Transport for NSW

New Lake Entrance Road and Pioneer Drive additional left turn lane

Review of Environmental Factors

July 2024

NSW GOVERNMENT

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Acknowledgement of Country

Transport for NSW acknowledges the Dharawal people as the traditional custodians of the land on which the New Lake Entrance Road and Pioneer Drive additional left hand lane project 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.

Approval and authorisation

Title	Project Development Manager
Accepted on behalf of Transport for NSW by:	Sarah Bowhay
Signed	
Date:	16/07/2024

Document review tracking

Draft No.	Date	Comments
Draft 1	1/3/2024	Provision of REF chapter 3 for Transport review
Draft 2	8/3/2024	Provision of REF chapters 1-5 for Transport review
Draft 3	19/4/2024	Provision of consolidated draft REF for Transport review
Draft 4	28/06/2024	Provision of final draft REF for Transport review
Version 1	16/07/2024	Final REF

Executive summary

The proposal

Transport for NSW (Transport) proposes to upgrade the intersection of New Lake Entrance Road and Pioneer Drive in Oak Flats to address existing congestion and reduce queuing.

Currently, the intersection experiences congestion, with traffic queues often extending from the roundabout, south to the Oak Flats Interchange and back onto the Princes Highway and Princes Motorway. To relieve congestion and reduce queuing, a new left turn lane on New Lake Entrance Road, on the southern approach to the roundabout is proposed.

Key features of the proposal include:

- Construct a rockfill retaining structure along the northbound side of New Lake Entrance Road to allow for up to 11 metres of new road pavement.
- Construct up to 11 metres of new road pavement to allow for:
    - an additional 3.5-metre wide left hand turning lane, providing about 150 metres of additional queuing capacity for traffic turning left into Pioneer Drive from New Lake Entrance Road
    - a 3 metre wide sealed shoulder
    - 3-7.5 metre of new pavement for the future long term intersection upgrade, and
    - 3 metre wide bicycle lane.
- Provision of a one metre wide verge on the northbound side of New Lake Entrance Road.
- Install a concrete safety barrier along the edge of the new pavement.
- Install a new kerb (with gaps) between the proposed left hand turning lane and the bicycle lane.
- Reseal the existing travel lane adjacent to the new left hand turning lane.
- Reconstruct the impacted shared user path along the southern side of Pioneer Drive, including a new kerb ramp.

Remove the existing drainage pipe along the existing left lane and install new pits and pipe drainage along the western edge of new pavement to tie into the existing drainage system.

- Provision of new signage and line marking.
- Protection and/or relocation of utilities.

Construction of the proposal is expected to commence in early 2025 and take about six months to complete.

Need for the proposal

The Oak Flats Interchange was upgraded in late 2021. Since opening, long queues of traffic have extended from the roundabout at New Lake Entrance Road and Pioneer Drive, south to the Oak Flats Interchange and back on to the Princes Motorway and Princes Highway, particularly in the morning travel peak.

Traffic modelling was carried out in late 2022 in response to community concerns and it was identified that an additional left turn lane from New Lake Entrance Road into Pioneer Drive is needed to reduce congestion from the Oak Flats Interchange. This additional left turn lane would also reduce the number of northbound vehicles queuing on New Lake Entrance Road and Pioneer Drive.

The proposal would increase the width of New Lake Entrance Road by 11 metres. This additional width would be used in the short term to separate the bicycle lane from live traffic and to install signs closer to the traffic lanes. Ultimately, this additional width would support the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work.

Proposal objectives

The objectives of the proposal are:

- Improve efficiency, reduce delays and queue lengths through the intersection.
- Ensure that the project is compatible with the long-term intersection upgrade design.
- Maintain the existing pedestrian and Active Transport Network.

Options considered

The topography along the western verge of New Lake Entrance Road slopes steeply away from the road to the west. To account for this slope and allow for New Lake Entrance Road to be widened, construction of a 150-metre long retaining wall parallel to New Lake Entrance Road is required. Several alternatives and options were investigated as part of the design development of the proposal, which included:

- Constructing a rock-filled retaining wall.
- Constructing a reinforced soil wall.
- Constructing a concrete retaining wall.

It was determined that the preferred option for the proposal was the construction of a rockfill wall. Some of the key factors that resulted in the rockfill wall being the best outcome for the various assessment criteria included faster construction methodology, lower cost, simpler construction logistics, minimal maintenance requirements and consistency with other retaining walls constructed in the surrounding locality.

Statutory and planning framework

The proposal is for road infrastructure facilities and is to be carried out on behalf of a public authority (Transport). Under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) the proposal can be assessed by Transport as both the proponent and the determining authority, and development consent from Shellharbour City Council is not required. This Review of Environmental factors (REF) fulfils the requirements of Section 5.5 of the EP&A Act and has been prepared in accordance with Section 171 of the Environmental Planning and Assessment Regulation 2021.

Community and stakeholder consultation

Community consultation to date has focused on adjacent landowners, who have been informed as part of geotechnical and survey investigation works undertaken in 2020 and 2023. Prior to construction, directly impacted stakeholders will be consulted on the proposed works. Letterbox notifications will be used for residents and businesses in the area to notify them of the proposal and its associated impacts.

Transport has consulted with Shellharbour City Council and State Emergency Services regarding the proposal, as per the requirements of Section 2.10 and Section 2.13 of State Environmental Planning Policy (Transport and Infrastructure) 2021.

Environmental impacts

The main environmental impacts of the proposal are:

Traffic and transport

Temporary traffic and transport impacts would occur during construction of the proposal, including:

- Travel times along New Lake Entrance Road being temporarily increased, due to a reduction in the existing speed limit of 60 kilometres per hour to 40 kilometres per hour along New Lake Entrance Road and Pioneer Drive, adjacent to the proposal area. Increased travel times may also affect bus routes that travel along New Lake Entrance Road and Pioneer Drive.
- The marked bicycle lane along the shoulder of New Lake Entrance Road in the northbound direction and the 70 metre long shared user path on the southern side of Pioneer Drive, west of the roundabout, would be temporarily closed during construction. Detours for pedestrian and cyclist access would be implemented and alternative arrangements managed through signage and wayfinding.

- Several privately owned parking bays are located along the southern side of the commercial property at 10 Pioneer Drive, of which up to nine car and three bus parking spaces would be temporarily occupied by light vehicles associated with the construction workforce. Public access to the parking bays would be restricted by the installation of security fencing and gate.

Construction traffic and transport impacts would be managed by the implementation of safeguards, including the preparation of a Traffic and Transport Management Plan as part of the Construction Environment Management Plan (CEMP).

Operation of the proposal is expected to benefit the local community in both the short term and long term. The provision of the additional left turn lane provides an increased capacity for queuing vehicles on New Lake Entrance Road, on approach to Pioneer Drive. The increased width of New Lake Entrance Road would be used in the short term to separate the bicycle lane from live traffic, thereby providing a safer route for cyclists.

Noise and vibration

Temporary noise and vibration impacts would occur during construction of the proposal, including:

- Noise generated from construction activities would exceed the recommended Noise Management Levels (NMLs) for sensitive receivers located near the proposal. The noisiest construction activity during standard (daytime) working hours (i.e. 7am to 6pm) would be vegetation clearing.
- Some construction activities would be required to be undertaken outside of standard working hours (i.e. at night) to minimise disruptions to local traffic on New Lane Entrance Road and Pioneer Drive, including site establishment works, relocation of utilities, paving works and line marking and road furniture installation. These construction activities may cause sleep disruption at nearby residences. The noisiest nighttime construction activity would be concrete sawing associated with pavement work.
- Sensitive receivers within 25 metres of the proposal area may experience vibration levels above the cosmetic damage criterion, and receivers within 100 metres of the proposal area may experience vibration levels above the human comfort criterion, during construction activities that required the use of equipment that is highly vibratory.

Construction noise and vibration impacts would be managed by the implementation of safeguards, including the preparation of a Noise and Vibration Management Plan as part of the CEMP. Following implementation of standard mitigation measures, it is predicted that no residential receivers would experience noise levels above the trigger levels for the implementation of Additional Mitigation Measures (AMMs) during standard hours or evening (6pm to 10pm) working hours.

For certain activities undertaken during the night period (10pm-7am) (e.g. paving works), after implementing standard mitigation measures, construction noise levels are predicted to still exceed NMLs. During the night period, it is predicted that up to 40 residential receivers would experience noise levels above the 'noticeable' AMM trigger level, and up to eight residential receivers would experience noise levels above the 'clearly audible' AMM trigger level. Additional mitigation measures would be implemented to reduce noise and vibration impacts on these receivers.

The results indicate that due to high existing road traffic noise levels in the locality, construction road traffic noise levels would be negligible. Operation of the proposal is not anticipated to result in an increase in traffic noise from current noise levels.

Landscape character and visual impacts

Temporary landscape character and visual impacts would occur during construction of the proposal. This would include a reduction in visual amenity associated with construction vehicles entering and existing the proposal area and ancillary facility, machinery and equipment moving about the proposal area and ancillary facility, construction security/exclusion fencing and stockpiling and storage of construction materials.

These visual impacts would occur for the duration of construction, anticipated to be about six months. Visual impacts would be localised, and views of construction activities would most commonly be experienced by road users of New Lake Entrance Road and Pioneer Drive. Users and visitors of the commercial property at 10 Pioneer Drive (including Little Peoples Early Learning Centre), which directly adjoins the proposal, would also have direct views of construction activities.

The removal of vegetation from the proposal area would have a moderate, permanent impact on landscape character and views. The absence of vegetation from the proposal area would give northbound road users an unobscured view of the landscape features to the west, including the multistorey commercial development at

10 Pioneer Drive, the South Coast train line, Oak Flats Train Station and commuter carpark, and Lake Illawarra Police Station. The view from southbound road users would be somewhat buffered by northbound vehicular traffic. The removal of existing vegetation would also give residents near the intersection of New Lake Entrance Road and Pioneer Drive an unobscured view of the multistorey commercial development at 10 Pioneer Drive, the South Coast train line, Oak Flats Train Station and commuter carpark, and Lake Illawarra Police Station. However, these views would mainly be from windows of the upper levels of dwellings that adjoin Pioneer Drive. Distant views to the foothills of the escarpment, south of the M1 Motorway, would also become visible.

Users and visitors of the commercial property at 10 Pioneer Drive (including Little Peoples Early Learning Centre), which directly adjoins the proposal, would also have direct views of the widened New Lake Entrance Road, unobscured by vegetation.

Landscape character and visual impacts would be managed by the implementation of safeguards outlined in the CEMP.

Justification and conclusion

While the proposal would result in some environmental impacts, including traffic, noise and vibration and visual impacts, these potential impacts have been minimised through appropriate design measures and site-specific mitigation measures and safeguards.

The benefits of undertaking the proposal include:

- Providing a safer route for cyclists, with the increased width of New Lake Entrance Road being used in the short term to separate the bicycle lane from live traffic.
- Providing improved traffic queuing conditions, with the additional left turn lane providing an increased capacity for queuing vehicles on New Lake Entrance Road, on approach to Pioneer Drive. This would reduce queuing back to the Oak Flats Interchange and on to the Princes Motorway and Princes Highway.
- Minimising adverse environmental impacts (including reducing the construction duration and magnitude of impacts) of the ultimate upgrade of the intersection of New Lake Entrance Road and Pioneer Drive on the surrounding community, by reducing the need for future work.

Compared with the 'do nothing' option where the intersection of New Lake Entrance Road and Pioneer Drive in Oak Flats is not upgraded, existing congestion and queuing would not be alleviated and benefits for future upgrades would not be achieved, the benefits of the proposal outweigh the identified and potential impacts.

Display of the review of environmental factors

This REF is on display for comment between 9 August and 6 September 2024. You can access the documents in the following ways:

Internet

The documents are available as pdf files on the Transport for NSW website at https://www.transport.nsw.gov.au/projects/current-projects/new-lake-entrance-road-and-pioneer-drive-additional-left-turn-lane

Printed copies

The REF can be viewed at the following location:

Shellharbour City Council, within Shellharbour Civic Centre
76 Cygnet Avenue (Corner of Cygnet and College Avenue)
Shellharbour City Centre, NSW 2529

8.30am to 4.30pm Monday to Friday

How can I make a submission?

To make a submission about this proposal, please send your written comments to:

southprojects@transport.nsw.gov.au

Submissions must be received by Wednesday 6 September 2024. Submissions will be managed in accordance with the Transport for NSW Privacy Statement. A copy of this statement can be made available upon request.

What happens next?

Transport will collate and consider the submissions received during public display of the REF and provide a Submission Report on the project website.

After this consideration, Transport will determine whether the proposal should proceed as proposed and will inform the community and stakeholders of this decision.

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

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1. Introduction

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

1.1 Proposal identification

Transport for NSW (Transport) proposes to upgrade the intersection of New Lake Entrance Road and Pioneer Drive in Oak Flats to address existing congestion and reduce queuing.

Currently, the intersection experiences congestion, with traffic queues often extending from the roundabout, south to the Oak Flats Interchange and back onto the Princes Highway and Princes Motorway. To relieve congestion and reduce queuing, upgrade work proposes a new left turn lane on New Lake Entrance Road, on the southern approach to the roundabout (the proposal). The proposal is shown in Figure 3-1.

Key features of the proposal include:

- Construct a rockfill retaining structure along the northbound side of New Lake Entrance Road to allow for up to 11 metres of new road pavement.
- Construct up to 11 metres of new road pavement to allow for:
    - an additional 3.5 metre wide left hand turning lane, providing about 150 metres of additional queuing capacity for traffic turning left into Pioneer Drive from New Lake Entrance Road
    - a 3 metre wide sealed shoulder
    - 3-7.5 metre of new pavement for the future long term intersection upgrade, and
    - 3 metre wide bicycle lane.
- Provision of a one metre wide verge on the northbound side of New Lake Entrance Road.
- Installation of a concrete safety barrier along the edge of the new pavement and a steel safety barrier alongside the shared user path on the southern side of Pioneer Drive.
- Install a new kerb (with gaps) between the proposed left hand turning lane and the bicycle lane.
- Reseal the existing travel lane adjacent to the new left hand turning lane.
- Reconstruct the impacted shared user path along the southern side of Pioneer Drive, including a new kerb ramp.
- Remove the existing drainage pipe along the existing left hand lane and install new pits and pipe drainage along the western edge of new pavement to tie into the existing drainage system.
- Provision of new signage and line marking.
- Protection and/or relocation of utilities.

The provision of the additional left-hand lane would increase the width of New Lake Entrance Road by 11 metres. This additional width would be used in the short term to separate the bicycle lane from live traffic and to install signs closer to the traffic lanes. Ultimately, this additional width would support the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work.

1.2 Location of the proposal

The proposal is in Oak Flats within the Shellharbour Local Government Area (LGA), about 85 kilometres south of Sydney and 15 kilometres south of Wollongong.

The proposal is about 100 metres north of the Oak Flats Interchange, a major interchange for the Princes Highway, Princes Motorway, East West Link and New Lake Entrance Road. New Lake Entrance Road is a major arterial road that connects Warilla and Oak Flats, while Pioneer Drive is a local road that links Oak Flats with Flinders, Blackbutt, Shell Cove and Shellharbour Village.

The proposal is bound by residential development of Blackbutt to the east, linear infrastructure including the South Coast train line, Oak Flats Interchange and the Pacific Motorway to the south, commercial development and public transport infrastructure such as Oaks Flats train station to the east and residential development of Oak Flats to the north.

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

Figure 1-1 Location of the proposal

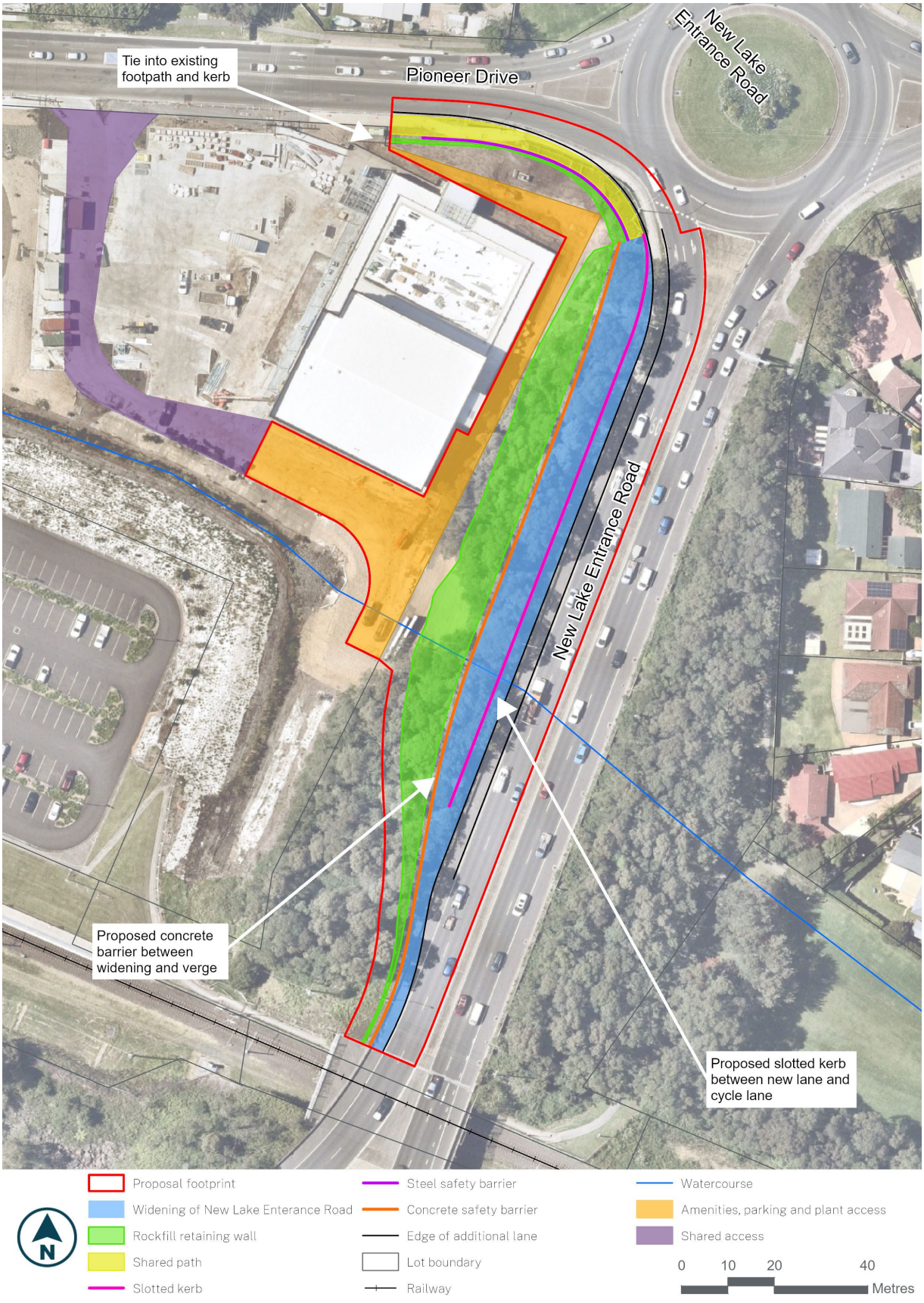

Figure 1-2 Key features of the proposal

1.3 Purpose of the report

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

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

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of Section 171 of the *Environmental Planning and Assessment Regulation 2021*, the factors in Guidelines for Division 5.1 assessments, (DPE 2022), Roads and Related Facilities EIS Guideline (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* (EPBC Act).

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

- Section 5.5 of the EP&A Act including that Transport examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.
- The strategic assessment approval granted by the Federal Government under the EPBC Act in September 2015, with respect to the impacts of Transport's road activities on nationally-listed threatened species, ecological communities and migratory species.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval sought from the Minister for Planning under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in Section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.
- The significance of any impact on nationally-listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and if offsets are required and able to be secured.

The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Department of Climate Change, Energy, the Environment and Water (DECCW) for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

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

2.1 Strategic need for the proposal

2.1.1 Future Transport Strategy

The Future Transport Strategy (Transport for NSW, 2022) outlines a framework to address transport challenges in NSW and is an update of the NSW Long Term Transport Master Plan, released in 2012, and the Future Transport Strategy 2056, released in 2018. It integrates planning for roads, freight and all other modes of transport and sets out initiatives, solutions and actions to meet NSW transport challenges.

The Future Transport Strategy identifies three key transport outcomes to guide investment, policy and reform, and service provision in NSW, including connecting customers, supporting successful places for communities, and enabling economic activity.

The proposal is aligned with a key transport outcome to connect customers as it would improve travel efficiency along New Lake Entrance Road.

2.1.2 Transport Sustainability Plan

The Transport Sustainability Plan 2021 (Transport for NSW, 2021) outlines Transport's sustainability focus areas and goals. These are aligned with the United Nations Sustainable Development Goals (UNSDGs) and include:

- Responding to climate change
- Protecting and enhancing biodiversity
- Improving environmental outcomes
- Procuring responsibly
- Partnering with communities
- Respecting culture and heritage
- Aligning spend and impact
- Empowering customers to make sustainable choices.

The proposal would be developed and delivered in accordance with the Transport Sustainability Plan.

2.1.3 Future Energy Strategy

The Transport Energy Strategy (Transport for NSW, 2020) outlines Transport's commitment to securing transport energy needs from sustainable sources and supports the transition of the transport sector to net zero emissions by 2050 (consistent with the objectives of the NSW Government's climate change policy framework).

The Future Energy Strategy considers both direct and indirect emissions from road, rail and ferry transport. These are defined as:

- Direct emissions are from the use of fossil fuels in internal combustion engines of transport vehicles. They also include emissions from vehicles used for construction and maintenance activities.
- Indirect emissions are from the use of fossil fuel generated energy to power transport vehicles, as well as emissions from construction and maintenance activities.

The proposal is aligned with the Transport Energy Strategy as it would aim to reduce direct and indirect emissions during the construction phase.

2.1.4 Road Safety Action Plan 2026

The 2026 Road Safety Action Plan (Transport for NSW, 2022) seeks to continue the accomplishments of the Road Safety Plan 2021 (Transport for NSW, 2018) and focuses on enhancing education and local engagement, transforming the safety of the road network and accelerating safety features in vehicles. The Plan also aligns with Future Transport, the NSW Government's transport planning strategy, which aims to ensure safety is designed into the transport network as NSW grows. The Plan includes the following targets:

- Halving fatalities on NSW roads by 2030.
- Reducing serious injuries by 30 per cent on NSW roads by 2030.

Currently, vehicles queuing on the off-ramps from the Princes Motorway and Princes Highway, creates hazardous conditions for other motorists travelling at speeds up to 100 kilometres per hour. The proposal is consistent with the directions set out in Road Safety Action Plan 2026 as it would reduce the number of northbound vehicles queuing on New Lake Entrance Road and back to the off-ramps from the Princes Motorway and Princes Highway, thereby minimising the risk of vehicle collisions. It would also provide for the separation of cyclists from live traffic, via the installation of a kerb between the bicycle lane and traffic lane.

2.2 Need for the proposal

The Oak Flats Interchange was upgraded in late 2021. Since opening, long queues of traffic have extended from the roundabout at New Lake Entrance Road and Pioneer Drive, south to the Oak Flats Interchange and back on to the Princes Motorway and Princes Highway, particularly in the morning travel peak.

Traffic modelling was carried out in late 2022 in response to community concerns and it was identified that an additional left turn lane from New Lake Entrance Road into Pioneer Drive is needed to reduce congestion from the Oak Flats Interchange. This additional left turn lane would reduce the number of northbound vehicles queuing on New Lake Entrance Road and back to the Oak Flats Interchange and on to the off-ramps from the Princes Motorway and Princes Highway.

The proposal would increase the width of New Lake Entrance Road by 11 metres. This additional width would be used in the short term to separate the bicycle lane from live traffic and to install signs closer to the traffic lanes. Ultimately, this additional width would support the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work.

2.3 Limitations of existing infrastructure

Currently, the intersection of New Lake Entrance Road and Pioneer Drive experiences congestion, with traffic queues often extending from the roundabout, south to the Oak Flats Interchange and back onto the off-ramps of the Princes Motorway and Princes Highway.

2.4 Proposal objectives and development criteria

2.4.1 Proposal objectives

The project objectives are:

- Improve efficiency, reduce delays and queue lengths through the intersection.
- Ensure that the project is compatible with the long-term intersection upgrade design.
- Maintain the existing pedestrian and Active Transport Network.

2.4.2 Development criteria

The development criteria for the proposal include:

- Design the proposal in a manner that is informed by environmental investigations to minimise adverse environmental impacts.

- Design the proposal in a manner that is informed by engineering and geotechnical constraints to maximise quality and durability.
- Satisfy the technical and procedural requirements of Transport and other stakeholders with respect to the design of the proposal.
- Optimise the design to ensure that the proposal can be practically and efficiently constructed and maintained while meeting proposal objectives.

