Townson Road Upgrade between Richmond Road & Jersey Road – Stage 1

Review of Environmental Factors

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Prepared by GHD Pty Ltd and Transport for NSW

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Document controls

Approval and authorisation

Title	**Townson Road Upgrade between Richmond Road & Jersey Road – Stage 1 review of environmental factors**
Accepted on behalf of Transport for NSW by:	**Matty Mathivanar** **Project Development Manager**
Signed:	*M Mathivanar*
Dated:	9 February 2021

Document status

Document status	Date	Prepared by	Reviewed by
Draft REF	3 March 2020	Sarah Viney	Aryel Pyliotis
Final draft REF	4 May 2020	Karen Yale	Kate Day
Final draft REF	6 November 2020	Karen Yale	Kate Day
Final REF	5 February 2021	Karen Yale	Matt Ferreira

Executive summary

The proposal

Transport for NSW proposes to widen and upgrade about 1.6 kilometres of Townson Road, between Richmond Road and Durham Road/Jersey Road. Key features of the proposal include:

- Widening and upgrading about 1.6 kilometres of Townson Road, between Richmond Road and Durham Road/Jersey Road, to provide:
  - Two 3.5 metre wide traffic lanes in each direction
  - A new section of Townson Road about 250 metres long, to the east of the existing alignment, between Meadow Road and Durham Road/Jersey Road to maintain east-west connectivity
- Providing a wide central median along the length of the upgrade narrowing at intersections to accommodate for turning lanes
- Constructing two bridges, each about 36 metres long, to reduce flooding afflux with one bridge over Bells Creek and another bridge about 50 metres east of Bells Creek
- Providing a new southbound slip lane at Richmond Road intersection from Townson Road
- Providing two new signalised intersections allowing all turning movements to and from Townson Road/Victory Road/'A planned new road', and formalised pedestrian crossings at each leg of the signalised intersection
- Constructing stubs for Victory Road north and the planned new road to the north and south of the Townson Road intersection, with a 3.5 metre wide traffic lane in each direction
- Providing a 3.0 metre wide shared path for pedestrians and cyclists on the southern side of Townson Road along the length of the proposal and a pedestrian crossing across the new southbound slip lane from Townson Road to Richmond Road
- Providing a 1.2 metre wide footpath on the northern side of Townson Road along the length of the proposal.

The proposal is to be delivered in phases – interim and ultimate. The delivery of the proposal would initially provide an interim phase with a single carriageway, one lane in each direction, on the southern side of the road corridor incorporating earthworks to allow future full road construction. Construction of the interim phase is anticipated to start in early 2022, opening to traffic in 2023. It is anticipated that the interim phase would be operational for a period of up to five years before the ultimate four lane dual carriageway is completed.

Key features of the interim and ultimate phases of the proposal are shown in Figures E1 and E2 below.

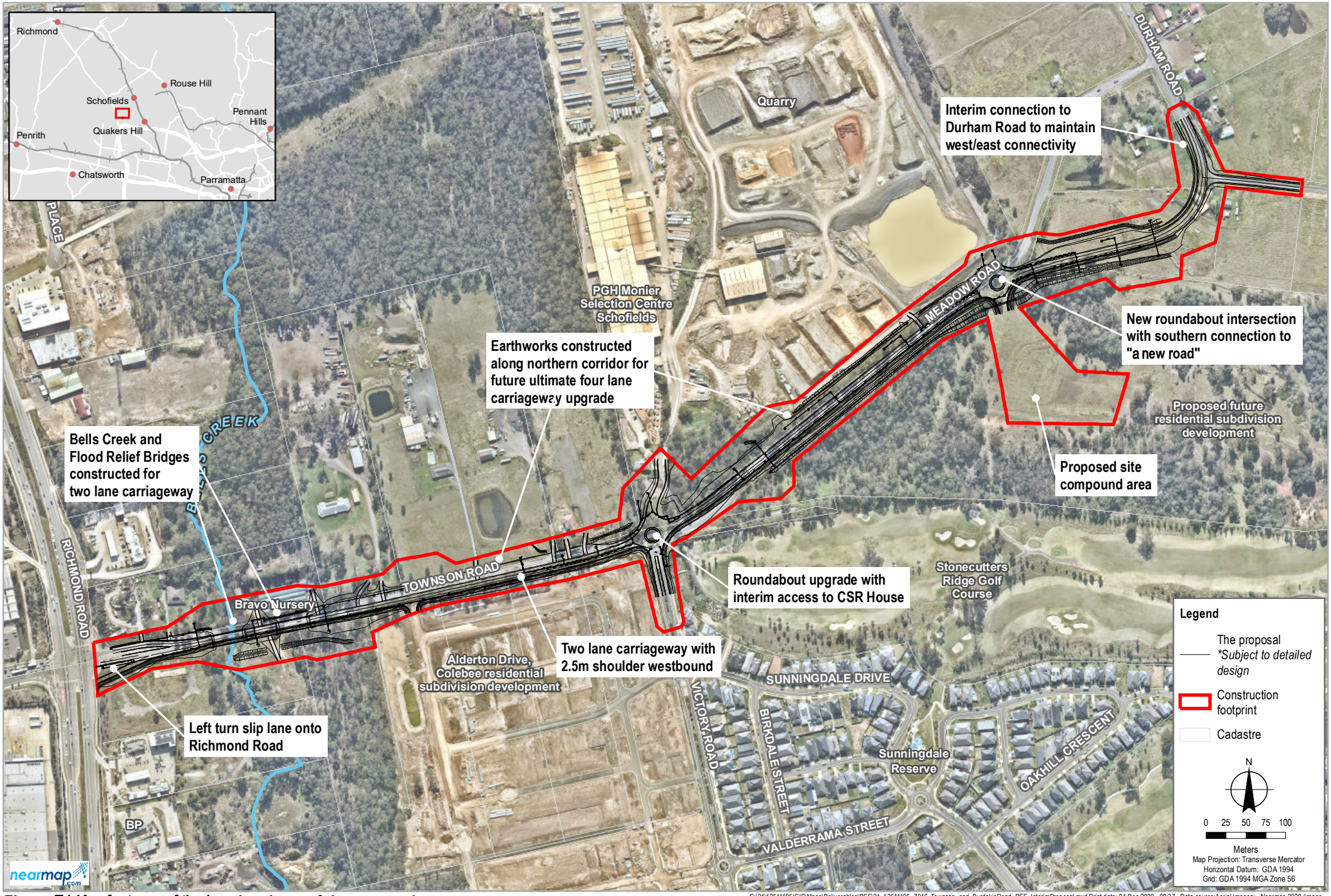

Figure E1 Key features of the interim phase of the proposal

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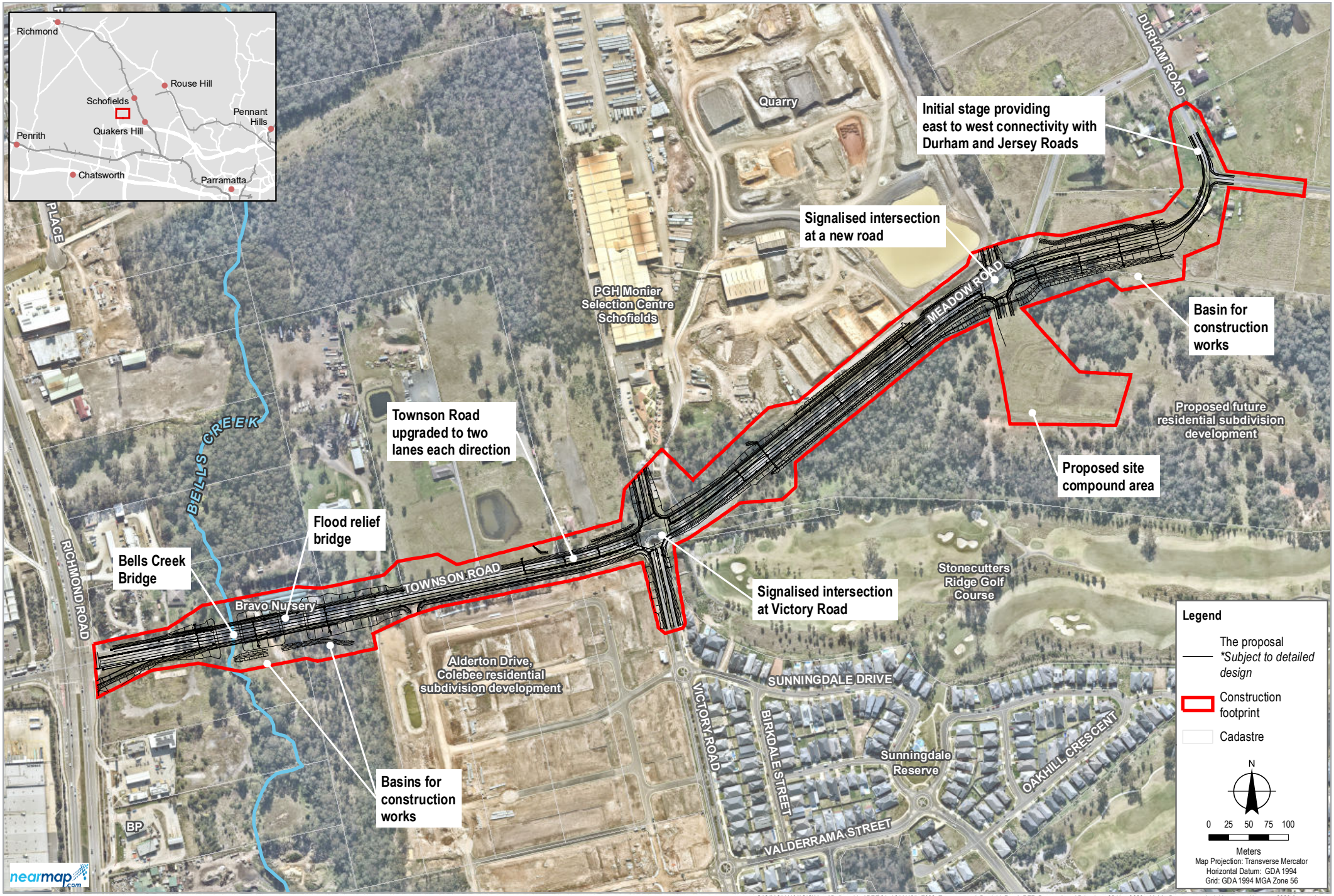

Figure E2 Key features of the ultimate phase of the proposal

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Need for the proposal

The proposal is located within the Marsden Park Industrial and West Schofields precinct of a NSW Government Priority Growth Area under the State Environmental Planning Policy (Sydney Region Growth Area). This is known as the North West Growth Area and would support predicted population growth by implementing greenfield urban growth. This includes housing, employment, shops, health and education facilities, parks, bushland, and new or upgraded infrastructure.

With the predicted population and economic growth within the North West Growth Area, the existing roads will be required to support the additional traffic of around 33,000 generated by the proposed residential developments, over the next 10 years. Richmond Road is the key arterial road for access to the North West Growth Area, while Townson Road is the key access point for the Sydney Business Park in Marsden Park.

The proposal would facilitate the growth and development of the North West Growth Area to improve connectivity, road safety, and active transport.

Proposal objectives

The objectives of the proposal are to:

- Facilitate the anticipated residential growth in the North West Growth Area as envisaged in the North West Growth Centre Structure Plan
- Improve network efficiency across the North West Growth Area
- Provide safe access to key facilities and the wider network for motorists, cyclists and pedestrians
- Promote public transport by providing better access to Schofields Railway Station and Tallawong Metro Station
- Improve flood resilience and access to flood evacuation routes.

In addition, development criteria and urban design objectives have been developed for this proposal.

Options considered

Three options and a base case “do nothing” option were considered for this proposal:

- Option 1 – ‘Do nothing’ – this option would not provide an upgrade to the road.
- Option 2 – ‘Wide corridor option’ – this option utilises most of the corridor reservation shown in the precinct plans and consists of a landscaped central median and a wide road corridor. A shared user path was included on either side of the road.
- Option 3 – ‘Southern option with full width corridor’ – this option is consistent with Option 2, however it involves moving the corridor to the south between Richmond Road and Victory Road.
- Option 4 – ‘Central option with full width corridor’ - this option is consistent with Option 2, however involves reducing the width of the central median and provision of a shared path along the southern side of the road corridor. A reduced footway reservation is provided along the northern side.

Option 4 was identified as the preferred option. This met the proposal objectives, development criteria and urban design objectives and requirements for ecologically sustainable development. This is a cost effective solution with better outcomes for constructability and maintenance and minimises the construction footprint. This has flow on benefits to adjacent property owners.

Statutory and planning framework

The objective of the State Environmental Planning Policy (Infrastructure) 2007 is to facilitate the effective delivery of infrastructure across NSW. Clause 94 permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

The proposal is for a road and is to be carried out on behalf of Transport for NSW. It can therefore be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*.

Community and stakeholder consultation

Transport for NSW has been involved in consultation with the community and stakeholders who have an interest in the proposal or may be impacted by the proposal. This includes the local community, the Aboriginal community, government agencies, public authorities including Blacktown City Council and utility providers.

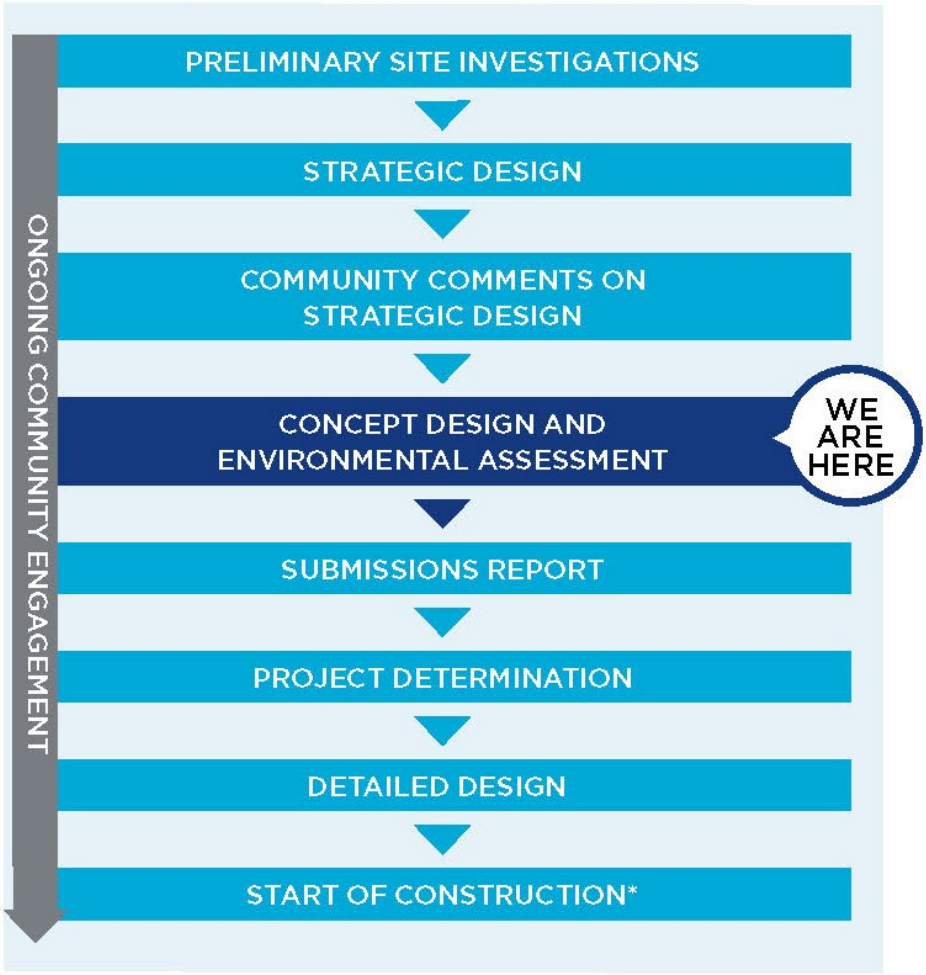
In November 2014, the North West Growth Area road network plan was released for public consultation, followed by a public announcement and brochure release.

Further consultation took place between July and August 2019, during the early stages of strategic planning and development for the proposal. During this consultation period three community sessions were held to offer and share information and understanding of the proposal to the community and stakeholders. Door knocking and workshops were held for local businesses in October 2019.

Key issues raised by the community and local businesses related to drainage and flooding, traffic, property, and impacts to Bells Creek.

The planning approval and consultation process for the proposal is shown below.

Planning approval and consultation process for the proposal



Environment impacts

The main environmental impacts of the proposal are:

Traffic and transport

The construction of the proposal would result in additional construction traffic, reduced access to properties, a detour and relocation of a bus stop. This would be related to road and lane closures and construction vehicles using the local roads. However, construction would be temporary and impacts are considered manageable through a Traffic Management Plan. This plan would include measures to address access for road users, local community and construction workers, site traffic control, and response plans. This would also address the cumulative impact of traffic due to other construction work in the vicinity of the proposal.

The traffic modelling of the interim phase shows a level of service from good operation to near capacity. It is likely that the interim phase would be at capacity five years from opening. The operation of the ultimate proposal would have long-term beneficial effects on traffic and better access to new residential developments, as it would result in additional capacity for traffic. It would cater for the future growth in traffic on the Townson Road corridor.

Noise and vibration

The majority of construction would be undertaken during standard construction hours. However, some work outside of standard construction hours would be necessary to reduce major traffic disruptions with construction at major intersections along Townson Road. During construction there are predicted exceedances of criteria during both standard hours and work outside of standard construction hours, during the interim and ultimate phases of the project. The predicted results indicate that up to 16 residential receivers are anticipated to exceed the sleep disturbance criteria for the construction of the new road during the interim phase. During the construction of the ultimate phase, up to 24 residences are predicted to exceed the sleep disturbance criteria.

In addition, 42 buildings within the study area (5 existing and 37 future) have been identified to fall within the 20 metre safe working distance for vibratory rolling works for construction of the planned new road during the interim phase. For the ultimate phase construction works, 39 buildings within the study area (3 existing and 36 future) have been identified to fall within the 20 metre safe working distance for vibratory rolling works.

A Noise and Vibration Management Plan would be prepared and implemented in accordance with government guidelines to reduce the impacts on the sensitive receivers. This management plan would address construction noise and vibration due to machinery and would include ongoing monitoring and consultation with sensitive receivers.

The operation of the proposal is likely to cause some additional noise disturbance due to road traffic noise. Noise levels are predicted to be exceeded at 37 sensitive receivers for the ultimate phase and 13 receivers for the interim phase of the proposal.

Hydrology and flooding

The proposal lies within the catchment of Eastern Creek which is a tributary of South Creek and lies within the Hawkesbury River catchment. The construction footprint crosses Bells Creek. The hydrologic design objectives include upgrading of the flood immunity of Townson Road to act as a local flood evacuation route across the Bells Creek floodplain with a flood immunity of 0.2 per cent (1 in 500 year) Annual Exceedance Probability.

Flood modelling has been carried out to confirm the flood immunity of the proposal and to determine any local or regional flood impacts that may arise from the construction and operation of the proposal.

Measures have been developed to mitigate adverse flood impacts on the Bells Creek watercourse and adjoining properties which could arise as a result of the proposal. These measures include the construction of a bridge over Bells Creek and a second floodplain relief bridge to the east across the Bells Creek floodplain including associated earthworks. The flood relief bridge would be located directly opposite an existing commercial and residential property on the northern side of Townson Road. To minimise flood impacts and maintain commercial operation of the property during the interim phase works, the proposal would incorporate the construction of a temporary flood diversion bund in front of the property. This would intercept floodwaters flowing under the bridge, diverting through culverts under the property access towards Bells Creek.

Biodiversity

The proposal would result in the removal of about one hectare of native vegetation from non-certified lands, and about 3.79 hectares from certified lands. Impacts to non-certified lands include the removal of about 0.6 hectares of Cumberland Plain Woodland, listed as a critically endangered ecological community and 0.4 hectares of River-flat Eucalypt Forest, listed as an endangered ecological community under the *Biodiversity Conservation Act 2016* and the *Environment Protection and Biodiversity Conservation Act 1999*. About 0.34 hectares is identified as 'existing native vegetation' under the Growth Centres Biodiversity Certification Order.

The proposal would result in impacts to around 900 *Grevillea juniperina* subsp. *juniperina*, listed as vulnerable under the *Biodiversity Conservation Act 2016*. Of these, 12 individuals would be removed from non-certified land. The proposal would also result in impacts to some threatened fauna species as a result of habitat clearance. This includes potential impact to the maternity colony of Southern Myotis, Cumberland Plain Land Snail and hollow-dependant and cave/culvert dwelling microbats. However, the proposed area of habitat clearance is not considered to significantly impact the species within the meaning of the *Biodiversity Conservation Act 2016* or the *Fisheries Management Act 1994*, and therefore, a Species Impact Statement or a Biodiversity Development Assessment Report is not required. With the proposed mitigation and management the proposal is unlikely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.

A Fauna and Flora Management Plan would be prepared in accordance with the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) and implemented as part of the construction environmental management plan. This would include protection and exclusion zones, pre-clearing surveys, unexpected finds protocols, and other mitigation measures. In addition, a Bat Management Plan for management of the impacts to the Southern Myotis has been prepared.

Biodiversity offsets would be required due to the likely impacts to a critically endangered ecological community, threatened species habitat and 'existing native vegetation'.

Property and land use planning

The proposal would require the full acquisition of one existing residential property. In addition, partial acquisition would be required of five residential properties, two commercial properties, one mixed use residential/commercial property and one new residential subdivision.

Impacts associated with partial property acquisition and adjustment include the need to relocate property boundary fencing, driveway adjustments, impacts to dams, roadside trees and landscaped areas. Property adjustment plans would be developed in consultation with the affected property owners.

All land acquisitions would be conducted in accordance with Blacktown City Council policy and compensation would be based on the requirements of the *Land Acquisition (Just Terms) Compensation Act* 1991.

Justification and conclusion

The proposal is located within the North West Growth Area, and is predicted to be a key east-west transport to link the North West Growth Area. The proposal is in a key location for access to important residential, commercial and social developments within the North West Growth Area. The provision of high quality road infrastructure would make the local area a more desirable place to live and work, leading to economic growth and subsequent increase in value of the area. With an improvement to traffic flow, access and connectivity, the proposal is expected to cater for the predicted population growth in the area.

The benefits of the proposal would include:

- A road network with increased capacity for future traffic growth
- The road upgrade would support the proposed development initiatives in the area by providing access and improved road infrastructure
- The road upgrade would provide an improved east-west link
- The road upgrade would support the urban development initiatives in the area by providing better access to public transport
- The proposal would support active transport to promote sustainable future
- The proposal would result in improved flood resilience and access to flood evacuation routes.

If the proposal did not proceed, there would be traffic congestion on existing Townson Road and other connecting roads leading to delays in travel times and undesirable safety outcomes, which is not consistent with government strategies and the principles of ecologically sustainable development.

Environmental impacts as a result of the proposal can be managed effectively with the implementation of the mitigation measures and safeguards proposed. The benefits of the proposal are considered to outweigh any adverse impacts.

Display of the review of environmental factors

This REF is on display for comment for 28 days.

The public display period will be advertised in the community update which will be distributed to the local community and also in the local newspaper, The Hawkesbury Gazette and Hawkesbury Courier. You can access the documents in the following ways:

Internet

The documents are available as pdf files on the Transport for NSW website at nswroads.work/TownsonRd.

Online community consultation will be carried out via Facebook.

Copies by request

Copies of the REF are available by contacting our project team on 1300 367 561.

How can I make a submission

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

- Townson Road upgrade, Transport for NSW, PO Box 973 Parramatta CBD NSW 2124
- NWGC@transport.nsw.gov.au.

Submissions will be managed in accordance with the Transport for NSW Privacy Statement which can be found here *https://www.transport.nsw.gov.au/about-us/transport-privacy* or by contacting privacy@transport.nsw.gov.au for a copy.

What happens next

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

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

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

Contents

Table index

Figure index

Appendices

1 Introduction

1.1 Proposal identification

Transport for NSW is proposing to construct a four-lane divided road along the Townson Road/Burdekin Road corridor, linking Richmond Road, Marsden Park in the west and Burdekin Road, Schofields in the east.

The overall program of work consists of two stages:

- Stage 1 involves an upgrade of about 1.6 kilometres of road extending from Richmond Road to south of Jersey Road (referred to as 'the proposal' for the purposes of this assessment)
- Stage 2 is about two kilometres in length involving the construction of a new road between the Stage 1 tie-in and Burdekin Road.

Stage 2 is subject to a separate planning approval.

Staged delivery of the proposal would involve:

- Interim phase – two lane plus earthworks
- Ultimate phase – completion of the remainder of the work for a four lane dual carriageway.

The proposal is located within the Marsden Park Industrial and West Schofields precincts of the North West Growth Area (NWGA), about 37 kilometres north-west of the Sydney central business district and three kilometres west of Schofields.

Key features of the proposal would include:

- Widening and upgrading about 1.6 kilometres of Townson Road, between Richmond Road and Durham Road/Jersey Road, to provide:
  - Two 3.5 metre wide traffic lanes in each direction
  - A new section of Townson Road about 250 metres long, to the east of the existing alignment, between Meadow Road and Durham Road/Jersey Road to maintain east-west connectivity
- Providing a wide central median along the length of the upgrade narrowing at intersections to accommodate for turning lanes
- Constructing two bridges, each about 36 metres long, to reduce flooding with one bridge over Bells Creek and another bridge about 50 metres east of Bells Creek
- Providing a new southbound slip lane at Richmond Road intersection from Townson Road
- Providing two new signalised intersections allowing all turning movements to and from Townson Road/Victory Road/'A planned new road', and formalised pedestrian crossings at each leg of the signalised intersection
- Constructing stubs for Victory Road north and the planned new road to the north and south of the Townson Road intersection, with a 3.5 metre wide traffic lane in each direction

- Providing a three metre wide shared path for pedestrians and cyclists on the southern side of Townson Road along the length of the proposal and a pedestrian crossing across the new southbound slip lane from Townson Road to Richmond Road
- Providing a 1.2 metre wide footpath on the northern side of Townson Road along the length of the proposal.

The location of the proposal is shown in Figure 1.1 and an overview of the proposal is shown in Figure 1.2. Chapter 3 describes the proposal in more detail.

The proposal is needed to provide better access for the new homes identified as part of the NWGA. The proposal would connect Sydney Business Park in Marsden Park with the Schofields centre and associated public transport services. This is further discussed in section 2.1.

The proposal is to be delivered in stages – interim and ultimate. The delivery of the proposal would initially provide an interim phase with a single carriageway, one lane in each direction, on the southern side of the road corridor incorporating earthworks to allow future full road construction. Construction of the interim phase is anticipated to start in early 2022, opening to traffic in 2023. It is anticipated that the interim phase would be operational for a period of up to five years before the ultimate four lane dual carriageway is completed.

1.2 Location and context

The proposal is located in the Blacktown local government area (LGA). The study area is dominated by rural and rural residential land uses. It also includes some commercial land uses along the length of Richmond Road.

Further information on the existing environment of the study area and the construction footprint is provided in Chapter 6.

