legend

- Proposal area
- Ancillary facility
- Road
- Watercourse

Road design

- Drainage pit
- Road alignment
- Drainage pipe
- Shared user path



Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

1:2,250 Date: 28/11/2024

GDA 2020

Data sources: WSP, Nearmap, NSWSS

3.2 Design

The following sections provide a description of the design criteria, major design features and engineering constraints of the proposal at the concept development stage. Further development and detailing of the proposal will occur in detailed design and pre-construction. This may trigger further environmental and planning assessment.

3.2.1 Design criteria

The proposal's design has been developed in accordance with the criteria listed in Table 3-1, as well as the following guidelines and standards:

- Guide to Road Design (Austroads, 2021) including Transport supplements
- Beyond the Pavement 2020 (Transport for NSW, 2020a)
- Transport technical directions, specifications and quality alerts
- Australian standards
- Australian Rainfall and Runoff (Ball et al., 2019)
- Soils and Construction – Managing Urban Stormwater, Volume 1 (Landcom, 2004) and Volume 2D (NSW Department of Environment and Climate Change (DECC), 2008).

Table 3-1 Design criteria

Design element	Design criteria
Posted speed	60 kilometres per hour (km/hr)
Design speed	70 km/hr
Design vehicle	26 m B-Double
Checking vehicle (turning path)	PBS Level 3A vehicles up to 36.5 metres (m) in length
Minimum widths	Through lane width: 3.3 m Turn lane width: 3.2 m Raised median width: 1.2 m Shoulder width: 1.5 m Shared path width: 2.5 m Bus bay width: 3 m
Batter slope	Generally 3H:1V cut and fill batters, but where trying to reduce property impacts 2H:1V has been adopted
Pavement surface	Retain existing pavement, overlay with asphalt concrete (AC)
Grade	Maximum vertical grade: 6.1 per cent (%)
Flood immunity	1% annual exceedance probability (AEP) (100-year Average Recurrence Interval (ARI)) flood event along Mandalong Road; 10% AEP (10-year ARI) flood event along Dora Street

3.2.2 Engineering constraints

The main issues and constraints considered by the proposal include:

- Property: Biraban LALC land, Lake Macquarie City Council land, commercial and residential properties and proposed development
- Access: private property and business access along Mandalong Road and Dora Street
- Utilities: protection and/or relocation of utilities, including electricity (high voltage and low voltage transmission lines and substation), gas, water, sewer and telecommunications
- Drainage: the need to upgrade the existing stormwater infrastructure
- Environment: maintaining fauna connectivity and reducing clearing.

3.2.3 Major design features

The major design features of the proposal are described in the following sections and shown in Figure 3-1. These features have been developed to concept design level and would be further refined as part of the detailed design process.

Intersections

Mandalong Road/Freemans Drive/Dora Street/Wyee Road

The existing roundabout at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection would be upgraded to a four-way signalised intersection, as shown in Figure 3-1. Signalised pedestrian and cyclist crossings would be provided on all four intersection approaches to allow for pedestrian and cyclist connectivity along and across Mandalong Road/ Dora Street and Freemans Drive/Wyee Road. Approaches of the intersection would be widened to increase capacity and reconfigured as described below. A central concrete median would be provided on all approaches of the intersection.

Dora Street/Ourimbah Street

The design would tie into the existing Dora Street/Ourimbah Street roundabout. A continuous central concrete median would be constructed from the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection to the roundabout.

Wyee Road/Alliance Avenue

The design would tie in to the proposed upgrade of the Wyee Road/Alliance Avenue intersection to a two lane roundabout, which would be designed and constructed by Lake Macquarie City Council under a separate approval. Approaches to the intersection would be widened to increase capacity and reconfigured as described below. A continuous central concrete median would be constructed from the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection to the new roundabout.

Carriageway

The proposed upgrade would generally follow the existing road alignment.

Mandalong Road

The eastbound approach of Mandalong Road to the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection would be reconfigured from one lane to become a combined through and left turn lane, one through lane, and one right turn lane. The westbound departure of Mandalong Road would be reconfigured from one lane to two through lanes merging into one lane at the western end of the proposal.

The posted speed limit along Mandalong Road would remain unchanged at 60 kilometres per hour.

A central raised median would extend in a westbound direction along Mandalong Road from the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection. A typical cross section for the carriageway is shown in Figure 3-2.

Freemans Drive

The southbound approach of Freemans Drive to the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection would be reconfigured from one lane to one right turn lane, one through lane, and one combined through and left turn lane. The northbound departure of Freemans Drive would consist of one through lane, as per the existing configuration.

The posted speed limit along Freemans Drive would remain unchanged at 60 kilometres per hour.

A central raised median would extend in a northbound direction along Freemans Drive from the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection.

Dora Street

The westbound approach of Dora Street to the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection would be reconfigured from one lane to one left turn lane, two through lanes and one right turn lane. The eastbound departure of Dora Street would be reconfigured from one lane to two through lanes, merging into one lane at the eastern end of the proposal. A typical cross section for the carriageway is shown in Figure 3-3. The posted speed limit along Dora Street would remain unchanged at 60 kilometres per hour.

A central raised median would extend along Dora Street from the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection to the Ourimbah Street/Dora Street roundabout.

Wyee Road

The northbound approach of Wyee Road to the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection would be reconfigured from one lane to one combined through and left turn lane and two right turn lanes. The southbound departure of Wyee Road to this intersection would be reconfigured from one lane to two through lanes to tie into the proposed upgrade of the Wyee Road/Alliance Avenue roundabout which would be designed and constructed by Lake Macquarie City Council under a separate approval.

The southbound approach of Wyee Road to the new Wyee Road/Alliance Avenue two lane roundabout would be reconfigured from one through lane and one right turn lane to one combined through and left turn lane and one combined through and right turn lane.

The posted speed limit along Wyee Road would remain unchanged at 60 kilometres per hour.

A central raised median would extend in a southbound direction along Wyee Road from the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection.

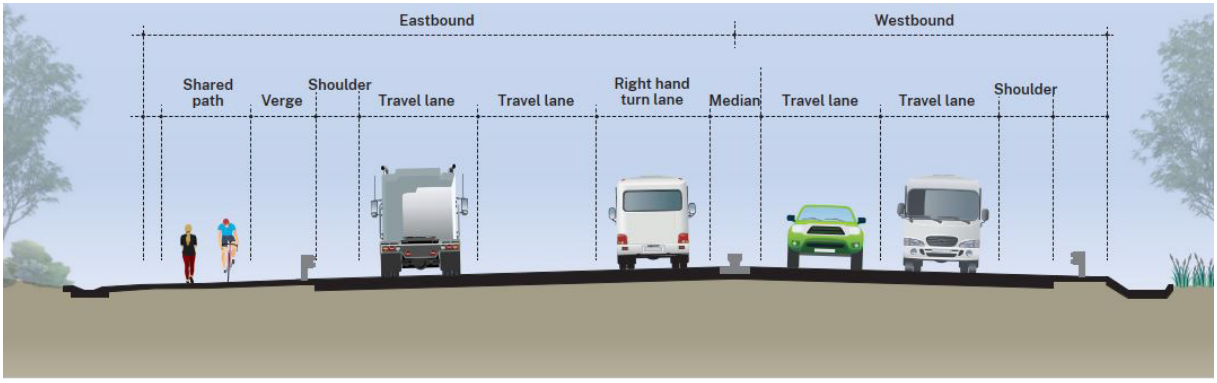


Figure 3-2 Typical cross section of Mandalong Road

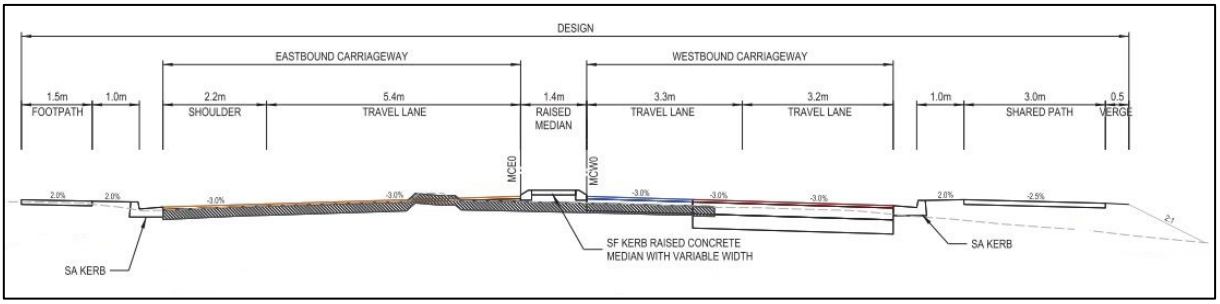


Figure 3-3 Typical cross section of Dora Street

Active transport

The proposal would provide the following pedestrian and cyclist facilities:

- new shared user paths:
  - a shared user path along the northern side of Mandalong Road, extending west from the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection, and extending north from the intersection along Freemans Drive
  - a shared user path along the southern side of Dora Street, extending east from the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection to the Dora Street/Ourimbah Street intersection, and extending south from the intersection along Wyee Road
- a footpath on the northern side of Dora Street, extending east from the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road intersection, and extending north from the intersection along the eastern side of Freemans Drive.

The shared used paths and footpaths would be concrete and tie into existing footpaths, where available.

Public transport

The proposal would replace the existing bus stop (ID 2264166) along Wyee Road with a new bus stop along Dora Street (eastbound), located east of the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection. A new bus stop would also be provided along Dora Street (westbound), west of the Dora Street/Ourimbah Street intersection. Bus shelters would be provided at the bus stops.

Stormwater and drainage

The proposed drainage system would use a combination of the existing drainage infrastructure and new pits, pipes, gutters, open channels and transverse drainage infrastructure. This would support stormwater drainage from the road pavements as well as the management of upslope catchment runoff through the road embankment.

The proposed drainage infrastructure is shown in Figure 3-1.

Transverse drainage

There are four existing transverse drainage lines within the proposal area that cross the road. The existing drainage would be retained and extended to suit the road widening where required. An additional concrete culvert pipe and headwall would be installed under the shared user path north of Mandalong Road at its crossing of Mullards Creek to control flows across the road corridor. The transverse drainage system has been designed for the one per cent AEP (100-year ARI) flood event.

Pavement drainage

The proposed pavement drainage system includes pits, pipes, gutters and channels to collect and convey storm water runoff from the upgraded road pavements. The drainage system has been designed for the one per cent AEP (100-year ARI) flood event along Mandalong Road.

The existing drainage systems within the proposal area would be utilised where possible and extended where needed to minimise new trenching and rework of the existing pavement. The proposed drainage networks would either connect to the existing drainage network or discharge into the inlet or outlet headwall of the proposed new or existing transverse drainage.

Scour protection

Scour protection would be provided at the proposed discharge point north of Mandalong Road as per section 3.13 in Part 5B of Guide to Road Design (Austroads, 2021) to prevent erosion and scour from the flow of water. Potential scour protection measures include concrete, rock riprap or grass lining, concrete headwalls with concrete or rock aprons and extended transition aprons. Selection of the most appropriate scour protection would be based on the modelled velocity and flow regime in the existing receiving watercourse. The design of scour protection would be further investigated in the detailed design stage for the proposal.

Batters

Batter slopes and earthworks have been designed in accordance with the proposal design criteria. Batter slopes are predominantly 3:1, except in areas where design has tried to avoid impacts on adjoining properties and 2:1 batters have been adopted.

The development of the road design has considered cut and fill earthworks balance and the need to provide an alignment that is well suited to the undulating topography. Benches for earthworks (i.e. a series of horizontal steps) would be provided where needed. Earthworks associated with batter slopes would generally involve minor changes to the vertical alignment of road embankments or cuttings.

Pavements

The proposal would use the existing pavements as much as possible to avoid the need for extensive new pavement layers**.** A variable asphalt concrete overlay would be used to rehabilitate the existing pavement in areas where the proposal is on top of the existing alignment. In sections where reconstruction of the pavement or road widening is required, a full depth pavement containing asphalt concrete or a heavily bound sub-base would be constructed to match the same road level as the rehabilitated pavement.

Central road median

A variable width raised central median would be provided along all approaches to the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road intersection as follows:

- on Mandalong Road, the central median would extend from the intersection in the westbound direction for around 290 metres
- on Freemans Drive, the central median would extend from the intersection in the northbound direction for around 70 metres
- on Dora Street, the central median would extend from the intersection to the Ourimbah Street/Dora Street roundabout
- on Wyee Road, the central median would extend from the intersection in the southbound direction for around 290 metres, where it would tie into the into the proposed upgrade of the Wyee Road/Alliance Avenue roundabout which would be designed and constructed by Lake Macquarie City Council under a separate approval.

Safety barriers

Existing safety barriers along Mandalong Road would be replaced and extended where required to protect against roadside hazards, such as roadside cuttings, steep batters and culvert headwalls, while minimising the impact on flooding, utilities and adjacent properties.

Property access and adjustments

A number of properties currently have driveways connecting directly to Mandalong Road, Dora Street and Wyee Road within the proposal area.

Access to properties would be maintained at all times during construction. Temporary short term disruptions to access arrangements may be required during construction to complete property adjustment works, road re-surfacing, utility works or construction of shared user paths and pedestrian pathways. An equivalent level of access to the existing situation would be provided unless agreed to by the landowner.

The proposal would result in permanent changes to some turning movements in and out of private properties as a result of the extension of the central median along Mandalong Road and Dora Street. The central median would restrict movements for improved safety. A short section of the central median on Dora Street would be modified to allow all movements to and from the Morisset Ambulance Station. Properties with impacted accesses during construction and operation are shown in Figure 3-1.

A number of properties have been identified as requiring adjustment to facilitate the proposal (refer to Section 3.6). Property adjustments would be minimised where possible and would include adjustments to property fencing and property access points.

Property access and adjustments are discussed further in sections 6.2 and 6.9.

Line marking and signage

The proposal includes permanent line marking and signage installation within and beyond the proposal area to inform, guide and manage road users, pedestrians and cyclists in the upgraded road corridor.

Temporary line marking and traffic control and other signs (such as project signage) would be required within and outside the proposal area during construction to inform, guide and manage vehicular traffic, pedestrians and cyclists around work areas to ensure the safety of construction workers, road users, pedestrians and cyclists.

Urban design and landscaping

The urban design objectives and principles prepared to guide the proposal design are identified in Section 2.3.3 and Appendix G. These consider how the proposal would integrate physically and visually with the surrounding environment (refer to Section 6.4).

An Urban Design Concept and Landscape Strategy has been developed for the proposal from the urban design objectives and principles. The strategy includes urban design direction for elements of the proposal, including materials and planting species. The urban design and landscaping strategy would be finalised during detailed design.

Further information on the urban design and landscaping strategy for the proposal is provided in Appendix G.

3.3 Construction activities

This section provides a summary of the likely construction methodology, staging, work hours, plant and equipment and associated activities that would be used to construct the proposal. For the purpose of this REF, an indicative construction schedule and methodology have been prepared.

The detailed construction staging plans and methods would be confirmed by the construction contractor(s) after completion of the detailed design. The actual construction methods may vary from the description in this chapter.

3.3.1 Work methodology

Construction staging

The proposal is anticipated to be constructed in the following stages to ensure safety of road users and site personnel, maintain traffic flows and minimise impacts on the community:

- Early works – during this stage, most utility and drainage adjustments and relocations, site preparation activities (e.g. implementation of environmental, traffic and pedestrian controls), site establishment activities (e.g. clearing and grubbing) and property adjustments, temporary property access revisions will take place.
- Main construction work, comprising:
  - Stage 1 – during this stage, the road corridor would remain in its existing arrangement and the existing roundabout and central medians and splitter island would be removed while temporary road pavement is established along Mandalong Road and Freemans Drive
  - Stage 2 – during this stage, traffic would operate in a temporary arrangement while the eastbound lanes of Mandalong Road and Dora Street and the southbound lanes of Freemans Drive and Wyee Road are constructed and traffic lights are installed at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection
  - Stage 2A – during this stage, traffic would operate in a temporary arrangement while the westbound lane of Dora Street and northbound lane of Wyee Road is constructed and traffic signal works at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road are completed
  - Stage 3 – during this stage, traffic would operate within the final upgraded road alignment with traffic signals at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection operating while the remaining works are completed along the northern side of Mandalong Road and western side of Freemans Drive and central medians and remaining traffic control signs are installed.

The main construction stages for the proposal are summarised in Table 3-2. Construction staging is subject to change during the detailed design phase and construction.

Table 3-2 Indicative main construction stages

Main construction stage	Time of day	Indicative activities
Stage 1	Night	• relocate utilities where impacted by the proposal, including temporary connections to maintain supply as required • remove existing median and splitters islands • remove roundabout island and construct pavement in former roundabout location • establish temporary road pavement along northern side of Mandalong Road and western side of Freemans Drive.
Stage 2	Day	• establish traffic control to direct traffic along temporary traffic lanes along northern side of Mandalong Road and Dora Street and western side of Freemans Drive and Wyee Road • reduce roundabout centre island and adjust location to allow traffic control during construction • carry out widening and upgrade works along the southern side of Mandalong Road and Dora Street and the eastern side of Freemans Drive and Wyee Road • install traffic signals at the Mandalong Road/Freemans Drive/Dora Street/ Wyee Road intersection.
Stage 2A	Day	• adjust roundabout centre island location to allow traffic control during construction • establish temporary road pavement on Dora Street and Wyee Road • carry out widening and upgrade works along the northern side of Dora Street and western side of Wyee Road • complete traffic signal works at the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road intersection.
Stage 3	Night	• carry out remaining widening and upgrade works along the northern side of Mandalong Road and western side of Freemans Drive • commission traffic signals at the Mandalong Road/Freemans Drive/Dora Street/ Wyee Road intersection • install central medians and remaining traffic control signs.

Construction scenarios and activities

The proposal is anticipated to involve the following general construction scenarios:

- enabling works
- site establishment, including establishing construction compounds/ancillary facilities
- utility relocations and adjustments
- earthworks
- drainage works
- pavement construction
- supporting infrastructure and finishing works
- landscaping
- operating site compounds
- demobilisation and rehabilitation.

Table 3-3 summarises the likely construction activities that would be carried out during each construction scenario.

Table 3-3 Indicative construction scenarios and activities

Construction scenario	Indicative activities
Enabling works (including early utility adjustments)	• drainage adjustments able to be done prior to the start of roadworks construction • property and property access adjustments, where required.
Site establishment and vegetation clearing (including establishing ancillary facilities)	• establish ancillary facilities including main site compounds and stockpile areas • establish sensitive areas, temporary fencing and exclusion zones • establish clearing limits and mark proposal boundary • transport plant and equipment to site • establish and maintain survey controls, progressively set out works for construction and check surveys for compliance with design • progressively install, monitor, maintain and modify traffic management controls such as temporary pavements, safety barriers, signage and pavement markings • progressively install, monitor, maintain and modify environmental controls such as erosion and sediment controls and water quality control measures as required • remove or grout redundant surface water pipes and pits • remove redundant kerb drainage • demolish existing concrete batching plant site at the Mandalong Road/Wyee Road intersection, except site shed and concrete slabs for material bays • vegetation clearing and grubbing • locate underground utilities • install temporary and permanent signage.
Utility adjustments (to be completed at any time during construction)	• protect existing utilities to be retained • relocate utilities where impacted by the proposal, including temporary connections to maintain supply as required • connect and/or cut over of utility services • remove any redundant utilities • adjust service connections to adjacent properties where required.
Earthworks	• strip topsoil and stockpile for re-use in landscaping where applicable • remove existing road formation and pavement as required • excavate cuttings and construct embankments • process, stockpile, haul and re-use or disposal offsite of excavated materials • batter stabilisation treatments and cut foundation treatments, including temporary vegetation treatments, where required • dispose of unsuitable and surplus material • the development of permanent beneficial re-use features.
Drainage works	• install transverse drainage, including pipe and box culverts and inlet and outlet works and scour protection works where required • construct subsurface drainage in association with earthworks construction where required • install temporary drainage measures • remove or grout redundant surface water pipes and pits, including kerb drainage • install/extend pipe and culvert crossings under the road pavement • install longitudinal stormwater drainage network • install permanent water quality measures.

Construction scenario	Indicative activities
Road pavement construction	• remove redundant traffic islands and roundabout medians. Construct new in-fill pavement • construct temporary pavements for traffic management • construct new pavements, including placing and compacting select fill, subbase and base material and asphalt • install sprayed bituminous surfacing • mill and resurface existing asphalt pavement • construct concrete pavement for medians, driveways, footpaths and shared paths • construct temporary tie-ins to the existing road surface, if required.
Supporting infrastructure and finishing works	• install kerbs and gutters including driveway crossings • install safety barriers • install new and modified traffic control signals • install intelligent transport system facilities, including closed-circuit television (CCTV) cameras and variable message signs (if required) • install street lighting • install pavement markings including lines, symbols and pavement markers • install signposting.
Landscaping	• rehabilitate disturbed areas progressively in accordance with the urban design and landscaping plan throughout construction, including tree planting and turfing.
Site compound operation	• operate during standard and out of hours • deliver equipment and materials • store construction materials • stockpile management • staff car parking • store construction plant and equipment.
Demobilisation	• transport stockpile waste and spoil and other waste materials to a licensed facility or suitable location (where required) • rehabilitate disturbed areas • remove temporary ancillary facilities • remove plant and equipment from site • remove environmental, safety and traffic controls • reinstate the site and all property accesses • landscape maintenance • other minor works as required.

3.3.2 Construction workforce and hours

The construction workforce may fluctuate between 20 and 50 personnel, depending on the delivery strategy adopted, the stage of construction and associated activities.

Where possible, construction work would be carried out during recommended standard construction working hours in accordance with the Interim Construction Noise Guideline (NSW DECC, 2009) (ICNG), as follows:

- Monday to Friday: 7 AM to 6 PM
- Saturday: 8 AM to 1 PM
- Sunday and public holidays: no work.

To minimise disruption to daily traffic, the local road network and disturbance to surrounding landowners and businesses, it would be necessary to carry out a number of construction activities outside of standard construction working hours, including (but not limited to):

- oversized deliveries, including major plant such as cranes and structures such as large pipes
- vegetation clearing, installing fauna crossings and landscaping next to traffic lanes requiring periodic lane closures
- installing and adjusting temporary pavements, barriers, signage and road markings for construction zones
- removing the existing roundabout, median and splitter islands that would require partial road closures
- installing transverse and longitudinal drainage and utility adjustments, removal of the existing road surface at intersections, pavement construction and new asphalt wearing surface works and the installing of wearing course and pavement markings, including lines, symbols and pavement markers, that would require partial road closures
- installing the new central medians, traffic light infrastructure, safety barriers and delineation devices
- service and utility cutovers and connections when not able to be done during normal hours
- traffic switches involving full or partial closures of the road and modifications to pavement markings, barriers and traffic signals, including the activation of new traffic signal arrangements.

These activities, including any unavoidable out of hours impulsive or tonal noise emissions are discussed in Section 6.3 and Appendix F.

Out of hours work would be subject to permitted road occupancy licences (ROLs) and construction staging.

3.3.3 Plant and equipment

An indicative list of plant and equipment that would typically be required during construction of the proposal is provided in Table 3-4. Additional equipment may be required and would be identified during construction planning by the construction contractor.

Table 3-4 Indicative plant and equipment for each construction scenario

Scenario	Indicative plant and equipment
Early works (including vegetation clearing and site establishment)	backhoe, mobile crane – franna, truck, excavator breaker, excavator, hand tools, suction truck, lighting – diesel generator, bobcat, chainsaw, chipper, tipper, light vehicles, tub grinder/ mulcher, water carts
Utility adjustments	backhoe, mobile crane – franna, truck, underbore rig, concrete saw, excavator breaker, excavator, hand tools, suction truck, lighting – diesel generator, concrete mixer truck, tipper, light vehicles, welding equipment, roller
Earthworks and drainage	backhoe, mobile crane – franna, truck, concrete saw, excavator breaker, excavator, hand tools, diesel generator, bobcat, concrete mixer truck, light vehicles, roller, road truck (bogie), road truck (hiab)
Road pavement construction	concrete mixer truck, concrete pump, concrete vibrator, excavators, hand tools, diesel generator, paving machine, vibratory roller, truck, asphalt truck and sprayer, light vehicles, milling machine, road marking machine, slip-forming machine, smooth drum roller, water carts
Landscaping and finishing works	backhoe, bobcat, concrete mixer truck, hand tools, line marking plant, mobile crane (franna), truck, dump truck (bogie truck)/tipper, light vehicles, water carts
Site compound operation	backhoe, truck, light vehicles, water carts
Demobilisation	light vehicles, small trucks, mobile crane (franna), skid steer loader (bobcat), trucks, excavator

3.3.4 Earthworks

The estimated quantities of materials associated with earthworks for the proposal are provided in Table 3-5.

These estimates may change depending on the actual quality of material, the depth to bedrock, and the suitability of the material for re-use in construction. Earthwork requirements would be confirmed during detailed design.

Table 3-5 Indicative earthworks quantities

Material	Estimated volumes (m^3)
Top soil	2,000
Excavation (cut) volume	4,430
Fill volume	6,200
Imported volume	2,000

3.3.5 Source and quantity of materials

Construction materials

The following materials would be required for the construction of the proposal:

- earthwork materials (e.g. sand, gravel, topsoil, general fill material) and selected material for road formation
- bitumen and aggregates (e.g. stone, sand, gravel) for pavement production
- binders to stabilise and treat the road formation and culvert bases
- cement, sand and aggregates (e.g. fly ash, gravel, crushed rock) for concrete used in drainage construction, pavement construction, and miscellaneous work such as barrier kerbs, kerbs and gutters, paving, sign footings and structural footings
- precast concrete elements for drainage construction (culverts, pits and headwalls) and miscellaneous work
- steel for barriers, railings, posts, signs, bus shelters and reinforcement in concrete
- lighting poles and lamps
- minor materials, including steel fastenings, adhesives sealants and paints, mulch/woodchip, plastic conduits and pits, temporary timber formwork and falsework.

The indicative quantities of the main materials are listed in Table 3-6. Quantities of materials would be revised as the design develops.

The amount of water that would be required during construction is unknown at this stage. The amount would depend on material sources and methodologies applied by the delivery contractor. Water would be sourced from authorised sources, including recycled or reused water.

Where possible, construction would reuse as much of the existing pavement and road formation material as possible to minimise the imported material needs of the proposal.

Cleared vegetation will be used as mulch or coarse woody debris for site erosion and sedimentation controls or rehabilitation, where possible and suitable for use.

Where possible, materials would be sourced from quarries nearby from projects around the Morisset area and/or appropriately licensed facilities, commercial suppliers within the Lake Macquarie, Newcastle or Sydney regions or other viable sources such as other nearby infrastructure projects. None of the materials proposed to be used are considered to be in short supply.

Table 3-6 Indicative material quantities for construction

Material type	Quantity
Concrete for kerbs and gutters, medians, shared paths and footpaths	2,100 cubic metres (m^3)
Pipes for drainage works (concrete and PVC)	1,620 m
Precast pits	60 units
Asphalt for road pavement	42,500 square metres (m^2)
Aggregate	60 m^3
Geotextile	4,000 m^2
Signs	45 units

3.3.6 Traffic management and access

Pedestrian, cyclist and road traffic would be impacted during all stages of construction, as described in Section 3.3.1. Construction would be staged to allow the existing road corridor to remain open to traffic, cyclist and pedestrian movements during construction. Additionally, evening and night works would be carried out, where possible, to further minimise impacts to traffic, cyclist and pedestrian movements.

Potential impacts to pedestrian, cyclist and road traffic are described in Section 6.2.

Construction traffic

Construction activities would generate traffic for the movement of construction workers, plant, equipment and materials and would include light and heavy vehicles, as summarised in Table 3-7. Around 15 light vehicles and 30 heavy vehicles would be required per day across the proposal area during peak construction periods. On average, there would be up to 10 light vehicle movements and up to 20 heavy vehicle movements during the peak hour across the proposal area. The largest construction traffic volumes would be generated during material delivery and during the main earthworks and civil construction

Construction related traffic would use the surrounding road network to:

- provide access for the workforce to the ancillary facilities and proposal area
- haul construction related materials to and from the proposal area
- carry equipment and materials from one section of the proposal area to another.

Transportation of materials, plant and equipment to and from the proposal area, including ancillary facilities, is expected to be mainly via Mandalong Road, Freemans Drive, Dora Street, Wyee Road and the M1 Pacific Motorway, which are existing routes approved for heavy vehicles, including B-doubles. However, the use of other roads may be required. Detailed haulage road routes would be determined during further development of the construction methodology with consideration of the construction contractor's requirements.

Most haulage vehicle movements are expected to occur within standard construction hours. Heavy machinery would be transported to and from site during off peak hours. Oversize and overmass vehicles are likely to be escorted and travel at slower speeds than other vehicles on the existing road network.

No construction vehicles would access or encroach on the boundaries of private property or other land that is outside of the proposal area.

Table 3-7 Indicative vehicle movements per day during the peak construction period

Vehicle type and association	Vehicle number		Typical travel patterns and limitations
	Average	Maximum	
Standard hours			
Construction traffic: heavy vehicles including waste and spoil vehicles up to 40 tonnes	24	30	Regular movements throughout the day (7 am to 6 pm)
Deliveries: light and heavy commercial vehicles up to 5 tonnes	5	15	Outside of peak periods (10 am to 3 pm). Parking within the main compound site
Workers: cars (light vehicles)	15	15	Outside of peak periods (10 am to 3 pm). Parking within the main compound site
Out of hours			
Construction traffic: heavy vehicles up to 40 tonnes	10	30	Early evening where possible (6 pm to 10 pm)

Traffic management

In most cases, work zones would be created behind safety barriers where construction work can be completed safely and during standard construction working hours, to avoid the need for lane closures.

Temporary safety barriers may be installed between opposing traffic and between construction zones and live traffic, to provide separation between road users and the construction zones. Where the use of safety barriers is not practical, construction work would be undertaken during out of peak traffic periods using temporary traffic management arrangements, such as night time and weekend lane closures and traffic controls, to divert or detour vehicles onto the surrounding road network around the worksite for short periods.

Generally, the construction staging would maintain two lanes along the proposal (a 3.0 metre lane and 1.2 metre shoulder in each direction) during construction. The speed limit in construction zones would generally be 60 kilometres per hour, however may need to be reduced to a minimum of 40 kilometres per hour for some activities such as placement of asphalt. Some construction activities would need to be carried out under lane and shoulder closures in accordance with approved Road Occupancy Licence (ROL) conditions and/or as night works to reduce traffic impacts and ensure the safety of construction workers and road users.

Access

All property accesses near the proposal would be maintained throughout construction (unless otherwise agreed with the property owner). Details about temporary and permanent changes to property access during construction are provided in Section 3.2.3.

Access for pedestrians, cyclists and bus users would be maintained for the duration of construction. Detours, alternative temporary pathways and safety barriers around construction work areas would be provided to maintain safe access. The existing bus stop along Wyee Road may need to be temporarily relocated during construction. The bus stop would be located as close as possible to the original or new bus stop location (as appropriate).

Access for emergency services would be retained throughout construction, including to the Morisset Ambulance Station on Dora Street.

Parking

The contractor would provide off-road construction parking within the ancillary facilities and proposal area to prevent construction workers parking on surrounding local roads, where possible.

Informal roadside parking for general traffic along Mandalong Road and Dora Street within the proposal area would be permanently removed during construction to accommodate road widening and the construction of shared user paths and pedestrian footpaths. Informal parking areas within vacant land along Freemans Drive within the proposal area would also be temporarily unavailable during construction, as these areas have been identified as the potential locations for ancillary facilities AF1 and AF2 (refer to Section 3.4).

3.4 Ancillary facilities

Temporary ancillary facilities would be required to facilitate construction of the proposal. The facilities would include:

- a site compound for site offices, car parking, sheds, workshops and storage
- areas for material delivery and storage
- water capture and treatment locations
- stockpile locations for materials, spoil and mulch.

Four potential ancillary facilities have been identified within the proposal area, as shown in Figure 3-1. The details of each ancillary facility are provided in Table 3-8. Identification of potential ancillary facility locations involved consideration of the following principles:

- operational during a flood event and avoid or minimise impacts to surrounding properties
- more than 40 metres from a watercourse
- more than 50 metres from residential dwellings
- in previously disturbed areas that do not require the clearing of native vegetation
- in plain view of the public to deter theft and illegal dumping
- outside the drip line of trees
- on relatively level ground
- away from areas of heritage value.

The use of the identified ancillary facilities is subject to formal agreement with landowners and availability once construction timing is confirmed.

Table 3-8 Proposed construction ancillary facilities

Site ID	Location	Approximate size (m^2)	Description
AF1	Part 6 Freemans Drive Morisset (part Lot 1, DP593089)	2,230	AF1 is located within vacant land owned by Lake Macquarie City Council on the northeastern corner of the existing Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection. The existing sign for Morisset on this land would be retained and protected during construction. The site is currently used for informal parking. The facility would be used for the storage of plant and equipment between construction phases, and for maintenance activities as required.
AF2	Road reserve of Freemans Drive and part Lot 469, DP755242	1,880	AF2 is located mainly within the road reserve of Freemans Drive, with a small section of the site located within vacant, cleared land owned by Biraban LALC. The site is currently used for informal parking and mobile food vendor business purposes (food truck). The facility would be used for the storage of plant and equipment between construction phases, and for maintenance activities as required.
AF3	9 Mandalong Road Morisset (entire Lot 1, DP771319)	2,810	AF3 is located on the southwestern corner of the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection. The site is currently used to manufacture and supply construction and building materials. The site would be used as the main site compound to facilitate construction work for the proposal.

Site ID	Location	Approximate size (m^2)	Description
AF4	Road reserve of Mandalong Road	1,570	AF4 is located within the road reserve along the northern side of Mandalong Road, around 50 metres east of the Mandalong Road/ Gimberts Road/Gateway Boulevard intersection. The facility is currently used by Transport as a maintenance and storage facility for road works. The facility would be used for the storage of plant and equipment between construction phases, and for maintenance activities as required.

The ancillary facilities would be accessed via Mandalong Road, Freemans Drive, Dora Street and Wyee Road.

It is anticipated that ancillary facilities would be predominantly used during standard construction hours. However, in some instances these facilities may need to be used outside of standard construction hours to facilitate construction activities. In these instances, appropriate management measures would be implemented in accordance with the Construction Environmental Management Plan (CEMP) and consultation would occur with potentially impacted receivers to minimise impacts.

Sites would be securely fenced with temporary fencing. Signs would be erected advising the general public of access restrictions. Upon completion of construction, the ancillary facilities, work areas and stockpiles would be removed, and the sites would be cleared of all rubbish and materials and rehabilitated.

If amendments or additional or alternative ancillary facilities are required, the contractor would consult with Transport to confirm the suitability of the proposed amendment or additional/alternative ancillary facility, and whether any additional environmental assessment is required.

Following the completion of the proposal, Transport would return ancillary facilities AF1 and AF2 to their existing condition or equivalent, in consultation with Lake Macquarie City Council.

Transport would also seek to lease an existing office space in the industrial area south of the proposal area along Mandalong Road to use as a local project office during construction.

3.5 Public utility adjustment

A number of utilities have been identified in the construction area that would need to be relocated or adjusted in the proposal area, as described in Table 3-9. Proposed adjustments would be finalised in consultation with utility providers during detail design.

Table 3-9 Public utility adjustments

Utility	Asset owner(s)	Adjustments
Telecommunications	Telstra/Optus/NBN Co/ Vocus (Nextgen)/ AAPT/Plus ES	Various optical fibre, cables and telephone conduits (including overhead cables), pits and pillars on both sides of the road corridor and across the road corridor would be relocated. Other optical fibre and telephone conduits would be protected during construction.
Electrical	Ausgrid	A number of high voltage and low voltage overhead cables and underground conduits along the road corridor would be relocated. Other overhead and underground cables would be protected during construction. Existing overhead lines would be maintained as overhead lines when relocated. All existing lighting assets (light poles and conduits) would be repositioned.
Gas	Jemena	A medium pressure gas mains (300 kiloPascal (kPa)) along the northern side of Mandalong Road crossing Freemans Drive at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout would be relocated. Other gas mains would be protected during construction.

Utility	Asset owner(s)	Adjustments
Sewer	Hunter Water	One diameter nominal (DN) 250 sewer rising man on the southern side of Mandalong Road, west of the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road roundabout, would be relocated. Other sewer rising mains and gravity mains would be protected.
Potable water	Hunter Water	Two DN150 water mains would be relocated: • a water main on the southern side of Mandalong Road, extending west of the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road to east of the roundabout • a water main extending from Wyee Road south of the existing Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout to Dora Street. A booster pump on the southern side of Dora Street would be relocated to the northern side of the road. Other water mains would be protected.

3.6 Property acquisition

The proposal would require the partial acquisition of five parcels of private land and public land, and full acquisition of one private land parcel (refer to Figure 3-4). Properties to be acquired are listed in Table 3-10, including the approximate area to be acquired. Land use zones identified in the table are based on zoning from the Lake Macquarie LEP.

Property adjustment plans would be developed in consultation with the relevant property owners. The extent of property acquisition would be refined and confirmed during detailed design in consultation with the property owners. Property acquisition would be undertaken in accordance with Transport's Land Acquisition Information Guide 2014 and the *Land Acquisition (Just Terms Compensation) Act 1991* (Land Acquisition Act).

A number of properties would also be temporarily partially leased for construction ancillary facilities, as shown in Figure 3-1. Further details of the ancillary facilities are provided in Section 3.4. Properties that would potentially be leased would be confirmed during detailed design in consultation with the property owner.

Table 3-10 Proposed property acquisition

Lot and DP	Address	Current owner	Acquisition type	Land use zone (under the Lake Macquarie LEP)
Lot 37 / DP9632	50 Mandalong Road, Morisset, 2264	Private	Partial	SP2 Infrastructure
Lot 223 / DP1012916	Gateway Blvd, Morisset, 2264	Lake Macquarie City Council	Partial	RE1 Public Recreation
Lot 31 / DP1064820	15 Mandalong Road, Morisset, 2264	Lake Macquarie City Council	Partial	RE1 Public Recreation
Lot 1 / DP771319	9 Mandalong Road, Morisset, 2264	Private	Full	E4 General Industrial SP2 Infrastructure RE1 Public Recreation
Lot 111 / DP1299752	126 Dora Street, Morisset, 2264	Private	Partial	RE2 Private Recreation
Lot 1 / DP 593089	6 Freemans Drive, Morisset, 2264	Lake Macquarie City Council	Partial	RE1 Public Recreation

Mandalong Road Upgrade

Figure 3-4
Property acquisition

Legend

- Proposal area
- Ancillary facility
- Property acquisition
- Cadastre
- Road
- Railway

Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

1:4,500

Date: 28/11/2024

GDA 2020

Data sources: Geoscience Australia, Nearmap, NSWSS

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.

The proposal involves the upgrade of a road and road infrastructure facilities and would be carried out by Transport, which is a public authority. The proposal is not State significant infrastructure or State significant development. Therefore, the proposal may be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW). Development consent from Lake Macquarie City Council, the Minister for Planning and Public Spaces or the Independent Planning Commission is not required.

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) (where applicable), is discussed in Chapter 5.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 4 of the State Environmental Planning Policy (Biodiversity and Conservation) 2021 (SEPP (Biodiversity and Conservation)) aims to encourage the proper 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 during development assessment by councils.

Section 4.4 of the SEPP identifies that the proposal lies on land on which Chapter 4 of the SEPP is applicable (as it is within the Lake Macquarie LGA). However, the proposal does not require development consent from Lake Macquarie City Council as it would be assessed under Division 5.1 of the EP&A Act.

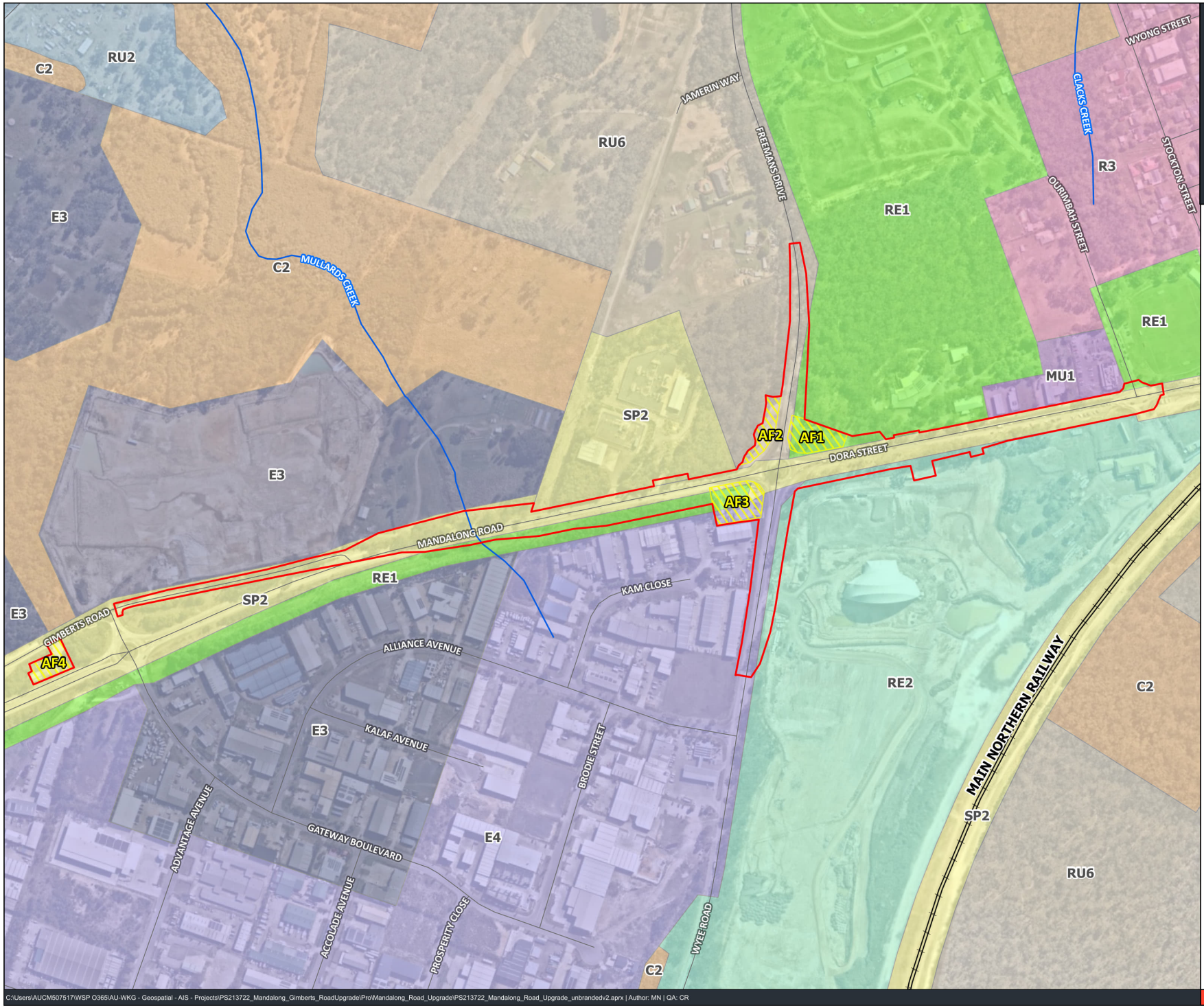
Regardless, the Biodiversity Assessment Report (BAR) prepared for the proposal (refer to Appendix D and summarised in Section 6.1) considers potential impacts of the proposal on koala habitat.

4.1.2 Local Environmental Plans

Lake Macquarie Local Environmental Plan 2014

The proposal is located within the Lake Macquarie LGA to which the Lake Macquarie Local Environmental Plan 2024 (Lake Macquarie LEP) applies. Land use zones under the Lake Macquarie LEP within the proposal area are shown in Figure 4-1.

Under clause 5.12(1) of the Lake Macquarie LEP, the LEP does not restrict or prohibit the carrying out of development by or on behalf of a public authority that is permitted to be carried out without consent under the SEPP (Transport and Infrastructure). As the proposal is permitted without consent under the SEPP (Transport and Infrastructure) (refer to Section 4.1.1) the consent requirements of the LEPs do not apply to the proposal.



Mandalong Road Upgrade

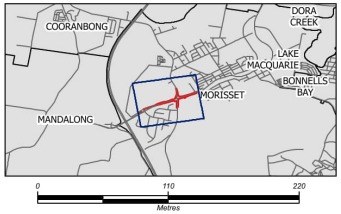
Figure 4-1
Land use zoning

Legend

- Proposal area
- Ancillary facility
- Road
- Railway
- Watercourse

Land zoning - Lake Macquarie Local Environmental Plan 2014

- C2 - Environmental Conservation
- E4 - General Industrial
- MU1 - Mixed Use
- R3,Medium Density Residential
- RE1 - Public Recreation
- RE2 - Private Recreation
- RU2 - Rural Landscape
- RU6 - Transition
- SP2 - Infrastructure
- E3 - Productivity Support



Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

1:4,500 Date: 21/11/2024

GDA 2020

Data sources: WSP, Nearmap, NSWSS

4.2 Other relevant NSW legislation

4.2.1 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) provides for the conservation and protection of threatened species, populations, ecological communities of animals and plants, and Areas of Outstanding Biodiversity Value through specific objectives relating to the conservation of biodiversity and promoting ecologically sustainable development.

Part 7 of the BC Act requires that the significance of the impact on threatened species, populations and endangered ecological communities listed under the BC Act or FM Act, are assessed using a five-part test. Where a significant impact is likely to occur, a SIS or BAR must be prepared.

A BAR was prepared for the proposal and is provided in Appendix D. The findings of the BAR are discussed in Section 6.1.

The assessment concluded that the proposal is not likely to have a significant impact on Areas of Outstanding Biodiversity Value, threatened ecological communities (TECs) or threatened species listed under the BC Act as discussed in Section 6.1. Neither a SIS, nor a BDAR is required for the proposal.

4.2.2 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides the basis for legal protection and management of all national parks, historic sites, nature reserves, wetlands and other state reserves in NSW. The proposal is not located within land reserved under the NPW Act.

The NPW Act also provides for the protection of 'Aboriginal objects' and 'Aboriginal places' under Part 6 of the Act and makes it an offence to harm Aboriginal objects, places or sites without permission. Where works will disturb Aboriginal objects, an Aboriginal Heritage Impact Permit (AHIP) is required.

An assessment of the potential impacts on Aboriginal cultural heritage was carried out for the proposal in accordance with the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services, 2011), as summarised in Section 6.12. An AHIP is not required for the proposal.

Transport has undertaken consultation with the Aboriginal community in accordance with the requirements of the Aboriginal cultural heritage consultation requirements for proponents (NSW Department of Environment, Climate Change and Water (DECCW), 2010a) and PACHCI, as described in Section 6.12.

4.2.3 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to protect items of State and local heritage significance and outlines the process for the approval of development that may impact on items of heritage significance.

Matters protected under the Heritage Act include items subject to an Interim Heritage Order and items listed on the State Heritage Register, the heritage schedules of local council LEPs, and the heritage and conservation registers established under section 170 of the Heritage Act by NSW Government agencies (section 170 Registers). The Heritage Act also provides for the protection of archaeological 'relics', being any deposit, object or material evidence that relates to the non-Aboriginal settlement of NSW and is of State or local heritage significance.

Approval from the Heritage Council of NSW is required under Part 4 of the Heritage Act for certain works to items or on land that is the subject of an Interim Heritage Order or listing on the State Heritage Register. An excavation permit is required under section 139 of the Heritage Act for the disturbance or excavation of any land containing or likely to contain a relic.

Potential impacts of the proposal on non-Aboriginal heritage have been assessed in Section 6.13. Provided that mitigation measures are followed, the proposal would not impact non-Aboriginal heritage items. Approval from the Heritage Council of NSW is not required for the proposal.

4.2.4 Roads Act 1993

The *Roads Act 1993* (Roads Act) regulates the carrying out of various activities in, on and over public roads. Under section 138 of the Roads Act, applicants are required to obtain approval from the relevant roads authority for the erection of a structure, the carrying out of work on or over a public road, or the digging up or disturbing the surface of a road.

The proposal involves construction work on Mandalong Road and Dora Street, which are classified State roads under the Roads Act and under the care and control of Transport. Intersecting side streets are unclassified local roads under the care and control of Lake Macquarie City Council. Under section 71, a roads authority may carry out road work on any public road for which it is the road authority and on any other land under its control. Under schedule 2 clause 5(1), section 138 does not require a public road authority to obtain a road authority's consent to operate road authority functions in, on or over an unclassified road.

Therefore, road authority consent is not required for the proposal. However, a ROL would be obtained by the Contractor for any temporary road or lane closures required for the proposal.

Consultation with Lake Macquarie City Council was carried out in accordance with the SEPP (Transport and Infrastructure) (refer to Section 5.4).

4.2.5 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve, protect and manage fisheries, aquatic systems and habitats in NSW including conserving fish stocks and key fish habitats. The FM Act establishes mechanisms for the listing of threatened species, populations and ecological communities or key threatening processes, the declaration of critical habitat and the consideration and assessment of threatened species impacts in the development assessment process.

Part 7A Division 4 of the Act prohibits the carrying out, without a licence, of activities that damage habitats or harm threatened species, populations or ecological communities. In determining the significance of impacts, the determining authority must consider the matters listed in section 1.7 of the EP&A Act.

Threatened species, populations and ecological communities of fish and marine vegetation are protected under the FM Act. In addition, an object of the FM Act is to conserve key fish habitat. There is no mapped key fish habitat within the proposal area (refer to Section 6.1). The closest mapped key fish habitat is associated with Mullards Creek, located around 760 metres north (downstream) of the proposal area. Therefore, Transport is not required to seek any permits under section 199 or section 219 of the FM Act.

4.2.6 Water Management Act 2000 and Water Act 1912

The *Water Management Act 2000* (WM Act) provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. The WM Act controls the extraction of and use of water, the construction of works such as dams and weirs, and the carrying out of activities in or near water sources in NSW. 'Water sources' are defined broadly and include the whole or any part of a river, lake, estuary, place where water occurs naturally on or below the surface of the ground, and NSW coastal waters. The North Coast Fractured and Porous Rock Groundwater Sources 2016 Water Sharing Plan applies to the proposal.