2.4.3 Urban design objectives

The urban design objectives prescribed by Beyond the Pavement (Transport for NSW, 2020) have been considered in the development of the proposal. The urban design objectives relevant to the proposal are:

- Contributing to urban structure, urban quality and the economy.
- Fitting with the built fabric.
- Fitting with the landform.
- Contributing to green infrastructure and responding to natural systems.

2.5 Alternatives and options considered

The topography along the western verge of New Lake Entrance Road slopes steeply away from the road to the west. To account for this slope and allow for New Lake Entrance Road to be widened, construction of a 150-metre long retaining wall parallel to New Lake Entrance Road is required. Several alternatives and options were investigated as part of the design development of the proposal.

2.5.1 Methodology for selection of preferred option

A constructability and value management workshop was held in February 2024, to evaluate three retaining wall options. The workshop was attended by representatives from Transport's environmental division, asset management division, geotechnical division, engineers as well as independent environmental and geotechnical specialists.

The methodology for selection of the preferred option involved a collaborative process during which weightings were assigned to various assessment criteria for each of the three options. The assessment criteria included:

- Cost.
- Direct impacts on native vegetation.
- Capacity for future-proofing for miscellaneous structures.
- Timeframe for delivery.
- Constructability (i.e. safety and simplicity of design).
- Ongoing maintenance (costs, access requirements and safety considerations).
- Impacts on the surrounding community, including construction noise and operational visual impact.

A risk register for each option was developed during the workshop, which considered site constraints, constructability risks associated with each construction methodology, plant and equipment requirements, site access and ancillary requirements, and risks to construction personnel, road users, pedestrian, cyclists and nearby receivers during construction.

2.5.2 Identified options

Three options for the retaining wall and the "Do nothing" option were evaluated (Stantec, 2024). These are summarised below.

Do nothing

The "do nothing" option would involve not upgrading the intersection of New Lake Entrance Road and Pioneer Drive in Oak Flats. Existing congestion and queuing would not be alleviated and benefits for future upgrades

would not be achieved. This option is considered suboptimal as it does not address the existing infrastructure limitations, does not fulfill the need for the proposal and does not achieve the project objectives.

Rock-filled retaining wall

Construction of a rockfill retaining wall would involve the progressive excavation of the existing slope to construct terraces for rock placement, followed by the progressive laying and pinning of geofabric along terraces, and the placement of rock fill from lower terraces to upper terraces. The retaining wall would be backfilled with crushed rock to achieve the levels required to widen New Lake Entrance Road.

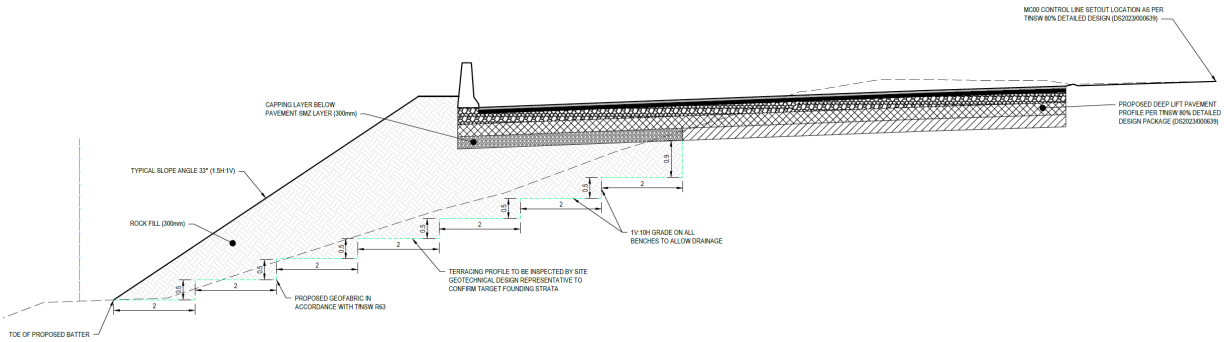

Figure 2-1 Typical cross section of rockfill retaining wall

Reinforced soil wall

Construction of a reinforced soil wall would involve the construction of a steep slope face using geotextile soil-filled bags. Geogrid (a synthetic product) would be installed horizontally at regular intervals into the soil behind the wall, further reinforcing the soil and increases the wall's stability. Additional mesh systems could be affixed to the slope face to encourage and support revegetation of the slope with grasses or groundcovers. The retaining wall would be backfilled with crushed rock to achieve the levels required to widen New Lake Entrance Road.

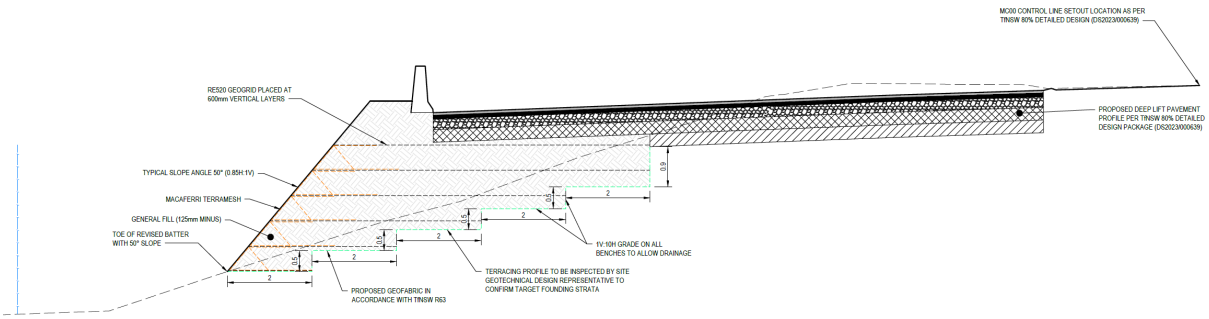

Figure 2-2 Typical cross section of reinforced soil wall

Concrete retaining wall

The retaining wall would be constructed of pre-cast L-shaped reinforced concrete components, also known as an L-wall. Each component would be lifted into place by a crane, at the bottom of the slope, and bolted together and sealed. Once assembled, the retaining wall would be backfilled with crushed rock to achieve the levels required to widen New Lake Entrance Road.

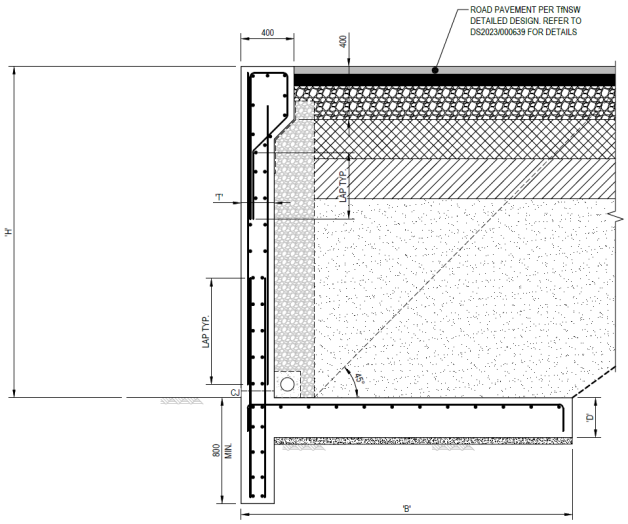

Figure 2-3 Typical cross section of a reinforced concrete retaining wall

2.5.3 Analysis of options

An analysis was conducted during the constructability and value management workshop, during which each retaining wall option was evaluated against the assessment criteria. The results of this multi-criteria analysis are summarised in Table 2-1.

Table 2-1 Evaluation of design options against assessment criteria

Criteria	Reinforced Concrete L-wall	Rockfill wall	Reinforced Soil wall
Cost	Poor	Good	Moderate
Direct impacts on native vegetation	Good	Poor	Poor
Capacity for future-proofing for miscellaneous structures	Poor	Poor	Moderate
Timeframe for delivery	Poor	Good	Moderate
Constructability: simplicity of design	Poor	Good	Moderate
Constructability: safety	Poor	Good	Moderate
Ongoing maintenance (costs, access requirements and safety considerations)	Poor	Good	Moderate
Impacts on the surrounding community, including construction noise and operational visual impact	Poor	Moderate	Good

Rating	Description
Good	Good outcome
Moderate	Moderate outcome
Poor	Poor outcome

2.5.4 Preferred option

Based on the result of the analysis, it was determined that the preferred option for the proposal was the construction of a rockfill wall. Some of the key factors that resulted in the rockfill wall being the best outcome for the various assessment criteria included:

- Having the lowest cost of all three options. The proximity of a quarry that could supply the rockfall (i.e. within two kilometres of the proposal area) was also a factor that reduced the cost of this option.
- Fast construction methodology that is not subject to weather constraints, as the placement of rockfill can continue during wet weather.
- Simple design favours simplistic construction logistics, which reduces the risk of errors and delays.
- Minimal to no maintenance requirement for the face of the rockfill wall.
- Rockfill walls have been constructed elsewhere in the surrounding area, allowing for a consistent aesthetic in embankment design.

3. Description of the proposal

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

3.1 The proposal

Transport proposes to upgrade the intersection of New Lake Entrance Road and Pioneer Drive in Oak Flats to address existing congestion and reduce queuing. This intersection is currently a roundabout without traffic lights, with New Lake Entrance Road comprising a six-lane divided road to the north of the roundabout and a four-lane divided road to the south. Pioneer Drive is a two-lane undivided road that transitions to a four-lane divided road on approach to the roundabout.

Currently, this intersection experiences congestion, with traffic queues often extending from the roundabout, south to the Oak Flats Interchange and back onto the Princes Highway. To relieve this congestion and reduce queuing, the upgrade involves a new left turn lane on New Lake Entrance Road, on the southern approach to the roundabout (the proposal). The proposal are shown in Figure 3-1.

Key features of the proposal include:

- Construction of a rockfill retaining structure along the northbound side of New Lake Entrance Road to allow for up to 11 metres of new road pavement.
- Construction of up to 11 metres of new road pavement to allow for:
    - an additional 3.5 metre wide left hand turning lane, providing about 150 metres of additional queuing capacity for traffic turning left into Pioneer Drive from New Lake Entrance Road
    - a 3 metre wide sealed shoulder
    - 3-7.5 metre of new pavement for the future long term intersection upgrade, and
    - 3 metre wide bicycle lane.
- Provision of a one metre wide verge on the northbound side of New Lake Entrance Road.
- Installation of a concrete safety barrier along the edge of the new pavement and a steel safety barrier alongside the shared user path on the southern side of Pioneer Drive.
- Installation of a new slotted kerb (with gaps) between the proposed left hand turning lane and bicycle lane.
- Resealing the existing travel lane adjacent to the new left hand turning lane.
- Reconstruction of the impacted shared user path along the southern side of Pioneer Drive, including a new kerb ramp.
- Removal of the existing drainage pipe along the existing left hand lane and install new pits and pipe drainage along the western edge of new pavement to tie into existing drainage system.
- Provision of new signage and line marking.
- Protection and/or relocation of utilities.

The provision of the additional left-hand lane would increase the width of New Lake Entrance Road by 11 metres. This additional width would be used in the short term to separate the bicycle lane from live traffic lane and to install signs closer to the traffic lanes. Ultimately, this additional width would support the long-term upgrade of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work.

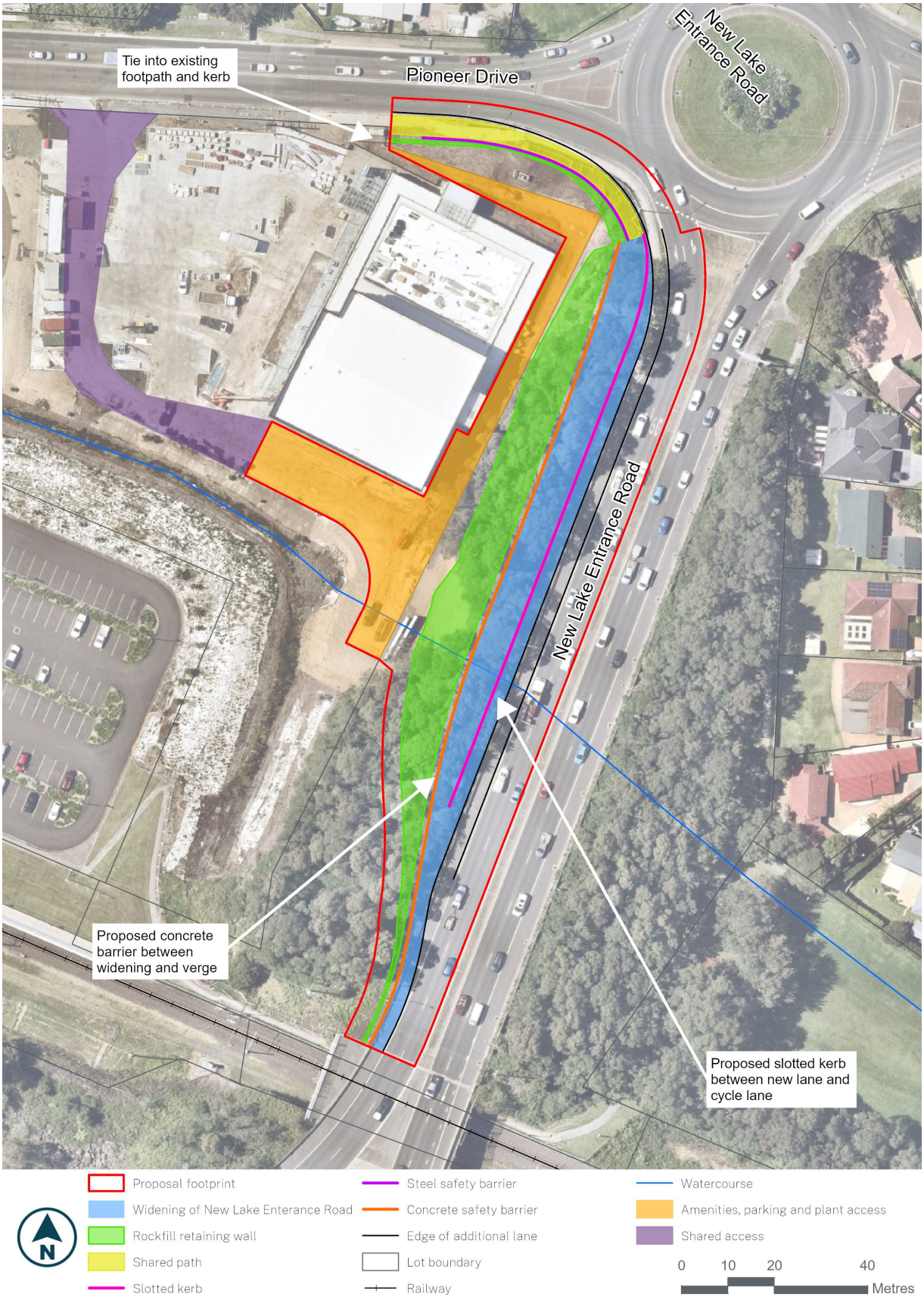

Figure 3-1: Key features of the proposal

3.2 Design

The following sections provide a description of the design criteria, design features and engineering constraints of the proposal.

3.2.1 Design criteria

The road design has been carried out in accordance with the following guidelines and standards:

- Austroads Guide to Road Design Part 3: Geometric Design (2021).
- Austroads Guide to Road Design Part 4: Intersections and Crossings - General (2023).
- Austroads Guide to Road Design Part 5: Drainage-General and Hydrology Considerations (2023).
- Austroads Guide to Road Design Part 5A: Drainage: Road Surface, Networks, Basins and Subsurface (2023).
- Austroads Guide to Road Design Part 5B: Drainage-Open Channels, Culverts and Floodway Crossings (2023).
- Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers (2022).
- Austroads Guide to Road Design Part 6A: Paths for Walking and Cycling (2021).
- Transport for NSW supplements to the Austroads Guide.
- Soils and Construction – Managing Urban Stormwater, Volume 1 (Landcom, 2004) and Volume 2D (Department of Environment and Climate Change, 2008).

Utilities would be designed in accordance with relevant Transport specifications.

The adopted design criteria for the proposal are summarised in Table 3-1.

Table 3-1 Design criteria adopted for the proposal design

Construction phase	Construction activities
Speed	Posted speed: 60km/h
Widths	Lane width of additional left-hand lane: 3.5m Shoulder width: 3m Sealed verge: 1m Bicycle lane: 3m
Rockfill slope	1 Vertical: 1.5 Horizontal
Pavement	Existing travel lane: spray seal New pavement: asphaltic concrete, heavily bound base, select material, upper zone and subgrade
Barriers	Concrete F-barrier along edge of pavement Steel W-Beam along edge of footpath
Kerb	Slotted SF kerb to separate bicycle lane from sealed shoulder

3.2.2 Engineering constraints

Key engineering constraints considered in the design of the proposal include:

- Existing levels: the additional left-hand lane needs to integrate with the existing levels of New Lake Entrance Road.
- Utilities: electrical, telecom, sewer and water utilities are present in the proposal area.
- Topography: the retaining wall needs to address the change in elevation between the road level and ground level to the east.
- Drainage: a large box culvert has already been extended from the western margin of New Lake Entrance Road, into the drainage swale located within 10 Pioneer Drive, Oak Flats. Drainage from the existing pavement needs to be integrated with new pavement drainage.
- Property: the proposal area is constrained by the lot boundary of the adjoining property at 10 Pioneer Drive, limitingthe gradient of the slope of the rock retaining wall and maintenance path at the toe of the wall.

3.2.3 Major design features

Rockfill retaining wall

The topography along the western verge of New Lake Entrance Road slopes steeply away from the road in a westerly direction. To account for this slope and allow for New Lake Entrance Road to be widened for the additional left-hand turning lane, construction of a rockfill retaining wall is required.

The rockfill retaining wall would be about five metres high along most of its length and would have a maximum height of seven metres near the drainage culvert in the centre of the proposal area.

Widened New Lake Entrance Road

The provision of the additional left-hand lane will increase the width of New Lake Entrance Road by 11 metres. This additional width will be used in the short term to separate the bicycle lane from live traffic lane and to install signs closer to the traffic lanes. Ultimately, this additional width will facilitate the long-term upgrade of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work.

Bicycle lane

The relocated three-metre wide bicycle lane will be provided along the new verge of New Lake Entrance Road, which would be separated from the live traffic lane by a slotted kerb. This provides additional safety for cyclists. A new ramp will be constructed to provide connectivity from the bicycle lane to the shared user path along the southern side of Pioneer Drive.

3.3 Construction activities

3.3.1 Work methodology

Construction activities would be carried out in accordance with a Construction Environmental Management Plan (CEMP) to ensure work complies with Transport's commitments and legislative requirements. Detailed work methodologies would be identified by the construction contractor.

Construction activities for the proposal would occur within the proposal area boundary shown in Figure 3-1. Establishment of the ancillary site, shown in Figure 3-3, is described in detail in Section 3.4.

Construction of the proposal is anticipated to involve the following activities and sequencing:

- Site establishment.
- Utility protection/relocation.
- Drainage works.
- Earthworks and slope preparation.
- Embankment widening.
- Finishing works and site demobilisation.

These activities are described in further detail below.

Site establishment

Site establishment works would include:

- Installation of barrier and perimeter fencing to restrict public access.
- Installation of sediment and erosion controls.
- Installation of temporary traffic and pedestrian controls, including diversion of existing shared user path/bicycle lane.
- Establishment of vehicle access points and construction slip lane.
- Marking of temporary parking areas for light vehicles and plant.
- Placement of temporary traffic and pedestrian controls.
- Establishment of temporary amenities.

- Additional survey and geotechnical investigation, as required.
- Marking of vegetation to be removed.

Utility protection/relocation

- Protection or relining of services, where required.
- Adjustment, relocation, and installation of services.
- Provision of temporary street lighting where required.

Slope preparation

Slope preparation works would include:

- Clearing and grubbing of vegetation.
- Stripping, stockpiling and management of mulch, topsoil and unsuitable material, including the use of topsoil and mulch as a bund on the western perimeter of the work area.
- Surplus excavated material to be stored or used on the ancillary site.
- Dispose of unsuitable excavated material, to a licensed facility.
- Construction of future gantry signage foundations, if required.
- Construction of a piling platform.

Construction of the retaining wall

Construction of the rockfill retaining wall will involve:

- Protection of the existing and recently extended concrete box culvert that discharges into the swale within 10 Pioneer Drive.
- Progressive excavation of the existing slope to construct terraces for rock placement.
- Progressive laying and pinning of geofabric along terraces.
- Progressive placement of rock fill from lower terraces to upper terraces.
- Importation and placement of fill material.

Widening of New Lakes Entrance Road

Provision of the 3.5 metre wide additional left-hand lane turning into Pioneer Avenue will require:

- Removal or infill of existing drainage pipe along the current verge of New Lake Entrance Road.
- Importation of fill and earthworks to level the future turning lane footprint.
- Installation of 450mm and 600mm pipes and drainage pits along the length of the new verge of the future turning lane.
- Placement of road pavement surface, including crushed rock road base, bitumen sealing, and asphalt works.
- Installation of slotted SF curb to delineate separated bicycle lane.
- Installation of cast in-situ concrete F-type barrier along road verge.
- Installation of signage.
- Line marking, including reinstatement of bicycle lane.

Finishing works and site demobilisation

- Removal of all traffic management devices and environmental controls, including temporary shared user path diversion.
- Landscaping along the toe of retaining wall, including the spreading of topsoil and mulch, and planting of trees and/or shrubs.
- Removal of construction phase amenities, equipment and materials at completion.

Figure 3-2: Key features of construction activities

3.3.2 Construction workforce

The construction workforce would fluctuate, depending on the stage of construction and associated activities. About 20 personnel at any given time is expected during the construction period.

3.3.3 Construction hours and duration

Construction of the proposal would generally be carried out during standard working hours:

- Monday to Friday: 7:00am to 6:00pm
- Saturday: 7:00am to 1:00pm
- Sunday and Public holidays: no planned work.

Consultation with the adjacent daycare will be undertaken prior to the commencement of construction. Construction of the proposal will consider nominated quiet times by the adjacent childcare centre, and noisy activities will be undertaken outside of these nominated quiet times where feasible.

Some construction activities would be required to be undertaken outside of these standard working hours, to minimise disruptions to local traffic on New Lakes Entrance Road and Pioneer Drive. Out Of Hours Works (OOHW) may include:

- Installation of temporary traffic controls associated with site establishment, including temporary traffic signage, install temporary concrete safety barriers (gates for entry and exit), and pedestrian and cyclist detours.
- Relocation or protection of utilities where traffic control is required.
- Placement of pavement layers (SMZ and HBB).
- Placement of asphalt layers.
- Line marking.
- Installation of slotted curb.
- Removal of temporary concrete safety barriers.
- Installation of new concrete barrier.

OOHW would be carried out during from Sunday to Thursday, between 8pm and 4am.

Construction of the proposal is expected to commence in early 2025 and take about six months to complete.

3.3.4 Plant and equipment

Plant and equipment expected to be used to construct the proposal are listed in Table 3-2.

Table 3-2 Plant and equipment to be used during construction

Plant / equipment	Site establishment	Earthworks and slope preparation	Utility works	Embankment widening	Drainage works	Finishing works	Establishment and operation of ancillary facility
Light Vehicles							X
Truck (Medium)	X		X				
Road Truck / Tipper	X	X		X	X	X	X
EWP	X					X	
Franna	X				X	X	
Excavators (27t)		X	X	X	X		
Hydraulic Hammer		X		X			
Front-end Loader		X					
Concrete Saw			X			X	
Vacuum Truck			X				
Backhoe			X	X	X		
Dozer				X			
Scraper				X			
Skid Steer							X
Compressor							X
Chainsaw		X					
Tub Grinder		X					
Pneumatic Hammer			X				
Concrete Truck					X	X	
Generator / Lighting			X				X
Truck Compressor					X		
Pavement Layer						X	
Asphalt Truck						X	
Rollers (Steel Drum/Multi-tire)					X	X	
Compactor				X			
Line Marking						X	
Water Cart				X			

3.3.5 Source and quantity of materials

Materials to be used to construct the proposal would be sourced from local quarries and appropriately licensed commercial suppliers in nearby areas. The estimated quantities of materials associated with the proposal are provided in Table 3-3. None of the materials proposed to be used are in short supply.

Table 3-3 Estimated quantity of materials to construct the proposal

Construction material	Quantity
Imported fill	197m^3
Rock fill	2,400 m^3
Road pavement materials, including crushed rock road base and asphalt	2,025 m^3
Precast drainage elements	Nine kerb entry units for stormwater (gully pits), one culvert junction box
Signs	One new road sign would be required to be installed in the new verge. Eight existing signs would be relocated.
Concrete safety barriers	185m
Steel safety barriers	40m

3.3.6 Traffic management and access

The proposal is expected to generate light and heavy vehicle traffic movements during construction. Vehicle movements would mainly be associated with:

- Delivery of construction materials including rock fill and precast structural elements.
- Removal of excess spoil.
- Importation of fill material for embankment widening.
- Delivery and removal of construction equipment and machinery.
- Workers travelling to and from the proposal area.

Construction traffic

It is anticipated that construction of the proposal would generate about 20 light vehicle movements to and from the site each day, as the workforce travels to and from the site. The number of light vehicle movements associated with the construction workforce would be reduced by carpooling where possible.