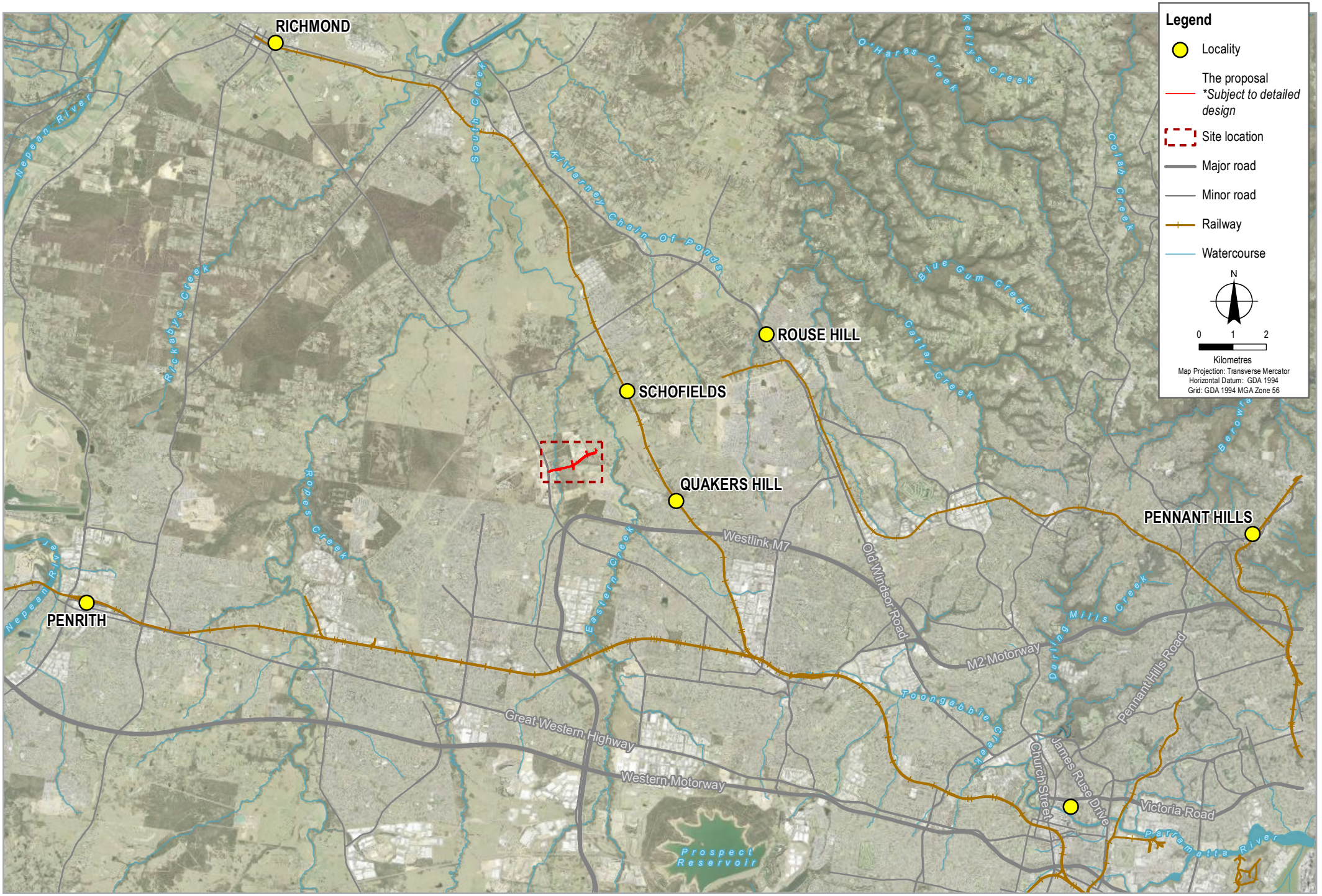


Figure 1.1 Location of the proposal

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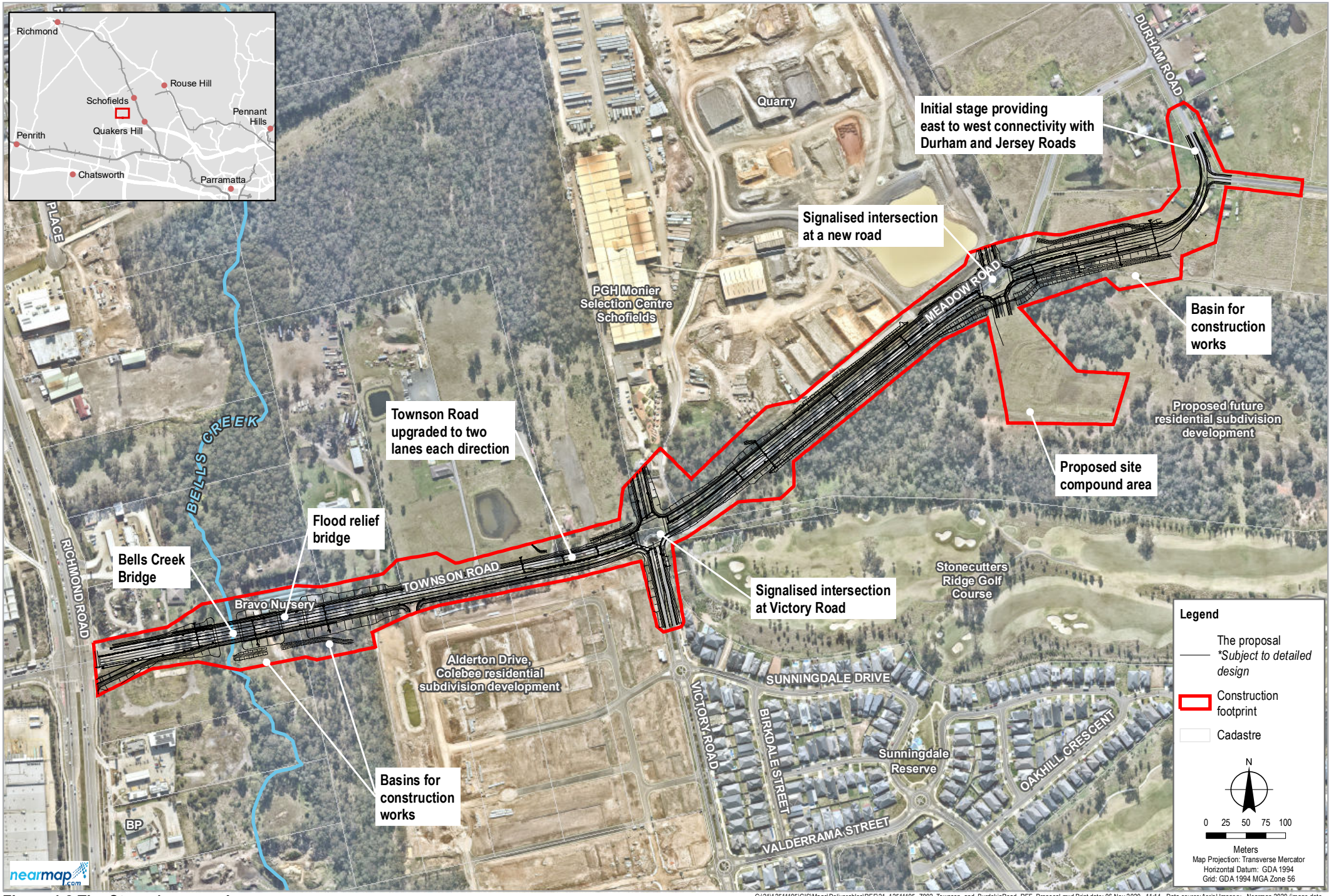

Figure 1.2 The Stage 1 proposal

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1.3 Purpose of the report

This review of environmental factors (REF) has been prepared by GHD Pty Ltd (GHD) on behalf of Transport for NSW. For the purposes of this proposal, Transport for NSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (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 clause 228 of the Environmental Planning and Assessment Regulation 2000, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979 (Is an EIS required? guidelines)* (DUAP, 1995/1996), *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 for NSW examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be 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 whether offsets are required and able to be secured
- The potential for the proposal to significantly impact any other matters of national environmental significance or the environment of Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

The following definitions have been used in this report:

- The 'construction footprint' refers to the area that may be directly impacted by the proposal, in which construction activities would occur, including the location of the construction compound.
- The 'study area' consists of land near, and including, the construction footprint. The study area is a wider area surrounding the construction footprint, including land that has the potential to be indirectly impacted by the proposal (for example, as a result of any noise impacts). The study area differs between the various specialist investigations.

2 Need and options considered

2.1 Strategic need for the proposal

The proposal is located within the NWGA. The growth area boundary predominantly includes land within the Blacktown LGA, Hawkesbury LGA and The Hills Shire LGA.

Priority Growth Areas (formerly Growth Centres) were established by the NSW Government under the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (Growth Centres SEPP) as a location for greenfield urban growth including housing, employment, shops, health and education facilities, parks, bushland, and new or upgraded infrastructure. To allow for a sustainable release of land, the NWGA was divided into 16 precincts. The proposal is located within the West Schofields precinct (see Figure 2.1).

Existing roads within the NWGA will be required to support significant increases in travel demand associated with the population, land use and economic growth forecasts for the region. Access within the NWGA is restricted by the T1 Western Line (Richmond railway line), which runs through the area in a north-south corridor. Existing east-west crossings of the Richmond railway line are limited, with only two grade separated crossings at Schofields Road and Westminster Bridge, and two level crossings at Garfield Road and Bandon Road.

Richmond Road serves as a principal arterial road for the NWGA, providing access to pedestrians, cyclists and buses within the NWGA and surrounding areas. The western end of Townson Road forms an intersection with Richmond Road and Hollinsworth Road, which provides the primary access into the Sydney Business Park in Marsden Park. This is the primary employment centre in the NWGA, and is therefore a major trip generator for travel within the area. There is also currently no direct connection between Townson Road and Burdekin Road. As such, local eastbound traffic needs to travel via either Schofields Road or Quakers Hill Parkway.

To facilitate growth and development in the NWGA, people who will live and work in the area, or travel through it, will need new infrastructure. This includes providing safe access to key facilities, as well as access to the wider transport network.

In 2015, the NSW Government published the *North West Growth Centre Road Network Strategy* to support the forecast growth in the NWGA. The Townson Road to Burdekin Road overall program of work is one of the proposals in planning as part of this strategy.

Benefits of the overall program (including both Stages 1 and 2) would include:

- A road network with increased capacity for future traffic growth
- The road upgrade would support the proposed development initiatives in the area by providing access and improved road infrastructure
- The road upgrade would provide improved east-west link
- The road upgrade would support the urban development initiatives in the area by providing better access to public transport
- The proposal would support active transport to promote sustainable future
- The proposal would result in improved flood resilience and access to flood evacuation routes.

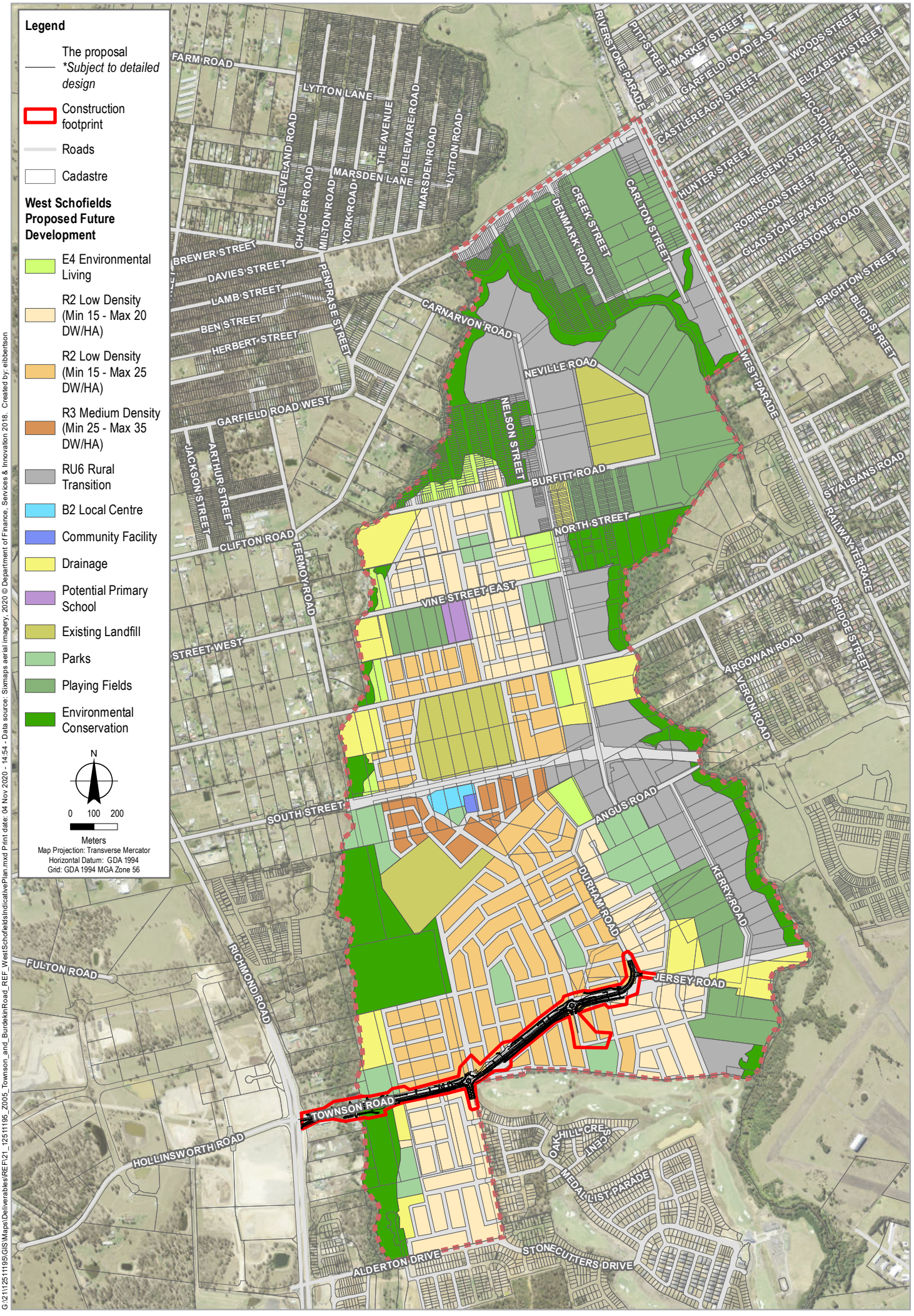


Figure 2.1 West Schofields indicative layout plan

2.1.1 Consistency with relevant strategic planning documents and significant developments in the study area

A review of relevant strategic planning documents was undertaken to identify whether the proposal is consistent with the aims and directions of these documents. The following sections provide a summary of the review.

Strategic infrastructure and transport planning documents

NSW State and Premier's priorities

The NSW Government has committed to 32 State Priorities, 14 of which are Premier's Priorities relating to social issues. The priorities aim to keep the economy strong, create jobs, deliver world-class services, protect the vulnerable and ensure that all NSW citizens and communities share in the state's success. The NSW Government has also committed to 46 State Outcomes.

Relevant priorities and/or outcomes are summarised below:

- Well-connected communities with quality local environments
- Safe and reliable travel – delivering ongoing operation, maintenance and overall performance of transport network, to ensure journey reliability and customer satisfaction
- Successful places – enhancing liveability and connectivity by delivering city shaping infrastructure projects, activating precincts and expanding network capacity
- Accessible transport – enabling and enhancing the equity and accessibility of the transport system for all customer groups.

Together with other upgrades in the NWGA, the proposal would provide adequate road capacity for projected population growth and would reduce travel time. The proposal would improve road safety by improving traffic flow and east-west connectivity. The proposal has also been designed to minimise impacts on the natural environment as documented in this REF. For these reasons, the proposal is considered to be consistent with the State priorities and/or outcomes.

Building Momentum State Infrastructure Strategy 2018-2038

Building Momentum State Infrastructure Strategy 2018-2038 (Infrastructure NSW, 2018) establishes the strategic directions, projects and initiatives to meet the infrastructure needs of a growing population and a growing economy.

The strategy investigates infrastructure demands over the next 20 years.

The proposal is consistent with the transport strategic objective of 'ensuring the transport system creates opportunities for people and businesses to access the services and support they need'. The proposal facilitates development in the NWGA.

The proposal is also consistent with the following transport recommendations:

- Invest in transport infrastructure that is integrated with land use to create opportunities for agglomeration and enhance productivity, liveability and accessibility, in support of the policy goal of a '30-minute city'
- Complete missing links in the regional network, creating travel time savings and safety benefits that increase productivity.

Future Transport Strategy 2056

The *Future Transport Strategy 2056* (Transport for NSW, 2018) is a suite of strategies and plans for transport developed in conjunction with the Greater Sydney Commission's *A Metropolis of Three Cities – the Greater Sydney Region Plan* (Greater Sydney Commission, 2018) and supporting regional plans, and Infrastructure NSW's *State Infrastructure Strategy* (Infrastructure NSW, 2018). The *Future Transport Strategy 2056* provides an integrated 40-year vision, directions and outcomes for transport in NSW.

The strategy's vision for the future of transport is for road and transport links to form part of an integrated and connected network across the Greater Sydney region with each of the three cities described in *A Metropolis of Three Cities* (the Eastern Harbour City, Central River City and Western Parkland City). The vision for the future of transport is based on six outcomes:

- Customer focused
- Successful places
- A strong economy
- Safety and performance
- Accessible services
- Sustainability.

The proposal is consistent with the strategy, as it would provide improved transport infrastructure for current and future residents in the NWGA. It will also encourage active travel through the use of the proposed shared path and footpath either side of the road. The proposal would support safe, efficient and reliable journeys for the community.

North West Growth Centre Road Network Strategy

In response to the *North West Priority Growth Area Land Use and Infrastructure Implementation Plan* (Department of Planning and Environment, 2015), the NSW Government confirmed the *North West Growth Centre Road Network Strategy* in July 2015. The strategy supports the immediate needs and long-term impacts of the NWGA.

During the development of the strategy and in consultation with key stakeholders, a number of Richmond railway line crossings were identified to effectively manage traffic across the NWGA. The five grade separated crossings included:

- Bandon Road, Vineyard
- Garfield Road, Riverstone
- Westminster Street bridge, Schofields
- Schofields Road, Schofields
- Burdekin Road and Townson Road, Quakers Hill.

The rail crossing at Townson Road - Burdekin Road is part of Stage 2. Therefore, the proposal would facilitate the construction of this level crossing and is considered consistent with the overall objectives of the strategy.

Consistency with relevant strategic land use planning

A Metropolis of Three Cities – the Greater Sydney Region Plan

A *Metropolis of Three Cities – the Greater Sydney Region Plan* (Greater Sydney Commission, 2018) sets a 40-year vision (to 2056) and establishes a 20-year plan to manage Greater Sydney's growth and change. The plan is built on a vision of three cities, where most residents live within 30 minutes of jobs, education, health facilities, and other services – the Western Parkland City, Central River City and Eastern Harbour City. It informs district and local plans and the assessment of planning proposals.

The plan includes 10 directions and 40 objectives for the future of Sydney. The proposal is consistent with *'Objective 2 – infrastructure aligns with forecast growth – growth infrastructure compact'* and '*Objective 3 – infrastructure adapts to meet future needs'*. The proposal is consistent with these objectives as it would provide improved access and connectivity, supporting the expected growth in the NWGA.

Central City District Plan

The Greater Sydney Commission's five district plans are a guide for implementing *A Metropolis of Three Cities – the Greater Sydney Region Plan* at a district level. These 20-year plans are a bridge between regional and local planning. Their purpose is to inform local environmental plans, community strategic plans and the assessment of planning proposals.

The proposal is located in an area subject to the *Central City District Plan* (Greater Sydney Commission, 2018). The Central City District is the central and major component of the Central River City, Greater Parramatta metropolitan centre. The Central City District will grow substantially, capitalising on its location close to the geographic centre of Greater Sydney. Unprecedented public and private investment is contributing to new transport and other infrastructure leading to major transformation.

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

- C1: Planning for a city supported by infrastructure
- C3: Providing services and social infrastructure to meet people's changing needs
- C5: Providing housing supply, choice and affordability, with access to jobs, services and public transport
- C9: Delivering integrated land use and transport planning and a 30-minute city.

The proposal is consistent with these priorities as it would provide improved access and connectivity, supporting the expected growth in the NWGA.

Greater Sydney Services and Infrastructure Plan

The *Greater Sydney Services and Infrastructure Plan (*Transport for NSW, 2018), which forms part of the *Future Transport Strategy 2056*, sets the strategic direction for transport in NSW over the next 40 years. Building on the State-wide transport outcomes identified in the *Future Transport Strategy 2056*, the plan identifies specific transport outcomes for Greater Sydney and the policy, service and infrastructure initiatives to achieve these outcomes.

The plan defines the vision for Sydney's future transport networks. Although the proposal is not shown as a city-shaping network, the proposal provides connectivity for the community in the NWGA and as part of the wider Central River City. It is consistent with *Customer Outcome 3: 'walking or cycling is the most convenient option for short trips around centres and local areas, supported by a safe road environment and suitable pathways'*. The proposal includes a shared user path and pedestrian footpath on either side of the road.

North West Priority Growth Area Land Use and Infrastructure Strategy

The *North West Priority Growth Area Land Use and Infrastructure Strategy* (Department of Planning and Environment, 2015) outlines plans for the growing NWGA and the infrastructure needed to support this growth. The broader vision for the NWGA is set out as six core objectives. Over the next ten years, 33,000 homes will be provided and the growth area will be home to around 92,400 people. A large number will be located in the suburbs of Marsden Park, Schofields, Colebee, Riverstone, Rouse Hill and parts of Vineyard. The Townson Road/Burdekin Road corridor is a key east-west link connecting these communities to the major arterial roads of Richmond Road and Windsor Road.

The extension of Townson Road to Burdekin Road and provision of an additional grade separated rail crossing of the Richmond railway line are listed in the strategy. They will facilitate the grid layout of roads linking key arterial roads to local residents and businesses. It is proposed that access to key arterial roads would be restricted, and there is a need for local roads like Townson Road and Burdekin Road to provide local business and property access.

2.2 Existing Infrastructure

A description of the existing road and transport infrastructure in the study area is provided below. Key roads and transport infrastructure are shown in Figure 1.2. A summary of existing traffic volumes is provided in section 6.1.

2.2.1 Townson Road

Townson Road is a sealed, local road about 800 metres in length with unsealed shoulders (see Figure 2.2). It is located between Richmond Road and just east of Victory Road. It is an undivided road with one lane in each direction, and line marking only available on the approaches to the intersections. There is a posted 60 kilometres per hour speed limit. There is no existing street lighting between the Bells Creek bridge and Victory Road.

At the western end of Townson Road, the road divides and is separated by a widened concrete median. It becomes Hollinsworth Road at the intersection with Richmond Road. There is a left turn lane, through lane and right turn lane heading westbound and a through lane and merge lane heading eastbound.

At the roundabout with Victory Road, Townson Road extends further west along a 'paper road' running parallel with Meadow Road and ending north of Stonecutters Ridge golf course. The road historically services rural residential land, however significant development for low and medium density residential use is underway south of the road.

In the study area, surface water runoff from Townson Road is generally collected in informal table drains, located on either side of the pavement. There is kerb and gutter at the Victory Road intersection only. About 200 metres east of Richmond Road there is an existing three cell box culvert at Bells Creek about three metres wide and two metres high.

Source: Google Maps

Figure 2.2: View of Townson Road to the east

2.2.2 Meadow Road

Meadow Road extends from the Victory Road and Townson Road intersection to the residential ring road west of Eastern Creek. This ring road consists of Jersey Road, Durham Road, Kerry Road and Angus Road. Meadow Road is also a sealed, local road, about 800 metres in length with a posted speed limit of 60 kilometres per hour. There is no existing street lighting other than that provided at the Victory Road intersection and one light at the intersection with Durham Road.

PGH Bricks and Pavers (the quarry) is located on Meadow Road, just north of the intersection with Victory Road. Meadow Road is a divided road with line marking and one lane in each direction up to just east of the quarry. The road then becomes an undivided and unmarked road with unsealed shoulders until the T-intersection with Durham Road. There is no line marking at this intersection.

In the study area, surface water runoff from Meadow Road is generally collected in informal table drains, located on either side of the road's edge. There is kerb and gutter at the Victory Road intersection only. A transverse drainage pipe is located under the road just east of the quarry and there is also a transverse drainage pipe located under the road at the intersection with Durham Road.

Meadow Road connects Townson Road with rural residential land surrounding the ring road which connects to Carnarvon Road and South Street, Schofields.

2.2.3 Parking

No stopping signs are located along some sections of Townson Road and Meadow Road. Beyond these parking restrictions, parking is generally unrestricted along the road corridor. There are no designated parking areas.

2.2.4 Bus services

Bus route 742 is the main service operating along Townson Road and is run by Busways Western Sydney. The Marsden Park to Rouse Hill route provides a service for the suburbs of Riverstone, Schofields, Rouse Hill, Kellyville Ridge and The Ponds. There is one bus stop (Stop ID 276516) located on the northern side of Hollinsworth Road, at the western end of the alignment at the intersection with Richmond Road. There is also another bus stop (Stop ID 276238) at the eastern end of the construction footprint at the intersection with Meadow Road and Durham Road.

2.2.5 Pedestrian and cyclist facilities

There is no pedestrian and cyclist infrastructure along Townson Road and Meadow Road with the exception of a footpath and off-road shared path at the southern approach of the Townson Road and Victory Road intersection. The pedestrian footpath extends along the length of Victory Road on the western side. On the eastern side, an off-road shared path extends for about 75 metres along Victory Road.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- Facilitate the anticipated residential growth in the NWGA as envisaged in the North West Growth Centre Structure Plan
- Improve network efficiency across the NWGA
- Provide safe access to key facilities and the wider network for motorists, cyclists and pedestrians
- Promote public transport by providing better access to Schofields Railway Station and Tallawong Metro Station
- Improve flood resilience and access to flood evacuation routes.

2.3.2 Development criteria

In the development of the options, the following development criteria and constraints were considered:

- Precinct planning for the NWGA and predicted growth in the region
- Key waterways and the need for flood immunity
- Railway line and rail infrastructure (within Stage 2)
- Active transport needs
- Overall cost
- Environmental constraints.

2.3.3 Urban design objectives

Urban design objectives for the proposal include:

- Reinforce the existing landscape character along the road alignment to create a distinctive and legible journey
- Protect and enhance existing views
- Improve connectivity along and across the road alignment
- Provide a unified suite of road and roadside elements that respond to the local setting
- Provide a landscape design that strengthens indigenous plant communities and natural landscape systems
- Provide a landscape design that delivers a sustainable solution for the future.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of the preferred option

The corridor and alignment (Townson Road to Burdekin Road) Stage 1 and Stage 2 combined was identified in the *North West Priority Growth Area Land Use and Infrastructure Implementation Plan* (Department of Planning and Environment, 2015). Although the alignment was set, Transport for NSW undertook a strategic assessment and design to inform the preferred options.

A range of options were considered to mitigate impacts and maximise benefits of the proposal. Selection of the preferred project considered how each of the options satisfies the need for the proposal as well as its performance against the objectives and development criteria outlined in section 2.3.

Descriptions of the key features of each option are provided in section 2.4.2. An analysis of each option is provided in section 2.4.4.

As the road corridor is a local road, Blacktown City Council were consulted throughout the options assessment.

2.4.2 Identified options

In April 2019, the *Burdekin Road and Townson Road Upgrade Strategic Business Case and Townson and Burdekin Road Options Report: from Richmond Road to Walker Street* (Roads and Maritime Services, 2019) (the 'options report') was developed. This report considered both this proposal and Stage 2 of the overall program of work. This was because the proposal and Stage 2 must ultimately form the one road alignment. As such, the discussion in this section reflects both Stages. The following options were considered:

- Option 1 – 'Do nothing'
- Option 2 – 'Wide corridor option'
- Option 3 – 'Southern option with full width corridor'
- Option 4 – 'Central option with full width corridor'.

These are discussed below. In addition, a number of sub-options were considered relating to intersection options, bridge options, staging options and options to limit through traffic. These are discussed further below.

Further information on the option development and assessment process, including the justification for selection of the preferred option, is provided in the following sections.

Option 1 - Do nothing

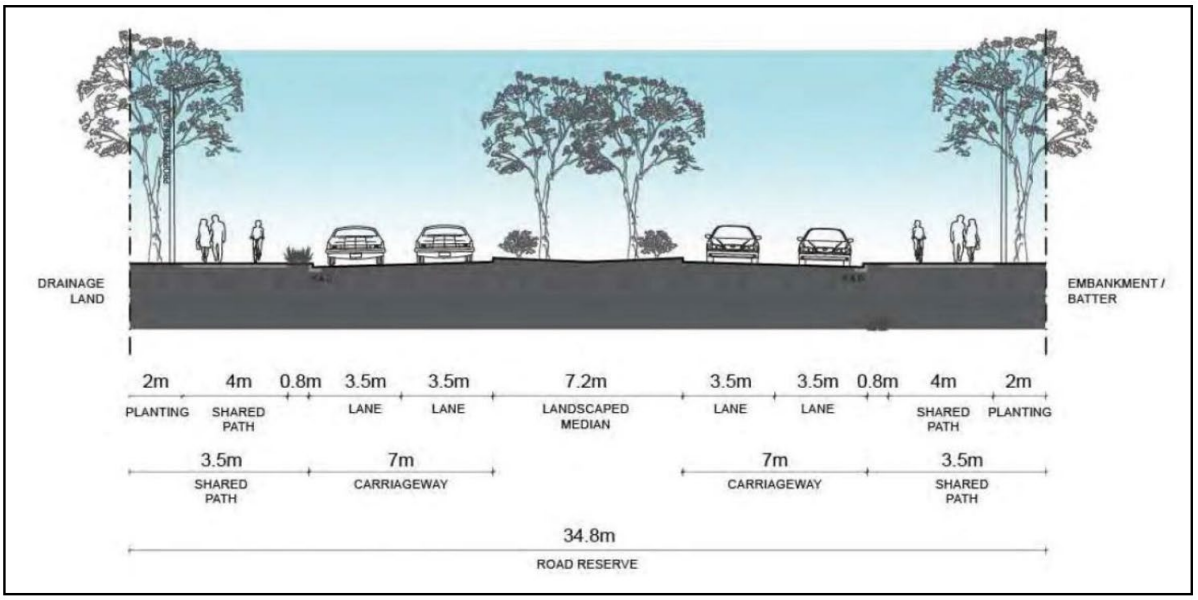
The do-nothing option would involve no upgrade to Townson Road and Burdekin Road.

Option 2 – Wide corridor option

Option 2 utilises most of the corridor reservation shown in the Department of Planning, Industry and Environment precinct plan. This option was developed in consultation with Blacktown City Council and consists of a landscaped central median and wide road corridor which would allow for additional turning lanes and may provide an opportunity for bus facilities if required. A shared user path was included on either side of the road.

The design of this option includes three new signalised intersections at Victory Road, Veron Road and a planned new road proposed to the east of the quarry to the north of Townson Road. A cross section was included in the West Schofields Draft Masterplan.

Figure 2.3 provides a cross section of option 2.