Section 56 of the WM Act establishes access licences for the taking of water within a particular water management area under a water sharing plan. Under section 21(1) and Schedule 4 Part 1(2) of the Water Management (General) Regulation 2018, Transport, as a roads authority, is exempt from the need to obtain an access licence in relation to water required for road construction and road maintenance. However, notification to the water owner would be required. The proposal does not involve any water take, use or supply from natural sources or flood diversion work.

Activity approvals under section 91 of the WM Act are required when a certain activity is likely to affect waterfront land or interfere with an aquifer. The proposal would be carried out on land defined as within 40 metres of waterfront land and meets the requirements for needing a controlled activity approval under section 91A(2). However, under Clause 41 of the Water Management (General) Regulation 2018, public authorities (such as Transport) are exempt from the requirement to obtain a controlled activity approval. A notification of the activity would need to be provided to the Water Group of the NSW Department of Planning, Housing and Infrastructure (DPHI) at least 30 days before the activity commences.

Under section 91(F) of the WM Act, approval is required for aquifer interference activities, which include the penetration of an aquifer, interference with water in an aquifer, the obstruction of the flow of water in an aquifer, the taking of water from an aquifer in the course of carrying out any activity prescribed by the Water Management (General) Regulation 2018, and the disposal of water taken from an aquifer.

Potential impacts of the proposal on groundwater have been assessed in Section 6.10. Groundwater is not likely to be intercepted during construction.

4.2.7 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* (CLM Act) establishes a process for investigating and, where appropriate, remediating land that the NSW Environment Protection Authority (EPA) has reason to believe is significantly contaminated so as to warrant regulation under the CLM Act. The CLM Act allows the EPA to declare land as significantly contaminated land and to order a public authority to carry out actions or prepare a plan of management for such land.

Under section 60 of the CLM Act, a person whose activities have contaminated land or an owner of land whose land has been contaminated (whether before or during the ownership of the land) above certain levels (as outlined in the Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (NSW EPA, 2015), is required to notify the EPA in writing as soon as they become aware of the contamination.

A Preliminary Site Investigation (Stage 1 contamination assessment) was carried out for the proposal (refer to Appendix I). The proposal area has been assessed as presenting potential low to medium risks of soil and/or groundwater contamination impacts during construction (refer to Section 6.6). Transport would notify the EPA if it is suspected that construction work has resulted in soil and/or groundwater contamination or encountered existing soil and/or groundwater contamination.

4.2.8 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides the legal framework for the management of air, noise, water and waste pollution.

Under Part 3.2 of the POEO Act, an environmental protection licence (EPL) is required for scheduled activities or scheduled development work as defined in Schedule 1 of the Act. The following scheduled activities set out in Schedule 1 are most relevant to the proposal:

- road construction if it results in four or more traffic lanes (not including bicycle lanes or lanes used for entry or exit), where the road is classified or proposed to be classified as a main road for at least three kilometres of its length in the metropolitan area, and for at least five kilometres in any other area (clause 35)
- extractive activities, where excavation required for the proposal is greater than 30,000 tonnes per year (clause 19)
- cement or lime handling, meaning the handling of cement, fly ash, powdered lime (other than agricultural lime) or any other similar dry cement products, but not if the handling occurs as part of the production of pre-mixed concrete (concrete batching), where more than 30,000 tonnes of cement or lime is handled per year (clause 6).

The overall proposal does not meet these trigger levels, therefore an EPL would not be required for the proposal.

The POEO Act would also require construction to be managed to prevent and avoid the potential to cause water, noise and/or air pollution and includes requirements in relation to the management of waste. This would be achieved through implementing the mitigation and management measures identified in Section 6.13. Notification to the EPA would be required in instances where any pollution incident has the potential to 'cause or threaten material harm to the environment' (refer to section 148 of the POEO Act).

In addition, the POEO Act require Transport to manage any future road upgrade in the proposal area to limit its potential to cause water, noise, air pollution and potential waste streams during construction.

4.2.9 Land acquisition (Just Terms Compensation) Act 1991

The Land Acquisition 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 will not be less than the market value of the land.

The proposal would require the partial acquisition of five properties, and full acquisition of one property, along Mandalong Road, Freemans Drive, Dora Street and Wyee Road to accommodate the proposed road upgrade.

All land acquisitions would be carried out in accordance with the Land Acquisition Act. Property requirements for the proposal are discussed in Section 3.6.

4.2.10 Crown Land Management Act 2016 and Crown Land Legislation Amendment Act 2017

The *Crown Land Management Act 2016* (Crown Land Management Act) and *Crown Land Legislation Amendment Act 2017* (Crown Land Legislation Amendment Act) set out the requirements for ownership, use and management of Crown Land. This includes the permissions and authorisations needed when planning the development of activities on Crown Land.

Under Clause 2.18 (1), the Minister for Primary Industries can:

> 'Despite any other provision of this Act, the Minister may grant a lease, licence, permit, easement or right of way over dedicated or reserved Crown land for any of the following purposes (a relevant interest)—
>
> (a) any facility or infrastructure,
>
> (b) any other purpose the Minister thinks fit.'

Under Division 5.8 of the Crown Land Act, the Minister may on the application of a holder of land, grant a permit (an enclosure permit) to the holder of the land to enclose, whether wholly or partly, any Crown Road or Crown Watercourse that crosses or bounds the land.

The proposal would require the temporary use of small sections of two parcels of Crown Land during construction:

- a Crown Road, the Ourimbah Street road reserve at the eastern end of the proposal area
- Crown Land, located at the intersection of Mandalong Road and Freemans Drive (the location of ancillary facility AF2).

Transport would secure a permit/lease/licence for the use of these land parcels before the start of construction in consultation with DPHI (Crown Lands).

4.2.11 Waste Avoidance and Resource Recovery Act 2001

The purpose of the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) is to develop and support the implementation of regional and local programs to meet the outcomes of a State-wide strategy for waste avoidance and resource recovery. It also aims to 'minimise the consumption of natural resources and final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste'.

Waste generation and disposal reporting would be carried out during the construction and operation of the proposal (refer to Section 6.13). Procedures would be implemented during construction to promote the objectives of the WARR Act.

4.2.12 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) provides a framework to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants and outlines the responsibilities of government, councils, private landholders and public authorities in the management of biosecurity matters. Under section 21 of the Biosecurity Act, any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised as is reasonably practicable.

The Biosecurity Act and Biosecurity Regulation 2017 provide specific legal requirements for high risk activities and State level priority weeds. The State level priority weeds and associated legal requirements relevant to the region are outlined in the Hunter Regional Strategic Weed Management Plan 2023 - 2027 (Hunter Local Land Services, 2022), together with the high risk priority weeds from the regional prioritisation process.

If present, priority weeds in the proposal area would be assessed and controlled to fulfil the General Biosecurity Duty and minimise biosecurity risks. The BAR (Appendix D) provides mitigation measures to manage weeds in the proposal area. This is discussed further in Section 6.1.

4.2.13 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.

Part of the proposal area is located on bushfire prone land. Potential bushfire risk and impacts are discussed in Section 6.11.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* (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 (MNES) or the environment of Commonwealth land. These are considered in Appendix A and Chapter 6.

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

Potential impacts to these biodiversity matters are also considered in Section 6.1 and Appendix D.

Findings - MNES

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

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 MNES. Section 6.1 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. Under the Act, a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the National Native Title Tribunal Native Title Vision website was carried out on 8 August 2024, with no Native Title holders/claimants identified for the proposal area.

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 the SEPP (Transport and Infrastructure), the proposal is permissible without development consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

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

5. Consultation

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

5.1 Consultation strategy

Transport has prepared a Community and Stakeholder Engagement Plan (CSEP) for the proposal to guide the communication and consultation activities for the proposal. The CSEP is designed to provide an agreed approach to communication and engagement, employing open communication channels and clear protocols. The consultation approach for the proposal aims to:

- provide the community and stakeholders with regular and targeted information to build awareness about the proposal and likely impacts and benefits of the proposal, including the proposal planning process and timeframes, proposed concept design and environmental impact assessment
- keep the local community and other key stakeholders regularly informed of progress of the proposal
- consult and inform the community and key stakeholders during each phase of the proposal to obtain feedback to be considered as the proposal progresses through preferred design display, environmental assessment and construction
- ensure community and stakeholder feedback is continuously fed into the proposal's development and used to understand and effectively assess impacts
- engage in a manner that is collaborative, innovative, adaptive and sustainable
- ensure that community and stakeholder enquiries about the proposal are managed and resolved effectively.

The relevant stakeholder groups that have been identified for the proposal included:

- National, State and local government agencies and elected government representatives
- local residents, businesses and developers
- special interest groups such as Aboriginal stakeholders, transport providers and environmental groups
- emergency services
- utility providers
- road users and public transport users
- wider community.

These stakeholder groups have been and will continue to be consulted on relevant aspects of the proposal using a variety of consultation methods and engagement activities. A summary of the consultation activities carried out to date and the planned ongoing or future consultation activities is provided in the sections below.

5.2 Community involvement

Transport has informed and involved the community and key stakeholders as the proposal has progressed, most notably during the preferred design display. Community and stakeholder feedback has been used to assist in preparing the REF.

The preferred design display used a number of consultation and engagement activities to seek comments, feedback, ideas and suggestions from the community on the proposed concept design features. These activities included contacting and meeting in person with potentially affected residents and stakeholders, and served to build a comprehensive database of any interested and concerned community members.

Communications and engagement activities with the community carried out by Transport to date are detailed within Table 5-1.

Table 5-1 Community engagement activities carried out for the proposal to date

Activity/consultation method	Summary
Project web page	The Mandalong Road upgrade, Morisset project web page was published to the Transport website on 29 November 2023 (https://www.transport.nsw.gov.au/projects/current-projects/mandalong-road-upgrade-morisset). The page continues to be updated as the proposal progresses to provide the latest proposal information. The project web page received 2,619 unique page visitors during the preferred design display period in 2024.
Project updates	Two project updates have been released via the project web page and distributed to 3,455 residents and businesses across Morisset: • November 2023 project update, providing background to the proposal, key features and benefits, key steps in the environmental assessment and planning process, and contact details for queries about the proposal • June 2024 'Have your say' project update, in which Transport invited the community and stakeholders to comment on the proposal. The project update showed the proposal preferred design, and outlined key features and benefits of the proposal, key steps in the project process, contact details and how to provide feedback on the display. Community members were encouraged to provide their feedback via an online survey, mail or email. Consultation was completed in August 2024 with 202 submissions received.
Community notifications	Two community notifications have been released in November 2023 and April 2024, distributed to impacted properties and published on the project web page to notify the community of field investigations on and around Mandalong Road from the M1 Pacific Motorway interchange to Ourimbah Street, Morisset.
Media release	A media release was issued to local media on 26 June 2024 announcing the preferred design and opportunity to provide feedback.
Consultation page	A page on Transport's 'Have your say' website was created to capture community feedback via an online survey (https://yoursay.transport.nsw.gov.au/mru). The web page received 926 views with 190 respondents completing the online survey during the display period for the preferred design.
Frequently Asked Questions	A Frequently Asked Questions information sheet was published on the proposal website in June 2024 to provide more detail and provide answers to frequently asked questions from stakeholders and the community about the preferred design display. The information sheet also provided contact details, how to provide feedback on the display and outlined the key steps in the project process.
Face-to-face meetings with property owners	One on one meetings were held with property owners that may potentially be directly affected by the proposal in April 2024.
Social media posts	Two social media posts were published on Transport's Facebook page during the display of the preferred design. Each post was geotargeted to the proposal area and its surrounds for seven days to create awareness of the display period, encouraging users to have their say and included direct links to the project web page and survey respectively. In the seven days from publication the posts had a combined reach of 74,072 users, with 1,362 actions (reactions, comment shares and link clicks).
Toll-free community enquiry number	A dedicated toll-free 1800 telephone number (1800 555 560) has been created to receive and respond to enquiries from the community and interested stakeholders on the proposal.
Project email address	A dedicated email address (mandalongrd@transport.nsw.gov.au) has been created to receive and respond to enquiries from the community and interested stakeholders.

5.2.1 Issues raised by the community

Transport undertook community consultation regarding the preferred design for the overall proposal between 26 June and 4 August 2024, and featured an extended consultation period given it fell over the school holidays (see June 2024 Project Update in Section 5.1). The aim of the consultation was to understand community views and values so that feedback could be considered in further development of the concept design and environmental assessment.

Transport received 202 submissions about a range of issues that are summarised in Table 5-2.

Where appropriate, concerns raised have been addressed in the concept design development or would be further considered in detailed design. Transport will continue to work closely with local residents and stakeholders in relation to the potential impacts of the proposal.

Table 5-2 Summary of issues raised by the community

Issue category	Issue/s raised	Response/where addressed in the REF
Support for the proposal	• Support for traffic signals at the Mandalong Road/ Freemans Drive/Dora Street intersection.	Transport has noted this feedback.
Proposal timeframe	• Comments that the upgrade should already be in place. • Requests to deliver the proposal as soon as possible.	Timing for delivery of the proposal is subject to project approval and the release of further government funding. This REF has been prepared to assess the potential environmental impacts of the proposal and is a key step in the environmental planning and assessment process.
Responsibility of upgrades	• Comments that other parties other than Transport should be responsible for funding and delivery of the proposal.	The project has been funded by the Australian and State governments, and Transport is the agency responsible for delivery. Transport will continue to work with Lake Macquarie City Council to ensure the proposal integrates with any planned projects on local roads, including the upgrade of the Wyee Road/Alliance Avenue intersection. Lake Macquarie City Council has consulted with developers regarding developer contributions/upgrades in the area as part of the development assessment process. Transport continues to consult with Lake Macquarie City Council as development in the area continues.
Alternative options	• Concerns that the proposal is being looked at in isolation, as benefits of the proposal may not be realised unless the proposal scope is increased to include Dora Street up to the Morisset CBD and Mandalong Road up to the M1 Pacific Motorway interchange. • Concerns that the proposal is a short-term solution, a waste of money, an outdated plan that does not meet community needs.	The Australian government and NSW State government are investing $76 million to improve traffic flow and safety for all users, while helping meet the future needs of an increased population and employment in the Morisset area. Transport has modelled a range of options and the preferred design meets the proposal objectives to help improve traffic flow and make the corridor safer for all road users (refer to Section 2.4). The proposal is limited to the proposal area as traffic modelling indicates that the proposed upgrades would improve travel times along Mandalong Road, Freemans Drive, Dora Street and Wyee Road (refer to Section 6.2). The upgrades also aim to improve safety for all road users, including pedestrians and cyclists, and improve active and public transport infrastructure. Transport is continuing to work with Lake Macquarie City Council to help improve the transport networks for Morisset and the surrounding areas. This will ensure Transport is responding to current and potential capacity issues, as well as anticipated changes in land use, population and travel demand across the network. Transport will continue to work with stakeholders to monitor land use changes and other growth factors in the area that may influence the need and timing for a larger upgrade. Feedback on other potential solutions has been passed onto Transport teams to assist with future planning.

Issue category	Issue/s raised	Response/where addressed in the REF
Proposal justification	• Requests to provide a justification for installing traffic lights at the Mandalong Road/Freemans Drive/ Dora Street intersection rather than improving the existing roundabout. • Concerns that installing traffic lights at the intersection would not improve traffic flows, or potentially increase traffic congestion. • Concerns that a roundabout is safer than a signalised intersection. • Concerns that the intersection is currently working efficiently and does not need to be improved. • Suggestions to rather increase capacity of the existing roundabout or install traffic lights to be used during peak hours only.	The Mandalong Road/Freemans Drive/Dora Street currently operates poorly with excessive delays in either or both of the morning and afternoon peak periods, which contributes to increased travel times (refer to Section 6.2.2). Formal walking, cycling and bus infrastructure within the study area is limited, resulting in safety risks for pedestrians, cyclists and bus users (refer to Section 6.2.2). Traffic volumes within the proposal area are expected to increase with the predicted population and employment growth within Morisset and surrounding areas (refer to Section 6.2.3). This is predicted to result in continued poor road network and intersection performance, increased road safety risks for pedestrians, cyclists and public transport users, and increased constructability challenges of future road upgrades associated with working next to/impacting increased traffic volumes (refer to Section 6.2.3). During the strategic assessment, several design options were investigated which included various improvements to the intersection, including installing traffic signals and upgrading the existing roundabout (refer to Section 2.4). Traffic modelling indicates the installation of traffic signals at the intersection would result in a greater reduction in travel time in both the morning and afternoon peak periods in future years than the roundabout improvement options. Traffic signals will optimise traffic movements for each leg of the intersection in the morning and afternoon peaks to improve overall efficiency of the intersection and traffic flows on Mandalong Road, Freemans Drive, Dora Street and Wyee Road. Signalised crossings also provide safer pedestrian and cyclist access and connections to public transport facilities, including Morisset Train Station. Retaining the existing roundabout would introduce new safety risks at the intersection associated with the proposed additional travel lanes and active transport facilities.

Issue category	Issue/s raised	Response/where addressed in the REF
Design and scope – road design	• Suggestions for additional turn lanes and/or dedicated slip lanes at the signalised Mandalong Road/Freemans Drive/Dora Street/ Wyee Road intersection. • Suggestions to increase extent of duplication on Mandalong Road and Dora Street. • Concerns that duplication of Mandalong Road and Dora Street would increase traffic congestion. • Questions about how the proposal would tie in with the Wyee Road/Alliance Avenue intersection upgrade.	During the strategic assessment, traffic modelling analysis was carried out for several different options as discussed above (refer to Section 2.4). Intersections are often the cause of congestion as traffic capacity at intersections is less than along sections of the road with no intersections. As such, intersections are usually targeted first for receiving upgrades to provide increased number of lanes on approach to the intersection and improve flow of traffic in all directions. Full duplication of Mandalong Road and Dora Street may be required in the future. The current preferred design would not constrain any further future duplication from occurring. The preferred design provided a solution that performed well in terms of reducing overall queue lengths and vehicle delays across all legs of the intersection. The preferred design was also determined to be the best solution for supporting predicted future traffic growth in Morisset and providing safer pedestrian and cyclist crossings at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection. The preferred design was selected to minimise impacts to utilities, the environment and adjacent properties, while still achieving desirable safety and efficiency outcomes. Additional lanes would increase the footprint of the proposal and impacts to property and the environment. Lake Macquarie City Council are currently planning to upgrade the Wyee Road/Alliance Avenue intersection. The southbound approach of Wyee Road to the new Wyee Road/Alliance Avenue intersection would be reconfigured from one through lane and one right turn lane to one through and left turn lane and one through and right turn lane to tie into the new two lane roundabout. Detailed information about the proposed road design is provided in Section 3.2.3.
Design and scope – traffic signals	• Requests to coordinate the phasing of the new traffic lights at the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road intersection with traffic lights in Morisset to optimise traffic flow, especially for eastbound traffic to accommodate vehicles travelling from the M1 Pacific Motorway.	The new traffic signals at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection will be coordinated with the existing traffic signals at the Dora Street/Doyalson Street intersection. The existing mid-block crossing in the Morisset CBD operates on demand, so cannot be coordinated with the traffic lights at Mandalong and Wyee Road intersection. Traffic signals will optimise the green signal for each leg in the morning and afternoon peaks to improve overall efficiency of the intersection and traffic flow through the proposal area.

Issue category	Issue/s raised	Response/where addressed in the REF
Design and scope – active transport	• Concerns that pedestrian footpaths are not needed. • Suggestions to include pedestrian footpaths/shared user paths along the southern side of Mandalong Road. • Suggestions to include pedestrian footpaths on Mandalong Road, Freemans Drive, Dora Street and Wyee Road. • Suggestions to provide a shared user path between Morisset Train Station and the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection and pedestrian/cyclist crossings. • Requests to provide on-road cycle lanes on Mandalong Road and Dora Street. • Requests to not provide any on-road cycle lanes to encourage cyclists to use shared user paths. • Requests to provide sufficient lighting along pedestrian footpaths.	A key objective of the proposal is to upgrade active transport infrastructure along Mandalong Road. These improvements will help provide multi-modal options that support a shift to more sustainable modes of transport. The proposal includes an off-road shared user path between Ourimbah Street and Gimberts Road, which would provide safe connections for pedestrians and cyclists. The shared user path then extends south on the eastern side of Wyee Road, to tie into the proposed Alliance Avenue/Wyee Road intersection upgrades delivered by Lake Macquarie City Council. These upgrades will cater for east-west pedestrian movements and pedestrian movements from Wyee Road into the Morisset Business Park. The off-road shared user path continues on the northern side of Mandalong Road between Wyee Road and Gimberts Road. This would improve active transport connections between Morisset Train Station and new developments in the area. The approved development application for the Cedar Mill event site development along the southern side of Dora Street includes a consent condition to construct a shared user path from Ourimbah Street to Morisset train station. The shared user path will include street lighting for user safety. Detailed information about the proposed active transport improvements is provided in Section 3.2.3.
Design and scope – public transport	• Suggestions to provide dedicated bus lanes. • Questions about whether event buses through the proposal area have been considered in the design. • Requests to change the location of bus stops.	There are currently four active bus routes operating within the proposal area, being bus route numbers 95, 278, 280 and 281 (refer to Section 6.2.2). Given the infrequent bus movements through the proposal area as well as the highly constrained corridor, dedicated bus lanes were not considered a feasible inclusion as part of the upgrades. Events at the Cedar Mill event site would be required to operate under their approval conditions and require a Construction Traffic Management Plan to ensure patrons and motorists safely interact during events. The proposal would provide two new bus stops, including bus shelters, on Dora Street. Transport will consult with bus service providers as the proposal progresses. Detailed information about the proposed public transport improvements is provided in Section 3.2.3.
Design and scope – road safety	• Requests to provide education to motorists to safely drive through the upgraded proposal area. • Requests to provide safety measures, such as speed cameras, as part of the proposal.	The proposed upgrades would include standard NSW directional signage as well as way finding signage to ensure motorists are able to safely navigate the upgraded intersections. Decisions on cameras to be installed within the proposal area are still to be determined. Closed-circuit television (CCTV) cameras are planned to be mounted to the new traffic control signals to monitor traffic flows and assist in the reporting on incidents.

Issue category	Issue/s raised	Response/where addressed in the REF
Alternative options	• Concerns that the proposal is being looked at in isolation, as benefits of the proposal may not be realised unless the proposal scope is increased to include Dora Street up to the Morisset CBD and Mandalong Road up to the M1 Pacific Motorway interchange. • Concerns that the proposal is a short-term solution, a waste of money, an outdated plan that does not meet community needs.	The Australian government and NSW State government are investing $76 million to improve traffic flow and safety for all users, while helping meet the future needs of an increased population and employment in the Morisset area. Transport has modelled a range of options and the preferred design meets the proposal objectives to help improve traffic flow and make the corridor safer for all road users (refer to Section 2.4). The proposal is limited to the proposal area as traffic modelling indicates that the proposed upgrades would improve travel times along Mandalong Road, Freemans Drive, Dora Street and Wyee Road (refer to Section 6.2). The upgrades also aim to improve safety for all road users, including pedestrians and cyclists, and improve active and public transport infrastructure. Transport is continuing to work with Lake Macquarie City Council to help improve the transport networks for Morisset and the surrounding areas. This will ensure Transport is responding to current and potential capacity issues, as well as anticipated changes in land use, population and travel demand across the network. Transport will continue to work with stakeholders to monitor land use changes and other growth factors in the area that may influence the need and timing for a larger upgrade. Feedback on other potential solutions has been passed onto Transport teams to assist with future planning.
Construction impacts		
Biodiversity	• Requests for a wildlife corridor to be established. • Concerns about how the proposal would impact on biodiversity measures implemented by approved developments in the area.	A BAR has been prepared for the proposal (refer to Appendix D) that considers the proposal's impact on biodiversity matters, including native flora and fauna, and identifies safeguards and management measures to mitigate these impacts. This includes the implementation of a Fauna Connectivity Strategy (refer to Section 6.1) to allow for wildlife movement through the proposal area. Transport will liaise with key stakeholders as the proposal progresses to address potential impacts on biodiversity measures implemented by approved developments.
Traffic	• Requests for more information on potential impacts to traffic and proposed management measures during construction. • Concerns that the proposal would result in increased congestion and delays during peak hours during construction.	Potential traffic impacts during construction of the proposal are discussed in Section 6.2.3 and safeguards and management measures to mitigate these impacts are provided in Section 6.2.4. Construction traffic, temporary lane configuration changes and temporary speed limit reductions would likely lead to increased travel times on the road network within and surrounding the proposal area during construction. To minimise these impacts, traffic control measures will be implemented to manage and regulate traffic movement during construction and some works will be undertaken outside of standard construction working hours. Transport will keep the community updated of potential traffic impacts throughout construction.

Issue category	Issue/s raised	Response/where addressed in the REF
Landscape character and visual amenity	• Requests for landscaping to be incorporated into the proposal area. • Requests to remove existing vegetation that obstructs views of oncoming traffic.	An Urban Design Concept and Landscape Strategy has been developed for the proposal to integrate the proposal physically and visually into the existing environment (refer to Appendix G). The strategy includes urban design direction for elements of the proposal, including materials and landscaping with native species. The Urban Design Concept and Landscape Strategy would consider Transport's Tree and hollow replacement guidelines (Transport for NSW, 2023a), which specifies replacement requirements for trees to be removed.
Socio-economic	• Request to retain informal parking on the southern side of Dora Street west of Ourimbah Street to allow the community to advertise private vehicles for sale.	It is the responsibility of Lake Macquarie City Council to manage informal parking in the Morisset area.
Land use and property	• Questions about property acquisition and associated impacts on businesses and land use.	Transport has met with all impacted property owners to discuss the proposed upgrade in order to better understand potential impacts. Potential impacts on private property and businesses are discussed in sections 6.5 and 6.9.
Hazard and risk	• Comments in relation to potential impacts on stormwater, electricity and water utilities.	Utilities potentially affected by the proposal are outlined in Section 3.5. Potential impacts on utilities are discussed in Section 6.11.3, and safeguards and management measures to minimise these impacts are provided in Section 6.11.4. Transport will liaise with utility providers and impacted property owners as the concept design progresses to determine any utility adjustments required.

Issue category	Issue/s raised	Response/where addressed in the REF
Operational impacts		
Traffic – congestion and parking	• Concerns that the proposal may result in congestion at the western and/or eastern ends of the proposal, being the M1 Pacific Motorway interchange and Dora Street up to the Morisset CBD. • Concerns about the potential impacts of the proposal on the performance of the local road network. • Concerns that the installation of traffic lights at the Mandalong Road/Freemans Drive/Dora Street/ Wyee Road intersection and additional lanes on Wyee Road would increase congestion at the Alliance Avenue/Wyee Road intersection. • Concerns that the proposal would result in congestion along Wyee Road and Freemans Drive on approach to the Mandalong Road/Freemans Drive/Dora Street/ Wyee Road intersection. • Concerns that motorists would use local roads, including Gimberts Road, Wyee Road and Alliance Avenue, as a rat run to avoid congestion on the State roads Mandalong Road and Dora Street, resulting in safety risks. Questions were raised about how the proposal would encourage motorists to use the State road network rather than local roads. • Concerns about the potential impacts of increased traffic and parking demand associated with future growth in the area, including commercial developments currently being constructed along Gimbers Road and Dora Street (Cedar Mills event site).	Traffic modelling indicates the proposal would improve traffic flow and reduce congestion along Mandalong Road, Freemans Drive, Dora Street and Wyee Road in both directions, and at the Alliance Avenue/Wyee Road intersection (refer to Section 6.2.3). Traffic modelling also indicates the proposal would significantly improve traffic performance of the broader road network (refer to Section 6.2.3). The existing road network within and around the proposal includes a combination of State roads and local roads. The installation of traffic signals at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection would provide a safe and efficient intersection for road users. Traffic modelling carried out as part of the design development indicates that travel times will be reduced on Mandalong Road and Dora Street, which would encourage motorists to use State roads rather than local roads. Transport has worked closely with Lake Macquarie City Council during the development of the preferred design to ensure the future growth of the area is catered for. All known developments near the proposal area have been included in the traffic modelling used to arrive at the preferred design. Transport acknowledges there is further improvements to be done in and surrounding the Morisset area. Transport will continue to work with the Australian government, Lake Macquarie City Council, developers, and other State governments agencies to plan, develop and secure funding for future investments in the transport network. Events at the Cedar Mill event site would be required to operate under their approval conditions and require a Construction Traffic Management Plan relevant to each individual event. This is to ensure patrons and motorists safely interact during events and impact to the non-event community is minimised.
Traffic – heavy vehicles	• Concerns that the upgraded Mandalong Road, Freemans Drive, Dora Street and Wyee Road would not be suitable for heavy vehicles.	The Mandalong Road, Dora Street, Freemans Drive and Wyee Road currently form part of a dedicated B-double route. The proposal has been designed in consideration of heavy vehicles, including B-doubles and oversized vehicles.

Issue category	Issue/s raised	Response/where addressed in the REF
Traffic – informal parking	• Concerns about the loss of informal parking at the intersection of Mandalong Road and Freemans Drive, as these areas are used by heavy vehicle drivers (as informal rest areas) and food trucks.	It is the responsibility of Lake Macquarie City Council to manage informal parking in the Morisset area. Food truck vendors will be consulted before the construction of the proposal. Transport has started discussions with Lake Macquarie City Council to help determine the potential impacts to licensing agreements for food truck vendors, and options to alleviate impacts as well as any required changes to license agreements.

5.2.2 Issues raised by impacted property owners

Following the community consultation period, Transport has undertaken further consultation with impacted property owners during August 2024, including residents, businesses, developers, Biraban LALC, NSW Ambulance and Lake Macquarie City Council. The issues raised by these stakeholders and responses to the issues raised are summarised in Section 2.3.2 of Appendix H.

5.3 Aboriginal community involvement

An Aboriginal heritage assessment was undertaken for the proposal in accordance with the PACHCI process. Effective consultation with Aboriginal people is an important step in the process of identifying and minimising cultural heritage impacts. A summary of the four stages of the PACHCI procedure is provided in Table 5-3.

Table 5-3 Summary of Transport's PACHCI stages (Roads and Maritime, 2011)

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

A Stage 1 PACHCI assessment has been completed for the proposal (refer to Section 6.12). The assessment found that the proposal is unlikely to harm known Aboriginal objects or places, and the proposal may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

Consultation with Biraban LALC was undertaken for the proposal as they are the responsible LALC for the Morisset area. Consultation undertaken to date with Biraban LALC is summarised in Section 5.2.2) and will be ongoing as the proposal progresses.

5.4 SEPP (Transport and Infrastructure) consultation

Clause 2.10 to 2.16 of the SEPP (Transport and Infrastructure) specify the requirements for consultation with councils and other public authorities for infrastructure development carried out by or on behalf of a public authority. Consultation is required in relation to specified development that impacts on:

- council related infrastructure or services (clause 2.10)
- local heritage (clause 2.11)
- flood liable (clause 2.12 and 2.13)
- coastal zone (clause 2.14)
- public authorities other than councils (clause 2.15).

Appendix B contains a SEPP (Transport and Infrastructure) consultation checklist that documents how SEPP (Transport and Infrastructure) consultation requirements have been considered. Key issues identified for the proposal that require consultation with councils and other public authorities under the SEPP (Transport and Infrastructure) include:

- the works are likely to generate traffic to an extent that will impact the capacity of the existing road system
- the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which Lake Macquarie City Council is the roads authority
- the works involve the installation of a temporary structure on, or the enclosing of, a public place that is under Lake Macquarie City Council's management or control, that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential
- the works would take place on land susceptible to flooding during the Probable Maximum Flood (PMF)
- the works would take place on land in a mine subsidence district.

Transport has consulted with the following agencies about the proposal in accordance with the SEPP (Transport and Infrastructure):

- Lake Macquarie City Council has been consulted with on 20 August 2024, as per the requirements of clause 2.10 of SEPP (Transport and Infrastructure)
- NSW State Emergency Service (SES) has been consulted with on 20 August 2024, as per the requirements of clause 2.13 of SEPP (Transport and Infrastructure)
- Subsidence Advisory NSW has been consulted with on 20 August 2024, as per the requirements of clause 2.15 of SEPP (Transport and Infrastructure).

Issues that have been raised as a result of SEPP (Transport and Infrastructure) consultation are outlined in Table C-1, Table C-2 and Table C-3 in Appendix C.

5.5 Government agency and stakeholder involvement

Various key government agencies and stakeholders have been consulted about the Proposal, including:

- Lake Macquarie City Council: Transport has provided Lake Macquarie City Council with a number of face to face briefings regarding the development of the proposal before, during and after SEPP (Transport and Infrastructure) consultation. Regular meetings have been held since November 2023 between Transport and Lake Macquarie City Council.
- Members of Parliament: Briefings to government officials at State and Federal levels have occurred throughout the development of the proposal.
- Residents and road users: Consultation with residents and road users has taken place during and after the 'Have Your Say' community engagement period.
- Internal Transport stakeholders: Input was provided during the options assessment phase and during the refinement of the proposal design.
- Government agencies: Department of Infrastructure, Transport, Regional Development, Communications and the Arts.
- Utility providers, including AusGrid, NBN, Optus, Jemina, Hunter Water and Telstra.

The outcomes of the consultation to date have been described in this chapter and earlier sections of this REF. Consultation will be ongoing with all the stakeholders noted above as the proposal design progresses and would continue prior to and during construction.

5.6 Ongoing or future consultation

Transport will continue to inform and seek feedback from the community and key stakeholders as the proposal progresses, including during detailed design and construction.

The community would continue to be updated prior to and during construction, including notification of road closures or night works in advance of the works occurring. Direct consultation would continue with affected landholders and stakeholders throughout construction. To effectively manage consultation during the construction stage of the proposal, a Communication Plan would be developed and implemented by the construction contractor.

6. Environmental assessment

This chapter 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 MNES under the EPBC Act.
- The factors specified in the Guideline for Division 5.1 assessments (DPE, 2022b) 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 measures are provided to mitigate the identified potential impacts.

6.1 Biodiversity

The potential impacts on biodiversity during construction and operation of the proposal are assessed in the Biodiversity Assessment Report (BAR) provided in Appendix D. The findings of the report are summarised in this section.

6.1.1 Methodology

The methodology for the BAR involved the following:

- a desktop review of relevant databases and previous investigations, to understand the existing environment and obtain records of Commonwealth and State listed threatened species, populations and ecological communities, and important habitat for migratory species and areas of outstanding biodiversity value known or predicted to occur within a 10 kilometre radius of the proposal area (the study area for the assessment). The list of databases and information sources reviewed are outlined in section 2.2 of Appendix D
- habitat suitability assessment, to assess the likelihood of occurrence for threatened and migratory species, populations and communities, following the collation of database records and species and community profiles
- field inspections of the study area from August to November 2024 in accordance with the Biodiversity Assessment Method (BAM) (NSW Department of Planning, Industry and Environment (DPIE), 2020) and threatened biodiversity survey guidelines, to identify and assess biodiversity values, including vegetation surveys, a hollow-bearing tree assessment, targeted threatened flora and fauna surveys and habitat assessments (refer to Field surveys section below)
- an assessment of significance for threatened species, populations and ecological communities positively identified during surveys or that are considered to have a moderate or high likelihood of occurring in the study area
- identifying potential impacts to biodiversity values during construction and operation of the proposal
- recommending safeguards and management measures, as well as the need for offsets.

Further detail about the methodology is provided in section 2 of Appendix D. The study area for the assessment is shown in Figure 6-1.

Field surveys

Field investigations undertaken for the assessment included:

- vegetation mapping surveys, including plot-based surveys in accordance with the BAM, to map and classify the vegetation into plant community types (PCTs) and condition classes
- targeted threatened flora surveys within the study area on 6 and 8 August, between 27 and 30 August, on 30 September, between 2 and 3 October, and on 11 October 2024 and 18 November 2024, including BAM vegetation plot surveys, random meander and parallel line transects
- targeted fauna surveys for threatened species considered to have a moderate or higher likelihood of occurrence within the study area between 27 and 30 August 2024, and between 30 September and 4 October 2024, including diurnal bird surveys, nocturnal surveys, and culvert inspections and Anabat surveys to identify presence of bats
- fauna habitat assessments, including:
  - identification and measurement of any hollow-bearing trees, including hollow size and height, to determine habitat suitability for several fauna species
  - aquatic habitat assessment of aquatic/riparian habitat within the study area
- recording of any other native fauna species that were opportunistically detected during the surveys.

6.1.2 Existing environment

Landscape context

The landscape context of the study area, which includes the proposal area and surrounding area surveyed, is described in Table 6-1.

Table 6-1 Landscape features

Landscape feature	Subject land
Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and subregion	The proposal is located within the Wyong subregion of the Sydney Basin bioregion.
NSW landscape regions (Mitchell landscapes)	The Gosford - Cooranbong Coastal Slopes landscape region covers the study area, which is described as the coastal fall of the Sydney Basin, rolling hills and sandstone plateau outliers of Triassic Narrabeen sandstones, extensive rock outcrop and low cliffs along ridge margins, with general elevation 0 to 75 m. Texture-contrast soils on lithic sandstones and shales. Loamy sand alluvium along creeks. Organic sand and mud in lagoons and swamps. Open forest and woodland of smooth-barked apple (*Angophora costata*), red bloodwood (*Corymbia gummifera*), brown stringybark (*Eucalyptus capitellata*), Sydney peppermint (*Eucalyptus piperita*), spotted gum (*Corymbia maculata*), bastard mahogany (*Eucalyptus carnea*),northern grey ironbark (*Eucalyptus siderophloia*) and grey gum (*Eucalyptus punctata*) on hills and slopes. Small areas of closed forest with turpentine (*Syncarpia glomulifera*), lilly pilly (*Acmena smithii*), mountain cedar wattle (*Acacia elata*), coachwood (*Ceratopetalum apetalum*), sassafras (*Doryphora sassafras*) and water gum (*Tristaniopsis laurina*) in gullies under high escarpments Prickly-leaved tea-tree (*Melaleuca stypheliodes*) and other shrubs with swamp mahogany (*Eucalyptus robusta*), swamp oak (*Casuarina glauca*), sedges and common reed (*Phragmites australis*) on swampy creek flats. Coastal heath subject to salt spray on headlands.
Local Government Area (LGA)	Lake Macquarie.
Native vegetation extent in the buffer area	Native vegetation cover has been identified as 66 per cent (%) within the biodiversity study area.
Cleared areas	Cleared areas are associated with infrastructure and recreation facilities within the suburb of Morisset.
Rivers and watercourses	Mullards Creek intersects the proposal area underneath Mandalong Road.

Landscape feature	Subject land
Wetlands	There are no wetlands or coastal wetlands mapped within the study area.
Connectivity features	Native vegetation on the north-eastern side of the existing Mandalong Road/ Freemans Drive/Dora Street/Wyee Road roundabout has some broken connectivity south to a large patch of remnant native vegetation association with Pourmalong Creek, Morisset.
Areas of Geological Significance and Soil Hazard Features	There are no areas identified to have geological significance or soil hazard features.
Areas of outstanding biodiversity value	None present.
Key fish habitat	There is no key fish habitat mapped within the study area.

Native and non-native vegetation

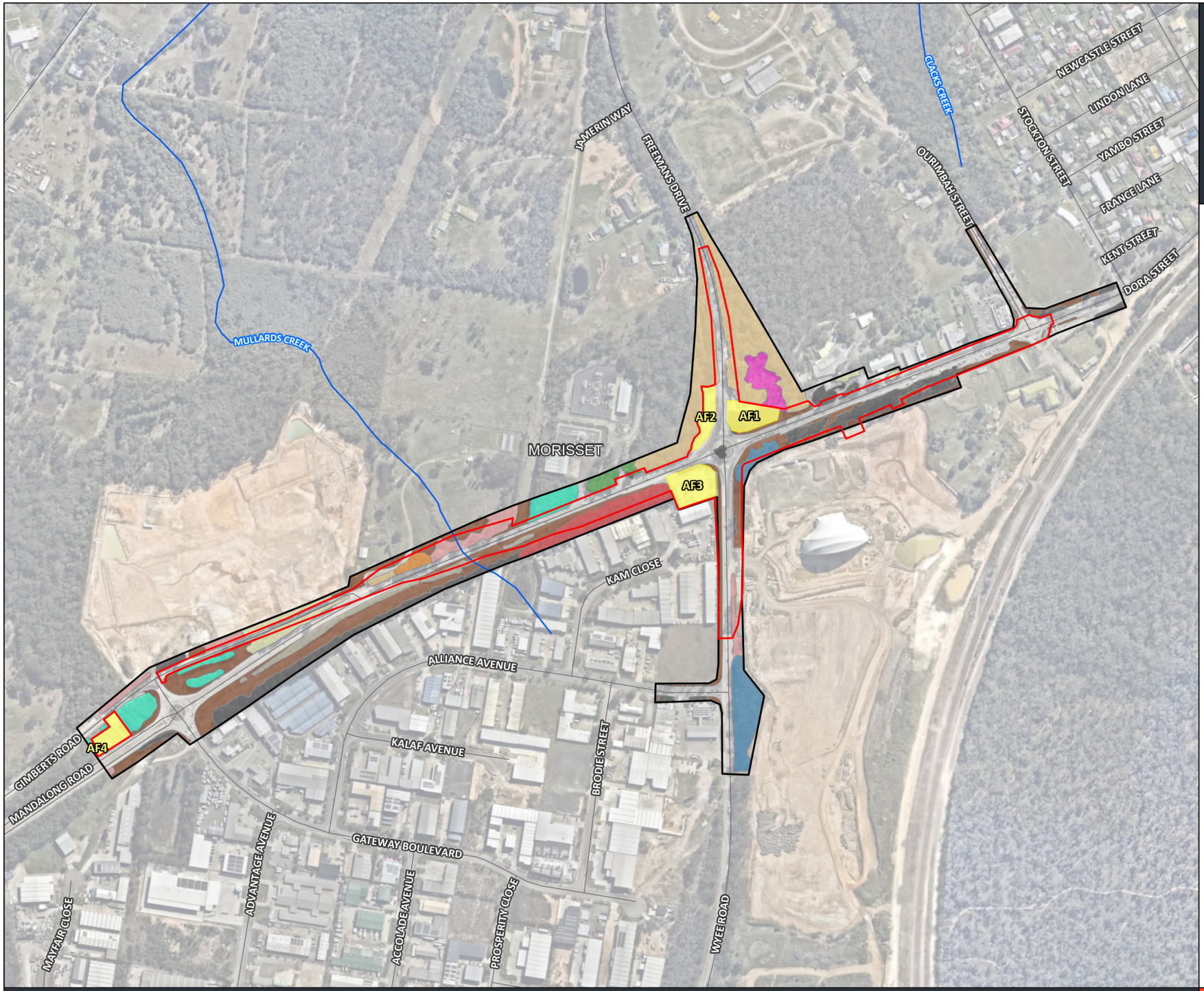
Four PCTs and four miscellaneous ecosystems (planted native trees, regrowth native shrubs, exotic grassland, planted exotic trees) have been identified within the study area. These PCTs and miscellaneous ecosystems are summarised in Table 6-2 and shown in Figure 6-1.

Table 6-2 Plant community types

PCT	Condition class[1]	Area in proposal area (hectares (ha))	Area in study area (ha)
PCT 3583: Hunter Coast Lowland Scribbly Gum Forest[2]	Good	0.36	2.46
PCT 3583: Hunter Coast Lowland Scribbly Gum Forest	Regrowth	0.02	0.24
PCT 3998 Lower North Creekflat Mahogany Swamp Forest	Good	0.01	0.13
PCT 3998 Lower North Creekflat Mahogany Swamp Forest	Moderate	0.23	0.46
PCT 3998 Lower North Creekflat Mahogany Swamp Forest	Planted native vegetation	0.25	0.53
PCT 4042 Lower North Riverflat Eucalypt Paperbark Forest	Moderate	0.08	0.08
PCT 4020 Coastal Creekflat Layered Grass Sedge Forest	Good	0.03	0.51
Total extent of native vegetation		**0.98**	**4.41**
Miscellaneous Ecosystem: Planted Native Trees	N/A	0.41	1.31
Miscellaneous ecosystem: Regrowth Native Shrubs	N/A	0.03	0.33
Miscellaneous ecosystem: Exotic Grassland	N/A	1.09	2.87
Miscellaneous ecosystem: Planted Exotic Trees	N/A	0.12	0.35
Total extent of non-native vegetation		**1.65**	**4.86**
Total extent of native and non-native vegetation		**2.63**	**9.27**

(1) Based on current broad condition, management regimes, species composition and structure.

(2) No access was available to PCT 3583 at the corner of Mandalong Road and Wyee Road and the southern section of Wyee Road. Therefore, these areas have conservatively been assumed to be in good condition.



Mandalong Road Upgrade

Figure 6-1

Native and non-native vegetation

Legend

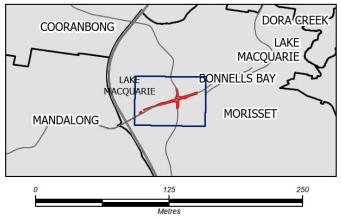
- Subject Land (Proposal area)
- Ancillary facility
- Study area
- Road
- Watercourse

Miscellaneous ecosystems

- Exotic grassland
- Regrowth native shrubs
- Planted exotic trees and shrubs
- Planted native trees

Plant community types

- PCT 3583: Hunter Coast Lowland Scribbly Gum Forest, Good
- PCT 3583: Hunter Coast Lowland Scribbly Gum Forest, Not ground truthed
- PCT 3583: Hunter Coast Lowland Scribbly Gum Forest, Regrowth
- PCT 3998: Lower North Creek Flat Mahogany Swamp Forest, Good
- PCT 3998: Lower North Creek Flat Mahogany Swamp Forest, Moderate
- PCT 3998: Lower North Creek Flat Mahogany Swamp Forest, Planted Native Vegetation
- PCT 4020: Coastal Creekflat Layered Grass Sedge Forest, Good
- PCT 4042: Lower North Riverflat Eucalypt Paperbark Forest, Moderate



Coordinate system: GDA2020 MGA Zone 56

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Date: 4/12/2024

GDA 2020

Data sources: Geoscience Australia, Nearmap, NSWSS

Threatened ecological communities

Two TECs listed under the BC Act occur in the study area that corresponds to three PCTs within the study area. One TEC listed under the EPBC Act occurs in the study area that corresponds to two PCTs within the study area. These TECs are summarised in Table 6-3 and shown in Figure 6-2.

Table 6-3 TECs listed under the BC Act and EPBC Act recorded in the study area

TEC	PCT	Condition class	Area (ha) in proposal area	Area (ha) in study area
BC Act				
Swamp Sclerophyll Forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act)	PCT 3998 Lower North Creekflat Mahogany Swamp Forest	Good	0.01	0.13
		Moderate	0.23	0.46
	PCT 4020 Coastal Creekflat Layered Grass Sedge Forest	Good	0.03	0.51
Total extent			**0.27**	**1.1**
River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act)	PCT 4042 Lower North Riverflat Eucalypt Paperbark Forest	Moderate	0.08	0.08
Total extent			**0.08**	**0.08**
EPBC Act				
Coastal Swamp Sclerophyll Forest of NSW and South East Queensland (listed as endangered under the EPBC Act)	PCT 3998 Lower North Creekflat Mahogany Swamp Forest	Good	0.01	0.13
	PCT 4020 Coastal Creekflat Layered Grass Sedge Forest	Good	0.03	0.51
Total extent			**0.04**	**0.64**

Threatened flora

A total of 29 threatened flora species listed under the BC Act and/or EPBC Act are known or predicted to occur within or near the study area. Ten of these species were considered to have a moderate or higher likelihood to occur within the study area and were identified as candidate species for targeted threatened flora surveys. Two threatened flora species, *Angophora inopina* (Charmhaven Apple) and *Tetratheca juncea* (Black-eyed Susan), both listed as vulnerable in the BC Act and EPBC Act, were recorded within the study area during field surveys.

The location of threatened flora species recorded in the study area is shown in Figure 6-2.

Mandalong Road Upgrade

Figure 6-2

Threatened flora species and Threatened Ecological Communities recorded within the study area

Legend

- Proposal area
- Ancillary facility
- Study area
- Watercourse
- Road

Threatened flora species

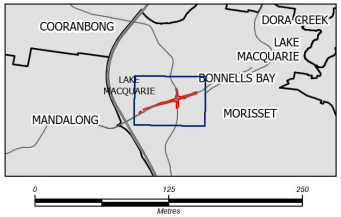
- *Angophora inopina* - Vulnerable (BC Act & EPBC Act)
- *Tetratheca juncea* - Vunerable (BC Act & EPBC Act)

Threatened ecological community (BC Act)

- Swamp Sclerophyll Forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (Endangered)
- River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (Endangered)

Threatened ecological community (EPBC Act)

- Coastal Swamp Sclerophyll Forest of NSW and South East Queensland (Endangered)



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Date: 12/11/2024

GDA 2020

Data sources: Geoscience Australia, Nearmap, NSWSS

Threatened fauna

The results of the habitat likelihood of occurrence assessments identified 87 threatened fauna species listed under the BC Act and/or EPBC Act that are known or predicted to occur within or near the study area. Twenty-one of these species were considered to have a moderate or higher likelihood to occur within the study area and were identified as candidate species for targeted threatened flora surveys.