Heavy vehicle movements would be periodic, with the highest number of heavy vehicle movements occurring during earthworks and asphalting. At the peak of construction, for a period of one to two weeks, about 50 heavy vehicle movements per day are anticipated.

Construction vehicle access

Site establishment will include the provision of a construction slip lane where the existing New Lake Entrance Road verge is, separated from the adjacent live traffic lane by concrete barriers. This slip lane would allow for the loading and unloading of material during the day without significantly impeding operational traffic travelling northbound on New Lake Entrance Road.

Construction workforce parking

Construction workforce parking would primarily be accommodated by the ancillary facility. Overflow parking would be accommodated by the Oak Flats Train Station commuter carpark, located to the west of the proposal area.

Several parking bays are located along the southern side of the commercial property at 10 Pioneer Drive, of which up to nine car and three private bus parks would be temporarily occupied by light vehicles associated with the construction workforce. Public access to the parking bays will be restricted by the installation of security fencing.

3.4 Ancillary facility

To support construction of the proposal, an ancillary facility will be required. The proposed ancillary facility is located on the southern side of Pioneer Drive, on vacant land adjacent to Lake Illawarra Police Station about 400 metres west of the proposal area Figure 3-3. This area has no native vegetation and currently provides an informal parking area for the police station.

The ancillary facility would support hardstand areas, site offices, amenities, stockpile and laydown areas and construction staff parking. The layout of the ancillary facility would be determined during detailed design of the proposal. Access to the ancillary facility would be provided by an existing driveway from Pioneer Drive, which traverses a public footpath parallel to Pioneer Drive. Traffic control would be implemented as required for heavy vehicle movements across this public footpath. The eastern portion of the ancillary site will continue to be available for informal parking for the police station during construction of the proposal.

No tree removal or substantial earthworks are required for the establishment of the ancillary facility. Properties located on the northern side of Pioneer Drive near the ancillary facility are mainly commercial and industrial premises, except for two residential properties.

Operational hours of the ancillary facility would generally align with the construction hours for the proposal:

- Monday to Friday: 7:00am to 6:00pm
- Saturday: 7:00am to 1:00pm
- Sunday and Public holidays: no planned work.

The ancillary facility would also operate during OOHW, as detailed in Section 3.3, to support construction activities that will occur outside of standard construction hours. OOHW would be carried out during from Sunday to Thursday, between 8pm and 4am.

Upon completion of construction of the proposal, the ancillary facility would be returned to its pre-existing condition. A hardstand area may be retained, by agreement with the landowner.

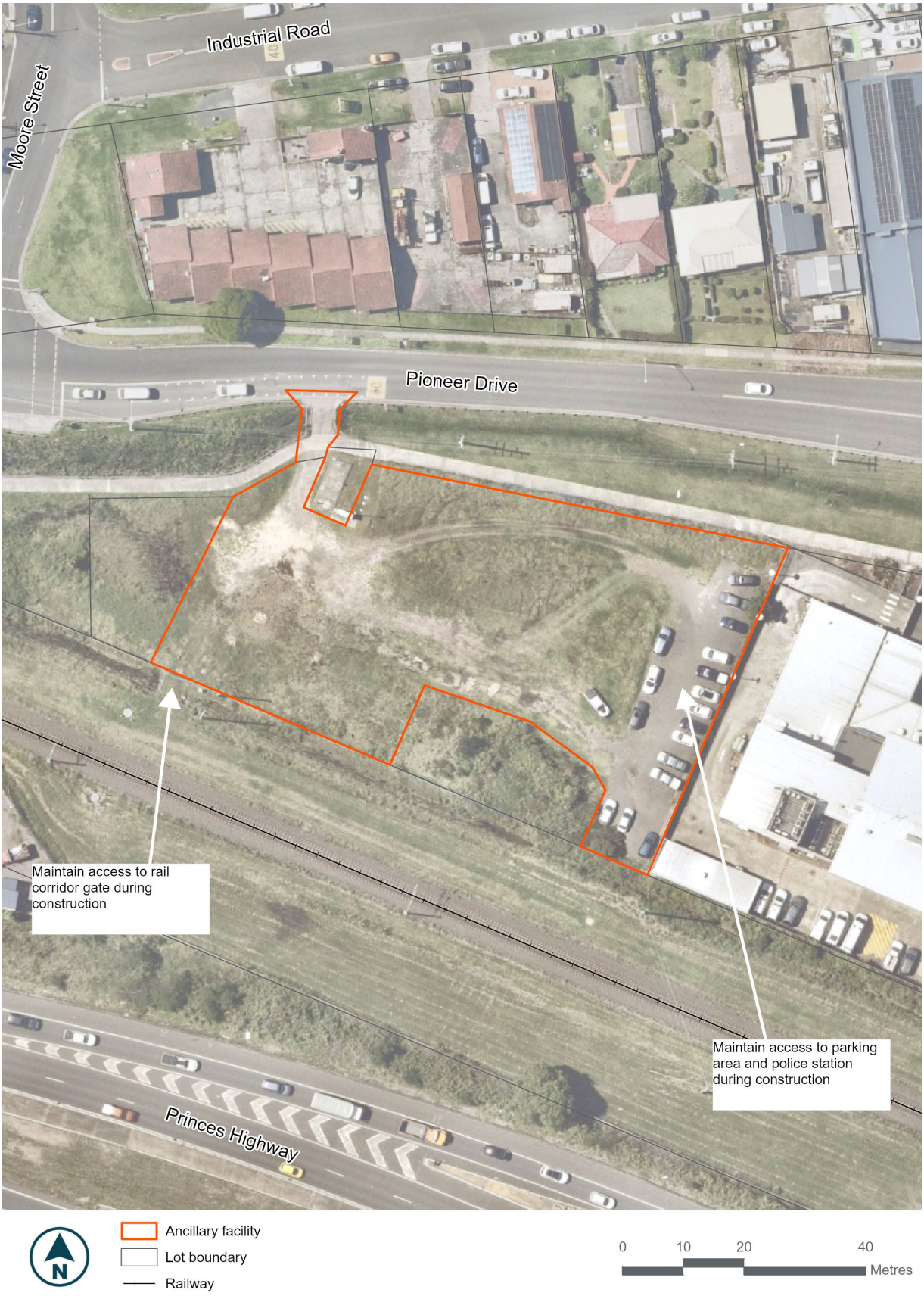

Figure 3-3 Ancillary facility to support construction of the proposal

3.5 Public utility adjustment

Public utility adjustments and relocations would be required for the proposal, including:

- Five street lights and associated electrical conduits will need to be replaced and relocated in the proposal area.
- Protection of a 600mm Sydney Water main that crosses under New Lake Entrance Road and under the footpath along the southern margin of Pioneer Drive.
- Telstra conduits are located near the Water main and may require protection.
- Protection or relining of a 300mm Sewer main, that crosses under New Lake Entrance Road may be required.

Proposed adjustments would be finalised in consultation with utility providers during detailed design.

3.6 Property acquisition

No property acquisition is required for the proposal. A lease agreement is required for the establishment and temporary use of the ancillary facility on Pioneer Drive, adjacent to the Lake Illawarra Police Station, and 10 Pioneer Drive.

4. Statutory and planning framework

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

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

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

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

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

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021.
- State Environmental Planning Policy (Planning Systems) 2021.
- State Environmental Planning Policy (Precincts – Central River City).
- State Environmental Planning Policy (Precincts – Eastern Harbour City).
- State Environmental Planning Policy (Precincts – Regional) 2021.
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021.

Section 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 of this REF.

4.1.2 Local Environmental Plans

The proposal is located within Shellharbour LGA. Land use and development within the Shellharbour LGA is regulated by the Shellharbour Local Environmental Plan 2013 (Shellharbour LEP 2013). Table 4-1 identifies the objectives for each of the affected zones under the Shellharbour LEP 2013 and considers the consistency of the proposal with those objectives. Land use zones located within and near the proposal are shown in Figure 4-1.

Table 4-1 Consistency of the proposal with the objectives of the Shellharbour LEP 2013

Zone	Objective	Comment
SP2 Infrastructure	• To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure.	The proposal area is entirely located within this zone. The proposal is consistent with the objectives of this zone.
E1 Local Centre	• To provide a range of retail, business and community uses that serve the needs of people who live in, work in or visit the area.	The ancillary facility is entirely located within this zone.

Zone	Objective	Comment
	• To encourage investment in local commercial development that generates employment opportunities and economic growth. • To enable residential development that contributes to a vibrant and active local centre and is consistent with the Council's strategic planning for residential development in the area. • To encourage business, retail, community and other non-residential land uses on the ground floor of buildings.	This land is currently vacant and is adjacent to Lake Illawarra Police Station, currently owned by DPHI. The ancillary facility would be established and operated for the duration of construction of the proposal. Upon completion of construction of the proposal, the ancillary facility would be returned to a condition agreed with the landowner. The temporary use of this land would not detract from its future use, which could include development that is consistent with the objectives of this zone.
R2 Low Density Residential	• To provide for the housing needs of the community within a low density residential environment. • To enable other land uses that provide facilities or services to meet the day to day needs of residents.	The entrance to the ancillary site and a small proportion of the proposal area falls within this zone. The proposal is consistent with the objective of providing facilities or services to meet the day to day needs of residents.

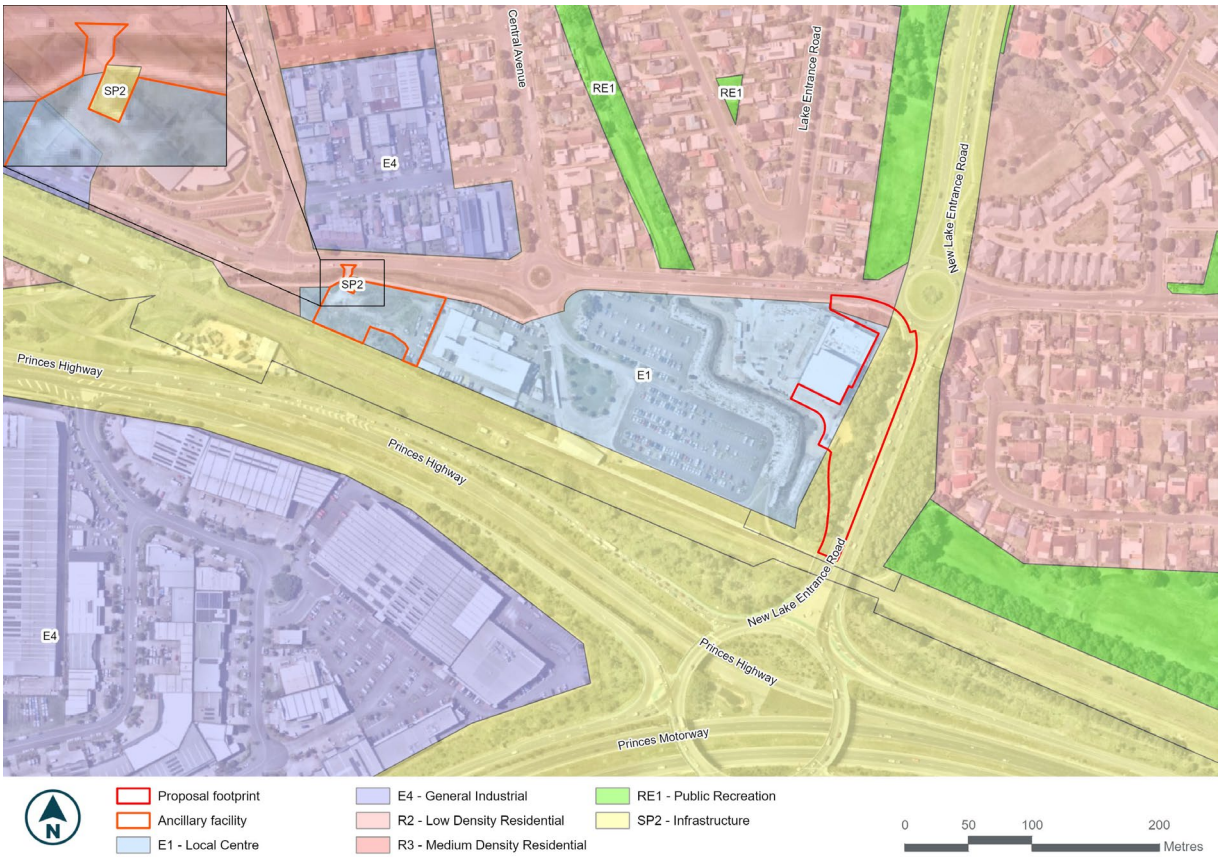

Figure 4-1 Land use zones prescribed by the Shellharbour LEP

4.2 Other relevant legislation

4.2.1 Roads Act 1993

New Lake Entrance Road is a State classified road (611) under the *Roads Act 1993* (Roads Act). Under Section 61 of the Roads Act, it is Transport's role to carry out road work on New Lake Entrance Road. Under Section 64 Transport may exercise the functions of a roads authority with respect to any classified road.

4.2.2 National Parks and Wildlife Act 1974

The harming or desecrating of Aboriginal objects or places is an offence under Section 86 of the *National Parks and Wildlife Act 1974* (NPW Act). Under Section 90, an Aboriginal Heritage Impact Permit (AHIP) may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

Potential impacts to Aboriginal cultural heritage as a result of the proposal have been assessed in accordance with the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (NSW Roads and Maritime Services, 2011) (PACHCI). An AHIP is not required for the proposal.

Further details regarding potential impacts of the proposal on Aboriginal cultural heritage are provided in Section 6.6.

4.2.3 Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Conservation Act 2016* (BC Act) is to maintain a healthy, productive and resilient environment for the greatest well-being of the community consistent with the principles of ecologically sustainable development.

Under Part 2 of the BC Act it is an offence to harm animals and plants; damage areas of outstanding biodiversity value; damage habitat of threatened species or ecological communities. Under Part 2, Division 2 of the BC Act it is a defence to a prosecution if the harm or damage was necessary for the carrying out of a Division 5.1 EP&A Act activity undertaken in compliance with the determination, or undertaken consistent with a state significant infrastructure approval under Division 5.2 of the EP&A Act.

Section 7.3 of the BC Act establishes a test to determine whether a proposed development or activity is 'likely to significantly affect threatened species'. If an activity under Division 5.1 of the EP&A Act is likely to significantly affect threatened species then a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) is required to be prepared.

A Biodiversity Assessment Report has been prepared for the proposal and is summarised in Section 6.3 and provided in Appendix D. The BAR concluded that the proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the BC Act.

4.2.4 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Chapter 6 of the REF.

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

Potential impacts to these biodiversity matters are also considered in Section 6.3 of the REF and Appendix D.

Findings - matters of national environmental significance

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

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

The assessment of the proposal's impact on nationally-listed threatened species, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Chapter 6 of the REF describes the safeguards and management measures to be applied.

4.2.5 Native Title Act 1993

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

A search of the National Native Title Tribunal's Native Title Vision website (accessed 2 April 2024) identified land in the study area as being wholly within the boundary of claim NSD1331/2017 – South Coast People. This Native Title Claim extends from Sutherland in the north to Eden in the south, generally encompassing the coast, the coastal plain and adjoining ranges. A determination on this claim has not been made.

Transport would provide a notice of the proposal to NTSCORP under Section 24KA of the Act and would invite comment on the proposal.

4.3 Confirmation of statutory position

The proposal is categorised as development for the purpose of [a road and/or road infrastructure facilities] and is being carried out by or on behalf of a public authority. Under Section 2.108 of SEPP (Transport and Infrastructure) the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

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

5. Consultation

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

5.1 Consultation strategy

Transport would endeavour to keep the community and stakeholders informed and proactively consulted throughout the development of the proposal. The purpose of consultation is:

- To keep community informed and increase understanding of the proposal.
- To gain local knowledge and consider comments and issues relating to the proposal.
- To ensure stakeholders potentially impacted by the proposal are provided clear information about possible property impacts.
- To provide clear and timely information and advise the community on how they may obtain information and communicate concerns, complaints and suggestions.

The REF is to be displayed for a minimum four week period. The REF will be made publicly available, and stakeholders and the community would be encouraged to participate, provide feedback and make a submission on the REF.

5.2 Community involvement

Community consultation undertaken with regard to the proposal is summarised in Table 5-1.

Table 5-1: Community consultation

Group	Consultation
Residents	Adjacent landowners were informed as part of geotechnical and survey investigation works undertaken in 2020, 2023 and 2024.
Other stakeholders	The developer of the adjacent 10 Pioneer Drive business park has been progressively consulted on the design and construction of the proposal. Consultation has included access for investigation works and construction and ongoing discussions with potential occupants to minimise construction and operational impacts.

5.3 Aboriginal community involvement

The proposal has been considered against the requirements of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services, 2011). This procedure is generally consistent with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (Department of Environment, Climate Change and Water, 2010). An outline of the procedure is presented in Table 5-2.

Table 5-2: Summary of Transport's Procedure for Aboriginal Cultural Heritage Consultation and Investigation

Stage	Description
Stage 1	The PACHCI Stage 1 was completed 23 February 2024 by Transport and determined that the proposal is unlikely to harm known Aboriginal objects or places, as: • The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area. • The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Heritage NSW's *Due diligence Code of*

	Practice for the Protection of Aboriginal objects in NSW and the Transport for NSW's procedure. • The cultural heritage potential of the study area appears to be reduced due to past disturbance. • There is an absence of sandstone rock outcrops likely to contain Aboriginal art. No further stages of the PACHCI were required to be completed.
Stage 2	Site survey and further assessment (not required).
Stage 3	Formal consultation and preparation of a cultural heritage assessment report (not required).
Stage 4	Implement environmental impact assessment recommendations (not required).

5.4 SEPP (Transport and Infrastructure) consultation

Shellharbour City Council and the State Emergency Service have been consulted under SEPP (Transport and Infrastructure) about the proposal as per the requirements of Section 2.10 and Section 2.13 of SEPP (Transport and Infrastructure), respectively. Appendix B contains a SEPP (Transport and Infrastructure) consultation checklist that documents how SEPP (Transport and Infrastructure) consultation requirements have been considered.

Issues raised from this consultation are outlined in Table 5-3 below.

Table 5-3 Issues raised through SEPP (Transport and Infrastructure) consultation

Group	Issue raised	Response / where addressed in REF
Shellharbour City Council	Council raised the expectation that the REF would identify: • The total area of vegetation to be cleared. • The Plant Community Type which the vegetation most closely aligns with/resembles. • The presence of any habitat features (such as hollow-bearing trees) that are proposed for removal. • An assessment of whether any threatened species are likely to be present and if so if they are likely to be impacted. • Any potential impacts on vegetation and how these will be avoided, minimised, or offset. Council requested the opportunity to provide further input as the REF is developed, particularly around any offsets that may be required for vegetation clearance.	Potential impacts on biodiversity during construction and operation of the proposal have been assessed as part of the Biodiversity Assessment Report, provided in Appendix D, and in Section 6.3 of this REF. The assessment addresses the aspects raised by Council during consultation. Council has been provided a copy of the Biodiversity Assessment Report as part of the SEPP (Transport and Infrastructure) consultation. Transport will consult with Shellharbour City Council to identify potential areas suitable to be planted with replacement trees in the surrounding locality. If suitable land cannot be identified, Transport would pay the required cost into Transport's Conservation Fund.
State Emergency Service (SES)	The SES raised the possibility that a potential lay down site and ancillary site may be affected to a minor level during a 1% AEP event and up to 1 metre depth during a Probably Maximum Flood (PMF). The NSW SES also requested that notification be provided where there are likely to be significant delays in the operation of local roads affected by the	The potential impacts of the proposal on flooding and safeguards and management measures to address these impacts are outlined in Section 6.4. In the event there are likely to be significant delays in the operation of local roads affected by the proposal during construction, Transport will notify the SES. This has been included in the traffic and transport safeguards and

Group	Issue raised	Response / where addressed in REF
	upgrades due to the possible implications for emergency vehicles.	management measures outlined in Section 6.1.4.

5.5 Government agency and stakeholder involvement

Transport have consulted with other government agencies and stakeholders with regard to the proposal, as summarised in Table 5-4. Transport is currently consulting with Sydney Water with regard to Sydney water assets located within or near the proposal area.

Table 5-4: Government and agency consultation

Agency	Consultation
Department of Planning, Industry and Housing	As the current landowner of the proposed ancillary site, adjacent to the Oak Flats Police Station, consultation has been undertaken with DPHI. A lease agreement with DPHI will be required for the establishment and temporary use of the ancillary facility, including plans for the post-construction condition of the site.
NSW Police	The eastern portion of the proposed ancillary site is currently used as an informal parking area for the police station (under a lease agreement between DPHI and the NSW Police). As a result, NSW Police have been consulted on the proposed use of the site. NSW Police did not object to the proposed use of the site, provided that access to parking is not disrupted.

5.6 Ongoing consultation

The REF will be placed on public exhibition for stakeholder and community comment. All comments received will be considered when finalising the proposal design. On receipt of any formal submission, an identification number will be provided for easy reference to responses in the determination report. The community would be kept informed of any further changes to the proposal resulting from this and any future consultation process.

Following the public display of the REF, all comments received would be recorded and addressed in a submissions report detailing how each issue raised would be considered in finalising the proposal design. The Submissions Report would be made available to the public on the project's Transport for NSW website. An update notification will be distributed to advise the availability of the submissions report.

If the proposal is approved, ongoing consultation activities would occur with the affected community including nearby landholders, businesses and road users during construction. Transport will consult with the owners and occupants of 10 Pioneer Drive, including the Little Peoples Early Learning Centre, to minimise construction noise and dust impacts. Transport will notify the owners and occupants of 10 Pioneer Drive at least 10 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact.

Ongoing communications and notifications may include:

- Community/construction updates.
- Media announcements.
- Live Traffic NSW updates and social media updates.
- Stakeholder meetings as required.
- Web page updates.
- Work notification letters (as required).

6. Environmental assessment

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

- Potential impacts on matters of national environmental significance under the EPBC Act.
- The factors specified in the Guideline for Division 5.1 assessments (DPE 2022) and as required under Section 171 of the Environmental Planning and Assessment Regulation 2021 and the Roads and Related Facilities EIS Guideline (DUAP 1996). The factors specified in Section 171 of the Environmental Planning and Assessment Regulation 2021 are also considered in Appendix A.
- Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Traffic and transport

6.1.1 Methodology

Potential impacts of the proposal on traffic and transport were assessed by completing a qualitative assessment, which included:

- A desktop review of publicly available information relevant to the proposal area, including:
  - Aerial imagery of roads and intersection layouts, active transport connections, and parking within and near the proposal area available through Google Maps (accessed 27 March 2024).
  - Cycleway Finder – Transport for NSW (accessed 27 March 2024).
  - Centre for Road Safety – Crashes Map for Shellharbour LGA (accessed 2 April 2024).
  - New Lake Entrance Road / Pioneer Drive Modelling Study: Options Assessment Report (SMEC, 2020).
- A review of existing traffic flows on New Lake Entrance Road, measured between 8 to 17 March 2024 as part of the Noise and Vibration Impact Assessment (Muller Acoustic Consulting, 2023) completed for the proposal (refer to Section 6.2), and current traffic volumes for Pioneer Drive (Shellharbour City Council, 2023).

6.1.2 Existing environment

Road network

The proposal is located on New Lake Entrance Road, immediately south of the intersection with Pioneer Drive in Oak Flats. This intersection consists of a two-lane roundabout.

New Lake Entrance Road is an arterial road that extends from the Oak Flats Interchange in the south, to College Avenue in Oak Flats, in the north. It is a four lane divided road, with the northbound and southbound lanes separated by a wide raised median. It has a posted speed limit of 60 kilometres per hour between the Oak Flats Interchange and a point 200 metres north of Pioneer Drive. North of this point, the posted speed limit is 80 kilometres per hour.

Pioneer Drive is a local road that extends from Moore Street, Oak Flats in the west, to Brunderee Road, Flinders in the east. It is generally a two lane road, except for between Central Avenue in the west and Westwood Drive in the east. Between these two points, Pioneer Drive is a four lane divided road with the eastbound and westbound lanes separated by a narrow raised median.

The proposal is located about 100 metres north of the Oak Flats Interchange, a major signalised interchange for the Princes Highway, Princes Motorway, East West Link and New Lake Entrance Road.

Existing traffic flows

Existing traffic flows on New Lake Entrance Road and Pioneer Drive are summarised in Table 6-1.

Table 6-1 Existing traffic flows

Road	Total traffic volume (total number of vehicles)	Day (7:00am -10:00pm)			Night (10:00pm – 7:00am)		
		Number of vehicles	% heavy vehicles	Speed limit (km/h)	Number of vehicles	% heavy vehicles	Speed limit (km/h)
New Lake Entrance Road	37,852	34,549	1	60	3,303	2	60
Pioneer Drive	12,356	11,278	1	50	1,078	2	50

The existing traffic flow data shows that most vehicles travelling along New Lake Entrance Road and Pioneer Drive are light vehicles, with traffic volumes about 10 times heavier during the day than at night. About 345 heavy vehicles travel along New Lake Entrance Road during the day and 66 at night, while 112 heavy vehicles travel along Pioneer Drive during the day and 21 at night.