Source: Burdekin Road and Townson Road Upgrade Strategic Business Case (2019), Figure 2-18.

Figure 2.3: Cross section of option 2

Option 3 – Southern option with full width corridor

Option 3 is consistent with Option 2, however it involves moving the corridor to the south between Richmond Road and Victory Road. This would reduce the number of local residents impacted by the proposal, however there would be greater impact to an approved development on the south side of Townson Road.

Option 4 – Central option with full width corridor

This option is consistent with Option 2, however involves reducing the width of the central median to 4.8 metres. A 5.0 metre wide footway reservation to accommodate a shared path is

provided along the southern side of the road corridor with a reduced footway reservation of 3.5 metres along the northern side.

Figure 3.7 provides a cross section of this option.

Design options

A number of design options were developed to support the proposal options discussed above in section 2.4.2. These included:

- Intersection options – inclusion of roundabouts instead of signalised intersections
- Bridge options – either a bridge or set of box culverts at Bells Creek to achieve flood immunity
- Limiting traffic – restrict traffic flows to minimise potential 'rat running' and congestion on Schofields Road and Richmond Road.

These design options offer optimisations in design that have been investigated as part of the proposal development (refer to section 2.6).

2.4.3 Consultation of options

The wide corridor option (option 2) was developed in consultation with Blacktown City Council. Consultation with Blacktown City Council was undertaken to discuss the purpose of the proposed median width 7.2 metres.

Option 3 was discussed in consultation with the General Manager Development of Luxeland Group. This determined that option 3 would have significant impacts on their development, and the cost involved in redesign would be significant.

2.4.4 Analysis of options

As noted in section 2.4.2 there were three options plus the 'do nothing' option, considered for the overall program. An analysis of these options is provided in Table 2.1.

Option 1 (do nothing) does not meet the need for the proposal or the objectives and development criteria listed in section 2.3. Options 2 to 4 meet the need for the proposal as well achieving the objectives and development criteria.

Therefore the analysis of options is based on the main impacts and differences between the options which related mainly to constructability and property impacts. These impacts are shown in Table 2.1. Other impacts such as traffic, road safety, utilities, physical constraints, environmental and geotechnical were also considered. However, these impacts were also similar across all options.

Table 2.1: Analysis of options (based on the options report)

Option	Meets proposal objectives	Significant constructability issues	Significant property impacts
Option 1 – 'Do nothing'	No This option would be inconsistent with strategic land use planning for the NWGA.	n/a	n/a
Option 2 – 'Wide corridor option'	Yes	Yes. The corridor reservation did not consider the footprint required for construction and earthworks.	No additional property impacts than that proposed.
Option 3 – 'Southern option with full width corridor'	Yes	No. Option 3 provides better outcomes for constructability and maintenance when compared with other options.	Yes. Although this option would reduce the number of local residents directly impacted by the road upgrade, the approved development to the south of Townson Road would be substantially impacted.
Option 4 – 'Central option with full width corridor'	Yes	No. Reducing the central median width and one of the shared user paths, allows for a greater footprint for construction leading to reduced constraints during construction.	No. Reduced property impacts due to a reduced footprint of work (ie, the central median) in comparison to other options.

Table 2.2 summarises the analysis of design options provided in the options report. The final design options developed for the proposal are described in section 2.6.

Table 2.2: Analysis of design options (based on the options report)

Meets proposal objectives	Significant constructability issues	Significant property impacts
Intersections		
Yes – meets all proposal and urban design objectives.	The high traffic volumes in the future forecast implied that the roundabouts need a significantly large diameter to function well. As having a roundabout of this size would mean that the footprint would exceed the allowed corridor.	Additional property impacts anticipated if the footprint exceeded the allowed corridor.
Bridges		
Yes – meets all proposal and urban design objectives.	Culverts can be cheaper than bridges, however due to the required apron structures at the openings additional constructability issues and costs may occur.	Due to the required apron structures at the openings of culverts, additional property acquisition on both sides of the road would be required. Replacing existing culverts with a bridge minimised property impacts.
Traffic limitation		
No – does not meet all proposal and urban design objectives. A design option considered a bus only section of road. However, this would artificially block local access. This would not align with the objectives to provide safe access to key facilities or better access to the railway or metro station.		

Options 2 to 4 all meet to a similar extent the need for ecologically sustainable development (ESD). These designs were developed with an objective of minimising impacts on property and the amenity of the study area while maintaining engineering feasibility and safety for all road users. These options would benefit future generations by addressing the future increases in traffic volumes and traffic congestion associated with movement of traffic, within the NWGA.

Option 1 would perform better for ESD as there would be no further impact of the surrounding environment. It would not however benefit future generations by addressing the

future increases in traffic volumes and traffic congestion associated with movement of traffic, within the NWGA.

2.5 Preferred option

Option 4 was identified as the preferred option, as it resulted in less constructability issues and property impacts. This is a cost effective solution with better outcomes for constructability and maintenance and minimises the construction footprint. This has flow on benefits to adjacent property owners.

The development of the sub-options are discussed in section 2.6.

2.6 Design refinements

Refinement of the design has been carried out in consultation with key stakeholders and issues raised about the proposal. Key stakeholders included:

- Blacktown City Council
- Department of Planning, Industry and Environment
- Utility providers
- Kennards
- Luxeland Developer
- CSR Brickworks Developer
- Nursery at 55 Townson Road.

Further investigation of the design options was carried out through risk assessment, value management and constructability workshops and health and safety in design workshops. The refinement process has included additional modelling (ie traffic modelling) and environmental assessment, where required. Following this investigation, the following refinements were adopted as part of the concept design:

- A bridge is proposed at Bells Creek instead of a set of box culverts to allow greater flood immunity for flood evacuation (flood immunity for a 0.2% AEP flood) and reduce potential impact from flooding into properties
- A left in left out access road would be provided for the residential development (Luxeland) to allow this development to have direct access to the south of Townson Road.
- A second bridge would be provided about 50 metres east of Bells Creek to provide increased flood immunity and capture the existing secondary waterway to alleviate afflux and velocity impacts to surrounding properties.
- An updated and revised intersection with the planned new road would be provided to allow access for the proposed future development to be developed by CSR Brickworks.
- Provision of a new southbound slip lane at Richmond Road intersection from Townson Road in order for this intersection and the Townson Road and Victory Road intersection to meet a satisfactory level of service up to 2036.
- A revised temporary connection road and tie-in stub would be included to provide a T-intersection with Meadow Road/Jersey Road to maintain east-west connectivity until Stage 2 is constructed and operational.

3 Description of the proposal

3.1 The proposal

The key features of the proposal are described below. Staged delivery of the proposal would involve:

- Interim phase – two lane plus earthworks
- Ultimate phase – completion of the remainder of the work for a four lane dual carriageway.

3.1.1 Key features of the interim phase

The interim phase (refer to Figure 3.1) would comprise the following:

- Widening and upgrading about 1.6 kilometres of Townson Road, between Richmond Road and Durham Road/Jersey Road, to provide:
  - Single 3.5 metre wide traffic lanes in each direction including 2.5 metre shoulder adjacent to the southern kerb line to accommodate breakdown vehicles on the westbound lane
  - A new section of Townson Road about 250 metres long, to the east of the existing alignment, between Meadow Road and Durham Road/Jersey Road to maintain east-west connectivity
- Victory Road and planned new road intersections would be constructed as roundabouts to suit the new alignment
- Victory Road north leg would provide an interim access to tie-into the existing CSR House
- Street lighting to be provided on the southern verge only to meet compliance for two lanes
- Single carriageway bridges would be provided for both the Bells Creek and flood relief bridge
- Providing a new southbound slip lane at Richmond Road intersection from Townson Road
- Providing a three metre wide shared path for pedestrians and cyclists on the southern side of Townson Road along the length of the proposal and a pedestrian crossing across the new southbound slip lane from Townson Road to Richmond Road.

Landscaping would be carried out during the interim phase. This would comprise the majority of new planting that would not be impacted by future work required to complete the proposal. This would include groundcover to stabilise the surface until the ultimate phase is completed. This would be designed in consultation with Blacktown City Council. Figure 3.2 and Figure 3.3 provide indicative images of cross sections of the interim phase of the proposal.

The construction methodology described in section 3.3, including the location of compound sites, would be the same for the interim construction work.

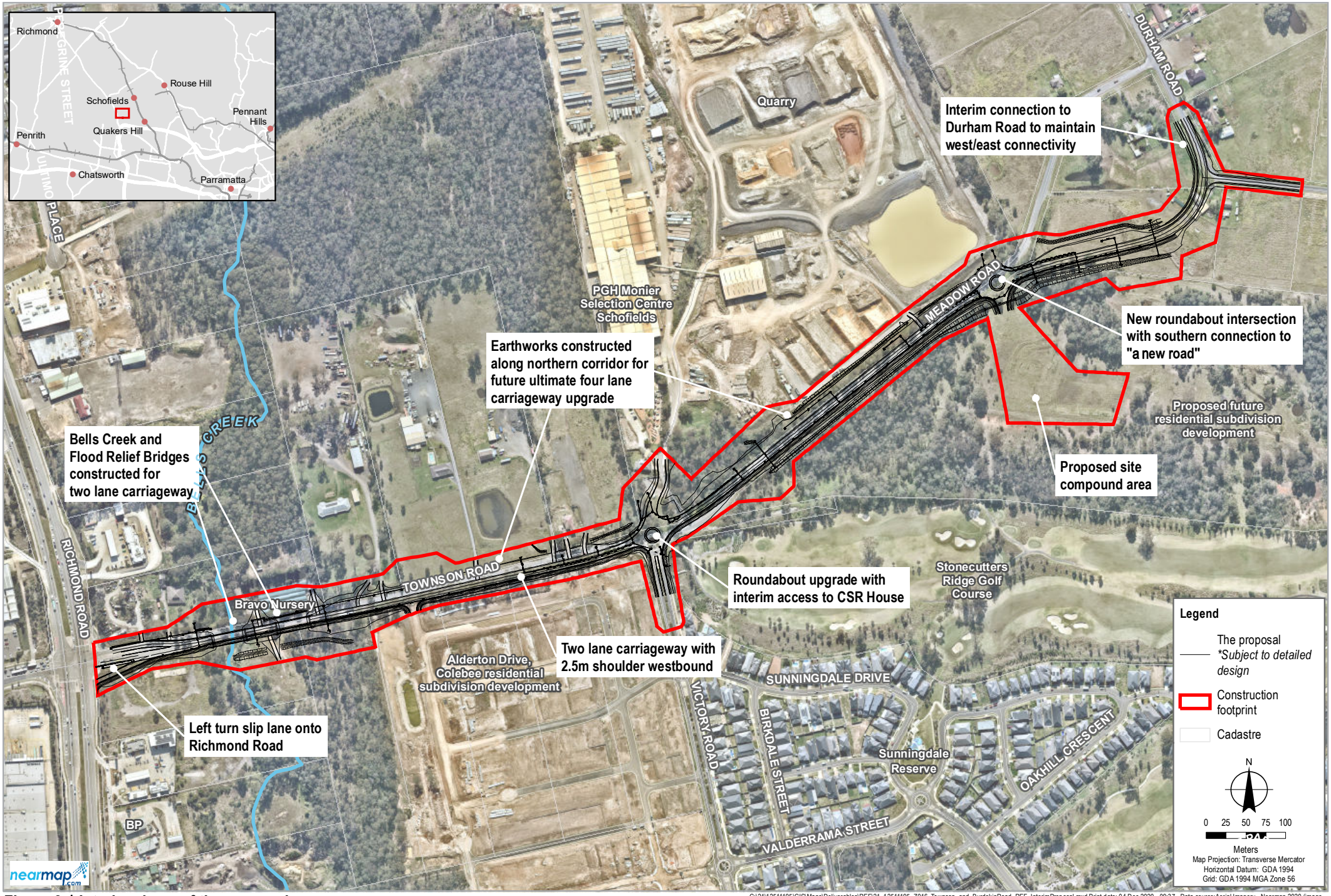


Figure 3.1 Interim phase of the proposal

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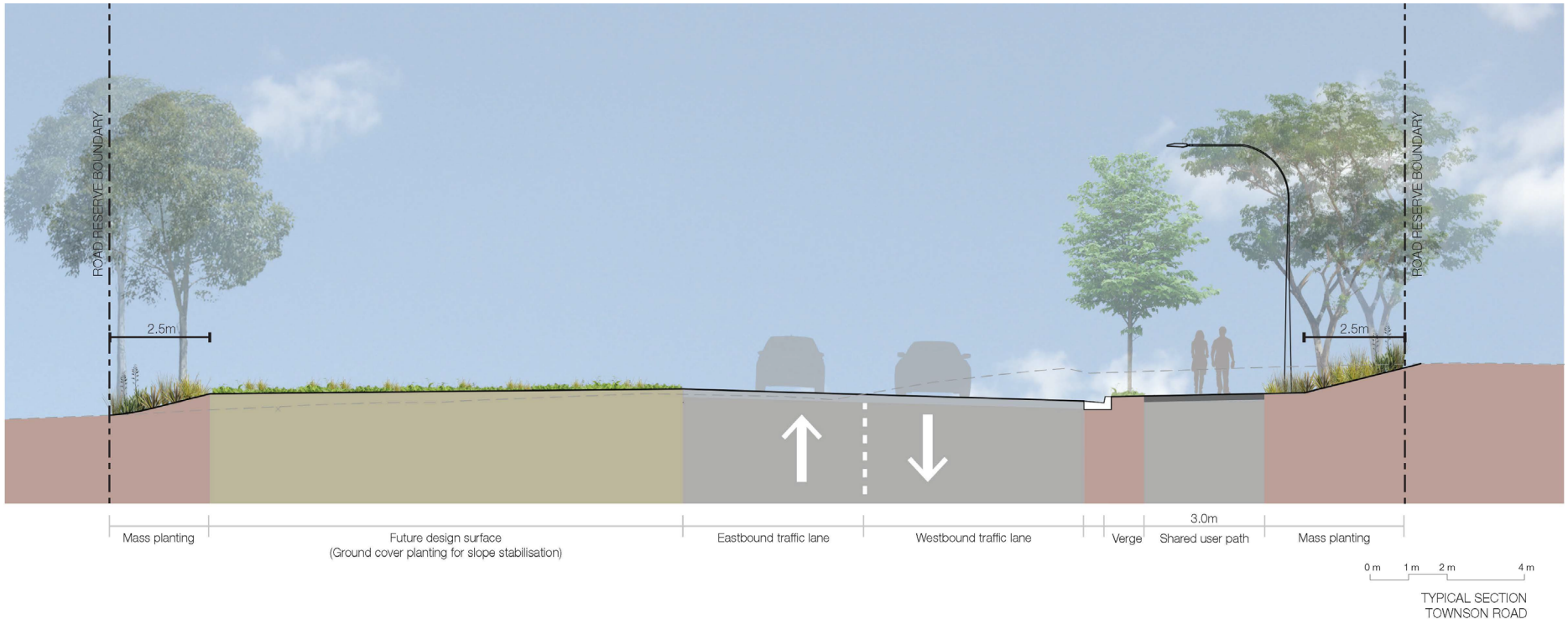

Figure 3.2: Typical section through Townson Road interim phase cut batters

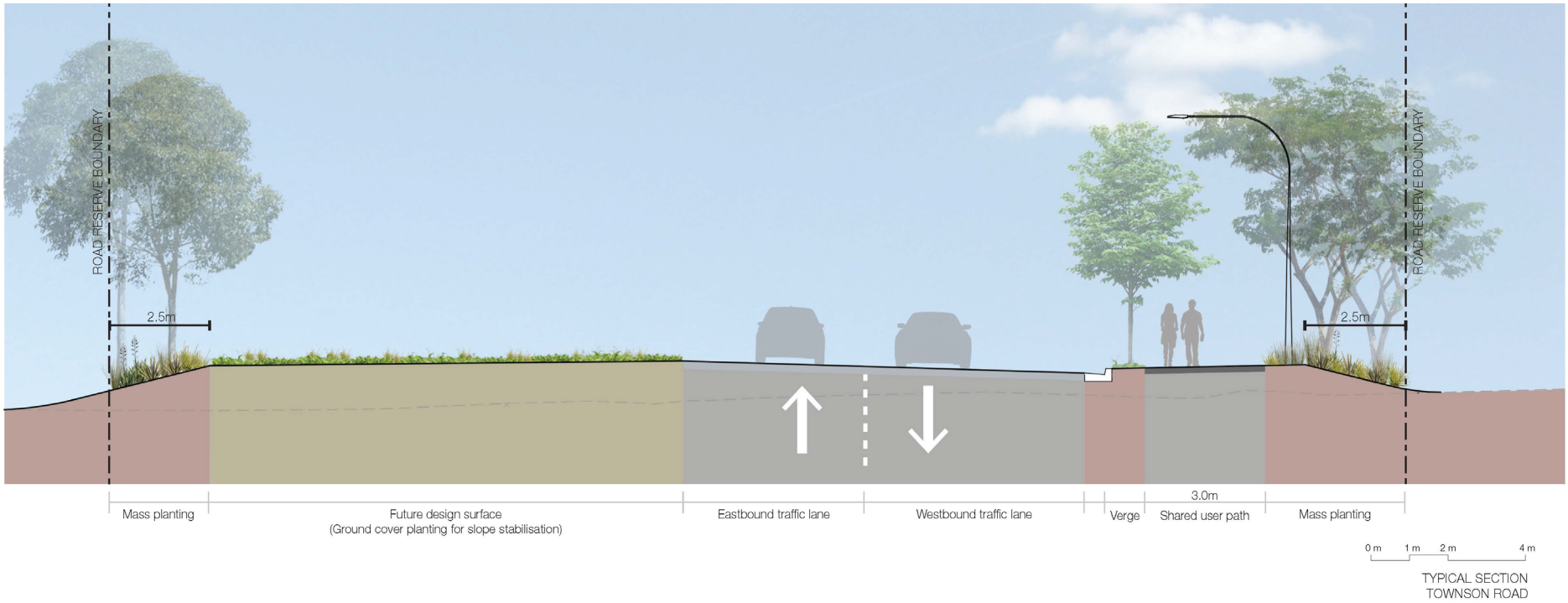

Figure 3.3: Typical section through Townson Road interim phase fill batters

3.1.2 Key features of the ultimate phase

Key features of the ultimate phase of the proposal are shown in Figure 3.4. This would include the carriageway widening from the interim phase design to include the following:

- Two 3.5 metre wide traffic lanes in each direction
- Providing a wide central median along the length of the upgrade narrowing at intersections to accommodate for turning lanes
- Construction of a flood relief bridge substructure and widening of the interim phase bridges
- Providing two new signalised intersections allowing all turning movements to and from Townson Road/Victory Road/'a planned new road', and formalised pedestrian crossings at each leg of the signalised intersection
- Replacing CSR access with a road stub for Victory Road north and the planned new road to the north, with a 3.5 metre wide traffic lane in each direction
- Providing a 1.2 metre wide footpath on the northern side of Townson Road along the length of the proposal
- Providing landscaping on the median and northern verges
- Provision of full lighting on the northern side of the carriageway.

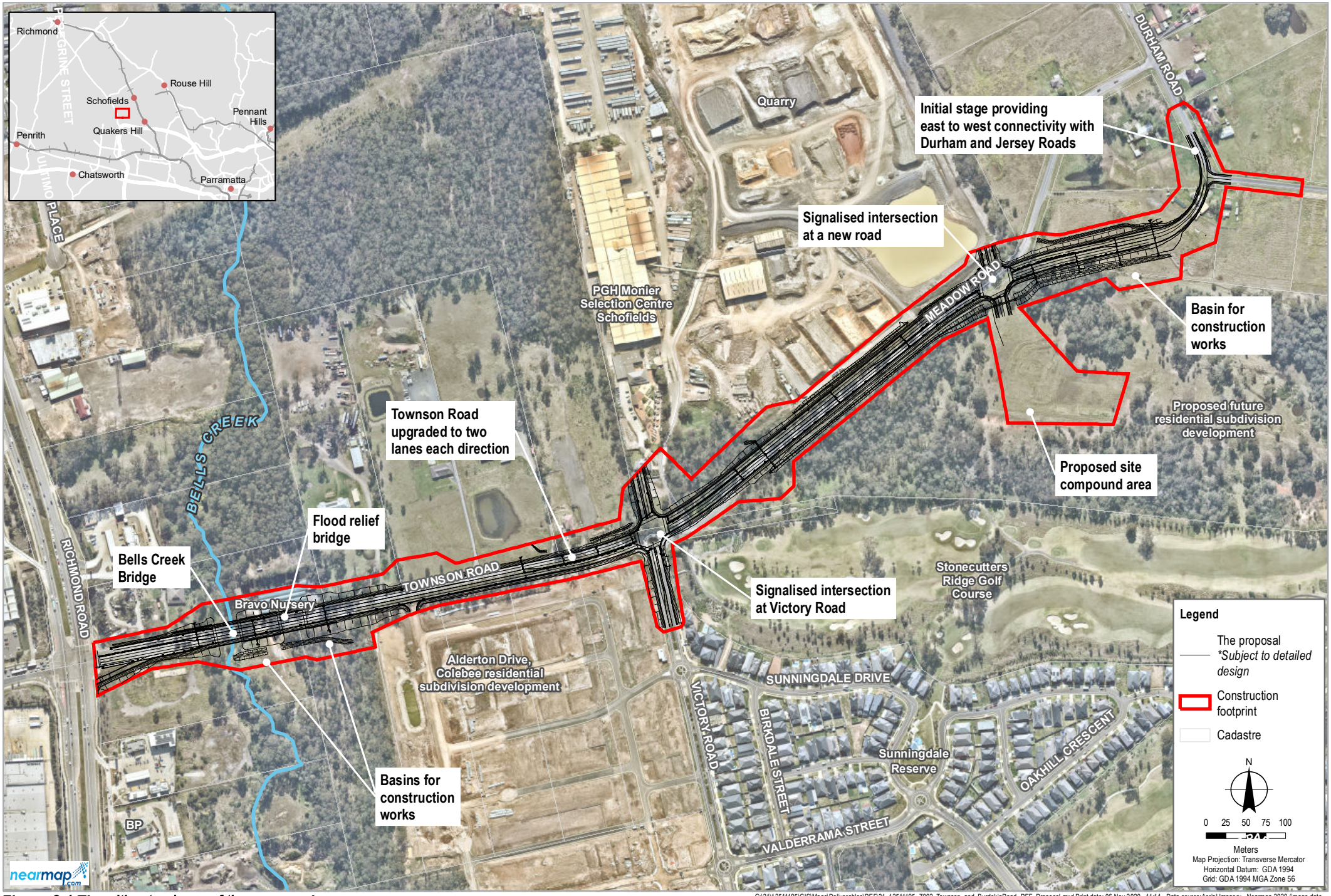

Figure 3.4 The ultimate phase of the proposal

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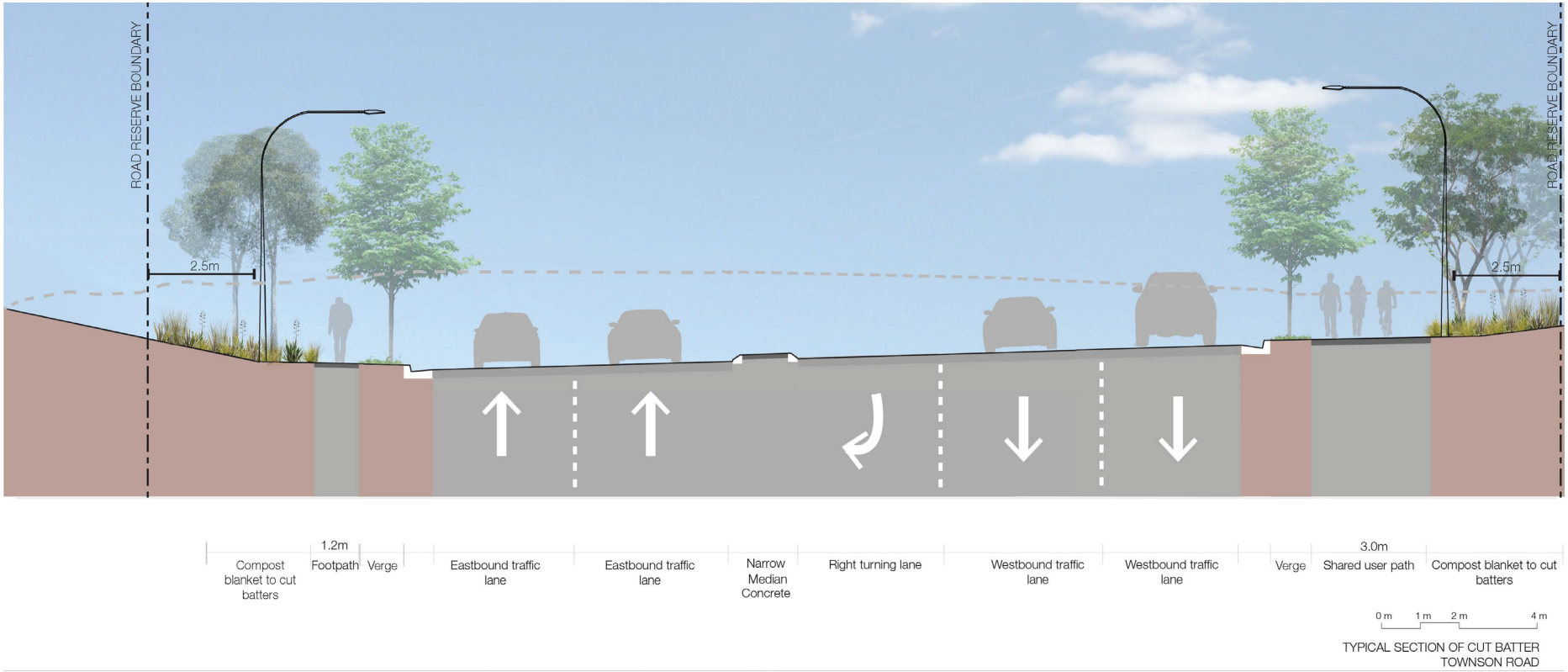

Figure 3.5: Typical section through Townson Road ultimate phase cut batter

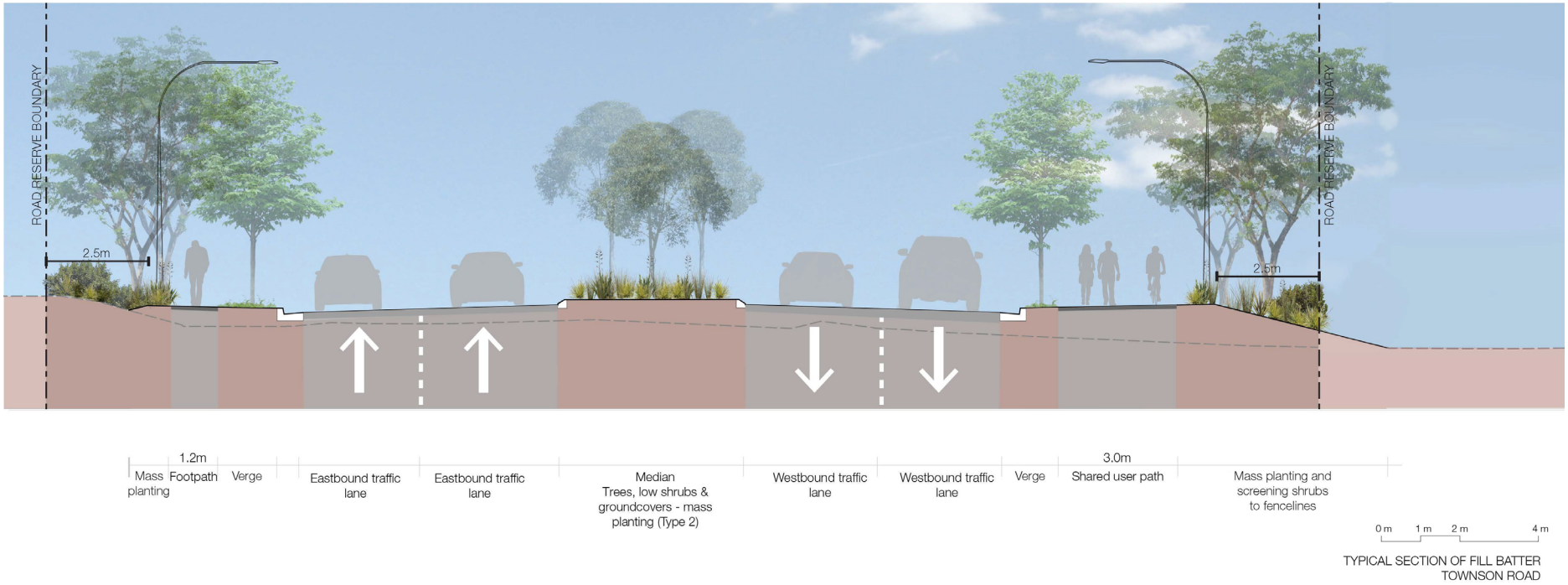

Figure 3.6: Typical section through Townson Road ultimate phase fill batters

3.2 Design

This section provides a detailed description of the concept design of the proposal. Concept design plans are provided for information in **Appendix C**. The design would be further refined at the detailed design stage.