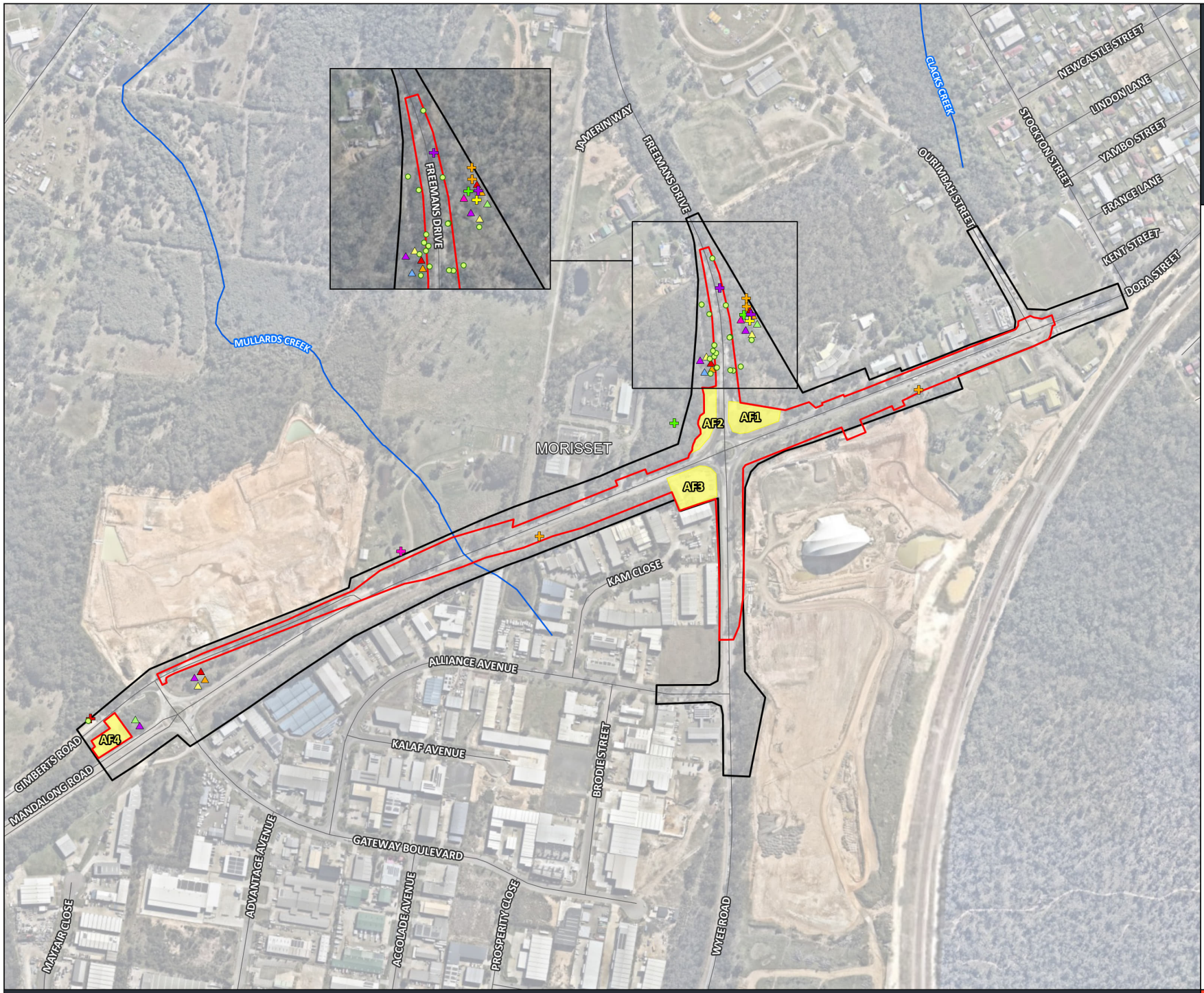
Twelve threatened fauna species (four bird and eight mammal species) were recorded within the study area. Two additional threatened fauna species, the Swift Parrot (*Lathamus discolor*) and Squirrel Glider (*Petaurus norfolcensis*), have been assumed as present within the study area as potential foraging and breeding habitat for these species has been identified within the study area.

Table 6-4 provides a summary of threatened fauna species that have been recorded or assumed present within the study area. The location of these species within the study area is shown in Figure 6-3.

Table 6-4 Threatened fauna species recorded during field surveys

Species name	EPBC Act	BC Act	Location recorded
Birds			
Varied Sitella (Daphoenositta chrysoptera)	Not listed	Vulnerable	The Varied Sitella was recorded on two occasions within the northern portion of the study area, to the east of Freemans Drive. The species is likely to use forested habitat within the study area and immediate locality.
a. Little Lorikeet (*Glossopsitta pusilla*)	Not listed	Vulnerable	The Little Lorikeet was recorded on four occasions in the study area, to the east of Freemans Drive, and to the south of Dora Street and Mandalong Road. The species is likely to use forested habitat, including the planted native vegetation containing blossoming trees, that represent foraging habitat and potential breeding habitat for the species within the study area and immediate locality.
b. Little Eagle (*Hieraaetus morphnoides*)	Not listed	Vulnerable	The Little Eagle was recorded flying over exotic grassland to the north of Mandalong Road. No breeding habitat in the form of stick nests or other breeding behaviours were noted. This species is likely to use foraging habitat within the study area and immediate locality.
Powerful Owl (*Ninox strenua*)	Not listed	Vulnerable	The Powerful Owl was recorded in two locations within PCT 3583. No hollows greater than 20 centimetres (cm) diameter were recorded within the study area. The Ring-tailed Possum was commonly recorded during spotlighting surveys, which is a prey species for the Powerful Owl. This species is likely to use foraging habitat within the study area and immediate locality.
Swift Parrot (*Lathamus discolor*)	Critically endangered	Critically endangered Serious and Irreversible Impact (SAII) entity	While not recorded within the study area during the field surveys, Important Habitat for the Swift Parrot occurs within the study area and proposal area and as a result this species is assumed to be present as a species credit species.

Species name	EPBC Act	BC Act	Location recorded
Microbats			
Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)	Not listed	Vulnerable	Acoustically recorded within the study area. Woodland habitats within the study area provide potential foraging, roosting and breeding opportunities for these species, due to the insect populations they attract and support and presence of hollow-bearing trees.
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	Not listed	Vulnerable	
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	Not listed	Vulnerable	
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	Not listed	Vulnerable	
Eastern Cave Bat (*Vespadelus troughtoni*)	Not listed	Vulnerable	Acoustically recorded within the study area. Woodland habitats within the study area provide potential foraging opportunities for these species, due to the insect populations they attract and support. There is an absence of roosting and breeding habitat for these species within the study area.
Little Bent-winged Bat (*Miniopterus australia*)	Not listed	Vulnerable	
Large Bent-winged Bat (*Miniopterus Orianae oceanensis*)	Not listed	Vulnerable	
Southern Myotis (*Myotis macropus*)	Not listed	Vulnerable	
Mammals excluding microbats			
Grey-headed Flying Fox (*Pteropus poliocephalus*)	Vulnerable	Ecosystem/ Species	The Grey-headed Flying Fox was recorded foraging within the study area. No evidence of breeding habitat (i.e. camps) was recorded within the study area throughout the survey program.
Squirrel Glider (*Petaurus norfolcensis*)	Not listed	Vulnerable	While not recorded within the study area during the field surveys, potential foraging and breeding habitat for the Squirrel Glider occurs within the study area and proposal area. This species also has previously been recorded within the study area. As a result, this species is assumed to be present as a species credit species.



Mandalong Road Upgrade

Figure 6-3

Threatened fauna and hollow bearing trees recorded within the study area

Legend

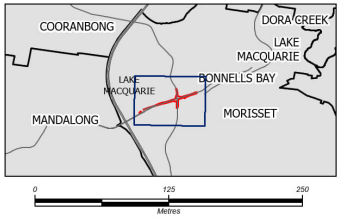
- Proposal area
- Ancillary facility
- Study area
- Road
- Watercourse
- Hollow-bearing tree

Threatened fauna species (mammals and birds)

- Grey-headed Flying Fox - Vulnerable (BC Act & EPBC Act)
- Little Eagle - Vulnerable (BC Act)
- Little Lorikeet - Vulnerable (BC Act)
- Powerful Owl - Vulnerable (BC Act)
- Varied Sittella - Vulnerable (BC Act)
- Squirrel Glider - Vulnerable (BC Act)

Threatened fauna species (microbats)

- Eastern Cave Bat – Vulnerable (BC Act)
- Eastern False Pipistrelle – Vulnerable (BC Act)
- Southern Myotis – Vulnerable (BC Act)
- Greater Broad-nosed Bat – Vulnerable (BC Act)
- Little Bent-winged Bat – Vulnerable (BC Act)
- Large Bent-winged Bat – Vulnerable (BC Act)
- Eastern Coastal Free-tailed Bat – Vulnerable (BC Act)



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GDA 2020

Data sources: Geoscience Australia, Nearmap, NSWSS

Hollow-bearing trees

Nineteen hollow-bearing trees were recorded within the study area, of which nine are located within the proposal area.

Wildlife connectivity corridors

Wildlife habitat within the study area and surrounding area are largely fragmented as a result of vegetation clearing associated with urban development, the existing road and rail network, including the M1 Pacific Motorway and Central Coast and Newcastle Railway Line, and transmission line easements.

Native vegetation within the north of the study area has retained some connectivity to the west, north and east to remnant patches of native vegetation associated with rural and forested areas. Since the existing road corridor is relatively narrow, there is the potential for ground level fauna movement across the proposal area, however it presents a considerable hazard to wildlife movement. The existing road corridor also presents a hazard for the movement of arboreal (living in trees) species, as the tree canopy does not close over the road at any location within the study area and the gap between adjacent tree cover varies between 10 to 35 metres.

One species that has been recorded moving through the landscape within the Morisset area is the Squirrel Glider (*Petaurus norfolcensis*), a small nocturnal arboreal marsupial, listed as vulnerable under the BC Act. Within the Lake Macquarie LGA the squirrel glider population is widely distributed and forms part of a larger population, the full extent of which is unclear.

Remnant vegetation areas in the locality of the proposal that is used by the Squirrel Glider include:

- continuous areas of open and shrubby woodlands and forests to the south and east of the Central Coast and Newcastle Railway Line
- to the south of the proposal area and west of the Central Coast and Newcastle Railway Line, from Wyee Road to the M1 Pacific Motorway
- north-west of the M1 Pacific Motorway to lower ridges of the Watagan Mountain that are dominated by sclerophyllous forests
- to the north-east of the proposal area within woodlands associated with Clack's Creek and Dora Creek within Morisset, and to the north-west near Gimberts Road.

Existing Squirrel Glider movement opportunities associated with the proposal area include:

- Freemans Drive: Wooded vegetation suitable for Squirrel Glider movements and habitation is located on both the eastern and the western sides of Freemans Drive.
- Mandalong Road and Gimberts Road: Vegetation from the western side of Freemans Drive extends west through the Ausgrid substation site along the northern side of Mandalong Road and Gimberts Road. Connectivity opportunities across Mandalong Road are limited due to large gaps in patches of vegetation and insufficient tree height.
- Wyee Road: There is no native tree canopy along the western side of Wyee Road within the proposal area. Native tree canopy along the eastern side of Wyee Road within the proposal area has largely been removed by the Cedar Mill event site development (south of Dora Street and east of Wyee Road). A series of glider poles has been installed to provide connectivity to trees along Dora Street and the eastern and western sides of Wyee Road south of Alliance Avenue.
- Dora Street: Native tree canopy within the former Morisset Golf Course has largely been removed by the Cedar Mill event site development, apart from roadside trees along the southern side of Dora Street. A number of glider poles has been installed along the southern side of Dora Street to provide connectivity between native vegetation to the south of Dora Street and native vegetation to the north of Dora Street. There is currently a single crossing opportunity for Squirrel Gliders across Dora Street associated with a remnant patch of woodland around 70 metres east of the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection. Since the vegetation on the northern side of the road is somewhat shorter than the planted trees on the southern side of the road, it is likely that movements from the south to the north might be more easily accomplished than movements from the north to the south. This crossing is identified as a key crossing and connection point for the local Squirrel Glider population.

Groundwater dependent ecosystems

Groundwater Dependent Ecosystems (GDEs) are defined as ecosystems that require access to groundwater to meet all or some of their water requirements in order to maintain the communities of plants and animals, ecological processes they support, and ecosystem services they provide (NSW Department of Land and Water Conservation (DLWC), 2002). The GDE Atlas (Bureau of Meteorology (BoM), 2024) maps locations of potential and known GDEs according to the following categories:

- aquatic GDE: ecosystems that potentially rely on the surface expression of groundwater, such as rivers, wetlands and springs
- terrestrial GDE: ecosystems that potentially rely on subsurface (shallow) groundwater, such as vegetation ecosystems
- subterranean GDE: ecosystems that potentially rely on the subterranean presence of groundwater, such as cave and aquifer ecosystems.

PCT 3583 (Hunter Coast Lowland Scribbly Gum Forest) is considered a low potential terrestrial GDE within the study area (BoM, 2024), that is occasionally reliant on groundwater in times of drought.

PCT 4020 (Coastal Creekflat Layered Grass Sedge Forest), PCT 4042 (Lower North Riverflat Eucalypt Paperbark Forest) and PCT 3998 (Lower North Creekflat Mahogany Swamp Forest) are not identified as having potential to be GDEs (Bureau of Meteorology 2024). However, these PCTs are all broadly classed as forested wetlands and are considered to be aquatic or terrestrial GDEs, dependent on where they are situated in the landscape.

The GDE Atlas (BoM, 2024) identifies moderate potential GDEs on the north-eastern and north-western sides of the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection, in the location of PCT 3583.

No subterranean GDEs were identified within the study area.

Aquatic habitat

Mullards Creek traverses the central section of the proposal area around 350 metres west of the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection. The creek flows towards Stockton Creek, around 1.2 kilometres north of the proposal area, which then drains into Dora Creek. Mullards Creek is not mapped as key fish habitat (NSW Department of Primary Industries (DPI), 2024), and is not considered likely to provide habitat for any threatened aquatic species listed under the FM Act. The nearest mapped key fish habitat is located around 350 metres north of the proposal area.

The stormwater channel located west of the Gimberts Road/Mandalong Road/Gateway Boulevard roundabout occurs within an area of PCT 4020 (Coastal Creekflat Layered Grass-Sedge Swamp Forest). The stormwater channel originates from a constructed wetland within the industrial estate (south of the proposal area) and is not classified as key fish habitat (NSW DPI, 2024). The stormwater channel consists of a stagnant pool with no instream habitat features or aquatic vegetation, and is not considered likely to provide habitat for any aquatic species.

Weeds, pests and pathogens

Ten exotic plant species recorded within the study area during the field surveys are listed as Priority Weeds for the Hunter Region under the Biosecurity Act (Hunter Local Land Services, 2022). Three of these species are also listed as Weeds of National Significance (WONS).

Priority Weeds and WONS recorded within the study area include:

- Fireweed (*Senecio madagascariensis*) (listed as WONS)
- Camphor Laurel (*Cinnamomum camphora*)
- African Lovegrass (*Eragrostis curvula*)
- Coolatai Grass (*Hyparrhenia hirta*)
- Crofton Weed (*Ageratina Adenophora*)
- Blackberry (*Rubus fruticosus species aggregate*) (listed as WONS)
- Lantana (*Lantana camara*) (listed as WONS)

- Pampas Grass (*Cortaderia selloana*)
- Narrow-leaf Privet (*Ligustrum sinense*)
- Spear Thistle (*Cirsium vulgare*).

The legal requirements for these weed species are outlined in section 3.4 of Appendix D.

The study area provides habitat for a range of commonly occurring pest species. Exotic pests likely to occur within the proposal area include the Black Rat, Cat, Common Myna, Common Starling, Dog, Fox, House Mouse and Rabbit.

Pathogens that have been recorded in the North Coast bioregion and have the potential to occur within the proposal area include Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*), Exotic Rust Fungi (order Pucciniales, e.g. Myrtle rust fungus *Uredo rangelii*), and Phytophthora Root Rot Fungus (*Phytophthora cinnamomi*).

Coastal wetlands

There are no mapped areas of coastal wetlands or proximity to coastal wetlands located within the study area. The nearest mapped area of coastal wetlands is located around one kilometre north of Mandalong Road and is associated with Mullards Creek.

Areas of outstanding biodiversity value

No declared areas of outstanding biodiversity value have been identified within the study area.

Matters of National Environmental Significance

Matters of National Environmental Significance listed under the EPBC Act that have the potential to occur in or near the study area include:

- one TEC, the Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland, was recorded within the study area (0.54 hectares) and the proposal area (0.04 hectares) (refer to Figure 6-2). The two PCTs that are considered to be consistent with this TEC are PCT 3998 (Lower North Creek Flat Mahogany Swamp Forest) and PCT 4020 (Coastal Creekflat Layered Grass-Sedge Swamp Forest)
- two threatened flora species, *Angophora inopina* (Charmhaven Apple) and *Tetratheca juncea* (Black-eyed Susan), have been recorded within the proposal area (refer to Figure 6-2)
- one threatened fauna species, the Grey-headed Flying Fox (*Pteropus poliocephalus*), has been recorded within the study area (refer to Figure 6-3). Four other threatened fauna species have a moderate likelihood to occur within the study area based on available foraging habitat, however none of these species were recorded within the study area during the field surveys:
  - Gang-gang Cockatoo (*Callocephalon fimbriatum*)
  - South-eastern Glossy Black Cockatoo (*Calyptorhynchus lathami lathami*)
  - Regent Honeyeater (*Anthochaera phrygia*)
  - Swift Parrot (*Lathamus discolor*)
- two migratory species, the Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*), have a moderate likelihood to occur within the study area based on available habitat. Important Habitat for the Swift Parrot is mapped within the study area but not for the Regent Honeyeater. Neither of the two species have been recorded within the study area during the field surveys
- no critical habitat or Wetlands of International Importance have been identified within 10 kilometres of the proposal area.

6.1.3 Potential impacts

Construction

Removal of native vegetation

The proposal would result in the removal of 0.98 hectares of native vegetation, as outlined in Table 6-5. The majority of vegetation (around 80 per cent, or 4.86 hectares) to be removed by the proposal is non-native, comprising native plantings, native shrub regrowth, and exotic grasses and trees.

Table 6-5 Direct impacts on native vegetation

PCT	Condition	TEC	Impacted area (ha)
PCT 3583: Hunter Coast Lowland Scribbly Gum Forest	Good	N/A	0.36
	Regrowth	N/A	0.02
PCT 3998 Lower North Creekflat Mahogany Swamp Forest	Good	Coastal Swamp Sclerophyll Forest of NSW and South East Queensland (listed as endangered under the EPBC Act) Swamp Sclerophyll Forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act)	0.01
	Moderate	Swamp Sclerophyll Forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act)	0.23
	Planted native vegetation	Does not meet listing criteria	0.25
PCT 4020 Coastal Creekflat Layered Grass Sedge Forest	Good	Coastal Swamp Sclerophyll Forest of NSW and South East Queensland (listed as endangered under the EPBC Act) Swamp Sclerophyll Forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act)	0.08
PCT 4042 Lower North Riverflat Eucalypt Paperbark Forest	Moderate	River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act)	0.03
Total extent of native vegetation			**0.98**

The 0.98 hectares of native vegetation to be cleared for the proposal includes 0.39 hectares of vegetation that meets the criteria for a TEC under the BC Act and EPBC Act, as outlined in Table 6-6.

Table 6-6 Direct impact to threatened ecological communities

TEC	Impacted area (ha)
BC Act listed TECs	
Swamp Sclerophyll Forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act)	0.27
River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act)	0.08
Total extent of BC Act listed TECs	**0.35**
EPBC Act listed TECs	
Coastal Swamp Sclerophyll Forest of NSW and South East Queensland (listed as endangered under the EPBC Act)	0.04
Total extent of EPBC Act listed TEC	**0.04**
Total extent of BC Act and EPBC Act listed TECs	**0.39**

Removal of threatened fauna habitat

The extent of native vegetation clearing estimated to result from the proposal is outlined in Table 6-5. This vegetation, with the addition of planted trees, provides suitable habitat for a range of threatened fauna species listed under the BC Act and EPBC Act. As such, direct impacts through loss of habitat for threatened fauna species would occur during construction.

Up to nine hollow-bearing trees would be removed by the proposal that may provide suitable habitat for bats, birds and arboreal mammals, reptiles and frogs. None of these trees have large hollows as much of the vegetation consists of regrowth.

Table 6-7 provides a summary of the direct impacts on potential threatened fauna habitat for those species assessed as having a moderate or higher likelihood of occurrence within the study area.

Table 6-7 Summary of potential direct impacts on threatened fauna habitat

Species name	EPBC Act[1]	BC Act[1]	Potential occurrence (Moderate, High, Recorded)	Associated PCT habitat in proposal area	Area (ha) of potential habitat to be directly impacted based on associated PCT
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	–	V	Moderate	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	E	E	Moderate	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
South-eastern Glossy Black Cockatoo (*Calyptorhynchus lathami lathami*)	V	V	Moderate	PCT 3998	0.49 ha of foraging habitat
Varied Sittella (*Daphoenositta chrysoptera*)	–	V	Recorded	PCT 3583 (Good Condition) PCT 3998 (all conditions) PCT 4020	0.85 ha of foraging habitat
Little Lorikeet (*Glossopsitta pusilla*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat

Species name	EPBC Act[1]	BC Act[1]	Potential occurrence (Moderate, High, Recorded)	Associated PCT habitat in proposal area	Area (ha) of potential habitat to be directly impacted based on associated PCT
Little Eagle (*Hieraaetus morphnoides*)	–	V	Recorded	PCT 3583 – good condition	0.36 ha of foraging habitat
Powerful Owl (*Ninox strenua*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Masked Owl (*Tyto novaehollandiae*)	–	V	Moderate	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Sooty Owl (*Tyto tenebricosa*)	–	V	Moderate	PCT 4020, PCT 4042	0.11 ha of foraging habitat
Regent Honeyeater (*Anthochaera phrygia*)	CE	CE	Moderate – Foraging habitat present on site	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Swift Parrot (*Lathamus discolor*)	CE	E	Assumed Previously recorded Impacted – area to the north of Mandalong Road is mapped as Swift Parrot Important habitat.	Important Mapped Habitat[2]	0.27 ha of foraging habitat
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Little Bent-winged Bat (*Miniopterus australia*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Large Bent-winged Bat (*Miniopterus Orianae oceanensis*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Southern Myotis (*Myotis macropus*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Eastern Cave Bat (*Vespadelus troughtoni*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Squirrel Glider (*Petaurus norfolcensis*)	–	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Koala (*Phascolarctos cinereus*)	E	E	Moderate	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha of foraging habitat
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	–	V	Moderate	PCT 3583, PCT 4020	0.40 ha of foraging habitat

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered under the BC Act or EPBC Act

(2) Important Mapped Habitat = areas that are considered important for a species (e.g. breeding areas or sites where multiple records have been located over multiple years) (NSW DPIE, 2020).

Removal of threatened flora

The proposal would result in direct impacts to two threatened flora species, *Angophora inopina* (Charmhaven Apple) and *Tetratheca juncea* (Black-eyed Susan), and potential threatened flora habitat within the proposal area.

Table 6-8 provides a summary of the direct impacts on threatened flora species and potential threatened flora habitat.

Table 6-8 Summary of potential direct impacts on threatened flora species and habitat

Species name	EPBC Act[1]	BC Act[1]	Potential occurrence	Associated habitat in proposal area	Impact within proposal area (ha or individuals)
Acacia bynoeana (Bynoe's Wattle)	V	E	Moderate	PCT 3583, PCT 3998, PCT 4020	0.90 ha
Angophora inopina (Charmhaven Apple)	V	V	Recorded	PCT 3583, PCT 3998, PCT 4020, PCT 4042	Around 3 individuals (0.19 ha)
Caladenia tessellata (Thick-lipped Spider-orchid)	V	V	Moderate	PCT 3583	0.39 ha
Cryptostylis hunteriana (Leafless Tongue Orchid)	V	V	Moderate	PCT 3583	0.39 ha
Diuris praecox (Rough Doubletail)	V	V	Moderate	PCT 3583	0.39 ha
Genoplesium insigne (Variable Midge Orchid)	CE	CE	Moderate	PCT 3583, PCT 3998, PCT 4020, PCT 4042	0.98 ha
Grevillea parviflora subsp. *parviflora* (Small-flower Grevillea)	V	V	Moderate	PCT 3583, PCT 3998,	0.87 ha
Rutidosis heterogama (Heath Wrinklewort)	V	V	Moderate	PCT 3583	0.39 ha
Tetratheca juncea (Black-eyed Susan)	V	V	Recorded	PCT 3583, PCT 3998	0.15 ha (no known clumps)

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered under the BC Act or EPBC Act.

Aquatic habitats

No Key Fish Habitat, threatened aquatic species, populations and communities have been identified within the study area or are considered likely to occur, and therefore, would not be impacted.

Injury and mortality

The majority of native and threatened fauna species with habitat within the study area are highly mobile and typically vacate the areas in which they reside at the commencement of vegetation clearing. However, some species, typically ground dwelling species, are less mobile and would be at risk of injury and mortality.

Fauna injury or mortality may occur during construction due to:

- vegetation removal activities, particularly during the felling of hollow-bearing trees or trees containing undetected arboreal mammals (e.g. gliders, reptiles or active nests)
- collisions with work vehicles or plant
- accidental entrapment in plant, excavated trenches or pits.

Groundwater dependent ecosystems

The proposal has the potential to directly and indirectly interfere with surface, subsurface and/or groundwater flows associated with the GDEs identified within the study area during vegetation removal and excavation. However, construction of the proposal is expected to only result in minor groundwater drawdown or groundwater inflows based on the likely depth of groundwater and minor extent of excavation (refer to Section 6.10). Therefore, any potential impacts on GDEs during construction of the proposal are likely to be negligible or minor.

Invasion and spread of weeds, pests and pathogens

Weeds and pathogens have the potential to be introduced during construction as a result of soil and plant material disturbance during vegetation removal, earthworks and movement of soil or infected animals, and attachment of seed (and other propagules) to vehicles and machinery. Issues such as exposure of weed seed in soil during the landscaping phase and the proliferation of weeds in the proposal area during construction may also occur.

Activities such as vegetation removal and increased noise and human presence have the potential to disperse pest species across the surrounding landscape and increase the ability of such species to utilise habitats. However, the proposal is not considered to increase pest animal populations more than what already exists.

Noise, light, dust and vibration impacts

The construction of the proposal would result in temporary localised increases in noise, light, dust and vibration. Some locally occurring fauna would likely relocate from areas near the proposal which are impacted by increased noise, light, dust and vibration to more suitable areas of habitat further afield for the duration of construction. However, most fauna species within the study area are already adapted to periodic disturbances from surrounding land uses (i.e. road traffic, construction and other human activities), and therefore are unlikely to be significantly impacted.

Changes to hydrology

Potential impacts to surface water hydrology are described in Section 6.10. These potential impacts are not likely to result in significant impacts to biodiversity values if safeguards and management measures outlined in Section 6.10.5 are implemented.

Operation

Wildlife connectivity and habitat fragmentation

The proposal would not separate continuous habitats into smaller fragments, however, would increase habitat isolation by reducing the size of current habitat patches next to the existing road corridor due to vegetation removal and increasing the distance between habitat fragments by widening the road corridor. The increase in canopy gap is likely to impact existing movement of arboreal fauna such as the Squirrel Glider, that has been recorded moving through the landscape within the Morisset area. Individuals would be deterred from crossing the road corridor and those that do may have an increased chance of vehicle strike.

Edge effects on adjacent native vegetation and habitat

Edge effects occur when environmental conditions are altered (such as light levels, noise and vibration, soil moisture conditions and extent of weeds) that consequently can promote the growth of different vegetation types, invasion by feral fauna, or change the behaviour of resident fauna.

The proposal is likely to introduce new edge effects and incrementally increase existing edge effects within the study area, mainly due to road widening. Given the current edge effects and highly modified nature of remaining patches of native vegetation, the incremental increase in edge effects on adjacent native vegetation and habitat is likely to be minor.

Injury and mortality

The proposed road widening associated with the proposal may incrementally increase the risk of vehicle strike within the locality, particularly for less mobile mammal species or species with limited habitat connectivity. The proposal has the potential to introduce or increase barriers that may trap or increase the length of time an animal would need to spend on the road to cross, leading to an increase of potential collision with a vehicle.

Current rates of roadkill or fauna population densities in the study area are unknown, therefore the consequences of vehicle strike on local populations of fauna is relatively unknown, and the significance of the potential impact cannot be predicted.

Noise, light and vibration impacts

Considering the existing levels of noise and vibration from the surrounding urban development and the high levels of use of the existing road corridor by vehicles, it is unlikely there would be a significant increase in noise and vibration during operation of the road that would result in any increased impacts to native fauna within the study area. Street lighting proposed as part of the overall proposal would be similar to that currently on the road, so that there would be no increase in impacts on native fauna.

Changes to hydrology

The proposal would result in negligible changes to surface water hydrology as described in Section 6.10, and is not likely to result in significant impacts to biodiversity values.

Cumulative impacts

Projects and proposed developments that have the potential to result in potential cumulative biodiversity impacts in combination with the proposal, due to their timing, scale and proximity to the proposal, are summarised in Table 6-9. Further details about these projects and proposed developments are provided in Section 6.14.

Potential impacts of the proposal on biodiversity values are considered to be minor in comparison to the other projects and proposed developments outlined in Table 6-9. The proposal is unlikely to result in any critical cumulative impact thresholds to be exceeded.

Table 6-9 Potential biodiversity impacts of present and future projects

Project/proposal	Similar Biodiversity Values Impacted	Construction impacts	Operational impacts
DA/1290/2019 – Cedar Mill Cultural Events Site at 126 Dora Street, Morisset. Currently under construction.	• PCT 3583 Hunter Coast Lowland Scribbly Gum Forest (equivalent to PCT 1636) • *Angophora inopina* • Squirrel Glider • Southern Myotis • Important Habitat mapping for Swift Parrot • Habitat for various threatened fauna species • Hollow-bearing trees.	• 6.45 ha of native vegetation • 6.45 ha of PCT 1636 Scribbly Gum – Red Bloodwood – Angophora inopina heathy woodlands on lowlands of the Central coast (equivalent to PCT 3583) • 30 *Angophora inopina* individuals and 0.9 ha of habitat • 6.45 ha of Squirrel Glider habitat impacted. • 3.4 ha of Southern Myotis habitat • 0.03 ha of Important Habitat for the Swift Parrot • Removal of two hollow-bearing trees • Removal of waterway and constructed dams • Impacts to wildlife connectivity for threatened fauna species • Potential impact on hydrological processes.	• Increased potential for vehicle strike from increased vehicle movement within the development site • Indirect impacts on aquatic habitat including potential alterations to hydrology • Increase to existing edge effects and noise/ vibration. Mitigation measures proposed: • Revegetation of PCT 1636 is proposed along the western edge of the development site, along Wyee Road • Installation of glider poles and a fauna over pass on Dora Street • Installation of nest boxes.

Project/proposal	Similar Biodiversity Values Impacted	Construction impacts	Operational impacts
DA/1286/2019 – Caravan Park and Camping Ground at 27 Wyee Road, Morisset. Currently under construction.	• PCT 3583 Hunter Coast Lowland Scribbly Gum Forest (equivalent to PCT 1636) • PCT 4020 Coastal Creekflat Layered Grass-Sedge Swamp Forest (equivalent to PCT 1718) • Swamp Sclerophyll Forest on Coastal Floodplains TEC • Angophora inopina • Tetratheca juncea • Squirrel Glider • Southern Myotis • Important Habitat mapping for Swift Parrot • Habitat for various threatened fauna species • Hollow-bearing trees.	• 2.75 ha of native vegetation • 2.44 ha of PCT 1636 Scribbly Gum – Red Bloodwood – Angophora inopina heathy Woodland on lowlands of the Central Coast (equivalent to PCT 3585) • 0.32 ha of PCT 1718 Swamp Mahogany – Flax-leaved Paperbark Swamp forest on coastal lowlands of the Central Coast (equivalent to PCT 4020) • 0.32 ha of Swamp Sclerophyll Forest on Coastal Floodplains TEC • 0.37 ha of *Tetratheca juncea* habitat • 36 *Angophora inopina* individuals and 0.6 ha of habitat • 2.75 ha of Squirrel Glider habitat (species recorded on site) • 0.32 ha of Wallum Froglet habitat (recorded on site) • 1.67 ha of Southern Myotis habitat (recorded on site) • 2.76 ha of Important Habitat for the Swift Parrot • removal of 3 hollow-bearing trees.	• Increase to existing edge effects and noise/ vibration • Indirect impacts on water quality including potential alterations to hydrology • Widening an existing barrier to wildlife movement • Increased potential for vehicle strike from increased vehicle movement within the development site.

Project/proposal	Similar Biodiversity Values Impacted	Construction impacts	Operational impacts
DA/356/2021 – 18 Lot Light Industrial and Business Park Subdivision in stages at 170 Gimberts Road, Morisset The majority of construction works have been completed. DA/1743/2023 – Industrial Warehouses (8 units) and Strata Subdivision at 158 and 136 Gimberts Road, Morisset Pre-lodgement application form submitted on 5 October 2023. Currently under assessment.	• PCT 3583 Hunter Coast Lowland Scribbly Gum Forest (equivalent to PCT 1636) • PCT 4042 Lower North Riverflat Eucalypt Paperbark Forest (equivalent to PCT 1598) • Swamp Sclerophyll Forest on Coastal Floodplains TEC • Tetratheca juncea • Important Habitat mapping for Swift Parrot.	• 1.03 ha of PCT 1598 Forest Red Gum grassy open forest on floodplains of the Lower Hunter (equivalent to PCT 4042) • 0.28 ha of PCT 1638 Smooth-barked Apple – Scribbly Gum Grass – shrub woodland (equivalent to PCT 3583) • 0.33 ha of PCT 1649 Smooth-barked apple – red mahogany – swamp mahogany – Melaleuca sieberi heathy swamp forest • 0.33 ha of Swamp Sclerophyll Forest on Coastal Floodplains TEC • 1.64 ha of Koala habitat (Scat Recorded on site) • 0.57 ha of Important Habitat for the Swift Parrot.	• Increased potential for vehicle strike from increased vehicle movement within the development site • Indirect impacts on aquatic habitat including potential alterations to hydrology • Increase to existing edge effects and noise/ vibration.

Conclusion on significance of impacts

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the BC Act or FM Act, and therefore a SIS or BDAR is not required.

The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act, and therefore a referral to the DCCEEW is not required.

6.1.4 Safeguards and management measures

Safeguards and management measures for potential impacts to biodiversity impacts as a result of the proposal are presented in Table 6-10. Other safeguards and management measures that would address potential biodiversity impacts are identified in sections 6.3.5, 6.4.4, 6.6.4, 6.10.4 and 6.14.4.

Table 6-10 Biodiversity safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
B1	Removal of native vegetation	Biodiversity impacts will be minimised through detailed design and construction, where practical and demonstrated within the Detail Design Report and Post-Clearing Report.	Contractor	Detailed design and Construction	Section 4.8 of QA G36 Environment Protection
B2	Removal of native vegetation	In accordance with the Transport Tree and Hollow Replacement Guidelines (EMF-BD-GD-0129), trees and hollows that require replacement will be identified and: • a Tree and Hollow Replacement Plan will be prepared to address the impacts prior to the commencement of works (refer to EMF-BD-GD-0219-TT1); OR • payment will be made to the Transport Conservation Fund prior to the commencement of works	Contractor	Detailed design	Additional safeguard
B3	Fauna and Flora impacts	Develop a Fauna and Flora Management Plan inclusive of wildlife connectivity in accordance with the Biodiversity Management Guideline (Transport, March 2024).	Contractor	Construction	Additional safeguard
B4	Fragmentation of identified habitat corridors	A Wildlife Connectivity Strategy is to be developed through detailed design in accordance with the draft Wildlife Connectivity Guidelines (Roads and Maritime Services, 2011) or equivalent updated Transport Guidelines.	Contractor	Detailed design	Additional safeguard
B5	Removal of native vegetation	Pre-clearing surveys and final pre-clearing checks will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction	Section 4.8 of QA G36 Environment Protection
B6	Fragmentation of identified habitat corridors	The Wildlife Connectivity Strategy is to focus on maintaining fauna connectivity, particularly for Squirrel Glider through the proposal and is to detail the following: (a) a review of the need and effectiveness of connectivity structures for the proposal (b) consideration of fauna connectivity structures where the project results in canopy gaps greater than 50 metres. (c) Identification of opportunities for supplementary habitat (d) Measures to minimise physical disturbance within the existing fauna corridor. (e) Measure to maximise the effectiveness of fauna connectivity measures, including but not limited to retention of mature vegetation around connectivity structures and landscaping (f) A program identifying the construction footprint and staging requirements, including the provision of connectivity structures (and associated features) as soon as practicable.	Contractor	Construction	Additional safeguard
B7	Direct impacts to threatened species	Habitat removal will be undertaken by staged clearing in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction	Additional safeguard

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
B8	Direct impacts to threatened species and TECs	If threatened fauna or flora species are discovered unexpectedly, stop works immediately and follow the Transport Unexpected Threatened Species Find Procedure contained in the Transport Biodiversity Guidelines – Guide 1 (Pre-clearing process (EMF-BD-GD-0032).	Contractor	Construction	Section 4.8 of QA G36 Environment Protection
B9	Aquatic impacts	Aquatic habitat (inclusive of Mullards Creek) will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b) and Section 3.3.2 of the Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (NSW DPI (Fisheries) 2013).	Contractor	Construction	Additional safeguard
B10	Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction	Additional safeguard
B11	Injury and mortality of fauna	Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction	Section 4.8 of QA G36 Environment Protection
B12	Invasion and spread of weeds	Weed species will be managed in accordance with Guide 6: Weed management of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction	Section 4.8 of QA G36 Environment Protection
B13	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with Guide 7: Pathogen management of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction	Section 4.8 of QA G36 Environment Protection

6.1.5 Biodiversity offsets

Although efforts have been made to avoid, minimise and mitigate ecological impacts associated with the proposal, some residual impacts would occur. The BAR identifies that the proposal is not likely to have a significant impact on any threatened biodiversity listed under the BC Act or EPBC Act and does not have a statutory obligation to offset impacts under NSW or Commonwealth legislation.

Transport provides biodiversity offsets, or where offsets are not reasonable or feasible, supplementary measures, for impacts that exceed Transport's offset thresholds, in accordance with the No Net Loss Guidelines (Transport, 2022h) and Tree and Hollow Replacement Guidelines (Transport, 2023a). The proposal does not meet the threshold criteria required to offset impacts to native vegetation or threatened species habitat within the proposal area (refer to section 7.1 of Appendix D for further details). Biodiversity offset calculations will be confirmed prior to clearing or removal of vegetation.

The study area contains a total of 764 trees, comprising 603 native trees and 161 amenity trees. Of these, a total of 493 trees (consisting of 344 native trees and 149 amenity trees) would be impacted by the proposal. As no offsets are triggered, the removal of native and amenity trees within the proposal area would require tree planting in accordance with the Tree and Hollow Replacement Guidelines (Transport, 2023a). If replacement is not feasible, or the entire replacement cannot be accommodated locally or can only be partially met, any remaining requirement can be met by transferring funds into the Transport Conservation Fund.

6.2 Traffic and transport

This section assesses the potential impacts of the construction and operation of the proposal associated with traffic and transport and identifies mitigation measures to address these impacts. A Mandalong Road Upgrade, Concept Design and REF – Traffic and Transport Assessment Report (Arcadis, 2024) has been prepared for the proposal and is provided in Appendix E. The findings of the report are summarised in this section.

6.2.1 Methodology

Overview

The traffic and transport assessment study area (study area) consists of key roads and intersections in the broader road network where the traffic conditions (such as volume, delay or performance) may change as a result of the proposal. The study area extends from Morans Creek in the west, to Mandalong Road/Fishery Point Road intersection in the east, to Freemans Drive (north of Stockton Street) in the north and to Wyee Road/Old Wyee Road intersection in the south, as shown in Figure 2-1 in Appendix E.

The traffic and transport assessment involved the following:

- reviewing the existing transport network, including a description of transport infrastructure, public transport service provision, pedestrian and cycle networks and infrastructure, speed environment, and traffic volumes and patterns in the study area
- analysing historic crash data along Mandalong Road (between Gimberts Road and Ourimbah Street) to understand current crash rates and trends
- analysing existing parking and access provisions in the proposal area
- traffic modelling of existing and forecast traffic scenarios for the AM and PM peak in the years 2023, 2029 (assumed year of opening) and 2039 (10 years after opening), using the Strategic Traffic Forecasting Model (STFM) (developed and operated by Transport) and the microsimulation traffic modelling software package VISSIM. The base year VISSIM model represented the 2023 (existing) traffic conditions
- assessing the potential traffic and transport impacts of the proposal on pedestrians, cyclists, public transport, private vehicles, freight, road safety and the surrounding built environment during construction and operation
- recommending safeguards and management measures to mitigate and manage the identified transport and traffic impacts.

6.2.2 Existing environment

Existing road network

The 1.3 kilometre section of Mandalong Road within the proposal area is located at the southern end of the B53 Morisset to Wallsend State Road, that connects the M1 Pacific Motorway to Morisset, as well as various suburbs along the western boundary of Lake Macquarie and Wallsend on the outskirts of Newcastle. East of the existing Mandalong Road/ Freemans Drive/Dora Street/Wyee Road roundabout, Mandalong Road becomes Dora Street which is the main road through the Morisset town centre.

Wyee Road is a regional road that extends south of the Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout for around 13 kilometres to the suburb of Doyalson, where it connects to the A43 Pacific Highway and A49 Central Coast Highway. It is a key link between Morisset and the northern residential suburbs of the Central Coast. Freemans Drive is a local road that provides a connection to Cooranbong to the north, and provides an alternate north-south route to both the B53 Main Road and the M1 Pacific Motorway.

Within the proposal area, Mandalong Road and Dora Street generally consist of one lane in each direction, divided by line marking or a concrete median. Wyee Road and Freemans Drive within the proposal area each consists of an undivided carriageway, with one lane in each direction. All of these roads have a posted speed limit of 60 kilometres per hour within the proposal area.

Intersection performance

The Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection is the only intersection within the proposal area and consists of a roundabout with a single circulating lane.

Intersection delays and level of service (LoS) modelled for this intersection during the AM and PM peak periods are provided in Table 6-11. The intersection currently operates poorly with excessive delays (LoS F) in either or both of the AM and PM peak periods, which contributes to increased travel times. In the AM peak, traffic modelling indicates the longest delays are experienced by westbound traffic on Dora Street and northbound traffic on Wyee Road, due to southbound traffic from Freemans Drive. In the PM peak, the longest delays are experienced by eastbound traffic on Mandalong Road, due to right turning traffic from Wyee Road.

Table 6-11 Existing LoS for the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection during the AM and PM peak periods

Approach of Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection	AM peak		PM peak	
	Delay (seconds)	LoS	Delay (seconds)	LoS
Freemans Drive	22	B	29	C
Dora Street	95	F	48	D
Wyee Road	59	E	82	F
Mandalong Road	17	B	234	F
Overall	**95**	**F**	**234**	**F**

Road traffic volumes

Traffic surveys undertaken during 2023 indicate that average weekday traffic volumes within the proposal area vary between around 6,700 vehicles per day (along Freemans Drive) to around 17,900 vehicles per day (along Mandalong Road).

On weekdays there are two peak traffic periods, the AM peak (from around 8:15 am to 9:15 am) and the PM peak (from around 3:30 pm to 4:30 pm), representing typical school and work commuting activities. In the weekday AM peak, the peak travel direction along the Mandalong Road and Dora Street corridor is westbound towards the M1 Pacific Motorway, with a traffic volume of up to around 910 vehicles per hour. In the weekday PM peak, the peak travel direction is eastbound towards Morisset, with a traffic volume of up to around 980 vehicles per hour.

Freemans Drive and Wyee Road carry up to around 340 and 770 vehicles per hour (respectively) during the weekday peak periods.

Heavy vehicles and freight

The M1 Pacific Motorway and Mandalong Road between the M1 Pacific Motorway and Freemans Drive form part of a dedicated B-double route for trucks up to 25 metres long and 4.6 metres in height. The surrounding road network, including Dora Street, Freemans Drive and Wyee Road, form part of a dedicated B-double route for trucks up to 25 metres long. The M1 Pacific Motorway and Mandalong Road between the M1 Pacific Motorway and Toronto also form part of the Oversize Overmass (OSOM) vehicle network (National Heavy Vehicle Regulator, 2023).

Daily heavy vehicle volumes on Mandalong Road and Dora Street vary between 1,400 and 4,300 heavy vehicles per day, representing between around six to 20 per cent of total traffic volumes on these roads. Daily heavy vehicle volumes on Wyee Road vary between 900 and 1,500 heavy vehicles per day, representing between around six to eight per cent of total traffic volumes on these roads. Heavy vehicle traffic in the proposal area is likely associated with the industrial precinct between Gateway Boulevard and Alliance Avenue.

Travel time

The average travel time in the peak travel direction along Mandalong Road within the study area is around 8.1 minutes in the AM peak period and around 10.2 minutes in the PM peak period. During the AM peak, westbound is the peak travel direction and during the PM peak, eastbound is the peak travel direction. The average travel speed along Mandalong Road is around 32 kilometres per hour during the AM peak period and around 25 kilometres per hour during the PM peak period, which is up to 40 per cent slower than the posted speed limit (60 kilometres per hour).

Road safety and crash history

Crash data was provided by Transport for a five-year period between 2015 and 2019 along Mandalong Road and Dora Street within the proposal aera. The data records all reported crashes and identifies the number of crashes that involved a fatality, injury or vehicle damage (non-casualty). Due to the influence of COVID-19 travel restrictions, crash data recorded between 2020 and 2022 was not considered in the assessment.

During the five-year period, seven crashes were recorded within the proposal area. Of these recorded crashes:

- no crashes were fatal
- two crashes caused serious injury
- four crashes resulted in either moderate or minor injury
- one crash involved vehicle damage only.

Six of the crashes within the proposal area involved rear-end collisions (85 per cent) and one crash involved a U-turn collision.

Two crashes within the proposal area were recorded at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout, and five crashes were recorded at mid-block sections along Mandalong Road and Dora Street.

Public transport

Bus services

The study area is serviced by seven bus routes, with three bus routes operating within the proposal area. Table 6-12 summarises the bus services and their frequencies that service the study area during the AM and PM peak periods.

During both the weekday AM and PM peak periods there are six bus services (in both directions) that run through the proposal area, which is equivalent to a bus running through the proposal area every 10 minutes. Only one bus service (bus route 281) has a bus stop within the proposal area (bus stop ID 2264168) along Wyee Road. Another 10 bus stops are located outside the proposal area within the study area.

Table 6-12 Existing bus routes and daily frequency during peak periods

Route number	Route description	Bus service frequency during weekdays		Within proposal area or surrounding road network
		AM peak	PM peak	
95	Lake Haven to Morisset via Gwandalan & Mannering Park	1 service	–	Within proposal area
163	Cessnock to Morisset via Kurri Kurri	1 service	–	Within proposal area
275	Toronto to Wangi via Fishing Point & Rathmines	–	–	Outside proposal area
278	Morisset to Silverwater (Loop Service)	1 service	1 service	Outside proposal area
279	Morisset to Sunshine (Loop Service)	–	1 service	Outside proposal area
280	Cooranbong to Morisset	3 services (every 20 minutes)	3 services (every 15 minutes)	Outside proposal area
281	Lake Haven to Wangi Wangi	–	–	Within proposal area

Rail services

Morisset Train Station is located around 520 metres east of the proposal area, within the study area. The station is serviced by the Central Coast and Newcastle Line, which provides connections between Newcastle and Sydney. Table 6-13 summarises the rail services and their frequencies that service Morisset Train Station during the AM and PM peak periods.

Table 6-13 Frequency of rail service to/from Morisset Train Station during weekday AM and PM peak periods

Service	Rail service frequency – weekday	
	AM peak (8:15 am – 9:15 am)	PM peak (3:30 pm – 4:30 pm)
Morisset to Sydney	2 services (every 30 minutes)	2 services (every 30 minutes)
Sydney to Morisset	3 services (every 20 minutes)	3 services (every 40 minutes)
Morisset to Newcastle	1 service	2 services (every 30 minutes)
Newcastle to Morisset	2 services (every 30 minutes)	2 services (every 30 minutes)

Active transport

Formal walking and cycling infrastructure within the proposal area and wider study area is limited. Walking and cycling opportunities along Mandalong Road between the M1 Pacific Motorway and Freemans Drive are restricted to narrow sealed road shoulders or shared traffic lanes, as there is no active transport infrastructure along, or next to, this section of the road.

A pedestrian footpath is provided within the study area along the northern side of Dora Street between Freemans Drive and Bakehouse Lane. Within the proposal area, the footpath extends along the northern side of Dora Street for around 300 metres west from the Dora Street/Ourimbah Street intersection. There are no shared user paths or formal pedestrian crossings within the proposal area. Pedestrian crossing opportunities are limited to a narrow central median along Dora Street at the eastern end of the proposal area and concrete islands on all approaches of the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road roundabout. Current active transport movements indicate pedestrian activity around the proposal area is mainly within the industrial precinct between Mandalong Road and Wyee Road, with some pedestrian activity observed along Wyee Road and Dora Street between the Morisset town centre and the industrial precinct.

Cyclists generally share the road with vehicles within the study area. A short section of cycleway is provided within the eastbound lane of Dora Street within the proposal area, extending for around 180 metres west from the Dora Street/ Ourimbah Street intersection. Other cycleways and shared user paths within the study area are located further east of the proposal area along Dora Street, east of Doyalson Street.

There is observed cyclist activity on Mandalong Road, Wyee Road, Freemans Drive and Dora Street. Dora Street and Wyee Road forms part of the Principal Bicycle Network in the Lake Macquarie City Council Walking Cycling and Better Streets Strategy (Lake Macquarie City Council, 2022b), representing the expected future increase in active travel demand in the Lake Macquarie LGA. While very limited pedestrian and cycling infrastructure is currently provided, the proposal area provides connection to the 13 kilometre 'Cooranbong to Morisset peninsula via Morisset' walking/cycling route, consisting of shared user paths, on-road cycle paths and pedestrian pathways

Parking

A large proportion of the proposal area is characterised by not having formal kerb and gutter and consists of varying shoulder widths and grass verge areas. Given the existing conditions of the proposal area, on-street parking arrangements are informal, and occur within the road verges of:

- the westbound lane of Dora Street (extending for around 250 metres west of the Dora Street/Ourimbah Street intersection)
- the westbound lane of Mandalong Road (extending for around 100 metres west of the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection)
- the northbound and southbound traffic lanes of Freemans Drive near the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road intersection (the proposed locations of ancillary facilities AF1 and AF2).

The closest formal on-street parking to the proposal within the study area is provided along the eastbound lane of Dora Street between Doyalson Street and Bridge Street, around 390 metres east of the proposal area. Time restrictions on this parking varies between 30 minutes and one hour.

6.2.3 Potential impacts

Construction

Construction traffic

The proposal would generate light and heavy vehicle movements on the surrounding road network to transport construction materials, equipment and construction workers to and from the proposal area. Around 15 light vehicles and 30 heavy vehicles would be required per day across the proposal area during peak construction periods. On average, there would be up to 10 light vehicle movements and up to 20 heavy vehicle movements during the peak hour across the proposal area during the peak construction period. Construction work areas would be accessed via Mandalong Road, Dora Street, Freemans Drive, Wyee Road and Gimberts Road, which are approved vehicle routes.