Road network performance

Several traffic surveys were conducted between May and June 2018 to inform the New Lake Entrance Road / Pioneer Drive Modelling Study: Options Assessment Report (SMEC, 2020), including vehicle turning counts and queue length surveys. Survey results and modelling outcomes are discussed below.

Intersection performance

Traffic modelling results identified the intersection of New Lake Entrance Road and Pioneer Drive as a critical section of the road network that requires improvements in the future to improve traffic flow (Table 6-2). This intersection operated at an unacceptable Level of Service, classed as F in the 2022 PM peak, upon the opening of the Albion Park Rail Bypass. By 2031, it is anticipated that queues from this intersection would result in wider network impacts, resulting in reduced performance of the Oaks Flat Interchange, as well as the Pioneer Drive and Central Avenue roundabout (SMEC, 2020).

Table 6-2 Peak hour level of service* results for future traffic modelling scenarios

Intersection	2022	2031	2041
New Lake Entrance Road / Pioneer Drive			
AM Peak (08:00 – 09:00)	C	E	F
PM Peak (16:00 – 17:00)	F	F	F
Oak Flats Interchange			
AM Peak (08:00 – 09:00)	B	B	C
PM Peak (16:00 – 17:00)	B	F	F
Pioneer Drive / Central Avenue			
AM Peak (08:00 – 09:00)	A	A	A
PM Peak (16:00 – 17:00)	A	F	F

*Level of service is a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. Level of service A represents free flowing traffic while level of service F represents a breakdown of flow with traffic exceeding the intersection capacity.

Queue length

The queue length for each approach to the New Lake Entrance Road / Pioneer Drive intersection were modelled for the year 2022, 2031 and 2041, as summarised in Table 6-3 (SMEC, 2020).

In the AM peak in 2022, the New Lake Entrance Road / Pioneer Drive intersection showed relatively good performance on all approaches. Queue lengths are forecast to increase by 2031, when rolling queues on the

southern approach are expected to occasionally reach the Oak Flats Interchange. By 2041, northbound and eastbound queues are predicted to almost reach the Oak Flats Interchange and the Pioneer Drive / Central Avenue intersection respectively, however no significant impact on traffic performance are anticipated at these intersections.

In the PM peak, performance of the New Lake Entrance Road / Pioneer Drive intersection was poor across all modelled years. In 2022, the eastbound and southbound approaches recorded maximum queues of 230 metres and 350 metres, respectively. By 2031, eastbound queues are expected to extend back through the Pioneer Drive / Central Avenue intersection, and by 2041 this would result in significant southbound queues on Central Avenue. Southbound queues at the New Lake Entrance Road / Pioneer Drive intersection are expected to exceed 740 metres in both 2031 and 2041.

In the northbound direction, queues at the New Lake Entrance Road / Pioneer Drive intersection would begin to impact the Oak Flats interchange, resulting in long queues on the Princes Highway eastbound off ramp, the Princes Motorway off ramp, as well as the East West Link approaches, in both 2031 and 2041.

Table 6-3 Maximum queue by New Lake Entrance Road / Pioneer Drive approach

Intersection	2022	2031	2041
Southbound			
AM maximum queue length (m)	60	100	170
PM maximum queue length (m)	350	740+	740+
Westbound			
AM maximum queue length (m)	70	160	220
PM maximum queue length (m)	140	130	240
Northbound			
AM maximum queue length (m)	140	200	260
PM maximum queue length (m)	220	270+	270+
Eastbound			
AM maximum queue length (m)	70	200	250
PM maximum queue length (m)	230	260+	260+

Road safety

A review of the NSW Centre for Road Safety crashes map (Transport for NSW, 2024) identified 13 vehicular crashes along New Lake Entrance Road and at the intersection of Pioneer Drive and New Lake Entrance Road, between 2018 and 2022. Nine of these occurred at the roundabout at the intersection of Pioneer Drive and New Lake Entrance Road, with three of these crashes resulting in moderate injuries to drivers and/or passengers.

Public transport

There are no bus stops near the proposal. The nearest bus stop is located on the northbound carriageway of New Lake Entrance Road, about 150 metres north of Pioneer Drive.

The South Coast train line runs in an east-west direction immediately south of the proposal area (under New Lake Entrance Road), which extends from Bondi Junction in eastern Sydney to Bomaderry, just north of Nowra. Oak Flats Train Station is located about 250 metres south-west of the proposal area, which also serves as a transport interchange with the following bus services:

- Route 37: Wollongong to Shellharbour via Dapto.
- Route 43: Port Kembla to Mt Brown.
- Route 51: Oak Flats to Wollongong via Stockland Shellharbour.

- Route 53: Shellharbour to Wollongong via Shell Cove and Warrawong.
- Route 57: Wollongong to Shellharbour via Warrawong.
- Route 75: Stockland Shellharbour to Calderwood and Tullimbar.
- Route 76: Shellharbour Village to Albion Park.

Several school bus services also stop at Oak Flats Train Station. Access to Oak Flats Train Station and the adjacent commuter car park is provided via Stanford Drive, off Pioneer Drive.

Active transport

A review of Transport's online Cycleway Finder identified that an unmarked bicycle lane is offered by the western shoulder of New Lake Entrance Road travelling in the northbound direction. On the northbound approach to the intersection of Pioneer Drive, a ramp from the shoulder connects to a 70 metre long shared path on the southern side of Pioneer Drive, west of the roundabout. This section of shared path terminates at a ramp onto Pioneer Drive, where no marked cycleway is provided.

In the southbound direction, a bicycle lane is offered by the unmarked shoulder on the eastern shoulder of New Lake Entrance Road. This provides connectivity between the marked cycleways associated with Oak Flats Interchange, delineated with green pavement, and the existing shared path on the southern side of Pioneer Drive, east of the roundabout.

A dedicated shared path is provided under New Lake Entrance Road, connecting Oak Flats Train Station and commuter car park to the suburb of Blackbutt, on the eastern side of New Lake Entrance Road. It also connects to the existing shared path on the southern side of Pioneer Drive, east of the roundabout.

Parking and access

There is no on-street parking along New Lake Entrance Road of Pioneer Drive. There are no driveways to public or private properties along New Lake Entrance Road near the proposal area.

A car park is associated with the commercial property located at 10 Pioneer Drive, immediately west of the proposal area. Access to this car park is via a driveway off Pioneer Drive, about 125 metres west of the intersection of New Lake Entrance Road.

A commuter carpark is located at Oak Flats Train Station, about 70 metres south-west of the proposal area. Access to this commuter car park is via Stanford Drive, off Pioneer Drive, about 270 metres west of the intersection of New Lake Entrance Road.

6.1.3 Potential impacts

Construction

Impacts on road network performance

The proposal is anticipated to generate up to 50 heavy vehicle movements and 20 light construction vehicle movements per day at the peak of construction activity. These movements would include about 10 light vehicles and 32 heavy vehicles during standard construction hours, and 10 light vehicles and 18 heavy vehicles during out of hours work periods. The number of vehicle movements associated with construction of the proposal would be within the range of daily variations in traffic volumes on the road network when compared to existing traffic levels. The overall impact of construction traffic on road network performance is therefore anticipated to be minor.

All plant, equipment and materials would be delivered to the proposal area via the construction slip lane (refer to Figure 3-2). This slip lane would allow for the loading and unloading of material during the day without substantially impeding traffic travelling northbound on New Lake Entrance Road.

Travel times along New Lake Entrance Road may be temporarily increased during construction, due to a reduction in the existing speed limit of 60 kilometres per hour to 40 kilometres per hour along New Lake Entrance Road and Pioneer Drive, adjacent to the proposal area.

Impacts on active transport

The unmarked bicycle lane along the western shoulder of New Lake Entrance Road in the northbound direction, and the 70 metre long shared path on the southern side of Pioneer Drive, west of the roundabout,

would be temporarily closed during construction. The unmarked bicycle lane along the eastern shoulder of New Lake Entrance Road in the southbound direction will remain open.

Detours for pedestrian and cyclist access would be implemented and alternative arrangements managed through signage and wayfinding. Indicative routes for the cyclist and pedestrian detours that would likely be in place for the duration of construction are shown in Figure 6-1.

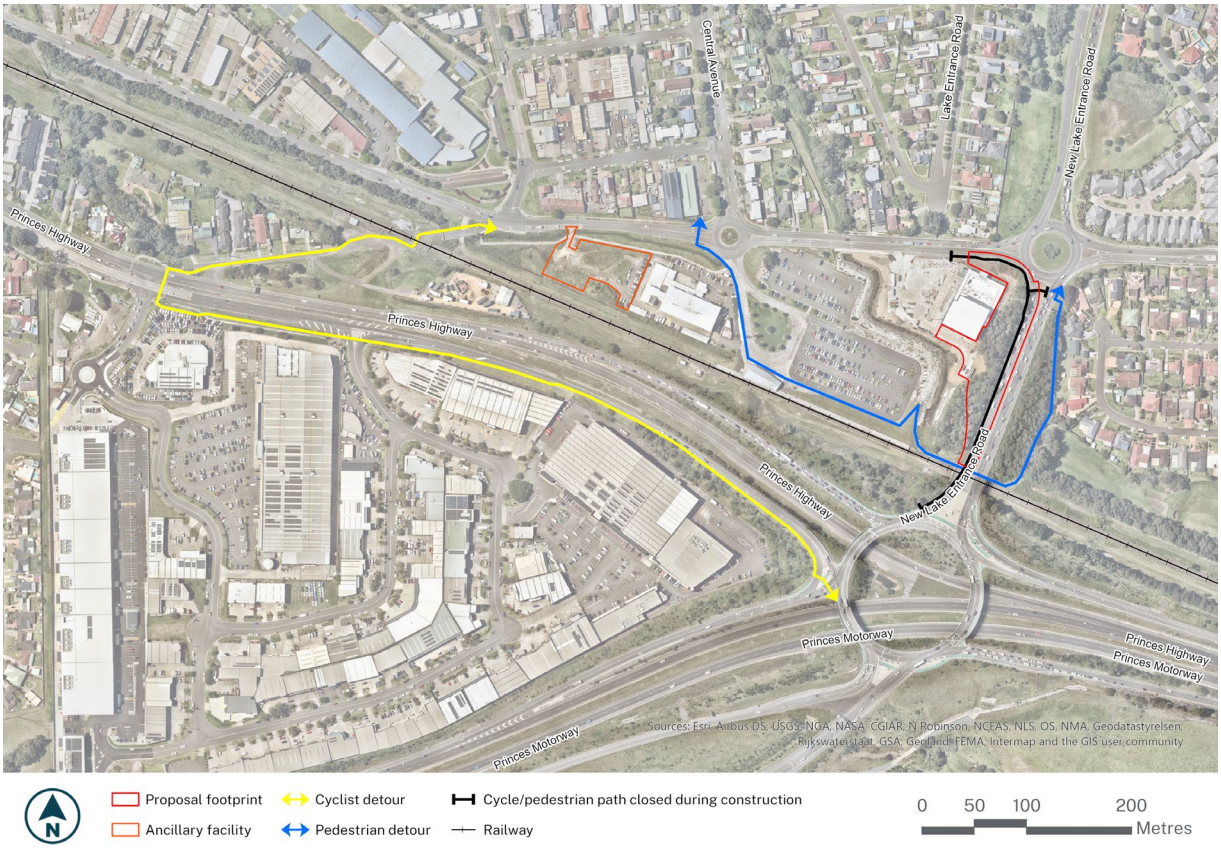

Figure 6-1 Temporary cyclist and pedestrian detours in place during construction

Impacts on public transport

The construction of the proposal is not anticipated to impact bus service reliability as there are no bus stops in the proposal area and construction traffic impacts on road network operation are minor. The temporary reduction in the existing speed limit along New Lake Entrance Road and Pioneer Drive during construction may result in minor increases in travel times for bus services that travel along these roads. Affected bus routes include Route 37, Route 43, Route 51, Route 53, Route 71, Route 75 and Route 76. Construction of the project would not impact train services utilising the South Coast train line, to the south of the proposal area.

Parking and access

Construction workforce parking would primarily be accommodated by the ancillary facility, with parking on the existing hardstand area to be maintained for use by NSW Police. Overflow parking (between seven and 10 vehicles) would be accommodated by the Oak Flats Train Station commuter carpark, located to the west of the proposal area.

Several parking bays are located along the southern side of the commercial property at 10 Pioneer Drive, of which up to nine car and three private bus parks would be temporarily occupied by light vehicles associated with the construction workforce. Public access to the parking bays would be restricted by the installation of security fencing.

Access to properties along Pioneer Drive would be maintained during construction, including the commercial property located at 10 Pioneer Drive, that adjoins the proposal area.

Operation

Operation of the proposal is expected to benefit the local community in both the short term and long term. The provision of the additional left turn lane provides an increased capacity for queuing vehicles on New Lake Entrance Road, on approach to Pioneer Drive. This would reduce queuing back to the Oak Flats interchange and on to the off-ramps from the Princes Motorway and Princes Highway.

The increased width of New Lake Entrance Road would be used in the short term to separate the bicycle lane from live traffic, thereby providing a safer route for cyclists.

Ultimately, this additional width would support the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work. The long-term upgrade of the intersection is expected to deliver improvements in travel times and reductions in traffic queuing.

6.1.4 Safeguards and management measures

Table 6-4 Traffic and transport safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Traffic Control at Work Sites Technical Manual (Transport for NSW, 2022) and QA Specification G10 Traffic Management (Transport for NSW, 2022). The TMP will include: • Confirmation of haulage routes. • Measures to maintain access to local roads and properties. • Site-specific traffic control measures (including signage) to manage and regulate traffic movement. • Measures to maintain pedestrian and cyclist access. • Requirements and methods to inform the local community of impacts on the local road network. • Requirements and methods to consult emergency services (police, ambulance, fire) and SES with regard to traffic delays during construction. • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident. • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic. • Monitoring, review and amendment mechanisms.	Contractor	Pre-construction Construction	Section 2.2 of QA G10 Traffic Management

Traffic and transport	Where practical, heavy vehicle movements will be planned to occur outside the traffic peak hours to minimise impacts on the existing road network operation during construction.	Construction contractor	Construction	Project specific safeguard

6.2 Noise and vibration

6.2.1 Methodology

Potential noise and vibration impact on sensitive receivers during construction and operation of the proposal have been assessed as part of the noise and vibration assessment prepared by Muller Acoustic Consulting and provided in Appendix C.

The noise and vibration assessment has been prepared in accordance with the following guidelines and policies:

- Road Noise Policy (RNP) (Department of Climate Change and Water, 2011).
- Road Noise Criteria Guideline (RNCG) (Transport for NSW, 2023).
- Construction Noise and Vibration Guideline (CNVG) (Roads) (Transport for NSW, 2023).
- Noise Policy for Industry (NPI) (NSW Environment Protection Agency, 2017).
- NSW Interim Construction Noise Guideline (ICNG) (Department of Environment and Climate Change, 2009).

In summary, the methodology for the noise and vibration assessment included the following:

- Identifying and classifying noise and vibration sensitive receivers and defining the proposal area. Receivers were classified using a combination of recent aerial and ground photography, web-based information sources and cadastral data.
- Carrying out unattended noise monitoring at two locations to determine the existing noise environment.
- Establishing project specific construction noise management levels (NML) with reference to the measured background noise levels and the ICNG (Department of Environment and Climate Change, 2009).
- Modelling predicted construction to predict noise levels at the nearest potentially affected receivers.
- Assessing construction noise levels against adopted noise management levels to determine potential impacts.
- Reviewing vibration intensive activities against minimum working distances for vibration intensive plant in the CNVG (Transport for NSW, 2023).
- Assessing of operational road traffic noise against the criteria in the RNP (Department of Climate Change and Water, 2011).
- Identifying safeguards and additional mitigation measures to be implemented to minimise construction noise impacts.

Study area

In accordance with the relevant guidelines, the study area for the purpose of the noise and vibration assessment for the proposal is defined as sensitive receivers located within one kilometre of the proposal.

Noise monitoring

An unattended noise survey was conducted in accordance with the procedures described in (Standards Australia, 1997). All equipment was appropriately calibrated prior to and following the monitoring event. Noise measurements were recorded at two monitoring locations between 8 March and 19 March 2024:

- L1: close to New Lake Entrance Road to measure existing road traffic noise levels.

- L2: at the boundary of dwellings at 30 and 32 Conway Crescent, to measure background noise level at the nearest sensitive receivers.

The monitoring locations are shown in Figure 6-2.

Figure 6-2 Noise logger locations

Noise modelling

A computer model was developed to quantify project noise emissions to neighbouring receivers using DGMR (iNoise, Version 2024) noise modelling software.

The model incorporated a three-dimensional digital terrain map giving all relevant topographic information used in the modelling process. The model uses relevant noise source data, ground type, attenuation from barrier or buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

6.2.2 Existing environment

Sensitive receivers

A review of aerial imagery identifies that the study area in the vicinity of the proposal area comprises predominantly residential properties. The type and number of sensitive receivers within one kilometres of the proposal include:

- About 1,000 residential building.
- About 180 commercial buildings.
- One education building.
- One childcare building.

The location of sensitive receivers is shown in Figure 6-3.

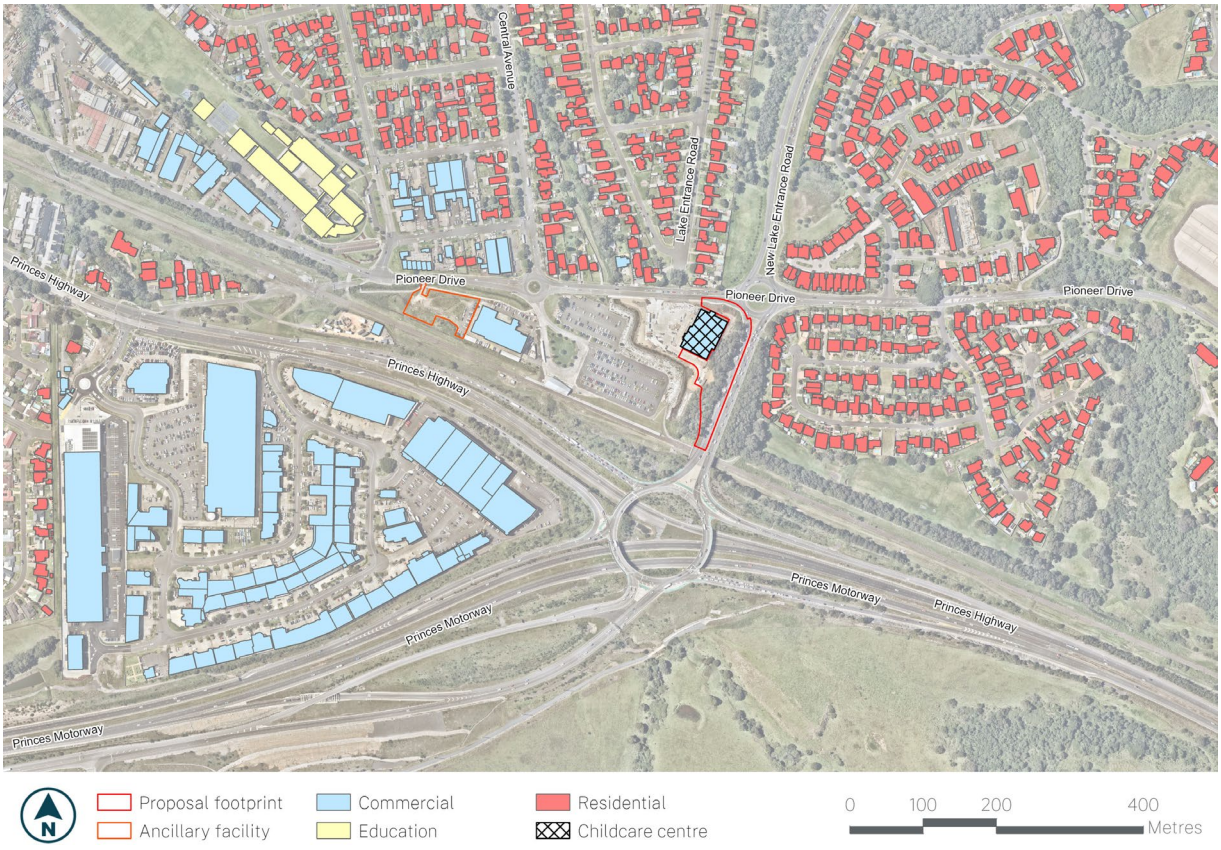

Figure 6-3 Sensitive receiver types

Existing noise environment

The existing noise environment surrounding the proposal area is typical of suburban environment with low to medium density residential housing, public recreation areas, commercial and light industrial premises, childcare centres and schools. The dominant noise sources in the locality include road traffic noise, other transport noise (aircraft and trains) and environmental noise (birds and insects). The existing background noise levels recorded near the proposal area are provided in Table 6-5.

Table 6-5 Existing Background Noise Levels

Location	Measured background noise level, RBL, dBA			Measured dB L_{Aeq}		
	Day 7am to 6pm	Evening 6pm to 10pm	Night 10pm to 7am	Day 7am to 6pm	Evening 6pm to 10pm	Night 10pm to 7am
L1	63	55	39	71	70	65
L2	47	45	37	55	61	50

6.2.3 Noise criteria

Recommended construction noise levels

The ICNG (Department of Environment and Climate Change, 2009) generally applies to the management of construction noise in NSW. This guideline provides recommendations on standard construction hours and construction noise management levels (NMLs). The recommended construction noise levels for residential receivers are summarised in Table 6-6.

Table 6-6 Noise Management Levels for residential receivers

Time of Day	Noise Management Level, $dBL_{Aeq(15min)}$
Recommended standard hours: Monday to Friday 7am to 6pm, Saturday 8am to 1pm, no work on Sundays or public holidays	Noise affected RBL + 10dB(A)
	Highly noise affected 75dB(A)
Outside recommended standard hours*	Noise affected RBL + 5dB(A)

* OOHW Period 1 (Day): Saturdays – 7am to 8am & 1pm to 6pm, Sundays/Public Holidays – 8am to 6pm

OOHW Period 1 (Evening): Monday to Friday – 6pm to 10pm
OOHW Period 2 (Night): Monday to Friday – 10pm to 7am, Saturdays/Sundays/Public Holidays – 6pm to 7am (8am on Sunday mornings and Public Holidays)

Construction noise management levels for the proposal

The NMLs for standard and OOHW periods for residential receivers during construction are summarised in Table 6-7.

Table 6-7 Noise Management Levels for residential receivers during construction

Location	Assessment Period	RBL, dBA	NML (dBA)	Highly noise affected NML (dBA)
L2 – All Residential Receivers	Standard Hours Monday to Friday 7am to 6pm, Saturday 8am to 1pm	47	57	75
	OOHW Period 1 (Day) Saturdays – 7am to 8am & 1pm to 6pm, Sundays/Public Holidays – 8am to 6pm	47	52	75
	OOHW Period 1 (Evening) Monday to Friday – 6pm to 10pm	45	50	75
	OOHW Period 2 (Night) Monday to Friday – 10pm to 7am, Saturdays/Sundays/Public Holidays – 6pm to 7am (8am on Sunday mornings and Public Holidays)	37	42	75

The Noise Management Levels (NMLs) during construction for non-residential receivers in the surrounding area are summarised in Table 6-8.

Table 6-8 Noise Management Levels for non-residential receivers during construction

Location	Assessment Period	Where NML applies	NML (dBA)
Education Institution	When in use	Internal noise level	45
Childcare Centres	When in use	Internal sleeping areas	35
		External play areas	55
Commercial Receivers	When in use	External noise level	70

Operational noise criteria

In accordance with the RNCG (Transport for NSW, 2023), the proposal is classified as minor works. The existing road criteria prescribed by the RNP (Department of Climate Change and Water, 2011) applies where the minor works result in an increase in noise levels by more than 2.0 dBA relative to the existing noise levels at the worst affected receiver.

Vibration criteria

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and heavy commercial/industrial buildings are presented in Table 6-9.

Table 6-9 Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage (British Standard BS 7385)

Type of building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4Hz and above	50mm/s at 4Hz and above
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

Humans may detect vibration levels which are well below levels that may cause damage to buildings or structures. Acceptable criteria for human exposure to continuous, impulsive and intermittent vibration are provided in Table 6-10.

Table 6-10 Vibration criteria for human exposure

Assessment Criteria	Critical working Areas (e.g. hospital operating theatres, precision laboratories)	Residences	Offices	Workshops
Continuous vibration				
Preferred peak velocity (mm/s)	0.14 (day or night*)	0.28 (day) 0.20 (night)	0.56 (day or night)	1.1 (day or night)
Maximum peak velocity (mm/s)	0.28 (day or night)	0.56 (day) 0.40 (night)	1.1 (day or night)	2.2 (day or night)
Impulsive vibration				
Preferred peak velocity (mm/s)	0.14 (day or night)	8.6 (day) 2.8 (night)	18.0 (day or night)	18.0 (day or night)
Maximum peak velocity (mm/s)	0.28 (day or night)	17.0 (day) 5.6 (night)	36.0 (day or night)	36.0 (day or night)
Intermittent vibration				
Preferred value ($m/s^{1.75}$)	0.10 (day) 0.10 (night)	0.20 (day) 0.40 (night)	0.40 (day or night)	0.80 (day or night)
Maximum value ($m/s^{1.75}$)	0.20 (day) 0.20 (day)	0.40 (day) 0.26 (night)	0.80 (day or night)	1.60 (day or night)

*Day is 7am to 10pm and night is 10pm to 7am.