The concept design was prepared in accordance with the requirements of a design management system certified under AS/NZS ISO 9001:2008 Quality Management Systems and with reference to relevant standards, guidelines and specifications.

3.2.1 Design criteria

As identified in section 1.1, relevant standard and guidelines have been adopted to ensure the proposal is designed to be safe, effective, well-planned and easily maintained. The relevant criteria adopted for the proposal is outlined in Table 3.1. A typical cross section of the alignment is shown in

Figure 3.7.

Cross section diagrams of other locations along the proposal are shown in section 3.2.3.

Table 3.1: Design criteria

Design element	Minimum design criteria
Design speed	70 km/hr with a posted speed of 60 km/hr 60 km/hr with a posted speed of 50 km/hr for side roads (Victory Road and the planned new road)
Design vehicle	26 m long B-Double or a 19 m long semi-trailer
Width of lanes	3.5 m
Median width (ultimate phase)	4.8 m narrowing to 1.5 m to allow for turning lanes at intersections. Side roads include a 2 m wide median.
Pavement type and grade	Flexible pavement - full depth asphalt pavement for Townson Road. The side roads are similar to Victory Road, a thin asphalt surfacing on granular base with a minimum pavement of 300 mm.
Safety barriers	As agreed with Council and TfNSW barriers would be provided at the outer extent at the bridge.
Provisions for pedestrians, cyclists and buses	See section 3.2.3
Batter slopes	4:1 ratio for cuttings and fill embankments
Landscaping	See section 3.2.3

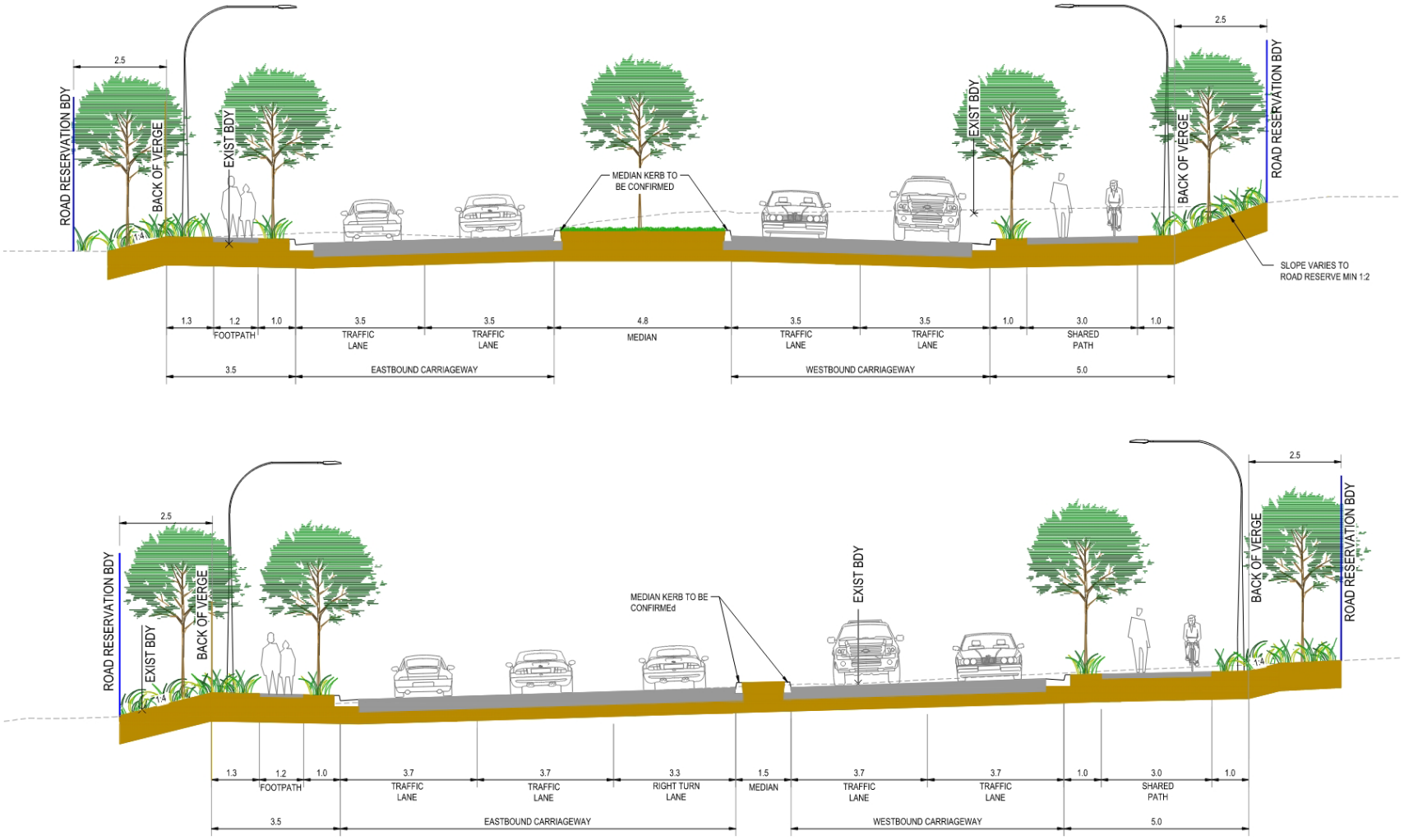

Figure 3.7: **Typical cross section of the ultimate phase of the proposal**

3.2.2 Engineering constraints

Building and operating the proposal would be restricted by a number of engineering and development constraints. Constraints have been identified through value engineering and constructability workshops and were considered during the design development. Table 3.2 lists the main constraints and discusses how they have been addressed in the concept design.

Table 3.2: Engineering constraints

Constraint	Design provision
Public utilities	The overhead utilities that run along Townson Road would be relocated underground, including underboring under Bells Creek. This eliminates the constraints of the poles and the associated clear zones. These can be accommodated within the footway reservation.
Minimal land space available for construction	Operational boundaries have been identified to accommodate all design elements and anticipated construction work. Property acquisition has also been identified which is to be confirmed with the landowners.
Flooding risk	An additional bridge has been added to the proposal east of the Bells Creek bridge to allow for flooding overflow. This reduces the risk of flooding to nearby properties.
Adjacent developments	The road alignment has been modified both horizontally and vertically to provide transition and connection to the residential development currently under construction to the south of Townson Road. The planned new road intersection has been relocated to align with the *West Schofields Draft Master Plan.*
Durham Road/ Jersey Road tie-in	The temporary connection road consists of a sweeping bend and T-intersection with Jersey Road. This would allow for the extension of Stage 2 whilst maintaining access to Durham Road and Jersey Road following completion of the proposal.

3.2.3 Major design features

Road widening

The proposal involves the widening and upgrading of about 1.6 kilometres of Townson Road, between Richmond Road and Durham Road/Jersey Road. It also includes a new section of road to the east of the existing alignment between Meadow Road and Durham Road/Jersey Road. The proposal would include two traffic lanes about 3.5 metres wide in each direction. A central median would be constructed along the length of the upgrade narrowing at intersections to allow for turning movements (descriptions of the intersection upgrades are detailed further below). The typical cross section is shown in

Figure 3.7.

To allow for this upgrade, the existing single lane carriageway would be widened up to seven metres to the north and five metres to the south. A new access stub is proposed for the residential development to the south of Townson Road about 420 metres east of Richmond Road. This stub would allow access to and from Townson Road.

A new section of Townson Road is proposed to be constructed to the east of the existing alignment between Meadow Road and Durham Road/Jersey Road. This would be provided at the interim phase to maintain east-west connectivity and would be removed on completion of the future Stage 2 works.

Intersection upgrades

Richmond Road

The existing layout of the Richmond Road and Townson Road intersection would be predominantly retained. To accommodate the predicted additional westbound left turn volumes, particularly in the future year 2036, an additional left turn slip lane would be provided. This would take traffic from Townson Road onto southbound Richmond Road.

To accommodate the alignment of the slip lane a new pedestrian crossing would be provided, to connect into the existing pedestrian crossing network.

A plan view showing the Richmond Road intersection is provided in Figure 3.8.

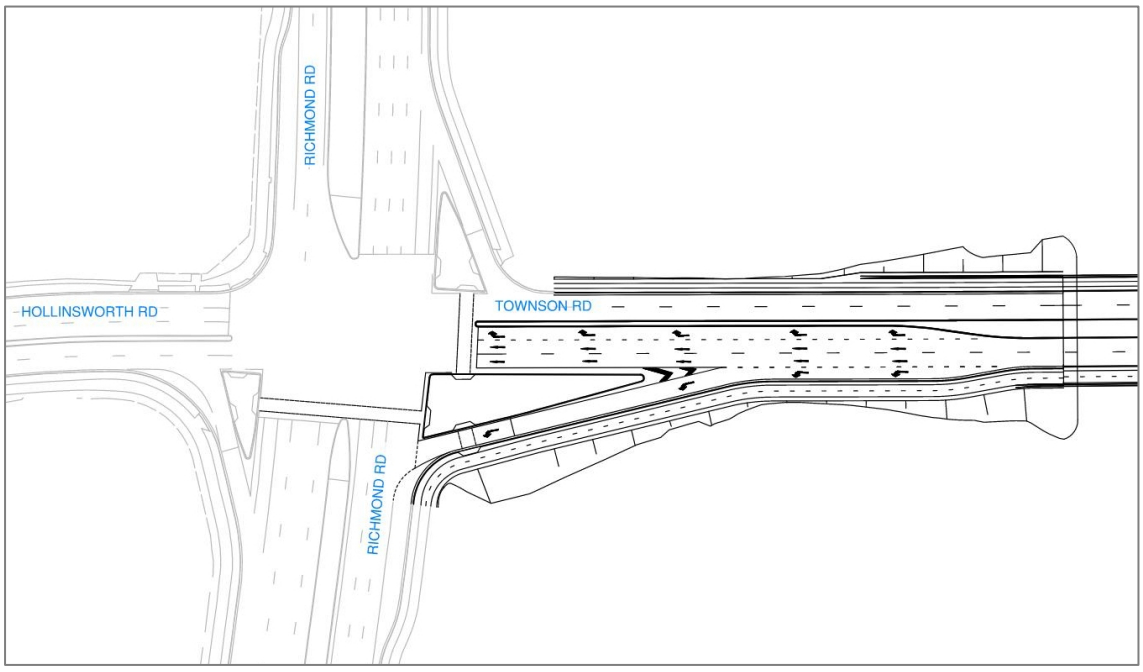

Figure 3.8: Plan view of the Richmond Road intersection – ultimate phase layout

Victory Road

The existing roundabout at the Victory Road intersection with Townson Road, is proposed to be removed and replaced with a signalised intersection. A stub for Victory Road north would be constructed to provide for a future subdivision development. The final layout would be determined as the design progresses.

Victory Road south is proposed to be upgraded for a length of about 120 metres with one lane in each direction (northbound and southbound) and a central median. Right turn lanes would be provided in all directions to and from Townson Road and Victory Road. This would allow for all traffic movements. The northern leg of the Victory Road intersection would be adjusted to accommodate 26 metre B-Double into CSR Brickworks.

Formalised pedestrian crossings are proposed at each leg of the signalised intersection, with a 1.2 metre wide footpath on the northern side and a three metre shared path on the southern side.

A plan view showing the Victory Road intersection is provided in Figure 3.9.

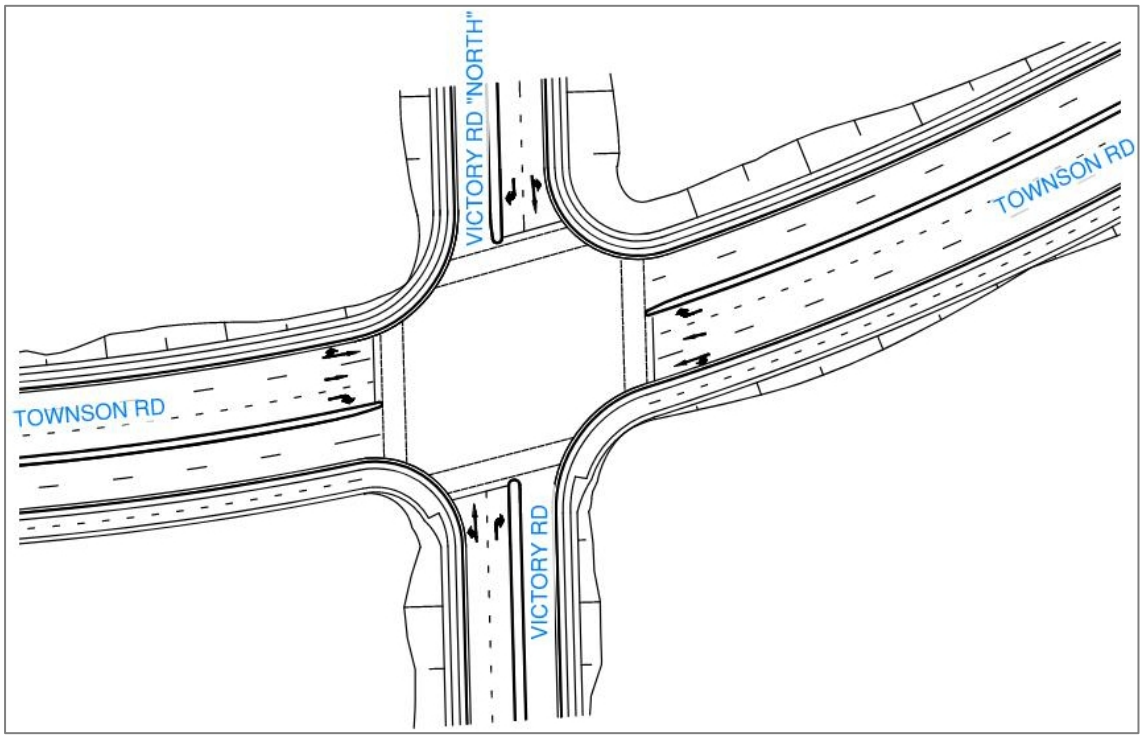

Figure 3.9: Plan view of the Victory Road intersection – ultimate phase layout

New intersection

A new intersection is proposed near the eastern end of Meadow Road to allow for access to future developments to the north and south of the proposal. This new access road would feature one lane in each direction with a central median provided for the northern leg of the new access road. The new access road provides stubs to allow tie-in for future developments. To allow for all traffic movements, right turn lanes would be provided in all directions to and from Townson Road and the new access road.

Similar to the Victory Road intersection, formalised pedestrian crossings are proposed at each leg of the new intersection consisting of a footpath about 1.2 metres wide on the northern side and a shared path about three metres wide on the southern side.

A plan view showing the new intersection is provided in Figure 3.10.

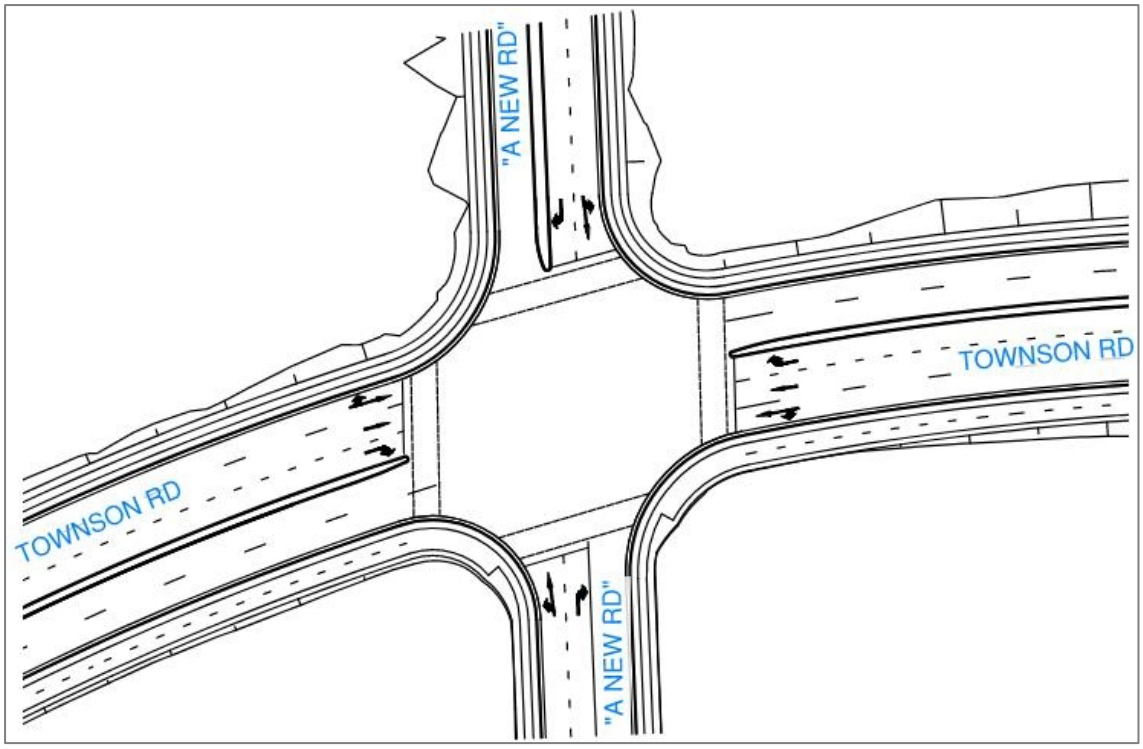

Figure 3.10: Plan view of the new intersection – ultimate phase layout

Bridges

An existing three cell box culvert at Bells Creek is proposed to be removed and replaced with a bridge to enable Townson Road to become a flood evacuation route. The existing culvert is about 200 metres east of Richmond Road with each cell about three metres wide and two metres high.

The proposed bridge is about 36 metres long. It would comprise a concrete two span deck with concrete piers. The concept design cross section for the Bells Creek bridge is shown on Figure 3.11. Utility services would be predominately placed within the footpath. The Sydney Water mains would be attached to the side of the bridge structure and the high pressure gas mains would be installed via underboring beneath Bells Creek, rather than on the bridge structure (see section 3.5). Piers would be located within the water body in order to minimise earthworks which would impact on surrounding private properties.

A flood relief bridge is proposed about 50 metres east of Bells Creek and is also about 36 metres in length. This additional bridge is required to reduce flooding afflux and allow for the movement of water under the road formation (see section 6.3).

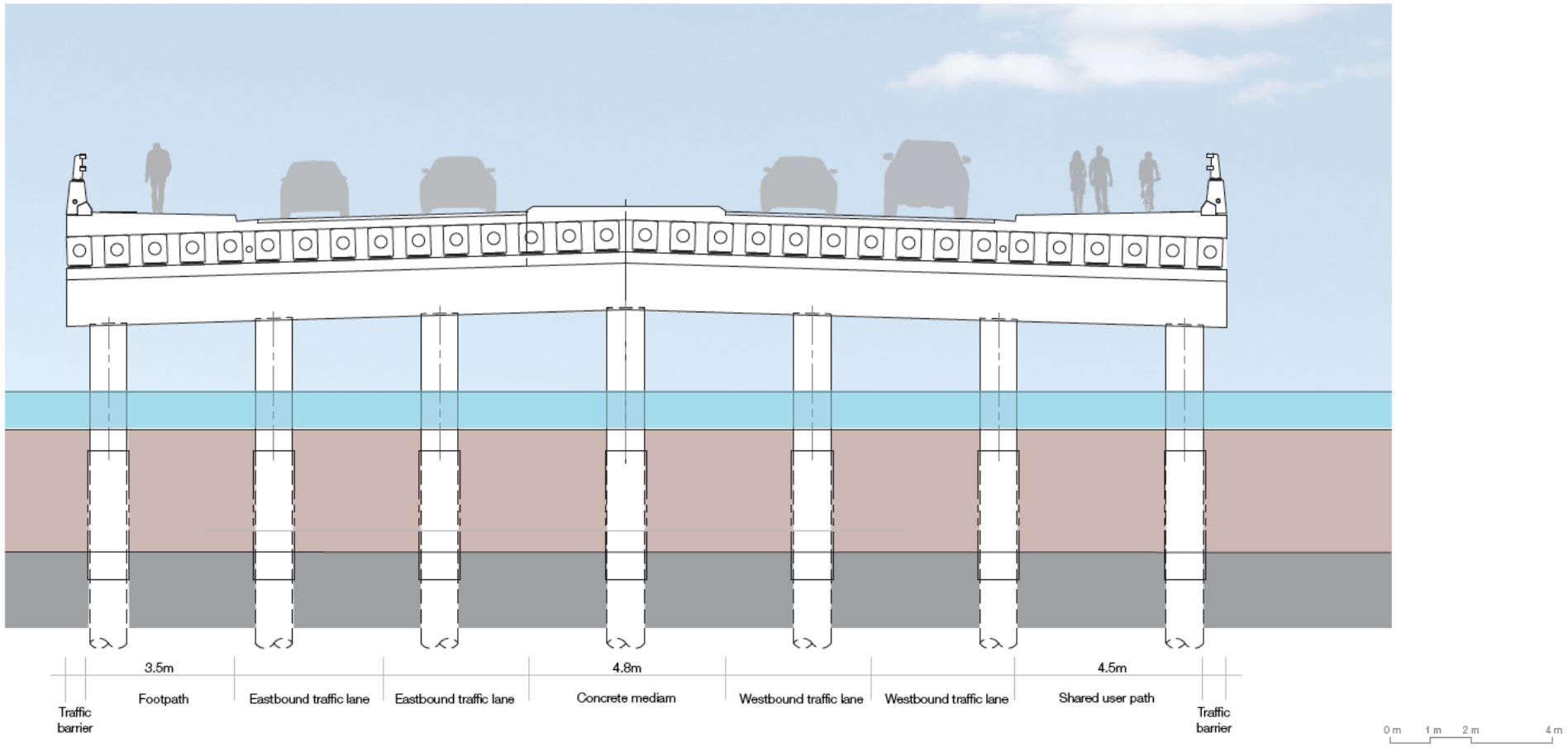

Figure 3.11: Indicative cross section of Bells Creek bridge for the ultimate phase of the proposal

3.2.4 Pedestrian and cyclist facilities

A three metre wide shared user path for pedestrians and cyclists is proposed along the southern side of Townson Road. A 1.2 metre wide footpath is proposed on the northern side of Townson Road and at intersections.

3.2.5 Urban design and landscaping

An urban design report was prepared by GHD to inform the concept design and is provided as **Appendix D**. A landscape character and visual impact assessment was also prepared by GHD and is provided in **Appendix D**.

The urban design strategy for the road corridor recognises the existing urban and landscape character and seeks to integrate the widened road and new bridge structures sensitively into the natural and suburban setting. The urban design would introduce a more formal arrangement to the landscape where adjacent to residential land uses. A naturalised character would be introduced adjacent to creek crossings and areas adjacent to existing vegetation.

The urban design objectives developed for the proposal are described in section 2.3.3. These objectives have been integrated into the concept design and would be considered further in the detailed design phase of the proposal. The impacts on existing landscape character and visual amenity are described in section 6.9.

3.2.6 Ancillary activities

Drainage and water quality

The proposal would include various drainage structures including longitudinal drains, cross drains and drainage associated with the bridges.

All drainage requirements have been designed in accordance with relevant guidelines and standards and relevant Australian rainfall and runoff data. The potential effect arising from climate change has also been considered in the modelling.

Townson Road would include kerb and guttering to collect and control runoff from the pavement surface. This runoff would be collected in the longitudinal drainage system which would include inlet pits to collect the stormwater from the kerb and gutter and pipes to convey the stormwater to outlet headwalls. These headwalls would outlet to vegetated swales which would convey stormwater to the nearest point of discharge to the watercourses that cross the proposal. Rock scour protection would be provided on headwall outlets and in areas where stormwater velocities are high to prevent erosion.

Culverts have been incorporated into the design to allow for the passage of stormwater across the proposal and to minimise flooding impacts on adjacent land. These are located about 150 metres east of Victory Road (a pipe culvert), at the planned new road intersection (a box culvert) and 130 metres east of Meadow Road (a pipe culvert). Each structure has been sized to ensure that peak water levels upstream do not exceed the design criteria for the adopted storm event.

The interim phase has taken into consideration the continued short-term operation of the Bravo Nursery (the commercial business on 9 Townson Road), prior to completion of the proposal. The design of the interim phase would provide a bund between the two access driveways into the Nursery compound. Also, a flood relief culvert would be constructed to reduce potential flooding impacts to this property. On completion of the proposal, the flood relief bridge would be extended to the north into the nursery property. At this point the bund and flood relief culvert would be removed so the waterway is opened to provide flood immunity for this section of Townson Road.

Water mains

A new water mains for Sydney Water, would be provided in the southern shared path and it would be connected to the external façade of the bridge structures.

Street lighting

A concept lighting design has been prepared for the proposal in accordance with *AS-NZS 1158-1-2: Road lighting - Vehicular traffic lighting - Guide to design, installation, operation and maintenance.* This would be further developed during detailed design in accordance with Transport for NSW quality assurance specifications. The concept design assumes all existing light poles would be removed and new light poles would be installed.

Street lighting would typically be single lighting columns with singular outreach arms. These would be located outside the clear zone at the back of the shared user path/footpath, on both sides of the road.

During the interim phase lighting would be provided on the southern side of the carriageway, which would be upgraded during the ultimate phase to provide lighting on the northern side of the carriageway for the full four lane divided road.

The Transport for NSW Intelligent Transport System (ITS) network would require an upgrade for the proposal. ITS underground conduits would generally follow the southern extent of the alignment ending about 100 metres west of Jersey Road for the anticipated tie-in to Stage 2. Communications and electrical conduits and pits would be installed at the interim phase to accommodate the future ITS requirements at the signalised intersection upgrades.

Signage and road furniture

Signposting requirements and related issues such as sign structures would be considered during the detailed design phase and would be developed in accordance with relevant Transport for NSW quality assurance specifications. At the concept design stage, only the removal or relocation of existing local signage along Townson Road is proposed.

It is anticipated the only other road furniture would be the inclusion of pedestrian fencing at, or adjacent to culverts and any embankments with a slope steeper than 1:2.

Cuttings and embankments

The majority of the alignment includes fill embankments and cuttings of less than two metres with slopes generally 4:1.

Fill embankments to a height of up to three metres are proposed near the bridges at the western end of Townson Road. The maximum slope would be 2:1 in these locations, generally 4:1 in all other locations. A typical cross section of a cut/fill batter is shown in Figure 3.5.

Transitional area between the proposal and Stage 2

Due to the uncertainty in the construction timeframe for Stage 2, there is a requirement to maintain connectivity from Richmond Road to Durham Road. An interim tie-in connection road about 100 metres in length would be constructed to allow for connectivity.

A T-intersection would be constructed at Jersey Road which would allow for turning movements either westbound along Townson Road or northbound along Durham Road. The work within the existing road formation on Jersey Road and Durham Road would involve pavement work, line marking, minor utility relocation (water and electrical) and signage to facilitate the T-intersection.

3.3 Construction activities

Construction activities would be guided by a construction environmental management plan (CEMP) to ensure work is carried out to Transport for NSW specifications within the specified work area. Detailed work methodologies would be identified by the construction contractor. The methodology would be similar for both the interim and ultimate phases of construction.

A key consideration for construction planning is the proposed temporary closure of Townson Road to construct the Bells Creek bridge and the flood relief bridge. This would be required during the interim phase. Existing traffic, construction traffic and also heavy traffic accessing the quarry site would be diverted via Victory Road and Alderton Drive, connecting to Richmond Road. Further information on the proposed diversion is provided in section 3.3.7.

The proposal is anticipated to involve the following general work methodology and sequencing:

- Establishment of temporary fencing
- Installation of erosion and sediment controls
- Establishment of construction compound site
- Utility relocations
- Vegetation clearing and grubbing
- Stripping, stockpiling and management of topsoil and unsuitable material
- Earthworks preparation
- Bulk earthworks
- Structural work, including bridges
- Drainage work
- Pavement and median construction
- Landscaping
- Installation of permanent traffic control signals
- Finishing work including installation of safety barriers, fencing, pavement marking, signposting, and street lights
- Removal of construction compound and site tidy up.

These are grouped and discussed further in Table 3.3.

3.3.1 Work methodology

Construction activities and the proposed work stages undertaken within each activity are outlined in Table 3.3.