Potential traffic impacts resulting from the construction of the proposal include:

- increased travel time due to reduced speed limits around work areas and ancillary facilities, operational and alignment changes to the road network and increased truck and construction machinery movements
- road safety impacts due to changes in traffic conditions, increased heavy vehicle traffic, and conflicts between general traffic and construction vehicles, particularly at construction ancillary facility access and egress points.

Construction would be staged to enable construction work and traffic movements to be completed safely and efficiently while maintaining traffic flows at all times and minimising overall impacts on the local community (refer to Section 3.3.1). Generally, the construction staging would maintain the existing lane arrangement (one lane in each direction) along the proposal area during construction. Temporary safety barriers would be installed between live traffic and construction zones, to provide separation between road users and the construction work areas. Existing speed limits will be maintained within the proposal area where possible. Where this cannot be achieved, speed limits will be reduced to a minimum of 40 kilometres per hour within the proposal area, to ensure the safety of workers and motorists.

Where possible, construction work would be carried out during recommended standard construction working hours. Some works, such as works within the road median, utility and drainage adjustments, and oversized deliveries, would be undertaken outside of standard construction working hours under a ROL to minimise disruption to daily traffic (refer to Section 3.3.2).

Public transport

All existing bus movements would be maintained during construction, with potential for minor delays to bus services due to construction speed limits or detours. The bus stop within the proposal area (on the western side of Wyee Road) may be temporarily relocated during construction to enable road widening, drainage and utility works. Upon completion of construction, the bus stop would be permanently removed, as it would be replaced by two new bus stops along Dora Street (refer to Section 3.2.3).

Active transport

Access would be maintained for cyclists and pedestrians during construction. Detours, alternative temporary pathways and safety barriers around the proposal area would be provided where possible to ensure safe passage for both pedestrians and cyclists.

Parking

Parking would be provided within the ancillary facilities for both light and heavy construction vehicles.

Informal roadside parking opportunities for general traffic along Mandalong Road, Dora Street, Freemans Drive and Wyee Road within the proposal area would be permanently removed during construction to allow for road widening and the construction of shared paths and pedestrian footpaths. Informal parking within vacant land next to Freemans Drive within the proposal area would be temporarily unavailable during construction to allow for the establishment and operation of ancillary facilities AF1 and AF2. As there is sufficient alternative formal and informal parking available on the surrounding road network and within residential and commercial land near the proposal, potential impacts on parking are considered to be minimal.

Property access

Some existing accesses to properties within the proposal area may be temporarily affected during construction due to changes in pedestrian and vehicle access to the properties. Most of these impacts would be limited to short term closures and alternative access arrangements would be made wherever feasible.

Commercial property access that may be affected by the proposal include the Ausgrid substation, Morisset Hospital Historical Society, Southlake Business Chamber and Community Alliance), Morisset Ambulance Station, 7-Eleven and Ampol service stations, McDonalds Morisset and Cedar Mill event site located along Mandalong Road and Dora Street within the proposal area.

Upon completion of works, property accesses would be reinstated and/or relocated as required.

Impacts on emergency services

Access would be maintained for emergency services during construction, including to the Morisset Ambulance Station on Dora Street. The contractor would inform the relevant authorities of any change to traffic conditions that would impact access prior to these works being undertaken.

Operation

Road network performance

Traffic modelling indicates that operation of the proposal would result in improved performance of the Mandalong Road/ Freemans Drive/Dora Street/Wyee Road intersection for all periods.

In 2039 (10 years after opening), the intersection would operate at LoS D and LoS E during the AM and PM peak periods (respectively) with the proposal, compared to LoS F during both the AM and PM peak periods without the proposal. The average delay at the intersection is predicted to be 50 seconds in the AM peak and 68 seconds in PM peak in 2039, compared to over 500 seconds in the AM peak and over 200 seconds in the PM peak in 2039. Overall, the proposal is expected to reduce delays at the intersection by up to 8 minutes in the AM peak and up to 2.5 minutes in the PM peak in 2039.

Travel times

Table 6-14 shows average travel times (minutes) with and without the proposal in 2029 and 2039.

The proposal is expected to reduce journey times on Mandalong Road and Dora Street during peak periods by up to 3.9 minutes by 2029 and up to 11.8 minutes by 2039.

Table 6-14 Travel time savings on Mandalong Road and Dora Street in 2029 and 2039

Year	Peak period	Direction	Average travel time (minutes)		
			Without proposal	With proposal	Time savings
2029	AM peak	Westbound (towards M1)	10.8	7	3.8
	PM peak	Eastbound (towards Morisset)	10.8	6.9	3.9
2039	AM peak	Westbound (towards M1)	13.6	7.9	5.7
	PM peak	Eastbound (towards Morisset)	20.3	8.5	11.8

Public transport

The proposal would improve bus travel time reliability due to reduced congestion and improved intersection performance. The proposed two new bus stops along Dora Street, new and improved shared user paths and footpaths and signalised pedestrian crossing facilities would improve connectivity, access and safety for public transport users.

Active transport

The proposal would provide a range of improvements to the existing active transport network and facilities, including:

- signalised crossings on all approaches to the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection
- a new shared user path along the northern side of Mandalong Road, extending along the western side of Freemans Drive
- a new shared user path along the southern side of Dora Street, extending along the eastern side of Wyee Road
- a new footpath on the northern side of Dora Street, extending along the eastern side of Freemans Drive.

These changes to the pedestrian and cyclist network would improve connectivity and provide safer access to bus stops for pedestrians and cyclists and encourage a shift towards more sustainable modes of travel.

Parking

The proposal would reduce informal parking opportunities within the proposal area along Mandalong Road, Dora Street, Wyee Road and Freemans Drive to accommodate road widening and active transport infrastructure improvements. As there is sufficient alternative formal and informal parking available on the surrounding road network and within residential and commercial land, potential impacts on parking are considered to be minimal.

Property access

All properties affected by changed access arrangements as a result of the proposal would be provided with restored or new permanent access arrangements. The extension of the central median along Mandalong Road and Dora Street would remove the right in/right out access to some properties along these roads, except the Morisset Ambulance Station. A short section of the central median on Dora Street would be modified to allow all movements to and from the Morisset Ambulance Station.

Road users coming from the westbound direction would continue to the Gimberts Road/Mandalong Road/ Gateway Boulevard intersection to make a U-turn to travel eastwards along Dora Street and turn left into properties along the northern side of Dora Street. To travel westbound from these properties, vehicles would be required to travel eastbound to the Dora Street/Ourimbah Street roundabout, to make a U-turn to travel westbound. This would result in a minor increase in the distance to access properties, however would provide safer and more reliable access.

6.2.4 Safeguards and management measures

Safeguards and management measures to minimise potential traffic and transport impacts of the proposal are presented in Table 6-15.

Table 6-15 Traffic and transport safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
TT1	Emergency services	Consultation with emergency services will be carried out during detailed design to confirm any requirements during construction and any operational road network changes.	Contractor	Detailed design	Additional safeguard
TT2	Property access during operation	Consultation will be undertaken with property owners, occupiers and businesses regarding changes to access arrangements.	Contractor	Detailed design/ pre-construction	Additional safeguard
TT3	Public transport access during construction	During construction, access to existing bus services within the proposal area must be maintained. Undertake consultation with bus service providers, to determine temporary stops and access requirements during construction.	Transport	Contractor	Additional safeguard
TT4	Public transport access during operation	Notification of the permanent closure of bus stop ID 2264168 will be undertaken with bus service providers during detailed design.	Transport	Detailed design	Additional safeguard
TT5	Traffic and transport	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's Traffic Control at Worksites, Technical Manual, Issue No. 6 (Transport for NSW, 2020e) and QA Specification G10 Traffic Management (Transport for NSW, 2020). This will include details on: • requirement and methods to consult and inform the local community of impacts on the local road network • confirmation of haulage routes • measures to maintain access to properties and local roads • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • access to ancillary facilities including entry and exit locations and measures to prevent construction vehicles queuing on public roads • a response plan for any construction road traffic incident • consideration of other developments which may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic	Contractor	Construction	Section 4.8 of QA *G36 Environment Protection*

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• monitoring, review and amendment mechanisms • M1 Pacific Motorway emergency detour route management during construction • maintaining OSOM movement and access through the proposal area.			
TT6	Property access	Existing access to properties will be maintained during construction. Where this is not feasible or reasonable, temporary alternative access arrangements will be provided following consultation with the affected property owners.	Contractor	Construction	Additional safeguard

6.3 Noise and vibration

The potential noise and vibration impacts associated with construction and operation of the proposal are assessed in the Noise and Vibration Impact Assessment provided in Appendix F. The findings of the report are summarised in this section.

6.3.1 Methodology

The noise and vibration impact assessment involved the following:

- identifying the noise and vibration impact assessment study area (study area) and associated noise and vibration sensitive receivers. The study area represents the likely extent of noise impacts and consists of the proposal area and a two kilometre radius around the proposal
- measuring the existing background noise levels at two noise monitoring locations and carrying out concurrent traffic count surveys to calibrate the existing road traffic noise models
- grouping sensitive receivers that are located at similar distances from noise generating activities into noise catchment areas (NCAs) and describing the existing noise environment for each NCA
- defining relevant assessment criteria to assess noise and vibration impacts
- identifying 'realistic worst-case' construction scenarios and representative plant and equipment for each construction scenario
- predicting and assessing construction noise levels for construction scenarios using the SoundPLAN (version 8.2) software in accordance with the Interim Construction Noise Guideline (NSW DECC, 2009) (ICNG), and Construction Noise and Vibration Guideline (Roads) (Transport for NSW, 2024) (CNVG)
- calculating and assessing construction vibration using source vibration levels and minimum working distances in accordance with relevant guidelines and standards, including Assessing Vibration: A Technical Guideline (NSW Department of Environment and Conservation (DEC), 2006) (AVaTG) and CNVG
- assessing the predicted operational road traffic noise levels in accordance with the Road Noise Policy (NSW DECCW, 2011) (RNP) and Road noise criteria guideline (Transport for NSW, 2023b) (NCG)
- recommending safeguards and management measures to be implemented to minimise noise and vibration impacts during construction and operation of the proposal, with reference to the CNVG and Road Noise Mitigation Guideline (NMG) (Transport for NSW, 2022e).

Noise monitoring

Noise monitoring was carried out near the proposal to determine the existing background noise environment. Noise monitoring and validation of noise monitoring data was carried out in accordance with Australian Standard (AS) 1055:2018 Acoustics, Description and Measurement of Environmental Noise (Standards Australia, 2018), AS 2702:1984 Acoustics – Methods for the Measurement of Road Traffic Noise (Standards Australia, 1984), Approved methods for the measurement and analysis of environmental noise in NSW (NSW EPA, 2022b) and the RNP.

Unattended noise monitoring was completed at two locations between 23 July 2024 and 6 August 2024. The noise monitoring locations were chosen to be representative of the different NCAs surrounding the proposal. Due to noise logger damage following initial deployment at one of the monitoring locations, monitoring was repeated at another location within the relevant NCA between 21 August and 4 September 2024. The noise monitoring locations are shown in Figure 6-4.

The noise monitoring equipment continuously measured existing noise levels in 15-minute periods during the daytime, evening and night time. Traffic count surveys were carried out alongside the unattended noise monitoring surveys to calibrate the road traffic noise volumes.

Attended noise monitoring was undertaken at each logging location at the time of their deployment to assist in identification and quantification of noise sources present, and to validate the unattended noise monitoring results. The attended noise monitoring results supported the accuracy of the unattended noise monitoring data.

Construction noise and vibration assessment

The construction noise and vibration assessment has been undertaken based on the following methodology:

- The Rating Background Levels (RBLs) (calculated in accordance with the NSW Noise Policy for Industry (NSW EPA, 2017) (NPfI)) for the proposal were calculated from the noise monitoring data obtained at the noise monitoring locations. The RBLs were used to establish construction Noise Management Levels (NMLs) with consideration of the ICNG.
- A list of likely construction activities and machinery was determined in consultation with Transport (refer to Section 3.3.3). Representative sound power levels and vibration levels for the selected plant were obtained from data provided in CNVG and relevant standards and databases.
- Noise associated with construction works during and outside of standard hours were predicted using the noise modelling software SoundPLAN. The model considered noise sources, existing receivers and the effect of distance, topography, atmospheric attenuation and obstacles such as barriers and buildings. The results of this modelling was then assessed against the construction NMLs for the proposal.
- Construction traffic was assessed with consideration to the RNP for assessment of construction traffic on public roads.
- Vibration levels from vibration-intensive construction plant and equipment were predicted and assessed using the CNVG minimum working distances for cosmetic damage and human response.

Operational noise assessment

Noise modelling was undertaken to predict noise levels from the operation of the proposal to the surrounding receivers. Local terrain, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the proposal and surrounding areas. Operational traffic noise was modelled for the following scenarios:

- year of opening (2028), without the proposal (‘no build’ scenario)
- year of opening (2028), with the proposal (‘build’ scenario).

The noise model was validated using the measured road traffic volumes and background noise measurements in the proposal area. Based on the comparison of measured and predicted road traffic noise levels, the model was considered to perform as expected and was deemed valid for predicting road traffic noise levels for the proposal.

6.3.2 Existing environment

Noise catchment areas and sensitive receivers

The study area was divided into three NCAs, as shown in Figure 6-4. These NCAs are based on areas with similar noise environments. The identified NCAs contain a mixture of residential, commercial, medical, and educational receivers, outdoor recreation areas (passive and active) and places of worship. A description of each NCA is provided in Table 6-16.

Table 6-16 Noise catchment areas and sensitive receivers

NCA	Description
NCA 1	Residential, commercial, educational and medical receivers, places of worship and outdoor recreation areas north of the proposal area, encompassing the Morisset township west of Stockton Street/Freemans Drive and surrounding areas.
NCA 2	Residential, commercial and educational receivers and outdoor recreation areas south of the proposal area, encompassing the Morisset Business Park and future Cedar Mill event site.
NCA 3	Residential, commercial, educational and medical receivers, places of worship and outdoor recreation areas east of the proposal area, encompassing the Morisset township east of Stockton Street/Freemans Drive and surrounding areas.

Background noise levels

Existing noise levels surrounding the proposal area are generally dominated by road traffic noise from Mandalong Road, Dora Street and other local roads. A summary of the background noise monitoring results is provided in Table 6-17. These noise levels were used to establish the appropriate construction NMLs.

Table 6-17 Background noise levels

Monitoring location	NCA	Address	Measured RBL (A-weighted decibels[1] (dBA))			$L_{eq\ (15\ hour)}$[3] (dBA)	$L_{eq\ (9\ hour)}$[4] (dBA)	L_{max}[5] (dBA)
			Standard hours[2]	Out of hours work (OOHW) Period 1[2]	OOHW Period 2[2]	7 am – 10 pm	10 pm – 7 am	Night
L1	3	77 Yambo Street, Morisset	44	43	38	50	46	70
L2	1 and 2[6]	20 Mandalong Road, Morisset	54	50	41	64	62	86

(1) dBA: A-weighted decibels.

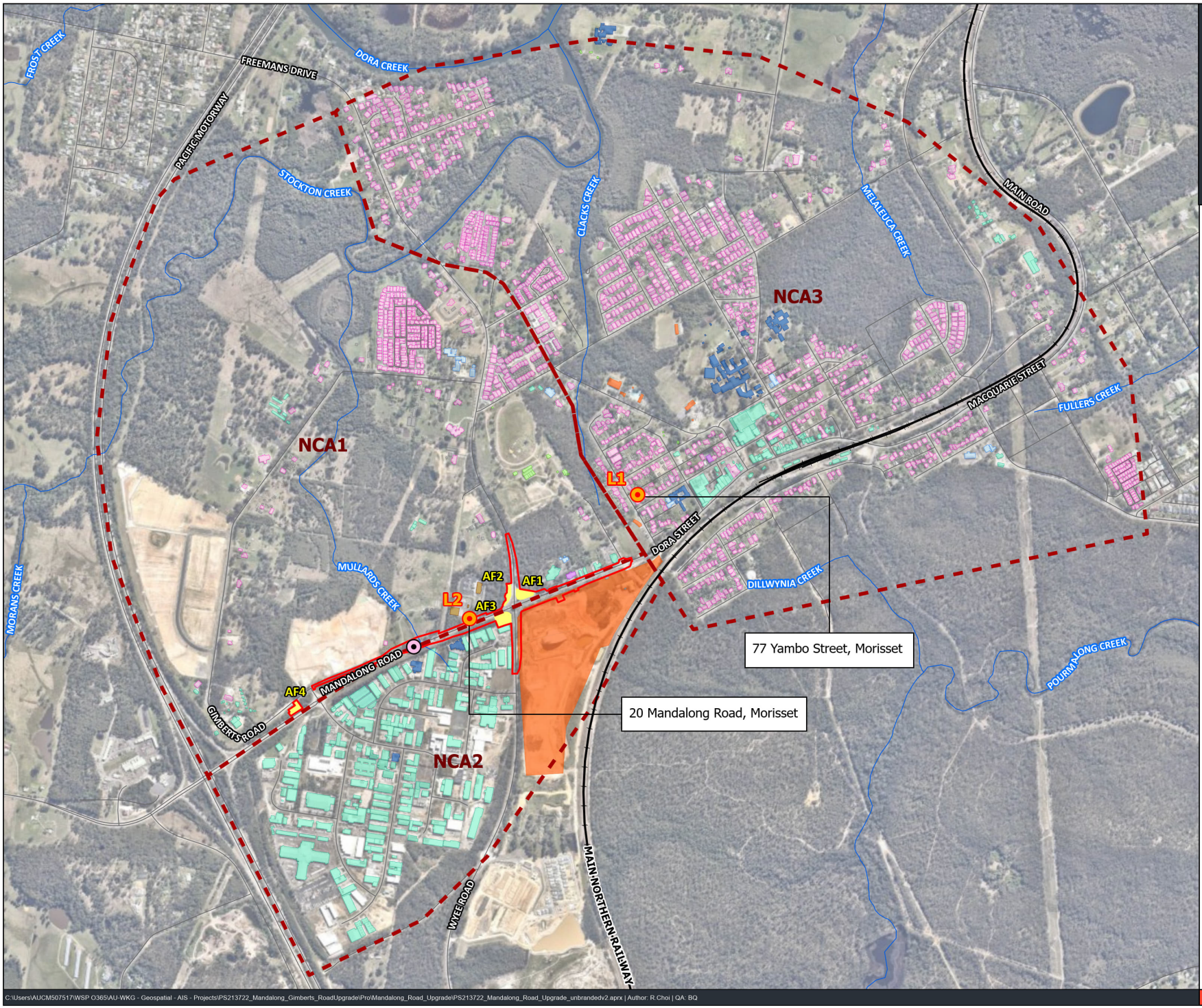
(2) Refer to Table 6-18 for definitions of standard and OOHW work hours.

(3) $L_{eq(15\ hour)}$: The average noise level over a 15 hour period between 7 am to 10 pm.

(4) $L_{eq(9\ hour)}$: The average noise level over a 9 hour period between 10 pm to 7 am.

(5) L_{max}: The 'Maximum Noise Level' for an event, used in the assessment of potential sleep disturbance during night time periods.

(6) As no residential receivers are located in NCA 2, noise monitoring at L2 in NCA 1 was conservatively taken to be representative of NCA 2.



Mandalong Road Upgrade

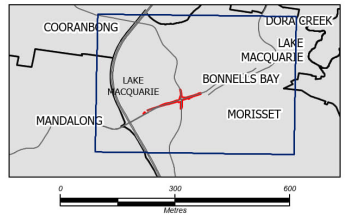
Figure 6-4
Noise monitoring locations, NCAs and sensitive receivers

Legend

- Proposal area
- Ancillary facility
- Road
- Railway
- Watercourse
- Noise monitoring location (attended and unattended)
- Traffic count location
- Noise catchment area

Sensitive receiver land use

- Active recreation
- Commercial
- Educational
- Non-sensitive
- Industrial
- Medical
- Place of worship
- Passive recreation
- Residential



Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

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GDA 2020

Data sources: Geoscience Australia, Nearmap, NSWSS

6.3.3 Criteria

Construction noise assessment periods

Construction of the proposal would be carried out during standard construction working hours where possible (refer to Section 3.3.2). However, some works may need to be completed outside standard working hours to ensure the safety of construction workers and road users, ensure safe and efficient operation of the road network, maintain critical access to local services, and meet the conditions of the ROL for the proposal (refer to Section 3.3.2). Standard hours and out of hours (OOHW) periods, as defined in the CNVG, are outlined in Table 6-18. Construction NMLs for the proposal have been developed for standard hours and OOHW periods.

Table 6-18 Construction hours (CNVG)

Period	Definition
Standard hours	Monday to Friday (7 am to 6 pm), Saturday (8 am to 1 pm)
OOHW Period 1	Monday to Friday (6 pm to 10 pm), Saturday (7 am to 8 am and 1 pm to 10 pm), Sunday/ public holidays (8 am – 6 pm)
OOHW Period 2	Monday to Friday (10 pm to 7 am), Saturday (10 pm to 8 am), Sunday/public holiday (6 pm to 7 am)

Construction noise management levels

NMLs were established for the proposal based on the RBLs in accordance with the ICNG. Where an exceedance of the NMLs is predicted, the ICNG advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practices to minimise the noise impact.

Noise impacts that exceed the residential NMLs have been assessed using the receiver perception categories from the CNVG outlined in Table 6-19. The ICNG also states that where construction noise levels are above 75 dBA at residential receivers during standard hours, they are considered 'highly noise affected' and require additional consideration in terms of noise mitigation and management measures.

Table 6-19 NML exceedance bands and corresponding CNVG perception categories

CNVG perception categories	Standard hours	OOHW periods
	NML exceedance (dBA)	
Noticeable	5–10 dBA above RBL	< 5
Clearly audible	< 10	5–15
Moderately intrusive	10–20	15–25
Highly intrusive	> 20	> 25

The proposal specific construction NMLs for residential receivers are provided in Table 6-20.

Table 6-20 Proposal specific construction NMLs at residential receivers

NCA	NML (dBA)			Sleep disturbance L_{eq}[2] (RBL + 15 dBA) (dBA)	Sleep awakening L_{max}[3] (65 dBA)
	Standard hours (RBL + 10 dBA)	Outside standard hours (RBL + 5 dBA)			
	Standard hours[1]	OOHW Period 2[1]	OOHW Period 2[1]		
NCA 1	64	55	46	56	65
NCA 2	No residential receivers identified				
NCA 3	54	48	43	53	65

(1) Refer to Table 6-18 for definitions of standard and OOHW work hours.

(2) L_{eq}: The average noise level over a period of time.

(3) L_{max}: The 'Maximum Noise Level' for an event, used in the assessment of potential sleep disturbance during night time periods.

A number of non-residential land uses have been identified in the study area. These include other sensitive land uses such as educational institutes, medical facilities, outdoor recreational areas and commercial properties. The ICNG also provides guidance for these types of receivers. Noise management levels recommended in the ICNG for non-residential receivers have been reproduced in Table 6-21. No separate criteria for out of hours construction works is provided for non-residential sensitive receivers as it is assumed that the buildings would be vacated during the evening and night time.

Table 6-21 Proposal specific construction NMLs at non-residential receivers

Non-residential land use	NML (when in use) (dBA)
Classrooms at schools, child care centres and other education institutions	45 (internal noise level)
Places of worship	45 (internal noise level)
Active recreation areas	65 (external noise level)
Commercial (offices, retail outlets and small commercial premises)	70 (external noise level)
Industrial	75 (external noise level)

Sleep disturbance

Construction noise during the night time period (10 pm to 7 am), has the potential to disturb people's sleep patterns. Guidance in the ICNG references further information in the RNP that discusses criteria for the assessment of sleep disturbance.

The guidance provided in the RNP recommends that to minimise the risk of sleep disturbance during the night time period, the $L_{eq(15\ min)}$ noise level outside a bedroom window should not exceed the RBL + 15 dBA. Similarly, to minimise the risk of sleep awakenings during the night time period, the L_{max} outside a bedroom window should not exceed 65 dBA. Where this level is exceeded, further detailed assessment is required. Section 5.4 of the RNP further notes:

- maximum internal noise levels below 50–55 dBA would be unlikely to result in people's sleep being disturbed
- if the noise exceeds 65–70 dBA once or twice each night, the disturbance would be unlikely to have any notable health or wellbeing effects.

A sleep disturbance screening criterion of RBL + 15 dBA was adopted for this assessment. Where this level is predicted to be exceeded, assessment against the maximum external noise limit of 65 dBL_{Amax} was considered to determine all feasible and reasonable safeguards.

Construction road traffic noise

In accordance with the RNP, an initial screening test was carried out to evaluate whether existing road traffic noise levels would increase by more than 2 dBA because of construction traffic. Where the predicted noise increase is 2 dBA or less, no further assessment is required. However, where the predicted noise level increase is greater than 2 dBA, and the predicted road traffic noise level exceeds the road category specific criterion in the RNP, noise mitigation should be considered for those receivers affected.

Construction vibration criteria

Construction vibration impacts have been assessed using the CNVG minimum working distances for human comfort, building contents and structural/cosmetic damage.

Human comfort

Human comfort vibration criteria have been determined by considering the AVaTG and British Standard (BS) 6472: 2008 – Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz) (British Standard Institution, 2008). Vibration from construction works tends to be intermittent in nature. The assessment of intermittent vibration outlined in the AVaTG is based on Vibration Dose Values (VDVs). The preferred and maximum VDVs for human comfort impacts are provided in Table 6-22.

Table 6-22 Preferred and maximum values for intermittent vibration (NSW DEC, 2006)

Receiver type	Period	Intermittent VDV ($m/s^{1.75}$)	
		Preferred value	Maximum value
Residential	Daytime (7 am to 10 pm)	0.2	0.4
Residential	Night time (10 pm to 7 am)	0.13	0.26
Offices, schools, educational institutes and places of worship	When in use	0.4	0.8

Structural or cosmetic damage

If vibration from construction works is sufficiently high it can cause damage to structural elements of affected buildings such as cracks or loosening of drywall surfaces, cracks in supporting columns and loosening of joints. Structural damage vibration limits are contained in British Standard BS 7385-2:1993 – Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration (British Standard Institution, 1993) (BS 7385) and German Standard DIN 4150-3: 1999 – Structural Vibration – Part 3: Effects of vibration on structures (Deutsches Institut für Normung, 1999) (DIN 4150).

Table 6-23 presents the BS 7385 peak vibration limits set so that the risk of cosmetic damage is minimal. The actual levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur may vary based on the type of structure affected.

Table 6-23 BS 7385 cosmetic damage criteria (British Standard Institution, 1993)

Type of structure	Peak component particle velocity (millimetres per second (mm/s))[1]		
	4–15 Hertz (Hz) [2]	15–40 Hz	40 Hz and above
Reinforced or framed structures Industrial or heavy commercial buildings	50		
Un-reinforced or light framed structures Residential or light commercial buildings	15 – 20	20 – 50	50

(1) Values referred to are at the base of the building, on the side of the building facing the source of vibration (where feasible).

(2) At frequencies below 4 Hz, a maximum displacement of 0.6 millimetres (zero to peak) should not be exceeded.

Safe working distances

Minimum working distances for typical vibration intensive construction equipment to achieve human comfort criteria and cosmetic building damage criteria are provided in the CNVG and summarised in Table 6-24. Impacts on human comfort and the physical structure of buildings are considered unlikely at distances greater than the minimum working distances.

Table 6-24 Recommended minimum working distances from vibration intensive equipment

Plant/equipment	Rating/description	Minimum working distance (m)	
		Cosmetic damage	Human response
Vibratory roller	< 50 kilonewton (kN) (typically 1–2 tonne (T))	5	20
	< 100 kN (typically 2–4 T)	6	20
	< 200 kN (typically 4–6 T)	12	40
	< 300 kN (typically 7–13 T)	15	100
	> 300 kN (typically 13–18 T)	20	100
	> 300 kN (> 18 T)	25	100
Small hydraulic hammer	300 kilograms (5 to 12 T excavator)	2	7
Jackhammer	Hand held	1	3

Operational noise criteria

In accordance with Section 5.6 of the Road noise criteria guideline (Transport for NSW, 2023c) (RNCG), further assessment is required where minor works increase road traffic noise levels by more than 2 dBA relative to the existing noise levels at the worst affected receiver. Where noise levels are predicted to increase by less than 2 dBA, the impacts are considered minor and noise mitigation is not required.

6.3.4 Potential impacts

Construction

Airborne noise

Construction of the proposal would result in exceedance of NMLs at residential receivers in all three NCAs during standard hours and OOHW periods. The receivers predicted to experience construction noise levels that exceed NMLs during each construction scenario are detailed and mapped in Appendix F. The predicted noise impacts at residential receivers during the loudest construction scenario (road pavement construction) are provided in Table 6-25 and Table 6-26. The predicted noise levels indicate that, without the implementation of noise mitigation measures:

- up to 131 residential receivers are predicted to experience exceedances of NMLs during standard hours
- up to two residential receivers may be highly noise affected (>75 dBA) during standard hours
- up to 538 residential receivers are predicted to experience exceedances of NMLs during OOHW periods
- noise levels during night works are predicted to exceed sleep disturbance limits at up to 189 residential receivers and exceed sleep awakening limits at up to 40 residential receivers.

Exceedances of NMLs are predicted at up to one medical receiver and two commercial receivers.

Noise levels during the operation of the ancillary facilities are not predicted to result in exceedances of NMLs at residential receivers during standard hours, or exceedances of sleep disturbance and sleep awakening limits during night works. Up to 22 residential receivers are predicted to experience exceedances of NMLs (typically less than 5 dBA) due to the operation of ancillary facilities during OOHW periods.

Table 6-25 Predicted noise impacts at residential receivers during loudest construction scenario (road pavement construction) during standard hours and OOHW periods.

NCA	Number of residential receivers exceeding NML (grouped by extent of exceedance)				
	0–10 dBA (Clearly audible)	10–20 dBA (Moderately intrusive)	>20 dBA (Highly intrusive)	Highly affected (>75 dBA)	Total
Standard hours[1]					
NCA 1	2	2	0	2	4
NCA 2	0	0	0	0	0
NCA 3	106	21	0	0	127
OOHW Period 1[1]					
NCA 1	2	3	2	0	7
NCA 2	0	0	0	0	0
NCA 3	48	114	13	0	175
OOHW Period 2[1]					
NCA 1	44	18	2	2	66
NCA 2	0	0	0	0	0
NCA 3	262	163	46	1	472

(1) Refer to Table 6-18 for definitions of standard and OOHW work hours.

Table 6-26 Predicted sleep disturbance and sleep awakening noise impacts at residential receivers during loudest construction scenario (road pavement construction)

NCA	Number of residential receivers exceeding NML (grouped by extent of exceedance)					
	0–5 dBA	5–10 dBA	10–20 dBA	20–30 dBA	> 30 dBA	Total
Sleep disturbance – L_{eq}[1]						
NCA 1	3	1	1	2	0	7
NCA 2	0	0	0	0	0	0
NCA 3	65	34	13	0	0	182
Sleep awakening – L_{max}[2]						
NCA 1	1	1	1	2	0	5
NCA 2	0	0	0	0	0	0
NCA 3	27	8	0	0	0	35

(1) L_{eq}: The average noise level over a period of time.

(2) L_{max}: The 'Maximum Noise Level' for an event, used in the assessment of potential sleep disturbance during night time periods.

The assessment is generally considered conservative as the noise level calculations assume several items of construction equipment are in use at the same time during each construction scenario at the closest point to the receiver. However, not all plant and equipment would typically operate concurrently, and plant and equipment would be used in different areas across the proposal area. The use of noise intensive equipment would also be limited to sporadic short periods. The actual exceedance during construction would generally be lower and maximum noise level impacts would only be experienced for limited periods where equipment is operating at their maximum capacity near the receiver.

Construction traffic noise

The proposal would generate up to 30 light vehicle movements and 60 heavy vehicle movements per day across the proposal area during the peak construction period. It is assumed that traffic associated with the construction of the proposal would use the surrounding road network to travel to and from the proposal area.

An increase in traffic noise greater than 2 dB along roads within the proposal area during construction is not considered likely based on the existing traffic volumes along Mandalong Road and Dora Street, and the estimated construction traffic movements and traffic volumes for the proposal. Therefore, noise levels from construction traffic would comply with the RNP criteria.

Construction vibration

The most vibration intensive equipment expected to be used during construction is vibratory rollers used during road pavement construction. Minimum working distances for vibration intensive equipment are described in Table 6-24 and shown in Appendix F. The use of vibratory rollers (weighing between 7 and 13 tonnes) has the potential to result in cosmetic damage risk at up to 11 properties, and potential human comfort impacts at up to 48 residential receivers. Where a smaller vibratory roller is used, potential impacts on surrounding sensitive receivers are expected to be significantly decreased. It is noted that the vibration sensitivity of buildings varies depending upon multiple factors, such as specific ground features, structural design, building condition and exposure period. Predicted impacts do not necessarily mean that cosmetic damage would occur.

Vibration mitigation measures have been recommended to minimise potential vibration impacts at the affected locations.

No heritage buildings or heritage structures have been identified within the cosmetic damage minimum working distance (i.e. 25 metres) (refer to sections 6.12 and 6.13 for further information about Aboriginal and non-Aboriginal heritage values within and surrounding the proposal area).

Operation

Operational road traffic noise during the daytime and night time periods were predicted for the future 'build' (with the proposal) and 'no build' (without the proposal) assessment scenarios for the year of opening (2028). The assessment considered future traffic growth from surrounding developments.

Noise modelling results indicate the proposal is likely to result in a minor change to operational noise levels at the majority of receivers. Non-residential receivers in NCA 2 are predicted to experience a slight increase in noise levels. The change in noise levels would be within 2 dBA of existing noise levels, which is not considered an audible change.

6.3.5 Safeguards and management measures

Safeguards and management measures to minimise potential noise and vibration impacts of the proposal are presented in Table 6-27.

Table 6-27 Noise and vibration safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV1	Construction noise and vibration	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared in accordance with the Transport Construction Noise and Vibration Management Guideline - Roads (Dec 2024) (CNVG) and implemented as part of the CEMP. The CNVMP will identify: • all potential significant noise and vibration generating activities associated with the works • noise and vibration sensitive receivers • measures to be implemented during construction to minimise noise and vibration impacts • a monitoring program to assess performance against relevant noise and vibration criteria • arrangements for consultation with affected neighbours and other sensitive receivers, including notification and complaint handling procedures, including: • notification of at least seven calendar days prior to commencement of any works • the construction activities likely to have noise or vibration impacts • the construction period and construction hours • any proposed mitigation measures for noise and vibration impacts • contact information for the proposal, including out of hours contact.	Contractor	Construction	Section 4.6 of QA *G36 Environment Protection*
NV2	Out of hours construction work	The CNVMP will also contain an out of hours works procedure to be developed and implemented in accordance with the CNVG.	Contractor	Construction	Additional safeguard

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV3	Construction noise and vibration training and awareness	All employees, contractors and subcontractors are to receive awareness training in control of noise and vibration as part of their regular site induction and updated prior to any significant period of nightwork. At a minimum training is to include: • all relevant proposal specific and standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures.	Contractor	Construction	Additional safeguard
NV4	Construction noise and vibration	Plant selection will be in accordance with the CNVG.	Contractor	Construction	Additional safeguard
NV5	Construction vibration	Where the use of vibration intensive equipment within the relevant minimum working distances cannot be avoided: • detailed property inspections will be completed to document the condition of buildings and structures within the minimum working distances. This will be conducted prior to the commencement of vibration intensive work. A copy of the report will be provided to the relevant landowner or land manager prior to the commencement of works. • receivers to be notified at least five days in advance of vibration intensive works and in advance of vibration monitoring • where vibration levels are predicted to exceed limits set within the CNVG, the use of less vibration intensive methods of construction or equipment will be considered where feasible and reasonable. • complete vibration monitoring is to be undertaken during works which are predicted to exceed limits within the CNVG.	Contractor	Construction	Section 4.7 of QA *G36 Environment Protection*

6.4 Landscape character and visual impacts

This section assesses the potential landscape character and visual impacts of the construction and operation of the proposal.

6.4.1 Methodology

The landscape character and visual impact assessment has been prepared in accordance with Transport's Environmental Impacts Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA-N04 (Transport for NSW, 2023e) (referred to in this chapter as 'the Guidelines') and Beyond the Pavement (Transport for NSW, 2020a).

The methodology for the assessment included:

- a site visit, review of relevant literature, and analysis of aerial photographs and topographic maps
- identifying the visual catchment surrounding the proposal (i.e. the approximate area where it would be possible to see the proposal) by considering the surrounding topographical features, built structures and screening vegetation
- identifying and describing landscape character zones (LCZs), which identify areas of similar character within and surrounding the proposal area
- identifying representative viewpoints within the visual catchment
- determining the sensitivity of each LCZ and viewpoint to changes in the landscape, through consideration of the existing quality of the views and number and type of visual receivers. For example, a pristine natural environment or historic setting would be more sensitive to change than a built-up industrial area
- determining the potential magnitude of change from construction and operation of the proposal for each LCZ and viewpoint, by considering the scale, nature and duration of change
- assessing the potential impacts of the proposal for each LCZ and viewpoint, which combines the level of sensitivity and magnitude of change using a matrix (refer to Table 6-28)
- recommending mitigation measures to minimise the potential landscape character and visual impacts identified.

Table 6-28 Landscape character and visual impact assessment matrix

Sensitivity	Magnitude				
	High	Moderate	Low	Negligible	
High	High	High-moderate	Moderate	Negligible	
Moderate	High-moderate	Moderate	Moderate - low	Negligible	
Low	Moderate	Moderate - low	Low	Negligible	
Negligible	Negligible	Negligible	Negligible	Negligible	

6.4.2 Existing environment

The Hunter Regional Plan 2041 identifies Morisset and the supporting local centres of Cooranbong and Wyee as the largest future growth area in the Central Coast and Hunter. The wider Morisset area, with direct links to the M1 Pacific Motorway and Main Northern Rail Line is expected to become a major transport corridor, connecting the Lower Hunter and Greater Newcastle City with the Central Coast City. Morisset itself is earmarked to transform into a regionally significant mixed-use centre, supporting an array of businesses and professional services, as well as providing land use opportunities for more intensive multi-storey commercial, mixed-use and residential development. The proposal would support planned growth within the Morisset area by increasing road capacity and improving active and public transport infrastructure to cater for the growing needs of the Lake Macquarie community.

The proposal is located to the east of the M1 Pacific Motorway in an area characterised by industrial and commercial land.

Landscape character zones

Five LCZs were identified within and surrounding the proposal area. These LCZs are described in Table 6-29 and shown in Figure 6-5.

Table 6-29 Landscape Character Zones

LCZ	General character	Sensitivity
LCZ01 - Infrastructure	LCZ01 includes the proposal area and surrounding roads connecting to the proposal area. Within the proposal area, the road ranges from two lanes on the eastern end at Ourimbah Street, to four lanes on approach to the roundabout at Gateway Boulevard and the M1 Pacific Motorway. The proposal area is a busy commuter road corridor with little pedestrian or cyclist amenity. The road is relatively flat with one notable dip near Mullards Creek, and is lined with screening trees but still offers some views into adjacent LCZs. The existing Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout within the proposal area has an established garden with manicured bushes and mature trees. LCZ01 further includes infrastructure associated with the Ausgrid electricity substation located on Mandalong Road. Powerlines run the length of the road and are a notable landscape feature. LCZ01 also includes rail infrastructure to the south of the proposal area associated with the Central Coast and Newcastle Line that provides connections between Newcastle and Sydney, and Morisset Station serviced by the Central Coast and Newcastle Line, located around 520 metres east of the proposal area. Morisset Station is not visible from the proposal area.	Low
LCZ02 - Commercial and Industrial	LCZ02 consists of areas zoned as E3 Productivity Support and E4 General Industrial, including commercial development along the northern side of Dora Street, the Morisset Business Park between Wyee Road and Gateway Boulevard, and the new bulky goods retail development, industrial warehouses and light industrial and business park currently being constructed along Gimberts Road (refer to Section 6.14). This LCZ is characterised by large paved areas for vehicle parking, steel and concrete warehouses, chain mail fencing, large signage and powerlines.	Low
LCZ03 - Recreational	LCZ03 consists of land used for recreational purposes and includes Auston Oval, and the Cedar Mill event site currently being construction along Dora Street (refer to Section 6.14). These spaces are typically cleared of trees with regularly mown fields and perimeter vegetation, and are zoned as RE1 Public Recreation and RE2 Private Recreation. At Auston Oval, low perimeter fences encourage informal use by the community while existing mature perimeter trees and ball-stop fencing create a buffer between the oval and Dora Street. The approved Cedar Mill event site development will consist of a privately owned recreational space which will include a multipurpose function building, café, restaurant, water play area, large expanses of lawn and paved areas, an amphitheatre seating area and events stage for concert spectators, a bus parking area and two car parking areas. The main event stage will be a 30 metre tall steel-framed organic-shaped canopy tent clad in white weather-resistant fabric, and will be visible from the road. It will have the capacity to host up to 30,000 people and will be noticeably lit up during evening events. Bushland associated with the Koompahtoo Aboriginal Reserve is visible beyond the Cedar Mill event site. Further south of the Cedar Mill event site a caravan park is being developed with 206 long term sites and two short term sites, community facilities, car parking, caravan parking and open space areas. The caravan park site will retain areas of existing bush land and trees within the site particularly the riparian vegetation located in the southern portion of the site.	High

LCZ	General character	Sensitivity
LCZ04 - Rural Residential	LCZ04 consists of privately owned land used for residential and farm infrastructure, and grazing native vegetation. The land is zoned as RU6 Transition, C2 Environmental Conservation, and E3 Productivity Support. The topography is gently undulating, with a dip in the terrain occurring near Mullards Creek. Vegetation is typically cleared grassy paddocks with scattered trees and dense perimeter plantings.	High
LCZ05 - Bushland	LCZ05 consists of dry sclerophyll native woodland and open forest dominated by *Eucalyptus haemastona*, *Corymbia gummifera* and *Eucalyptus capitellata* tree species. The LCZ has a fairly open tree canopy, mid-tall trees and a dense shrub layer, which supports a range of natural habitats. Parts of the LCZ can be viewed extensively from Freemans Drive. The Koompahtoo Aboriginal Reserve is not located directly next to the proposal area, but is within viewing distance from Dora Street and the planned Cedar Mill event site, which transitions into coastal swamp forest and wetlands as it approaches Lake Macquarie. These areas are zoned C2 Environmental Conservation, RU6 Transition and RE1 Public Recreation.	Low

Viewshed mapping and viewpoints

The experience of viewers varies according to the duration, field of view and nature of exposure to the proposal. Areas directly next to the proposal area are expected to have medium to high visibility of the proposal, as illustrated in Figure 6-6. The potential visibility of the proposal from these areas would be mainly determined by the local topography and would be further reduced by intervening vegetation and fences present along the existing road corridor.

A total of five viewpoints were selected from publicly accessible locations within the proposal area, representing a range of distances and perspectives, or locations where views would appear most prominent within the proposal area. Viewpoint locations are presented on Figure 6-5, and include:

- VP01 view south-west along Dora Street
- VP02 view north-west along Dora Street towards the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection
- VP03 view south-east along Freemans Drive
- VP04 view north-east along Mandalong Road
- VP05 view west along Mandalong Road.

The location and physical attributes of the viewpoints are defined in Table 6-30.

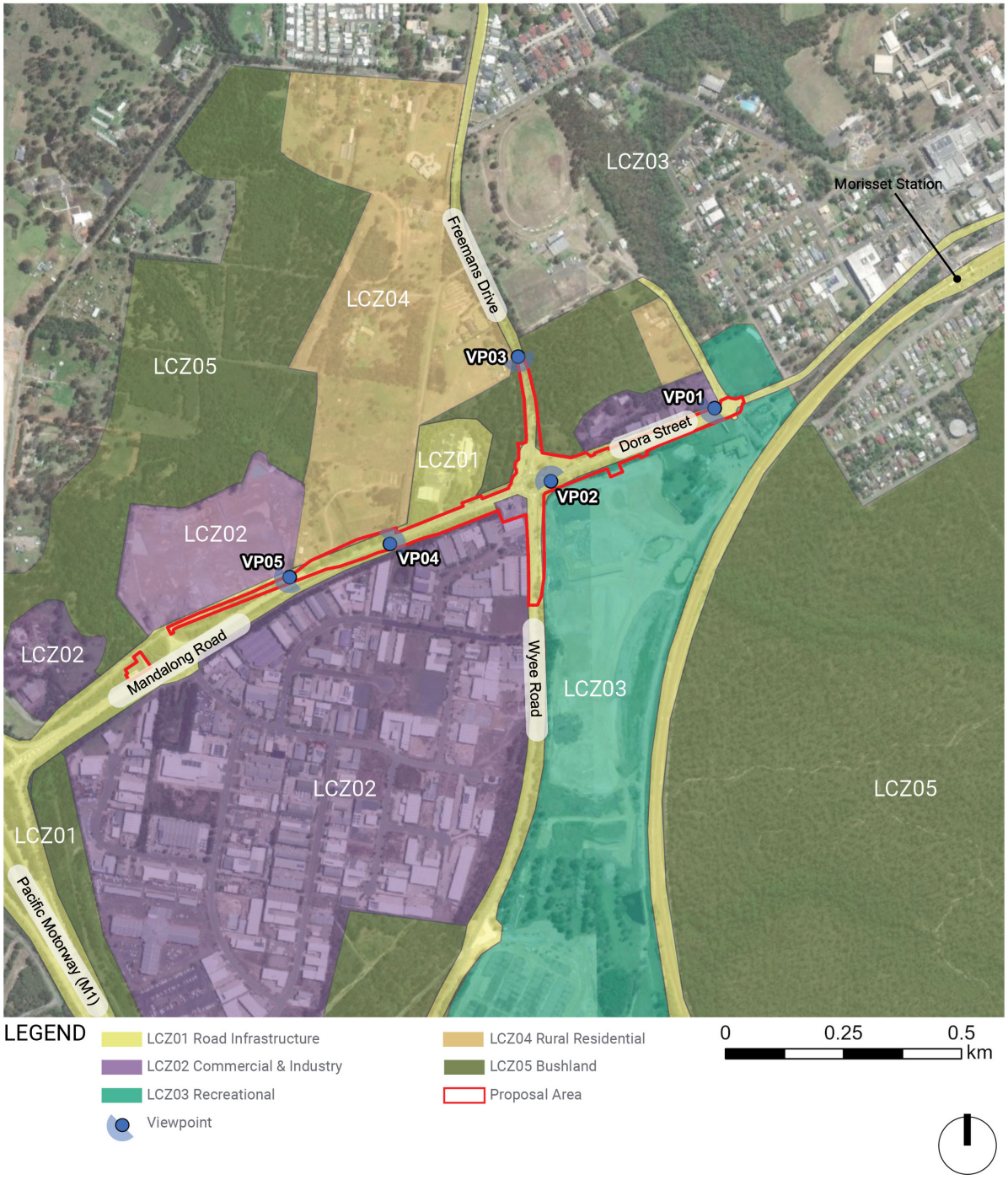


Figure 6-5 Landscape Character Zones and viewpoints

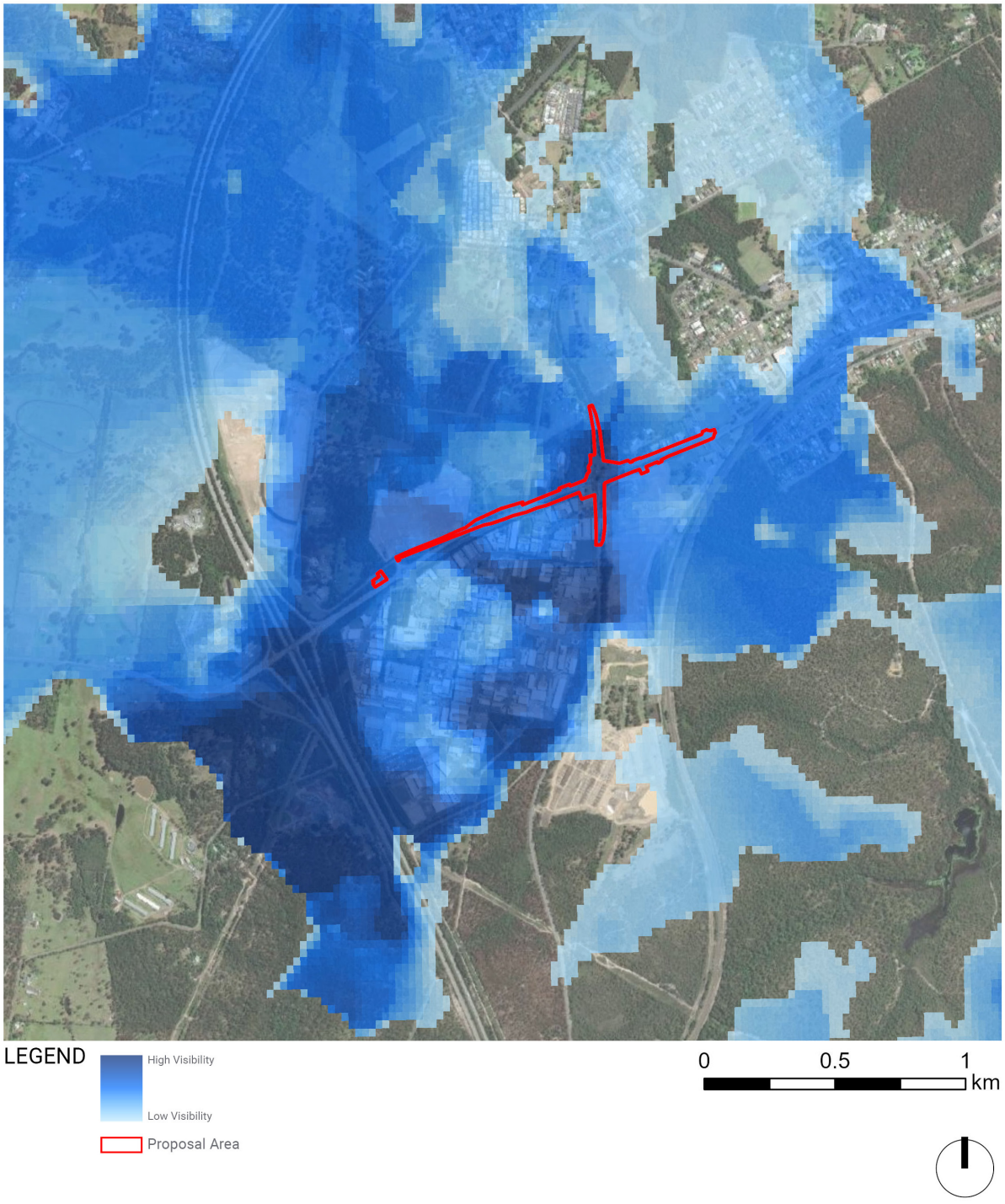


Figure 6-6 Visibility of the proposal

6.4.3 Potential impacts

Construction

During construction, landscape character and visual impacts would likely occur due to:

- vegetation clearance, excavations and earthworks
- removal of existing road infrastructure, including the existing Mandalong Road/Freemans Drive/Dora Street/ Wyee Road roundabout
- demolition of infrastructure at the concrete batching plant site, except the site shed and concrete slabs that would be retained for use as material bays during construction
- movement and operation of various plant and equipment and light and heavy vehicles
- erection and use of temporary facilities such as fencing, lighting and ancillary facilities for material and equipment storage. Four potential ancillary facilities have been identified for the proposal. The location, and current and proposed use of these facilities, are described in Section 3.4
- construction of road infrastructure.