6.2.4 Potential impacts

Construction

Construction noise levels

Construction noise impacts consider the sound power levels (SWLs) of construction plant and equipment involved in each stage, or scenario, of construction. The construction scenarios for the proposal are listed in Table 6-11. The sound power levels of plant and equipment involved in each construction scenario are listed in the noise and vibration assessment (Appendix C).

Noise modelling of construction noise has assumed that all plant and equipment is operating simultaneously and at maximum capacity for the duration of the assessment period. As typical construction plant and equipment are unlikely to operate simultaneously but may be used sequentially across each part of the construction area, this assessment provides an assessment of the likely worst-case impacts from each stage of the construction works during standard hours.

Table 6-11 Proposed construction scenarios

Construction scenario	Description of activities
S1 – Site establishment	• Installation of boundary fences and traffic control measures
S2 – Vegetation Clearing	• Removal or trimming trees to provide a clear corridor
S3 – Utility adjustment	• Relocation of utilities
S4 – Road widening works	• Excavation and formation of road alignment • Placement and compaction of sublayers
S5 – Drainage structures	• Excavation of trenches and pits • Delivery and placement of pipes and pits • Compacting
S6 – Pavement works	• Laying of new pavement
S7 – Road furniture installation / line marking	• Signposting • New line markings
S8 – Ancillary Site	• Operation of ancillary site

Construction would typically be undertaken during standard construction hours, however, some construction activities would be required to be undertaken outside of standard working hours to minimise disruptions to local traffic on New Lane Entrance Road and Pioneer Drive. OOHW may include site establishment works (construction scenario S1), relocation of utilities (construction scenario S3), paving works (construction scenario S6) and line marking and road furniture installation (construction scenario S7).

A summary of the predicted $L_{Aeq(15min)}$ noise emissions for each construction scenario, during various periods, is presented in Table 6-12. Predicted levels exceeding the NMLs are displayed in **bold** text. Predicted noise levels have not been provided for construction scenarios that would not occur outside of standard construction hours.

Table 6-12 Highest Predicted noise level for each construction scenario

Receiver type	Period	NLM (dBL_{Aeq})	S1	S2	S3	S4	S5	S6	S7	S8
Residential	Standard	57	**68**	**74**	**68**	**73**	**66**	**69**	**62**	**62**
	OOHW (Day)	52	**68**	N/A	**68**	N/A	N/A	**69**	**62**	N/A
	OOHW (Evening)	50	**68**	N/A	**68**	N/A	N/A	**69**	**62**	N/A
	OOHW (Night)	42	**68**	N/A	**68**	N/A	N/A	**69**	**62**	N/A
Education	When in use	70	52	51	51	51	52	51	51	50
Child care centre	When in use	60	**64**	**70**	**65**	**69**	**62**	**66**	59	41
Commercial	When in use	70	**71**	**80**	**72**	**76**	70	**73**	64	64

The results of the assessment demonstrate that $L_{Aeq(15min)}$ noise emissions would be above the relevant NMLs for residential receivers for all construction scenarios during standard and OOHW periods.

The noisiest construction scenario during standard hours would be vegetation clearing (construction scenario S2), with up to 30 residential receivers, within 120 metres of the proposal area predicted to experience noise levels above the standard hours NML. Construction noise levels during vegetation clearing are also predicted to exceed the recommended NMLs, including highly affected NML of 75dB $L_{Aeq(15min)}$. Further discussion of NML exceedances for each construction scenario is provided in Table 6-13.

Table 6-13 NML exceedances for construction scenarios

Construction scenario	Number of residential receivers impacted by NML exceedances	Non-residential receivers impacted by NML exceedances
S1	• Standard hours: up to 15 residential receivers within 70 metres of the proposal • OOHW (Day): up to 25 residential receivers within 90 metres of the proposal • OOHW (Evening): up to 40 receivers within 120 metres of the proposal • OOHW (Night): up to 220 receivers within 450 metres of the proposal • Noise levels are not expected to exceed the highly affected NML at any residential receiver location.	• Commercial receivers at the commercial complex located at 10 Pioneer Drive, Oak Flats • Lake Illawarra Police Station at 6 Pioneer Drive, Oak Flats • Little Peoples Early Learning Centre at 10 Pioneer Drive, Oak Flats.
S2	• Standard hours: up to 30 residential receivers within 120 metres of the proposal • Noise levels are not expected to exceed the highly affected NML at any residential receiver location. • This construction scenario is not anticipated to be undertaken outside of standard hours.	• Commercial receivers at the commercial complex located at 10 Pioneer Drive, Oak Flats (including highly affected NML of 75dB $LAeq^{(15min)}$) • Little Peoples Early Learning Centre at 10 Pioneer Drive, Oak Flats.
S3	• Standard hours: up to 15 residential receivers within 85 metres of the proposal • OOHW (Day): up to 25 residential receivers within 105 metres of the proposal • OOHW (Evening): up to 35 receivers within 150 metres of the proposal • OOHW (Night): up to 145 receivers within 450 metres of the proposal • Noise levels are not expected to exceed the highly affected NML at any residential receiver location.	• Commercial receivers at the commercial complex located at 10 Pioneer Drive, Oak Flats • Little Peoples Early Learning Centre at 10 Pioneer Drive, Oak Flats.
S4	• Standard hours: up to 25 residential receivers within 100 metres of the proposal. • Noise levels are not expected to exceed the highly affected NML at any residential receiver location. • This construction scenario is not anticipated to be undertaken outside of standard hours.	• Commercial receivers at the commercial complex located at 10 Pioneer Drive, Oak Flats • Little Peoples Early Learning Centre at 10 Pioneer Drive, Oak Flats.
S5	• Standard hours: up to 12 residential receivers within 70 metres of the proposal	• Little Peoples Early Learning Centre at 10 Pioneer Drive, Oak Flats.

Construction scenario	Number of residential receivers impacted by NML exceedances	Non-residential receivers impacted by NML exceedances
	• Noise levels are not expected to exceed the highly affected NML at any residential receiver location. • This construction scenario is not anticipated to be undertaken outside of standard hours.	
S6	• Standard hours: up to 15 residential receivers within 100 metres of the proposal • OOHW (Day): up to 35 residential receivers within 160 metres of the proposal • OOHW (Evening): up to 50 receivers within 280 metres of the proposal • OOHW (Night): up to 245 receivers within 490 metres of the proposal • Noise levels are not expected to exceed the highly affected NML at any residential receiver location.	• Commercial receivers at the commercial complex located at 10 Pioneer Drive, Oak Flats • Little Peoples Early Learning Centre at 10 Pioneer Drive, Oak Flats.
S7	• Standard hours: up to 7 residential receivers within 50 metres of the proposal • OOHW (Day): up to 13 residential receivers within 80 metres of the proposal • OOHW (Evening): up to 15 receivers within 100 metres of the proposal • OOHW (Night): up to 75 receivers within 290 metres of the proposal • Noise levels are not expected to exceed the highly affected NML at any residential receiver location.	• No exceedances anticipated.
S8	• Standard hours: up to 2 residential receivers within 40 metres of the proposal • Noise levels are not expected to exceed the highly affected NML at any residential receiver location. • This construction scenario is not anticipated to be undertaken outside of standard hours.	• No exceedances anticipated.

Following implementation of standard mitigation measures, it is predicted that no residential receivers would experience noise levels above the trigger levels for the implementation of Additional Mitigation Measures (AMMs) during standard hours or the OOHW (Day) period.

During OOHW (Night), after implementing standard mitigation measures, construction noise levels are predicted to still exceed NMLs. During OOHW (Night), it is predicted that up to 40 residential receivers would experience noise levels above the 'noticeable' AMM trigger level, and up to eight residential receivers would experience noise levels above the 'clearly audible' AMM trigger level during paving works. Additional management measures are prescribed by the CNVG (Transport for NSW, 2023) and AMMs applicable to the construction activities during OOHW (Night) are summarised in Table 6-14.

Maximum noise levels

Construction activities that occur at night may generate noise levels that could cause sleep disturbance at residential receivers near the proposal area. A summary of the predicted maximum noise levels for construction scenarios that would occur during the OOHW (Night) period is provided in Table 6-14.

Table 6-14 Maximum noise levels for OOHW (Night) construction activities

Construction Scenario	Recommended NML (dB L_{Amax})	Highest predicted noise level at residential receivers
S1	65	71
S3	65	71
S6	65	85
S7	65	71

The results of the assessment demonstrate that maximum noise levels are predicted to exceed the maximum noise screening criterion of 65dB L_{Amax} at nearby residential receivers during all construction scenarios. Pavement works (construction scenario S6) were identified as the noisiest construction activity, as a result of a concrete saw being used.
Further assessment of maximum noise levels was undertaken for the activity with the greatest potential for sleep disturbance effects, identified as paving works (S6) utilising a concrete saw. The results of the modelling identified that approximately 23 residential receivers within about 220 metres of the proposal area, and two residential receivers within 65 metres of the compound site are predicted to experience noise levels above the maximum noise screening criterion during paving works (S6). Modelling of maximum noise level events are typically representative of short duration events, such as the peak noise level from a concrete saw or the impact noise from a rock hammer, and are unlikely to be sustained for any length of time.

Standard noise mitigation and management measures in accordance with the ICNG would be implemented during construction of proposal where practicable, including measures to minimise of sleep disturbance within the surrounding locality during night works. Particularly noisy activities, such as concrete sawing, would not be carried out outside standard hours wherever possible.

Construction road traffic noise

Construction of the proposal is anticipated to generate up to 50 heavy vehicle movements and 20 light construction vehicle movements per day at the peak of construction activity. These movements will include about 10 light vehicles and 32 heavy vehicles during standard construction hours, and 10 light vehicles and 18 heavy vehicles during out of hours work periods.

Construction traffic noise would be greatest where there is a concentration of vehicle movements, such as the ancillary facility and the construction slip lane. A summary of the increase in road traffic noise levels from construction traffic associated with the proposal is presented in Table 6-15. The results indicate that due to high existing road traffic noise levels in the locality, construction road noise levels would be negligible, with increases in noise levels anticipated to remain well below the 2dB $L_{Aeq(period)}$ increase criterion.

Table 6-15 Road traffic noise generated by construction of the proposal

Road	Period	Existing traffic	Number of construction vehicles	Increase in traffic volume	Increase in traffic noise (dBLAeq)
New Lake Entrance Road	Day	34,549	42	0.2%	<0.1
	Night	3,303	28	0.9%	<0.1
Pioneer Drive	Day	11,278	42	0.4%	<0.1
	Night	1,078	28	2.6%	<0.2

Vibration

Equipment with the greatest potential for vibration to be used during construction of the proposal include pneumatic hammers (jackhammers) for the demolition of existing concrete structures, and vibratory rollers prior to the placement of the new road pavement surface. Peak levels of vibration from rolling typically occurs as the roller stops to change direction and a resonance is created as the roller (and vibrator) is stationary.

The assessment of potential vibration impacts determined that receivers within about 25 metres of the proposal area may experience vibration levels above the cosmetic damage criterion, and receivers within about 100 metres of the proposal area may experience vibration levels above the human comfort criterion, during the use of the vibratory roller. Additional mitigation measures will be considered for highly vibration intensive activities near residential receivers, and would be detailed in the Construction Noise and Vibration Management Plan (refer to Section 6.2.5).

Operation

Road traffic noise

The proposal would not result in a change to daily traffic volumes or a significant increase in average vehicle speeds, which are the primary determinants for an increase in road traffic noise.

Changes in road traffic noise levels are not predicted to increase by more than the 2dBA increase criteria. Compared to current traffic noise levels, operation of the proposal (noting average traffic speeds are not expected to substantially change) would result in a negligible change in road traffic noise (<0.2dB $L_{Aeq(period)}$ for residential and commercial receivers, including the childcare centre at 10 Pioneer Drive, for both the day period (7am to 10pm) and night period (10pm to 7am).

A second modelling scenario was assessed, assuming an increase in average vehicle speeds of about 25 per cent. The results of the analysis show that where vehicle speeds do increase as a result of the proposal, road traffic noise levels are anticipated to increase by up to 0.8dB $L_{Aeq(period)}$ for nearby residential receivers, and up to 1dB $L_{Aeq(period)}$ for commercial receivers.

As the operational road traffic noise level changes are within the 2dBA increase criteria (above which an increase in noise levels would be discernible), no specific safeguards are required.

Maximum noise levels

The maximum noise level assessment, carried out where noise impacts (potential sleep disturbance) from road traffic noise at night are expected to occur, identified that the $L_{Aeq(1hr)}$ noise levels for the night period (with a +2.5dB correction for façade reflection) would be 58dBA, which is below the maximum noise level assessment criterion of 65dB L_{Amax}.

6.2.5 Safeguards and management measures

Table 6-16 Noise and vibration safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) and identify: • All potential significant noise and vibration generating activities associated with the activity. • Feasible and reasonable mitigation measures to be implemented, taking into account Beyond the Pavement (Transport for New South Wales, 2020). • Additional mitigation measures required, in accordance with CNVG (Transport for NSW, 2023).	Contractor	Pre-construction/ construction	Section 4.6 of QA G36 Environment Protection
Out of hours work	As part of the NVMP, an out-of-hours work protocol will be developed, which defines: • All scheduled and planned out-of-hours activities.	Contractor	Construction	Section 4.6 of QA G36 Environment Protection

	• Very noisy activities should, where practicable, be programmed for normal working hours. If the work cannot be undertaken during the day, it should be completed before 12:00am. In particular, there should be no jackhammering or saw cutting after midnight.			
Noise and vibration	The selection of plant and machinery will consider noise emissions, operated to reduce maximum noise levels, maintained regularly and turned off when not in use.	Contractor	Construction	Additional measure
Noise and vibration	All sensitive receivers (local residents, early childhood centres and education institutions) likely to be affected will be consulted and notified at least 10 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The project. • The construction period and construction hours. • Contact information for project management staff. • Complaint and incident reporting. • How to obtain further information.	Contractor	Pre-construction/ construction	Construction Noise and Vibration Guideline (Transport for NSW, 2023)

6.3 Biodiversity

6.3.1 Methodology

Potential impacts on biodiversity during construction and operation of the proposal have been assessed as part of the Biodiversity Assessment Report (BAR), prepared by Lesryk Environmental and provided in Appendix D. The study area for the BAR comprised of the proposal area, the ancillary facility and vegetation that is adjacent to and continuous with the proposal area.

The methodology for the BAR included the following:

- A desktop review of databases and previous studies to identify Commonwealth and State listed threatened species, populations, and ecological communities or other biodiversity values predicted to occur in the locality of the study area.
- A field survey carried across the study area on 28 March and 11 April 2024, involving:
  - Identify and classify vegetation zones and Plant Community Types (PCT), if present.
  - Opportunistic observations of fauna species.
  - Assessing habitat of the study area and the likelihood of occurrence of threatened species or community identified in database searches.
  - Tree and hollow-bearing tree survey.
- An assessment of likely occurrence of NSW and nationally listed threatened species based on desktop research, field surveys and with regard to their habitat requirements.
- Assessing the potential impacts of construction and operation of the proposal on biodiversity values, including assessments of significance where required.

- Identification of construction and operational safeguards and management measures, as well as the need for any biodiversity offsets.

6.3.2 Existing environment

Landscape context

The proposal area is characterised by paved roads, a vegetated embankment to the west of New Lake Entrance Road and exotic maintained grassland south of Pioneer Drive. The vegetation that occurs on embankment to the west of New Lake Entrance Road was planted in 2003 as part of the landscaping works associated with the construction of the Oak Flats Interchange (Hayes Environmental, 2005). Species that were planted included a diversity of Acacia, Eucalypt and Melaleuca species, with occasional plantings of other local native shrubs and trees.

Previous biodiversity assessments (Niche, 2020) have identified that the proposal area has been highly modified as a result of past road construction, with no natural landforms remaining. At the time of the field survey, due to recent heavy rain fall, some sections of the embankment area exhibiting slumping where surface runoff has been concentrated. Erosion of these sections has exposed the deposited fill material that was used in the embankment construction. No remnant areas of vegetation have been retained and the planted vegetation offers limited habitat to fauna species, given that this vegetation is highly modified and degraded by edge effects and sediment runoff from the roads and the surrounding urban area.

The ancillary facility is characterised by existing hardstand areas that are currently being used for overflow parking, unmaintained patches of exotic grasses and shrubs, and maintained exotic grassland. Several juvenile native trees were identified within the ancillary facility.

Vegetation

The vegetation within the proposal area consists of a canopy of native plantings such as River Red Gum (*Eucalyptus tereticornis*), Spotted Gum (*Corymbia maculata*), Coast White-box (*Eucalyptus quadrangulata*) and Swamp She-Oak (*Casuarina glauca*) up to 15 metres tall. The midstory is comprised of native species such as Bracelet Honey-myrtle (*Melaleuca armillaris* subsp. *armillaris*), Prickly-leaved Tea Tree (*Melaleuca styphelioides*) and exotic species such as Large-leaved Privet (*Ligustrum lucidum*) and Sweet Pittosporum (*Pittosporum undulatum*) up to five metres tall. The understory is dominated by Lantana (*Lantana camara)* up to three metres tall. The groundcover is dominated by exotic species including Cockspur (*Echinochloa crus-galli*), Kikuyu (*Cenchrus clandestinus*), Asparagus Fern (*Asparagus virgatus)*, and Turkey Rhubarb (*Rumex sagittatus*) up to one metre tall. Climbers and vines present in the proposal include native species such as Scrambling Lily (*Geitonoplesium cymosum*) and Wonga-wonga Vine (*Pandorea pandorana*) and exotic species such as Moth Vine (*Araujia sericifera*) and Madeira Vine (*Anredera cordifolia*).

The vegetation within the proposal area does not conform to the definition of any PCTs defined by the BioNet Vegetation Classification system. A PCT is a specific assemblage of native plant species associated with particular environmental conditions such as soil, temperature, moisture, topography and elevation. Vegetation that is classified as a particular PCT would be required to be offset in accordance with the NSW Biodiversity Offset Scheme. Vegetation of the proposal area is instead classified as PCT 0 – Not Classified.

The vegetation within the ancillary facility is also consistent with PCT 0 – Not Classified. A canopy layer is absent and the midstory contains several juvenile Forest Red Gums. The understory, where present, is dominated exclusively by Lantana. The groundcover was dominated by exotic grasses and forbs including Kikuyu, Rhodes Grass (*Chloris gayana*) and Fennel (*Foeniculum vulgare*).

Threatened Ecological Communities

No Threatened Ecological Communities were identified in the study area.

Threatened flora species

No threatened flora species were identified in the study area. Threatened flora species previously recorded or considered to have habitat within 10 kilometres of the study area were determined to have a low likelihood of occurrence in the study area, due to the degraded and disturbed nature of the study area and absence of preferred habitat features.

Threatened fauna species

No threatened fauna species were identified in the study area. Given the small size and isolation of vegetation present within the study area, a lack of important habitat features and the degraded and disturbed nature of

the study area, all threatened fauna species previously recorded or considered to have habitat within 10 kilometres of the study area were determined to have a low likelihood of occurrence in the study area. No indirect evidence (such as large stick nests, damaged trees, white-wash accumulations) to suggest the presence of a viable local population of threatened fauna occurring within, or close to, the study area, was identified.

A flying-fox camp is located at Blackbutt Reserve in Shellharbour, about two kilometres east of the study area. The camp was last surveyed in May 2022, when between 1 and 499 Grey-headed Flying-foxes (*Pteropus poliocephalus*) were recorded. Individuals from this colony may fly over and/or forage upon flowering eucalypts within the study area on occasion.

Fauna habitat

Planted vegetation of the study area offers limited habitat to fauna species, given that this vegetation is highly modified and degraded by weeds, edge effects and sediment runoff from the roads and the surrounding urban area. No hollow-bearing trees or other notable habitat features such as stick nests were identified. When in flower, the eucalypts offer a seasonal foraging resource to highly mobile species such as the Grey-headed Flying-fox, but similar plants are present at other localities within the surrounding urban area. Fauna species identified in the study area were limited to highly mobile and commonly occurring bird and lizard species.

Planted vegetation of the study area occurs as an isolated patch that is fragmented from other areas of vegetation in the surrounding locality by linear infrastructure, including New Lake Entrance Road, Pioneer Drive and the South Coast train line.

Aquatic habitat

One waterway, an unnamed drainage line, is present within the study area. The unnamed drainage line is a constructed channel that is typically dry and conveys water following heavy rainfall events only. This channel extends from the outlet of the concrete box culverts that convey stormwater under New Lake Entrance Road, to three concrete pipe culverts under Pioneer Drive. North of Pioneer Drive, this watercourse flows in a north-westerly direction though urban residential development of Oaks Flat, eventually flowing into Horsley Inlet which drains into Lake Illawarra.

This channel was constructed as part of the development of the commercial property at 10 Pioneer Drive. It is not mapped as Key Fish Habitat.

Groundwater Dependant Ecosystems

A review of the Groundwater Dependent Ecosystems Atlas (BoM 2024b) did not identify any terrestrial, aquatic or subterranean Groundwater Dependent Ecosystems (GDE) within the study area.

Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Values were identified in the study area.

Matters of National Environmental Significance

No Matters of National Environmental Significance (MNES) protected under the EPBC Act occur within the study area.

6.3.3 Potential impacts

Construction

Removal of vegetation

Up to 1.05 hectares of vegetation would be removed for the proposal, including about 0.62 hectares of planted trees, shrubs and exotic vegetation from the proposal area, and about 0.43 hectares of exotic groundlayer vegetation from the ancillary facility. The extent of vegetation to be removed is shown in Figure 6-4. The vegetation to be removed does not comprise a native PCT and is classified as PCT 0-Not Classified.

Figure 6-4 Vegetation to be removed from the proposal area and ancillary facility

Up to 171 individual trees would be removed from the proposal area, including 85 small trees and 86 medium trees. None of these trees support hollows. No amenity trees or large trees require removal.

Removal of habitat

The 1.05 hectares of vegetation to be removed offers limited habitat to locally recorded threatened flora and fauna species. The 0.62 hectares of planted trees, shrubs and exotic vegetation from the proposal area offer some foraging and sheltering habitat to highly mobile fauna species. The 0.43 hectares of exotic groundlayer vegetation to be removed from the ancillary facility offers very limited foraging habitat to highly mobile fauna species. These habitat resources occur commonly throughout the surrounding locality. Construction of the proposal would not isolate or further fragment habitat in the surrounding locality or form an additional barrier to the movement and dispersal patterns of fauna.

Invasion and spread of weeds

Several weed species have been identified in the study area. This includes Lantana, Fireweed (*Senecio madagascariensis*), Climbing Asparagus (*Asparagus plumosus*), Asparagus Fern and Madeira Vine which are listed:

- As Priority Weeds of the South East region (which includes the Shellharbour LGA) (DPI 2024a).
- Under Schedule 3 of the NSW Biosecurity Regulation 2017.
- Weeds of National Significance.

The further spread of weeds is most likely to occur during construction, associated with earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery during all phases.

Invasion and spread of pathogens and disease

There is currently no evidence of *Phytophthora cinnamomi* or *Puccinia psidii* (Myrtle Rust) in the vegetation of the proposal area. The proposal has the potential to introduce, spread or exacerbate plant diseases caused by *Phytophthora cinnamomi* and Myrtle Rust. These diseases are most likely introduced or spread through the importation or movement of soil, water and landscaping materials, either directly or through incidental attachment to machinery.

Reduction in the biodiversity of Australian native fauna and flora due to red imported fire ant (Solenopsis Invicta)

There is currently no evidence for the presence of fire ants in the proposal area. The proposal has the potential to introduce fire ants to the proposal area, via the importation of materials such as mulch, soil (including soil adhering to plant and equipment) that has originated from or has been used in a fire ant-infested area.

Fauna injury and mortality

The removal of native vegetation may result in the injury or mortality of sheltering or nesting wildlife.

Aquatic impacts

Construction of the proposal would not directly impact the constructed channel that flows north-west from the proposal area. Safeguards will be installed to avoid and minimise indirect impacts on this unnamed drainage line, as outlined in Section 6.4.

Impacts on Groundwater Dependent Ecosystems

As there are no GDEs mapped in the proposal area, no impacts on GDEs as a result of construction of the proposal are anticipated.

Light and dust

Earthworks, heavy vehicle deliveries, movement of plant and equipment may generate dust, particularly during dry and windy weather when large area of soil are exposed. Night works would require the installation of temporary lighting, however, as vegetation would most likely be removed from the proposal area in the early stages of construction, impacts of light spill on fauna habitat would be negligible.

Operation

No operational impacts on biodiversity are anticipated, as no further removal of vegetation or habitat would occur post-construction.