Table 3.3: Construction overview

Construction activity	Typical activities
Enabling work	• Community notification of construction commencement • Relocation of flora and fauna species, if required • Road and intersection modifications at the proposed construction access points • Utility relocations at selected locations • Construction of minor access roads • Construction of temporary accesses • Property demolition work • Installation of temporary construction signage and lighting • Fencing of construction areas and site compounds • Construction of temporary side tracks
Site establishment	• Construction of access roads for main alignment west to east • Establishment of on-site compounds • Clearing of vegetation and stockpiling of mulch materials • Stripping topsoil and stockpiling for reuse in batter stabilisation • Progressive construction of sedimentation and erosion controls as required, including construction of diversion and catch drains along the proposal formation • Progressive installation of temporary fencing • Temporary traffic management arrangements
Bulk earthworks	• Excavation of cuttings and stockpiling of structurally suitable materials to be used as fill • Construction of fill embankments • Placement and compaction of selected material • Excavation of unsuitable materials, including blending and/or disposal of surplus material
Drainage and structures	• Construction of longitudinal and vertical drainage structures within cuttings • Construction of subsurface drainage • Construction of road longitudinal and cross drainage including outlets and scour protection work • Construction of open drains and catch drains including scour protection work

Construction activity	Typical activities
Bridge construction	• Establishment of bridge work compounds • Demolition of existing culvert structures • Installation of temporary access tracks and drainage culverts over waterways to enable access • Construction of bridge foundations • Construction of bridge abutments and piers • Construction of bridge substructures and superstructures
Pavement work	• Construction of base and sub-base pavement layers • Construction of pavement drainage including kerb and gutter, as required • Construction of medians and barriers • Construction of pavement wearing course
Finishing Work	• Final pavement line marking • Signposting • Street lighting • Landscaping and tree planting • Reinstatement of disturbed surfaces (eg Construction compounds) • Demobilisation

3.3.2 Construction workforce

The construction workforce is expected to fluctuate, depending on the phase of construction and associated activities. The workforce is expected to peak at about 80 personnel per day, for both the interim and ultimate phases of work. The final number of construction workers would be identified by the construction contractor.

3.3.3 Construction duration and hours

Construction of the interim phase is anticipated to start in early 2022, opening to traffic in 2023. It is anticipated that the interim phase would be operational for a period of up to five years before the ultimate phase work is completed.

Both phases of construction work are anticipated to take around 18 months each to complete.

Standard work hours

Standard construction hours would be adopted in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) as shown in Table 3.4. Most construction activities would be undertaken during this time.

Table 3.4: Standard construction hours

Day	Start time	Finish time
Monday to Friday	7.00 am	6.00 pm
Saturday	8.00 am	1.00 pm
Sundays and public holidays	No regular work	

Out-of-hours work

It is anticipated that the majority of construction would be carried out during standard construction working hours. However, out-of-hours work may be required to construct the new intersections at Victory Road and at the new access road. This would minimise traffic disruptions.

If required, out-of-hours work times would be confirmed by the contractor and are likely to be between Monday to Friday 8.00 pm to 5.00 am. Weekend work may be required, subject to road occupancy licences and approved construction staging. Any work undertaken outside of standard working hours would be in accordance with the ICNG and the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016). Prior notification would be given to the community regarding work hours.

3.3.4 Plant and equipment

A range of plant and equipment would be used during construction. The equipment and plant requirements would be identified by the construction contractor. An indicative list of plant and equipment is provided in Table 3.5.

Table 3.5: Indicative plant and equipment

Indicative items of plant and equipment	
Hand tools	Generator
Excavators	Road line marking trucks
Light vehicles	Rollers
Flat-bed delivery trucks	Asphalt and concrete pavers
Graders	Concrete mixers
Water truck	Cranes
Loaders (front end and skid steer)	Material transfer vehicles
Elevated work platform	Piling rig/auger
Concrete saws	Hydraulic hammers
Rock breakers	Compacters

3.3.5 Earthworks source and quantity of materials

The proposal would involve minor earthworks. The estimated quantities of materials associated with earthworks are provided in Table 3.6. The majority of the spoil generated by the proposal would be reused within the site. The majority of the earthworks would be carried out during the interim phase.

Table 3.6: Indicative earthwork quantities

Material	Volume (cubic metres)
Spoil	27,500
Imported select material	10,700

The proposal would require earthworks for the following:

- Trenching excavation for the relocation of existing utilities and the installation of new services
- Removal of existing, and construction of, new road pavement, drainage, kerbs and footpaths
- Road widening of Townson Road.

The existing Bells Creek culverts would be demolished as part of the proposal. This would be undertaken as part of the interim work.

Subject to testing, the cut material is assumed suitable for reuse as general fill. This would be confirmed during detailed design. Materials would be sourced from appropriately licensed facilities. Wherever possible, materials would be sourced from commercial suppliers in nearby areas. None of the materials proposed to be used are considered to be in short supply.

Surplus material that cannot be used on-site or on other projects would be classified in accordance with the *NSW EPA Waste Classification Guidelines* (EPA, 2014) and disposed of at an approved materials recycling or waste disposal facility.

The amount of water that would be required during construction is unknown at this stage. The amount would depend on material sources and methodologies applied by the contractor. The use of material such as ready mix concrete (required for pavement and kerbs) would reduce the amount of water required onsite during construction. Water would also be required for compaction of pavement layers, such as select layers to adjust the moisture content, and for dust suppression. It is proposed that water would be obtained from Sydney Water's water supply network.

3.3.6 Temporary drainage and water management

Temporary sediment basins would be installed near Bells Creek to detain and treat stormwater prior to release to Bells Creek during construction. These basins would be removed after construction of the road pavement and when revegetation is established sufficiently to control erosion without the need for sediment basins.

Other sediment and erosion control measures would be developed as part of the CEMP and may include temporary diversion channels, sediment fencing and the use of mulch bunds to manage stormwater flows and filter sediment.

3.3.7 Traffic management and access

Traffic management

A Traffic Management Plan (TMP) would be prepared in accordance with Roads and Maritime's *Traffic Control at Work Sites* (RTA, 2010a) and Roads and Maritime Specification *G10 - Control of Traffic* (Roads and Maritime, 2015). The TMP would provide details of the traffic management to be implemented during construction to ensure that traffic flow on the surrounding network is maintained where possible. The TMP would also ensure the safe separation of workers onsite from vehicles on Townson Road, Richmond Road, Victory Road and Meadow Road.

The speed limit on Townson Road would be reduced to 40 kilometres per hour in construction zones for the duration of construction work subject to Transport Management Centre and Council approval. Lane closures are anticipated along Townson Road during construction work. Parking for construction workers would be provided at the construction compound site.

Timing of construction activities and traffic management during construction would also be detailed in the TMP under a Road Occupancy License. The TMP would also detail specific haulage routes that construction traffic would follow throughout the construction phase. The TMP would be reviewed by Transport for NSW prior to the commencement of construction.

Traffic diversion during construction

During construction, Townson Road traffic would be diverted from the proposal area to a temporary diversion through Victory Road and Alderton Drive for a period of six months during the construction of the Bells Creek bridge (see Figure 3.12). Access would be maintained for private properties on Townson Road, either side of Bells Creek.

The proposed diversion offers a number of benefits to the proposal and the community, including:

- Allowing offline construction of the Bells Creek bridge, minimising construction traffic impacts to road users
- Reducing safety issues associated with the construction and community interface
- Accelerating the construction program, resulting in a possible earlier completion date
- Simplifying the bridge construction as it would not need to be constructed in stages.

Temporary traffic signals would be provided at the intersection of Victory Road and Townson Road to provide a safe turning environment for local traffic. The pavement width at the intersection would be confirmed during detailed design to ensure heavy vehicles are accommodated.

Temporary line marking would be provided at the Victory Road/Townson Road intersection. The speed limit of the local roads is currently sign posted at 50 kilometres per hour. This is likely to be sufficient during the diversion. The diversion is not proposed to be used by construction traffic.

Any changes to existing traffic movements would be made available to the public through community updates and/or newsletters.

During the temporary closure, the existing bus stop on Hollinsworth Road eastbound (Stop ID: 276516) would be serviced by the existing bus stop on Richmond Road southbound (Stop ID: 2761174). The location of a further three temporary bus stops would be investigated along the traffic diversion as the design progresses. These have been indicatively identified near Stapleton Avenue and near the Victory Road intersection with Townson Road and are shown on Figure 3.12. The associated impacts of the proposed temporary traffic diversion are discussed in Section 6.1.

Construction vehicle movements

Construction of the proposal would generate heavy vehicle movements. These heavy vehicle movements would mainly be associated with:

- Delivery of construction materials
- Spoil removal
- Delivery and removal of construction equipment and machinery.

Light vehicle movements would be required for the movement of construction personnel, including contractors, site labour force and specialist supervisory personnel. Estimated construction traffic numbers are provided in Table 3.7.

Table 3.7: Construction traffic estimates

Vehicle type	Total number of vehicles per day (average)	Total vehicle movements per day (average)
Employee cars	20	40
Light construction vehicles and utilities	12	48
Heavy vehicles and trucks	5	20

Figure 3.12: Proposed traffic diversion during the temporary closure of Townson Road

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Access management

While it is the intention that access to all properties would be maintained at all times during construction of the proposal, changes to this may become unavoidable. The construction traffic management and construction access arrangements would be identified by the appointed contractor. Where access restrictions are required, consultation with affected property owners would occur to agree on appropriate alternative arrangements.

There are no existing pedestrian facilities within the construction footprint. Appropriate wayfinding signage would be used to guide pedestrians through the construction area, including temporary footpaths, if required.

3.4 Ancillary facilities

A possible construction compound site has been identified to the south of Townson Road between Victory Road and the tie-in with Stage 2 as shown on Figure 1.2. The proposed compound site is about 1.5 hectares of cleared land.

The site is proposed to be accessed from the existing Townson Road. This area is identified for a future residential subdivision development. It is not anticipated that vegetation clearing would be required as a cleared area has been identified. Further discussion is provided in section 6.6.

The compound site would be hardstand with buildings and offices, workforce parking, refuelling areas toilets/amenities, potential storage of chemicals and fuels, and stockpile and laydown areas. The nearest residential receivers are located over 200 metres to the south, along Sunningdale Drive. Recreational receivers would be located adjacent to the compound site, within Stonecutters Ridge golf course. The existing quarry is located to the north of Townson Road in this location.

The compound site is proposed to be operational during standard construction working hours.

The establishment of the compound site would form part of the site establishment work and would indicatively include:

- Erection of site fencing and establishment of erosion and sediment control measures
- Construction of hardstand areas, including dedicated hard stand for plant and equipment, plant inspection and maintenance, vehicle washdown and bunded storage areas for fuels and chemicals (if required)
- Establishment of prefabricated or purpose-built temporary offices, crib sheds and storage sheds
- Establishment of temporary utility connections, if required.

Stockpiles would be required for the duration of construction. Construction stockpile sites would temporarily store materials for construction, or materials generated from within the construction site. This could include road base constituents, stripped topsoil, and excess spoil unsuitable for use for the proposal.

Stockpiles would be managed in accordance with the requirements of Roads and Maritime's *Stockpile Site Management Guideline* (Roads and Maritime, 2015) and the Roads and Maritime QA Specification R44 – Earthworks. Site establishment activities for all stockpile sites would include activities such as the erection of site fencing and establishment of sediment and erosion control measures. There may be a need to store bridge materials for the construction of the Bells Creek bridge, to minimise haulage from the construction compound. This would be undertaken within the construction footprint and would be confirmed during detailed construction planning.

Should additional ancillary facilities be identified as being required, the siting of ancillary facilities should be located within areas:

- At least 40 metres away from the nearest waterway
- Of low ecological and heritage conservation significance
- At least 100 metres away from residential dwellings and other land uses that may be sensitive to noise
- On relatively level ground
- Outside the 1 in 10 year ARI floodplain.

Once the location of additional facilities are identified, consultation with the Transport for NSW Environment and Sustainability Branch would be undertaken to confirm the suitability of the locations and whether any additional environmental assessment is required.

3.5 Public utility adjustment

Initial utility investigations have identified numerous utilities within the construction footprint as outlined in Table 3.8.

Table 3.8: Identified utilities in close proximity to the proposal

Utility	Utility provider	Description
Electricity/street lighting	Endeavour Energy	High voltage and low voltage overhead assets along Townson Road and Meadow Road including a pole mounted transformer requiring relocation underground.
Gas	Jemena	Two high pressure 1050 kPa gas mains across Townson Road requiring relocation with underbore beneath Bells Creek and earthworks. Other gas work would include 110 mm smaller mains providing local supply would be relocated to the new footway / verge.
Phone/internet	Telstra National Broadband Network (NBN)	One 100 mm Telstra duct within the construction footprint. NBN assets are mainly located within the Telstra ducts. The fibre optic cables would require relocation.

Utility	Utility provider	Description
Water/sewer	Sydney Water Council Private	A 100 mm potable water asset requiring relocation to either the new footpath or clear of the road earthworks. A 150 mm potable water main may be impacted at Victory Road and may require adjustment. A rising sewer main traverses Townson Road near the intersection with Richmond Road. This would have sufficient depth to remain in situ.
Intelligent transport systems ITS	TfNSW	Electrical and communication conduits to provide the ITS for the proposed signalised traffic control systems at Victory Road and the planned new road intersections. To be located within the shared path.

3.6 Property acquisition

The proposal would require the full acquisition of one existing residential property. In addition, partial acquisition would be required of four residential properties, two commercial properties, one mixed use residential/commercial property and one new residential subdivision.

Properties impacted by acquisition or adjustments are listed in Table 3.9. The extent of property impacts would be refined and confirmed during detailed design in consultation with the property owners. For partial acquisitions, property adjustment plans would be developed in consultation with the property owner.

Additional strips would also be required to be leased on a temporary basis for construction purposes. The leased land would be reinstated on completion of construction and handed back to the respective owners. All acquisitions would be conducted in accordance with Blacktown City Council policy and compensation would be based on the requirements of the *Land Acquisition (Just Terms) Compensation Act 1991*.

Table 3.9: Proposed property acquisition

Description	Area of acquisition (m^3)	Full/ partial acquisition	Current owner	Lot and DP	Land use zone (LEP)
46 Durham Road	23,852	Full	Private developer	Lot 28/ DP 12076	SP2/RU4
9 Townson Road	2039	Partial	Private property /commercial	Lot 43/ DP 1175138	B5/E2/RU4
35 Townson Road	619	Partial	Private property	Lot 8/ DP 17048	RU4
51 Townson Road	458	Partial	Private property	Lot 9/ DP 17048	RU4
55 Townson Road	450	Partial	Private property	Lot 10/ DP 17048	RU4
63 Townson Road	611	Partial	Private property	Lot 11/ DP 17048	RU4
6 Townson Road	1775	Partial	Commercial property	Lot 44/ DP 1175138	B5/E2
75 Townson Road	10880	Partial	Commercial property	Lot 3/ DP 232574	RU4
Luxeland Marsden Park	4484	Partial	Private developer	Lot 356/ DP 1253165	SP2/E2/ R2/RE1

In addition, a strip of land would be temporarily acquired from a private developer. This is to enable the construction of the new section of Townson Road between Meadow Road and Durham Road/Jersey Road to maintain east-west connectivity. This land would be returned to the developer following completion of the Stage 2 proposal, with Townson Road extension to the east towards Burdekin Road.

Table 3.10: Proposed temporary property acquisition

Description	Area of acquisition (m^3)	Full/ partial acquisition	Current owner	Lot and DP	Land use zone (LEP)
5 Meadow Road	1143	Partial	Private developer	Lot 29/ DP 112076	RU4

4 Statutory planning framework

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for a road and is to be carried out on behalf of Transport for NSW, it can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under State Environmental Planning Policy (Coastal Management) 2018, State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (State Significant Precincts) 2005.

Part 2 of ISEPP 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 ISEPP (where applicable), is discussed in Chapter 5 of this REF.

State Environmental Planning Policy (Sydney Region Growth Centres) 2006

State Environmental Planning Policy (Sydney Regional Growth Centres) 2006 (the Growth Centres SEPP) is the legal instrument that establishes the planning rules and objectives for Sydney's Growth Centres. Consent authorities must apply this policy when they make planning decisions about land within the Growth Centres areas. Parts of the study area are located within the North West Growth Centre.

Biocertification

Under section 126G of the now repealed *Threatened Species Conservation Act 1995*, the Minister applied the principle of Biodiversity Certification to the Growth Centres SEPP. Clause 18(2) of the *Threatened Species Conservation Amendment (Special Provisions) Act 2008* outlines that Biocertification applies to 'all development and activities that may be carried out under the Growth Centres SEPP, and, to all threatened species, populations and ecological communities.' Biodiversity certification that was conferred on land under the *Threatened Species Conservation Act 1995* and that was in force on the repeal of that Act is taken to be biodiversity certification conferred on the land under Part 8 of the BC Act.

Biocertification removes the need to undertake threatened species assessments or prepare species impact statements (SIS) for species and communities listed under the BC Act. Portions of the construction footprint are located within land certified under the Growth Centres SEPP. Activities in biocertified land are taken to be not likely to significantly affect any threatened species, population or ecological community, as these impacts have already been offset, and a determining authority is not required to consider the effect on biodiversity values of the activity.

Biocertification does not apply to threatened biota listed under the FM Act. As such, there is a requirement to assess impacts with respect to this Act in both certified and non-certified land.

Non-certified areas

Portions of the study area comprise non-certified lands, predominately associated with riparian areas associated with Bells Creek. Where present, riparian vegetation comprises River-flat Eucalypt Forest, listed as an endangered ecological community under the BC Act. Some areas of Cumberland Plain Woodland in the study area are identified as 'existing native vegetation' (ENV) under the Growth Centres SEPP.

There would be direct and indirect impacts on threatened ecological communities within non-certified land. The potential for impacts on threatened biota occurring within non-certified areas is discussed further in section 6.6.

Under the Biodiversity Certification Order for the Sydney Region Growth Centres, offsets are developed in accordance with the relevant biodiversity measures 10 and 11 detailed in Schedule 1 of the Biodiversity Certification Order (Minister for the Environment, 2007). Offsets are only required for clearing of vegetation mapped as ENV within non-certified lands.

Patches of ENV occur within the southern half of the construction footprint. These areas, along with offsetting requirements for impacts on ENV in non-certified land are discussed in section 6.6.

The proposal would involve clearing of native vegetation on land that is not subject land. In accordance with clause 18A of State Environmental Planning Policy (Sydney Region Growth Centres) 2006, Transport for NSW has given written notice to the Department of Planning, Industry and Environment regarding the need to clear native vegetation on land that is not subject land within the meaning of clause 17 of Schedule 7 to the Threatened Species Conservation Act 1995.

Commonwealth endorsement of Biocertification

On 28 February 2012, the Commonwealth Environment Minister approved all actions associated with development of the Sydney Growth Centres as described in the *Sydney Growth Centres Strategic Assessment Program Report* (NSW Government, 2010). This endorsement removes the requirement for site by site approvals under the *Environment Protection and Biodiversity Conservation Act 1999* as long as proposed actions are consistent with the endorsed Program. No approval under the EPBC Act is therefore required for impacts on threatened and migratory biota listed under the Act within certified areas.

Sydney Regional Environmental Plan No. 20 – Hawkesbury Nepean River

The proposal is located on land to which the deemed SEPP, Sydney Regional Environmental Plan No. 20 – Hawkesbury Nepean River (No.2 – 1997) (SREP 20) applies. The proposal does not require consent under SREP 20. However, under clause 4(1) (b), the matters listed under clauses 5 and 6 that apply to a proposal must be considered by a public authority or State owned corporation carrying out development that does not require consent. Table 4.1 addresses these matters as they apply to the proposal.

Table 4.1: Consideration of the provisions of SREP 20

Consideration	Comment
Clause 5	
5(a) The aim of this plan which is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context	This REF assesses the impacts of the proposal and takes into account the potential regional impacts. The proposal is not anticipated to have any significant and/or regional level impacts on the Hawkesbury-Nepean River system.
5(b) The strategies listed in the Action Plan of the Hawkesbury-Nepean Environmental Planning Strategy	The proposal is consistent with the strategies listed in the Action Plan.
5(c) Whether there are any feasible alternatives to the development or other proposal concerned	The need for the proposal and the options considered are discussed in section 2 of this REF.
5(d) The relationship between the different impacts of the development or other proposal and the environment, and how those impacts would be addressed and monitored.	Section 6.15 provides an assessment of the potential impacts of the proposal including cumulative impacts and identifies mitigation measures to minimise these impacts.
Clause 6	
6(1) Total catchment management is to be integrated with environmental planning for the catchment	Section 6.4 provides an assessment of the potential impacts of the proposal. The proposal would not result in any significant impacts on the catchment. Drainage and water quality requirements have been considered as part of the proposal (refer to section 3.2.6 and 3.3.6) with the future development of the catchment in mind.
6(2) The environmental quality of environmentally sensitive areas must be protected and enhanced through careful control of future land use changes and through management and (where necessary) remediation of existing uses	Mitigation measures and environmental management plans, listed in section 6 and 7, would be implemented to minimise impacts on environmentally sensitive areas such as waterways (refer to section 6.4 for further detail).

Consideration	Comment
6(3) Future development must not prejudice the achievement of the goals of use of the river for primary contact recreation (being recreational activities involving direct water contact, such as swimming) and aquatic ecosystem protection in the river system. If the quality of the receiving waters does not currently allow these uses, the current water quality must be maintained, or improved, so as not to jeopardise the achievement of the goals in the future. When water quality goals are set by the Government these are to be the goals to be achieved under this policy.	Mitigation measures and environmental management plans, listed in section 6 and 7, would be implemented to minimise impacts on water quality (refer section 6.4 for further detail).
6(4) Aquatic ecosystems must not be adversely affected by development which changes the flow characteristics of surface or groundwater in the catchment.	The proposal would not adversely impact (either directly or indirectly) the ecosystems of waterways in the study area. Biodiversity impacts are considered in section 6.6.3.
6(5) The importance of the river in contributing to the significance of items and places of cultural heritage significance should be recognised, and these items and places should be protected and sensitively managed and, if appropriate, enhanced.	The proposal would not impact on the cultural heritage significance of the river, either directly or indirectly. An assessment of the potential for heritage impacts was undertaken, and the results are summarised in section 6.7.
6(6) Manage flora and fauna communities so that the diversity of species and genetics within the catchment is conserved and enhanced.	The proposal has considered biodiversity impacts and measures to minimise impacts in are summarised in section 6.6.
6(7) The scenic quality of the riverine corridor must be protected.	The proposal would not impact on the scenic quality of the Nepean River.
6(8) Agriculture must be planned and managed to minimise adverse environmental impacts and be protected from adverse impacts of other forms of development.	The proposal would require the acquisition of a number of properties zoned RU4 (Primary Production Small Lots). Further information is provided in sections 3.6 and 6.11. Measures identified in this REF would help minimise impacts to surrounding land uses including agriculture.
6(9) Rural residential development should not reduce agricultural sustainability, contribute to urban sprawl, or have adverse environmental impacts (particularly on the water cycle or on flora or fauna).	Not applicable to the proposal.
6(10) All potential adverse environmental impacts of urban development must be assessed and controlled.	This REF has assessed and has provided measures to avoid or mitigate potential impacts from the proposal.

Consideration	Comment
6(11) The value of the riverine corridor as a significant recreational and tourist asset must be protected.	The proposal would not impact upon any recreational land or tourism operations.
6(12) Development should complement the vision, goal, key principles and action plan of the Metropolitan Strategy.	As described in 2.1.1, the proposal is consistent with the Metropolitan Strategy.

4.1.2 Local Environmental Plan

The Blacktown Local Environmental Plan 2015 (the Blacktown LEP) applies to land within the Blacktown local government area. The majority of the proposal is located within land zoned SP2 (Infrastructure) and RU4 (Primary Production Small Lots). The construction footprint also crosses and impacts on land zoned E2 (Environmental Conservation). All land use within proximity of the proposal are discussed in section 6.11.

The zone provisions provide that the proposal would be permitted with consent in these zones. However, clause 5.12 of the LEP states that '…*this Plan does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent, or that is exempt development, under State Environmental Planning Policy (Infrastructure) 2007*'.

As the proposal is permitted without consent under ISEPP, the consent requirements of the LEP do not apply.

4.2 Other relevant NSW legislation

Other NSW environmental legislation that is directly relevant to the approval and/or assessment of the proposal is considered in Table 4.2.

Table 4.2: Consideration of relevant NSW legislation

Act	Potential approval requirement	Relevance to the proposal
Protection of the Environment Operations Act 1997 (POEO Act)	An environment protection licence (EPL) is required for scheduled activities or scheduled development work. Road construction is a scheduled activity under clause 35 of Schedule 1 of the Act if it results in four or more traffic lanes (not including bicycle lanes or lanes used for entry or exit), where the road is classified or proposed to be classified as a main road for at least three kilometres of its length in the metropolitan area, and for at least five kilometres in any other area.	The proposal is not considered to be a scheduled activity as it is less than three kilometres long. It is likely that the proposal would result in the extraction of about 40,000 tonnes of material. As such, an EPL would not be required.

Act	Potential approval requirement	Relevance to the proposal
	Extractive activities are also a scheduled activity under Schedule 1 of the Act where the extraction or processing (over the life of the construction) is more than 150,000 tonnes.	
*Biodiversity Conservation Act 2016 (*BC Act)	Part 7.3 of the BC Act lists five factors that must be taken into account when determining the significance of potential impacts of a proposed activity on threatened species, populations or ecological communities (or their habitats) listed under the BC Act. The 'five part test' or 'test of significance' is used to assist in the determination of whether a project is 'likely' to impose 'a significant effect' on threatened biota and thus whether a species impact statement (SIS) is required.	The proposal would not result in significant impacts to any listed flora, fauna or communities, and a species impact statement is not required. Further information is provided in section 6.6. Further information on the proposal with respect to certified lands is provided in section 6.6.
Fisheries Management Act 1994 (FM Act)	The FM Act aims 'to conserve, develop and share the fishery resources of the State for the benefit of present and future generations'. To meet these objectives, Part 7 of the FM Act outlines legislative provisions to protect fish habitat and Part 7A outlines provisions to conserve threatened species of fish and marine vegetation and their habitat.	Section 199 of the FM Act states that an approval is not required for a public authority to undertake dredging or reclamation work. They are, however, required to give the Minister written notice of the proposed work and consider any matters received from the Minister within 28 days of the notice. The REF proposal would involve work within Bells Creek however, work would not obstruct fish passage as passage would be available at any given time. A permit is therefore not considered to be required under section 219 of the FM Act.

Act	Potential approval requirement	Relevance to the proposal
Biosecurity Act 2015	In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.	Priority weeds were identified within the study area and would be managed in accordance with the requirements of the Act. Further information is provided in section 6.6.
National Parks and Wildlife Act 1974	An Aboriginal heritage impact permit (AHIP) is required under section 90 of the Act to harm or desecrate an Aboriginal heritage object.	An Aboriginal heritage due diligence assessment of the proposal was undertaken. The assessment identified that the proposal would impact on three Aboriginal sites. Further information is provided in section 6.7.
Heritage Act 1977	Approval under section 57(1) is required for work to a place, building, work, relic, moveable object, precinct, or land listed on the State Heritage Register. An excavation permit is required under section 139 to disturb or excavate any land containing or likely to contain a relic.	No listed items would be impacted by the proposal. Further information is provided in section 6.8.
Roads Act 1993 (Roads Act)	Section 138 of the Roads Act requires that a person must not carry our work in, on or over a public road or dig up or disturb the surface of a public road without the prior consent of the appropriate roads authority.	Townson Road and Meadow Road are unclassified roads managed by Blacktown City Council. Richmond Road is managed by TfNSW. The majority of the proposal would be constructed by Blacktown City Council. TfNSW would construct the proposal where it intersects with Richmond Road. Both are exempt under Section 138 from needing to obtain consent or a road occupancy licence for work on an unclassified road.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

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

A referral is not required for proposed road activities that may affect nationally listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in February 2012 (*Sydney Growth Centres Strategic Assessment Program Report* (NSW Government, 2010)).

Potential impacts to these biodiversity matters are also considered as part of Chapter 6 of the REF and Appendix A.

Findings – matters of national environmental significance

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

Findings – nationally listed biodiversity matters

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.

4.3.2 Other relevant Commonwealth legislation

Native Title Act 1993

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

A search of the Native Title Tribunal Native Title Vision website was undertaken, with no Native Title holders/claimants identified.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road and is being carried out by or on behalf of a public authority. Under clause 94 of ISEPP 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 for NSW is the determining authority for the proposal. The majority of construction of the proposal would be managed by Blacktown City Council. Any work relating to the intersection at Richmond Road would be undertaken in consultation with Transport for NSW under Works Authorization Deed.

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

The following approvals would be required:

- An AHIP under section 90 of the *National Parks and Wildlife Act 1974* to impact Aboriginal heritage items
- Notification to the Minister for Primary Industries prior to any dredging or reclamation work in Bells Creek, under section 199 of the FM Act.

5 Consultation

5.1 Consultation strategy

Consultation with potentially affected property owners, relevant government agencies and other stakeholders has been undertaken by Transport for NSW during the proposal development and concept design phase. The purpose of consultation has been to:

- Inform the community and key stakeholders of the proposal
- Canvas comments and issues about the proposal from those who may be affected
- Advise potentially directly affected community members of the potential property impacts
- Advise the community and key stakeholders how they may obtain further information or communicate concerns, complaints or suggestions.

A summary of consultation undertaken to date is provided in sections 5.2 to 5.5.

5.2 Community involvement

Consultation with the community to date has involved the following activities:

- The NWGA road network including the proposal was released for public consultation in November 2014
- A community update brochure was distributed to provide an update of proposed road network improvements and advertise the community information sessions
- Three community sessions were held for the community and stakeholders, providing the opportunity to increase their understanding of Transport for NSW's plans for the NWGA. Sessions were held between July and August 2019 at Schofields Community Centre and Riverstone Sports Centre
- Information on the proposal has been placed on the Transport for NSW website, including background information, the latest news on the proposal, and community contact information
- Door knocking of businesses in Marsden Park and along Richmond Road was completed in October 2019 introducing the proposal and inviting business owners to the businesses workshop and provide feedback
- A workshop for businesses was held in October 2019 to provide business owners with the opportunity to increase their understanding of the proposal and provide feedback
- Consultation and briefings with key stakeholders and landowners has been undertaken throughout the development of the proposal.