Non-residential receivers at commercial and industrial properties along Dora Street and Wyee Road and road users (motorists, pedestrians and cyclists) would have clear views of construction activities and ancillary facilities, however, would have low sensitivity to these impacts. The magnitude of potential landscape character and visual impacts for these receivers is expected to be moderate, considering impacts would be temporary and short term, resulting in potential moderate-low impacts for these receivers.

One residential property along Freemans Drive would have filtered views of the proposal through vegetation, and would have a high sensitivity to landscape character and visual impacts. The magnitude of potential landscape character and visual impacts for this receiver is expected to be low, as construction activities would occur at this location only for a short period of time, resulting in a potential moderate impact for the receiver.

Only one other residential property along Mandalong Road would have views of the proposal, however this property is currently uninhabited and the property is currently subject to a development proposal.

Operation

Table 6-30 provides an assessment of the potential landscape character and visual impacts at each viewpoint.

The existing landscape within and surrounding the proposal area is mainly characterised by commercial and industrial land uses, with patches of dense bushland surrounding the existing corridor. Permanent visual amenity and landscape changes would result from the removal of vegetation, widening of the road corridor, provision of new road infrastructure and property acquisition. The proposed upgrades would align with the existing visual character of the area, and would result in a low visual impact for road users and non-residential receivers along Dora Street and Wyee Road at the selected viewpoints.

The landscape character and visual environment of the Morisset area and surrounds is expected to continue to undergo change during operation of the proposal, associated with Morisset's expansion as a regional growth area. The proposal aims to respond to and support predicted land use and population changes in the Morisset area as it becomes a major transport corridor and a regionally significant mixed-use centre.

Table 6-30 Potential landscape character and visual impact assessment of the proposal

Viewpoint 01: Dora Street (VP01)		
		
Description and sensitivity	**Magnitude of change**	**Impact**
Viewpoint VP01 looks south-west along Dora Street, and would be experienced by road users and non-residential receivers along Dora Street. The existing visual character is highly modified and consists of the existing road, pedestrian footpath, signage, powerlines, and informal roadside carparking. The Cedar Mill event site is currently being constructed along the southern side of Dora Street. Buildings and signage associated with the McDonalds restaurant, Ampol and 7-Eleven service stations and Morisset Ambulance Station are located along the northern side of the road. The topography is flat with scattered exotic and native vegetation. The visual sensitivity of this viewpoint has been assessed as **low**.	The proposal would remove roadside vegetation (including mature trees) at this location to accommodate widening of the road corridor from two lanes to four lanes and the construction of a new shared user path along the southern side of the road. The relocation of powerlines to the south may reduce their dominance in the midground of this view but could still be visible. The loss of existing mature street trees would open up views to the south-west, towards the Cedar Mill event site, Morisset Business Park and distant hills. These impacts are expected to reduce over time as replacement plantings establish and mature. The magnitude of change at this viewpoint is expected to be **low.**	The overall visual impact is expected to be **low**.
Viewpoint 02: Corner of Wyee Road and Dora Street (VP02)		
		
Description and sensitivity	**Magnitude of change**	**Impact**
View point VP02 looks north-west along Dora Street towards the existing Mandalong Road/Freemans Drive/ Dora Street/Wyee Road roundabout. The landscape in this location is highly modified, and is mainly characterised by road infrastructure, powerlines, vacant land (used as informal parking areas) and manicured roundabout plantings. Dense native bushland is located further away from the road corridor to the north, and commercial and industrial buildings are located to the south-west. The visual sensitivity of this viewpoint has been assessed as **low**.	The proposal would widen the road corridor from two lanes to seven lanes and replace the roundabout and its landscaping with traffic signals. The concrete batching plant located at the Mandalong Road/Wyee Road intersection would be partly demolished (with the site shed and concrete slabs retained). The modifications would open up views to the Morisset Business Park and Mandalong Road and increase the built form in this location. The visual impact of the modifications would gradually reduce over time as replacement plantings establish and mature. The magnitude of change at this viewpoint is assessed as **low**.	The overall visual impact is expected to be **low**.

Viewpoint 03: Freemans Drive (VP03)		
		
Description and sensitivity	**Magnitude of change**	**Impact**
Viewpoint VP03 looks south-east along Freemans Drive. This view is characterised by dense native vegetation (associated with LCZ05), road infrastructure (associated with LCZ01), and an unsealed driveway (associated with LCZ04). The topography gradually rises, then falls to meet the roundabout at the Mandalong Road/Freemans Drive/ Dora Street/Wyee Road intersection. The visual sensitivity of this viewpoint has been assessed as **low.**	The proposal would require the removal of roadside vegetation to accommodate widening of the road corridor. The loss of existing mature street trees would open up views to the south-east, however bushland would still frame the majority of the view. The visual impact of the modifications would gradually reduce over time as replacement plantings establish and mature. Surrounding residents may experience an increase in night lighting and light spill due to the widened road corridor. Inclusion of new elements such as glider poles would have a minimal visual impact. The magnitude of change at this viewpoint is assessed as **low.**	The overall visual impact is expected to be **low**.

Viewpoint 04: Mandalong Road (VP04)		
		
Description and sensitivity	**Magnitude of change**	**Impact**
Viewpoint VP04 looks north-east along Mandalong Road. The Morisset Business Park is located on the southern side of the road, and agricultural land is located on the northern side of the road. An electricity substation is located to the east. Stands of scattered and dense vegetation are located on both sides of the road, screening surrounding buildings. Powerlines are a dominant feature in this location. The topography inclines slightly to the south-east. The visual sensitivity of this viewpoint has been assessed as **low.**	The proposal would require removal of vegetation along the southern side of Mandalong Road for road widening, and to the north-east to accommodate the new shared user path. This would open up views towards the Morisset Business Park and to agricultural land to the north. The visual impact of the modifications would gradually reduce over time as replacement plantings establish and mature. The magnitude of change at this viewpoint is assessed as **low.**	The overall visual impact is expected to be **low**.

Viewpoint 05: Mandalong Road (VP05)

Description and sensitivity	Magnitude of change	Impact
Viewpoint VP05 looks west along Mandalong Road. The proposed shared user path along the northern side of Mandalong Road would be slightly elevated above Mandalong Road, and separated by vegetation from the road. The existing landscape character is dominated by the Morisset Business Park south of Mandalong Road (associated with LCZ02), with street trees screening the existing buildings from the road. The construction of a new large bulky goods retail development is visible to the north. The visual sensitivity of this viewpoint has been assessed as **low.**	The proposed shared user path would reuse the existing Old Mandalong Road. The scale of the existing infrastructure would remain the same which allows for the existing vegetation to be retained. The new shared user path and improved verge plantings would be a positive change to the existing visual amenity. The interface with the new large bulky goods retail development to the north is yet to be determined. The magnitude of change at this viewpoint is assessed as **low**.	The overall visual impact is expected to be **low**.

6.4.4 Safeguards and management measures

An Urban Design Concept and Landscape Strategy has been developed for the proposal (refer to Section 3.2.3 and Appendix G) to consider how the proposal would integrate physically and visually with the surrounding environment. The strategy includes urban design direction for elements of the proposal, including materials and planting species. The urban design and landscaping strategy would be finalised during detailed design.

Other safeguards and management measures to minimise potential landscape character and visual impacts of the proposal are presented in Table 6-31.

Table 6-31 Landscape character and visual impacts safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
LV1	Landscape character and visual impacts	The Urban Design Report will be prepared in accordance with Beyond the Pavement (Transport for NSW, 2020a) as part of the detailed design. The Urban Design Report will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Urban Design Report will include design treatments for: • location and identification of existing vegetation and proposed landscaped areas, including species to be used • built elements • pedestrian and cyclist elements, including footpath and shared user path locations, paving types and pedestrian crossings • fixtures, such as seating, lighting, fencing and signs • details of the staging of landscape works, taking account of related environmental controls • procedures for monitoring and maintaining landscaped or rehabilitated areas • Aboriginal Cultural interpretation in consultation with the Biraban LALC.	Contractor	Detailed design	Standard safeguard
LV2	Vegetation removal	Landscaping species selection in areas more likely to support existing or future wildlife connectivity must be included in the design with regard to their overall structure and refuge value. This includes planting of taller canopy species next to the road to facilitate future glider movement across the roadway.	Contractor	Detailed design	Additional safeguard

6.5 Socio-economic

The potential socio-economic impacts associated with the construction and operation of the proposal are assessed in the Socio-economic Impact Assessment provided in Appendix H. The findings of the report are summarised in this section.

6.5.1 Methodology

A 'moderate' level of assessment was completed for the proposal in accordance with the Environmental Impact Assessment Practice Note – Socio-economic Assessment (Transport for NSW, 2020b) (SEIA Practice Note), to reflect the scale and magnitude of potential impacts to the socio-economic environment. In accordance with the SEIA Practice Note, the assessment involved the following:

- scoping the potential socio-economic issues and identifying communities potentially affected by the proposal's construction and operation
- defining a local study area and regional study area to reflect the geographical areas affected by direct and indirect social impacts and benefits. The local study area consists of the Australian Bureau of Statistics (ABS) Morisset Suburb and Localities (SALs) unit, and the regional study area consists of the Lake Macquarie LGA, as shown in Figure 6-7

- describing the existing socio-economic environment in the local and regional study areas to provide a baseline from which the impacts of the proposal were assessed. This involved:
  - reviewing existing NSW and local government policies, plans and strategies relevant to the social and economic environment of the local and regional study areas
  - analysing key population and demographic indicators, including ABS 2021 Census data on population and housing
  - analysing data and information on local business and industry, employment and income, and dwelling characteristics
  - reviewing existing social infrastructure and community features near the proposal, including recreation and amenity uses, schools, churches, public transport and walking and cycling facilities
  - confirming what the local and regional community values are through review of community consultation reports relevant to the local and regional study areas
  - reviewing other technical studies and consultation completed for the proposal, as well as undertaking consultation with residents, businesses and stakeholders, including online interviews with seven stakeholder groups
- identifying and assessing the potential impacts and benefits of the construction and operation of the proposal to land use, property and socio-economic values
- recommending safeguards and management measures to avoid, manage or mitigate negative impacts and support potential benefits where practicable
- assessing the potential residual impacts following the implementation of safeguards and management measures.

Significance of impacts

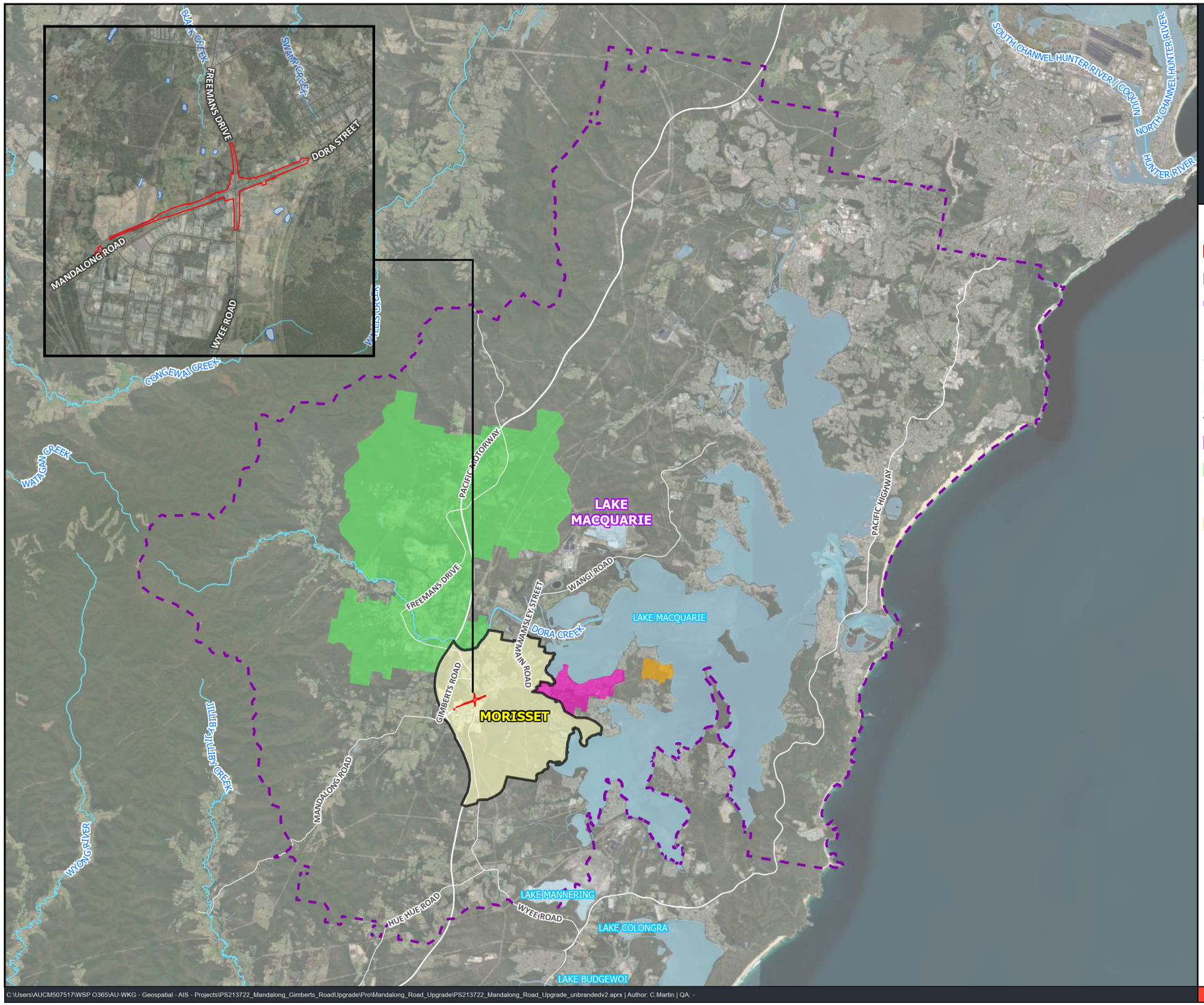
Determination of the significance of likely impacts is based on the sensitivity and magnitude of the impacts:

- sensitivity is defined by the susceptibility or vulnerability of people, receivers or receiving environments to adverse changes caused by the impact, or the importance placed on the matter being affected
- magnitude refers to the scale, duration, intensity and scope of the proposal, including how it will be constructed and operated.

The impact grading matrix utilised to assess the level of significance of potential negative impacts, as outlined in the SEIA Practice Note, is provided in Table 6-32.

Table 6-32 Grading matrix to assess the level of significance of socio-economic impacts

Sensitivity	Magnitude				
	High	Moderate	Low	Negligible	
High	High	High-moderate	Moderate	Negligible	
Moderate	High-moderate	Moderate	Moderate-low	Negligible	
Low	Moderate	Moderate-low	Low	Negligible	
Negligible	Negligible	Negligible	Negligible	Negligible	



Mandalong Road Upgrade

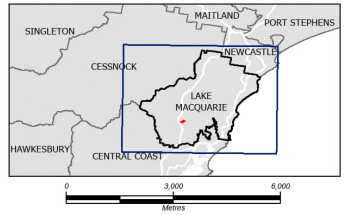
Figure 6-7
Social impact assessment regional and local study area

Legend

- Proposal area
- Local study area
- Regional study area
- Road
- Watercourse
- Waterbody

Suburb

- Bonnells Bay
- Cooranbong
- Morisset
- Silverwater



Coordinate system: GDA2020 MGA Zone 56
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GDA 2020

Data sources: Geoscience Australia, Nearmap, NSWSS

6.5.2 Existing environment

Socio-economic profile

The socio-economic profile of communities in the local and regional study areas, based on ABS 2021 Census data and other data from the ABS, is outlined in Table 6-33. Full details of the socio-economic indicators are provided in Section 4 of Appendix H.

Table 6-33 Socio-economic profile of communities in the local and regional study areas

Profile	Description
Population	• The local study area has a total resident population of 4,078, representing around 2 per cent (%) of residents in the regional study area, which has a total population of 213,845. • Between 2006 and 2021, the population of the local study area increased by around 34%, whereas the population of the regional study area increased by around 13%. • The population of the Morisset-Cooranbong and Bonnells Bay-Silverwater regions within the regional study area is expected to increase significantly over the next 20 years as a result of predicted employment growth and development. • Around 7% of the local study area population identify themselves as Aboriginal and/or Torres Strait Islander people.
Age	• There is a relative high proportion of older residents in the local study area, which is reflected by the large number of residential aged care facilities in the local study area. Almost half of the local population (around 43%) is over 60 years old, whereas almost a third of the regional population (around 28%) is over 60 years old. In the local study area, around 21.5% of the population is aged 70–80, and around 9% is aged 85 and over, compared to around 12.9% and 3.1% (respectively) of the population in the regional study area.
Housing	• There are around 1,827 dwellings in the local study area, of which 92% are occupied private dwellings. • Housing in the local study area mainly comprises separate houses, with this dwelling type accounting for around 74.5% of occupied dwellings. • Almost half (around 43.1%) of occupied dwellings in the local study area are located within retirement villages, compared to around 4% in the regional study area. • Residential areas in the local study area are mainly located around the Morisset train station to the east of the proposal. The closest existing residential areas to the proposal area are between 125 and 500 m west, north and east of the proposal (along Mandalong Road, Freemans Drive and Stockton Street in Morisset). Two rural residential properties are located next to the proposal area along Mandalong Road and Freemans Drive. A caravan park is currently under construction at the southern end of the Cedar Mill event site (currently under construction at the southern side of Dora Street) around 700 m south of the proposal. • Four small residential developments are being constructed within the local study area, between 1.7 and 4 km west, north and east of the proposal area. Medium to large residential developments are being constructed within the regional study area at Cooranbong and Wyee, between 6 and 7 km north and south of the proposal area.
Disadvantage and need for assistance	• Communities in the local study area display a high level of relative disadvantage, whereas communities in the regional study area display a high level of relative advantage, based on the Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) (ABS, 2018).

Profile	Description
Income and employment	• There is a relatively high proportion of residents in the local study area with a low income (median weekly household income of less than $650), which is reflective of the relatively higher levels of socio-economic disadvantage in the local area, and the large proportion of older residents living in retirement villages. • Unemployment levels in the local study area are almost double the unemployment levels in the regional study area and over half of all residents in the local study area that are 15 years or older are not in the labour force. This can be attributed to the large proportion of older residents living in the local study area who are likely to be retired or unable to work due to age and/or disability. • The main industries of employment in the local study area include social assistance services, aged care residential services, supermarket and grocery stores, hospitals (except psychiatric hospitals) and takeaway food services. This reflects the large proportion of older residents and residential aged care in the local area.
Travel behaviour	• Households in the local and regional study areas generally have a high level of access to a private vehicle, with a low proportion of households (less than 10%) without a vehicle. • The most common travel to work method in the local area is by car (as driver or passenger), followed by public transport.

Local business and industry

A range of businesses and industries in the local study area service the needs of communities within the local and regional study areas, including:

- a concrete batching plant within the proposal area (located at the intersection of Mandalong Road and Wyee Road)
- businesses and industries located in Morisset Business Park next to the proposal area along Mandalong Road, including:
  - eight automative repair shops and mechanics (including a truck repair shop)
  - a brewery
  - four trade, fabrication and contracting businesses
  - a storage facility
  - a television broadcasting station
  - two early education centres
  - a dance school
  - a barber
  - two automotive dealerships
- businesses located next to the proposal area along the northern side of Dora Street, including two petrol stations and a McDonalds restaurant
- supermarkets and other businesses within Morisset town centre, located around 600 metres east of the proposal area.

Developments that would offer potentially significant employment and recreation opportunities are currently being constructed near the proposal, including the Cedar Mill event site (next to the proposal area along Dora Street) and a bulky goods retail development, industrial warehouses and light industrial and business park (north of the proposal area along Gimberts Road). Further detail on these developments and other significant developments proposed or approved near the proposal area are provided in Section 6.14.

Community values

Values and features likely to be important to communities in the local and regional study areas for quality of life and wellbeing based on feedback received through consultation undertaken for the proposal and undertaken by Lake Macquarie City Council for the Morisset Place Strategy (Lake Macquarie City Council, 2024) include:

- environmental and natural features such as Lake Macquarie, bushland, and native flora and fauna
- visual amenity values
- rural character of the local area
- culture and tourism opportunities provided by bushland and heritage sites within Morisset
- Aboriginal heritage values (refer to Section 6.12). The proposal is located on Awabakal Country, within the Biraban LALC area.

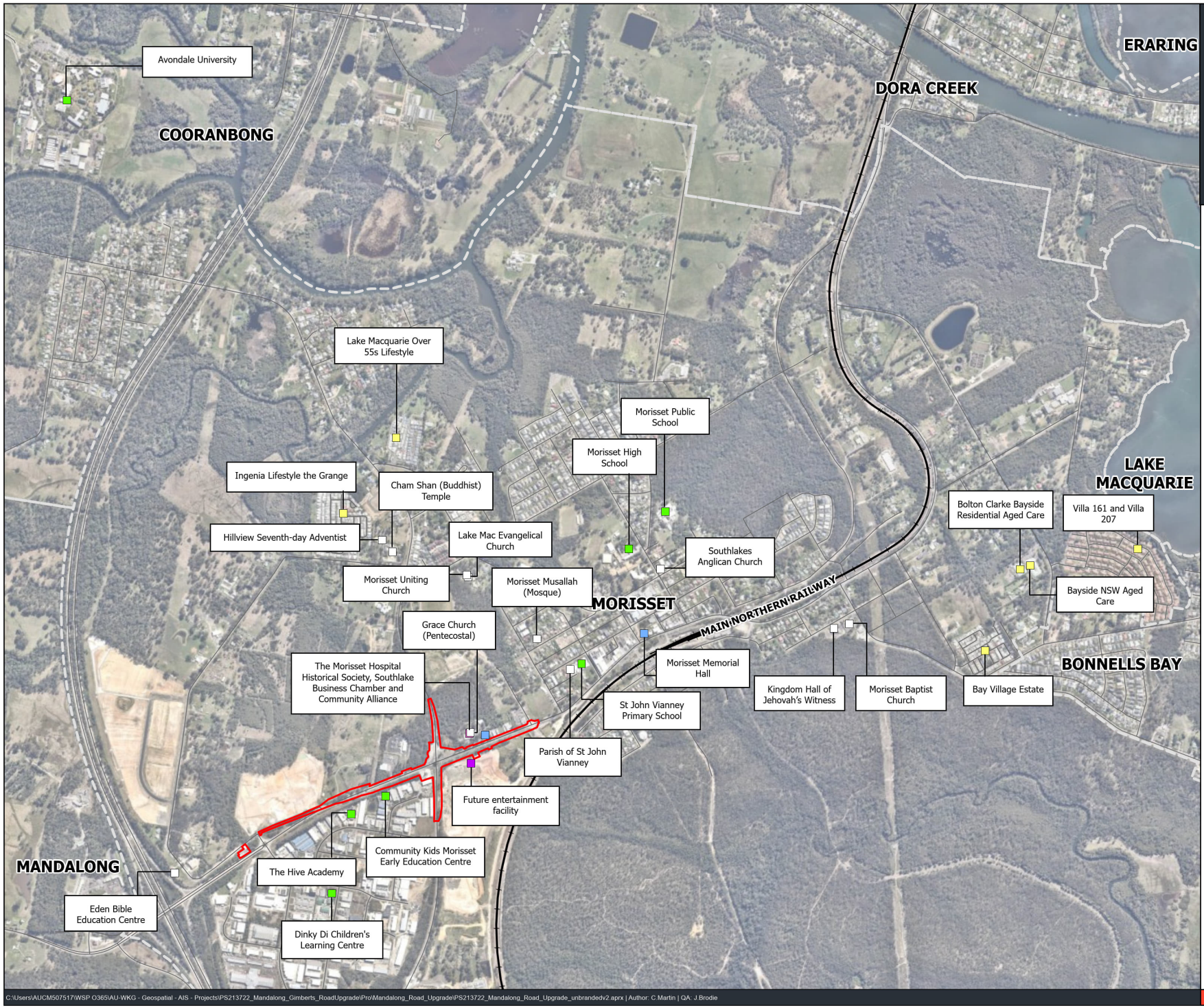
Social infrastructure and community facilities

Social infrastructure refers to the facilities, structures and services that support the physical, social, cultural or intellectual development or welfare of the community. Existing social infrastructure located within the local study area include educational institutions, community halls and centres, health, medical and emergency services, aged care facilities and places of worship, as shown in Figure 6-8. A future entertainment facility, the Cedar Mill event site, is currently being constructed next to the proposal area along Dora Street. The proposal area provides an important link to these social infrastructure facilities.

It is likely that the community using social infrastructure within the local study area commute to these facilities via the roads within the proposal area and the surrounding road network.

Access and connectivity

A description of the key transport infrastructure and facilities in the local study area, including roads, rail, bus services, pedestrian and cyclist access is provided in Section 6.2.2.



Mandalong Road Upgrade

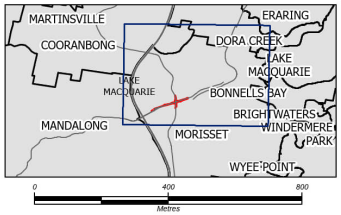
Figure 6-8
Social infrastructure

Legend

- Proposal area
- Suburb
- Road
- Railway

Social infrastructure

- Aged care
- Community centres and associations
- Community halls and centres
- Education
- Future entertainment facility
- Place of worship



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GDA 2020

Data sources: Geoscience Australia, Nearmap, NSWSS

6.5.3 Potential impacts

Construction

Economy

Construction of the proposal may have a positive effect on some businesses and industry within the local and regional study areas through increased expenditure and employment related to construction of the proposal. The proposal may also result in adverse economic impacts for property owners and employees due to full and partial property acquisition, and adverse economic impacts to businesses and services due to changes in access and informal parking areas.

Businesses near the proposal may experience increased expenditure through purchases by the construction workforce. The local and regional economy would benefit through purchases of labour and material from the transportation, logistics, manufacturing, processing, construction and specialist service industries for construction. During construction, the proposal would provide direct employment for up to 50 people.

The proposal would require the partial acquisition of five parcels of private and public land, and full acquisition of one private land parcel, as described in Section 3.6 and shown in Figure 3-4. The extent of property acquisition would be refined and confirmed during detailed design in consultation with the property owners and would be minimised where possible. Property acquisition would be undertaken in accordance with Transport's Land Acquisition Information Guide 2014, and the Land Acquisition Act and Land Acquisition Reform 2016 process.

Properties subject to partial acquisition would mainly include strip acquisition of properties along the road corridor to accommodate the widened road corridor and active transport infrastructure. Further details on property impacts are provided in Section 6.9. Partial acquisitions are not expected to impact the long term viability of the existing or future uses of affected properties, as acquisition would represent only a small portion of the overall land holding. It is anticipated that property owners would retain the ability to absorb or adapt to change.

The property subject to full acquisition, the concrete batching plant at the Mandalong Road/Wyee Road intersection, would be closed prior to acquisition. Since this business has many locations across the Lake Macquarie region and the rest of Australia, potential impacts on the business and its employees are not likely to be significant.

During consultation, stakeholders raised concerns about potential disruption to businesses and services from potential impacts on access and informal parking during construction.

Some existing accesses to properties within the proposal area may be temporarily affected during construction due to changes in pedestrian and vehicle access to the properties. Most of these impacts would be limited to short term closures and alternative access arrangements would be made wherever feasible (refer to Section 6.2). The extension of the central median along Mandalong Road and Dora Street would permanently remove the right in/right out access to some properties along these roads, except the Morisset Ambulance Station. A short section of the central median would be modified to allow all movements to and from the Morisset Ambulance Station.

The proposal would result in temporary and permanent impacts on informal parking within the proposal area. Informal parking within vacant areas along Freemans Drive within the proposal area would be temporarily unavailable during construction to allow for the establishment and operation of ancillary facilities AF1 and AF2 and would be reinstated once construction is completed. Concerns were raised about the temporary loss of these informal parking areas as it is used by food trucks. Informal roadside parking for general traffic along Mandalong Road and Dora Street within the proposal area would be permanently removed during construction to allow for road widening and the construction of shared user paths and pedestrian footpaths. However, since there is sufficient alternative formal and informal parking on the surrounding road network and within surrounding residential and commercial areas, potential impacts on parking would be minimal. Parking for light and heavy construction vehicles would be provided within the ancillary facilities.

A summary of the potential economic impacts and benefits during construction, as well as the assessed sensitivity, magnitude and significance of each impact and benefit, is provided in Table 6-34.

Table 6-34 Potential economic impacts and benefits during construction of the proposal

Potential impact/affected group	Sensitivity	Magnitude	Significance (pre-mitigation)
Positive economic flow-on effects for businesses			
Businesses in the local and regional study areas	Low	Low	Low (positive)
Impacts on business operations and flow-on effects on employees due to full and partial property acquisition			
Property owner of property subject to full acquisition	Low	High	Moderate
Employees of the business operating at the property subject to full acquisition	Moderate	High	High-moderate
Property owners of properties subject to partial acquisition	Moderate	Low	Moderate-low
Economic impacts on businesses and services due to impacts on access and parking			
Owners of businesses and services on Dora Street	Low	Moderate	Moderate-low
Food truck operators	Low-moderate	Moderate-high	Moderate

Community values

Community wellbeing may be affected due to full and partial property acquisition, perceived safety risks for pedestrians and cyclists, stress due to potential vibration impacts and changes to cultural values and sense of place during construction.

Property owners and employees have expressed uncertainty about the potential impacts of property acquisition on business operation, employment and properties, including property access during consultation. The extent of property acquisition would be refined and confirmed during detailed design in consultation with the property owners and would be minimised where possible. Property acquisition would be undertaken in accordance with Transport's Land Acquisition Information Guide 2014 and the Land Acquisition Act and Land Acquisition Reform 2016 process.

Increased construction traffic and changes in traffic conditions, including temporary detours or alternative routes for pedestrians and cyclists, may result in perceived safety risks for pedestrians and cyclists during construction. During sporting events at Auston Oval next to the eastern end of the proposal, there may be a larger presence of children and families with a higher sensitivity to these impacts. Access would be maintained for cyclists and pedestrians throughout construction. Detours, alternative temporary pathways and safety barriers around the proposal area would be provided where possible to ensure safe passage for both pedestrians and cyclists. In addition, speed limits would be reduced to protect pedestrians and cyclists during construction.

The use of vibration-intensive equipment during construction has the potential to result in cosmetic damage to some residential properties (refer to Section 6.3). Property owners and/or occupiers of properties potentially affected by vibration impacts may experience stress as a result of these impacts, which may affect their wellbeing.

Cultural values and sense of place of the local community may be impacted during construction due to full property acquisition, changes to landscape character and visual amenity due to construction activities, the widened road corridor and new road infrastructure, and removal of vegetation. Impacts on cultural values and sense of place would be experienced differently by community members and road users, depending on their attachment to place, and frequency of visiting those places. The proposal is not expected to impact Aboriginal or non-Aboriginal heritage values (refer to sections 6.12 and 6.13).

A summary of the potential impacts on community values during construction, as well as the assessed sensitivity, magnitude and significance of each impact, is provided in Table 6-35.

Table 6-35 Potential impacts on community values during construction of the proposal

Potential impact/affected group	Sensitivity	Magnitude	Significance (pre-mitigation)
Uncertainty among property owners and employees due to full and partial property acquisition			
Property owner of the property subject to full acquisition	Low	High	Moderate
Employees of business operating at property subject to full acquisition	High-moderate	High-moderate	High-moderate
Property owners of properties subject to partial acquisition	Moderate	Low	Moderate-low
Perceived safety risks for pedestrians and cyclists			
Pedestrians and cyclists in the proposal area	Moderate	Low	Moderate-low
Users of Auston Oval	Moderate	Low	Moderate-low
Stress due to potential vibration impacts to properties			
Owners/occupiers of properties subject to potential vibration impacts	Moderate	Low	Moderate
Changes to cultural values and sense of place			
Employees of business operating at property subject to full acquisition	Moderate	Moderate	Moderate
Residents and employees and customers of businesses and services near the proposal area	Low	Low	Low
Other residents of the local study area	Moderate	Negligible	Negligible

Local amenity

Amenity refers to the quality of life, character and elements in a community that make it a more pleasant and comfortable place to be a part of. Residents, employees, customers and service users near the proposal area may experience stress and frustration associated with potential amenity impacts related to potential noise, vibration, air quality, visual and traffic impacts during construction (refer to sections 6.2, 6.3, 6.4 and 6.7). Some community members may be more sensitive to these impacts than others.

A summary of the potential impacts on amenity during construction, as well as the assessed sensitivity, magnitude and significance of each impact, is provided in Table 6-36.

Table 6-36 Potential impacts on amenity during construction of the proposal

Potential impact/affected group	Sensitivity	Magnitude	Significance (pre-mitigation)
Potential stress and frustration due to potential amenity impacts			
Service users and employees of Hive Academy Childcare Centre and Community Kids Morisset Early Education Centre affected by amenity	High	Moderate	High-moderate
Residents near the proposal affected by noise, vibration, dust and traffic and transport impacts	Moderate	Moderate	Moderate
Adjacent non-residential receivers affected by noise, vibration and dust (customers and employees)	Low	Moderate	Moderate-low
Residents of the local study area affected by traffic and transport impacts	Moderate	Negligible	Negligible

Access and connectivity

The proposal would result in temporary changes to access and connectivity, including:

- temporary increases in travel times due to increased construction traffic and changes in traffic conditions (including speed limit reductions and lane configuration changes)
- perceived road safety risks due to temporary changes in traffic conditions
- temporary changes to pedestrian access within the proposal area due to footpath diversions
- temporary delays to bus services due to increases in travel times, and temporary relocation of a bus stop within the proposal area
- temporary changes to property access, however, access to Morisset Ambulance Station on Dora Street would be maintained throughout construction
- temporary and permanent removal of informal roadside parking within the proposal area.

A summary of the potential impacts on access and connectivity during construction, as well as the assessed sensitivity, magnitude and significance of each impact, is provided in Table 6-37.

Table 6-37 Potential impacts on access and connectivity during construction of the proposal

Potential impact/affected group	Sensitivity	Magnitude	Significance (pre-mitigation)
Affected accessibility for road users due to potential traffic and transport impacts			
Service users of emergency services	High	Low	Moderate
Public transport users, pedestrians and cyclists	Moderate	Low	Moderate
Motorists	Low	Low	Low

Operation

Economy

Operation of the proposal is anticipated to result in improved livelihoods for businesses, as reduced travel times within the proposal area would result in reduced freight costs, increased quality of service and improved employment access and connectivity. This would support future economic growth and development within the local and regional study areas.

The proposal would result in minor adjustments to property access to accommodate the widened road corridor and improved active transport infrastructure (refer to Section 6.9), however this is not expected to have any material impact on businesses.

A summary of the potential economic impacts and benefits during operation of the proposal, as well as the assessed sensitivity, magnitude and significance of each impact and benefit, is provided in Table 6-38.

Table 6-38 Potential economic impacts and benefits during operation of the proposal

Potential impact/affected group	Sensitivity	Magnitude	Significance (pre-mitigation)
Improved livelihoods for businesses due to reduced travel times			
Businesses in the local study area	Low	Moderate	Moderate-low (positive)
Businesses in the regional study area	Low	Low	Low (positive)
Potential loss of income associated with changes to property access			
Property owners of properties subject to property access adjustments	Moderate	Negligible	Negligible

Community values

The proposal would provide a range of improvements to existing active and public transport infrastructure, including new shared user paths and a pedestrian footpath, signalised crossings at the Mandalong Road/Freemans Drive/Dora Street/ Wyee Road intersection and two new bus stops along Dora Street (refer to Section 3.2.3). Safer access and improved connectivity for pedestrians and cyclists would help to encourage people to walk and cycle, which would contribute positively to levels of physical activity in the community and general health and wellbeing.

A summary of the potential benefit to community values during operation, as well as the assessed sensitivity, magnitude and significance of the benefit, is provided in Table 6-39.

Table 6-39 Potential benefits to community values during operation of the proposal

Potential impact/affected group	Sensitivity	Magnitude	Significance (pre-mitigation)
Wellbeing and safety benefits due to increased active and public transport opportunities			
Public transport users, pedestrians and cyclists	Moderate	High	High-moderate (positive)

Local amenity

The proposal would enhance aesthetic values within the proposal area through urban design and landscaping.

An Urban Design Concept and Landscape Strategy has been developed for the proposal to integrate the proposal physically and visually with the surrounding environment and improve the overall comfort of road users (refer to Section 3.2.3). Vegetation removal during construction would be offset by landscaping works and the proposed urban design features to provide shade, habitat and visual screening from properties and improve the visual aesthetic of the upgraded infrastructure.

A summary of the potential benefit to local amenity during operation of the proposal, as well as the assessed sensitivity, magnitude and significance of the benefit, is provided in Table 6-39.

Table 6-40 Potential benefits to local amenity during operation of the proposal

Potential impact/affected group	Sensitivity	Magnitude	Significance (pre-mitigation)
Enhanced aesthetic values through urban design and landscaping			
Residents of the local study area	Moderate	Low	Moderate-low (positive)

Access and connectivity

The proposal would improve access and connectivity for local and regional communities by reducing travel times and improving trip reliability in the local and broader road network (refer to Section 6.2). The new shared user paths, pedestrian footpath and signalised crossings would improve access and connectivity for pedestrians and cyclists, and improvements to bus infrastructure and bus service times would improve access and connectivity for public transport users (refer to Section 6.2).

The removal of the roundabout at the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection would remove the opportunity to make a U-turn at this intersection. However, road users would still be able to use the Gimberts Road/ Mandalong Road/Gateway Boulevard and Dora Street/Ourimbah Street roundabouts to make a U-turn. The extension of the central median along Mandalong Road and Dora Street would remove the right in/right out access to some properties along these roads, except the Morisset Ambulance Station (refer to Section 6.2). A short section of the central median on Dora Street would be modified to allow all movements to and from the Morisset Ambulance Station. These changes to property access may inconvenience residents, employees and customers, however would ensure safer and more reliable access to properties.

The proposal would reduce informal parking opportunities within the proposal area to accommodate road widening and active transport infrastructure improvements. As there is sufficient alternative parking on the surrounding road network and within residential and commercial land, the impact on access and connectivity due to the loss of informal parking is considered to be minimal.

A summary of the potential benefits and impact of the proposal to access and connectivity during operation, as well as the assessed sensitivity, magnitude and significance of each benefit and impact, is provided in Table 6-41.

Table 6-41 Potential benefits and impacts to access and connectivity during operation of the proposal

Potential impact/affected group	Sensitivity	Magnitude	Significance (pre-mitigation)
Improved travel efficiency			
Residents of the local study area	Moderate	High	High-moderate (positive)
Residents of the regional study area	Low	High	Moderate (positive)
Improved access and connectivity for pedestrians, cyclists and public transport users			
Pedestrians, cyclists and public transport users in the local study area	Moderate	High	High-moderate (positive)
Public transport users in the regional study area	Low	High	Moderate (positive)
Inconvenience due to extension of central median, loss of U-turn and loss of informal parking			
Employees and customers affected by extension of central median	Low	Negligible	Negligible
Property owners affected by extension of central median	Low	Low	Low
Residents of the local study area	Moderate	Negligible	Negligible

6.5.4 Safeguards and management measures

Safeguards and management measures to minimise potential socio-economic impacts of the proposal are outlined in Table 6-42. Other safeguards and management measures that would minimise potential socio-economic impacts are identified in sections 6.2.4, 6.3.5, 6.4.4, 6.7.4 and 6.9.4.

Table 6-42 Socio-economic safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
SE1	Consultation	A Community and Stakeholder Engagement Plan (CSEP) will be prepared and implemented as part of the CEMP to help provide timely notification and information to the community during construction. The CSEP will include as a minimum: • processes to actively identify the affected local community and obtain contact details, including routine review • consultation activities to provide advance notification of details and timing of proposed activities to affected residents, property owners, services and businesses, including for notifying traffic changes and access changes, major project milestones and managing night and weekend work processes • project hotline or contact number for complaints • how the project webpage will be maintained for the duration of the project • a complaints handling procedure.	Contractor	Construction	Core safeguard SE1 in *QA G36 Environment Protection*

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
SE2	Relocation of bus stop during construction	Public transport users will be notified in advance of any changes to bus stop locations through signage at the existing bus stop. Temporary bus stops will have similar features to existing bus stops. Consultation with the relevant bus authorities will be undertaken (including school buses) to mitigate potential impacts to bus routes and times.	Contractor	Construction	Additional safeguard
SE3	Emergency vehicle access	Consultation will be completed with emergency services to ensure adequate emergency vehicle access is maintained for the duration of construction. Regular updates will be provided to emergency services about any changes to local access during construction. Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.	Contractor	Construction	Additional safeguard
SE4	Impacts on nearby property owners and land occupiers	Transport will continue to consult with the community and affected property owners and land occupiers. Discussions including the nature and timing of construction works will be required to identify relevant biodiversity, noise, traffic, air quality, access and visual impact mitigation measures for residents, stakeholders, and road users.	Transport	Construction	Additional safeguard

6.5.5 Residual impacts

A ‘residual risk rating’ has been applied to identify the significance of each potential social impact identified in the social impact assessment for the proposal, after the implementation of the proposed mitigation measures detailed in Section 6.5.4. The potential impacts and their residual risk ratings are summarised in Table 6-43 and Table 6-44.

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Table 6-43 Potential residual socio-economic impacts from construction of the proposal

Potential impact	Affected/benefited group	Significance (pre-mitigation)	Safeguards and management measures	Sensitivity	Magnitude	Significance (post-mitigation)
Economic						
Impacts on business operations and flow-on effects on employees due to full and partial property acquisition	Property owner of property subject to full acquisition	Moderate	Mitigation measures SE1 and SE4	Low	Moderate	Moderate-low
	Employees of the business operating at the property subject to full acquisition	High-moderate		Moderate	Moderate	Moderate
	Property owners of properties subject to partial acquisition	Moderate-low		Moderate	Negligible	Negligible
Economic impacts on businesses and services due to impacts on access and informal parking areas	Owners of businesses and services on Dora Street	Moderate-low	• Mitigation measures SE1, SE3 and SE4 • CTMP	Low	Low	Low
	Food truck operators	Moderate	Mitigation measures SE1 and SE5	Low-moderate	Moderate	Moderate-low
Positive economic flow-on effects for business	Businesses in the local and regional study area	Low (positive)	No enhancement measures proposed	Low	Low	Low (positive)
Community values						
Uncertainty among property owners and employees due to full and partial property acquisition	Property owner of the property subject to full acquisition	Moderate	Mitigation measures SE1 and SE4	Low	Low	Low
	Employees of business operating at property subject to full acquisition	High-moderate		High-moderate	Moderate	Moderate
	Property owners of properties subject to partial acquisition	Moderate-low		Moderate	Negligible	Negligible

Potential impact	Affected/benefited group	Significance (pre-mitigation)	Safeguards and management measures	Sensitivity	Magnitude	Significance (post-mitigation)
Perceived safety risks for pedestrians and cyclists	Pedestrians and cyclists in the proposal area	Moderate-low	• Mitigation measure SE1 • CTMP • CEMP	Moderate	Low	Moderate-low
	Users of Auston Oval	Moderate-low		Moderate	Low	Moderate-low
Stress due to potential vibration impacts to properties	Owners/occupiers of properties subject to potential vibration impacts	Moderate	• Mitigation measure SE1 • CEMP • CNVMP • Detailed property inspections will be completed to document the condition of buildings and structures within the minimum working distances. • Where alternatives cannot be implemented, vibration monitoring is to be undertaken and receivers notified at least seven calendar days in advance of works.	Low	Negligible	Negligible
Changes to cultural values and sense of place	Employees of business operating at property subject to full acquisition	Moderate	Mitigation measures SE1 and SE4	Moderate	Low	Moderate-low
	Residents and employees and customers of businesses and services within the proposal area	Low		Low	Negligible	Negligible
	Other residents of the local study area	Negligible		Low	Negligible	Negligible

Potential impact	Affected/benefited group	Significance (pre-mitigation)	Safeguards and management measures	Sensitivity	Magnitude	Significance (post-mitigation)
Local amenity						
Stress and frustration due to potential amenity impacts	Service users and employees of Hive Academy Childcare Centre and Community Kids Morisset Early Education Centre affected by amenity impacts	High-moderate	• Mitigation measure SE1 • Air quality management measures in CEMP • CNVMP • All sensitive receivers likely to be affected will be notified at least seven calendar days prior to commencement of any works associated with the scenario that may have an adverse noise or vibration impact • Noise and vibration control training as part of their regular site induction for employees and contractors	Moderate	Low	Moderate-low
	Residents near the proposal affected by noise, vibration, dust, and traffic and transport impacts	Moderate		Moderate	Low	Moderate-low
	Adjacent non-residential receivers affected by noise, vibration and dust (customers and employees)	Moderate-low		Low	Low	Low
	Residents of the local study area affected by traffic and transport impacts	Negligible		Low	Negligible	Negligible
Access and connectivity						
Affected accessibility for road users due to potential traffic and transport impacts	Service users of emergency services	Moderate	• Mitigation measures SE1 and SE2 • CTMP	High	Negligible	Negligible
	Public transport users, pedestrians and cyclists	Moderate		Low	Low	Low
	Motorists	Low		Low	Low	Low

Table 6-44 Potential residual socio-economic impacts from operation of the proposal

Potential impact	Affected/benefited group	Significance (pre-mitigation)	Mitigation	Sensitivity	Magnitude	Significance (post-mitigation)
Economic						
Potential loss of income associated with adjustments to property access	Property owner and employees subject to property access adjustments	Negligible	Mitigation measure SE4	Low	Negligible	Negligible
Improved livelihoods for businesses due to reduced travel times	Businesses in the local study area	Moderate-low (positive)	No enhancement measures proposed	Low	Moderate	Moderate-low (positive)
	Business in the regional study area	Low (positive)		Low	Low	Low (positive)
Community values						
Wellbeing and safety benefits due to increased active and public transport opportunities	Public transport users, pedestrians, and cyclists	High-moderate (positive)	No enhancement measures proposed	Moderate	High	High-moderate (positive)
Local amenity						
Enhanced aesthetic values through urban design and landscaping	Residents of local study area	Moderate-low (positive)	No enhancement measures proposed	Moderate	Low	Moderate-low (positive)

Potential impact	Affected/benefited group	Significance (pre-mitigation)	Mitigation	Sensitivity	Magnitude	Significance (post-mitigation)
Access and connectivity						
Inconvenience due to extension of central median, loss of U-turn and loss of informal parking	Employees and deliveries affected by extension of central median	Negligible	Mitigation measures SE1 and SE4	Low	Negligible	Negligible
	Property owners/occupiers affected by extension of central median	Low		Low	Low	Low
	Residents of the local study area	Negligible		Moderate	Negligible	Negligible
Improved access and connectivity for pedestrians, cyclists and public transport users	Pedestrians, cyclists and public transport users in the local study area	High-moderate (positive)	No enhancement measures proposed	Moderate	High	High-moderate (positive)
	Public transport users in the regional study area	Moderate (positive)		Low	High	Moderate (positive)
Improved travel efficiency	Residents of the local study area	High-moderate (positive)	No enhancement measures proposed	Moderate	High	High-moderate (positive)
	Residents of the regional study area	Moderate (positive)		Low	High	Moderate (positive)

6.6 Soils and contamination

This section assesses the potential impacts of the construction and operation of the proposal associated with soils and contamination and identifies mitigation measures to address these impacts. The Stage 1 Preliminary Site Investigation carried out for the proposal is provided in Appendix I. The findings of the assessment are summarised in this section.

6.6.1 Methodology

Soils

The methodology for the soils assessment included:

- a desktop review of geology and soil landscape information using publicly available reference material sources including geological maps, soil and landscape maps, and online databases, to identify the topography within and surrounding the proposal area and the condition, risks and constraints of soils within the proposal area
- identifying potential geotechnical, soil and fill issues for the proposal
- recommending safeguards and management measures to manage potential soil impacts associated with the construction and operation of the proposal.

Contamination

The methodology for the Preliminary Site Investigation included:

- a desktop review of publicly available information to understand the site history, existing environment and potential risk for contamination. The assessment was completed for the area within one kilometre of the proposal area (the study area for the assessment) and included a review of:
  - the existing environment of the study area in relation to topography, geology, hydrology, hydrogeology, soils, naturally occurring asbestos, and downstream sensitive receivers and receiving environments
  - site history, including historical aerial photographs (from each decade from 1950 to 2024 (where available) and available aerial imagery services (Google Earth and SIX Maps)
  - NSW EPA (Environment Protection Authority), Geoscience Australia, NSW Department of Primary Industries (DPI) and Department of Defence databases, relating to potential contamination within the study area
  - previous contamination investigations undertaken within and near the proposal area
- WaterNSW's groundwater bore database (WaterNSW, 2024) to identify registered groundwater bores within two kilometres of the proposal area
- a site inspection on 20 August 2024 of publicly accessible areas within the proposal area, adjacent land uses and potential areas of environmental concern (areas with known or potential contamination associated with current or historical land uses)
- identifying areas of environmental interest (AEI) within the study area
- developing a conceptual site model to evaluate the potential risks to human health and the environment during construction and operation of the proposal
- a preliminary risk assessment, which aims to identify risks to be minimised through design of the proposal and areas for further assessment prior to construction of the proposal
- recommending safeguards and management measures to address the identified contamination risks.