The proposal includes the installation new drainage infrastructure, to replaces the existing pit and pipe system that is currently located along the northbound verge of New Lake Entrance Road (refer to Section 6.4 for further information). The existing surface water flow patterns would be maintained, and operation of the proposal is unlikely to result in changes to hydrology for the unnamed drainage line.

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 2016 or FM Act 1994 and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act. Therefore, the proposal does not require referral of the matter to the Federal Minister for the Environment.

6.3.4 Safeguards and management measures

Table 6-17 Biodiversity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity	Clearing and grubbing safeguards will be incorporated and implemented as part of the CEMP. Including but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones. • Pre-clearing survey requirements.	Contractor	Detailed design / pre-construction	Section 4.8 of QA G36 Environment Protection

	• Procedures for unexpected threatened species finds and fauna handling. • Protocols to manage weeds and pathogens.			
Native vegetation, threatened flora and TECs	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Pre-construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
Fauna injury and mortality	Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
Fauna injury and mortality	Vegetation removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
Fauna injury and mortality	Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)

Invasion and spread of weeds	Weed species will be managed in accordance with Guide 6: Weed management of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)

6.3.5 Biodiversity offsets

Transport's Biodiversity Policy (Transport for NSW, 2022) sets out the approach to avoid, minimise, mitigate and offset impacts of Transport projects and includes a commitment to replace native and amenity trees unavoidably lost through development.

Although efforts have been made to avoid, minimise and mitigate potential impacts on biodiversity, some residual impacts would occur. As a result, the proposal would trigger one threshold set out by No Net Loss Guidelines (Transport for NSW, 2022), as summarised in Table 6-18.

Table 6-18 Transport's biodiversity offset thresholds (Transport for NSW, 2022)

Impact	Threshold	Does proposal trigger threshold?
Works involving clearing of a Critically Endangered Ecological Community (CEEC)	Where there is any clearing of an CEEC in 'moderate to good' condition	No
Works involving clearing of an Endangered Ecological Community (EEC)	Where clearing of a EEC ≥2 ha in 'moderate to good' condition	No
Works involving clearing of Vulnerable Ecological Community (VEC)	Where clearing of VEC ≥ 5 ha in 'moderate to good' condition	No
Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species (excluding exotic and planted vegetation that cannot be assigned to a plant community type)	Where clearing ≥1 ha in 'moderate to good' condition	No
Works involving removal of known threatened flora species and their habitat	Where loss of individuals is ≥10 or where clearing of habitat is ≥1 ha	No
Type 1 or Type 2 key fish habitats	Where there is a net loss of habitat	No

Impact	Threshold	Does proposal trigger threshold?
Any residual biodiversity impact that doesn't require offsets in accordance with the No Net Loss Guideline is to be assessed against the requirements of the Tree and Hollow Replacement Guideline.	Any clearing of hollows and/or trees ≥5cm Diameter at Breast Height (DBH)	Yes, 171 trees ≥5cm DBH will be removed from the proposal area

Up to 171 individual trees would be removed from the proposal area (refer to Table 6-19), which will be required to be replaced in accordance with Tree and hollow replacement guidelines (Transport for NSW, 2023). Consistent with Transport's Biodiversity Policy, trees may either be replaced on nearby land with the consent of the landowner or, where this is not feasible, payment may be made to Transport's Conservation Fund.

Transport will consult with Shellharbour City Council to identify potential areas suitable to be planted with replacement trees in the surrounding locality. If suitable land cannot be identified, Transport would pay the required cost into the Conservation Fund.

Table 6-19 Trees to be removed from the proposal area and requirement for replacement or compensation

Tree size	Number of trees to be removed	Replacement requirement	Required number of replacement trees	Required cost to be paid into Conservation Fund
Small trees (DBH greater than 5cm, but less than 20cm)	85	Plant a minimum 2 trees for every tree removed	170	$10, 625
Medium trees (DBH greater than 20 cm, but less than 50cm)	86	Plant minimum 4 trees for every tree removed	344	$43, 000
Total	**171**	**N/A**	**514**	**$53, 625**

6.4 Hydrology, water and flooding

6.4.1 Methodology

Potential impacts of the proposal on surface water, groundwater and flooding were assessed by completing a qualitative desktop assessment. A review of publicly available information was undertaken to inform the existing environment of the proposal area, including:

- Flooding reports and previous hydrology assessments, including:
  - Horsley Creek Flood Study (Rienco Consulting, 2011).
  - Horsley Creek Floodplain Risk Management Study and Plan (GHD, 2017).
- Australian Groundwater Explorer database (Bureau of Meteorology, 2024).

6.4.2 Existing environment

Surface water

The proposal is located within the Horsely Creek catchment, located on the southern side of Lake Illawarra. Watercourses within the catchment generally drain to Horsely Creek and then Horsely Inlet, which flows into Koona Bay in Lake Illawarra. A large proportion of the catchment has been cleared of vegetation for residential and light industrial development, and many of the watercourses have been highly modified and degraded as a result (Rienco Consulting, 2011).

Stormwater from New Lake Entrance Road and surrounding road network is channelled into two concrete box culverts, which discharge into an unnamed drainage line. This unnamed drainage line comprises a constructed channel that is typically dry and conveys water following heavy rainfall events only. This channel extends from

the outlet of the concrete box culverts that convey stormwater under New Lake Entrance Road, to three concrete pipe culverts under Pioneer Drive. North of Pioneer Drive, this watercourse flows in a north-westerly direction though urban residential development of Oak Flats, eventually flowing into Horsley Inlet which drains into Lake Illawarra. This channel was constructed as part of the development of the commercial property at 10 Pioneer Drive.

Groundwater

Groundwater has not been identified in the proposal area by previous geotechnical investigation (Stantec, 2024). Test pit excavations carried out for the development of 10 Pioneer Drive, adjacent to the proposal area, identified the presence of groundwater at a depth of two metres below the existing ground surface level, west and downslope of the existing toe of the embankment along New Lake Entrance Road (SMEC, 2017).

A search of the Australian Groundwater Explorer identified one registered borehole in the locality. The registered borehole (GW013399), located about 250 metres east of the proposal, was installed in 1946 primarily for stock water purposes.

Flooding

The Horsley Creek catchment experiences flooding both from floodwaters rising from Lake Illawarra, as well as localised heavy downpours causing stormwater overland flows, with peak flow typically occurring less than 20 minutes after a storm peak (Rienco Consulting, 2011). In 2011, flood depths of between 0.15 and 0.25 metres were recorded in the unnamed watercourse immediately west of the proposal area. Flood modelling indicates that these flood depths at this same location would generally not increase further under 20%, 10%, 5%, 2% and 1% Annual Exceedance Probability (AEP) events (GHD, 2017).

While the proposal area itself is not flood affected, the ancillary facility may be affected by flood depths between 0.15-0.25 metres during a 1% AEP Flood Event (GHD, 2017).

Figure 6-5: Watercourses in the surrounding area

6.4.3 Potential impacts

Construction

Impacts on surface water

During construction, there is a risk that surface water runoff from the proposal area could impact local receiving waters including the unnamed watercourse downstream of the proposal area, that flows into Horsely inlet. Surface water runoff could erode the works area and adjoining areas outside of the proposal area, carry sediment-laden waters, contaminants and construction waste if not adequately managed. Safeguards have been proposed to ensure adequate erosion and sediment control measures are in place and the risk of water pollution is adequately managed.

Impacts on groundwater

As groundwater has not been previously identified in the proposal area, construction of the proposal is unlikely to interact with groundwater, as construction does not involve any major excavation activities. The proposal would not affect groundwater inflows or drawdown. Construction would not impact the registered borehole located about 250 metres east of the proposal area.

Flooding impacts

Construction activities within the proposal area and ancillary facility are not anticipated to affect flood behaviour. No construction activities would temporarily or permanently obstruct the unnamed watercourse downstream of the proposal area, that flows into Horsely Inlet. The existing concrete box culvert under New Lake Entrance Road would not be affected by construction the proposal. There would be no change in the capacity or velocity of flows through the culvert as a result of the proposal.

The ancillary facility may be affected by flood depths between 0.15-0.25 metres during a 1% AEP Flood Event (GHD, 2017). Flooding during construction could impact the ancillary site and/or cause damage to construction plant and equipment. Construction sites could also increase potential runoff to the catchments during heavy rainfall due to an increase of impermeable surface. However, this increase would be relatively small in terms of the overall catchment area, and unlikely to significantly increase the severity of any flood events. The ancillary facility is not bound by significant barriers to surface water flow and it is expected that in the event of a flood, surface water would drain from the ancillary facility relatively quickly.

Operation

Impacts on surface water

The proposal includes the installation of 450 millimetre pipes and drainage pits along the length of the new verge of the future turning lane. This drainage infrastructure replaces the existing pit and pipe system that is currently located along the northbound verge of New Lake Entrance Road. The new drainage infrastructure would connect to the existing stormwater system and continue to drain to the unnamed watercourse downstream of the proposal area, that eventually flows into Horsely Inlet. As the existing surface water flow patterns will be maintained, operation of the proposal is unlikely to result in increased stormwater flow volumes or velocity.

Impacts on groundwater

Operation of the proposal is unlikely to interact with groundwater. The proposal would not result in groundwater drawdown nor affected groundwater recharge.

Impacts on flooding

Operation of the proposal is not anticipated to affect flood behaviour. The proposal would not modify or obstruct the unnamed watercourse downstream of the proposal area, that flows into Horsely Inlet. The existing concrete box culvert under New Lake Entrance Road would not be affected by operation of the proposal. There would be no change in the capacity or velocity of flows through the culvert as a result of the proposal. The increase in impermeable surface would also be small in the context of the overall catchment.

6.4.4 Safeguards and management measures

Table 6-20 Hydrology safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil and water	A site-specific Erosion and Sediment Control Plan will be prepared and implemented as part of the CEMP. The Plan will include arrangements for managing wet weather events, including	Contractor	Detailed design / pre-construction	Section 2.2 of QA G38 Soil and Water Management

	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.			
Sediment run-off	The extent of ground disturbance and exposed soil will be minimised to the greatest extent practicable to minimise the potential for erosion.	Contractor	Construction	Section 2.2 of QA G38 Soil and Water Management

6.5 Geology, soils and contamination

6.5.1 Methodology

Potential issues relating to geology, soils and contamination relevant to the proposal were identified by completing a desktop review of the following sources:

- EPA contaminated land record of notices (NSW Environmental Protection , 2024) (accessed 2 April 2024).
- Contaminated sites notified to the EPA (NSW Environmental Protection Authority, 2024) (accessed 2 April 2024).
- MinView spatial geology website (Department of Regional NSW, 2024) (accessed 2 April 2024).
- Soil Landscapes of the Kiama 1:100,000 map sheet (Hazelton, 1992).
- Geotechnical and Preliminary Environmental Site Assessment: Multi-Level Retail and Residential Development, Pioneer Drive, Oak Flats, NSW (SMEC, 2017).
- New Lake Entrance Road to Pioneer Drive-Detailed Retaining Wall Design Services Geotechnical Factual Report (Stantec, 2024).

6.5.2 Existing environment

Geology

A review of the MinView spatial geology website (Department of Regional NSW, 2024) identified that the proposal is underlaid by two geological units:

- Much of the proposal area is underlaid by Alluvial Fan Deposits (Qavf), comprised of fluvially deposited quartz lithic sand, silt, gravel and clay.
- A small portion of the proposal area, in proximity to the intersection of New Lake Entrance Road and Pioneer Drive, is underlaid by Berry Siltstone (Pshb), comprised of mid to dark grey siltstone, grading up sequence to very fine grained sandstone, highly fossiliferous with sporadic dropped pebbles.

Soils

The proposal area is located within the Albion Park soil landscape (Hazelton, 1992). This soil landscape is described as being located on “short steep upper slopes with long gentle foot slopes”. The soil is moderately deep (50-100cm) and is described as having limitations of waterlogging, seasonally high water table and a high available water holding capacity (amongst others). These limitations are indicative of a clay based soil with limited infiltration capacity. The topsoils in this landscape have high erodibility while subsoils have moderate erodibility.

Acid Sulfate Soil

Acid Sulfate Soils (ASS) are sediments and soils containing iron sulphides that generate sulphuric acid following exposure to oxygen through drying and rewetting. ASS usually occur in low lying parts of coastal floodplains, rivers and creeks. Potential Acid Sulphate Soils (PASS) contain iron sulphides that have not been exposed to air or oxidised. They pose an environmental risk as they would become acidic when exposed to air during construction activities.

The Acid Sulfate Soil Risk Map (DCCEEW, 2023) indicates that the proposal area is not located within an identified ASS risk area.

Contamination

A search of the NSW EPA's contaminated land record of notices was carried out for the Shellharbour LGA. The search did not identify any sites in or near the proposal area. A search of the List of Contaminated Site Notified to the NSW EPA did not identify any contaminated sites in or near the proposal area.

A Preliminary Environmental Site Assessment was carried on land adjacent to the proposal area, to assess the potential for contamination to be present prior to the development of the commercial property at 10 Pioneer Drive, Oak Flats (SMEC, 2017). Test pits were excavated to depths of between 1.6 m and 3.1 m below existing site ground levels. No chemical analytes exceeded the adopted assessment criteria for soil materials analysed from the site. No asbestos was detected within soil samples tested.

A review of historical aerial photography (Google Earth Pro, 2024) shows that the proposed ancillary facility site was vacant and supported cleared grassland until at least 2008. By 2010, the Lake Illawarra Police Station had been constructed, and the adjacent land (the proposed ancillary facility site) has been stripped of groundlayer vegetation and contained a number of construction stockpiles. By 2011, the proposed ancillary facility site appeared to support groundlayer vegetation again. By 2013-2014, an informal hardstand area had been established and was being used for carparking for the Lake Illawarra Police Station, with informal driveways through the site connecting this hardstand area to Pioneer Drive. Between late 2021 and late 2022, groundcover had again been removed from the south-eastern corner of the site and earthworks undertaken. By 2024, groundcover vegetation had regrown in this area.

Due to past use of the proposed ancillary site, including earthworks and construction stockpiling, potential contamination may be present on the surface or sub-surface. The existing stockpile located within the proposed ancillary facility will be delineated with exclusion fencing to prevent disturbance of this unclassified material.

6.5.3 Potential impacts

Construction

Construction activities involving ground disturbance such as vegetation clearing and progressive excavation for construction of the retaining wall would increase the potential for erosion, which may result in the mobilisation of soils and subsequent sedimentation of receiving environments.

During construction, there would be potential for construction activities to result in contamination of soil and/or water due to leaks and spills of potentially contaminating materials. Measures would be used during construction to minimise the risk of spills and contain spills if they occur. Spill response procedures would be followed.

Operation

Upon completion of construction, any disturbed areas would be stabilised. It is not expected that operation of the proposal would have any ongoing impacts on soils or contamination.

6.5.4 Safeguards and management measures

Table 6-21 Soils safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Contaminated land	A pre-construction Land Condition Assessment will be undertaken of the ancillary facility, to determine the baseline condition of the site prior to being utilised for the proposal.	Transport	Pre-construction	Additional measure
Contaminated land	In the event that indicators of contamination are encountered during construction (such as odours, staining, ACM, visually contaminated materials etc.), work in the immediate area would cease and the Transport Environmental Officer would be notified to provide further direction.	Contractor	Pre-construction	Section 4.2 of QA G36 Environment Protection

Accidental spill	A site-specific emergency spill plan will be developed and include spill-management measures in accordance with the Transport *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities.	Contractor	Pre-construction	Section 4.3 of QA G36 Environment Protection
Unclassified stockpile material	The existing stockpile located within the proposed ancillary facility will be delineated with exclusion fencing to prevent disturbance of this unclassified material.	Contractor	Pre-construction Construction	Additional measure
Contaminated land	A post-construction Land Condition Assessment will be undertaken of the ancillary facility upon the completion of construction, to ensure that the ancillary facility site is returned to its baseline condition.	Transport	Post-construction	Additional measure

Other safeguards and management measures to address soil impacts are identified in Section 6.4.4.

6.6 Aboriginal cultural heritage

6.6.1 Methodology

A preliminary assessment of Aboriginal cultural heritage was carried out for the proposal in accordance with Stage 1 of the PACHCI (Roads and Maritime Services, 2011). The Stage 1 PACHCI advice is provided in Appendix E.

In addition to the Stage 1 PACHCI, an extensive search of the Aboriginal Heritage Information Management System (AHIMS) (Heritage NSW) was conducted on 17 April 2024 to identify and map known Aboriginal heritage sites within, or near the proposal.

6.6.2 Existing environment

An AHIMS search carried out on 17 April 2024 identified eight Aboriginal sites and objects within two kilometres of the proposal. These sites are shown in Table 6-22 and Figure 6-6.

Table 6-22 AHIMS sites within two kilometres of the proposal area

ID	Name	Context	Features	Status	Distance (m)
52-5-0790	YTOF AS 6	Open site	Artefact	Valid	327
52-5-1095	Deakin AS1	Open site	Artefact	Valid	1398
52-2-1159	Karro Bay; Albion Park	Open site	Shell, Artefact (Midden)	Valid	1505
52-5-0647	Koona Bay 2	Open site	Shell	Valid	1572
52-5-0190	Koona Bay 1; Albion Park	Open site	Shell, Artefact (Midden)	Valid	1602
52-5-0762	Yallah to Oaks Flats AS 1	Open site	Artefact	Destroyed	1620
52-5-0221	Kurrura point	Open site	Shell, Artefact (Midden)	Valid	1685

ID	Name	Context	Features	Status	Distance (m)
52-5-0222	Mogurah Point	Open site	Shell, Artefact (Midden)	Valid	1789

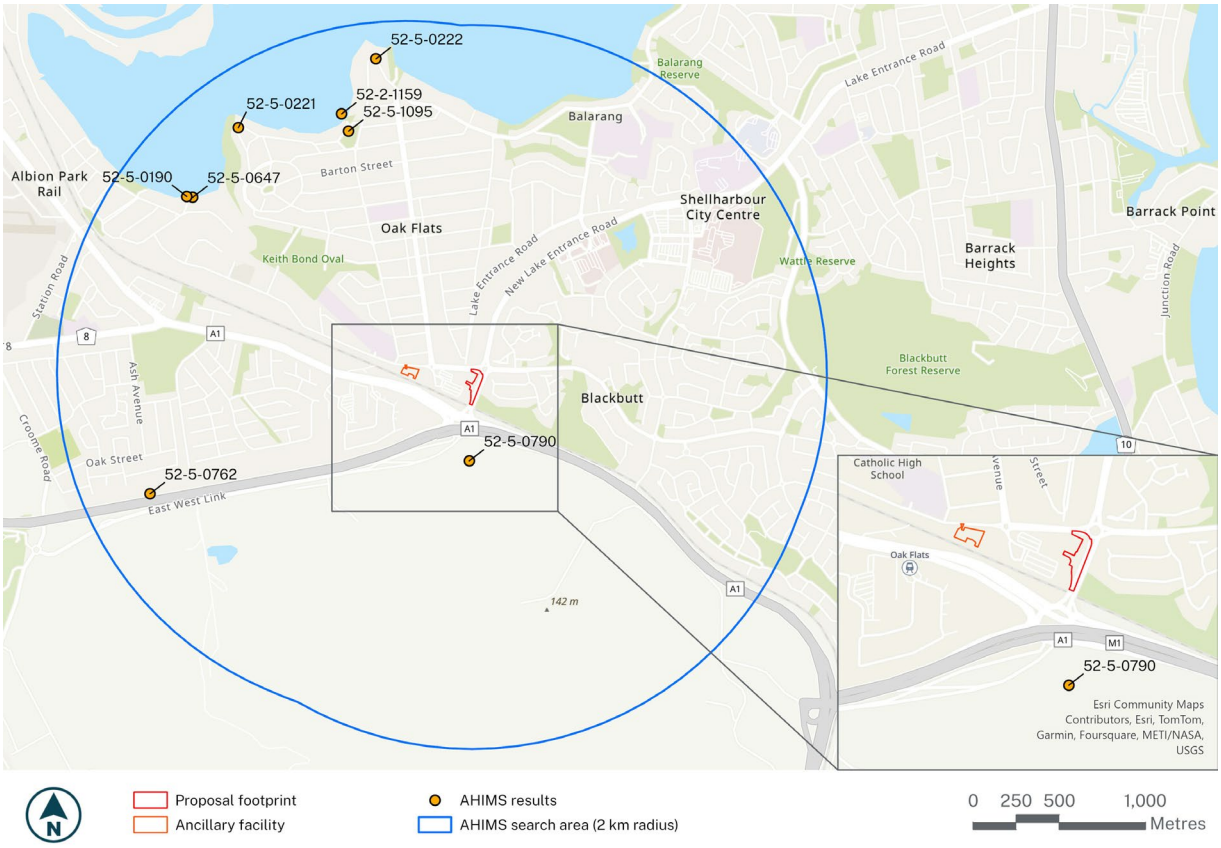

Figure 6-6: AHIMS search results

6.6.3 Potential impacts

Construction

The PACHCI Stage 1 determined that:

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

Any Impact to Aboriginal cultural heritage is therefore not expected during construction.

Operation

The proposal is not expected to have any operational impacts to Aboriginal cultural heritage.

6.6.4 Safeguards and management measures

Table 6-23 Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal heritage	The Unexpected heritage items procedures (Transport for New South Wales, 2022) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	Section 4.9 of QA G36 Environment Protection

6.7 Non-Aboriginal heritage

6.7.1 Methodology

Potential non-Aboriginal heritage issues relevant to the proposal area were considered by completing a desktop review of the following sources:

- Australian Heritage Database (Department of Climate Change, Energy, the Environment and Water, 2024) (accessed 2 April 2024).
- State Heritage Inventory (Heritage NSW, 2024) (accessed 2 April 2024).
- Transport for NSW S170 Heritage and Conservation Register (Transport for NSW, 2024).
- Shellharbour LEP.

6.7.2 Existing environment

A review of databases and the Shellharbour LEP identified one item of non-Aboriginal heritage significance within or near the proposal area; Oak Flats subdivision and road layout (item I033). Item I033 extends from the southern shore of Lake Illawarra in Oak Flats, to the northern side of Pioneer Drive. The proposal footprint and ancillary facility do not encroach on the mapped extent of item I033. The location of item I033 in relation to the ancillary facility and the proposal footprint is shown in Figure 6-7. No heritage conservation areas were identified within or near the proposal area.

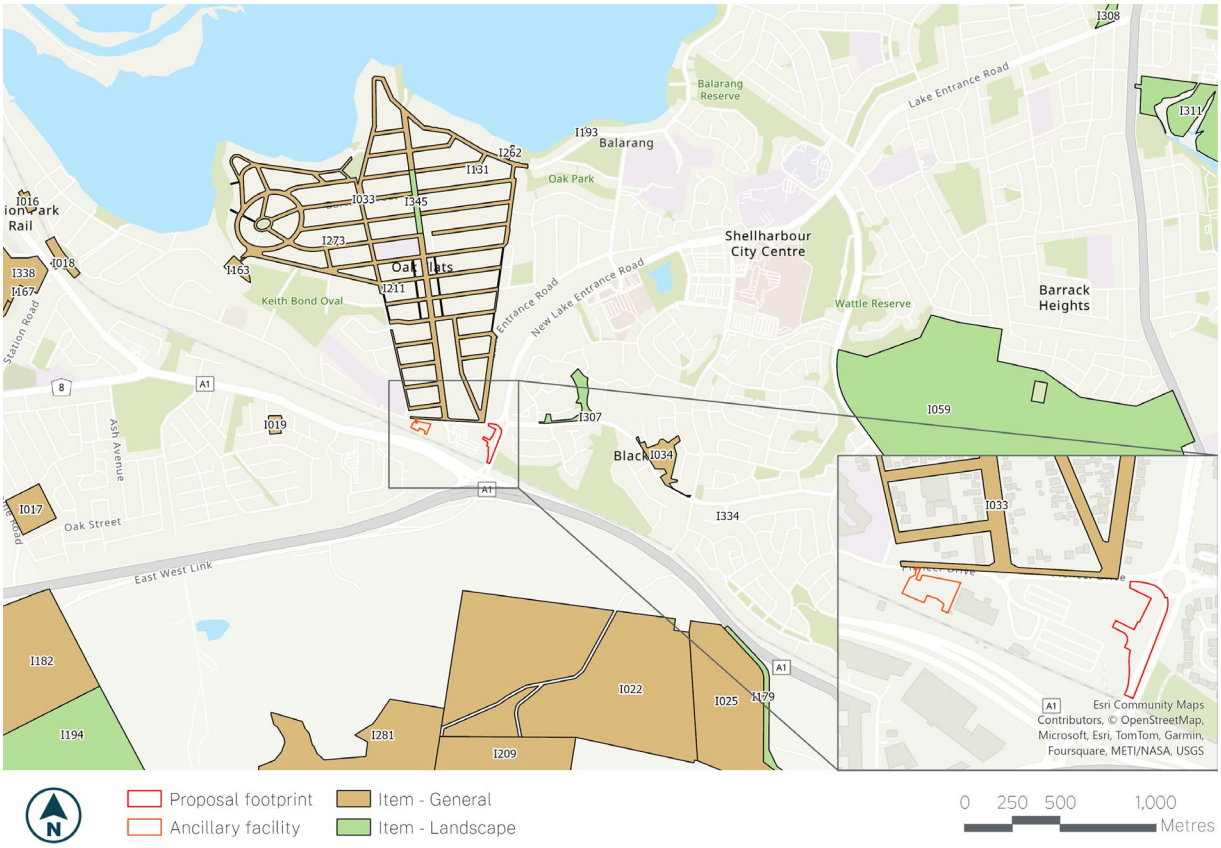

Figure 6-7 Location of non-Aboriginal heritage item I033

6.7.3 Potential impacts

Construction

Construction of the proposal would not impact upon items of non-Aboriginal heritage significance, or heritage conservation areas.