The results of community consultation to date and the key issues raised by community members for the proposal are summarised in Table 5.1.

Table 5.1: Summary of issues raised by the community

Group	Issue raised	Response/where addressed in REF
Residents	Concern about having a stormwater basin for the proposal in their property.	The design has developed so the proposal would not require a stormwater basin within a residential property. Drainage requirements are discussed in section 3.2.6.
	Property impacts – concern about acquisition of land and quality of adjustments (ie gates).	Property acquisition and potential social impacts arising from this are discussed in section 3.6, 6.11 and 6.12.
	Concern about how high the bridge will be over Bells Creek and associated visual impacts.	Visual impacts are discussed in section 6.9. A description of the bridge is provided in section 3.2.3.
	Flooding impacts – concern with impacts to surrounding properties from the proposal.	An assessment of potential flooding impacts is provided in section 6.3.
Local businesses	Agreement that without the proposal, development in the area could not proceed.	The road design is discussed in Chapter 3 and shown in Appendix C.
	Concern about access to Durham Road, particularly traffic filtering onto the road from the proposal before Stage 2 is completed and associated congestion; and how would access to properties be provided on this road.	Operational traffic arrangements and impacts are discussed in sections 3.2.3 and 6.1.
	What would the traffic arrangements be during construction to maintain access to commercial properties and business.	Construction traffic arrangements and impacts are discussed in sections 3.3.7 and 6.1.
	Concern about access to properties during operation.	Operational traffic arrangements and impacts are discussed in sections 3.2.3 and 6.1.

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 PACHCI requirements

PACHCI Stage	Description
PACHCI Stage 1	Initial assessment – **completed**
PACHCI Stage 2	Site survey and further assessment – **completed**
PACHCI Stage 3	Formal consultation and preparation of a cultural heritage assessment report – **completed**
PACHCI Stage 4	Implement environmental impact assessment recommendations – not completed

Transport for NSW invited Aboriginal stakeholders who hold knowledge relevant to determining the cultural heritage significance of Aboriginal objects and Aboriginal places in the area in which the proposed activity is to occur to register an interest in a process of community consultation.

As part of the Aboriginal heritage investigations for the preparation of this REF, an archaeological field survey of the construction footprint was undertaken in December 2019 by Kehller Nightingale Consultancy and field representatives of the registered Aboriginal parties. The results of the survey are discussed in section 6.7.

Responses to the proposed assessment methodology were received from Darug Aboriginal Land Care (DALC), Didge Ngunawal Clan (DNC), Kamilaroi Yankuntjatjara Working Group (KYWG), Murra Bidgee Mullangari Aboriginal Corporation (MBMAC), Muragadi and Yulay Cultural Services (YCS). All responses from the relevant groups agreed with the recommendations and endorsed the proposed assessment approach.

The draft cultural heritage and assessment report was provided to registered Aboriginal stakeholders for review and comment in February 2020. All registered Aboriginal stakeholders were provided with a 28 day period for review. Stakeholders were also invited to attend a meeting during the review period to discuss the draft report and assessment findings. No comments or feedback were received from stakeholders.

5.4 ISEPP consultation

Clauses 13 to 16 of the ISEPP specify the requirements for consultation with councils and other public authorities for infrastructure development carried out by or on behalf of a public authority. Consultation is required in relation to specified development (clause 16) or development that impacts on:

- Council related infrastructure or services (Clause 13)
- Flood liable land (Clause 15).

The consultation checklist is provided in **Appendix B**. As the proposal has the potential to impact on the local road network consultation was undertaken with Blacktown City Council in accordance with the ISEPP.

A letter was issued to Council on 29 November 2019. The letter provided information on the proposal and requested input in terms of any issues or concerns. Consultation with Blacktown City Council and issues discussed are provided in section 5.5.

5.5 Government agency and stakeholder involvement

As noted above, Transport for NSW has consulted with Blacktown City Council during the development of the proposal. Consultation with other departments within Transport for NSW has also been undertaken in relation to bus routes and road closures.

Transport for NSW has also consulted with NSW Ambulance and NSW Fire and Rescue during the development of the proposal. Consultation with these government agencies was undertaken to confirm the social baseline and to discuss the potential socio-economic impacts of the proposal.

Under clause 18A of *State Environmental Planning Policy (Sydney Region Growth Centres) 2006*, Transport for NSW must give written notice to the Department of Planning, Industry and Environment regarding the proposal where the need to clear native vegetation has been identified on land that is not subject land within the meaning of *clause 17 of Schedule 7 to the Threatened Species Conservation Act 1995*.

Table 5.3 below identifies the feedback received by each stakeholder group during consultation for the proposal.

Table 5.3: Summary of stakeholder feedback

Agency	Issue raised	Response
Utility providers	• Concerns with the complexity of relocating some utilities • Consultation is required with utility owners if any adjustments required.	The proposed utility adjustments are discussed in section 3.5. This includes consultation requirements and any required relocations. Mitigation measures are provided in section 6.11.3.
Blacktown City Council	• Preference for a four lane configuration • Proposed traffic diversion route • Preference for bridge barriers to the rear of footpaths and shared paths • Use of screen planting near development fencing • Preference for maximum tree canopy cover and for tree planting behind the kerb.	The proposal design is discussed in Chapter 3. Proposed landscaping options are discussed in section 3.2.5. Blacktown City Council would continue to be consulted as the design progresses and landscaping options are confirmed.

Agency	Issue raised	Response
NSW Ambulance	• Construction activities are not expected to lead to increased demand on ambulance services • Ongoing communication with NSW Ambulance and the community about the proposal and changes to the transport network is important to support NSW Ambulance response times to emergencies during construction • Once operational, the proposal is expected to be positive and would support NSW Ambulance response times.	A stakeholder engagement and community consultation strategy would be prepared prior to construction commencing (refer to section 5.6). This would include requirements for ongoing consultation with key stakeholders.
NSW Fire and Rescue	• Unlikely that construction would lead to increased demand on fire and rescue services provided appropriate traffic control systems are in place • Once operational, the proposal is expected to be positive by improving response times and reducing the current travel distance.	A stakeholder engagement and community consultation strategy would be prepared prior to construction commencing (refer to section 5.6). This would include requirements for ongoing consultation with key stakeholders.
Department of Planning, Industry and Environment - Place, Design and Public Spaces – North West Growth Areas	• The proposal would need to clear a small area (0.34 ha) of native vegetation that is not subject land	No issue raised.

5.6 Ongoing or future consultation

Transport for NSW would continue to consult with the community and relevant stakeholders during the design and construction of the proposal. The REF would be placed on public display and comments invited. Following public display, submissions would be collated and a submissions report prepared to address any issues raised by stakeholders. The submissions report would be made available to the public via the Transport for NSW website. The community would be informed of any major design changes that are required to address community concerns. In addition, the following consultation activities would be undertaken as required:

- Meetings with councils and other relevant stakeholders, including government agencies, utility providers, bus operators, adjacent landowners and community stakeholders
- Providing updates to the local community during the construction planning phase and construction period of the proposal
- Updating the Transport for NSW project webpage.

6 Environmental assessment

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

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the guidelines Is an EIS required? (DUAP 1995/1996) as required under clause 228(1) *of the* Environmental Planning and Assessment Regulation 2000 and the *Roads and Related Facilities EIS Guideline (DUAP 1996)*. The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 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

This section summarises the results of the traffic and transport assessment for the proposal undertaken by GHD as input for the REF. The full report is provided in Appendix E.

The scope of the assessment included:

- A review of existing road features, traffic volumes and turn counts at major intersections, public transport, pedestrian and cyclist facilities and traffic survey data
- Traffic modelling for peak traffic conditions during construction
- Assessing the impacts of construction of the proposal on the road network
- Predicting the impacts of the operation of the proposal for future traffic scenarios in 2026 and 2036. Assessment of cumulative impacts of the operation of the proposal
- Provision of mitigation measures to manage the potential impacts of the proposal.

The study area for the assessment includes all local and state roads that would be affected by the proposal. These include Richmond Road, Townson Road and Jersey Road and other local roads which act as road links that provide ingress/egress to the surrounding traffic network.

The future traffic scenarios for the proposal assume that Stage 2 of the design is completed such that the future traffic growth associated with the connection of Townson Road to Burdekin Road can be assessed.

For the interim phase, the future traffic scenarios do not consider the completion of Stage 2. From this assessment the average delay and overall level of service at each intersection along the proposal corridor has been determined.

A detailed description of the methodology is provided in the full report (Appendix E).

6.1.2 Existing environment

Existing road network

Richmond Road

Richmond Road is a principal arterial road for the North West Growth Area. It is a divided carriageway with two lanes in each direction and signalised traffic controls at intersections. There is no street parking on either side of the road. There is dedicated pedestrian, bicycle and bus transport facilities. The signposted speed limit is 80 kilometres per hour.

Townson Road

Townson Road is a local road as defined by the *Roads Act 1993* under control of Blacktown City Council. It intersects Richmond Road, the road extends from Richmond Road to the east to Victory Road in Marsden Park. The road is an undivided carriageway with one lane in each direction. Line markings are provided at the approaches to intersections only. There is restricted parking on either side of the road. There are no dedicated pedestrian, bicycle or public transport facilities. The signposted speed limit is 60 kilometres per hour.

Meadow Road

Meadow Road extends from the Victory Road and Townson Road intersection to the residential ring road west of Eastern Creek. This ring road consists of Jersey Road, Durham Road, Kerry Road and Angus Road. Meadow Road is also a sealed, local road, about 800 metres in length with a posted speed limit of 60 kilometres per hour. There is no existing street lighting other than that provided at the Victory Road intersection and one light at the intersection with Durham Road.

Local Roads

The study area is interspersed by a network of local roads providing direct access to properties and Schofields Station located in the east of the study area. Local roads including Victory Road and Durham Road are under control of Blacktown City Council.

Figure 3.1 shows the roads in the study area.

Existing traffic volumes

Traffic surveys carried out in the study area included:

- Classified intersection counts
- Queue length surveys
- Midblock traffic counts
- Travel time surveys.

Traffic data collection locations are provided in Table 6.1. The midblock traffic survey at locations ATC1 – ATC5 were undertaken between Wednesday 4 September 2019 and Tuesday 10 September 2019 over a 24-hour period for the duration of seven days. Table 6.1 summarises the surveyed weekday traffic volumes based on traffic counts undertaken during the survey period.

Table 6.1: Existing Traffic counts - Average vehicles per day

Road/Intersection	Direction	Weekday AM peak average vehicles per hour	Weekday PM peak average vehicle per hour	Weekdays (Average vehicles per day)
ATC 1 – South Street between Richmond Road and Fulton Road	Eastbound	97	97	1077
	Westbound	99	75	1081
ATC 2 – Schofields Road between Railway Terrace and Junction Road	Eastbound	904	763	9218
	Westbound	763	786	9350
ATC 3 – Quakers Hill Parkway between Eastern Road and Nirimba Drive	Northbound	1165	1827	18835
	Southbound	1592	1320	18318
ATC 4 –Richmond Road between Alderton Drive and Hollinsworth Road	Northbound	1816	1463	22192
	Southbound	1523	1400	21250
ATC 5 – Railway Terrace between Jerralong Drive and Woolworths Schofields Access.	Northbound	658	746	8608
	Southbound	831	753	8628

Table 6.2 summarises the survey of traffic volumes at existing intersections for morning and evening peak traffic volumes at Townson Road and Richmond Road, Townson Road and Victory Road, Meadow Road and Durham Road.

Table 6.2: Traffic volumes at intersections as surveyed on Tuesday 3 September 2019

Intersection	Light Vehicles		Heavy vehicles	
	Morning Peak (7.15 – 8.15)	Evening Peak (4.45 – 5.45)	Morning Peak (7.15 – 8.15)	Evening Peak (4.45 – 5.45)
	Total vehicles per hour	Total vehicles per hour	Total vehicles per hour	Total vehicles per hour
Richmond Road and Townson Road	3516	3983	550	258
Townson Road and Victory Road	698	605	41	13
Meadow Road and Durham Road	619	495	15	11

Existing travel time

Travel time surveys were undertaken between Richmond Road and Victory Road and between Victory Road and Durham Road. The survey results demonstrated the westbound vehicles on Townson Road approaching Richmond Road experience delays at the intersection. This reduces the overall average speed heading west across the intersection at Richmond Road, resulting in lower speed than the posted speed limit of 60 kilometres per hour.

The average speed on Townson Road between Richmond Road and Victory Road during peak travel times range between 52 kilometres per hour and 54 kilometres per hour eastbound and 49 kilometres per hour and 53 kilometres per hour westbound. Between Victory Road and Durham Road the average speed is between 50 kilometres per hour and 52 m/h eastbound and 28 kilometres per hour and 41 kilometres per hour westbound.

Public transport

Accessibility to public transport is important for reducing the reliance on private vehicles. For new developments, a walkable distance of 400 metres to 800 metres to public transport is recommended or a 1.5 kilometre bicycle riding distance to encourage public transport use (NSW Planning, 2004).

A bus interchange is located outside Schofields Station. The bus services operating from this interchange are outlined in Table 6.3. Bus route 742 is the main service that operates along Townson Road.

Table 6.3: Bus services operating from Schofields Station

Route	Coverage	Frequency
734	Riverstone to Blacktown via Schofields	Weekday 37 services Weekend 17 services
	Blacktown to Riverstone via Schofields	Weekday 37 services Weekend 17 services
751	Blacktown to Rouse Hill Town Centre	Weekday 39 services Weekend 16 services
	Rouse Hill Town Centre to Blacktown	Weekday 47 services Weekend 27 services
742	Marsden Park to Rouse Hill	Weekday 15 Weekend 6
	Rouse Hill to Marsden Park	Weekday 15 Weekend 6
N71	Richmond to City Town Hall	Weekday 5 services Weekend 5 services
	City Town Hall to Richmond	Weekday 5 services Weekend 5 services

Cycling

There are no cycleway provisions along Townson Road. There is one section, which is located at the Townson Road/Victory Road roundabout south approach that provides a cycle crossing and connects to an off-road shared path. This shared path continues for approximately 75 metres along the eastern side of Victory Road, where it terminates.

Along Richmond Road, off-road shared paths are available on both sides of the road. These shared paths are connected by signalised cycle lantern crossings at the intersection of Townson Road/Richmond Road/Hollinsworth Road on all four approaches.

Towards the east of the proposal, an off-road shared path is available on the northern side of Burdekin Road. The shared path begins at the end of Railway Terrace to the south of Schofields Station and continues for the length of Burdekin Road.

A bicycle rack is provided on the western side of Schofields Station.

Walking

There are no provisions for pedestrian infrastructure along Townson Road. However, a pedestrian footpath is provided at the Townson Road/Victory Road roundabout southern approach. This footpath extends along the length of Victory Road on the western side.

Towards the east of the study area, pedestrian infrastructure in the form of the shared path is provided on the northern side of Burdekin Road.

6.1.3 Potential impacts

Construction

The proposed construction activities and construction hours are outlined in section 3.3. Potential construction related impacts are generally associated with the introduction of construction traffic onto the local road network and changes to traffic flow and access arrangements during the construction period.

Construction traffic generation, access and trip distribution

It is anticipated that up to 80 personnel per day would be likely to access the construction site. The movement of light vehicles would be in the order of 12 to 50 vehicles per day with less than two to five vehicles every hour over the peak travel times. The expected volume of construction personnel trips is low and is not expected to impact the operation of the adjoining road network.

Heavy vehicle truck movements for delivering materials and removing spoil from the proposal are expected to be in the order of five to ten vehicle movements per hour. The increases in traffic movements is considered to be low and falls within typical daily fluctuations. Heavy vehicle movements are not expected to impact the operation of the adjoining road network.

Proposed traffic diversion during construction

The construction of the bridge at Bells Creek would require the closure of Townson Road between Richmond Road and Victory Road for a period of about six months during construction of the interim phase. During the bridge construction, only residential and commercial access would be permitted access to Townson Road. During construction of the ultimate phase, minimal road closure would be needed.

A diversion would be put in place to divert existing traffic and construction traffic via Victory Road and Alderton Drive. Figure 3.12 shows the diversion route. This diversion would result in minor increases in travel time.

Parking

It is anticipated that parking for construction personnel would be restricted to the designated compound site and areas for construction workers only. As such, there should be minimal impact to on-street parking and traffic flow on the existing road network.

Public transport

During construction of the interim phase, bus route 742 that operates along Townson Road would be diverted via Victory Road and Alderton Drive and re-join the existing route at Richmond Road. This would result in the temporary closure of bus stop ID 276516 (Hollinsworth Road at Richmond Road) and bus stop ID 2761174 (Richmond Road east of Townson Road). Provision of temporary bus stops on the diverted route would be determined in consultation with Busways. The diversion and temporary arrangements would be in place for about six months during the construction with alternative temporary bus stops located about 70 metres east from the existing location on Victory Road, near the intersection with Townson Road. Figure 3.12 shows bus stop locations which would be impacted by the proposal. During construction of the ultimate phase, minimal road closure would be needed and therefore there would be minor temporary disruption to bus route 742.

Operation

The proposal requires the intersections on this corridor to accommodate the future traffic growth when the connection to Burdekin Road is implemented in the future, forming an east-west corridor south of Schofields Road.

Future traffic predictions were carried out to determine 2026 and 2036 future traffic growth within the Townson Road corridor. This traffic growth is attributed to new developments that are planned within the study area, and background traffic expected to rise once the road link is complete. It is assumed that all development would be completed by 2026.

Five future developments are planned in the study area. Predicted traffic volumes associated with the new developments are summarised in Table 6.4.

Table 6.4: Traffic movements for new developments by 2026 and 2036

Development name	Land Use	Proposed access	Daily	AM Peak (per hour)	PM Peak (per hour)
			No. of Trips	No. of Trips	No. of Trips
CSR	Low Density Residential	Victory Road North planned new road Schofields Road	14720	1310	1360
	Medium Density Residential		940	90	90
Altove	Medium Density Residential	Veron Road South Internal local street to Schofields Road	940	90	90
	High Density Residential		2280	290	230

Development name	Land Use	Proposed access	Daily	AM Peak (per hour)	PM Peak (per hour)
			No. of Trips	No. of Trips	No. of Trips
Luxeland	Low Density Residential	LILO access Victory Road South Alderton Drive	2570	230	240
Kennards	Commercial; Fast food	Richmond Road	2520	40	230
Private Properties	Low Density Residential	Victory Road North planned new road South planned new road North Veron Road North	7700	680	710
	Medium Density Residential		1290	130	130

The predicted background traffic growth for operation of the proposal including traffic growth associated with new developments planned within the study area is summarised in Table 6.5. This is compared with the existing 2019 volumes with the percentage increase shown.

There are instances of a reduction in background traffic volumes for both light and heavy vehicles. This is likely to be due to changes in route choice as the local road network develops in the future to provide other more favourable routes.

Table 6.5: Estimated traffic growth compared to the existing 2019 volumes

Year	AM peak (veh/hr)		PM peak (veh/hr)	
	Light vehicle	Heavy vehicle	Light vehicle	Heavy vehicle
Existing 2019	**3874**	**472**	**4330**	**256**
2019 to 2026 background growth	1939 (total increase)	-12 (total decrease)	2077 (total increase)	-9 (decrease)
	7.2% per year	-0.4% per year (decrease)	6.9% per year	-0.5% per year (decrease)
2026 to 2036 background growth	3694 (total increase)	169 (total increase)	3690 (total increase)	163 (total increase)
	5.6% per year	2.1% per year	5.0% per year	3.7% per year

Interim phase of the proposal

Table 6.6 shows the level of service predicted for the interim phase. This shows a level of service from good operation to near capacity. It is likely that the interim phase would be at capacity by 2026. Beyond 2026, it is likely the interim phase would be oversaturated at the Victory Road intersection and additional lanes and signalised intersections proposed for the ultimate phase would be required to maintain a satisfactory level of service.

Table 6.6: Interim phase intersection performance - 2026

Intersection	AM peak Level of service	PM peak Level of service
Richmond Road and Townson Road intersection	C	C
Townson Road and Victory Road	D	D
Townson Road and planned new road	B	A

Note: Level of service: A-Good operation; B-Good with acceptable delays and spare capacity; C-Satisfactory operation; D-Near capacity; E-At capacity, at signals incidents will cause excessive delays; F-Unsatisfactory with excessive queuing.

Ultimate phase of the proposal

A summary of the traffic modelling results for the ultimate phase of the proposal with the four-lane divided road, is shown in In 2026 the worst performing intersection is the Richmond Road/Townson Road intersection. The worst performing approaches at this intersection are on the east bound (onto Townson Road) and west bound (onto Hollinsworth Road) for both the AM and PM peak.

The 2036 assessment is based on Richmond Road having six lanes. During 2036, most approaches at these intersections are operating at a satisfactory level.

Table 6.7 and Table 6.8. The results presented below are those simulated with the current four lanes configuration on Richmond Road for 2026. In 2026 the worst performing intersection is the Richmond Road/Townson Road intersection. The worst performing approaches at this intersection are on the east bound (onto Townson Road) and west bound (onto Hollinsworth Road) for both the AM and PM peak.

The 2036 assessment is based on Richmond Road having six lanes. During 2036, most approaches at these intersections are operating at a satisfactory level.

Table 6.7: Ultimate phase 2026 intersection performance for the proposal

Intersection	AM peak		PM peak	
	Average delay (s)	Level of service	Average delay (s)	Level of service
Richmond Road and Townson Road intersection	44	D	53	D
Townson Road and Victory Road	42	C	40	C
Townson Road and planned new road	46	D	35	C

Note: Level of service: A-Good operation; B-Good with acceptable delays and spare capacity; C-Satisfactory operation; D-Near capacity; E-At capacity, at signals incidents will cause excessive delays; F-Unsatisfactory with excessive queuing.

Table 6.8: Townson Road modelled layouts 2036 intersection performance for the proposal

Intersection	AM peak		PM peak	
	Average delay (s)	Level of service	Average delay (s)	Level of service
Richmond Road and Townson Road intersection	44	D	50	D
Townson Road and Victory Road	52	D	44	D
Townson Road and planned new road	45	D	45	D

Note: The 2036 assessment is based on Richmond Road with six lanes.

The modelling results show that by providing an additional left turn slip lane at the Townson Road and Richmond Road intersection for southbound traffic, sufficient capacity would be provided to cater for future traffic growth on the Townson Road corridor.

The proposed layouts for the proposal at Victory Road and Townson Road intersection and Victory Road and planned new road intersection were assessed to be sufficient to accommodate the future traffic growth in 2036.

An assessment of additional traffic throughputs on Townson Road corridor as a result of the potential widening of Richmond Road to six lanes was carried out. The Townson Road and Victory Road intersection and Townson Road and planned new road intersection would still operate within capacity with the additional throughputs of up to 130 vehicles per hour in 2036.

6.1.4 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 Roads and Maritime Traffic Control at Work Sites Manual (RTA, 2010). 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 consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • A response plan for any construction related traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms.	Contractor	Detailed design/Pre-construction	Core standard safeguard TT1 Section 4.8 of QA G36 Environment Protection
Emergency services access	Consultation with emergency service authorities will be undertaken during development of the detailed design and maintained throughout construction as the proposal progresses.	TfNSW/Contractor	Detailed design and Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Access during construction	Current traffic movements and property accesses are to be maintained during the work. Any disturbance is to be minimised to prevent unnecessary traffic delays and businesses/residences informed.	Contractor	Construction	Core standard safeguard T1
Management of heavy vehicles	An assessment of heavy vehicles from construction and through traffic (on diversion routes) will consider: • Vehicle types/maximum size which can negotiate the road network. In particular Alderton Drive and Victory Road due to restricted manoeuvrability of longer vehicles • Coordination to prevent queuing or double parking.	Contractor	Construction	Additional safeguard
Worker parking	Provision of parking within the compound site for workers and construction vehicles.	Contractor	Construction	Additional safeguard
Road closures	• TCPs will be developed in accordance with *Roads and Maritime Traffic Control at Work Sites manual* (2018) and *AS1742.3 – Traffic Control for Works on Roads.* • Residences and businesses in the local area will be notified on any road closures.	Contractor	Construction	Additional safeguard
Pedestrian and cyclists	• Safe pedestrian and cyclist access around and past the work site will be provided. Pedestrians will be clearly directed to utilise formed paths where possible or temporary paths will be provided as a short- term measure. • Clear visibility at the site egress along the road network and the pedestrian pathway will be maintained.	Contractor	Construction	Additional safeguard

Other safeguards and management measures that would address traffic and transport impacts are identified in section 6.2.

6.2 Noise and vibration

A Noise and Vibration Assessment was prepared by GHD in February 2020 (Appendix F) and is summarised in this section.

6.2.1 Methodology

The noise and vibration assessment was prepared in accordance with the following guidelines and the Transport for NSW brief:

- BS 7385 – 2: 1993, *Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration* (British Standard, 1993)
- *Noise Policy for Industry* (NPI) (EPA, 2017)
- *Noise Criteria Guideline* (NCG) (Roads and Maritime, 2015)
- *Noise Mitigation Guideline* (NMG) (Roads and Maritime, 2015)
- *Noise Model Validation Guideline* (NMVG) (Roads and Maritime, 2018)
- *At-Receiver Noise Treatment Guideline* (ARNTG) (Roads and Maritime, 2017)
- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009)
- *Construction Noise and Vibration Guideline* (CNVG) (RMS, 2016)
- *Assessing Vibration: A Technical Guideline* (DEC, 2006)
- *Environmental Noise Management Manual* (RTA 2001)
- *Road Noise Policy* (RNP) (DECCW, 2011).

The assessment involved carrying out background noise monitoring and simultaneous traffic counts to quantify the background environment, develop relevant noise goals and validate the noise model. Noise monitoring was undertaken between Wednesday 30 October 2019 and Monday 11 November 2019, at five locations near the construction footprint.

Construction noise and vibration assessment

The assessment involved:

- Establishing the noise and vibration assessment criteria for the proposal
- Assessing the potential construction noise and vibration impacts by identifying the likely construction activities
- Assessing the potential noise impacts on the surrounding sensitive receivers against the construction noise management levels and sleep disturbance criteria for the interim and ultimate phase of the proposal
- Assessing the potential construction vibration impacts to sensitive receivers
- Providing mitigation measures where required.

Operational noise assessment

The assessment involved:

- Establishing the noise study area in accordance with the NCG
- Establishing the operational noise assessment criteria based on land uses within the study area
- Developing a traffic noise model to predict noise for the current year (2019), interim opening and design year (2023 and 2028) and the ultimate phase of the proposal opening and design year (2028 and 2038) for both build and no build options (in accordance with the NCG)
- Identifying the road classification of the study area to determine the transition zones and predicted road traffic changes over a 10 year period from opening
- Providing mitigation measures where required.

6.2.2 Existing environment

Sensitive receivers

The study area for the noise and vibration assessment included land within 600 metres of the overall proposal. There are around 400 existing receivers within 600 metre of the construction footprint. In addition, around 500 future receivers are expected to be constructed in development sites within around 600 metres of the proposal. The residential areas in the study area were categorised into four separate noise catchment areas (NCAs) and in addition one commercial and one industrial NCA. The four NCAs have different acoustic environments and land uses with differing background noise levels based on their proximity to noisy sources such as roads and industry. The sensitive receivers are shown in Figure 6.1 and summarised in Table 6.9.