6.6.2 Existing environment

Geology, soils and topography

A review of the Gosford-Lake Macquarie Special 1:100 000 Geological Sheet series (Geological Survey of New South Wales, 2015) indicates the proposal area is underlain by the Tuggerah Formation, consisting of laminite, claystone and siltstone, interbedded with fine to medium-grained sandstone.

The Soil Landscapes of the Gosford-Lake Macquarie 1:100,000 Sheet (Murphy and Tille, 1993) indicates that the proposal area is underlain by the Gorokan soil landscape, characterised by moderately deep (50–150 centimetres deep) soloths, yellow podzolic soils and grey-brown podzolic soils, with gleyed podzolic soils along drainage lines. Limitations of the soil landscape include a very high erosion hazard, localised foundation hazard, seasonal water logging, hardsetting, and strongly acid, low fertility, plastic, impermeable soils. Soil landscapes within the proposal area are shown in Figure 6-9.

The land within and surrounding the proposal area generally consists of gently undulating hills, ranging from around 0 metres Australian Height Datum (mAHD) to around 40 mAHD. Land within the proposal area slopes towards the central and western sections of the proposal area, with elevation varying from 10 mAHD at the western end of the proposal area to 30 metres mAHD at the northern end of the proposal area.

Acid sulfate soils

Acid sulfate soils are the common name given to naturally occurring sediments and soils containing iron sulfides which, when exposed to oxygen, generate sulfuric acid (Ahern, Stone & Blunden, 1998). There are no areas mapped as Class 1 to Class 5 acid sulfate soils within the proposal area. An area to the north of the proposal area along Mandalong Road is mapped as having the potential to contain Class 5 acid sulfate soils, which is defined as an area within 500 metres of Class 1 to 4 acid sulfate soils areas.

The probability of occurrence of acid sulfate soils is mapped on the Atlas of Australian Acid Sulfate Soils (Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2011) as being extremely low (one to five per cent).

Salinity

There is no dryland salinity areas mapped within the study area (National Land and Water Resources Audit, 2020).

Naturally occurring asbestos

No areas with known potential for encountering naturally occurring asbestos have been identified within one kilometre of the proposal area (State Government of NSW and Department of Regional New South Wales, 2015).

Groundwater

Section 6.10 identifies the groundwater source relevant to the proposal area and registered boreholes and groundwater users near the proposal area.

Contamination

Registered sites

A review of the NSW EPA, NSW DPI and Department of Defence public registers of contaminated sites was carried out to assess the potential for contamination hazards within the study area. A number of potential current and former contaminant sources have been identified within the study area and are detailed in Table 6-45.

One potentially contaminated site, a concrete batching plant (the location of ancillary facility AF3), is located within the proposal area. One currently licensed activity, the application of herbicides to waters within the Lake Macquarie LGA (including Mullards Creek), intersects the proposal area. There were no former gas works, sites listed on the NSW EPA per- and polyfluoroalkyl substances (PFAS) investigation program, areas where unexploded ordinance is known to occur, or cattle dips identified within the study area.

Table 6-45 Potential current and former contaminant sources

Item	Details
List of contaminated sites regulated by or notified to the NSW EPA	Four sites within the study area have been notified to the NSW EPA under the CLM Act: • Mandalong Mine, Mandalong Road (303 metres west of proposal) • Railcorp Station Masters Cottage, 24 Dora Street (589 metres north-east of proposal) • Morisset High school, Bridge Street (672 metres north-east of proposal) • Service station, 57 Dora Street (834 metres north-east of proposal). None of the notified sites occur within the proposal area. The NSW EPA register states that regulation under the CLM Act is not required for any of the listed premises. *Source: NSW EPA List of NSW contaminated sites notified to EPA – Accessed July 2024.*
Clean Up/Penalty Notices	Two sites within the study area have been issued a clean-up / penalty notice under Section 91 of the POEO Act: • Main Northern Railway Line operated by Sydney Trains (115 metres east of proposal) (Penalty Notice Number (No) 3173530755) • Alexanders Mulch and Soil, operated by Vinci Bros. Pty Ltd (528 metres south-west of proposal) (Clean Up Notice No's 1520836 and 1518177). *Source: NSW EPA Records of Notice – Accessed July 2024.*
Current NSW EPA licensed activities	Four activities licensed under the POEO Act occur within the study area: • waters within the Lake Macquarie LGA, including Mullards Creek (intersecting the proposal area), relating to application of herbicides (Environment Protection Licence (EPL) No 6332) • railway infrastructure and rolling stock operations associated with the Main Northern Railway Line (115 metres east of the proposal area), operated by Sydney Trains (EPL No 12208) • coal works (Mandalong Mine), at Kerry Anderson Drive (300 metres west of the proposal area), operated by Centennial Mandalong Proprietary Limited (Pty Ltd) (EPL No 365) • generation of electrical power for Mandalong Mine from waste coal mine gas at a facility along Kerry Anderson Drive (470 metres west of the proposal area), operated by EDL Holdings (Australia) Pty Ltd (EPL No 21230). *Source: NSW EPA POEO Act Licensed Activity Register – Accessed July 2024.*
Delicensed activities still regulated by the NSW EPA	One delicensed activity regulated by the NSW EPA occur within the study area: • concrete works at 230 Mandalong Road, licence held by Hanson Construction Materials Pty Ltd (within proposal area, being the location of ancillary facility AF3). *Source: NSW EPA POEO Act Licensed Activity Register – Accessed July 2024.*
Former licensed activities, now revoked or surrendered	Three former licensed activities, now revoked or surrendered under the POEO Act occurred within the study area: • application of herbicides to waterways (that intersect the proposal area) issued to Luhrmann Environment Management Pty Ltd on 6 September 2000 (licence surrendered) • application of herbicides to waterways (that intersect the proposal area) issued to Robert Orchard on 7 September 2000 (licence surrendered) • application of herbicides to waterways (that intersect the proposal area) issued to Sydney Weed & Pest Management Pty Ltd on 9 November 2000 (licence surrendered). *Source: NSW EPA Former Licensed Activities register – Accessed July 2024.*

Item	Details
National Waste Management Database/ National Liquid Fuel Facilities Database	Two properties within the study area are listed under the National Waste Management Site Database, both being soft plastics drop-off facilities: • Woolworths, 103 Dora Street (390 metres north-east of proposal) • Coles, 35 Yambo Street (650 metres north-east of proposal). Five properties within the study area are listed under the National Liquid Fuel Facilities database: • 7-Eleven, 133 Dora Street, Morisset (directly north of proposal area) • Ampol (formerly named Caltex Woolworths), 125 Dora Street, Morisset (directly north of proposal area) • Ampol, 5-11 Gateway Boulevard, Morisset (150 metres south-east of proposal) • BP, 50 Alliance Avenue, Morisset (100 metres south of proposal) • Metro Fuel, 57 Dora Street, Morisset (830 metres north-east of proposal). *Source: Geoscience Australia, Waste Management Facilities – Accessed July 2024.*

Previous investigations

Laboratory results of soil samples collected during soil investigations conducted by Transport in June 2024 were reviewed. White (chrysotile) asbestos from cement sheeting was visually detected in soil samples from one investigation location TP10 (shown in Figure 6-9), located near Mullards Creek beneath the existing road. The borehole logs indicate the identified asbestos was from a broken pipe, likely from redundant utilities. No other samples were analysed for asbestos.

Samples from three locations (HA01, HA02 and HA04) (shown in Figure 6-9) were analysed for total recoverable hydrocarbon (TRH), benzene, toluene, ethylbenzene and total xylenes (BTEX), polycyclic aromatic hydrocarbons and heavy metals. All concentrations reported were below the National Environment Protection (Assessment of Site Contamination) Measure 2013 criteria applicable to recreational open space and commercial/industrial land uses.

Site history

A review of historical aerial imagery from between 1954 and 2024 has identified changes in land use within and near the proposal area. In 1954, Mandalong Road existed as an unsealed road, with several local roads and access tracks intersecting the proposal area. Land surrounding the proposal area consisted mostly of dense undisturbed vegetation and agricultural land, with the Main Northern Railway located to the east of the proposal area. Significant land clearing is evident from 1954 to 1984, mainly for farming purposes and the development of rural residential properties and the Morisset RSL and Country Club (bowling and golf course), later called Morisset Country Club. By the 1990's, the M1 Pacific Motorway has been constructed and further residential development has taken place to the north and east of the proposal area. Increased development took place from 2002 to 2024 with the development of the industrial/commercial precinct south of Mandalong Road (Morisset Business Park) and commercial properties along Dora Street.

Potential areas of environmental interest

A site inspection of the proposal area and immediately surrounding areas was completed on 20 August 2024 to confirm land use adjacent to the proposal area and identify potential contamination risks for the proposal.

Seven potential AEIs were identified within the study area that pose a potential contamination risk for the proposal. The potential AEIs are described in Table 6-46 and shown in Figure 6-9.

Table 6-46 Potential areas of environmental interest

ID	Area of interest	Location	Potential contamination source	Contaminants of concern[1]	Comments
AEI 1	Former Morisset Country Club (clubhouse, golf course and bowling greens), 126 Dora Street, Morisset	Outside of proposal area. South of proposal area along Dora Street.	Old construction materials, use of herbicides and pesticides, fertilisers, storage of chemicals.	Heavy metals, asbestos, TRH/BTEXN, PAHs, herbicides and pesticides.	There were no observed signs of contamination leaving the site. The clubhouse building was fenced off and under renovation/demolition works. The clubhouse building likely contains degraded hazardous building materials, such as asbestos. Potential for soils/ groundwater near the proposal area to be contaminated.
AEI 2	Ampol Service Station, 125 Dora Street, Morisset	Outside proposal area. Directly north of proposal area along Dora Street.	Underground fuel storage and dispensing.	TRH/BTEXN, PAHs, lead.	Service station sites are located upgradient of the proposal area. No signs of contamination observed to be leaving the site. No known notifications of contamination made to the NSW EPA. The sites have been assessed by NSW EPA and regulation under the CLM Act is not required. Potential for soils/ groundwater near the proposal area to be contaminated.
AEI 3	7-Eleven Service Station, 133 Dora Street, Morisset				
AEI 4	Concrete batching plant, 9 Mandalong Road, Morisset	Within proposal area. Location of ancillary facility AF3.	Dust, surface water run-off, and chemical storage from cement activities.	Fuels (TRH), cement (high alkalinity). Fly ash, iron and sulphur oxides and silica.	No signs of contamination observed to be leaving the site. Water was being used to control dust. Chemicals were observed to be stored adequately in a bunded area. The site is de-licensed, formerly regulated by the NSW EPA (Notice number – 103545). All buildings and structures on the site (except the concrete slabs and site shed) will be demolished and removed prior to construction of the proposal. Potential for soils near the proposal area to be contaminated.

ID	Area of interest	Location	Potential contamination source	Contaminants of concern[1]	Comments
AEI 5	Bushland area along Freemans Drive, Mandalong Road and Dora Street	Within proposal area. Location of ancillary facilities AF1 and AF2.	Potential for dumped domestic waste material.	TRH/BTEXN, oil and grease, heavy metals, PAH, asbestos.	Surface soils potentially impacted by contaminated waste material associated with illegal roadside dumping.
AEI 6	Ausgrid substation, 20 Mandalong Road, Morisset	Outside proposal area. North of proposal area along Mandalong Road.	Transformers, storage of chemicals.	PCBs, heavy metals, TRH/BTEXN, PAHs.	The substation site is located upgradient of the proposal area. No signs of contamination observed to be leaving the site. Potential for soils/groundwater near the proposal area to be contaminated.
AEI 7	Asbestos find at investigation location TP10	Within proposal area. Located near Mullards Creek beneath the existing road.	Possibly from redundant utilities.	Bonded asbestos.	Borehole logs indicate the identified asbestos was from a broken pipe, possibly from redundant utilities.

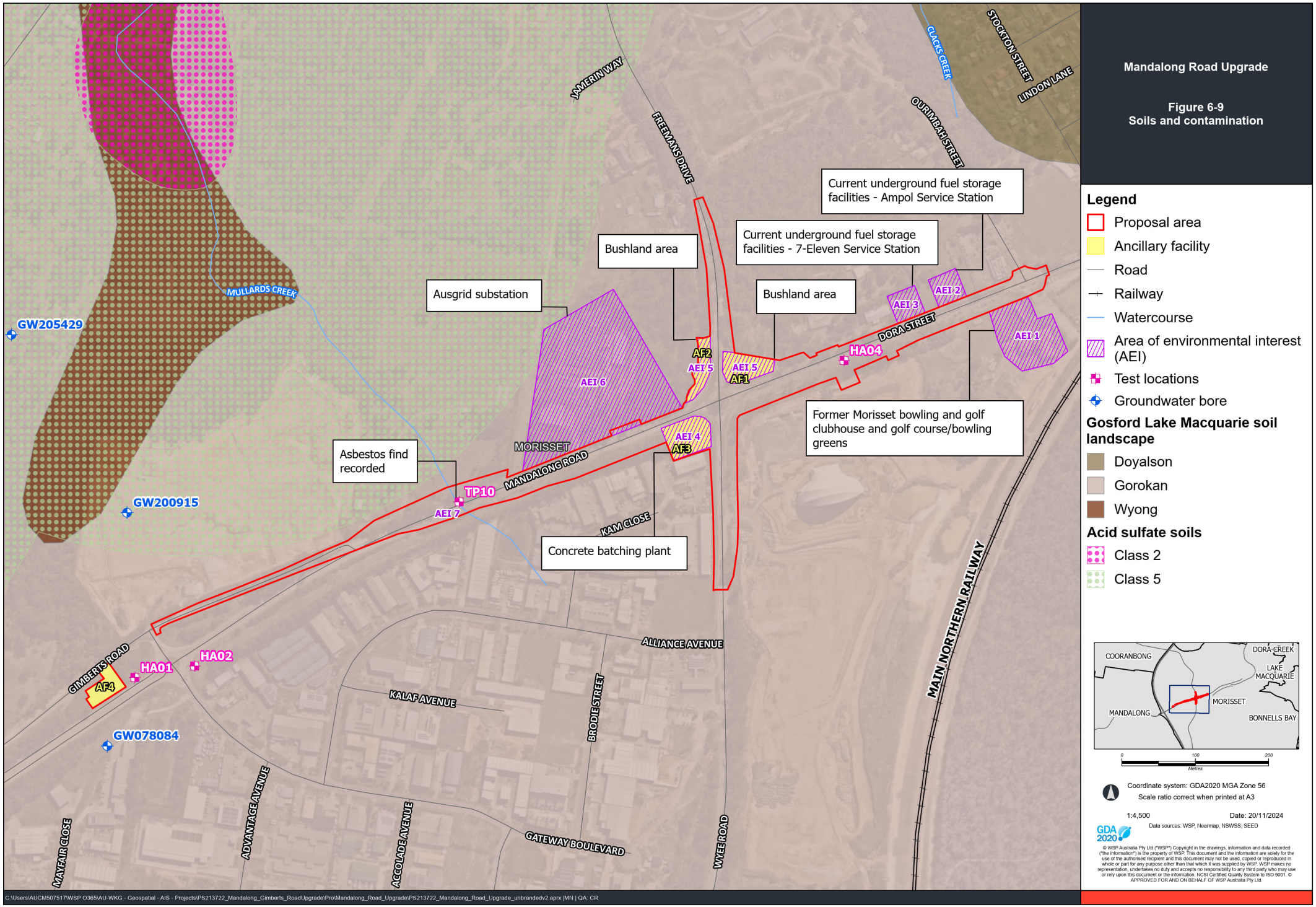
(1) TRH – total recoverable hydrocarbon
BTEXN - Benzene, Toluene, Ethyl benzene, Xylenes (ortho and meta/para) and Naphthalene
PAHs – polycyclic aromatic hydrocarbons
PCB – polychlorinated biphenyl.

Sensitive receivers

Sensitive receivers are defined as human or ecological receivers which may be susceptible to harmful impacts if exposed to contamination.

Ecological receivers include watercourses (including Mullards Creek, Stockton Creek and Dora Creek), groundwater, and low to moderate potential GDEs (refer to Section 6.1).

Human health receivers within the study area include staff employed in commercial and industrial businesses, users of groundwater, construction and maintenance workers, and road users (including pedestrians and cyclists).


Mandalong Road Upgrade
Figure 6-9
Soils and contamination
Legend
Proposal area
Ancillary facility
Road
Railway
Watercourse
Area of environmental interest (AEI)
Test locations
Groundwater bore
Gosford Lake Macquarie soil landscape
Doyalson
Gorokan
Wyong
Acid sulfate soils
Class 2
Class 5
Current underground fuel storage facilities - Ampol Service Station
Current underground fuel storage facilities - 7-Eleven Service Station
Bushland area
Bushland area
Ausgrid substation
Asbestos find recorded
Concrete batching plant
Former Morisset bowling and golf clubhouse and golf course/bowling greens
GW205429
GW200915
GW078084
HA01
HA02
HA04
TP10
AF1
AF2
AF3
AF4
AEI 1
AEI 2
AEI 3
AEI 4
AEI 5
AEI 6
AEI 7
MULLARDS CREEK
CLACKS CREEK
J.J.MERIN WAY
FREEMANS DRIVE
OURIMBAH STREET
STOCKTON STREET
LINDON LANE
DORA STREET
MANDALONG ROAD
MORISSET
KAM CLOSE
ALLIANCE AVENUE
KALAF AVENUE
BRODIE STREET
GIMBERTS ROAD
MAIN NORTHERN RAILWAY
MAYFAIR CLOSE
ADVANTAGE AVENUE
ACCOLADE AVENUE
GATEWAY BOULEVARD
WYEE ROAD
COORANBONG
DORA CREEK
LAKE MACQUARIE
MORISSET
MANDALONG
BONNELLS BAY
0
100
200
Metres
Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3
1:4,500
Date: 20/11/2024
Data sources: WSP, Nearmap, NSWSS, SEED
GDA 2020
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6.6.3 Potential impacts

Construction

Erosion and sedimentation

Soil erosion, loss of topsoil, and sediment deposition to the receiving environment could occur with the removal of vegetation and disturbance of the ground surface during site preparation, earthworks, excavation and other construction activities. Soil erosion and sedimentation would most likely occur in areas of larger excavation, and where excavation is required next to Mullards Creek. Earthmoving activities also have the potential to expose loose soils and transport soil material to the surrounding environment. Safeguards and management measures outlined in Section 6.6.4 would be implemented during construction to minimise erosion and sedimentation impacts.

Acid sulfate soils

Where acid sulfate soil is exposed during excavation works, runoff from these areas could pollute watercourses within or near the proposal area. It is unlikely that acid sulfate soils would be encountered during construction. If potential or actual acid sulfate soils are encountered during construction, the unexpected finds protocol would be implemented.

Salinity

Saline soils are not predicted to occur within the proposal area, and impacts from salinity are not expected during construction of the proposal.

Contamination

Construction activities, including excavation activities, spoil management, vegetation clearing, vehicle movement, pavement works, drainage and utility works, have the potential to disturb contaminated soil and groundwater, if present.

The preliminary risk assessment conducted for the proposal is outlined in Table 6-47. This assessment considered the potential risk factors, pathways and receivers for contaminants near the proposal and the potential exposure to contaminants of potential concern during construction. The risk ratings applied in the assessment are defined as:

- negligible risk: no management required
- low risk: unlikely contamination source identified; impact can be managed by implementing standard construction management practices or work, health and safety controls in accordance with relevant guidelines
- medium risk: possible contamination source identified; contamination specific management plans and/or controls are required
- high risk: likely contamination source identified; health/ecological risk assessment and/or engineered controls and/or environmental/health monitoring are required.

The assessment found that widespread contamination across the proposal area is unlikely to be present. A detailed site investigation, including preparation of a sampling analysis quality plan, is not deemed to be required for the proposal. The identified AEIs present potential low to medium risks of soil and groundwater contamination impacts during construction. Medium risks of contamination are associated with:

- illegal dumping in bushland areas, due to potential exposure to hazardous waste material, including asbestos
- the concrete batching plant at the intersection of Mandalong Road and Wyee Road, as hazardous materials may be present. All buildings and structures on the site, except the concrete slabs and site shed, would be demolished and removed prior to construction of the proposal
- disturbance of soils beneath the existing road near Mullards Creek during shallow earthworks, due to potential exposure to asbestos fibres.

Potential impacts associated with the identified contamination risks include:

- interaction with potentially contaminated soils and groundwater as a result of ground disturbance, including disturbance and potential migration/mobilisation of contaminants
- release of potentially contaminated groundwater if construction activities such as trenching and drainage works intercept groundwater and de-watering is required

- contamination of soils due to disturbance of materials containing hazardous substances (including asbestos pipes)
- direct contact and inhalation of contaminated soil, illegally dumped material and groundwater by construction workers where construction activities result in the exposure of existing contamination
- inhalation of asbestos fibres by construction workers where construction activities result in the disturbance of buried asbestos
- managing and disposal of contaminated soils encountered during construction in areas where existing contamination is present.

Potential contamination risks will be managed through implementation of a Construction and Environmental Management Plan (CEMP) during construction as well as other safeguards and management measures outlined in Section 6.6.4.

Table 6-47 Preliminary risk assessment

ID	Area of interest	Contaminants of concern	Construction activity	Construction impact (if unmitigated)	Contamination risk
AEI 1	Former Morisset Country Club (clubhouse, golf course and bowling greens), 126 Dora Street, Morisset	Hydrocarbons, heavy metals, PAHs pesticides, herbicides and asbestos.	Nearby excavation, vegetation clearing, vehicle movement, temporary stockpiling and utilities works.	If not managed appropriately, disturbance/reuse of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: • direct contact, ingestion and inhalation by construction workers • off-site transport of contaminants via vehicle/plant movements • risk of dust exposure to construction workers • potential vapour intrusion into service trenches and excavations • surface water run-off and discharge into the receiving environment.	Low
AEI 2	Ampol Service Station, 125 Dora Street, Morisset	Contaminants include hydrocarbons, PAHs, lead.	Nearby excavation, vegetation clearing, vehicle movement, temporary stockpiling and utilities works.	If not managed appropriately, disturbance/reuse of contaminated soil and groundwater could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: • direct contact, ingestion and inhalation by construction workers • off-site transport of contaminants via vehicle/plant movements • risk of dust exposure to construction workers • potential vapour intrusion into service trenches and excavations • incidental groundwater discharge into receiving environment (aquatic and terrestrial ecosystems) • surface water run-off and discharge into the receiving environment.	Low

ID	Area of interest	Contaminants of concern	Construction activity	Construction impact (if unmitigated)	Contamination risk
AEI 3	7-Eleven Service Station, 133 Dora Street, Morisset	Contaminants include hydrocarbons, PAHs, lead.	Nearby excavation, vegetation clearing, vehicle movement, temporary stockpiling and utilities works.	If not managed appropriately, disturbance/reuse of contaminated soil and groundwater could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: • direct contact, ingestion and inhalation by construction workers • off-site transport of contaminants via vehicle/plant movements • risk of dust exposure to construction workers • potential vapour intrusion into service trenches and excavations • incidental groundwater discharge into receiving environment (aquatic and terrestrial ecosystems) • surface water run-off and discharge into the receiving environment.	Low
AEI 4	Concrete batching plant, 9 Mandalong Road, Morisset	Hydrocarbons, cement (high alkalinity), fly ash, iron and sulphur oxides and silica.	Demolition of concrete slabs and site shed, operation of ancillary facility AF3, excavation, vegetation clearing, vehicle movement, temporary stockpiling and utilities works.	If not managed appropriately, disturbance/reuse of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: • exposure to high alkaline soils and silica during shallow earthworks • direct contact, ingestion and inhalation by construction workers • off-site transport of contaminants via vehicle/plant movements • risk of dust exposure to construction workers • surface water run-off and discharge into the receiving environment.	Low to medium
AEI 5	Bushland area along Freemans Drive, Mandalong Road and Dora Street (includes ancillary facilities AF1 and AF2).	Hydrocarbons and asbestos Hazardous materials from illegal dumping.	Operation of ancillary facilities, vegetation clearing, excavation, vehicle movement, temporary stockpiling and utilities works.	If not managed appropriately, disturbance/reuse of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: • direct contact, ingestion and inhalation by construction workers • off-site transport of contaminants via vehicle/plant movements • risk of dust/asbestos fibre exposure to construction workers • surface water run-off and discharge into receiving environment.	Medium

ID	Area of interest	Contaminants of concern	Construction activity	Construction impact (if unmitigated)	Contamination risk
AEI 6	Ausgrid substation, 20 Mandalong Road, Morisset	Hydrocarbons, PAHs, PCBs and heavy metals.	Nearby excavation, vegetation clearing, vehicle movement, temporary stockpiling and utilities works.	If not managed appropriately, disturbance/reuse of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: • direct contact, ingestion and inhalation by construction workers • off-site transport of contaminants via vehicle/plant movements • risk of dust exposure to construction workers • surface water run-off and discharge into receiving environment.	Low
AEI 7	Asbestos find at investigation location TP10	Bonded asbestos	Excavation, vehicle movement, temporary stockpiling and utilities works.	If not managed appropriately, disturbance of asbestos containing material could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: • off-site transport of contaminants via vehicle/plant movements • risk of dust/asbestos fibre exposure to construction workers.	Medium

Operation

Erosion and sedimentation

Once the proposal is operational and the surfaces disturbed during construction have been sealed or revegetated prior to operation, erosion and sedimentation risks would be minimal.

There would be potential for indirect impacts on soils as a result of runoff and drainage. These potential impacts would be managed by operational water quality measures including scour protection along drainage lines, culvert inlets and outlets (refer to Section 6.10).

Contamination

During operation, contamination impacts would generally be associated with potential contamination of soil, surface water and groundwater which may arise through normal vehicle operation (tyre wear, minor leaks of lubricants, oils and fuels), maintenance practices or a spill or accident. Relevant authorities and emergency services would be responsible for the management of spills and leaks associated with vehicle accidents. The proposal is not expected to result in an increase in potential contamination impacts from operation of the existing roads within the proposal area.

6.6.4 Safeguards and management measures

Safeguards and management measures to minimise potential soil and contamination impacts of the proposal are presented in Table 6-48. Safeguards and management measures to minimise potential contamination impacts to surface water and groundwater quality are identified in Section 6.10.

Table 6-48 Soils and contamination safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
SC1	Contamination	Complete a Detailed Site Investigation (Stage 2) contamination investigation and report to review and confirm any medium to high AEIs that are rated with a medium to high risk in the Preliminary Site Investigation (Stage 1).	Contractor	Detailed design	Section 2.1 of QA G38 Soil and Water Management
SC2	Contamination and asbestos	A Contamination Land Management Plan (CLMP) will be developed and implemented in accordance with relevant NSW EPA guidelines, Australian Standards and relevant industry codes of practice. Waste classification and testing of materials, potentially contaminated soils and illegally dumped materials will be carried out in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014). The CLMP will demonstrate the implementation of the recommendations of the DSI. All identified contaminated materials will be cleared prior to topsoil stripping activities. The plan will also include an asbestos management procedure to manage asbestos and asbestos containing material, if encountered during construction. The asbestos procedure will include: • identification of potential asbestos on site • procedures to manage and handle asbestos, if encountered during construction • procedures for disposal of asbestos in accordance with NSW EPA guidelines, Australian Standards and relevant industry code of practice.	Contractor	Construction	Section 4.2 of QA G36 Environment Protection
SC3	Contamination risk at ancillary facilities	A pre-construction land assessment shall be undertaken in accordance with Transport's Management of waste on Residual Land Procedure (Transport for NSW, 2023f). A post-construction land assessment will be completed upon vacation of the ancillary facilities to ensure land has not been contaminated during use of the ancillary facilities.	Contractor	Construction	Additional safeguard

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
SC4	Unidentified contamination	An unexpected contamination finds procedure will be included in the CLMP. This procedure will be prepared in accordance with Transports Guideline for the Management of Contamination (Transport for NSW, 2013). The procedure will outline the appropriate management protocols to be followed in the event of potential contamination being found during construction activities, including odours or visually contaminated materials.	Contractor	Construction	Section 4.2 of QA G36 Environment Protection

6.7 Air quality

The potential air quality impacts associated with the construction and operation of the proposal are assessed in the Air Quality Impact Assessment provided in Appendix J. The findings of the report are summarised in this section.

6.7.1 Methodology

The air quality assessment involved the following:

- reviewing the existing information, including local topography, prevailing climate and meteorological conditions and ambient air quality. The prevailing climate and meteorological conditions around the proposal were established using publicly available data from the Bureau of Meteorology (BoM) monitoring stations at Lake Macquarie and Mangrove Mountain. Ambient air quality conditions were established using publicly available data from local emissions sources and background air quality data sourced from the nearest monitoring stations to the proposal at Morisset and Wyong
- identifying air quality sensitive receivers within the air quality assessment study area (study area) with the potential to be adversely affected by the proposal. The study area comprises the proposal area and a 250 metre radius around the proposal area, as shown in Figure 6-10
- conducting a worst-case qualitative risk-based assessment of potential construction dust impacts for the sensitive receivers within 20 metres of the proposal in accordance with the *Good Practice Guide for the Assessment and Management of Air Pollution from Road Transport Projects* (Clean Air Society of Australia and New Zealand (CASANZ), 2023) (CASANZ guidance) and *Guidance on the assessment of dust from construction Version 2.1* (Institute of Air Quality Management (IAQM), 2023) (IAQM guidance)
- conducting a screening assessment using the Transport Roadside Air Quality screening tool (RAQST) (Transport for NSW, 2023d) to estimate the levels of key pollutants ((nitrogen dioxide (NO_2), particulate matter with a diameter of 10 micrometres or less (PM_{10}) and particulate matter with a diameter of 2.5 micrometres or less ($PM_{2.5}$)) during operation of the proposal, based on predicted traffic volumes and air pollutant criteria (see Air pollutant criteria section below). The screening assessment considered daily traffic in 2023 (existing conditions) and daily traffic in 2039 (opening year of the proposal). The outcomes of the screening assessment were used to determine the need for a detailed RAQST assessment that considers all pollutants
- recommending site-specific safeguards and management measures required to be implemented to minimise air quality impacts during construction and operation of the proposal.

Air pollutant criteria

The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales 2022 (Approved Methods) (NSW EPA, 2022b) sets out impact assessment criteria for air pollutants, as outlined in Table 6-49. In order to assess the total air quality impact, the predicted impact of the proposal is added to the existing background levels.

Table 6-49 Air quality impact assessment criteria

Pollutant	Averaging period	Assessment criterion (micrograms per cubic metre (µg/m^3))
PM_{10}	24-hours	50
	Annual	25
$PM_{2.5}$	24-hours	25
	Annual	8
NO_2	1-hour	164
	Annual	31

6.7.2 Existing environment

Climate and meteorology

Meteorological conditions, particularly temperature, rainfall, relative humidity, wind speed and wind direction, determine the direction and rate at which emissions from a source disperses.

The existing climatic and meteorological conditions were identified using data from the Lake Macquarie Automatic Weather Station (AWS) (BoM station ID: 061412), located around three kilometres north-west of the proposal area. Wind data was obtained from the Mangrove Mountain AWS (BoM station ID: 061375), located around 33 kilometres south-west of the proposal area as reliable wind data could not be obtained from the Lake Macquarie AWS. Table 6-50 summarises the climatic and meteorological from these two weather stations.

The area is characterised by a humid subtropical climate, with cool to mild winters and hot and humid summers. Between 2019 and 2023, the annual average maximum and minimum temperatures experienced were around 27 degrees Celsius in summer and around 19 degrees Celsius in winter, respectively. The highest humidity is observed in the afternoon. The majority of the annual rainfall occurs in the summer months, with only a few significant rainfall events during the winter. The predominant wind direction is from the west to north-west, and the average wind speed is around 1.9 metres per second.

Table 6-50 Climatic and meteorological data (2019 - 2023)

Parameter	Units	Summer (December to February)	Autumn (March to May)	Winter (June to August)	Spring (September to November)
Maximum temperature	Degrees Celsius (°C)	27.2	23.3	18.6	23.6
Minimum temperature	°C	17.5	12.2	6.1	11.2
Relative humidity (9 am)	Per cent (%)	76	88	82	75
Relative humidity (3 pm)	%	92	95	88	90
Monthly rainfall	Millimetres (mm)	78	64	43	49
Days of rain	days	8	7	4	6

Background air quality

The proposal area consists of an existing road corridor, located in a suburban area with a mix of residential, commercial and light industrial activities. The main contributors to air emissions within the locality are vehicles operating on the road network and wind-blown dust from cleared land.

A review of the National Pollutant Inventory (NPI) identified Mandalong Mine (an underground coal mine), located around 0.9 kilometres west of the proposal, as the nearest facility to contribute to air quality conditions in the locality. Emissions at the mine include fine particles ($PM_{2.5}$ and PM_{10}), oxides of nitrogen, sulfur dioxide, Volatile Organic Compounds (VOCs), and carbon monoxide, among other substances. Additional industrial and commercial activities may be present in the local area beyond those listed on the NPI database that could impact on air quality within the vicinity of the proposal. However, these activities would operate below the air quality thresholds specified for the relevant industry type and are not required to report under the NPI program.

The nearest air quality monitoring station to the proposal is located in Morisset, around seven kilometres east of the proposal area. Since the Morisset air quality monitoring station was commissioned in 2020, data from the Wyong air quality monitoring station was also obtained to analyse long term trends. Data from the Morisset and Wyong air quality monitoring stations indicated that background concentrations of common pollutants like carbon monoxide (CO), NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) are generally below the criteria specified in the Approved Methods, and ambient air quality is generally rated as 'good' to 'very good'. Exceedances of particulate matter (PM_{10} and $PM_{2.5}$) criteria were primarily recorded during the bushfires in the summer of 2019 to 2020.

Sensitive receivers

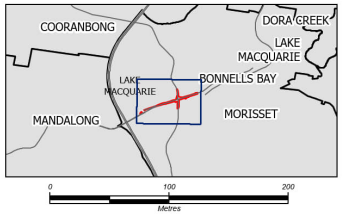
Sensitive receivers for air quality impacts include human sensitive receivers such as residential receivers, students and staff members who live, work or attend educational institutions, and ecological sensitive receivers such as threatened fauna, flora and ecological communities listed under State and Commonwealth legislation. Human sensitive receivers near the proposal are shown in Figure 6-10.

Mandalong Road Upgrade

Figure 6-10
Air quality sensitive receivers

Legend

- Proposal area
- Ancillary facility
- Watercourse
- Road
- Railway
- Sensitive receivers



Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

1:4,500 Date: 21/10/2024

GDA 2020

Data sources: Geoscience Australia, Nearmap, NSWSS

6.7.3 Potential impacts

Construction

During construction, the generation of dust would be the main impact on air quality for the proposal. These emissions may adversely impact nearby sensitive receivers if not adequately managed. Construction activities that may result in potential dust impacts include:

- demolition activities, including removal of road pavement, roundabout, median and splitter islands and pedestrian footpaths, and demolition of buildings and structures at the batching concrete batching plant at the intersection of Wyee Road and Mandalong Road (except the concrete slabs and site shed)
- earthworks, including clearing and grubbing, stripping of topsoil, excavation, and disposal of unsuitable material
- construction activities, including road upgrades and widening, and installing new traffic signals and central medians
- track-out, defined as dirt, mud or other materials being tracked onto a paved road by a vehicle leaving the proposal area.

These activities are considered to present a low to medium risk of dust impacts, based on the scale of the activities and the sensitivity of the area to dust impacts, as shown in Table 6-51.

Other potential emissions during construction include exhaust emissions from construction vehicles, plant and equipment, odours generated during the application of asphalt and line marking, and other airborne hazardous materials that may be generated during demolition and excavation activities due to the presence of unexpected contamination within the proposal area (refer to Section 6.6). These impacts would be temporary and minor, providing appropriate safeguards and management measures are implemented.

Table 6-51 Risk of potential dust impacts during construction

Impact	Risk			
	Demolition	Earthworks	Construction	Track-out
Dust soiling	Medium risk	Medium risk	Medium risk	Medium risk
Human health	Medium risk	Medium risk	Medium risk	Medium risk
Ecological	Medium risk	Medium risk	Medium risk	Low risk

Operation

The potential impact to air quality during operation of the proposal is generally associated with motor vehicle emissions due to changes in the volumes of motor vehicles, mode of travel and proximity to sensitive receivers.

The predicted levels of key pollutants (NO_2, PM_{10} and $PM_{2.5}$) would remain below the relevant air quality criteria at all sensitive receivers during operation of the proposal. The overall traffic growth and widening of the road for the proposal (reducing the distance from the nearest sensitive receivers) would result in a minor increase of vehicle emissions, however traffic growth and the associated increase in vehicle emissions would already occur without the proposal. Overall, there would be no changes to air quality during the operation of the proposal, and a detailed air quality assessment is not required.

It is important to note that estimation of future emissions does not include changes in fuel efficiency or type of vehicle fuel used. Anticipated future improvements in fuel efficiency and vehicle type may further reduce emissions throughout the transport system in NSW over the long term.

6.7.4 Safeguards and management measures

Safeguards and management measures to minimise potential air quality impacts of the proposal are presented in Table 6-52. Other safeguards and management measures to minimise potential soil impacts (including erosion and sedimentation) are identified in Section 6.6.4.

Table 6-52 Air quality safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
AQ1	Air quality impacts	Air quality management measures for the proposal area and any ancillary facilities will be implemented as part of the CEMP. The CEMP will identify: • all dust and odour sensitive receivers • potential sources of air pollution during construction, including dust, vehicles transporting waste, plant and equipment • air quality management objectives consistent with relevant published EPA and/or DPIE guidelines • mitigation and suppression measures to be implemented • methods to manage works during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces • community notification and complaint handling procedures. Measures will include (but not be limited to): • use of water sprays or dust suppression surfactants as required for dust suppression • adjusting the intensity of activities based on observed dust levels and weather forecasts • minimising the amount of materials stockpiled and position stockpiles away from surrounding sensitive receivers • limiting vehicle movements to designated entry/exit routes and parking areas, and implementing measures to minimise the tracking of material onto paved roads • covering of loads • stabilising disturbed areas as soon as practicable, including new access routes • minimising the extent of disturbance as far as practicable.	Contractor	Construction	Standard safeguard Section 4.4 of *QA G36 Environment Protection*

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
AQ2	Combustion emissions	Combustion emissions generated during construction will be minimised through: • ensuring all vehicles and machinery are fitted with appropriate emission control equipment and maintained in a proper and efficient manner • minimising the use of diesel- or petrol-powered generators by using mains electricity or battery-powered equipment where practicable • ensuring all vehicles switch off engines when stationary, to prevent unnecessary idling vehicles.	Contractor	Construction	Additional safeguard

6.8 Sustainability

This section assesses sustainability initiatives associated with the proposal, as well as the potential impacts of the proposal on climate change due to the release of greenhouse gas emissions, and an assessment of the potential impacts of climate change on the proposal.

6.8.1 Policy setting

Sustainability

Transport is committed to delivering transport services, projects, operations and programs in a manner that balances economic environmental and social issues to ensure a sustainable transport system for NSW.

The Transport Environment and Sustainability Policy (Transport Environment and Sustainability Policy) (Transport for NSW, 2020c) outlines Transport's commitment to deliver transport which contributes to economic prosperity and social inclusion in an environmentally responsible and sustainable manner, consistent with the Future Transport Strategy, and how this will be achieved.

The Transport Sustainability Plan 2021 (Transport Sustainability Plan) (Transport for NSW, 2021) has been developed to address a range of NSW government legislative requirements and is informed by key strategic and regulatory drivers. The Transport Sustainability Plan identifies eight focus areas and key sustainability initiatives and actions to embed sustainability into the delivery of Transport infrastructure and services. Section 6.8.4 discusses the eight focus areas and how the proposal responds to these focus areas.

Climate change

Transport is committed to urgent, transformative and leading action on climate change consistent with the NSW Climate Change Adaptation Strategy (NSW Government, 2022) and consider climate change risk in all key relevant decisions. Transport is committed to Net Zero emissions consistent with Australia's commitments under the 2016 Paris Agreement, endorsed by the NSW Government, and the NSW Climate Change Policy Framework (Office of Environment and Heritage, 2016).

6.8.2 Methodology

Sustainability assessment

Sustainable development is defined by the National Strategy for Ecologically Sustainable Development (Council of Australian Governments, 1992) as 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.

A high-level assessment of sustainability initiatives associated with the proposal has been carried out in consideration of the Transport Sustainability Plan and Transport Environment and Sustainability Policy. The sustainability assessment for the proposal broadly involved:

- defining the sustainability context for the proposal within the broader context of NSW's objective of improving transport efficiency, and the relevant Transport policies and guidelines
- reviewing the sustainability focus areas and associated objectives from the Transport Sustainability Plan and Transport Environment and Sustainability Policy and describing how these focus areas apply to the proposal
- identifying requirements for managing sustainability during detailed design, construction and operation of the proposal.

Climate change

Climate change is the general term used to refer to the altering of climatic conditions over long periods of time (i.e. from years to centuries) associated with the accumulation of greenhouse gases in the atmosphere.

The Climate Change Risk Assessment has been prepared in accordance with Transport's Climate Risk Assessment Guidelines (Transport for NSW, 2022f) to consider the resilience of the proposal to climate change. Climate change risks relevant to the proposal have been assessed in accordance with the Climate Risk Ready NSW Guide (NSW DPIE, 2021), Australian Standard/ New Zealand Standard 31000:2009 Risk Management – Principles and Guidelines (Standards Australia/Standards New Zealand, 2009), Australian Standard AS5334 – 2013: Climate change adaptation for settlements and infrastructure – A risk-based approach (Standards Australia, 2013), and Transport's Climate Change Risk Assessment Guidelines (Transport for NSW, 2022f).

The methodology for the Climate Change Risk Assessment included:

- establishing the context of the proposal by:
  - confirming climate change variables relevant to the proposal, including historical climate data
  - reviewing vulnerability and resilience of local communities
  - reviewing relevant climate change projections for the proposal
- undertaking a risk assessment, including identifying, analysing and evaluating climate change risks
- identifying and assessing risk treatment and adaption measures to reduce the hazard, exposure, or vulnerability of the proposal to identified climate change risks
- reassessing residual climate change risks.

Time periods

The design life of key proposal elements has informed the selection of the time periods used in the assessment against which climate change risks are assessed. Climate projections have been based on three time periods: current climate to 2030 (2020–2039), near future to 2050 (2040–2059), and far future to 2090 (2080–2099). These projections have been compared with the historical baseline period from 2008 to 2024.

Climate change emission scenario

The Intergovernmental Panel on Climate Change (IPCC) publishes four greenhouse gas concentration trajectories known as Representative Concentration Pathways (RCP). Scenario RCP8.5 has been used in this assessment as it is a very close match to historical carbon dioxide emissions and represent the most plausible levels of future carbon dioxide emissions under current and stated global climate change policies. This scenario represents carbon dioxide (CO_2) concentrations of 940 parts per million (ppm) by 2100 and a global mean temperature increase of 3.7 degrees Celsius (and likely range of 2.6 to 4.8 degrees Celsius).

Climate change projections

Climate change projections used in the assessment were based on publicly available data from AdaptNSW (NSW Government, 2024a) and the BoM. AdaptNSW reports on the projections of seven climate models across specific regions, including the Hunter region.

Climate variables

An initial risk screening indicated the proposal would be vulnerable to the following climate variables and hazards:

- direct risks:
  - precipitation and rainfall intensity
  - cyclones and storms (Including wind, hail and lightning)
  - flooding
  - air temperature and humidity
  - solar radiation
  - heatwaves and droughts
  - bushfire weather
- indirect risks:
  - bushfire smoke and heat
  - heat impact (including equipment, charging infrastructure and concrete).

Direct risks are those resulting from climate or weather events which occur at the proposal area, whereas indirect risks arise from climate or weather events which occur outside of the proposal area.

Risk assessment and evaluation

A qualitative risk assessment was carried out to determine the potential risks to the proposal assets from climate change. This involved:

- describing the hazard evolving from the climate variable/s based on climate change projections for the proposal
- describing how the climate change hazard could affect the proposal and its associated assets, and assessing the consequence, likelihood and risk rating of this impact.

Adaptation (treatment) measures to reduce the hazard, exposure or vulnerability of the asset or service to the identified climate change risks were considered. Consideration was given to the feasibility, effectiveness and cost of adaptation measures.

6.8.3 Existing environment

Climate change projections

The current (2030), near future (2050) and far future (2090) climate change projections for the proposal area are provided in Table 6-53.

Table 6-53 Current and future climate change projections for the proposal area

Climate variable	RCP 8.5 2030		RCP 8.5 2050		RCP 8.5 2090	
	Summer	Winter	Summer	Winter	Summer	Winter
Annual mean temperature (degrees Celsius (°C))	+0.80	+0.71	+1.60	+1.64	+ 3.26	+3.45
Annual maximum temperature (°C)	+0.79	+0.8	+1.59	+1.71	+3.13	+3.47
Annual minimum temperature (°C)	+0.88	+0.63	+1.75	+1.53	+ 3.61	+3.36
Average rainfall (per cent (%))	-9.48	-23.72	-21.23	-26.00	-6.00	-25.03
Hot days (days above 35°C)	+1.07	0.00	+3.01	0.00	+6.08	0.00
Cold nights (days below 2°C)	0.00	-0.04	0.00	-0.04	0.00	-0.04
Fire weather day (Forest Fire Danger Index (FFDI) above 50)	-0.07	+0.02	+0.25	+0.02	+0.20	+0.10
Sea level rise (centimetres (cm))	N/A	N/A	23		59	

6.8.4 Potential impacts

Sustainability

Table 6-54 provides a summary of responses to the goals of the key focus areas of the Transport Sustainability Plan in relation to the proposal. The majority of the sustainability focus area impacts have been considered in other sections of this REF.

Table 6-54 Sustainability focus areas that relate to key environmental constraints for the proposal

Sustainability focus area	Proposal response
Respond to climate change	Key climate change hazards include extreme rainfall and flooding, increased temperature, humidity and solar radiation, extreme storm events, extreme bushfire hazards and extreme heatwaves and droughts. The proposal considers potential risks from climate change in Section 6.8.4. Adaptation measures to mitigate these risks are outlined in Section 6.8.5.
Protect and enhance biodiversity	The proposal would improve outcomes for biodiversity by avoiding, mitigating or offsetting the proposal's potential impacts on threatened species (flora and fauna), populations and ecological communities (refer to Section 6.1).
Improve environmental outcomes	The proposal would improve environmental outcomes by avoiding, mitigating or offsetting the proposal's potential environmental impacts, as described in sections 6.1 to 6.14.
Procure responsibly	Sustainable procurement would be carried out for the goods and services required to deliver the proposal and would contribute value to the environmental, social and economic wellbeing of the community, in alignment with the requirements in the NSW Government Procurement Policy Framework (NSW Government, 2024b). The proposal would aim to align with the NSW circular economy policy by prioritising procurement of recycled materials, and designing for disassembly and end of life recycling of materials.
Partner with communities	Transport has informed and involved the community and key stakeholders as the proposal has progressed, and their feedback has been used to inform the proposal design and the REF (refer to Section 5.2.1). Transport will continue to inform and seek feedback from the community and key stakeholders as the proposal progresses, including during detailed design and construction. The proposal would aim to create a positive legacy for the community.
Respect culture and heritage	Potential Aboriginal and non-Aboriginal heritage impacts and management measures are discussed in sections 6.12 and 6.13. The proposal is not expected to result in any impacts on known Aboriginal and non-Aboriginal heritage items and places. Where possible, the proposal would investigate opportunities to integrate cultural heritage design principles into the Urban Design Concept and Landscape Strategy (refer to Section 3.2.3) to ensure cultural and heritage values are acknowledged, integrated and preserved.
Align spend and impact	The proposal has considered whole of life cycle costs and broader economic value created, rather than upfront cost, throughout design development to deliver the best value to the community. Sustainability improvements and enhancements have been valued and integrated into this decision making.
Empower customers to make sustainable choices	The proposal would improve active and public transport infrastructure through the provision of new and improved active and public transport infrastructure (refer to Section 6.2). These improvements would encourage customers to walk, cycle and/or use public transport as the preferred modes of sustainable transport.

Climate change

Adaptation measures have been considered for risks rated high, as well as some risks rated medium. A summary of the initial and revised climate change risks identified for the proposal, before and after the application of adaptation measures, is provided in Table 6-55. With the implementation of adaptation measures, all high risks would be avoided and medium risks would be reduced by around 30 per cent.

Table 6-55 Summary of initial and revised climate change related risks for the proposal

Risk Rating	Initial risks	Revised	Reduction (%)	Target (%)
Extreme	0	0	N/A	100%
High	3	0	100%	100%
Medium	25	17	32%	50%
Low	8	19	N/A	N/A

6.8.5 Safeguards and management measures

Sustainability initiatives identified for the proposal, as well as safeguards and management measures to minimise potential climate change impacts for the proposal, are presented in Table 6-56.

Table 6-56 Sustainability and climate change safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
CC1	Climate change	Detailed design will consider adaptation measures for all climate change risks with an risk rating of medium or above. Refer to Transports Climate Change Risk Assessment Report.	Contractor	Detailed design	Additional safeguard
CC2	Sustainability	Implement project specific Baseline Sustainability Requirements during detailed design and construction.	Contractor	Detailed design and construction	Additional safeguard
CC3	Sustainability	Fuel efficient plant, equipment and vehicles will be selected for use during construction where feasible and reasonable. Construction plant and equipment will be well maintained to maximise fuel efficiency.	Contractor	Construction	Additional safeguard
CC4	Sustainability	The procurement of goods and services in accordance with the Sustainable Procurement Policy (Transport for NSW, 2016), Environment and Sustainability Policy (Transport for NSW, 2020c) and Transport for NSW Sustainability Plan (Transport for NSW, 2021) will consider goods and services that: • are from local suppliers • make use of recycled materials or materials with a low embodied energy content • are energy efficient or have low embodied carbon • minimise the generation of waste.	Contractor	Construction	Additional safeguard

6.9 Property and land use

This section assesses the potential impact of the construction and operation of the proposal on land use and property.