Operation

Operation of the proposal would not impact upon items of non-Aboriginal heritage significance, or heritage conservation areas.

6.7.4 Safeguards and management measures

Table 6-24 Non-Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non-Aboriginal heritage	The Unexpected heritage items procedures (Transport for New South Wales, 2022) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Pre-construction, Construction	Section 4.9 of QA G36 Environment Protection

6.8 Landscape character and visual impacts

6.8.1 Methodology

Potential impacts on landscape character and visual amenity were assessed by completing a qualitative desktop assessment which included:

- Viewing the streetscape during a site inspection and on Google Maps Streetview
- Review of the Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment (EIA-N04) (Transport for NSW, 2023)
- Preparing a qualitative assessment of potential impacts during both construction and operation
- Identification of safeguards and mitigation measures to address potential impacts.

The Guidelines for Landscape Character and Visual Impact Assessment establish an assessment process with reference to the sensitivity of an area and magnitude of the proposal in that area (refer to Table 6-25).

Table 6-25: Landscape character and visual impact assessment matrix

		MAGNITUDE			
SENSITIVITY		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

Guidance on the meaning of different ratings is provided in Table 6-26.

Table 6-26: Magnitude and sensitivity of visibility

Rank	Description
Negligible	Very minor loss or alteration to one of more key elements/features/characteristics of the baseline visual character (i.e. pre-upgrade view) and/or introduction of elements that are consistent with the visual character to the existing landscape character (i.e. approximating the 'no change' situation).
Low	Minor loss of/or alteration to one or more key elements/features/characteristics of the baseline visual character (i.e. pre-upgrade view) and/or introduction of elements that are consistent with the existing landscape character.
Moderate	Partial loss of/or alteration to one or more key elements/features/characteristics of the baseline visual character (i.e. pre-upgrade view) and/or introduction of elements that may be prominent but not considered to be substantially uncharacteristic of the existing landscape character.
High	Substantial to total loss of key elements/features/characteristics of the baseline visual character (i.e. pre-upgrade view) and/or introduction of elements considered to be totally uncharacteristic of the existing landscape character.

The landscape character assessment considered the combination of the area's built, natural, and cultural character or sense of place. The impact was determined by applying the landscape character and visual impact assessment matrix.

The potential visual impact of the proposal has been assessed in relation to the key viewpoints. The levels of potential visual impact have been assessed by considering the combination of magnitude of visual change in the landscape and its proximity to the viewer and the sensitivity in relation to the quality of the view and how sensitive it is to the proposed change.

The magnitude of visual change is strongly influenced by the level of visibility of the proposal resulting from the combination of scale, extent, distance and duration of the views. Visual sensitivity depends on the nature of the existing environment and on the likely response from people viewing the scene. For example, people driving on a busy road and/or at high speeds are likely to be less sensitive to a change in the environment

since they are focused on changes in traffic conditions and driving, compared to someone who is enjoying a recreational experience or someone who is viewing the scene from their living room.

6.8.2 Existing environment

Landscape and topography

The proposal is located upon the low-lying coastal plain south of Lake Illawarra. The dominant features of the landscape in which the proposal is situated includes:

- Significant linear infrastructure, such as arterial and local roads, the South Coast train line, the Princes Highway and the Princes Motorway.
- Medium density residential development of the suburbs of Oak Flats and Blackbutt, characterised by single and two-storey dwellings.
- Light industrial and commercial development along Pioneer Drive.
- Social infrastructure such as Lake Illawarra Police Station and Oak Flats Train Station.
- Public open space, landscaped areas and vegetated areas such as along New Lake Entrance Road, Karen's Corner Park and alongside the South Coast train line.
- Utility services including street lighting and overhead powerlines.

Given the limited scale of the proposal, it was not necessary to divide the proposal area and adjacent areas into separate landscape character zones.

Potential viewers

Potential viewers of the proposal include:

- Residents along Pioneer Drive (near the intersection of New Lake Entrance Road), the southern end of Lake Entrance Road and Theodore Street, the southern end of Albatross Drive.
- Employees of and visitors to commercial properties at 10 Pioneer Drive, which directly adjoins the proposal. This includes the early childhood education centre and fitness centre.
- Road users, pedestrians and cyclists along Pioneer Drive and New Lake Entrance Road.
- Pedestrian and cyclists utilising the shared user path between Oak Flats Train Station and Blackbutt.
- Train passengers travelling on the South Coast rail line.

For assessment, three representative viewpoints have been identified. These viewpoints are described in Table 6-29 and are shown in Figure 6-8.

Table 6-27: Magnitude and sensitivity of visibility

ID	Description	Image	Sensitivity
V1	View south-west from residential properties on the north-east corner of the intersection. Residences on the eastern side of Ne Lake Entrance Road would have a similar view, except at a closer distance and partially screened by a concrete wall.		Low While this is experienced by a residential receiver, the level of sensitivity to change in the view is assessed as low recognising that it includes a busy intersection.

ID	Description	Image	Sensitivity
V2	View north along New Lake Entrance Road.		Low The level of sensitivity to change in the view is assessed as low noting that it is experienced only for short periods and almost exclusively by road users.
V3	View east from 10 Pioneer Drive, Oak Flats.		Moderate The level of sensitivity to change in the view is assessed as moderate recognising the screening effect of existing native vegetation along the western side of New Lake Entrance Road.

Figure 6-8: Location of assessed viewpoints

6.8.3 Potential impacts

Construction

The construction phase of the proposal would result in temporary visual impacts to the existing landscape and would include:

- Construction vehicles entering and existing the proposal area and ancillary facility.
- Machinery and equipment moving about the proposal area and ancillary facility.

- Construction security/exclusion fencing surrounding the construction footprint.
- Signage.
- Stockpiling and storage of construction materials.
- Vegetation removal from the proposal area.

These visual impacts would occur for the duration of construction, anticipated to be about six months. Visual impacts would be localised, and views of construction activities would most commonly be experienced by road users of New Lake Entrance Road and Pioneer Drive. Users and visitors of the commercial property at 10 Pioneer Drive (including Little Peoples Early Learning Centre), which directly adjoins the proposal, would also have direct views of construction activities.

Temporary lighting would be required for construction activities that would be required to be undertaken outside of standard working hours, to minimise disruptions to local traffic on New Lakes Entrance Road and Pioneer Drive (refer to Section 3.3). As no residential properties directly adjoin the proposal area, potential impacts of light spill would be negligible (noting partial screening by a wall for residences on the eastern side of New Lake Entrance Road).

Operation

Operation of the proposal would overall be consistent with the existing visual character of the area, as the proposal comprises modest widening of an existing arterial road. There would be some change to the tree lined character of the road at this location.

Visual impact ratings for the three assessed viewpoints are provided in Table 6-28.

Table 6-28: Visual impact ratings for assessed viewpoints

ID	Description	Magnitude of change	Impact
V1	View south-west from residential properties on the north-east corner of the intersection.	Moderate	Moderate-low
V2	View north along New Lake Entrance Road.	Moderate	Moderate-low
V3	View east from 10 Pioneer Drive, Oak Flats.	Moderate	Moderate

The removal of the existing vegetation from the proposal area would affect the view experienced by road users of New Lake Entrance Road and Pioneer Drive. The removal of existing vegetation from the proposal area would give northbound road users an unobscured view of the landscape features to the west, including the multistorey commercial development at 10 Pioneer Drive, the South Coast train line, Oak Flats Train Station and commuter carpark, and Lake Illawarra Police Station. The view from southbound road users would be somewhat buffered by northbound vehicular traffic.

The removal of existing vegetation would also give residents in near the intersection of New Lake Entrance Road and Pioneer Drive an unobscured view of the multistorey commercial development at 10 Pioneer Drive, the South Coast train line, Oak Flats Train Station and commuter carpark, and Lake Illawarra Police Station. However, these views would mainly be from windows of the upper levels of dwellings that adjoin Pioneer Drive. Distant views to the foothills of the escarpment, south of the Princes Motorway, would also become visible.

Users and visitors of the commercial property at 10 Pioneer Drive (including Little Peoples Early Learning Centre), which directly adjoins the proposal, would also have direct views of the widened New Lake Entrance Road, unobscured by vegetation.

New street lighting to be installed as part of the proposal would generally align with the current number of and intervals between street lights.

6.8.4 Safeguards and management measures

Table 6-29 Landscape character and visual safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Lighting	Minimise night works and provide lighting which minimises light spill.	Contractor	Construction	Additional measure
Visual amenity	Construction areas and the ancillary facility will be maintained during construction, kept tidy and well-presented including sorting regular removal of excess materials to reduce visual impact.	Contractor	Construction	Additional measure
Visual amenity	The ancillary facility and construction areas (outside of the operational area of the proposal) will be progressively restored to at least its pre-construction condition.	Contractor	Construction, post-construction	Additional measure

6.9 Socio-economic, property and land use

6.9.1 Methodology

The socio-economic assessment was prepared in accordance with the Environmental Impact Assessment Practice Note: Socio-economic assessment (Transport for NSW, 2020). This socio-economic assessment:

- Identifies the existing socio-economic characteristics of the locality through desktop research including reference to Australian Bureau of Statistics 2021 Census of Population and Housing data.
- Identifies the types and locations of social infrastructure that could be affected by the proposal.
- Identifies the location of businesses that could be affected by the proposal.

The socio-economic assessment has evaluated the significance of impacts by considering sensitivity (vulnerability to change and capacity to adapt) and magnitude (scale, duration, intensity, and scope) of the proposal.

6.9.2 Existing environment

Land use and tenure

The proposal area is located within the public road reserve and is surrounded by various land uses including:

- Medium density residential development of Oak Flats and Blackbutt to the east and north.
- Light industrial and commercial development along Pioneer Drive, Oak Flats. An early childhood education centre and fitness centre at 10 Pioneer Drive directly adjoin the proposal to the west.
- Major transport infrastructure, including the South Coast Rail Line, Princes Highway and Princes Motorway to the south.
- Social infrastructure including public services such as Oak Flats Train Station and bus stops at Oak Flats Train Station, and recreational areas such as Karen's Corner Park to the north.
- Lake Illawarra Police Station to the west and adjacent to the ancillary facility.

Local businesses and industry

The largest employment sectors in Shellharbour LGA are hospitals, other social assistance services, aged care residential services, supermarket and grocery stores and iron smelting and steel manufacturing (Australian Bureau of Statistics, 2021). Local businesses adjacent to the proposal at 10 Pioneer Drive include Little People's Early Learning Centre, Warrigal Care and Planet Fitness. Other businesses on Pioneer Drive, west of

Central Avenue, include pet grooming, car detailing and food retail services. Key income and employment information for the Shellharbour LGA is summarised in Table 6-30.

Table 6-30 Key income and employment data (Australian Bureau of Statistics, 2021)

Indicator	Shellharbour LGA
Median household income (weekly)	$1,647
Unemployment	4.3%

Utilities

A Sydney Water 600 millimetre water main is located below the footpath alongside the southern verge of Pioneer Drive, a portion of which falls within the proposal area. An existing water valve along this pipeline also occurs within the proposal area.

Several Telstra conduits are located in the area around and above the water main, these may need slight movement or protection as part of the water main works.

An existing electricity cable is located below the footpath alongside the southern verge of Pioneer Drive, and western verge of New Lake Entrance Road, that services several existing light poles that will be replaced as part of the project.

An existing sewer crosses the proposal area about 80 metres south of the intersection of New Lake Entrance Road and Pioneer Drive.

Population and demographics

Key population and demographic information for the Shellharbour LGA is summarised in Table 6-31.

Table 6-31: Key population and demographic information (Australian Bureau of Statistics, 2021)

Indicator	Shellharbour LGA	NSW
Population	76, 271	8,072,161
Median age	39	39
Age 0-14 years	19.2%	18.2%
Age 15-65 years	62.6%	64.2%
Age 65 and over	18.3%	17.7%
Aboriginal and/or Torres Strait Islander	5%	3.4%

Travel to work

The primary mode of travel for people in the Shellharbour LGA is by car, with 61.4% of employed people over the age of 15 travelling to work in a car as a driver or a passenger. A much higher proportion of the Shellharbour LGA population travel to work by car than the broader NSW population, where only 47.2% travel to work by car. The proportion of households that have two, three or more cars per household is also higher in Shellharbour than across NSW. Just 1.1% of people in Shellharbour LGA travel to work by public transport, and this proportion is smaller the than the broader NSW population, where 4% of the population travels to work by public transport. A summary of the method of travel to work is provided in Table 6-32.

Table 6-32 Methods of travel to work for Shellharbour LGA (Australian Bureau of Statistics, 2021)

Indicator	Shellharbour LGA	NSW
Car (as driver)	57.5%	43.1%
Car (as passenger)	3.2%	3.2%
Walked	0.9%	2.5%
Truck	0.8%	0.7%
Bus	0.5%	0.9%
Public transport	1.1%	4%
2 motor vehicles per household	38.9%	34.1%

3 or more vehicles per household	22.9%	17.5%

6.9.3 Potential impacts

Construction

Potential construction impacts associated with the proposal would be localised. The estimated duration of construction is six months. The proposal would have the potential to cause minor and temporary impacts (as considered in this chapter of the REF), such as:

- Construction of the proposal may temporarily impact the local amenity and character of the proposal area. Impacts to amenity would generally result from construction noise, dust and visual impacts and would generally be experienced by road users, nearby residential receivers and commercial properties.
- Construction of the proposal would provide direct employment opportunities which would positively impact local workers and contractors engaged to deliver the proposal.
- Construction of the proposal would result in up to nine car and three bus parking bays along the southern side of the commercial property at 10 Pioneer Drive being temporarily unavailable.

Each section of Chapter 6 provides safeguards to minimise impacts associated with the construction phase of the proposal and would in-turn contribute to minimising socio-economic impacts of the proposal during construction. Safeguards are proposed in this section to further reduce impacts to the community by way of notifications to potentially affected local residents and businesses.

Operation

The proposal would operate within land zoned 'SP2 Infrastructure' under the Shellharbour LEP and would be generally consistent with the objectives of this zone, as considered in Table 4-1. The proposal is located on land owned by Transport and would not involve any property acquisition.

Operation of the proposal is expected to benefit the local community in both the short term and long term. The increased width of New Lake Entrance Road would be used in the short term to separate the bicycle lane from live traffic, thereby providing a safer route for cyclists. Ultimately, this additional width would support the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work. A reduced construction duration and magnitude of the ultimate upgrade of the intersection would minimise adverse environmental impacts on the surrounding community.

6.9.4 Safeguards and management measures

Table 6-33 Property and land use safeguards and land use

Impact	Environmental safeguards	Responsibility	Timing	Reference
Socio-economic impacts	Local residents and affected businesses will be notified before work starts regarding the timing, duration and likely impact of construction activities, including interruptions to utility services.	Transport	Pre-construction	Additional measure

6.10 Other impacts

6.10.1 Existing environment and potential impacts

Table 6-34 Other potential impacts

Environmental factor	Existing environment	Potential impacts
Air quality	Sensitive receivers for air quality include known or likely future locations where people are likely to work or reside. This includes but is not limited to dwellings, schools, hospitals, offices or public recreational areas. Sensitive receivers include: • Pedestrians, cyclists and road users along New Lake Entrance Road and Pioneer Drive • Surrounding residential, commercial and light industrial areas. The main influence on existing air quality would be road traffic, noting that the Princes Motorway is located about 200 metres south of the proposal, which conveys four lanes of high-speed traffic. Additional influences on air quality include the operation of the hard rock quarries in Croom, about two kilometres south of the proposal.	Potential impacts associated with the proposal include minor emissions from machinery (e.g. delivery vehicles, construction plant) and dust. Emissions from construction vehicles / equipment would be minor and short term. Dust could be generated from a variety of activities including: • Earthworks for construction of the rockfill wall • Transportation and handling of soils and materials • Use of construction vehicles, machinery, plant and equipment. The total amount of dust would depend on the silt and moisture content in the soil, prevailing weather conditions and the types of activities being carried out. Depending on wind speed and direction, short-term impacts could be experienced at some nearby sensitive receivers, although these would be highly localised. Nuisance dust can be expected to impact on residential and commercial areas when annual average dust deposition levels exceed 4g/m^2/month. The mobilisation of dust associated with the proposal is expected to be below nuisance levels through the implementation of appropriate mitigation measures.

Environmental factor	Existing environment	Potential impacts
Waste and resource use	Transport for NSW is committed to ensuring the responsible management of unavoidable waste and promotes the reuse of such waste in accordance with the resource management hierarchy principles outlined in the *Waste Avoidance and Resource Recovery Act 2001*. These resource management hierarchy principles, in order of priority are: • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Disposal is undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*). By adopting the above principles, Transport for NSW aims to efficiently reduce resource use, reduce costs, and reduce environmental harm in accordance with the principles of ecologically sustainable development.	The proposal is not expected to generate large quantities of waste materials. The following waste streams have been identified during construction of the proposal: • Spoil • Waste concrete / asphalt • General garbage and refuse. Vegetation to be removed from the proposal area would be mulched and reused on site or for landscaping purposes on other Transport-managed projects. Operation of the proposal will involve the use of resources including, electricity, water, fuel and oils. Detailed design is to consider sustainability opportunities such as renewable energy options and water sensitive design in line with Transport's Sustainability Plan 2021. Further detail is provided in Section 8.

Environmental factor	Existing environment	Potential impacts
Climate change and greenhouse gases	AdaptNSW Interactive Climate Change Projections map (AdaptNSW, 2024)for the Illawarra Region identified that the region is projected to: • Increase in temperature by 0.6°C between 2020 and 2039 • Increase in temperature by 1.9°C between 2060 and 2079 • Decrease in annual rainfall of 0.4% between 2020 and 2039 • Increase in annual rainfall of 6.5% between 2060 and 2079 • Decrease in the number of cold nights (<2°C) by 4.4 nights between 2020 and 2039 • Decrease in the number of cold nights (<2°C) by 11.2 nights between 2060 and 2079 • Increase in the number of high danger fire days by 0.4 days between 2060 and 2079 • Increase in the number of hot days (>35°C) by 1.9 days between 2020 and 2039 • Increase in the number of hot days (>35°C) by 5.4 days between 2060 and 2079.	The following construction activities would generate greenhouse gas emissions during construction: • Fossil fuel combustion during the use of plant, equipment and vehicles • Electricity use • Embedded emissions from manufacture and delivery of materials. During operation, climate change risks would include: • Increased carbonation rate of concrete resulting in reinforced concrete structures not lasting their required lifespan • More extreme and frequent rainfall events combined with sea level rise leading to flooding events and stormwater flows beyond design stage predictions leading to increased flooding to travel lanes and/or unexpected overflows to private property. Climate change risks would be considered further during finalisation of the design and construction procurement.

Environmental factor	Existing environment	Potential impacts
Hazards and risks	Existing hazards and risks are associated with the operation of the existing road network and the presence of above-ground and underground utilities. The proposed ancillary facility could also be at risk of flooding in larger storm events (refer to Section 6.4).	Hazards and risks associated with the construction of the proposal would potentially include: • Carrying out work within or next to a busy road • Carrying out work near existing services and utilities (e.g. power lines and water main) • The use and storage of hazardous materials • The use of heavy machinery • Unexpected excavation of contaminated land • Sparks and/or hot works causing fire, particularly during dry, hot periods • Unauthorised access to the construction work site • Inundation of the ancillary facility during larger storm events. Construction hazards and risks are manageable through the application of standard mitigation measures, which have been includes in this REF and/or which would be developed by the construction contractor prior to construction. Hazards or risks associated with the operation of the proposal would not represent any substantial change from the existing road environment.

6.10.2 Safeguards and management measures

Table 6-35 Other impacts Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality	Safeguards will be implemented as part of the CEMP. These will include but not be limited to: • Potential sources of air pollution. • Air quality management objectives consistent with any relevant published EPA and/or DPE guidelines. • Mitigation and suppression measures to be implemented. • Methods to manage work during strong winds or other adverse weather conditions.	Contractor	Pre-construction	Section 4.4 of QA G36 Environment Protection
Waste management	Safeguards will be implemented as part of the CEMP. These will include but not be limited to: • Measures to avoid and minimise waste associated with the project.	Contractor	Pre-construction	Section 4.2 of QA G36 Environment Protection

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• Classification of wastes and management options (re-use, recycle, stockpile, disposal). • Statutory approvals required for managing on- and off-site waste, or application of any relevant resource recovery exemptions. • Procedures for storage, transport and disposal monitoring, record keeping and reporting.			
Waste	A Waste Management Plan (WMP) will be prepared 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 project. • classification of wastes and management options (re-use, recycle, stockpile, disposal). • statutory approvals required for managing on- and off-site waste, or application of any relevant resource recovery exemptions. • procedures for storage, transport and disposal. • monitoring, record keeping and reporting. The WMP will align with the Environmental Procedure - Management of Wastes on Transport for NSW Land (Transport, 2014) and relevant Transport Waste fact sheets.	Contractor	Pre-construction, construction	Section 4.2 of QA G36 Environment Protection

6.11 Cumulative impacts

6.11.1 Study area

The study area for the cumulative impact assessment considered other projects located within a five-kilometre radius of the proposal area. Searches of the NSW Major Projects Register and Shellharbour City Council's current capital works and works under investigation were undertaken to identify any major developments within the study area.

6.11.2 Other projects and developments

Shellharbour City Council projects under assessment, development or construction in the study area include:

- Lake Entrance Road retaining wall renewal, between Government Road and Lang Street Oak Flats (about 250 metres north of the proposal): renewing damaged or deteriorating sections of the existing retaining wall, modifying two existing pedestrian ramp/step crossings and installed guard rail along the upper section of the project. Project is currently on hold while council seeks a suitable contractor.

Major projects under assessment, development or construction in the study area include:

- New Shellharbour Hospital, 85 Dunmore Road, Dunmore (about four kilometres south-east of the proposal): construction of a new hospital, at-grade and multi-storey carpark, widening and upgrade

works to Dunmore Road, landscaping, utility/ services connections, and other supporting infrastructure. Project is currently seeking approval from DPHI.

6.11.3 Potential impacts

Table 6-36 Potential cumulative impacts

Environmental factor	Construction impacts	Operational impacts
Noise and vibration	There is the potential for the proposal to occur concurrently with nearby construction works associated with other projects. There is low potential for cumulative noise impacts (generating a higher noise level than for any individual project) where works are carried out at the same time. As there are other projects within 600 metres of the proposal it is likely there would be cumulative noise impacts on receivers affected by the proposal when noise generating construction activities occur concurrently. Without coordination, nearby projects may also interrupt respite periods of the proposal. This would exacerbate noise impacts on sensitive receivers.	The operation of other projects identified near the proposal are unlikely to create noise and vibration impacts to sensitive receivers of the proposal. Therefore, there are no expected cumulative noise impacts likely to affect sensitive reivers during operation of the proposal.
Traffic and transport	Multiple projects which generate construction traffic, and / or which involve traffic lane closures can combine to result cumulative delays and affect people's ability to access places of employment, services, family and friends. Where lane closures are needed, coordination with other projects would reduce the potential for cumulative impacts (i.e. the number of closure/diversion periods).	The proposal would improve the operational performance of the road network and would have a positive effect on the cumulative impacts of other projects on traffic and transport.

6.11.4 Safeguards and management measures

Table 6-37 Cumulative safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative construction impacts	Current and upcoming projects with the potential to interact with the proposal will be monitored. Where potential cumulative impacts are identified, the scheduling of works will be coordinated with interacting projects to minimise potential impacts. This will include: • Scheduling works to allow suitable respite periods for construction noise. • Scheduling of works to minimise consecutive construction noise impacts, where feasible. • Coordinating lane closures and pedestrian/cyclist diversions to	Transport	Pre-construction Construction	Project specific control

		minimise the overall number of occasions where disruption occurs.			

7. Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts during detailed design, construction and operation. A framework for managing potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are listed.