Table 6.9: Sensitive receivers within 600 metres of the proposal

Usage	Existing/Future	Number
Commercial	Existing	43
Educational	Existing	1
Industrial	Existing	5
Passive recreation	Existing	1
Residential	Existing	346
Residential	Future	Around 500

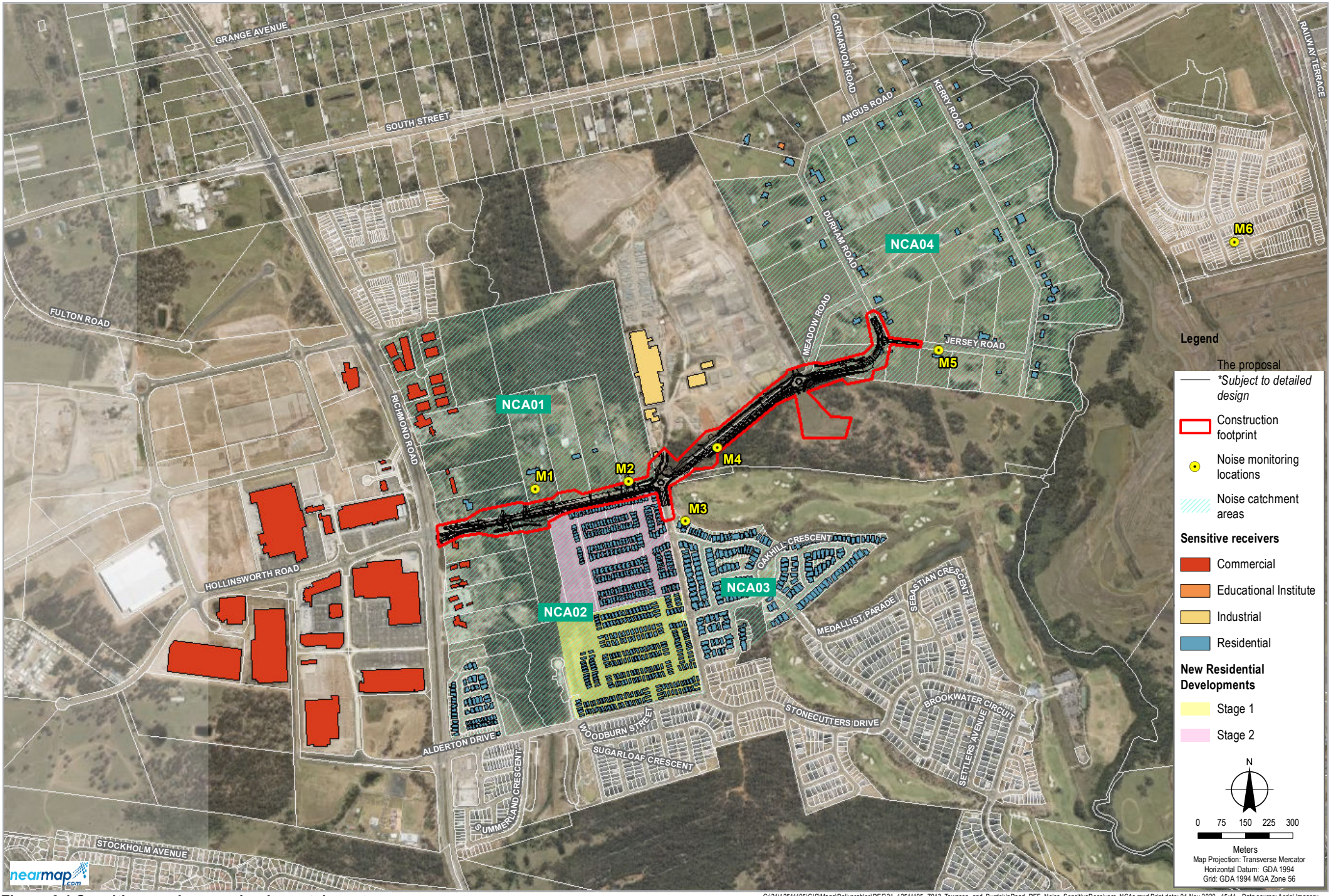

Figure 6.1 Sensitive receivers and noise catchment areas

G:\21\12511195\GIS\Maps\Deliverables\REF\21_12511195_Z013_Townson_and_BurdekinRoad_REF_Noise_SensitiveReceivers_NCAs.mxd Print date: 04 Nov 2020 - 15:41 - Data source: Aerial Imagery - Nearmap 2019 (image date 12/09/2019, image extracted 21/10/2019) © Department of Customer Service 2020. Created by: eibbertson

Existing noise environment

The study area comprises mainly low to medium residential development, commercial and industrial land uses. Monitoring locations are listed in Table 6.10. Road traffic noise monitoring data was assessed during weekdays only as traffic flows during weekends is atypical. Road traffic noise was recorded as higher during weekdays due to higher traffic volumes.

The noise monitoring results are typical of areas influenced by road traffic noise in rural and suburban residential environments. A summary of the monitoring results is provided in Table 6.10 and the location of the monitoring is shown on Figure 6.1.

Table 6.10: Summary of noise monitoring results, dBA

Monitoring location and address	Background noise descriptors [1]			Road traffic noise descriptors			
	Day	Evening	Night	7 am to 10 pm	10 pm to 7 am	7 am to 10 pm	10 pm to 7 am
M1 – 35 Townson Road	43	43	41	54	53	55	56
M2 - 63 Townson Road	43	39	37	61	56	63	59
M3 - 66 Sunningdale Drive	43	38	37	52	48	52	50
M4 - 75 Townson Road	41	37	37	65	59	67	62
M5 - 32 Jersey Road	38	36	31	55	40	57	53

Note: 1. Day: 7 am to 6 pm, Monday to Saturday; 8 am to 6 pm Sundays and Public Holidays; Evening: 6 pm to 10 pm Monday to Sunday & public holidays; Night: 10 pm to 7 am, Monday to Saturday; 10 pm to 8 am Sunday & public holidays.

6.2.3 Noise and vibration criteria

Construction noise

Construction noise management levels for the proposal were developed in accordance with the ICNG for each identified sensitive receiver. Standard hours for construction activity are defined as Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm and no work on Sundays or public holidays.

For work during recommended standard hours:

- The noise affected level represents the noise level for which there may be some community reaction to noise. The noise affected level is calculated by adding 10 dB(A) to the rating background level. For this assessment, the lowest measured background noise levels for each noise catchment area have been used.
- The highly noise affected level represents the point above which there may be strong community reaction to noise. The ICNG specifies that the highly noise affected level is 75 dB(A).

For any work outside the recommended standard hours:

- A strong justification would typically be required for work outside the recommended standard hours
- The proponent should apply all feasible and reasonable work practices to meet the noise affected level
- For work outside recommended standard hours, the *Interim Construction Noise Guideline* level is calculated by adding 5 dBA to the rating background noise level
- Where all feasible and reasonable practices have been applied and noise is more than five dBA above the noise affected level, the proponent should negotiate with the community.

Sleep disturbance:

- The noise management level for sleep disturbance is based on the maximum internal noise level of 55 dBA as recommended by the *Road Noise Policy* (DECCW, 2011).

There would be two construction phases, one associated with the interim work and one associated with the ultimate works. The proposal specific construction noise management levels and sleep disturbance criteria are provided in Table 6.11.

Table 6.11: Proposal specific construction noise management level, dBA

Receiver area	Construction noise management level, $L_{Aeq(15min)}$					
	During recommended standard hours		Outside of recommended standard hours			
	Noise affected	Highly noise affected	Day	Evening	Night	Sleep dist. criteria[1] L_{Amax}
Residential (NCA01 NCA02)	53	75	48	44	42	65
Residential (NCA03)	53	75	48	43	42	65
Residential (NCA04)	48	75	43	41	36	65
Child care centre	55 (External noise level)[1]					
Golf course	60[1]					
Commercial premises	70[1] (External noise level)					
Industrial premises	75[1] (External noise level)					
Recommended standard hours: 7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday, no work on Sunday or public holidays Outside of recommended standard hours: Day - 7 am to 8 am and 1 pm to 6 pm Saturday, 8 am to 6 pm Sunday and public holidays; Evening - 6 pm to 10 pm Monday to Sunday & public holidays; Night - 10 pm to 7 am, Monday to Saturday; 10 pm to 8 am Sunday and public holidays.						

Note: 1. Only applies when properties are being used.

Construction vibration

Vibration criteria have been set with consideration to *Assessing Vibration: a technical guideline* (DEC, 2006). *British Standard BS 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings* (1 Hz to 80 Hz) is recognised by the guideline as the preferred standard for assessing the 'human comfort criteria'. Table 6.12 summarises the accepted and maximum value for human comfort impacts by intermittent vibration assessed using the vibration dose value.

Table 6.14 presents guideline values from *German Standard DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structures* for the maximum absolute value of the velocity at the foundation of various types of building. Experience has shown that if these values are complied with, damage that reduces the serviceability of the building would not occur. If damage nevertheless occurs, it is to be assumed that other causes are responsible.'

Table 6.12: Human comfort intermittent vibration limits (BS 6472-1992)

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

Humans are capable of detecting vibration at levels which are well below those causing risk of damage to a building. The degrees of perception for humans are suggested by the vibration level categories shown in Table 6.13.

Table 6.13: Guidance on effects of vibration levels for human comfort (BS 5228.2-2009)

Vibration level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration at this level in residential environments would cause complaints but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure.

British Standard 7385-2:1993 *Evaluation and measurement for vibration in buildings Part 2 - Guide to damage levels from ground borne vibration* which represents a definitive standard against which the likelihood of building damage from ground vibration can be assessed. Table 6.14 shows the vibration levels in this standard for building damage criteria due to construction activities.

Table 6.14: Transient vibration guide values–minimal risk of cosmetic damage

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

Noise and vibration criteria- operation

Noise predictions were used to assess the increase in noise levels from the proposal. The NCG recommends applying the existing road criteria where minor work increases noise levels by more than 2.0 dBA. As per the NCG, an assessment of the no build and build noise levels for the opening year has been undertaken to quantify the increase in noise levels. If the increase at the worst affected receiver is less than 2.0 dBA, the objectives of the NCG are met and further assessment is not required.

For the ultimate phase assessment, it is assumed that Stage 2 is built. This provides a worst-case assessment as traffic volumes would be higher due to the connection of Townson Road to Burdekin Road. For the interim phase, it is assumed that Stage 2 is not built and traffic along Townson Road continues to Durham Road and Carnarvon Road to connect to South Street.

6.2.4 Potential impacts

Construction

Construction of the proposal would take place in two phases, the interim and ultimate phase. Each phase is expected to take about 18 months to complete. Construction and would result in a short-term increase in localised noise levels, particularly for residences close to the construction footprint.

It is anticipated that construction would be carried out during standard construction working hours however some out of hours work (OOHW) may be required. Night work would be necessary to construct the new intersections to minimise traffic disruptions along Townson Road.

The construction activities have been grouped into 12 possible scenarios of the proposal, seven scenarios for the interim phase and five scenarios for the ultimate phase. The estimated combined sound power level of construction equipment for each scenario are shown in Table 6.15. Table 6.15 provides a summary of the predicted exceedances of the construction noise criteria for each construction scenario and which activities are proposed for night work. The location of each NCA is shown on Figure 6.1.

Table 6.15: Predicted number of exceedances of the Noise Management Level for the proposal

Staging	Interim							Ultimate				
	CS01	CS02	CS03	CS04	CS05	CS06	CS07	CS08	CS09	CS10	CS11	CS12
Standard construction hours	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	✓	×
OOHW2 (Night)	×	×	×	×	×	×	✓	×	×	×	×	✓
NCA01	5	5	4	0	3	5	5	5	0	3	5	5
NCA02	117	191	43	0	31	94	136	121	0	21	93	148
NCA03	29	40	0	0	0	17	57	31	0	0	16	170
NCA04	25	41	0	5	0	15	33	25	5	0	16	55
All residential	176	277	47	5	34	131	231	182	5	24	130	378
Highly noise affected	40	50	3	0	0	37	3	41	0	0	38	10
Sleep dist. L_{A1} >65	-	-	-	-	-	-	16	-	-	-	-	24
Commercial	1	3	0	0	0	1	-	1	0	0	1	-
Industrial	0	1	0	0	0	0	-	1	0	0	1	-
Child care centre	0	0	0	0	0	0	-	0	0	0	0	-
Golf course	1	1	0	0	0	1	-	1	0	0	1	-

Note:

1.  - color scale of impacts (low to high)

The predicted levels indicate that the noise management levels would be exceeded during both standard hours and night work for both the interim and ultimate phases.

The results provided in Table 6.15 indicate that, without mitigation, construction noise may exceed the noise management levels at up to 277 sensitive receivers during standard construction hours and up to 378 sensitive receivers during night work.

The predicted noise levels are considered worst-case and would decrease as the construction activity moves along the road corridor, away from affected receivers. Construction machinery would likely move around the study area altering noise for individual receivers. Also, during any given period, the equipment used would operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time. Therefore, the actual noise generated by construction would generally be less than the predicted noise levels.

Interim phase

CS01 – Enabling works, site establishment and utility relocation - Exceedances of the residential NMLs (standard hours) are predicted at all NCAs, with the greatest number of exceedances predicted to occur in NCA02. The highly noise affected level of 75 dBA is predicted to be exceeded at 40 residences. Non-residential NMLs are also predicted to be exceeded at one commercial building and at the golf course.

CS02 – Bulk earthworks and construction of drainage and structures - The residential NMLs (standard hours) are predicted to be exceeded at all NCAs, with the greatest number of exceedances predicted to occur in NCA02, The highly noise affected level predicted of 75 dBA is to be exceeded at 50 residences. Non-residential NMLs are also predicted to be exceeded at 3 commercial buildings, one industrial building and at the golf course.

CS03 – Construction of access roads along Townson Road - Exceedances of the residential NMLs (standard hours) are predicted at NCA01 and NCA02, with the greatest number of exceedances predicted to occur in NCA02. The highly noise affected level of 75 dBA is predicted to be exceeded at three residences. Noise levels are not predicted to exceed the NMLs at non-residential buildings.

CS04 – Construction compound - Noise levels are predicted to exceed the residential NMLs (standard hours) five residences within NCA04, with no residences exceeding the highly noise affected level. No non-residential buildings are predicted to exceed the NMLs.

CS05 – Bridge construction - Exceedances of the residential NMLs (standard hours) are predicted at NCA01 and NCA02, with the greatest number of exceedances predicted to occur in NCA02. The highly noise affected level is not predicted to be exceeded and no non-residential buildings are predicted to exceed the NMLs.

CS06 – Pavement and finishing works - Exceedances of the residential NMLs (standard hours) are predicted at all NCAs, with the greatest number of exceedances predicted to occur in NCA02. The highly noise affected level is predicted to be exceeded at 37 residences. Non-residential NMLs are also predicted to be exceeded at one commercial building and at the golf course.

CS07 Intersection night works - Noise levels are predicted to exceed the residential NMLs at all NCAs with the greatest number of exceedances occurring in NCA02. The highly affected noise level of 75 dBA is predicted to exceeded at three residences. The sleep disturbance criteria noise levels are predicted to exceed 65 dBA at 16 residential receivers.

Ultimate phase

CS08 – Enabling works and site establishment - The residential NMLs (standard hours) are predicted to be exceeded at all NCAs, with the greatest number of exceedances predicted to occur in NCA02. The highly noise affected level of 75 dBA is predicted to be exceeded at 41 residences. Non-residential NMLs are also predicted to be exceeded at one commercial buildings, one industrial building and at the golf course.

CS09 – Construction compound - Noise levels are predicted to exceed the residential NMLs (standard hours) five residences within NCA04, with no residences exceeding the highly noise affected level. No non-residential buildings are predicted to exceed the NMLs.

CS10 – Bridge widening - The residential NMLs (standard hours) are predicted to be exceeded at NCA01 and NCA02, with the greatest number of exceedances predicted to occur in NCA02. The highly noise affected level is not predicted to be exceeded and no non-residential buildings are predicted to exceed the NMLs.

CS11 – Pavement widening and finishing works - The residential NMLs (standard hours) are predicted to be exceeded at all NCAs. The greatest number of exceedances are predicted to occur in NCA02 with the highly noise affected level predicted to be exceeded at 38 residences. Non-residential NMLs are also predicted to be exceeded at one commercial buildings, one industrial building and at the golf course.

CS12 Intersection night works - Noise levels are predicted to exceed the residential NMLs at all NCAs with the greatest number of exceedances occurring in NCA03. The highly affected noise level of 75 dBA is predicted to exceeded at 10 residences. The sleep disturbance criteria noise levels are predicted to exceed 65 dBA at 24 residential receivers.

Construction traffic

The main access routes for construction vehicles would be along Richmond Road, Alderton Drive, Victory Road and Townson Road travelling in both directions. Construction would generate heavy vehicle movements associated with the transportation of construction machinery, equipment and materials to the site. Light vehicle movements would be associated with employees and smaller deliveries.

The CNVG recommends that, in assessing construction traffic noise impacts, “an initial screening test should first be applied by evaluation whether noise levels would increase by more than 2 dBA due to construction traffic or a temporary reroute due to a road closure. Where increases are 2 dBA or less then no further assessment is required”.

The additional traffic during the construction of the interim phase is not predicted to increase noise levels by more than 2 dBA for sensitive receivers along the temporary access road directly adjacent to Townson Road.

The additional traffic during the construction of the ultimate phase is not predicted to increase noise levels by more than 2 dBA for sensitive receivers along Townson Road given construction heavy vehicles limit their speed to 40 km/hr along these roads. As such, compliance with the *Road Noise Policy* (RNP) (DECCW, 2011) is anticipated.

Construction vibration

Safe working buffer distances to comply with the human comfort and cosmetic damage criteria were sourced from the CNVG and are presented in Table 6.16.

Table 6.16: Vibration safe working distances in metres

Plant item	Rating/Description	Minimum working distance	
		Cosmetic damage (BS 7385)	Human response (OH&E Vibration guideline)
Vibratory Roller	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m

For the interim construction works, 42 buildings within the study area have been identified to (five existing and 37 future) fall within the 20 metre safe working distance for vibratory rolling works. For the ultimate phase construction works, 39 buildings within the study area have been identified to (3 existing and 36 future) fall within the 20 metre safe working distance for vibratory rolling works. Mitigation measures to reduce potential vibration impacts to receivers are presented in section 6.2.5.

No heritage structures have been identified within the study area.

No vibration impacts are anticipated as a result of bored piling to construct the Bells Creek Bridge.

For the interim construction work, 43 buildings within the study area have been identified (seven existing and 36 future) to fall within the 20 metre safe working distance for vibratory rolling work.

Operation

Operational noise

The predicted day and night-time period noise levels have been assessed at receivers for the current year (2019), interim opening and design year (2023 and 2028) and the ultimate proposal opening and design year (2028 and 2038) for both build and no build options.

The controlling criterion from the NCG are predicted to be exceeded at 37 residential receivers who would therefore be considered for additional mitigation measures. Thirteen receivers would be impacted at the interim phase. These are presented in Table 6.17 and shown on Figure 6.2.

Low noise pavement or noise barriers have been considered where four or more closely spaced receivers exceed the noise criteria. Four closely spaced residences along the northern side of Sunningdale Drive qualify for this mitigation in relation to the ultimate phase. Noise modelling of low noise pavement surfaces and a noise barrier analysis should be undertaken during the detailed design phase of the project, to consider where this mitigation is reasonable and feasible to use.

At-property treatments have been recommended for all other receivers. Safeguards and mitigation measures are discussed further in section 6.2.5 and in Appendix F.

Table 6.17: Receivers exceeding operational noise criteria, interim and ultimate phase of the proposal

Receiver ID	Residential Address	Receiver Type	NCA	Ultimate phase Max. exc. above criteria	Interim phase Max. exc. above criteria
R0034	35 Townson Road Marsden Park	Residential	NCA01	6	6
R0035	51 Townson Road Marsden Park	Residential	NCA01	5	5
R0036	9 Townson Road Marsden Park	Residential	NCA01	12	10
R0037	55 Townson Road Marsden Park	Residential	NCA01	5	4
R0038	63 Townson Road Marsden Park	Residential	NCA01	12	12
R0812	41 Sunningdale Drive Colebee	Residential	NCA03	8	-
R0818	68 Sunningdale Drive Colebee	Residential	NCA03	3	-
R0828	60 Sunningdale Drive Colebee	Residential	NCA03	1	-
R0835	52 Sunningdale Drive Colebee	Residential	NCA03	1	-
R0857	66 Sunningdale Drive Colebee	Residential	NCA03	5	3
R0859	20 Valderrama Street Colebee	Residential	NCA03	2	-
R0861	21 Valderrama Street Colebee	Residential	NCA03	1	-
R0863	22 Valderrama Street Colebee	Residential	NCA03	9	-
R0870	20 Victory Road Colebee	Residential	NCA03	7	-
R0871	14 Victory Road Colebee	Residential	NCA03	5	-
R0872	40 Victory Road Colebee	Residential	NCA03	7	-

Receiver ID	Residential Address	Receiver Type	NCA	Ultimate phase Max. exc. above criteria	Interim phase Max. exc. above criteria
R0873	44 Victory Road Colebee	Residential	NCA03	7	-
R0874	42 Victory Road Colebee	Residential	NCA03	7	-
R0875	38 Victory Road Colebee	Residential	NCA03	7	-
R0876	36 Victory Road Colebee	Residential	NCA03	7	-
R0877	24 Victory Road Colebee	Residential	NCA03	7	-
R0878	34 Victory Road Colebee	Residential	NCA03	6	-
R0879	12 Victory Road Colebee	Residential	NCA03	6	-
R0880	32 Victory Road Colebee	Residential	NCA03	8	-
R0881	48 Victory Road Colebee	Residential	NCA03	5	-
R0882	46 Victory Road Colebee	Residential	NCA03	5	-
R0883	50 Victory Road Colebee	Residential	NCA03	5	-
R0884	16 Victory Road Colebee	Residential	NCA03	7	-
R0885	26 Victory Road Colebee	Residential	NCA03	1	-
R0886	22 Victory Road Colebee	Residential	NCA03	7	-
R0887	30 Victory Road Colebee	Residential	NCA03	7	-
R0888	18 Victory Road Colebee	Residential	NCA03	7	-
R0911	61 Durham Road Schofields	Residential	NCA04	8	4

Receiver ID	Residential Address	Receiver Type	NCA	Ultimate phase Max. exc. above criteria	Interim phase Max. exc. above criteria
R0923	61 Durham Road Schofields	Residential	NCA04	3	13
R0926	46 Durham Road Schofields[1]	Residential	NCA04	17	21
R0929	42 Jersey Road Schofields[1]	Residential	NCA04	21	9
R0954	5 Meadow Road Schofields	Residential	NCA04	4	8
R0914	55 Durham Road Schofields	Residential	NCA04	-	11
R0818	68 Sunningdale Drive Colebee	Residential	NCA03	-	4

Note: 1. to be acquired as part of the proposal or Stage 2 proposal.

Sleep disturbance

A maximum noise level assessment has been undertaken based on the ultimate phase to predict the potential worst-case sleep disturbance impacts. It should be noted that the prediction of maximum noise levels for new roads possess a reasonable level of uncertainty. The difference in maximum noise levels due to the proposal is predicted to result in the following:

- For residential receivers within NCA01, no discernible difference in perceived noise levels.
- For residential receivers within NCA02, an increase of up to 8.4 dBA. However, it should be noted that the closest residences to Townson Road within NCA02 are yet to be built (Luxeland Development).
- For residential receivers within NCA03, no discernible difference in perceived noise levels.
- The residential receivers within NCA04 are predicted to receive the largest variability in the difference of maximum noise levels, with the receiver at R0929 predicted to expect a maximum noise level increase of up to 18 dBA. It should be noted that the majority of receivers within NCA04 are predicted to expect a reduction in maximum noise levels due to the upgraded road configuration.
- Some receivers may be exposed to more frequent maximum noise events due to the increased traffic volumes on the road.

Pedestrian crossing operation noise (ultimate phase)

Operational noise impacts from the installation of pedestrian audio tactile devices at residential receivers has been assessed. As part of the signalised intersections at Victory Road and the planned new road, pedestrian crossing lights would be installed for the ultimate phase. These intersections are proposed to be roundabouts for the interim phase and as such, no pedestrian crossing lights will be installed.

Noise generated by the audio tactile devices at the pedestrian crossing signal post for the ultimate phase of the proposal, is predicted to comply with the sleep disturbance noise criteria at all existing sensitive receivers during the night time period. Impacts to future receivers which are discussed in the section below.

Figure 6.2 Receivers exceeding operational noise criteria

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Future receivers

No exceedances of the criteria were identified for the future buildings with the initial Luxeland development. As such, no mitigation measures have been recommended for the receivers within this development.

Exceedances of the criteria are predicted for the future buildings within Luxeland development. The Luxeland developer is responsible for ensuring the requirements of the State Environmental Planning Policy (Infrastructure) are met as part of their Development Application Consent Conditions. As such, no mitigation measures have been recommended for the receivers within this development.

Noise generated by the audio tactile devices at the pedestrian crossing signal post is predicted to exceed the sleep disturbance noise criteria for the six closest residential receivers within the Luxeland Development (corner of Townson Road and Victory Road South). The Luxeland developer is responsible for ensuring the requirements of the State Environmental Planning Policy (Infrastructure) are met as part of their Development Application Consent Conditions. As such, no mitigation measures have been recommended for these receivers.

Noise mitigation is the responsibility of the developer where the approval for the individual dwelling has been approved subsequent to the approval of the proposal as the RNP noise goals apply only to existing receivers. As such, any dwelling that is approved prior to the approval of the proposal would qualify for noise mitigation.

Operational vibration

There are no expected operational vibration impacts associated with the proposal.

6.2.5 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: urban design policy, process and principles* (Roads and Maritime, 2014) • A monitoring program to assess performance against relevant noise and vibration criteria • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.	Contractor	Pre-construction	Core standard safeguard NV1 Section 4.6 of *QA G36 Environment Protection*
Noise and vibration	All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least 7 days prior to commencement of any work associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The 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	Core standard safeguard NV2

Impact	Environmental safeguards	Responsibility	Timing	Reference
Community consultation	All sensitive receivers (eg local residents) likely to be affected will be notified prior to commencement of any work associated with the activity that may have an adverse noise or vibration impact. The ENMM Practice Note (vii) provides community consultation procedures for road work outside normal working hours. 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	Construction	Additional safeguard
Building vibration	Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage.	Contractor	Pre-construction	Additional safeguard
Construction noise from inappropriate practices	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All relevant project specific and standard noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Construction traffic routes • Site opening/closing times (including deliveries) • Environmental incident procedures.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction traffic noise	Management of construction related traffic or traffic reroutes should as a minimum include the following controls: • Scheduling and routing of vehicle movements • Speed of construction related heavy vehicles should be limited to 40 km/hr along Alderton Drive, Victory Road and Townson Road • Driver behaviour and avoidance of the use of engine compression brakes • Ensuring vehicles are adequately silenced before allowing them to access the site • Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work • Loading and unloading of materials/deliveries is to occur as far as possible away from sensitive receivers • Select site access points and roads as far as possible away from sensitive receivers • Dedicated loading/unloading areas to be shielded if close to sensitive receivers • Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible • Avoid or minimise out of hours movements where possible.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction noise form machinery and equipment	The use and selection of machinery and equipment will: • Use quieter and less vibration emitting construction methods where reasonable and feasible • The noise levels of plant and equipment must have operating sound power or sound pressure levels compliant with the criteria in Appendix H of the CNVG. Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturer's specifications or Appendix H of the CNVG • The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 2 of the CNVG • The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site.	Contractor	Construction	
Hours of construction activity	Where reasonable and feasible, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. Further to this, it is recommended that the use of mulchers, jack hammers, concrete saws, rock breakers, compaction or other equipment used in very close proximity to the receivers should be limited where feasible and reasonable to the standard construction hours.	Contractor	Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
Extended duration of noise and vibration activity	If highly noise affected impacts are predicted high noise and vibration generating activities may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block. If highly noise affected impacts are predicted no more than four consecutive nights of high noise and/or vibration generating work may be undertaken over any seven-day period, unless otherwise approved by the relevant authority.	Contractor	Construction	
Road noise	The NMG recommends noise mitigation in the following order of preference: • Quieter road pavement surfaces • Noise mounds • Noise barriers (noise walls) • At-property treatments.	Contractor	Construction	
Audio tactile device noise at pedestrian crossings	Noise mitigation measures applicable to the audio tactile devices to reduced potential sleep disturbance impacts should include volume adjustment limiting the devices to a sound pressure level of 68 dBA at 1 metre. These mitigation measures would also need to consider health and safety requirements.	Contractor	Construction	
Post construction monitoring	To confirm that the noise level targets are achieved, the NMG refers to the ENMM Practice Note 8 which recommends that a post-construction noise monitoring program be undertaken.	Blacktown City Council	Operation	

Other safeguards and management measures that would address noise and vibration impacts are identified in section 6.1.

6.3 Hydrology and flooding

This section summarises the results of the hydrology and flooding assessment undertaken by GHD and provided in Appendix G.

6.3.1 Methodology

The methodology used to survey the construction footprint for the hydrology study can be summarised as following:

- Review of previous studies relating to the flooding and hydrology surrounding the proposal area
- Review of proposal design criteria, applicable design standards and relevant legislation and policies
- Flood modelling to access the existing conditions, proposed conditions and effectiveness of mitigation options
- Recommendations for monitoring and management of identified impacts and risk.

6.3.2 Existing environment

Hydrology

The proposal is located within the catchment of Eastern Creek. The Eastern Creek catchment extends six kilometres south of Townson Road. Significant water bodies in the vicinity of the construction footprint includes the tributaries of Bell's Creek and Eastern Creek. The construction footprint crosses both of these tributaries.

Eastern Creek is located to the east of the proposal and Bells Creek on the western side of the construction footprint. Both creeks flow in a northerly direction. Bells Creek flows into Eastern Creek approximately three kilometres downstream of Townson Road.

Bells Creek crosses under Townson Road through a three cell box culvert with each cell opening around three metres wide and two metres high. Townson Road is currently utilised as a causeway to allow major flows that exceed the culvert capacity to flow over the road surface. A flood level marker is installed to indicate flood depths during heavy storms.

The southern portion of the Eastern Creek catchment is heavily urbanised with residential development being the primary land use. To the north of the catchment area there are areas of semi-rural and light industrial land use.

The location of water bodies is shown on Figure 1.2 and Figure 6.3.