6.9.1 Methodology

The methodology for the land use and property assessment included:

- reviewing the Lake Macquarie LEP, aerial photography, publicly available databases and Lake Macquarie City Council strategies and plans to identify property ownership and existing and future land uses within and around the proposal area
- identifying property acquisition or leasing requirements
- assessing potential impacts on existing and future land uses and properties during construction and operation of the proposal
- recommending safeguards and management measures for construction and operation to mitigate potential impacts.

6.9.2 Existing environment

Land tenure

Property within and surrounding the proposal area comprises State owned land (road corridor), land owned by Lake Macquarie City Council and Biraban LALC, privately owned land and Crown Land.

A search of the Native Title Tribunal Register of Native Title Applications, Registration Decisions and Determinations did not identify any Native Title holders/claimants in the proposal area or immediate surrounds.

Land use and zoning

The proposal is located in the Lake Macquarie LGA in the suburb of Morisset (refer to Figure 1-1). The proposal area consists mainly of an existing road corridor, with other key land uses within and surrounding the proposal area comprising:

- roads and transport infrastructure, including the M1 Pacific Motorway (west of Mandalong Road), local roads and the Main North Railway Line (south-east of Dora Street)
- electrical infrastructure, including a substation and transmission easement north of Mandalong Road
- commercial uses along Dora Street and within the Morisset Business Park south of Mandalong Road, including but not limited to, service stations, a restaurant, childcare centres, automotive dealerships and mechanics, and retailers
- general industrial uses within the Morisset Business Park south of Mandalong Road
- community facilities north of Dora Street, including the Morisset Hospital Historical Society, Southlake Business Chamber and Community Alliance and a place of worship
- semi-rural residential uses, including rural living and small farms north of Mandalong Road
- bushland along Freemans Drive and north of Mandalong Road
- recreational uses east of Dora Street and north-east of Freemans Drive, including Auston Oval and Morisset Showground.

A future entertainment facility, the Cedar Mill event site, is currently being constructed south of Dora Street and a bulky goods retail development is currently being constructed north of Mandalong Road (at the western end of the proposal). Other developments currently under construction or being planned near the proposal are outlined in Section 6.14.

The proposal area is mainly located on land zoned as SP2 Infrastructure (Classified Road) under the Lake Macquarie LEP. Other land zones within the proposal area include:

- RE1 – Public Recreation
- RE2 – Private Recreation
- RU6 – Transition
- E4 – General Industrial
- SP2 – Infrastructure (Electricity Transmission or Distribution Network).

Land use zoning within and surrounding the proposal area is shown in Figure 4-1.

6.9.3 Potential impacts

Property

The proposal has been designed and developed to minimise property acquisitions and has prioritised the use of the existing road corridor where possible. Nevertheless, some temporary use and permanent acquisition and adjustment of properties would be required.

The proposal would require partial acquisition of five parcels of land, held by private landowners and Lake Macquarie City Council, and full acquisition of one land parcel, held by a private landowner. Properties to be acquired are detailed in Section 3.6 and shown in Figure 3-4. The extent of property acquisition would be refined and confirmed during detailed design in consultation with the property owners, and will be minimised where possible.

Property acquisition would be carried out in accordance with the Land Acquisition Act, accounting for the NSW Government Land Acquisition Reform 2016, and Transport's Land Acquisition Information Guide 2014 (Roads and Maritime Services, 2014). These provisions would ensure that the acquisition would be undertaken 'equitably' and without any impact on the commercial properties or owners' statutory rights. The acquisition of council owned and managed, 'community land' would be carried out in accordance with the *Local Government Act 1993*. Any potential impacts to community land would require agreement from Lake Macquarie City Council.

The full acquisition of the privately owned concrete batching plant would result in the permanent closure of this facility. All structures, except the site shed and concrete pads, would be demolished at the property. The site would be used as the main site compound (ancillary facility AF3) to facilitate construction work for the proposal. Upon completion of construction, this site would be revegetated and become road reserve.

Partial acquisition would mostly consist of strip acquisition of five properties along the road corridor to accommodate the widened road corridor and active transport infrastructure improvements (refer to Figure 3-4). These acquisitions are not expected to impact on the long-term viability of the existing or any future uses of the properties affected, as the land to be acquired represents only a small portion of the overall land holding. Property adjustment plans would be developed in consultation with the relevant property owners. Where required, property adjustments would reinstate existing driveway accesses of these properties.

Socio-economic impacts of property acquisition are discussed in Section 6.5. Transport would continue to consult with affected property owners before and during construction to minimise the potential for impacts on property.

Temporary leases would be required over some properties for construction ancillary facilities. Further details of the ancillary facilities are provided in Section 3.4. Transport would engage in a lease agreement with affected landowners for the construction period. Leased land would be rehabilitated in consultation with the relevant landowners and returned as soon as practicable at the completion of construction.

Existing access to properties fronting Mandalong Road, Dora Street and Wyee Road would be maintained throughout construction. Access to some properties may be temporarily disrupted due to construction activities within the existing verge areas immediately outside of the properties. Access to Morisset Ambulance Station on Dora Street would be maintained throughout construction.

The proposal would permanently change access to some properties along Dora Street and Mandalong Road, due to the extension of the central median. The central median would restrict right-turn movements in and out of properties for improved safety. A short section of the central median on Dora Street would be modified to allow all movements to and from the Morisset Ambulance Station. Further details of impacts on traffic and transport including property access are provided in Section 6.2.

Land use

During construction, temporary impacts to land use would mainly result from the temporary leasing of land for ancillary facilities AF1 and AF2 and changes in amenity for some land uses near the construction works and ancillary facilities. Further details about these ancillary facilities are provided in Section 3.4. Potential impacts of changes to amenity on existing land uses are discussed in sections 6.3, 6.4, 6.5 and 6.7.

Permanent changes to land use would start prior to commencement of construction due to property acquisition. The widening of the road corridor for the proposal would require partial (strip) acquisition on both sides of the road corridor (refer to Section 3.6). Land at these locations, including land currently used for commercial and recreational purposes, would be rezoned to transport infrastructure corridor after partial acquisition. This is not expected to have any substantial effect on the functionality or viability of the current or future use of the affected properties.

The full acquisition of the privately owned concrete batching plant would result in the permanent closure of this facility. Potential socio-economic impacts of the closure of the concrete batching plant are discussed in Section 6.5. Upon completion of construction, this site would be revegetated and handed back to Lake Macquarie City Council to manage.

6.9.4 Safeguards and management measures

Safeguards and management measures to minimise potential property and land use impacts of the proposal are presented in Table 6-57. Other safeguards and management measures that would address potential property and land use impacts are identified in sections 6.2.4, 6.3.5, 6.4.4, 6.5.4 and 6.7.4.

Table 6-57 Property and land use safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
LP1	Property acquisition	All property acquisition and associated property adjustments will be carried out in accordance with the requirements of Transport's Land Acquisition Information Guide 2014, Land Acquisition Act, NSW Government Land Acquisition Reform 2016, and Transport's Land Acquisition Information Guide 2014 (Roads and Maritime Services, 2014), in consultation with landowners.	Transport	Detailed design	Additional safeguard
LP2	Property adjustment	Property adjustments for the proposal will be completed in consultation with affected property owners and business operators.	Contractor	Construction	Additional safeguard
LP3	Leased land	Areas of land leased for the purposes of construction will be reinstated at the end of the lease to at least an equivalent standard in consultation with the landowner.	Contractor	Construction	Additional safeguard

6.10 Surface water, flooding and groundwater

This section assesses the potential impact of the proposal on surface water, flooding and groundwater.

6.10.1 Methodology

The methodology for the desktop assessment involved:

- reviewing relevant legislation, policy and guidelines
- reviewing publicly available literature, databases, aerial photography, topographic mapping and existing land use, including the Dora Creek Flood Study (WMAWater, 2015), Lake Macquarie LEP, and NSW Planning Portal Spatial Viewer (NSW DPHI, 2024), to characterise the existing physical attributes of the proposal area and surrounds, including the catchments, watercourses and associated floodplains, existing water quality, and flooding conditions and drainage patterns
- identifying groundwater occurrence and use within 500 metres of the proposal area through a review of previous geotechnical investigations completed in the proposal area (refer to Section 6.6) and WaterNSW's real time registered groundwater bore database
- assessing the proposal's potential impacts on surface water and groundwater water quality, drainage, and potential flooding impacts, during construction and operation
- recommending safeguards and management measures for construction and operation to reduce potential impacts.

6.10.2 Existing environment

Catchments and watercourses

The Lake Macquarie LGA is dominated by the central feature of Lake Macquarie that is a coastal estuary with a catchment of 648 square kilometres. The proposal area is located in the Dora Creek sub-catchment that drains an area of around 238 square kilometres (WMAWater, 2015). The Dora Creek catchment is the largest catchment flowing into Lake Macquarie, which ultimately drains to the Pacific Ocean via the Swansea Channel. Dora Creek has two main tributaries; Jigadee Creek which enters from the north, and Stockton Creek which enters from the south (WMAWater, 2015). The Dora Creek catchment is comprised of industrial, urban, rural residential and natural land uses.

Mullards Creek, an ephemeral first order watercourse, traverses the central section of the proposal area around 350 metres west of the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection, as shown in Figure 6-11. The creek is classified as a first order stream at this location, according to the Strahler stream ordering system (Strahler, 1957). Mullards Creek flows north towards Stockton Creek, located around 1.2 kilometres north of the proposal area, which then drains into Dora Creek.

Drainage

The existing Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection is located at the top of the drainage catchment area on a crest that separates the Dora Creek catchment (to the north) from the Pourmalong Creek catchment (to the south). Stormwater from Freemans Drive and the eastern end of Mandalong Road drains to the west and discharges at Mullards Creek via vegetated table drains along the northern side of Mandalong Road, and via a twin culvert (750 and 600 millimetres wide in diameter) from the southern side of Mandalong Road. The twin culvert also captures runoff from the industrial development along the southern side of Mandalong Road. Stormwater from the western end of Mandalong Road drains east towards Mullards Creek via vegetated table drains along the northern side of the road.

Stormwater from Dora Street and Wyee Road drains via vegetated table drains to the east into the former Morisset Golf course, which is currently being developed into the Cedar Mill event site. Historically, stormwater drained through the former Morisset Golf Course via a network of channels and dams to discharge to existing culverts under the Main Northern Railway line, located to the east of the proposal area. The former Morisset Golf Course is currently being developed into the Cedar Mill event site. A pit and pipe network is being constructed in the Cedar Mill event site to convey all stormwater runoff into a basin, prior to discharging at the existing culvert under the Main Northern Railway line.

The existing stormwater system within the proposal area consists of a network of table drains, culverts, pits and pipes. Kerbs and gutters are mainly absent from the proposal area, except at the Mandalong Road/Freemans Drive/Dora Street/ Wyee Road roundabout and along the northern side of Dora Street. The existing pavement drainage system can generally capture and convey runoff from storms up to the 10 per cent AEP (one in 10 year ARI) storm event across the proposal area. Existing drainage along Dora street consist of a sag inlet pit which is only able to convey the 50 per cent AEP (one in two year ARI) storm event. All larger flood events overtop the road crown and flow through the Cedar Mills event site via their internal drainage network.

Flooding

Flooding within the Dora Creek catchment occurs following heavy rainfall where flood flows in excess of channel capacities results in overbank flooding, or due to high water levels occur in Lake Macquarie. The largest flood event recorded in the Dora Creek catchment, based on peak levels, occurred in March 1977 followed by a flood event in June 2007. There is no long term flood height record at a single location which would allow the height of these floods to be compared. The 2007 flooding event at Dora Creek catchment was recorded at just below the five per cent AEP (1 in 20 year ARI) flood event level. A rainfall gauge installed on Dora Street has recorded very little significant rainfall events over 104 years of operation, with more than 150 millimetres recorded only during two rainfall events (in 1908 and 2007).

The proposal area is generally located above the 0.2 per cent AEP (1 in 500 year ARI) flood event level. The Dora Creek Flood Study (WMAWater, 2015) indicates that the western end of the proposal area, including ancillary facility AF4, may be susceptible to flooding during the one per cent AEP (1 in 100 year ARI) and Probable Maximum Flood (PMF) flood events, as shown in . The Lake Macquarie LEP also indicates that ancillary facility AF1 would be located on land mapped as a flood planning area (land below the level of a one per cent AEP (1 in 100 year ARI) flood event plus freeboard (typically 0.5 metres)), as shown in Figure 6-11.

Surface water quality

The Lake Macquarie City Council's most recent State of the Environment Report 2018–2019 (Lake Macquarie City Council, 2019) notes that marine and estuarine ecosystems indicators for water quality (such as the number of aquatic species and the extent of seagrasses) remain stable, although pressures on these ecosystems, including urbanisation, industry and recreational use, and climate change, are increasing. Overall water quality within the Dora Creek estuary was rated as good (rating level B) during the 2018-2019 sampling period, with trigger value exceedances identified for turbidity and chlorophyll-a (Lake Macquarie City Council, 2019). Saline water has been recorded in Dora Creek at the confluence of Stockton Creek and Dora Creek (NSW Waterwatch, 2024), that may be attributed to tidal influence at Bonnells Bay in Lake Macquarie (6.5 kilometres downstream). A weir is located around 4.5 kilometres upstream in Dora Creek that separates freshwater and estuarine environments.

Groundwater

The proposal area is located within the Sydney Basin-North Coast Groundwater Source regulated by the water sharing plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016. Groundwater is conceptualised to generally flow from areas of relatively high elevation towards areas of relatively low elevation, before discharging to creeks as baseflow, or via evapotranspiration in areas of relatively low elevation where groundwater levels are close to the surface. Groundwater within the proposal area is therefore expected to flow towards the central and western sections of the proposal area, towards Mullards Creek.

Three groundwater boreholes registered for stock and domestic use have been identified within 500 metres of the proposal area (WaterNSW, 2024). Groundwater bores within 500 metres of the proposal area are shown in Figure 6-11. Groundwater levels in these boreholes are recorded as ranging from between five metres to seven metres below ground level.

During geotechnical investigations for the proposal, groundwater was encountered at the following locations within and near the proposal area:

- at a depth of 0.9 metres below ground level within the proposal area along Dora Street (refer to test pit location TP25 in Figure 6-11)
- at depths of between 0.15 and 1.10 metres below ground level on the northern side of Mandalong Road east of ancillary facility AF4 (refer to hand auger sample location HA01 in Figure 6-11)
- at a depth of 0.55 metres below ground level on the northern side of Mandalong Road south of the proposal area (refer to test pit location TP08 in Figure 6-11)

- at depths of between 0.46 and 0.55 metres below ground level south-west of the proposal area (refer to test pit locations TP05 and TP07 in Figure 6-11)
- at depths of between 0.20 and 0.42 metres below ground level immediately south of the proposal area along Wyee Road (refer to test pit location TP22 in Figure 6-11).

Groundwater was not encountered at any other geotechnical investigation location.

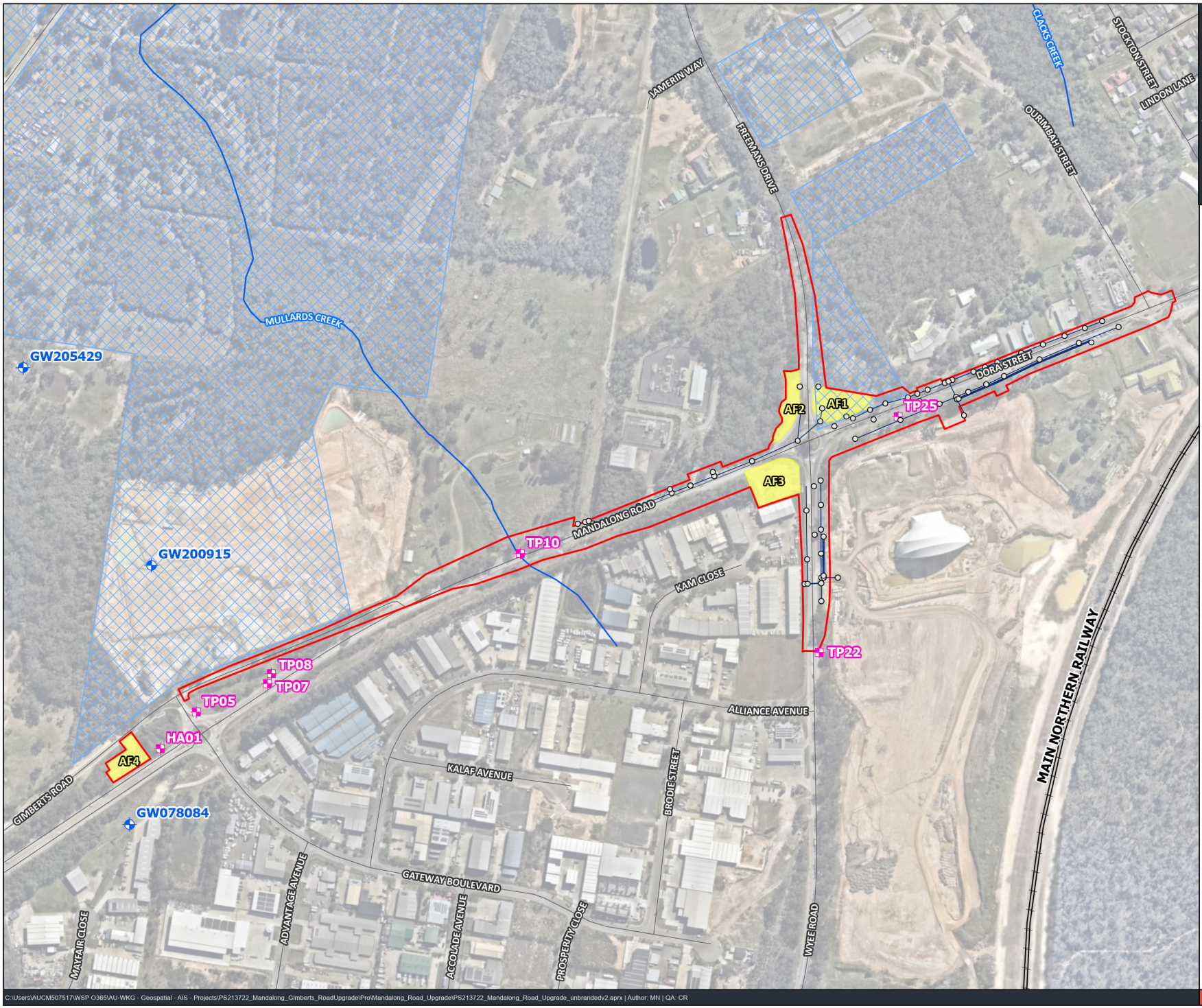
Sensitive receiving environments

Sensitive receiving environments may include areas of high conservation or community value, or environments that supports ecosystem or human uses of water, and that are particularly sensitive to pollution or degradation of water quality.

Sensitive receiving environments identified within and near the proposal area include:

- a first order stream, Mullards Creek, traversing the central section of the proposal area. However, Mullards Creek is not mapped as Key Fish Habitat and is not considered likely to provide habitat for threatened aquatic species listed under the FM Act (refer to Section 6.1). The nearest mapped Key Fish Habitat is located further upstream in Mullards Creek, around 350 metres north of the proposal area
- three PCTs that correspond to three TECs within and surrounding the proposal area, including the Swamp Sclerophyll Forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act), River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered under the BC Act) and Coastal Swamp Sclerophyll Forest of NSW and South East Queensland (listed as endangered under the EPBC Act) (refer to Section 6.1)
- aquatic and terrestrial GDEs located within and surrounding the proposal area (refer to Section 6.1).

No coastal wetlands, littoral rainforests, coastal environment areas or coastal vulnerability areas have been identified within or near the proposal area. The nearest coastal wetland is located around one kilometre north of the proposal.



Mandalong Road Upgrade

Figure 6-11
Surface water, flooding and groundwater

Legend

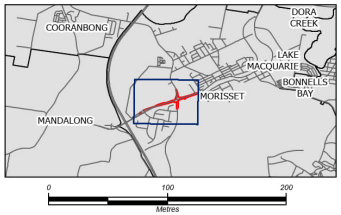
- Proposal area
- Ancillary facility
- Watercourse
- Road
- Railway
- Registered groundwater bore
- Geotechnical investigation location

Proposed drainage

- Drainage pipe
- Drainage pit

Lake Macquarie LEP 2014

- Flood planning area



Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

1:4,500 Date: 26/11/2024

GDA 2020

Data sources: WSP, Nearmap, NSWSS

Mandalong Road Upgrade

Figure 6-12
Flooding

Legend

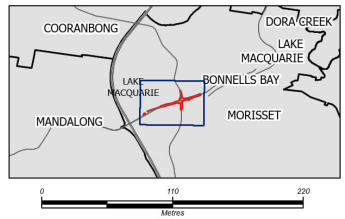
- Proposal area
- Ancillary facility
- Road
- Railway
- Watercourse

Probable maximum flood (m)

- >4

1 in 100 year flood (m)

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- >4



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1:4,500 Date: 12/12/2024

GDA 2020

Data sources: Geoscience Australia, Nearmap, NSWSS

6.10.3 Water quality criteria and objectives

The NSW Government has developed the Lake Macquarie and Tuggerah Lakes Water Quality Objectives (WQO) and River Flow Objectives (RFO) to represent the community's environmental values and long term goals for waterways within the Lake Macquarie catchment (NSW DECCW, 2006). In addition, the Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ) has developed guidelines (ANZECC/ARMCANZ, 2018) to provide a nationally consistent approach to water quality management. These objectives and guidelines provide benchmarks for assessment of the existing water quality within the Lake Macquarie catchment, to achieve healthy waters and ensure the maintenance or improvement of water quality.

The receiving watercourse impacted by the proposal is Dora Creek. Dora Creek is classified as a 'waterway affected by urban development' (DECCW 2006). The water quality objectives that apply to Dora Creek include the protection of:

- aquatic ecosystems
- visual amenity
- secondary contact recreation (e.g. boating and wading).

The river flow objectives that apply to Dora Creek include:

- maintain wetland and floodplain inundation
- mimic natural drying in temporary waterways
- maintain natural flow variability in all streams
- maintain natural rates of change in water levels
- minimise effects of weirs and other structures.

There is the potential for the current water quality to not meet the existing guidelines and trigger values (ANZECC/ARMCANZ, 2018) for protecting nominated environmental values. Irrespective of the current condition of waterways, the proposal should not further degrade water quality. As such, the key objective of the proposal is to minimise the potential impact on downstream receiving waters.

6.10.4 Potential impacts

Construction

Water quality

Key risks to surface water and groundwater quality during construction would include increased sediment, nutrient loadings and contamination and increased pH levels associated with the following:

- erosion of exposed soils during vegetation clearing, excavation, stockpiling and transport of spoil
- instream works to extend the existing culvert in Mullards Creek to enable the extension of the existing shared user path
- mobilisation and migration of potential surface and subsurface contaminants during excavation within potentially contaminated areas (refer to Section 6.6) and wash down of vehicles at ancillary facilities
- inadequate containment of accidental spills or leaks of chemicals, fuels and oils during the use or maintenance of vehicles, machinery, plant and equipment and road surfacing
- waste and litter from construction activities and personnel transported by wind and stormwater into watercourses
- inadequate containment of concrete spills and concrete wash out water
- use of fertilisers, herbicides or pesticides during landscaping.

Drainage discharge from the proposal area (water released into a stormwater drain or channel) would be intermittent and potential risks to water quality would likely be limited to prolonged and heavy periods of rainfall.

The extent of soil disturbance at any particular time is likely to be minimal as working alongside live traffic would limit the extent of areas excavated, which would limit the potential for soil erosion and sedimentation to occur.

The minor scale of the drainage works within Mullards Creek would enable drainage works to be completed during a period without rainfall and/or without standing surface water in the drainage line to minimise any potential impacts.

Stormwater runoff from the proposal area would flow into vegetated table drains along the road corridor that would spread out flows, reduce the velocity of flows and capture sediments and pollutants before the stormwater enters watercourses. Where rainfall volumes exceed the retention capacity of the road reserve drainage system, surface water would flow via the surrounding rural lands into Mullards Creek or enter the proposed pit and pipe drainage system in the Cedar Mill event site.

Hydrology and flooding

Potential impacts to surface water hydrology and flooding during construction include:

- reduced infiltration associated with vegetation clearance, soil compaction and paving to accommodate widening of the road corridor
- alteration or impedance of existing drainage paths caused by excavations, the presence of plant and equipment and stockpiling of excavated soil and materials, resulting in localised areas of flooding and scour
- flooding of the proposal area and surrounding areas due to obstruction of overland flow paths by temporary stockpiles, safety barriers and other construction elements at the western end of the proposal area and ancillary facility AF4 during the PMF flood event, and at ancillary facility AF1 during the one per cent AEP (1 in 100 year ARI) flood event
- flooding of the proposal area and/or surrounding areas due to the temporary decommissioning of drainage systems during utility relocations or adjustments.

Groundwater levels and flows

Excavation work required to build the proposal would generally be relatively shallow in depth (around 1.8 metres) and is not likely to intercept regional groundwater. As such, no impacts on groundwater resources is anticipated as a result of the proposal.

Sensitive receiving environments

Potential impacts on sensitive receiving environments due to potential impacts on surface and groundwater quality as a result of construction activities include:

- smothering of downstream aquatic habitats and lagoon/streambank vegetation
- increased turbidity, which reduces the amount of light available for aquatic fauna and flora
- excessive plant growth and algal blooms, resulting in oxygen depletion and the death of aquatic organisms
- increased toxicity, which may reduce aquatic fauna's ability to reproduce and their lifespan.

The proposal involves instream works to extend the drainage culvert in Mullards Creek to enable the extension of the existing shared user path. However, no native flora or fauna has been identified within this section of Mullards Creek, and therefore no direct impacts are expected on this sensitive receiving environment.

Operation

Water quality

The proposed road upgrade would result in a minor increase in impervious area within the Dora Creek catchment due to the widened road pavement and improved and new active transport infrastructure. This may result in a minor increase in pollutant loads in receiving watercourses during rainfall events.

Contaminants that have the potential to be present within stormwater include litter, sediment and suspended solids, nutrients, heavy metals, toxic organic compounds, oils and surfactants (chemical compounds that reduce the surface tension between two liquids, a liquid and a gas, or a liquid and a solid, e.g. cleaning products, detergents or soaps). Potential sources of these contaminants within the operational area of the proposal include:

- exhaust particles from vehicle engines
- wear and tear products from brakes, tyres, and other mechanical parts
- minor discharges from vehicle engines, including fluids, lubricants, and other similar materials
- minor discharges from leaking or damaged loads
- litter or other waste
- loss of goods/materials and spills of hydrocarbons during vehicle accidents.

The improved road design and road safety of the operational area would reduce the potential for loss of goods/materials and spills associated with vehicle accidents and the release of wear and tear products. Existing roadside table drains would continue to capture surface flows from the road corridor and capture sediments and pollutants before the stormwater enters downstream watercourses. The overall potential impact on water quality within the Dora Creek catchment is therefore expected to be negligible, and no specific operational surface water quality controls are required to achieve the water quality objectives and criteria for the catchment.

Hydrology and flooding

The proposed road upgrade has the potential to result in minor changes to surface water flow patterns and runoff to receiving watercourses, due to the increased impervious area from the widened road pavement and improved and new active transport infrastructure. However, impacts associated with these hydrological changes would be negligible as the proposal includes the provision of new and modified drainage infrastructure (including new longitudinal drains and transverse drains) to accommodate the changes in surface flow patterns (refer to Section 3.2.3).

The pavement drainage system has been designed for the one per cent AEP (100-year ARI) flood event along Mandalong Road, except along Dora Street where it has been designed for the 10 per cent AEP (10-year ARI) flood event. The operational area is generally located above the 0.2 per cent AEP (1 in 500 year ARI) flood event level, and is not expected to be impacted by any flood events.

Groundwater levels and flows

No permanent groundwater take is proposed during operation of the proposal. Therefore no impacts to groundwater levels or flows are predicted during operation as no groundwater would be extracted.

Sensitive receiving environments

Potential impacts on sensitive receiving environments during operation of the proposal are expected to be negligible as the overall impact on water quality within the Dora Creek catchment is expected to be negligible.

6.10.5 Safeguards and management measures

Safeguards and management measures to minimise potential surface water impacts of the proposal are presented in Table 6-58. Other safeguards and management measures to address potential water quality impacts are identified in Section 6.5.

Table 6-58 Surface water, flooding and groundwater safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
WQF1	Soil erosion and water pollution	All stormwater outlet locations and culverts would be designed to include appropriate dissipation and/or scour protection measures as required to control scour and erosion within the receiving watercourse with consideration to the existing channel form and lining.	Contractor	Construction	Additional safeguard
WQF2	Erosion and sedimentation	A Construction Soil and Water Management Plan (CSWMP) will be developed as a sub plan of the CEMP, and prepared in accordance with Managing Urban Stormwater: Soils and Construction –Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction – Volume 2D Main Road Construction (NSW DECC, 2008). This plan will outline measures to manage soil and water quality impacts associated with the construction work. The CSWMP will include, but not be limited to: • measures to minimise/manage erosion and sediment transport both within and outside the proposal area • preparation of progressive erosion and sediment control plans (ESCP) for all progressive stages of construction • measures to manage stockpiles, including locations, separation of spoil types, sediment controls and stabilisation in accordance with the Stockpile Site Management Guideline (Roads and Maritime Services, 2015) • concrete management procedures • 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.	Contractor	Construction	Section 2.1 of QA G38 Soil and Water Management

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
WQF3	Accidental spills or leaks	A site-specific emergency spill procedure will be developed as part of the CSWMP, and include spill management measures in accordance with the Roads and Maritime Code of Practice for Water Management (RTA, 1999) and relevant NSW EPA guidelines. The spill procedure will include measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport and NSW EPA).	Contractor	Construction	Section 4.3 of QA G36 Environment Protection
WQF4	Flooding	Ancillary facility sites (where stockpiling will occur) that are mapped within the one per cent AEP (1 in 100 year ARI) flood level, will be established to a minimum ground level above the one per cent AEP (1 in 100 year ARI) flood level.	Contractor	Construction	Additional safeguard
WQF5	Contamination of surface water	The refuelling and maintenance of plant and equipment will be undertaken in a designated area that is no less than 50 metres away from a watercourse.	Contractor	Construction	Additional safeguard
WQF6	Contamination of surface water	Vehicle wash downs and concrete washouts will be carried out within designated sealed bunded facility, or carried out off-site.	Contractor	Construction	Additional safeguard
WQF7	Contamination of surface water	Daily visual water quality checks (including for turbid plumes and hydrocarbon spills or slicks) will be carried out when working in or near Mullards Creek.	Contractor	Construction	Additional safeguard
WQF8	Water quality	Construction water quality monitoring will be undertaken upstream and downstream of the proposal to ensure that controls and site practices are effective at maintaining current water quality conditions. Monitoring will be undertaken in accordance with the Guideline for Construction Water Quality Monitoring (RTA, undated).	Contractor	Construction	Section 2.3 of QA G38 Soil and Water Management

6.11 Hazard and risk

This section assesses the potential hazards and risks for the proposal during construction and operation.

6.11.1 Methodology

A desktop assessment was undertaken of publicly available land uses and planning layers to determine existing hazards and risks relevant to bushfire, utilities, storage or handling of hazardous and dangerous materials, and mine subsidence. Mitigation measures for the proposal were identified to manage the identified potential hazards and risks, where relevant.

6.11.2 Existing environment

Bushfire

NSW Rural Fire Service (RFS) bushfire prone land mapping (NSW DPHI, 2024) indicates Vegetation Category 1 bushfire prone land (highest bushfire risk) is located immediately adjacent to the proposal area along Mandalong Road and Freemans Drive, as shown in Figure 6-13. The central section and western end of the proposal area are mapped as being within the vegetation buffer of Vegetation Category 1 bushfire prone land. The buffer area is land that directly adjoins bushfire prone land and are the areas in which developments and people are most likely to be affected by a bushfire in the adjacent land.

Utilities

Existing utilities identified within the proposal area include electrical, gas, potable water, sewer and telecommunications assets, as summarised in Section 3.5.

Dangerous goods and substances

Generally, there is no existing storage or handling of hazardous and dangerous materials associated with the operation of the existing roads within the proposal area, beyond small quantities that may occasionally be used for maintenance activities. As the proposal is located within an industrial/commercial area and near the M1 Pacific Motorway, hazardous materials and dangerous goods may occasionally be transported through the proposal area.

Storage and handling of small quantities of hazardous and dangerous materials also occur at the existing Transport maintenance and storage facility along Mandalong Road. The facility would be used as an ancillary facility (AF4) for the proposal during construction. Hazardous and dangerous materials are stored, handled and used at the Transport facility in accordance with manufacturer's guidelines.

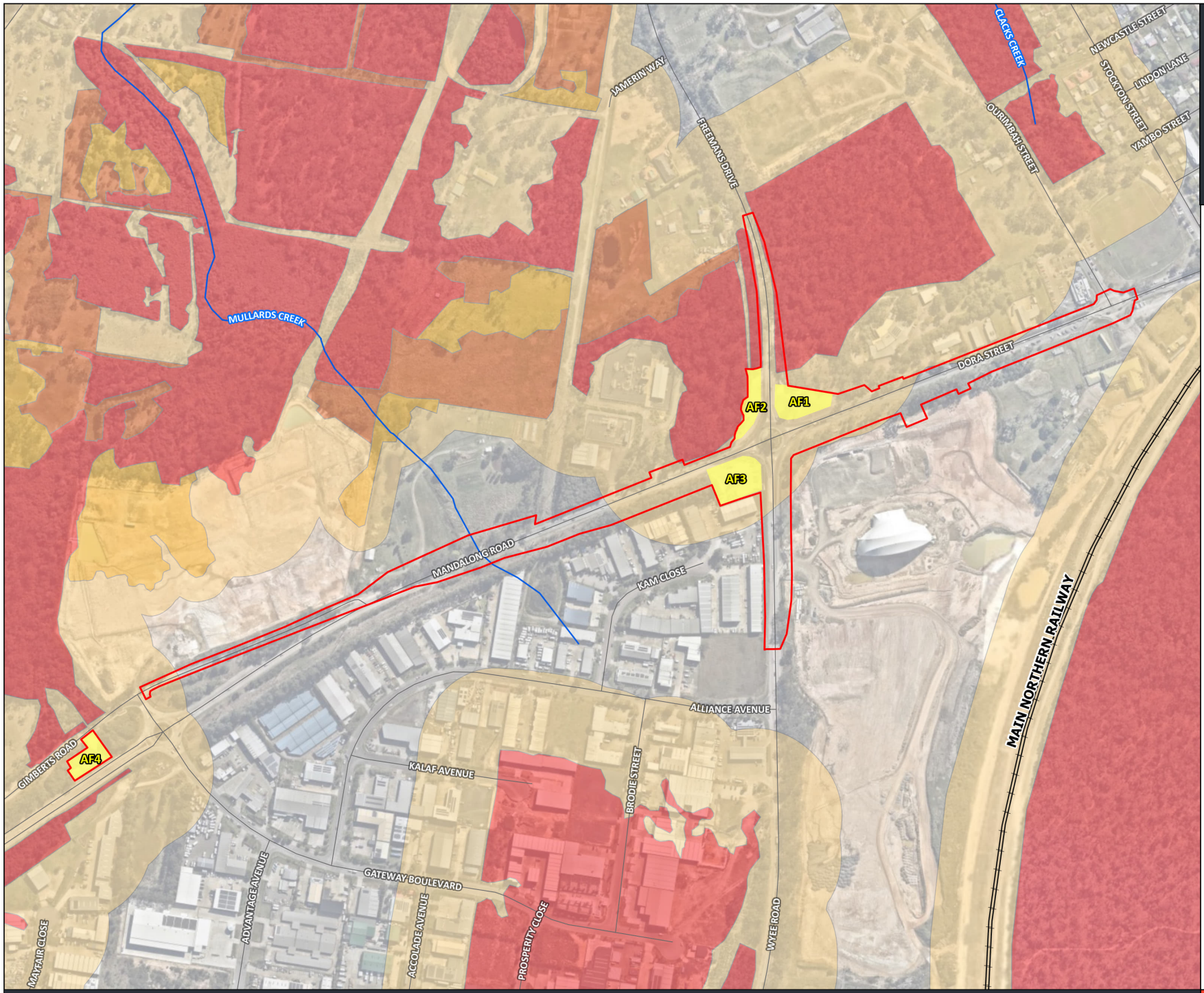
Hazardous materials and substances, including asbestos containing materials, may also be present within areas of potentially contaminated land identified within and near the proposal area (refer to Section 6.6.2).

Mine subsidence

Mandalong Coal Mine, an underground longwall thermal coal mine, is located around 300 metres west of the proposal area. It commenced operations in January 2005 and holds the authorisation to extract a maximum of 6.5 million tonnes of Run of Mine (ROM) coal each year.

The proposal is located in the West Lake mine subsidence district. Mine subsidence is a risk in areas which have been subject to underground coal mining as the land above can sink and fill the voided mine drifts, causing tilts and strains on the ground surface. In areas where coal extraction has taken place, subsidence generally occurs within a relatively short time after extraction.

Consultation undertaken with Subsidence Advisory NSW (refer to Section 5.4) indicated that underground coal mining has occurred in the north-eastern portion of the proposal area at depths of between 120 to 150 metres below ground level. Future coal extraction under the proposal area is considered unlikely.



Mandalong Road Upgrade

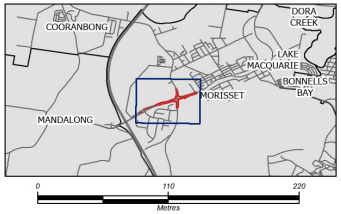
Figure 6-13
Bushfire prone land

Legend

- Proposal area
- Ancillary facility
- Road
- Railway
- Watercourse

Bushfire prone land

- Vegetation category 1
- Vegetation category 2
- Vegetation category 3
- Vegetation buffer



Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

1:4,500 Date: 21/11/2024

GDA 2020

Data sources: WSP, Nearmap, NSWSS

6.11.3 Potential impacts

Construction

Bushfire

Bushfires, whether preventative burning or unintentionally ignited, can result in the loss of vegetation, fauna and habitats. It can also result in property damage and pose a risk to the safety and health of the workforce, road users and local residents due to heat, smoke and ash generation.

As the proposal would be partially located within and near bushfire prone land, it has the potential to increase bushfire risk in the area. Potential sources of ignition resulting from construction include accidental ignitions such as cigarettes, sparks from construction plant or vehicles, mulch stockpiling, hot works such as welding and grinding, electrical faults in equipment, the use of fuels and chemicals, and activities undertaken at ancillary facilities such as cooking. Construction activities involving flammable materials and ignition sources would be managed to ensure that the potential for fire is minimised.

During construction there may be temporary delays and congestion within the proposal area and surrounding road network, due to reduced speed limits and temporary lane closures in the proposal area. This has the potential to delay response times and/or access for emergency services, including fire crews, in the event of a bushfire.

It is noted that the removal of vegetation in the proposal area during construction would reduce the risk of bushfires occurring by widening the road corridor, increasing the existing firebreak or containment line.

Utilities

A number of existing overhead and underground utilities within the proposal area would need to be relocated or adjusted before the commencement of major earthwork in the immediate area (refer to Section 3.5). Damage and/or failure to shut down, isolate or otherwise appropriately manage utilities during these works has the potential to result in the accidental release of electrical currents, mains gas or sewage, and temporary disruption to or outages of local services, and pose a risk to public and worker safety.

Asset owners of the affected utilities have been contacted, with consultation continuing during detailed design and construction, to determine specific requirements/mitigation measures for working next to these assets. Access to utilities within the proposal area would be maintained for utility providers during construction, where possible.

Dangerous goods and substances

During construction, dangerous and hazardous materials and substances, including oils, fuels, concrete, asbestos, cleaning agents, adhesives and glues, would be transported, used and/or stored within the proposal area. Potential impacts to soil and water quality and workforce safety may result from spills or inappropriate and inadequate handling and storage of these materials.

Hazardous materials and dangerous goods associated with the construction of the proposal are not expected to be required in significant quantities and would not exceed the threshold quantities outlined in the Resilience and Hazards SEPP.

Mine subsidence

Earthworks would be undertaken within the proposal area to widen the road corridor and install road and active transport infrastructure. Excavation is not expected to exceed depths of two metres below ground level.

Consultation with Subsidence Advisory NSW has not identified any mine subsidence risks for the proposal given the nature of the proposed works. No specific design requirements in relation to mine subsidence have been identified for the proposal and mine subsidence risk does not need to be further considered during detailed design.

Operation

Bushfire

The proposal is not expected to pose a significant bushfire hazard during operation as a result of ongoing vegetation management activities along the road corridor.

Once operational, the proposal would improve the resilience of the proposal area and surrounding community to respond to natural disasters and traffic incidents. The widening of the road corridor and removal of vegetation would increase the buffer zone between bushfire prone land and residential and commercial/industrial areas. The proposal would also improve access for emergency services, including the NSW RFS, and increase the capacity of the road network in the event of an emergency.

Utilities

Operation of the proposal is not expected to impact the operation and maintenance of utilities within the proposal area.

Dangerous goods and substances

The operation of the proposal is not expected to increase risks associated with transportation of hazardous materials and dangerous goods via the proposal area and the surrounding road network, compared to the existing scenario. The handling and storage of dangerous goods and materials, if required during ongoing maintenance works of the road corridor, would be carried out in accordance with suppliers' instructions, and would comply with applicable legislation, guidelines and standards.

Mine subsidence

No mine induced subsidence impacts are anticipated during operation of the proposal.

6.11.4 Safeguards and management measures

Safeguards and management measures to minimise potential hazards and risks for the proposal are presented in Table 6-59. Other safeguards and management measures to minimise potential impacts to soils and water quality are identified in sections 6.6 and 6.10 respectively.

Table 6-59 Hazards and risks safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
HR1	Bushfire	A Bushfire Management Plan will be prepared in accordance with Planning for Bush Fire Protection 2019 (NSW Rural Fire Service, 2019) and implemented as part of the CEMP.	Contractor	Construction	Additional safeguard

6.12 Aboriginal cultural heritage

A Stage 1 assessment of Transport's PACHCI was completed to assess the proposal's potential risk of impacts on Aboriginal cultural heritage. This section summarises the findings of the PACHCI Stage 1 Assessment, including existing Aboriginal cultural heritage values in the area and potential impacts of the proposal, and identifies safeguards to mitigate potential impacts.

6.12.1 Methodology

The PACHCI Stage 1 Assessment included:

- review of the scope, extent and timeframes of the proposed works
- review of current and historical land use
- searches of the Aboriginal Heritage Information Management System (AHIMS) to identify known Aboriginal sites or places within or near the proposal area
- searches of other relevant heritage registers, including the State Heritage Inventory and the Australian Heritage Database
- review of previous heritage assessments or environmental impact assessments relevant to the proposal area
- search of the Native Title Register.

6.12.2 Existing environment

Land use history

The proposal is located within Awabakal Country. The Awabakal presence within the Lake Macquarie region extends back around 11,000 years and is reflected in both tangible aspects (i.e. Aboriginal cultural heritage sites) and intangible aspects (i.e. landscape features that provided physical and spiritual sustenance to the Awabakal Peoples and other Aboriginal People they invited into their Country) of Aboriginal culture.

Archaeological investigations indicate that Aboriginal people utilised a variety of available environments in the Lake Macquarie region, including estuaries, rivers, mountains, forests, plains, rocky shorelines, and swamps. There was a tendency for groups to move towards the coastal areas in the warmer months and the hinterland in the cooler months. Lake Macquarie was a significant place of activity for the Awabakal people, being an important place for hunting, fishing, and gathering, but also being connected to Dreaming stories and sites of cultural significance.

Over 500 Aboriginal cultural heritage sites have been registered in the Lake Macquarie region, including burials, shell middens, artefact scatters and isolated artefacts, rock shelters, art sites (paintings and engravings), modified trees, hearths, stone arrangements, tool sharpening sites (grinding grooves) and other sites associated with stone tool making (Heritage Now, 2021). Surface artefact sites are the most common site type in the region. The regional archaeological background demonstrates that there is an archaeological patterning to site distribution in the Morisset/Mandalong area. The lakes and major estuaries in the east contain midden and potential archaeological deposit (PAD) sites, whereas the elevated land to the west contains grinding grooves on outcrops of sandstone (Heritage Now, 2021).

Previous and current land clearing for commercial and industrial development and associated infrastructure within Morisset has resulted in a high level of disturbance within the proposal area and surrounds over the last 50 years. The proposal area has specifically been subject to extensive excavation, filling and levelling during previous road construction and surrounding industrial and commercial development.

Landscape context

The proposal is located within a gently undulating landscape, with land within the proposal area sloping towards the central and western sections of the proposal area. Mullards Creek, a tributary of Dora Creek, traverses the central section of the proposal area around 350 metres west of the Mandalong Road/Freemans Drive/Dora Street/Wyee Road intersection.

The Dora Creek catchment has been identified as an area of high conservation value, with artefact scatters the most likely site type to occur in the catchment's floodplains (Umwelt, 2011). However, the proposal is located within the Gorokan soil landscape, which is an erosional landscape that undergoes considerable erosion in places where protective vegetation cover has been disturbed. It is therefore likely that previous vegetation clearance would have removed many of the artefact bearing topsoils in the proposal area (Heritage Now, 2021). There is also an absence of sandstone rock outcrops likely to contain Aboriginal art.

The landscape in which the proposal site is located is known as sandstone country, consisting of Hawkesbury sandstone. The local Aboriginal community has utilised the vast amounts of sandstone to practice art (for varying purposes) and seek shelter when needed. Pigment and engraving rock art are prominent within the landscape and make up a large number of the many cultural sites within the region.

Natural resources (plants and animals), including wallaby, birdlife, fish, oysters and many plant species, were and are important sources of food and lifestyle sustenance for the Aboriginal community.

Database searches

A search of the AHIMS carried out on 26 June 2019 as part of the PACHCI Stage 1 Assessment identified four registered Aboriginal sites located over one kilometre from the proposal area. An updated AHIMS search carried out on 3 July 2023 identified one additional registered Aboriginal site (Site ID 45-3-4588) around 250 metres north of the western end of the proposal area. An updated AHIMS search carried out on 16 August 2024 (provided in Appendix K) did not identify any additional registered Aboriginal sites within 250 metres of the proposal area.

6.12.3 Potential impacts

Construction

The proposal would not impact how the local Aboriginal community access cultural areas and natural resources as there are no known Aboriginal cultural heritage sites within or near the proposal area.

There is potential to impact previously unrecorded Aboriginal sites during construction while carrying out activities which involve ground disturbance and excavation.

Although the proposal area and surrounds contain landscape features that indicate the presence of Aboriginal objects, the cultural heritage potential of these areas appears to be reduced due to high levels of past disturbance associated with road construction and the surrounding commercial and industrial development.

The PACHCI Stage 1 Assessment concluded that the proposal would not harm known Aboriginal objects or places, and no further investigation is required.

Operation

There are no expected impacts on Aboriginal heritage during operation.

6.12.4 Safeguards and management measures

Safeguards and management measures to minimise potential Aboriginal heritage impacts of the proposal are presented in Table 6-60.

Table 6-60 Aboriginal heritage safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
AH1	Aboriginal heritage	The Unexpected Heritage Items Procedure (Transport for NSW, February 2024) to be implemented as part of the CEMP will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction.	Contractor	Construction	Section 4.9 of QA *G36 Environment Protection*

6.13 Other impacts

This section describes the environmental factors with negligible to minor potential impacts associated with constructing and operating the proposal. Their impacts can be safeguarded against and managed through adopting effective standard safeguards and mitigation measures (refer to Section 6.13.2).

6.13.1 Existing environment and potential impacts

A summary of other minor potential environmental impacts are provided in Table 6-61.

Table 6-61 Other minor potential environmental impacts

Environmental factor	Existing environment	Potential impacts
Waste and resource management	The existing road corridor generates small quantities of waste including roadside litter and excess materials from maintenance activities, such as green waste and material from clearing roadside drainage.	**Construction** The proposal is likely to generate waste during vegetation clearance, excavation, removal of the existing road pavement, demolition of the concrete batching plant structures and slabs (at the Mandalong Road/Wyee Road intersection), construction of the new road pavement and utility adjustments. Waste streams likely to be generated include: • green waste, such as mulched vegetation material and weeds • excess spoil from excavation where it is not deemed suitable for reuse within the proposal area • demolition waste such as concrete, steel, asphalt, and utility pipes/conduits • excess construction material wastes, such as timber formwork, concrete, steel fastenings and anchors, adhesives, sealant and paints • small volumes of excess fuels, oils and chemicals resulting from plant and equipment maintenance • wastewater from dust suppression, and wash-down and bunded areas • redundant or damaged erosion and sediment controls • packaging materials from items delivered to site, such as pallets, crates, cartons, plastics and wrapping materials • general waste, including food and other wastes generated by construction workers. There is the potential for some of these waste materials to be contaminated (refer to Section 6.6). The inappropriate management of waste generated by the proposal could result in potential impacts to soils, water quality, air quality, human health and visual amenity, and large volumes of waste sent to landfill. With the implementation of well-established waste management safeguards and management measures outlined in Section 6.13.2, potential impacts associated with waste management are expected to be minimal. Section 3.3.5 describes the resources that would be needed to build the proposal. These resources are common materials and their use would not result in any resource supply shortages in the region.

Environmental factor	Existing environment	Potential impacts
		Operation Any impact associated with waste and resource use during operation of the proposal would be negligible and largely consistent with the existing operation of the road.
Non-Aboriginal heritage	A desktop search of historic registers including the World Heritage List, National Heritage List, Commonwealth Heritage List, NSW State Heritage Register, Section 170 Heritage and Conservation Registers, Register of National Estate and the heritage schedule of the Lake Macquarie LEP was undertaken for the proposal area and surrounds (refer to Appendix K). There are no non-Aboriginal heritage items located within the proposal area. Non-Aboriginal heritage items located within 200 metres of the proposal area include: • 'Great Northern Railway', located around 90 metres south-east of the proposal area, listed as a local heritage item under the Lake Macquarie LEP (Item ID 189) • 'Tree—Morisset's Campsite', located around 140 metres south-east of the proposal area at 147 Macquarie Street, Morisset, listed as a local heritage item under the Lake Macquarie LEP (Item ID 120).	The proposal would not have any direct impacts on non-Aboriginal heritage items during construction and operation. There would be limited potential for indirect impacts, including visual amenity, vibration, noise or dust impacts, at non-Aboriginal heritage items near the proposal during construction and operation, as the proposal would be separated from these heritage items by the surrounding built and natural environment. The proposal area is located within land that has been subject to previous disturbance during road construction and surrounding commercial and industrial development and is unlikely to contain potential archaeological remains.