7.1 Environmental management plans (or system)

Safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A CEMP will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Transport for NSW Environment and Sustainability Officer 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 would be developed 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 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 proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Manager Environment and Sustainability Manager or Local Environment Officer prior to commencement of the activity. As a minimum, the CEMP will include the following: • Requirements associated with statutory approvals. • Roles and responsibilities. • Communication requirements. • Induction and training requirements. • Details of how the project will implement the identified safeguards outlined in the REF, including those relating to the management of biodiversity, soil and water, landscape and visual, air quality and waste. • Issue-specific environmental management plans, specifically Traffic and Transport and Noise and Vibration. • Procedures for monitoring and evaluating environmental performance, and for corrective action. • Reporting requirements and record-keeping. • Procedures for emergency and incident management. • Procedures for audit and review. • The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor / Transport for NSW project manager	Pre-construction / detailed design	QA G36 Environment Protection
TT1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport Traffic Control at Work Sites Technical Manual (Transport for NSW, 2022) and QA Specification G10 Traffic Management (Transport for NSW, 2022). The TMP will include: • Confirmation of haulage routes.	Contractor	Pre-construction Construction	Section 4.8 of QA G36 Environment Protection

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Measures to maintain access to local roads and properties. • Site-specific traffic control measures (including signage) to manage and regulate traffic movement. • Measures to maintain pedestrian and cyclist access. • Requirements and methods to inform the local community of impacts on the local road network. • Requirements and methods to consult SES regarding traffic delays during construction. • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident. • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic. • Monitoring, review and amendment mechanisms.			
TT2	Traffic and transport	Where practical, heavy vehicle movements will be planned to occur outside the traffic peak hours to minimise impacts on the existing road network operation during construction.	Construction contractor	Construction	Additional measure
NV1	Noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) and identify: • All potential significant noise and vibration generating activities associated with the activity. • Feasible and reasonable mitigation measures to be implemented, considering Beyond the Pavement: urban design policy, process and principles (Transport, 2014). • Additional mitigation measures required, in accordance with CNVG (Transport for NSW, 2023). • A monitoring program to assess performance against relevant noise and vibration criteria. • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures.	Contractor	Pre-construction/ construction	Section 4.6 of QA G36 Environment Protection

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.			
NV2	Out of hours work	As part of the NVMP, an out-of-hours work protocol will be developed, including any requirements set under the EPL which defines: • All scheduled and planned out-of-hours activities. • Any oversized and other deliveries needing to take place out-of-hours as required by the police or other authorities for safety reasons. • Other tie-in, utility connection and intersection work that may need to take place out-of-hours for road user safety issues. • Out-of-hours emergency work needed to prevent the loss of life, property, to prevent harm or as agreed under negotiation with EPA and affected sensitive receivers. • The record-keeping process for capturing agreed and emergency out-of-hours work. • Very noisy activities should, as much as practicable, be programmed for normal working hours. If the work cannot be undertaken during the day, it should be completed before 12:00am. In particular, there should be no jackhammering or saw cutting after midnight.	Contractor	Construction	Section 4.6 of QA G36 Environment Protection
NV4	Noise and vibration	The selection of plant and machinery will consider noise emissions, operated to reduce maximum noise levels, maintained regularly and turned off when not in use.	Contractor	Construction	Additional measure
NV5	Noise and vibration	All sensitive receivers (local residents, early childhood centres and education institutions) likely to be affected will be notified at least 7 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The project. • The construction period and construction hours. • Contact information for project management staff. • Complaint and incident reporting. • How to obtain further information.	Contractor	Pre-construction/ construction	Construction Noise and Vibration Guideline (Transport for NSW, 2023)

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B1	Biodiversity	Clearing and grubbing safeguards will be incorporated and implemented as part of the CEMP. Safeguards will include but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones. • Pre-clearing survey requirements. • Procedures for unexpected threatened species finds and fauna handling. • Protocols to manage weeds and pathogens.	Contractor	Detailed design / pre-construction	Section 4.8 of QA G36 Environment Protection
B2	Native vegetation, threatened flora and TECs	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Pre-construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
B3	Fauna injury and mortality	Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
B4	Fauna injury and mortality	Vegetation removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
B5	Fauna injury and mortality	Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
					and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
B6	Invasion and spread of weeds	Weed species will be managed in accordance with Guide 6: Weed management of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
B7	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024).	Contractor	Construction	Biodiversity Management Guideline: Protection and managing biodiversity on Transport for NSW project (Transport for NSW, 2024)
SW1	Soil and water	A site-specific Erosion and Sediment Control Plan will be prepared and implemented as part of the CEMP. The Plan will include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.	Contractor	Detailed design / pre-construction	Section 2.2 of QA G38 Soil and Water Management
SW2	Sediment run-off	The extent of ground disturbance and exposed soil will be minimised to the greatest extent practicable to minimise the potential for erosion.	Contractor	Construction	Section 2.2 of QA G38 Soil and Water Management
C1	Contaminated land	A pre-construction Land Condition Assessment will be undertaken of the ancillary facility, to determine the baseline condition of the site prior to being utilised for the proposal.	Transport	Pre-construction	Additional measure

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
C2	Contaminated land	In the event that indicators of contamination are encountered during construction (such as odours, staining, ACM, visually contaminated materials etc.), work in the immediate area would cease and the Transport Environmental Officer would be notified to provide further direction.	Contractor	Pre-construction	Section 4.2 of QA G36 Environment Protection
C3	Accidental spill	A site-specific emergency spill plan will be developed and include spill-management measures in accordance with the Transport Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities.	Contractor	Pre-construction	Section 4.3 of QA G36 Environment Protection
C4	Unclassified stockpile material	The existing stockpile located within the proposed ancillary facility will be delineated with exclusion fencing to prevent disturbance of this unclassified material.	Contractor	Pre-construction Construction	Additional measure
C5	Contaminated land	A post-construction Land Condition Assessment will be undertaken of the ancillary facility upon the completion of construction, to ensure that the ancillary facility site is returned to its baseline condition.	Transport	Post-construction	Additional measure
AH1	Aboriginal heritage	The Unexpected Heritage Items Procedure (Transport for NSW, 2022) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	Section 4.9 of QA G36 Environment Protection
NH1	Non-Aboriginal heritage	The Unexpected heritage items procedures (Transport for New South Wales, 2022) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Pre-construction, Construction	Section 4.9 of QA G36 Environment Protection

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
LV1	Lighting	Minimise night works and provide lighting which minimises light spill.	Contractor	Construction	Additional measure
LV2	Visual amenity	Construction areas and the ancillary facility will be maintained during construction, kept tidy and well-presented including sorting regular removal of excess materials to reduce visual impact.	Contractor	Construction	Additional measure
LV3	Visual amenity	The ancillary facility and construction areas (outside of the operational area of the proposal) will be progressively restored to at least its pre-construction condition.	Contractor	Construction, post-construction	Additional measure
SE1	Socio-economic impacts	Local residents and affected businesses will be notified before work starts regarding the timing, duration and likely impact of construction activities, including interruptions to utility services.	Transport	Pre-construction	Additional measure
AQ1	Air quality	Safeguards will be implemented as part of the CEMP. These will include but not be limited to: • Potential sources of air pollution. • Air quality management objectives consistent with any relevant published EPA and/or DPE guidelines. • Mitigation and suppression measures to be implemented. • Methods to manage work during strong winds or other adverse weather conditions.	Contractor	Pre-construction	Section 4.4 of QA G36 Environment Protection
W1	Waste management	Safeguards will be implemented as part of the CEMP. These will include but not be limited to: • Measures to avoid and minimise waste associated with the project. • Classification of wastes and management options (re-use, recycle, stockpile, disposal). • Statutory approvals required for managing on- and off-site waste, or application of any relevant resource recovery exemptions. • Procedures for storage, transport and disposal monitoring, record keeping and reporting.	Contractor	Pre-construction	Section 4.2 of QA G36 Environment Protection
CI	Cumulative construction impacts	Current and upcoming projects with the potential to interact with the proposal will be monitored. Where potential cumulative impacts are	Transport	Pre-construction Construction	Additional measure

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		identified, the scheduling of works will be coordinated with interacting projects to minimise potential impacts. This will include: • Scheduling works to allow suitable respite periods for construction noise. • Scheduling of works to minimise consecutive construction noise impacts, where feasible. • Coordinating lane closures and pedestrian/cyclist diversions to minimise the overall number of occasions where disruption occurs.			

7.3 Licensing and approvals

No licences or approvals are anticipated to be required for the proposal.

8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Section 193 of the Environmental Planning and Assessment Regulation 2021.

8.1 Justification

While the proposal would result in some environmental impacts, including traffic, noise and vibration and visual impacts, these potential impacts have been minimised through appropriate design measures and site-specific mitigation measures and safeguards.

Compared with the 'do nothing' option where the intersection of New Lake Entrance Road and Pioneer Drive in Oak Flats is not upgraded, existing congestion and queuing would not be alleviated and benefits for future upgrades would not be achieved, the benefits of the proposal outweigh the identified and potential impacts.

8.1.1 Social factors

Construction of the proposal could result in some short-term negative social impacts. The combined effect of construction noise, temporary traffic delays as well as general disturbance caused by construction activity, could result in a temporary loss of amenity for local residents, road users, business owners along Pioneer Drive and others who live near the proposal. However, the social benefits of undertaking the proposal include:

- Providing a safer route for cyclists, with the increased width of New Lake Entrance Road being used in the short term to separate the bicycle lane from live traffic.
- Providing improved traffic queuing conditions, with the additional left turn lane providing an increased capacity for queuing vehicles on New Lake Entrance Road, on approach to Pioneer Drive. This would reduce queuing back to the off-ramps from the Princes Motorway and Princes Highway.
- Minimising adverse environmental impacts (including reducing the construction duration and magnitude of impacts) of the ultimate upgrade of the intersection of New Lake Entrance Road and Pioneer Drive on the surrounding community, by reducing the need for future work.

8.1.2 Biophysical factors

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats within the meaning of the BC Act. Therefore, a Statement of Significance 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. Therefore, a referral under the provisions of the EPBC Act is not required.

The biophysical benefits of undertaking the proposal include being constructed and operated on land which is specifically zoned for the development of infrastructure, and which has been previously disturbed and modified for road construction. As described in Section 6.3, vegetation to be removed comprises planted trees and shrubs, which is not classified as a native PCT.

8.1.3 Economic factors

The proposal is consistent with several strategies and plans including:

- Future Tranport Strategy
- Transport Sustainability Plan
- Future Energy Strategy
- Road Safety Plan 2021.

An outline of these strategies and plans and how they apply to the proposal is presented in Section 2.1. The main economic benefit of undertaking the proposal relates to reducing the need for future work required for the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive.

8.1.4 Public interest

The proposal is expected to benefit the local community in both the short term and long term. Factors of the proposal that are in the public interest include:

- The increased width of New Lake Entrance Road would be used in the short term to separate the bicycle lane from live traffic, thereby providing a safer route for cyclists.
- The proposal would also provide improved traffic queuing conditions, with the additional left turn lane providing an increased capacity for queuing vehicles on New Lake Entrance Road, on approach to Pioneer Drive. This would reduce queuing back to off-ramps from the Princes Highway and Princes Motorway.
- Ultimately, the increased width of New Lake Entrance Road would support the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work. A reduced construction duration and magnitude of the ultimate upgrade of the intersection would minimise adverse environmental impacts on the surrounding community.

8.2 Objects of the EP&A Act

Table 8-1 Objects of the Environmental Planning and Assessment Act 1979

Instrument	Requirement
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal would provide short-term safety benefit and minimise adverse environmental impacts on the surrounding community associated with the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive. The proposal has been designed to minimise the environmental and social impacts of the surrounding area. Safeguards and management measures would be implemented to minimise any environmental impacts associated with construction and operation of the proposal.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically sustainable development is considered in Section 8.2.1.
1.3(c) To promote the orderly and economic use and development of land.	The proposal is located on land that is zoned for the provision of infrastructure. The proposal is compatible with existing infrastructure.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposal.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The proposal would have minimal direct and indirect impacts on the environment, as detailed in Section 6.3. These impacts have been minimised and mitigated where possible. Residual impacts biodiversity impacts will be offset. The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the BC Act. The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	There are no items of built and cultural heritage (including Aboriginal cultural heritage) near the proposal. No impacts on built and cultural heritage (including Aboriginal cultural heritage) are anticipated as a result of the proposal.

Instrument	Requirement
1.3(g) To promote good design and amenity of the built environment.	The proposal has been subject to consideration of urban design and visual impacts (refer to Section 6.8).
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.	Consultation was undertaken with Shellharbour City Council and State Emergency Services regarding environmental and planning issues relevant to the proposal (refer to Section 5.4). Key stakeholders will be consulted prior to the commencement of, and during the proposed works. Notification will be undertaken a minimum of Ten days prior to the commencement of the work. Communication will include a letter drop, a media release and traffic alerts.

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 assessment of environmental impacts for this REF and the development of mitigation measures. Specialist studies were incorporated to gain a detailed understanding of the existing environment and identify best practice environmental mitigation and management measures to minimise environmental risks.

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.

Operation of the proposal is expected to benefit the local community in both the short term and long term. The increased width of New Lake Entrance Road would be used in the short term to separate the bicycle lane from live traffic, thereby providing a safer route for cyclists. Ultimately, this additional width would support the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work. A reduced construction duration and magnitude of the ultimate upgrade of the intersection would minimise adverse environmental impacts on the surrounding community. These short and long-term benefits are relevant to both current and future generations of local communities.

Conservation of biological diversity and ecological integrity

Preserving biological diversity and ecological integrity requires that ecosystems, species and genetic diversity within species are maintained. Trees to be removed from the proposal area will be offset in accordance with Tree and hollow replacement guidelines (Transport for NSW, 2023). Consistent with Transport's Biodiversity Policy, trees may either be replaced on nearby land with the consent of the landowner or, where this is not feasible, payment may be made to Transport's Conservation Fund.

Transport will consult with Shellharbour City Council to identify potential areas suitable to be planted with replacement trees in the surrounding locality. If suitable land cannot be identified, Transport would pay the required cost into the Conservation Fund.

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.

The value of the project to the community in terms of improved safety was recognised. Ultimately, the proposal would support the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work. A reduced construction duration and magnitude of the ultimate upgrade of the intersection would minimise adverse environmental impacts on the surrounding community.

8.3 Conclusion

The proposal to upgrade the intersection of New Lake Entrance Road and Pioneer Drive in Oak Flats is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. This has included consideration, impacts on threatened species and ecological communities and their habitats, and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and retaining wall options assessment. The proposal, as described in the REF, best meets the project objectives but would result in impacts on traffic and transport, noise and vibration and landscape character. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve road safety, cyclist safety and would support the long-term upgrade of the intersection of New Lake Entrance Road and Pioneer Drive, by reducing the need for future work. On balance the proposal is considered justified, and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared nor approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance nor the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

9. Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.

Name:	Laura Hoffman
Position:	Associate - Environment
Company name:	BD Infrastructure
Date:	16/7/2024

I certify that I have reviewed and endorsed the contents of this REF and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under Section 170 of the EP&A Regulation, and the information is neither false nor misleading. I accept it on behalf of Transport for NSW.

Name:	Sarah Bowhay
Position:	Project Development Manager
Transport region/program:	Project Development South
Date:	16/07/2024

10. EP&A Regulation publication requirement

Table 10-1 EP&A Regulation publication requirement

Requirement	Yes/No
Does this REF need to be published under Section 171(4) of the EP&A Regulation?	Yes

11. References

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Terms and acronyms used in this REF

Table 11-1 Terms and acronyms used in this REF

Term / Acronym	Description
AusLink	Mechanism to facilitate cooperative transport planning and funding by Commonwealth and state and territory jurisdictions
BC Act	*Biodiversity Conservation Act 2016 (NSW)*
CEMP	Construction environmental management plan
EIA	Environmental impact assessment
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
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)*
Heritage Act	*Heritage Act 1977 (NSW)*
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
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)*
NML	Noise Management Level
NPW Act	*National Parks and Wildlife Act 1974 (NSW)*
OEH	Office of Environment and Heritage within the Department of Planning and Environment.
OOHW	Out of Hours Work
PEA Act	*Protection of the Environment Administration Act 1991.*
QA Specifications	Specifications developed by Transport for use with road work and bridge work contracts let by Transport.
RMS	NSW Roads and Maritime Services, now Transport for NSW
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 (Precincts – Central River City)	State Environmental Planning Policy (Precincts – Central River City) 2021
SEPP (Precincts – Eastern Harbour City)	State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021

SEPP (Precincts – Regional)	State Environmental Planning Policy (Precincts – Regional) 2021
SEPP (Resilience and Hazards)	State Environmental Planning Policy (Resilience and Hazards) 2021
SEPP (Transport and Infrastructure)	State Environmental Planning Policy (Transport and Infrastructure) 2021
SES	State Emergency Service
Transport	Transport for NSW

Appendix A - Consideration of Section 171 factors and matters of national environmental significance and Commonwealth land

Section 171 Factors

In addition to the requirements of the Guideline for Division 5.1 assessments (DPE 2022) and the Roads and Related Facilities EIS Guideline (DUAP 1996) as detailed in the REF, the following factors, listed in Section 171 of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
• Any environmental impact on a community? The proposal would involve temporary minor environmental impacts during the construction phase. Temporary construction impacts relate to traffic and transport impacts, noise and vibration impacts, and landscape character and visual impacts. These potential construction impacts would be managed through the implementation of safeguards, therefore resulting in a temporary and/or minor impacts. Longer-term operational issues relate to the removal of vegetation and habitat and a change in existing views as a result of the loss of vegetation to be removed. The magnitude of these impacts is minor and they would be managed through the implementation of safeguards, resulting in a minor long-term impact. The proposal would result in positive improvements to road safety and traffic efficiency within the community.	Short term minor (negative). Long term minor (negative). Short term minor (positive).
• Any transformation of a locality? Construction of the proposal would result in temporary impacts for the existing locality, predominantly through negative visual amenity impacts associated with the placement and movement of construction plant and equipment as well as vegetation removal. These impacts would be minimised through the implementation of a range of safeguards outlined in Section 7. The magnitude of these impacts are not considered to be transformative for the Oak Flats locality and surrounding suburbs.	Short term, minor (negative).
• Any environmental impact on the ecosystems of the locality? Construction of the proposal would result in the loss of about 1.05 hectares of vegetation. Vegetation to be removed does not consist of a native PCT and offers limited habitat resources to threatened flora and fauna species. Potential construction impacts would be managed through the implementation of safeguards of offsets, therefore resulting in a minor impacts on the ecosystems of the locality.	Short term and long term minor (negative).
• Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? During construction, the proposal would temporarily reduce the visual amenity of the locality due to the removal of vegetation, and visibility of the construction works. During operation, the absence of vegetation would give the community unbuffered views of adjacent landscape features, including linear infrastructure, carparks and a commercial development. During construction there would be additional construction traffic movements and traffic impacts on New Lake Entrance Road and the immediate surrounding road network. During operation, traffic and safety aspects of the proposal are anticipated to be improved. No scientific or recreational values of the locality are anticipated to be impacted due to the proposal.	Short term, minor, (negative). Long term (neutral).
• Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	Nil.

Factor	Impact
There are no items of aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance (including Aboriginal cultural heritage) near the proposal. Therefore no impacts on built and cultural heritage (including Aboriginal cultural heritage) are anticipated as a result of the proposal.	
• Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? Vegetation to be removed is not classified as a native Plant Community Type, and comprises 1.05 hectares of native and exotic trees and shrubs, that offers limited habitat to protected fauna. The 171 native trees species (small and medium) to be removed will be offset in accordance with Tree and hollow replacement guidelines (Transport for NSW, 2023). Consistent with Transport's Biodiversity Policy, trees may either be replaced on nearby land with the consent of the landowner or, where this is not feasible, payment may be made to Transport's Conservation Fund. Potential impacts would be managed through the implementation of safeguards, therefore resulting in a minor impacts on habitat of protected fauna.	Long-term, minor (negative)
• Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal is unlikely to further endanger any species of flora or fauna due to the small area of disturbed vegetation proposed to be removed.	Long-term, minor (negative)
• Any long-term effects on the environment? The removal of vegetation from the proposal area would have a long-term minor negative impact on the existing environment.	Long-term, minor (negative)
• Any degradation of the quality of the environment? During construction, degradation of the quality of the environment could occur through sediment-laden run-off leaving the proposal area, chemical spills and fuel leaks. Landscape and visual amenity may be impacted by the presence of signage and construction machinery. These potential construction impacts would be managed through the implementation of safeguards, therefore resulting in a temporary and/or minor impacts. The removal of a small area of vegetation from the proposal area would have a long-term minor negative impact on the existing environment.	Long-term, minor (negative)
• Any risk to the safety of the environment? Environmental management plans and work health and safety plans would be implemented to minimise any safety risks during construction of the proposal.	Short term, minor (negative)
• Any reduction in the range of beneficial uses of the environment? The proposal would result in traffic impacts during construction which would include a small increase in the volume of heavy vehicles, interruption of traffic flow and temporary change in speed limit. These traffic impacts would temporarily reduce the beneficial use of the local road network during construction. In the long-term, there would be no reduction in the range of beneficial uses of the environment.	Short term, minor (negative)
• Any pollution of the environment? During construction, pollution of the environment could occur through sediment-laden run-off leaving the proposal area, chemical spills and fuel leaks. These potential construction impacts would be managed through the implementation of	Short term, minor (negative)

Factor	Impact
safeguards, therefore resulting in a temporary and/or minor impacts.	
• Any environmental problems associated with the disposal of waste? Contaminated waste is not anticipated to be generated or uncovered because of the proposal. Stockpile and compound sites would be managed in a way that minimises on-site waste and manages excess materials. Waste generated by the proposal would be recycled or reused as much as practicable. All materials that cannot be reused or recycled would be disposed of appropriately.	Nil.
• Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? All required resources for the proposal are readily available and have not been identified as being in short supply.	Nil.
• Any cumulative environmental effect with other existing or likely future activities? No cumulative impacts are expected.	Nil.
• Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposal is not located within a coastal area and would not result in any impact on coastal processes and coastal hazards.	Nil.
• Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1, The proposal aligns with state level strategic plans, as detailed in Section 2.1.	Nil
• Other relevant environmental factors. The proposal would not impact on any other environmental factors.	In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Section 6 of this assessment.

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Department of Climate Change, Energy, the Environment and Water .

A referral is not required for proposed actions that may affect nationally-listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
• Any impact on a World Heritage property? There are no World Heritage listed items located in the proposal area or within close proximity to the proposal area. The proposal would not impact on any World Heritage properties.	Nil.
• Any impact on a National Heritage place? There are no National Heritage places listed items located in the proposal area or within close proximity to the proposal area. The proposal would not impact on any National Heritage places.	Nil.

Factor	Impact
• Any impact on a wetland of international importance? There are no wetland of international importance listed items located in the proposal area or within close proximity to the proposal area. The proposal would not impact on any wetlands of international importance.	Nil
• Any impact on a listed threatened species or communities? No threatened species or threatened ecological communities were identified in the proposal area. The small area of disturbed vegetation to be removed from the proposal area offers limited habitat to threatened flora and fauna species previously recorded within 10 kilometres of the proposal area. The BAR concluded that the proposal would not have a significant impact on any threatened species or ecological communities.	Nil
• Any impacts on listed migratory species? The small area of vegetation to be removed does not comprise preferred habitat for listed migratory species. The proposal would not have a significant impact on migratory bird species.	Nil
• Any impact on a Commonwealth marine area? There are no Commonwealth marine areas located in or within close proximity to the proposal. The proposal would not impact on a Commonwealth marine area.	N/A
• Does the proposal involve a nuclear action (including uranium mining)? The proposal related to road and rail infrastructure and does not involve a nuclear action.	N/A
• Additionally, any impact (direct or indirect) on the environment of Commonwealth land? The proposal is not located on Commonwealth land and would not result in any impact (direct or indirect) on Commonwealth land.	N/A

Appendix B - Statutory consultation checklists

Transport and Infrastructure SEPP

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No	Not applicable	Section 2.110
Bus Depots	Does the project propose a bus depot?	No	Not applicable	Section 2.110
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No	Not applicable	Section 2.110

Development within the Coastal Zone

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No	Not applicable	Section 2.14

Note: See interactive map at *Planning Portal NSW spatial viewer -find a property*. Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program.

Council related infrastructure or services

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	No	Not applicable	Section 2.10
Traffic	Are the works likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area?	No	Not applicable	Section 2.10
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a	No	Not applicable	Section 2.10

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
	substantial impact on the capacity of any part of the system?			
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No	Not applicable	Section 2.10
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	No	Not applicable	Section 2.10
Road & footpath excavation	Will the works involve more than *minor* or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No	Not applicable	Section 2.10

Local heritage items

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	No	Not applicable	Section 2.11

Flood liable land

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	No	Not applicable	Section 2.12

Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance?	No	Not applicable	Section 2.13

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government.

Public authorities other than councils

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	No	Not applicable	Section 2.15
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Not applicable	Section 2.15
Navigable waters	Do the works include a fixed or floating structure in or over navigable waters?	No	Not applicable	Section 2.15
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Not applicable	Section 2.15
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Not applicable	Section 2.15
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in Section 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	Not applicable	Section 2.15
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	Not applicable	Section 2.15

Appendix C – Noise and Vibration Assessment

Appendix D – Biodiversity Assessment Report

Appendix E-PACHCI STAGE 1

NSW GOVERNMENT