6.13.2 Safeguards and management measures

Safeguards and management measures to minimise potential waste, resource and non-Aboriginal impacts of the proposal are presented in Table 6-62.

Table 6-62 Other minor environmental impacts safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
O1	Resource use	The following resource management hierarchy principles will be followed: • avoid unnecessary resource consumption as a priority • avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery) • disposal will be undertaken as a last resort (in accordance with the WARR Act).	Contractor	Construction	Additional safeguard
O2	Waste	A Waste Management Plan (WMP) will be prepared in accordance with the Waste management guideline (Transport for NSW, 2023g), and relevant Transport waste fact sheets, and implemented as part of the CEMP. The WMP will include but not be limited to: • measures to avoid and minimise waste associated with the proposal • procedures for classification of wastes, in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014) and applicable provisions under the POEO Act, and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on- and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal at an appropriately licenced facility including the identification of suitable temporary storage areas for material awaiting classification • monitoring, record keeping and reporting.	Contractor	Construction	Section 4.2 of *QA G36 Environment Protection*
O3	Waste	If vegetation is to be mulched and transported off-site for beneficial re-use, it is to be assessed for the presence of weeds, pests, and other diseases and a Mulch Management Plan prepared in accordance with the Transport Technical Procedure: Mulch Management. The use and storage of mulch onsite from any source will be in accordance with Environmental Direction 25: Management of Tannins from Vegetation Mulch (Transport for NSW, 2012).	Contractor	Construction	Additional safeguard

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
O4	Non-Aboriginal Heritage	If unexpected non-Aboriginal heritage items are uncovered during construction of the proposal, all works will cease in the vicinity of the material/find and the steps in the Unexpected heritage items procedure (Transport for NSW, February 2024) will be followed. Transport's Senior Environment Specialist - Heritage must be contacted immediately. Work would only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	Section 4.10 of QA G36 Environment Protection

6.14 Cumulative impacts

Cumulative impacts may arise from the interaction of construction and/or operation activities of the proposal and other existing or planned projects in the wider area. These impacts may occur as the result of the interaction of impacts within a single project or due to the combined effects of a number of projects occurring simultaneously in a given area. Cumulative impacts may not be considered significant on their own but may be more significant when considered in association with other impacts. In accordance with Clause 171(2) of the EP&A Regulation 2021, any cumulative environmental effects of the proposal with other existing or likely future activities must be taken into account in assessing the potential environmental impacts of the proposal.

This section assesses the extent to which the proposal contributes to the cumulative impacts of existing and planned developments or activities on the environment.

6.14.1 Study area

The study area used for the assessment of cumulative impacts has been defined by identifying other developments or activities that are currently under construction, or are likely to commence, within Morisset and its surrounding suburbs during the proposal's scheduled construction timeframe. Subject to planning approval and funding, construction of the proposal is expected to commence in 2026 and be completed by 2028.

Proposed developments with the potential for cumulative impacts with the proposal were identified through a search of the DPHI Major Projects website, Transport for NSW projects webpage, Hunter and Central Coast Regional Planning Panel register, and Lake Macquarie City Council development application register in November 2024. This assessment includes projects of similar scale and function and excluded local residential developments or minor works on local roads not near the proposal.

6.14.2 Other projects and developments

Projects and proposed developments that have the potential to result in cumulative impacts in combination with the proposal, due to their timing, scale and proximity to the proposal, are summarised in Table 6-63. The potential impacts of the proposal are described in sections 6.1 to 6.13.

Table 6-63 Present and future projects

Project	Project description	Location	Timeframe	Potential impacts
Gimberts Roundabout Upgrade	The upgrade includes widening of the approaches to the Gimberts Road/Mandalong Road/Gateway Boulevard intersection, providing new shared user paths, and road and drainage infrastructure upgrades. The Gimberts Road intersection upgrade would tie into the proposal along Mandalong Road and the proposed shared user path along the northern side of Mandalong Road.	Directly west of the proposal area.	Construction expected to start in 2025 and completed before construction of the proposal.	Traffic and transport, noise and vibration, air quality, biodiversity, visual, socio-economic, soils and water quality impacts.
Wyee Road/Alliance Avenue Intersection Upgrade	The T-intersection would be upgraded to a three leg, single-lane roundabout, with splitter islands on all three of the intersection approaches.	Directly south of the proposal area.	Construction expected to start in 2025 and completed before construction of the proposal.	Traffic and transport, noise and vibration, air quality, visual, socio-economic, soils and water quality impacts.
DA/1290/2019 – Cedar Mill Cultural Events Site at 126 Dora Street, Morisset	The development involves the redevelopment of the former Morisset Golf Club into an entertainment facility (the Cedar Mill Amphitheatre), function centre, market and associated works, including the installation of: • main stage for the main event area • car parking and coach parking • internal and external site fencing • access roads • utility works • lighting and delay towers • back of house hardstand area.	Directly south of the proposal area.	Approved on 21 February 2022. Last amended approval (DA/1290/2019/B) received on 15 November 2023. Currently under construction.	Traffic and transport, noise and vibration, air quality, biodiversity, visual, socio-economic, soils and water quality impacts.

Project	Project description	Location	Timeframe	Potential impacts
DA/1291/2019 – Cedar Mill Cultural Events Site at 126 Dora Street, Morisset	The development involves the redevelopment of the former Morisset Golf and Country Club building and surrounds into a restaurant/cafe, function centre and recreation facility (indoor and outdoor). The development comprises the following: • alterations to the existing club building to create function rooms, a family multipurpose activity space and indoor seating associated with a proposed café • outdoor café seating • outdoor space for seating and children's play area immediately adjoining the remodelled club building • a proposed new building to be used as a café with both internal and external seating areas • removal of the former bowling greens • redesign of existing car parking areas • a family water play park minor site regrading works.	Directly south of the proposal area.	Approved on 14 August 2020. Last amended approval (DA/1291/2019/C) received on 8 May 2024. Currently under construction.	Traffic and transport, noise and vibration, air quality, biodiversity, visual, socio-economic, soils and water quality impacts.
DA/1960/2011 – Bulky Goods Premises with Associated Works at 76 Mandalong Road, Morisset	The development includes: • site clearing and bulk earthworks with an approximate area of 22,000 m^2 • clearing of EEC vegetation • demolition of the existing dwelling and removal of 16 trees • construction of a new building consisting of 10 units for the purposes of bulky goods retail • car parks, internal roads and loading docks • relocation of substation • construction of a diversion drain/embankment • access to Mandalong Road via modifications to existing roundabout, exit and entry lanes • upgrade of the Gimberts Road/Mandalong Road intersection, including widening of the Gimberts Road approach to the intersection, road and drainage infrastructure upgrades and new shared user paths.	Directly north of the proposal area along Gimberts Road.	Last amended approval (DA/1960/2011/B) received on 15 March 2021. Latest modified development application (DA/1960/2011/C) lodged on 20 May 2024. Currently under construction.	Traffic and transport, noise and vibration, air quality, biodiversity, visual, socio-economic, soils and water quality impacts.

Project	Project description	Location	Timeframe	Potential impacts
DA/3175/2021 – Subdivision and associated infrastructure works, specialised retail premises, veterinary hospital, indoor gymnasium, take away food and drink premises, and signage at 56 – 76 Mandalong Road, Morisset	The development includes: • Torrens title subdivision – three lots into two lots • community title subdivision – one Community Lot Association and six Community Lots • three buildings to be used for specialised retailing and take away food premises • car parking • pedestrian paths, playground area and amenities • internal road works, driveways and loading docks • access via approved intersection with Gimberts Road and Old Mandalong Road • new left in, left out access onto Mandalong Road, with associated deceleration lane • associated drainage works, retaining walls and landscaping • signage, including two pylon site directory signs, building signage zones and tenancy business • identification signage zones • installation of Aboriginal scarred tree • utilities, services and landscaping.	Directly north of the proposal area along Mandalong Road.	Approved on 26 August 2024. Currently under construction.	Traffic and transport, noise and vibration, air quality, biodiversity, visual, socio-economic, soils and water quality impacts.
DA/356/2021 – 18 Lot Light Industrial and Business Park Subdivision in stages at 170 Gimberts Road, Morisset	The proposal involves the demolition of existing structures on the site, and subdivision of the property into 28 lots, with associated earthworks, construction of roads and pavement, landscaping and all internal utilities infrastructure.	380 metres north-west of the proposal area.	Approved on 20 July 2022. The majority of construction works have been completed.	Traffic and transport, noise and vibration, air quality, biodiversity, visual, socio-economic impacts.

Project	Project description	Location	Timeframe	Potential impacts
DA/1743/2023 – Industrial Warehouses (8 units) and Strata Subdivision at 158 and 136 Gimberts Road, Morisset	The proposal involves the construction and use of two buildings containing eight units with ancillary mezzanine offices including car parking, new driveway entrance, signage, landscaping and associated site works and strata subdivision. The units would be used for warehouse purposes.	560 metres north-west of the proposal area.	Pre-lodgement application form submitted on 5 October 2023. Currently under assessment.	Traffic and transport, noise and vibration, air quality, visual, socio-economic impacts.
DA/1286/2019 – Caravan Park and Camping Ground at 27 Wyee Road, Morisset	The development includes: • establishment of a caravan park consisting of 206 long term and two short term sites • establishment of two shared amenities building for use by campers • establishment of communal facilities within the site for use by park users, including club house, tennis court, pickle ball court, community garden and men's shed • associated landscaping • associated access roads, stormwater facilities, car parking • an informal parking area that can be used for staff parking during events and festivals.	700 metres south of the proposal area.	Amended approval (DA/1286/2019/A) received on 30 May 2022. Currently under construction.	Traffic and transport, noise and vibration, air quality, biodiversity, visual, socio-economic, soils and water quality impacts.

6.14.3 Potential impacts

The potential cumulative impacts of the proposal in combination with the identified present and future projects are outlined in Table 6-64.

Table 6-64 Potential cumulative impacts

Environmental factor	Construction impacts	Operational impacts
Biodiversity	Potential cumulative biodiversity impacts during construction of the proposal and nearby projects include: • removal of native vegetation, including threatened flora and ecological communities • removal of threatened fauna habitat • habitat fragmentation and potential impacts on wildlife connectivity • potential impacts on hydrological processes • fauna injury and mortality • invasion and spread of weeds, pests, pathogens and disease • changes in native fauna behaviour due to potential noise, vibration, light and dust impacts. The proposal's removal of 0.98 hectares of native vegetation and other potential impacts on biodiversity would result in incremental cumulative effects on biodiversity, This incremental increase is considered unlikely to significantly exacerbate impacts on biodiversity such that critical thresholds for threatened biodiversity values would be reached (refer to section 5.3 of Appendix D).	The operation of the proposal and nearby projects is expected to lead to a loss of vegetation communities and loss of biodiversity values across the local area. Increased edge effects and impacts on wildlife connectivity would also occur. These cumulative impacts area not expected to be significant (refer to section 5.3 of Appendix D).
Traffic and transport	Potential temporary cumulative traffic and transport impacts during construction of the proposal and nearby projects, where construction timeframes overlap, include: • increased travel times and congestion due to speed limit restrictions, temporary lane closures and additional construction traffic • increased road safety risks due to increased heavy vehicle movements and construction activity within the road corridor • changes to pedestrian, cyclist and public transport access • altered property access arrangements. Coordination between project teams and the implementation of traffic and transport safeguards and management measures by each project would ensure that potential cumulative traffic and transport impacts are minimised.	Commercial developments near the proposal would result in an increase in local traffic. The proposal, in combination with upgrades to the Gimberts Road/ Mandalong Road/Gateway Boulevard and Wyee Road/Alliance Avenue intersections would support the potential increase in traffic by providing additional capacity at these key intersections along Mandalong Road and Wyee Road. The proposal would reduce travel times and congestion for motorists and improving access and connectivity for public and active transport users. Without operation of the proposal and other proposed road upgrades identified in Table 6-63, traffic performance within the B53 Morisset to Wallsend corridor would continue to deteriorate with predicted population and employment growth in the Lake Macquarie region, resulting in heavy congestion and road safety risks for road users. Collectively, the proposal and other road upgrades would improve travel times and reliability, road safety and active and public transport access and connectivity to support future development along the Mandalong Road corridor associated with growth in the Morisset area.

Environmental factor	Construction impacts	Operational impacts
Noise and vibration	Construction of the proposal at the same time as other nearby projects would potentially lead to temporary short term cumulative increases in construction noise and vibration levels (including construction traffic noise) experienced by sensitive receivers. There may also be a risk of construction fatigue for sensitive receivers that may have recently experienced noise and vibration generated from completed construction activities. With the implementation of reasonable and feasible safeguards and management measures by each project, potential cumulative noise and vibration impacts are not expected to be significant.	Any cumulative noise impacts during operation are expected to be negligible.
Landscape character and visual impacts	Potential cumulative landscape and visual impacts are expected where construction periods of the proposal and nearby projects overlap due to extended periods of exposed and cleared areas as a result of vegetation removal and earthworks, temporary stockpiling and fencing, and increased construction traffic, lighting, plant and equipment. The majority of these impacts would be short term and temporary while construction activities are undertaken. Cumulative long term changes to landscape character and visual amenity would occur during construction as rural landscapes and residential areas are converted to infrastructure and industrial and commercial developments. However, each project is expected to improve visual amenity over the long term through improved urban design and landscaping. Overall, potential cumulative impacts on landscape character and visual amenity are not expected to be significant.	Cumulative operational landscape and visual impacts are expected due to permanent land use changes, vegetation removal and changes to built form. The key changes would be associated with the conversion of rural landscapes and residential areas to infrastructure and industrial and commercial developments. However, each project is expected to improve visual amenity over the long term through improved urban design and landscaping. Overall, cumulative landscape and visual impacts during operation are not expected to be significant.
Socio-economic	Potential cumulative socio-economic impacts (including temporary traffic and transport delays and disruptions, noise and vibration, air quality and visual amenity impacts) could occur during construction if other projects are constructed concurrently or in close timing with the proposal. Where construction of the proposal and other projects occurs over consecutive months or years, the local community and stakeholders may experience consultation and construction fatigue. Construction activities would also have benefits for local businesses due to increased demand for goods and services and increased employment opportunities. With the implementation of safeguards and management measures by each project to minimise potential traffic and transport, noise and vibration, air quality and visual amenity impacts, potential cumulative socio-economic impacts are not expected to be significant.	The operation of the proposal and nearby projects would provide significant socio-economic benefits in the Lake Macquarie region through growth in investment, infrastructure and employment opportunities. The proposal, in combination with the Gimberts Road upgrade, would also support economic and population growth of the Morisset area and the wider Lake Macquarie region by reducing travel times and congestion for motorists, and improving access and connectivity for public and active transport users.

Environmental factor	Construction impacts	Operational impacts
Soils and contamination	Where construction periods of the proposal and the identified projects overlap, there is the potential for cumulative erosion and sedimentation impacts. With the implementation of standard erosion and sedimentation safeguards and management measures by each project, potential cumulative erosion and sedimentation impacts are not expected to be significant. It is considered that there is an overall beneficial impact in relation to potential contamination impacts when considering the proposal in addition to the identified projects, as all projects would manage and/or rehabilitate any known contamination issues.	The proposal, in combination with the identified projects, is not expected to result in any cumulative soil or contamination impacts.
Air quality	There is potential for cumulative impacts relating to temporary dust generation during construction of the proposal along with the construction of the surrounding development. With the incorporation of standard safeguards and management measures, the proposal and the identified projects would have only a minor impact in terms of cumulative dust generation.	The proposal, in combination with the identified projects, is not expected to result in any cumulative air quality impacts.
Surface water and flooding	During construction, potential negative impacts to the water quality of sensitive receiving environments, as well as surface water hydrology (including the volume, rate, timing, duration and velocity of flows), could arise if construction of future developments were to occur concurrently with the proposal. Safeguards and mitigation measures for the proposal would be sufficient to avoid and manage the proposal's cumulative contribution to water quality and surface water hydrology impacts.	During operation, the proposal's contribution to cumulative water quality and surface water hydrology impacts is expected to be negligible.

6.14.4 Safeguards and management measures

It may not be possible to directly safeguard or manage impacts from other projects to minimise cumulative impacts. However, there would be an opportunity for Transport to work with the other developers to modify the proposal's construction methodology and timing to consider the above cumulative effects.

Safeguards and management measures that would be implemented to minimise potential cumulative impacts of the proposal are presented in Table 6-65. Other safeguards and management measures to minimise potential cumulative impacts are identified in the relevant sections in Chapter 6 and are summarised in Chapter 7.

Table 6-65 Cumulative impact safeguards and management measures

Ref	Impact	Environmental safeguards	Responsibility	Timing	Reference
CU1	Cumulative construction impacts	The CEMP will include processes for ongoing consultation to be undertaken with proponents and construction contractors of surrounding projects in accordance with the CSEP to: • obtain information about project timeframes and impacts • manage the interfaces of the proposal's staging and programming in combination with the other projects occurring in the area • identify and implement appropriate safeguards and management measures to minimise cumulative impacts.	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 license 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 Environment and Sustainability Officer 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 will be prepared in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G40 – Clearing and Grubbing, QA Specification R44 – Earthworks and QA Specification G10 – Traffic Management.

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 proposal 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
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement in accordance with QA G36 Environment Protection, prior to commencement of the activity. As a minimum, the CEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • induction and training requirements • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review • hazard and risk controls. The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor	Pre-construction
GEN2	General - notification	All businesses, residential properties and other key stakeholders (e.g. local council, emergency services) affected by the activity will be notified at least five working days prior to commencement of the activity.	Contractor	Pre-construction
GEN3	General - environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the proposal. This will include up-front site induction and regular 'toolbox' style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. As a minimum these must include: • threatened species and their habitat, • no go areas, such as works in watercourses.	Contractor	Pre-construction
B1	Removal of native vegetation	Biodiversity impacts will be minimised through detailed design and construction, where practical and demonstrated within the Detail Design Report and Post-Clearing Report.	Contractor	Detailed design and Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B2	Removal of native vegetation	In accordance with the Transport Tree and Hollow Replacement Guidelines (EMF-BD-GD-0129), trees and hollows that require replacement will be identified and: • a Tree and Hollow Replacement Plan will be prepared to address the impacts prior to the commencement of works (refer to EMF-BD-GD-0219-TT1); OR • payment will be made to the Transport Conservation Fund prior to the commencement of works.	Contractor	Detailed design
B3	Fauna and Flora impacts	Develop a Fauna and Flora Management Plan inclusive of wildlife connectivity in accordance with the Biodiversity Management Guideline (Transport, March 2024).	Contractor	Construction
B4	Fragmentation of identified habitat corridors	A Wildlife Connectivity Strategy is to be developed through detailed design in accordance with the draft Wildlife Connectivity Guidelines (Roads and Maritime Services, 2011) or equivalent updated Transport Guidelines.	Contractor	Detailed design
B5	Removal of native vegetation	Pre-clearing surveys and final pre-clearing checks will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction
B6	Fragmentation of identified habitat corridors	The Wildlife Connectivity Strategy is to focus on maintaining fauna connectivity, particularly for Squirrel Glider through the proposal and is to detail the following: (a) a review of the need and effectiveness of connectivity structures for the proposal (b) consideration of fauna connectivity structures where the project results in canopy gaps greater than 50 metres. (c) Identification of opportunities for supplementary habitat (d) Measures to minimise physical disturbance within the existing fauna corridor. (e) Measure to maximise the effectiveness of fauna connectivity measures, including but not limited to retention of mature vegetation around connectivity structures and landscaping (f) A program identifying the construction footprint and staging requirements, including the provision of connectivity structures (and associated features) as soon as practicable.	Contractor	Construction
B7	Direct impacts to threatened species	Habitat removal will be undertaken by staged clearing in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction
B8	Direct impacts to threatened species and TECs	If threatened fauna or flora species are discovered unexpectedly, stop works immediately and follow the Transport Unexpected Threatened Species Find Procedure contained in the Transport Biodiversity Guidelines – Guide 1 (Pre-clearing process (EMF-BD-GD-0032).	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B9	Aquatic impacts	Aquatic habitat (inclusive of Mullards Creek) will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b) and Section 3.3.2 of the Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (Department of Primary Industries (DPI) (Fisheries NSW) 2013).	Contractor	Construction
B10	Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction
B11	Injury and mortality of fauna	Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction
B12	Invasion and spread of weeds	Weed species will be managed in accordance with Guide 6: Weed management of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction
B13	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with Guide 7: Pathogen management of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024b).	Contractor	Construction
TT1	Emergency services	Consultation with emergency services will be carried out during detailed design to confirm any requirements during construction and any operational road network changes.	Contractor	Detailed design c
TT2	Property access during operation	Consultation will be undertaken with property owners, occupiers and businesses regarding changes to access arrangements.	Contractor	Detailed design
TT3	Public transport access during construction	During construction, access to existing bus services within the proposal area must be maintained. Undertake consultation with bus service providers, to determine temporary stops and access requirements during construction.	Contractor	Construction
TT4	Public transport access during operation	Notification of the permanent closure of bus stop ID 2264168 will be undertaken with bus service providers during detailed design.	Transport	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
TT5	Traffic and transport	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's Traffic Control at Worksites, Technical Manual, Issue No. 6 (Transport for NSW, 2020e) and QA Specification G10 Traffic Management (Transport for NSW, 2020f). This will include details on: • requirement and methods to consult and inform the local community of impacts on the local road network • confirmation of haulage routes • measures to maintain access to properties and local roads • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • access to ancillary facilities including entry and exit locations and measures to prevent construction vehicles queuing on public roads • a response plan for any construction road traffic incident • consideration of other developments which may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms • M1 Pacific Motorway emergency detour route management during construction • maintaining OSOM movement and access through the proposal area.	Contractor	Construction
TT6	Property access	Existing access to properties will be maintained during construction. Where this is not feasible or reasonable, temporary alternative access arrangements will be provided following consultation with the affected property owners.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NV1	Construction noise and vibration	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared in accordance with the Transport Construction Noise and Vibration Management Guideline - Roads (Dec 2024) (CNVG) and implemented as part of the CEMP. The CNVMP will identify: • all potential significant noise and vibration generating activities associated with the works • noise and vibration sensitive receivers • measures to be implemented during construction to minimise noise and vibration impacts • a monitoring program to assess performance against relevant noise and vibration criteria • arrangements for consultation with affected neighbours and other sensitive receivers, including notification and complaint handling procedures, including: – notification of at least seven calendar days prior to commencement of any works – the construction activities likely to have noise or vibration impacts – the construction period and construction hours – any proposed mitigation measures for noise and vibration impacts – contact information for the proposal, including out of hours contact.	Contractor	Construction
NV2	Out of hours construction work	The CNVMP will also contain an out of hours works procedure to be developed and implemented in accordance with the CNVG.	Contractor	Construction
NV3	Construction noise and vibration training and awareness	All employees, contractors and subcontractors are to receive awareness training in control of noise and vibration as part of their regular site induction and updated prior to any significant period of nightwork. At a minimum training is to include: • all relevant proposal specific and standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NV4	Construction noise and vibration	Plant selection will be in accordance with the CNVG.	Contractor	Construction
NV5	Construction vibration	Where the use of vibration intensive equipment within the relevant minimum working distances cannot be avoided: • detailed property inspections will be completed to document the condition of buildings and structures within the minimum working distances. This will be conducted prior to the commencement of vibration intensive work. A copy of the report will be provided to the relevant landowner or land manager prior to the commencement of works. • receivers to be notified at least five days in advance of vibration intensive works and in advance of vibration monitoring • where vibration levels are predicted to exceed limits set within the CNVG, the use of less vibration intensive methods of construction or equipment will be considered where feasible and reasonable. • complete vibration monitoring is to be undertaken during works which are predicted to exceed limits within the CNVG.	Contractor	Construction
LV1	Landscape character and visual impacts	The Urban Design Report will be prepared in accordance with Beyond the Pavement (Transport for NSW, 2020a) as part of the detailed design. The Urban Design Report will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Urban Design Report will include design treatments for: • location and identification of existing vegetation and proposed landscaped areas, including species to be used • built elements • pedestrian and cyclist elements, including footpath and shared user path locations, paving types and pedestrian crossings • fixtures, such as seating, lighting, fencing and signs • details of the staging of landscape works, taking account of related environmental controls • procedures for monitoring and maintaining landscaped or rehabilitated areas • Aboriginal Cultural interpretation in consultation with the Biraban LALC.	Contractor	Detailed design
LV2	Vegetation removal	Landscaping species selection in areas more likely to support existing or future wildlife connectivity must be included in the design with regard to their overall structure and refuge value. This includes planting of taller canopy species next to the road to facilitate future glider movement across the roadway.	Contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
SE1	Consultation	A Community and Stakeholder Engagement Plan (CSEP) will be prepared and implemented as part of the CEMP to help provide timely notification and information to the community during construction. The CSEP will include as a minimum: • processes to actively identify the affected local community and obtain contact details, including routine review • consultation activities to provide advance notification of details and timing of proposed activities to affected residents, property owners, services and businesses, including for notifying traffic changes and access changes, major project milestones and managing night and weekend work processes • project hotline or contact number for complaints • how the project webpage will be maintained for the duration of the project • a complaints handling procedure.	Contractor	Construction
SE2	Relocation of bus stop during construction	Public transport users will be notified in advance of any changes to bus stop locations through signage at the existing bus stop. Temporary bus stops would have similar features to existing bus stops. Consultation with the relevant bus authorities will be undertaken (including school buses) to mitigate potential impacts to bus routes and times.	Contractor	Construction
SE3	Emergency vehicle access	Consultation will be completed with emergency services to ensure adequate emergency vehicle access is maintained for the duration of construction. Regular updates will be provided to emergency services about any changes to local access during construction. Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.	Contractor	Construction
SE4	Impacts on nearby property owners and land occupiers	Transport will continue to consult with the community and affected property owners and land occupiers. Discussions including the nature and timing of construction works will be required to identify relevant biodiversity, noise, traffic, air quality, access and visual impact mitigation measures for residents, stakeholders, and road users.	Transport	Construction
SC1	Contamination	Complete a Detailed Site Investigation (Stage 2) contamination investigation and report to review and confirm any medium to high AEIs that are rated with a medium to high risk in the Preliminary Site Investigation (Stage 1).	Contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
SC2	Contamination, including asbestos	A Contamination Land Management Plan (CLMP) will be developed and implemented in accordance with relevant NSW EPA guidelines, Australian Standards and relevant industry codes of practice. Waste classification and testing of materials, potentially contaminated soils and illegally dumped materials will be carried out in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014). The CLMP will demonstrate the implementation of the recommendations of the DSI. All identified contaminated materials will be cleared prior to topsoil stripping activities. The plan will also include an asbestos management procedure to manage asbestos and asbestos containing material, if encountered during construction. The asbestos procedure will include: • identification of potential asbestos on site • procedures to manage and handle asbestos, if encountered during construction • procedures for disposal of asbestos in accordance with NSW EPA guidelines, Australian Standards and relevant industry code of practice.	Contractor	Construction
SC3	Contamination risk at ancillary facilities	A pre-construction land assessment shall be undertaken in accordance with Transport's Management of waste on Residual Land Procedure (Transport for NSW, 2023f). A post-construction land assessment will be completed upon vacation of the ancillary facilities to ensure land has not been contaminated during use of the ancillary facilities.	Contractor	Construction
SC4	Unidentified contamination	An unexpected contamination finds procedure will be included in the CLMP. This procedure shall be prepared in accordance with legislation and TfNSW QA Specification G36 (Environmental Protection) The procedure will outline the appropriate management protocols to be followed in the event of potential contamination being found during construction activities, including odours or visually contaminated materials.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
AQ1	Air quality impacts	Air quality management measures for the proposal area and any ancillary facilities will be implemented as part of the CEMP. The CEMP will identify: • all dust and odour sensitive receivers • potential sources of air pollution during construction, including dust, vehicles transporting waste, plant and equipment • air quality management objectives consistent with relevant published EPA and/or DPIE guidelines • mitigation and suppression measures to be implemented • methods to manage works during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces • community notification and complaint handling procedures. Measures will include (but not be limited to): • use of water sprays or dust suppression surfactants as required for dust suppression • adjusting the intensity of activities based on observed dust levels and weather forecasts • minimising the amount of materials stockpiled and position stockpiles away from surrounding sensitive receivers • limiting vehicle movements to designated entry/exit routes and parking areas, and implementing measures to minimise the tracking of material onto paved roads • covering of loads • stabilising disturbed areas as soon as practicable, including new access routes • minimising the extent of disturbance as far as practicable.	Contractor	Construction
AQ2	Combustion emissions	Combustion emissions generated during construction will be minimised through: • ensuring all vehicles and machinery are fitted with appropriate emission control equipment and maintained in a proper and efficient manner • minimising the use of diesel- or petrol-powered generators by using mains electricity or battery-powered equipment where practicable • ensuring all vehicles switch off engines when stationary, to prevent unnecessary idling vehicles.	Contractor	Construction
CC1	Climate change	Detailed design will consider adaptation measures for all climate change risks with an risk rating of medium or above. Refer to Transports Climate Change Risk Assessment Report.	Contractor	Detailed design
CC2	Sustainability	Implement project specific Baseline Sustainability Requirements during detailed design and construction.	Contractor	Detailed design and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
CC3	Sustainability	Fuel efficient plant, equipment and vehicles will be selected for use during construction where feasible and reasonable. Construction plant and equipment will be well maintained to maximise fuel efficiency.	Contractor	Construction
CC4	Sustainability	The procurement of goods and services in accordance with the Sustainable Procurement Policy (Transport for NSW, 2016), Environment and Sustainability Policy (Transport for NSW, 2020c) and Transport for NSW Sustainability Plan (Transport for NSW, 2021) will consider goods and services that: • are from local suppliers • make use of recycled materials or materials with a low embodied energy content • are energy efficient or have low embodied carbon • minimise the generation of waste.	Contractor	Construction
LP1	Property acquisition	All property acquisition and associated property adjustments will be carried out in accordance with the requirements of Transport's Land Acquisition Information Guide 2014, Land Acquisition Act, NSW Government Land Acquisition Reform 2016, and Transport's Land Acquisition Information Guide 2014 (Roads and Maritime Services, 2014), in consultation with landowners.	Transport	Detailed design
LP2	Property adjustment	Property adjustments for the proposal will be completed in consultation with affected property owners and business operators.	Contractor	C Construction
LP3	Leased land	Areas of land leased for the purposes of construction will be reinstated at the end of the lease to at least an equivalent standard in consultation with the landowner.	Contractor	Construction
WQF1	Soil erosion and water pollution	All stormwater outlet locations and culverts would be designed to include appropriate dissipation and/or scour protection measures as required to control scour and erosion within the receiving watercourse with consideration to the existing channel form and lining.	Contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
WQF2	Erosion and sedimentation	A Construction Soil and Water Management Plan (CSWMP) will be developed as a sub plan of the CEMP, and prepared in accordance with Managing Urban Stormwater: Soils and Construction –Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction – Volume 2D Main Road Construction (NSW DECC, 2008). This plan will outline measures to manage soil and water quality impacts associated with the construction work. The CSWMP will include, but not be limited to: • measures to minimise/manage erosion and sediment transport both within and outside the proposal area • preparation of progressive erosion and sediment control plans (ESCP) for all progressive stages of construction • measures to manage stockpiles, including locations, separation of spoil types, sediment controls and stabilisation in accordance with the Stockpile Site Management Guideline (Roads and Maritime Services, 2015) • concrete management procedures • 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.	Contractor	Construction
WQF3	Accidental spills or leaks	A site-specific emergency spill procedure will be developed as part of the CSWMP, and include spill management measures in accordance with the Roads and Maritime Code of Practice for Water Management (RTA, 1999) and relevant NSW EPA guidelines. The spill procedure will include measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport and NSW EPA).	Contractor	Construction
WQF4	Flooding	Ancillary facility sites (where stockpiling will occur) that are mapped within the one per cent AEP (1 in 100 year ARI) flood level, will be established to a minimum ground level above the one per cent AEP (1 in 100 year ARI) flood level.	Contractor	Construction
WQF5	Contamination of surface water	The refuelling and maintenance of plant and equipment will be undertaken in a designated area that is no less than 50 metres away from a watercourse.	Contractor	Construction
WQF6	Contamination of surface water	Vehicle wash downs and concrete washouts will be carried out within designated sealed bunded facility, or carried out off-site.	Contractor	Construction
WQF7	Contamination of surface water	Daily visual water quality checks (including for turbid plumes and hydrocarbon spills or slicks) will be carried out when working in or near Mullards Creek.	Contractor	Construction
WQF8	Water quality	Construction water quality monitoring will be undertaken upstream and downstream of the proposal to ensure that controls and site practices are effective at maintaining current water quality conditions. Monitoring will be undertaken in accordance with the Guideline for Construction Water Quality Monitoring (RTA, undated).	Contractor	Construction
HR1	Bushfire	A Bushfire Management Plan will be prepared in accordance with Planning for Bush Fire Protection 2019 (NSW Rural Fire Service, 2019) and implemented as part of the CEMP.	Contractor	Construction
AH1	Aboriginal heritage	The Unexpected Heritage Items Procedure (Transport for NSW, February 2024) to be implemented as part of the CEMP will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
O1	Resource use	The following resource management hierarchy principles will be followed: • avoid unnecessary resource consumption as a priority • avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery) • disposal will be undertaken as a last resort (in accordance with the WARR Act).	Contractor	Construction
O2	Waste	A Waste Management Plan (WMP) will be prepared in accordance with the Waste management guideline (Transport for NSW, May 2023), and relevant Transport waste fact sheets, and implemented as part of the CEMP. The WMP will include but not be limited to: • measures to avoid and minimise waste associated with the proposal • procedures for classification of wastes, in accordance with the NSW EPA Waste Classification Guidelines (NSW EPA, 2014) and applicable provisions under the POEO Act, and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on- and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal at an appropriately licenced facility including the identification of suitable temporary storage areas for material awaiting classification • monitoring, record keeping and reporting.	Contractor	Construction
O3	Waste	If vegetation is to be mulched and transported off-site for beneficial re-use, it is to be assessed for the presence of weeds, pests, and other diseases and a Mulch Management Plan prepared in accordance with the Transport Technical Procedure: Mulch Management. The use and storage of mulch onsite from any source will be in accordance with Environmental Direction 25: Management of Tannins from Vegetation Mulch (Transport for NSW, 2012).	Contractor	Construction
O4	Non-Aboriginal Heritage	If unexpected non-Aboriginal heritage items are uncovered during construction of the proposal, all works will cease in the vicinity of the material/find and the steps in the Unexpected heritage items procedure (Transport for NSW, February 2024) will be followed. Transport's Senior Environment Specialist - Heritage must be contacted immediately. Work would only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction
CU1	Cumulative construction impacts	The CEMP will include processes for ongoing consultation to be undertaken with proponents and construction contractors of surrounding projects in accordance with the CSEP to: • obtain information about project timeframes and impacts • manage the interfaces of the proposal's staging and programming in combination with the other projects occurring in the area • identify and implement appropriate safeguards and management measures to minimise cumulative impacts.	Contractor	Construction

7.3 Licensing and approvals

Licenses and approvals needed for the proposal are summarised in Table 7-2.

Table 7-2 Summary of licensing and approvals required

Instrument	Requirement	Timing
Roads Act 1993 (section 138)	A ROL would be required from the relevant roads authority by the contractor prior to work on public roads.	Prior to start of the activity.
Crown Land Management Act 2016 (Division 3.4, 5.5 and 5.6)	Lease or license to occupy areas of Crown Land. Note: Work on Crown land triggers the requirement for a 24KA notice under the Native Title Act. The notice is to be prepared by the legal team and sent to NTSCORP (the Native Title Service Provider for Aboriginal Traditional Owners in NSW and the Australian Capital Territory). This is required whether there is a claim on the land or not.	Prior to start of the activity.

8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Section 193 of the Environmental Planning and Assessment Regulation 2021.

8.1 Justification

Mandalong Road is identified as a critical link within the B53 Morisset to Wallsend Corridor, providing an important connection from the M1 Pacific Motorway to Morisset and southern parts of the Lake Macquarie LGA. The NSW Government identifies Morisset and the surrounding areas of Cooranbong and Wyee as regionally significant growth areas, with the area representing the largest future growth area in the Central Coast and Hunter Regions (NSW DPE, 2022b). The wider Morisset area is expected to become a major transport corridor, connecting the Lower Hunter and Greater Newcastle City with the Central Coast City.

Traffic modelling indicates Mandalong Road/Dora Street between Gimberts Road and Ourimbah Street is used by up to around 22,900 motorists every day and is subject to substantial traffic congestion and delays during peak periods. The Mandalong Road/Freemans Drive/Dora Street/Wyee Road roundabout is identified as a critical pinch point in the local area and the broader B53 Morisset to Wallsend Corridor. With predicted population and employment growth, daily traffic volumes are predicted to increase by around 56 to 75 per cent over the next 20 years, resulting in increased congestion, delays and safety risks for road users, pedestrians and cyclists.

The proposal would improve travel efficiency, safety and trip reliability along Mandalong Road, Freemans Drive, Dora Street and Wyee Road, which would improve access and connectivity for local and regional communities, business and industry. This would have long term benefits and support improved access to current and future growth and employment areas in the Lake Macquarie region. As such, the proposal meet the strategic objectives of a number of local, State and Commonwealth plans, policies and strategies, including the National Road Safety Strategy, State Infrastructure Strategy, Future Transport Strategy and Hunter Regional Plan 2041.

The proposal, as described in this REF, best meets the proposal objectives. However, it would still result in some potential impacts during construction and operation including construction noise and vibration, changes to access and traffic delays during construction, land acquisition and property adjustments, visual and landscape changes, loss of established street trees with community value. These potential impacts would be managed and minimised by mitigation measures during construction and operation of the proposal.

8.1.1 Social factors

As outlined in Section 6.5, the proposal would have some short term negative social impacts during the construction phase of the proposal. The combined effect of construction noise and vibration, traffic delays, vegetation removal and temporary changes to access to local businesses and residences, as well as general disturbance caused by construction activity, and associated construction traffic would result in a general temporary loss of amenity for people who live and work near the proposal. Partial and full property acquisitions may also result in potential impacts on the wellbeing of those affected. Safeguards and management measures outlined in Section 7.2 would be implemented to minimise these potential impacts. This would include continued consultation with directly affected property owners, residents, business owners and the local community as well as further refinement of the design and construction methodology to avoid or minimise impacts.

Once operational, the proposal would have a long term positive impact on access and connectivity for road users, pedestrians, cyclists and public transport users within Morisset and the wider Lake Macquarie region by reducing travel times and congestion and improving road safety. These benefits are considered to outweigh the potential adverse social impacts identified.

8.1.2 Biophysical factors

The design for the proposal has been specifically refined to minimise removal of native vegetation and impacts on threatened species, where possible. The proposal involves widening an existing main road corridor and would therefore minimise the amount of land required for its development and the consequential impact on adjoining land uses, watercourses and ecosystems. The proposal would generally follow the existing topography and would thereby minimise the need for earthworks.

The proposal would result in the removal of 0.98 hectares of native vegetation, including 0.39 hectares of the following TECs listed under the EPBC Act and BC Act:

- 0.27 hectares of Swamp Sclerophyll Forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (endangered under the BC Act)
- 0.08 hectares of River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (endangered under the BC Act)
- 0.04 hectares of Coastal Swamp Sclerophyll Forest of NSW and South East Queensland (endangered under the EPBC Act).

The proposal would also remove around 4.86 hectares of non-native vegetation, comprising native plantings, native shrub regrowth, and exotic grasses and trees.

The removal of vegetation for the proposal would remove suitable habitat for a range of threatened fauna species listed under the BC Act and EPBC Act, as well as threatened flora species and potential threatened flora habitat within the proposal area. Up to nine hollow-bearing trees would be removed by the proposal that may provide suitable habitat for bats, birds and arboreal mammals, reptiles and frogs. The proposal would increase existing habitat fragmentation which may impact wildlife connectivity, including movement of arboreal fauna, and result in minor edge effects. There is also a risk of injury and mortality of terrestrial fauna species, including threatened fauna species, to occur.

Overall, the proposal is not likely to significantly impact threatened species, populations, ecological communities or their habitats, within the meaning of the BC Act, FM Act or EPBC Act.

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

Hazardous materials may be encountered during demolition, vegetation clearing, excavation and other construction activities, which may result in the mobilisation/migration of contaminants and exposure risks to construction workers and sensitive receiving environments.

Any potential negative biophysical impacts of the proposal would be managed by safeguards and management measures proposed in Section 7.2 and would be outweighed by the long term benefits of the proposal.

8.1.3 Economic factors

The proposal would be constructed largely within the existing road corridor with minimal land acquisition required. The upgrade of the existing road corridor would minimise long term disruption and economic impacts on residents, businesses and motorists.

During construction, there may be short term temporary impacts on business and industry due to temporary amenity impacts, disruptions in property access and traffic delays and congestion due to temporary changes in traffic conditions and increased construction traffic. However, purchases of labour and materials during construction of the proposal would create employment and demand for goods and services, which would boost the local and regional economies.

Once operational, the proposal would improve road safety and accessibility along Mandalong Road, Freemans Drive, Dora Street and Wyee Road through reduced congestion, travel time savings and improved travel reliability for staff, customers and deliveries. This would have a long term positive impact on business and industry within Morisset and surrounding suburbs as it would contribute to improve productivity and reduce costs associated with reduced traffic delays and congestion for road users. This would support urban renewal projects planned in the area and general improvements to business and industry within Morisset and surrounding suburbs.

The extension of the central median along Mandalong Road and Dora Street would result in minor changes to property access, however the median would improve safety for all road users.

The long term economic benefits of the proposal are considered to outweigh the short term inconvenience on the local community and businesses during construction of the proposal and minor changes to property access.

8.1.4 Public interest

The public interest is best served through the equitable distribution of resources and investment in public infrastructure that fulfils the need of the majority.

The proposal is justified to be in the public interest on the basis that it would improve travel efficiency, safety and trip reliability along Mandalong Road, Freemans Drive, Dora Street and Wyee Road without any significant negative long term impacts on society, the biophysical environment or the local economy. The proposal is also aligned with several local, State and Commonwealth government plans, policies and strategies, including the State Infrastructure Strategy and Future Transport Strategy.

8.2 Objects of the EP&A Act

The objects of the EP&A Act provide a framework within which the justification of the proposal can be considered. A summary of this assessment is provided in Table 8-1.

Table 8-1 Objects of the EP&A Act

Instrument	Requirement
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal would improve the social and economic welfare of the community by improving travel efficiency, road safety and trip reliability, while minimising impacts on the natural and built environment through the proposal design and safeguards and management measures recommended in this REF.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The principles of ecologically sustainable development have been considered throughout the design and development of the proposal. An options process was undertaken for the proposal that has considered a range of constraints to identify the least environmental impact, as well as feedback from key stakeholders and the community (refer to Chapter 2). Chapter 6 of the REF has considered relevant economic, environmental and social considerations, and the principles of ecologically sustainable development are considered in Section 8.2.1.
1.3(c) To promote the orderly and economic use and development of land.	The proposal would support predicted future economic and residential growth in Morisset and the Lake Macquarie region by upgrading key transport infrastructure to growth areas.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposal.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The need to minimise impacts on the environment, including native vegetation and threatened species, has been considered throughout the development of the proposal. Where potential impacts on the environment have been identified, including native animals and plants, ecological communities and their habitats, safeguards and management measures have been proposed to avoid or minimise the impacts (refer to Section 7.2).
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Potential impacts on Aboriginal and non-Aboriginal cultural heritage are discussed in sections 6.12 and 6.13. An assessment of impacts to Aboriginal heritage has been undertaken in accordance with the requirements of the PACHCI. The assessments concluded that the proposal would not impact any known/registered built or cultural heritage values. Further, the proposal area has low archaeological potential as the proposed work would be contained within areas identified as having high levels of past and present disturbance. However, safeguards and management measures have been recommended to avoid any potential impacts on unidentified heritage values (refer to sections 6.12 and 6.13).

Instrument	Requirement
1.3(g) To promote good design and amenity of the built environment.	The Urban Design Concept and Landscape Strategy for the proposal has been developed in accordance with Beyond the Pavement (Transport for NSW, 2020a) to ensure the proposal integrates physically and visually with the surrounding environment (refer to Section 3.2.3). Temporary amenity impacts from increased traffic, noise, vibration and dust during construction would be managed through implementation of safeguards and management measures in accordance with the CEMP (refer to Section 7.2).
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 the 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.	Chapter 5 outlines the community and stakeholder consultation carried out during various stages of the proposal. There would be further opportunities for the public to comment on the proposal during the exhibition of the REF.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed 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.

The precautionary principle has guided the options assessment, assessment of environmental impacts and the development of safeguards and management measures.

The concept design has sought to minimise environmental impacts while maintaining engineering feasibility and safety for all road users. Specialist studies were undertaken for key environmental issues to provide accurate and impartial information for the evaluation of options and development of the proposal. In developing the proposal, the best available technical information, environmental standards and measures have been used to minimise environmental risks. In particular, the noise and air quality models adopted conservative ('worst-case') assumptions (refer to sections 6.3 and 6.7), to take a precautionary approach to assessing environmental impacts.

Safeguards and management measures would be implemented during construction and operation of the proposal to minimise potential impacts. No safeguards and management measures would be postponed because of a lack of scientific certainty or information. A CEMP would be prepared before construction starts to ensure the proposal achieves a high level of environmental performance during construction.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations.

The proposal would benefit future generations by improving road safety and helping to address the future increases in traffic volumes and traffic congestion associated with movement of traffic along Mandalong Road, Freemans Drive, Dora Street and Wyee Road. This would cater for future population and traffic growth in the region. While the proposal would have some adverse impacts, they are not considered to be of a nature or extent that would result in disadvantage to any specific section of the community or to future generations.

Should the proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would experience a significant increase in travel time on Mandalong Road, Freemans Drive, Dora Street and Wyee Road and intersection LoS would deteriorate to unacceptable levels. Traffic modelling of future year periods indicate that the proposal would provide a safer, reliable and more efficient road corridor on Mandalong Road and Dora Street between Gimberts Road and Ourimbah Street.

Conservation of biological diversity and ecological integrity

This principle requires the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival.

As part of the assessment process, a comprehensive assessment of the existing local environment has been carried out to recognise and manage any potential impacts of the proposal on local biodiversity.

Although efforts have been made to avoid, minimise and mitigate ecological impacts associated with the proposal, some residual impacts would occur. The key impact on biodiversity associated with the proposal is the direct removal of 0.98 hectares of native vegetation, including 0.39 hectares of TECs listed under the EPBC Act and BC Act. This would remove suitable habitat for a range of threatened fauna species listed under the BC Act and EPBC Act, as well as threatened flora species and potential threatened flora habitat within the proposal area.

An assessment of significance has been prepared for potentially affected threatened species, populations and ecological communities listed under the BC Act and EPBC Act. The assessment concluded the proposal would not result in a significant impact on threatened biodiversity or ecological integrity.

An Urban Design Concept and Landscape Strategy has been developed for the proposal, which includes planting locally endemic species within the proposal area to ensure that biological diversity and ecological integrity in the local area is maintained over the long term.

The proposal would not have a significant impact on biological diversity and ecological integrity.

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 examined the environmental consequences of the proposal and identified mitigation measures for areas that may possibly experience adverse impacts. Implementation of these mitigation measures would increase the capital and operational costs of the proposal. This shows that environmental resources were valued in economic terms.

The proposal was developed with an objective of minimising potential impacts on the surrounding environment, thereby minimising costs to the environment.

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:	Alex McDonald
Need to Position:	National Technical Director, Approvals
Company name:	WSP
Date:	5 February 2025

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:	Andrew Thompson
Position:	Project Development Manager
Transport region/ program:	Infrastructure Projects and Engineering (IPE) division
Date:	5 February 2025

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Terms and acronyms used in this REF

Term/acronym	Description
ABS	Australian Bureau of Statistics
AEI	Area of environmental concern
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ARI	Average Recurrence Interval
AVaTG	Assessing Vibration: A Technical Guideline (NSW Department of Environment and Conservation (DEC), 2006)
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BDAR	Biodiversity Development Assessment Report
BoM	Bureau of Meteorology
BC Act	*Biodiversity Conservation Act 2016 (NSW)*
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline
CTMP	Construction Traffic Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DECC	Department of Environment and Climate Change
DPE	Department of Planning & Environment
DPIE	Department of Planning, Industry and Environment
DPHI	Department of Planning, Housing and Infrastructure
EIS	Environmental impact statement
EP&A Act	*Environmental Planning and Assessment Act 1979 (NSW).* Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*. Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process
EPL	Environment protection licence
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	*Fisheries Management Act 1994 (NSW)*
GDE	Groundwater Dependant Ecosystems
Heritage Act	*Heritage Act 1977 (NSW)*
ICNG	Interim Construction Noise Guideline
LALC	Local Aboriginal Land Council

Term/acronym	Description
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 *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*
NCA	Noise catchment area
NCG	Road noise criteria guideline
NML	Noise Management Level
NMG	Road Noise Mitigation Guideline
NPfI	NSW Noise Policy for Industry
NPW Act	*National Parks and Wildlife Act 1974 (NSW)*
NSW	New South Wales
NSW EPA	NSW Environment Protection Authority
OEH	Office of Environment and Heritage within the Department of Planning and Environment.
OOHW	Out of Hours Works
OSOM	Oversize and overmass
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
POEO Act	*Protection of the Environment Operations Act 1997 (NSW)*
QA Specifications	Specifications developed by Transport for use with road work and bridge work contracts let by Transport.
RBL	Rating Background Level
REF	Review of Environmental Factors
ROL	Road Occupancy Licence
RNP	NSW Road Noise Policy
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act
SEPP (Biodiversity and Conservation)	State Environmental Planning Policy (Biodiversity and Conservation) 2021
SEPP (Planning Systems)	State Environmental Planning Policy (Planning Systems) 2021
SEPP (Transport and Infrastructure)	State Environmental Planning Policy (Transport and Infrastructure) 2021
SES	State Emergency Services
SIS	Species Impact Statement
TEC	Threatened Ecological Community
Transport	Transport for NSW
WARR Act	*Waste Avoidance and Resource Recovery Act 2001 (NSW)*
WM Act	*Water Management Act 2000 (NSW)*
WQO	Water Quality Objectives