Flooding

The proposal crosses Bells Creek and a tributary of Eastern Creek. The existing Townson Road formation that crosses Bells Creek is frequently overtopped by flood waters. The modelled flood level immediately upstream of Townson Road varies from 27.43 metres Australian Height Datum (AHD) on the western edge of the floodplain to 27.52 metres AHD on the eastern side. Flood modelling also determined that the existing 1 in 100 year flood level exceeds the road crest of Townson Road by a depth of 0.5 metres and extends across an area of around 200 metres in width.

In the vicinity of Townson Road, the 1 in 100 year flood level velocities within Bells Creek vary from about 1.5 metres per second to 3.0 metres per second. The higher floodplain velocity values have been identified nearer to the main channel of Bells Creek.

East of Victory Road, the proposal drains to a tributary of Eastern Creek which flows from west to east. Stormwater flows enter this tributary from catchments to the north and south of Meadow Road.

6.3.3 Potential impacts

Construction

There is potential for flood and hydrology impacts as a result of the construction work undertaken on the floodplain for both the interim and ultimate phases. This work includes:

- Earthworks across the floodplain including partial removal and replacement of existing formation
- Placement of temporary stockpiles within the floodplain
- Construction of temporary piling platforms for the bridge construction.

Construction activities have the potential to result in local changes to overland flow regimes and the obstruction of drainage paths resulting in temporary localised flooding. This could result in minor increases in surface flows along existing overland flow paths to the nearest drainage line. To minimise the potential for localised flooding (and erosion) during construction, it would be necessary to plan, implement and maintain measures aimed at intercepting any concentrated flow and diverting it toward the existing stormwater drainage system.

Construction activities are not expected to affect flooding behaviour in the area. The potential impacts associated with the proposal being located in a flood prone area are discussed under operational impacts below.

In the event that a flood occurs during construction, there is potential for large scale movement of any un-stabilised earthworks and unsecured construction materials.

Further safeguards and mitigation methods are identified in section 6.3.4.

Operation

Ultimate phase of the proposal

There is potential for impacts on the flood behaviour of Bells Creek and the general hydrology of the study area during the operation phase of the ultimate phase. The proposal would result in a cumulative loss of flood plain storage across Bells Creek floodplain as a result of widening of the road formation within land that currently contributes to flood storage during major floods. Potential impacts would be as a result of the following aspects of the proposal:

- Removal of existing causeway road embankment and redistribution of flood flows through the proposed floodplain bridges
- Loss of floodplain storage due to widened embankment within the floodplains of Bells Creek
- Increased runoff to Bells Creek from the additional impervious area created by the widened road pavement.

Potential impacts at a one per cent AEP flood event (1:100 year event) due to the above work include a maximum flood level impact increase of 0.02 metres on the western side of the floodplain. This increase would occur on existing commercial land that is adjoined by and forms part of the Bells Creek floodplain, immediately south of Townson Road. This increased flood level is not expected to impact existing buildings on this land. On the eastern side of the floodplain, the maximum flood level impact increase is 0.19 metres at the edge of the floodplain, south of Townson Road. Downstream of Townson Road, minor increases in flood levels adjacent to Townson Road are predicted to occur at the proposed bridge opening locations. These increases would reduce to zero within one hundred metres downstream of the proposal. Land affected on the eastern side of the floodplain are classified under the Blacktown Council's LEP as not developable and therefore any impacts are not considered significant.

The lowest level of the proposal is close to the Bells Creek floodplain. The design of the proposal provides around 0.9 metres of freeboard. This will enable Townson Road to remain trafficable as a flood evacuation route during rare flood events up to a 0.2 per cent AEP (1:500 year event) magnitude. Downstream of Townson Road, there are localised minor increases of up to 0.05 metres in flood levels adjacent to Townson Road which occur at the proposed bridge opening locations but which reduce to zero within one hundred metres downstream of the proposal. However, there is also a small reduction in flood levels of up to 0.10 metres on the eastern floodplain. A hydraulic assessment (CSS 2016) of the proposed future residential developments found that discharges and flood levels in the Bells Creek catchment may increase in future due to planned urban development. It was reported that the 0.2 per cent AEP flood levels in Bells Creek near Townson Road could, in future, rise by between 0.1 and 0.25 metres under a fully developed scenario. The freeboard of 0.9 metres provided by the proposal is considered to be sufficient for Townson Road to provide flood immunity across Bells Creek in a 0.2 per cent AEP event under future development scenarios.

The adjacent residential development, located to the east of the floodplain on the south side of Townson Road included a stormwater retarding basin constructed on the fringe of the floodplain. The performance of the basin would not be impacted by the proposal and the building floor levels of the residential lots that form the development are set above the probable maximum flood levels.

Velocity impacts may include velocity increases of up to 1.1 metres per second in areas observed on the floodplain leading into and out of the proposed bridges. These impacts have the potential to result in increased scour in proximity to the bridges.

Velocities are predicted to be reduced upstream of Townson Road on the eastern floodplain as a result of this proposal. It should be noted that in some cases, reduced velocities can result in an increased deposition of silt following flood events. However, this reduction would occur in an area with already existing low velocities and presence of silt deposition. As the proposal is not expected to significantly alter this behaviour, the potential impacts are not considered significant.

The proposal would incorporate measures as part of the design to mitigate potential changes to flooding conditions and manage the conveyance of stormwater through the proposal. These measures would include:

- The inclusion of two floodplain bridges across the Bells Creek floodplain to mitigate upstream flood impacts and provide for passage of the 0.2 per cent (1:500 year event) Annual Exceedance Probability flood event to enable Townson Road to act as a flood evacuation route during extreme flood events
- Culverts to allow for the passage of stormwater across the proposal and to minimise flooding impacts on adjacent land

- Vegetated swales on both sides of the proposal, east of Victory Road to direct off site stormwater flows safely to the east towards the tributary of Eastern Creek
- Scour protection to the Bells Creek bridge abutments to minimise the possibility of scour of the road embankment. Scour protection comprising rock or scour resistant vegetation would also be provided on culvert outlets and within channels.

Climate change modelling considered rainfall intensity increases of 15 per cent. This showed that one per cent Annual Exceedance Probability flood levels could increase by up to 0.15 metres in Bells Creek. This would not impact the flood immunity of the proposal.

Interim phase of the proposal

The interim phase of the proposal would incorporate a bridge over Bells Creek and a flood relief bridge to the east of Bells Creek.

During the interim phase, the flood relief bridge would be located directly opposite an existing commercial and residential property on the northern side of Townson Road. To minimise flood impacts and maintain commercial operation of the property during the interim phase work, the proposal would incorporate the construction of a temporary flood diversion bund in front of the property. This would intercept floodwaters flowing under the bridge, diverting through culverts under the property access towards Bells Creek.

The bund would be effective in mitigating both flood level increases and changes in flood hazard associated with the proposed floodplain relief bridge.

6.3.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Drainage design	Consult with Council during detailed design to ensure appropriate integration with Council's stormwater network. Design will include: • The reinstatement of local scour protection work in unlined channels, where present • Ensuring stormwater network alternatives are in place prior to any disconnection or diversion of stormwater infrastructure.	TfNSW	Detailed design	Additional safeguard
Stormwater runoff	Detailed design to result in no net increase in stormwater runoff rates in all storm events, unless it can be demonstrated that increased runoff rates as a result of the proposal would not increase downstream flood risk.	TfNSW	Detailed design	Additional safeguard
Piers in waterway	Where feasible and reasonable, the bridge is to be designed to ensure piers and associated scour protection are not constructed within the waterway.	TfNSW	Detailed design	Additional safeguard
Flood hazard	As part of the CEMP, a flood risk management plan will be prepared that details the processes for monitoring of flood alerts. The plan will specify the steps to be taken in the event a flood warning is issued including removal or securing of loose material in the floodplain and removal or securing of all fuels and chemicals.	Contractor	Pre-construction and Construction	Additional safeguard
Flood hazard	Storage of excess materials within the floodplain, including within compound areas will be minimised. As far as is practical materials are to be ordered on, or, as close as possible to, an as needs basis.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Flood hazard	Install drainage work prior to or concurrent with road formation construction to minimise potential adverse impacts upstream and/or downstream of site.	Contractor	Construction	Additional safeguard
Management of water bodies	Work within or near the creek will be undertaken with consideration given to the NSW Department of Primary Industries (Water) *Guidelines for controlled activities on waterfront land – Riparian corridors* (2018).	Contractor	Construction	Additional safeguard

Other safeguards and management measures that would address hydrology and flooding impacts are identified in section 6.4.4.

6.4 Surface water and groundwater

This section summarises the results of the surface water and groundwater assessment undertaken by GHD, provided in **Appendix H**.

6.4.1 Methodology

The potential impacts of the proposal were assessed by collating data from desktop studies and field surveys. A number of tasks were undertaken to assess the potential impacts, including:

- A review of similar assessments for previous projects in the surrounding area
- Identification and review of legislation, policies and guidelines relevant to surface water and groundwater impacts for the proposal
- Characterisation of the existing environment including: climate, topography, geology, hydrology, hydrogeology, water quality and sensitive receiving environments
- Analytical groundwater calculations to predict potential groundwater inflows and radius of influence at specific excavation sites
- Assessment of potential surface water related impacts to satisfy the minimal impact considerations of the *National Water Quality Management Strategy* (ARMCANZ & ANZECC, 2000)
- Assessment of potential groundwater related impacts to satisfy the minimal impact considerations of the *NSW Aquifer Interference Policy* (Department of Primary Industries, 2012)
- Recommendations for monitoring and management of identified impacts and risk, including mitigation measures as appropriate.

6.4.2 Existing environment

The proposal is located within the Hawkesbury-Nepean catchment. The Hawkesbury-Nepean catchment covers approximately 22,000 square kilometres and flows approximately 470 kilometres from Goulburn to Broken Bay. The catchment provides drinking water, recreational opportunities, agriculture and fisheries produce and tourism resources for the Sydney Metropolitan area. The proposal lies within the South/Wianamatta Creek subcatchment of the Hawkesbury-Nepean Catchment. The South/Wianamatta Creek subcatchment covers about 490 square kilometres and is one of the most degraded subcatchments of the Hawkesbury-Nepean.

Surface Water

The closest surface water body to the proposal is Bells Creek, which crosses the proposal in the western portion of the site and generally flows from south to north. Eastern Creek is about 550 metres east of the proposal and also flows from north to south. Bells Creek and Eastern Creek connect about 3.5 kilometres north of the proposal and eventually drain into the Hawkesbury River, about 13 kilometres north of the proposal. The proposal does not intersect Eastern Creek. However, it is partially located within the Eastern Creek catchment.

The Bells Creek catchment has an area of about 14 square kilometres. The northern portion of the site is bordered by a quarry, which would be decommissioned and rehabilitated for residential development in the future. There are no surface water discharge points from the quarry to the construction footprint. There are numerous farm dams within the study area.

The *Waterway Health Report Card 2017-2018* (Blacktown City Council, 2018) shows that the existing health of the Bells Creek waterway has fluctuated between fair and good since 2014. Bells Creek is not classified as Key Fish Habitat according to the Department of Primary Industries Key Fish Habitat mapping (Department of Primary Industries, 2019).

Surface water features are shown on Figure 6.3.

Groundwater

A review of existing groundwater borehole records identified 12 groundwater bores located within two kilometres of the construction footprint (refer to Figure 6.3). All were registered as monitoring bores and ranged from a depth of nine metres to about 20 metres. Four of the existing boreholes included standing water level data, ranging from about six metres to eight metres below ground level. The closest borehole to the proposal is about 226 metres north west of the site with a standing water level of about six metres.

It appears that groundwater use is limited with the exception of providing a base flow to waterways. Although there is no existing data, moderate to high salinity potential is expected across the construction footprint as shown on the *Salinity Potential in Western Sydney* map (Department of Infrastructure, Planning and Natural Resources, 2003).

A review of the *Groundwater Dependent Ecosystem Atlas* (Bureau of Meteorology, 2019) identified the nearest high potential 'aquatic' groundwater dependent ecosystem (GDE) as South Creek, about 5.3 kilometres north west of the proposal. 'Aquatic' ecosystems rely on the surface expression of groundwater.

There were a number of moderate and high potential terrestrial GDEs located in and surrounding the construction footprint. Of these, Cumberland River Flat Forest and Cumberland Shale Plains Woodlands areas are located within the construction footprint. 'Terrestrial' ecosystems rely on the subsurface presence of groundwater. GDEs are shown on Figure 6.3.

A conceptual groundwater model was prepared based on the available data for the study area. The groundwater level has been conservatively assumed to be 2.5 metres below ground level. It is assumed to flow northerly towards Bells Creek or Eastern Creek. Groundwater quality data is limited in existing boreholes.

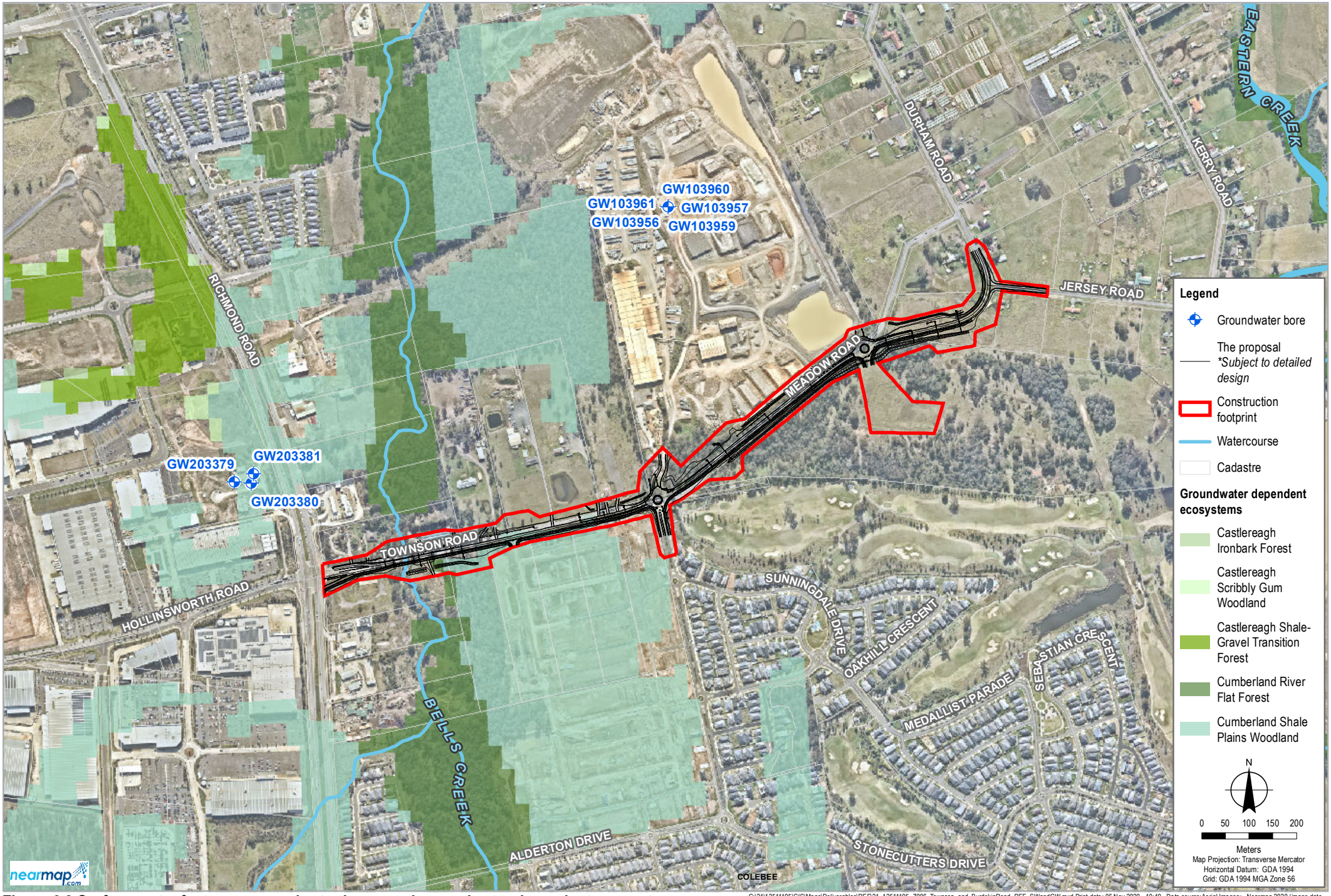

Figure 6.3 Surface water features, groundwater bores and groundwater dependent ecosystems

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6.4.3 Potential impacts

Construction

Surface water

Construction activities have the potential to impact on water quality within local receiving waters, including Bells Creek. The main potential impacts relate to soil disturbance, which represents a risk to surface water quality due to sediment laden run-off during construction. Pollutants such as sediment, soil nutrients and construction waste have the potential to mobilise and enter drainage lines, particularly during high rainfall events.

Water quality impacts could also potentially occur during construction as a result of contamination by fuel or chemical spills from construction equipment and vehicles.

Temporary construction sediment basins would be installed near Bells Creek to detain and treat stormwater prior to release to Bells Creek during the construction period. These basins would be removed after construction of the road pavement and when revegetation is established sufficiently to control erosion without the need for sediment basins.

Other sediment and erosion control measures would be developed as part of the CEMP and may include temporary diversion channels, sediment fencing and the use of mulch bunds to manage stormwater flows and filter sediment.

The final location and size of the temporary sediment basins would be confirmed during the development of the detailed design.

The construction of Bells Creek bridge requires earthworks on the banks of the creek and construction of scour protection measures within the creek at the bridge abutments. Bells Creek bridge and the flood relief bridge would require excavation of the floodplain locally to transition floodwaters smoothly through the structures and back to the floodplain. Bells Creek would also include a low flow channel to allow for connectivity between the upstream and downstream creek channel. This would provide for safe fish passage. This would result in the potential for increased turbidity and contamination from accidental spills during construction of the bridge.

The impact of construction activities on the quality of runoff discharging to the receiving drainage lines would be minimised by implementing a construction soil and water management plan as part of the CEMP. The likelihood of adverse impacts on water quality would be further reduced by the implementation of mitigation measures in sections 6.4.4.

Groundwater

Generally, the excavations and cuttings for the proposal would be relatively shallow compared to the potential depth of the groundwater table. The majority of the proposal is not likely to exceed an excavation depth of 2.5 metres below the existing ground level. However, there is potential for construction to encounter and impact groundwater with work near the Victory Road intersection. The groundwater model prediction estimates that even under worst case conditions, any interception of groundwater is likely to be very minor and localised. As a result, substantial dewatering is not expected to be required.

Groundwater may also be intersected during the construction of the bridges. The bored piling depth is likely to exceed 2.5 metres. To facilitate bored piling, it is likely that pits would need to be excavated to the bedrock prior to bored piling commencing. The expected depth to bedrock is identified at about four metres below ground level. Again, the groundwater model prediction estimates that even under worst case conditions, any interception of groundwater is likely to be very minor and localised. As a result, substantial dewatering is not expected to be required.

If groundwater is encountered during construction, it would be pumped out into a contained area, tested, and if necessary treated, before re-use, discharge or disposal.

In accordance with the *NSW Aquifer Interference Policy*, construction of the proposal is not predicted to result in any decline in groundwater pressure or groundwater head at any water supply work. It is also not predicted to alter the beneficial use of the groundwater.

However, excavation activities for the bridge construction may impact high potential GDEs in, or immediately adjacent to the proposal. Based on assumed water levels, this is anticipated to be of low risk and any impacts would be minor and temporary. Where excavation activities are likely to occur in close proximity to GDEs and groundwater is likely to be intercepted, groundwater elevations would be monitored. This would be reported as part of the surface water and groundwater quality monitoring program during the construction works. Further details are provided in section 6.4.4.

Operation

During operation, the following potential surface water and groundwater impacts have been identified:

- Increased pollutant generation and changes in groundwater recharge as a result of increased in hardstand areas
- Increased potential for pollutant generation as a result of increased traffic movements
- Pollution of receiving waters as a result of poor stabilisation of soils, inadequate erosion control/scour protection and/or failed revegetation.

The operational drainage is outlined in section 3.2.6. The implementation of the mitigation measures provided in section 6.4.4 would reduce any impacts as a result of the proposal.

Surface water

Stormwater run-off from impervious road surfaces can impact the water quality of receiving watercourses as a result of the transport of pollutants, including:

- Sediment from paved surfaces
- Heavy metals attached to particles washed off paved surfaces
- Oil, grease and other hydrocarbon products
- Litter
- Nutrients such as nitrogen and phosphorus from atmospheric deposition of particles.

The proposal incorporates features to reduce risks to soils and water quality during operation Townson Road would include kerb and guttering to collect and control runoff from the pavement surface. This runoff would be collected in the longitudinal drainage system which would include inlet pits to collect the stormwater from the kerb and gutter and pipes to convey the stormwater to outlet headwalls. These headwalls would outlet to vegetated swales which would convey stormwater to the nearest point of discharge to the watercourses that cross the proposal. Rock scour protection would be provided on headwall outlets and in areas where stormwater velocities are high to prevent erosion.

Culverts have been incorporated into the design to allow for the passage of stormwater across the proposal and to minimise flooding impacts on adjacent land (see section 3.2.6).

Given the implementation of these features, the operation of the proposal would not be expected to substantially impact on downstream water quality.

The proposal has been designed to avoid direct impact upon farm dams.

Groundwater

There are no anticipated long-term impacts from the interception of groundwater in the construction footprint. Increased hardstand areas may result in some changes to the rates of rainfall infiltration. However, surface runoff would continue to flow towards Bells Creek to the west or Eastern Creek to the east. Therefore a reduction in rainfall infiltration is likely to have a negligible effect in flows available to groundwater receptors in the area, such as high potential GDEs.

6.4.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Erosion and sedimentation	A Soil and Water Management Plan will be prepared as part of the CEMP in accordance with the requirements of TfNSW contract specification G38. The SWMP would address the following: • TfNSW Code of Practice for Water Management, the Roads and Maritime Services' Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 'the Blue Book' (Landcom, 2004) and Volume 2 (DECC, 2008) • Technical Guideline: Temporary Stormwater Drainage for Road Construction (Roads and Maritime Services, 2011) • Technical Guideline: Environmental Management of Construction Site Dewatering (Roads and Maritime Services, 2011). The SWMP would detail the following as a minimum: • Identification of catchment and sub-catchment areas, high risk areas and sensitive areas including separation of on-site and off-site water • Erosion and sediment control measures • Dewatering plan (including a map) which includes process for monitoring, flocculating and dewatering water from site (ie sediment basin and sumps) • Details of the management of groundwater in-flow during construction • Include progressive site specific erosion and sedimentation control plans to be updated fortnightly, as a minimum • Identify high risk activities (such as the bridge construction) and the details required for work method statements to be developed and signed by TfNSW prior to construction	Contractor	Pre-construction	Core standard safeguard SW2 QA *G38 Soil and Water Management*

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• The process for monitoring potential wet weather and identification of controls to be implemented in the event of wet weather with controls shown on the erosion and sedimentation control plans • Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.			
Water quality monitoring	A surface water and groundwater quality monitoring program will be developed as part of the soil and water management plan. The monitoring program will be prepared in accordance with the requirements of the *Townson Road to Burdekin Road Stage 1 Surface Water and Groundwater Assessment* (GHD, 2020).	Contractor	Pre-construction and construction	Additional safeguard
Impacts to GDEs	Where excavation activities are likely to occur in close proximity to GDEs and groundwater is likely to be intercepted, groundwater elevations will be monitored. This will be reported as part of the surface water and groundwater quality monitoring program.	Contractor	Construction	Additional safeguard

Other safeguards and management measures that would address surface water impacts are identified in sections 6.3 and 6.5.

6.5 Soils and contamination

6.5.1 Existing environment

Topography, geology and soils

The topography of the study area is characterised as gently undulating with low rising crests and elevations ranging between 20 and 40 metres above sea level.

A review of the *Soils Landscapes of Penrith 1:100,000 Sheet* indicates that the construction footprint is underlain by the Blacktown residual soil unit. The Blacktown residual soil landscape typically comprises of clayey soils over gently undulating crests. The soil unit can have moderately reactive, highly plastic subsoils and poor drainage. The geology of the Blacktown Soil Landscape is characterised by quaternary sediments, St Marys formation and Bringelly Shale.

The proposal is also underlain by the South Creek soil unit. The South Creek soil unit typically comprises sandy and clay loam underlain by Wianamatta Group shales and Hawkesbury sandstone. This soil unit is highly erodible and is subject to frequent flooding.

Salinity

Salinity potential mapping for the study area (Department of Infrastructure, Planning and Natural Resources, 2002) indicates that there is a moderate potential for salinity to occur within the construction footprint, with some areas of high potential and known salinity located near Bells Creek and Eastern Creek.

Acid sulfate soils

The CSIRO Atlas of Australian Acid Sulfate Soils indicates the study area as having a low to extremely low probability of occurrence of acid sulfate soils.

Contamination

The NSW Environment Protection Authority's (EPA) Contaminated Lands Register was searched on 22 August 2019 for the suburbs of Marsden Park, Schofields and Colebee. No listed contaminated sites were identified within, or in the vicinity of the construction footprint. The EPA notified sites list was searched on 17 January 2020 for the suburbs of Marsden Park, Schofields and Colebee. One site was identified 1.75 kilometres north of the proposal.

A search of the EPA POEO Act Register identified five current licenses within one kilometre of the proposal, as shown in Table 6.18.

Table 6.18: List of organisations with POEO licences within one kilometre of the proposal

Organisation	Address	Activity	Distance from construction footprint
PGH Bricks and Paver Pty Ltd	75 Townson Road, Schofields	Ceramic waste generation, Ceramics production, Crushing, grinding or separating, Land-based extractive activity, Mining for minerals	Within construction footprint
Costco Wholesale Australia Pty Ltd	10 Langford Drive, Marsden Park	Petroleum products and fuel production	240 metres west
Linfox Australia Pty Ltd	3 Harris Avenue, Marsden Park	General chemicals storage	590 metres west
Blacktown Waste Services Pty Ltd	25 Harris Avenue, Marsden Park	Land-based extractive activity Non-thermal treatment of general waste. Waste disposal by application to land Waste storage, other types of waste. Waste storage, waste tyre	690 metres west
Sydney Trains	PO Box K349 Haymarket, NSW	Railway systems and activities	1 kilometre east

A preliminary site investigation was undertaken in August 2019 and is provided in Appendix I. The preliminary site investigation identified the following potential sources of contamination, including:

- Potential for hydrocarbon, metals and asbestos impacts from unknown fill material identified within a private property dam wall along Townson Road
- Asbestos containing materials at a private property along Jersey Road
- Potential soil and groundwater impacts from hydrocarbons related to quarrying activities
- Potential pesticide and herbicide contamination of soil and surface water at a commercial premises
- Potential hydrocarbon impacts of soil and groundwater associated with heavy machinery and truck storage yards
- Potential hydrocarbon and heavy metals impacts from surrounding service stations on Richmond Road.

As potential sources of contamination were identified, a detailed site investigation (DSI) was then undertaken by GHD in January 2020.

As part of the DSI, the following work was undertaken:

- Soil samples from the proposal's geotechnical locations
- Groundwater monitoring and sampling of the four installed groundwater wells
- Surface water samples from Bells Creek and Eastern Creek
- Analysis of samples for the contaminants of potential concern including:
  - Asbestos (presence or absence)
  - Metals (arsenic, cadmium, copper, chromium, mercury, nickel, lead and zinc)
  - Benzene, toluene, ethylbenzene & xylene (BTEX)
  - Total recoverable hydrocarbons (TRH)
  - Polycyclic aromatic hydrocarbons (PAH)
  - Organochlorine pesticides (ORP)
  - Organophosphate pesticides (OPP)
  - Polychlorinated biphenyl (PCB)
  - Per- and poly-fluoroalkyl substances (PFAS)
- Assessment of laboratory analytical results in accordance with relevant guidelines.

The results indicated there were elevated concentrations of copper, zinc and mercury above the nominated criteria in groundwater samples taken from multiple locations suggesting this is representative of the regional groundwater quality. Elevated levels of zinc were also detected in surface water samples collected from Bells Creek. Asbestos was not detected at any sampling location and no soil samples reported concentrations of the contaminants of potential concern above the nominated criteria.

Collected soil samples were also assessed against the criteria in the *Waste Classification Guidelines Part 1: Classifying Waste guidelines* (EPA, 2014). Based on the preliminary waste classification results soil within the construction footprint would likely classify as General Solid Waste (SCC1) (refer to section 6.13).

6.5.2 Potential impacts

Construction

Topography, geology and soils

As discussed in section 3.3.5, around 10,700 cubic metres of certified fill material would be imported. Fill material imported from off-site would be sourced from certified suppliers to avoid the potential for importing contaminated material. The majority of the earthworks would be carried out during the interim phase with cut material being reused as fill on-site with about 27,500 cubic metres of spoil expected.

The cut and fill requirements are not considered to be major alterations to the existing topography from a regional perspective and would only be noticeable in the direct vicinity of the proposal.

Overall, the proposal would not result in any substantial changes to local topography. The vertical alignment would generally match the existing nature of the terrain along Townson Road and Meadow Road.

Erosion and sedimentation

During construction, work activities have the potential to expose large areas of soil.

If not adequately managed this could have the following impacts:

- Erosion of exposed soil and stockpiled materials
- Disturbance of saline soils and potential for increase saline runoff
- Dust generation from excavation, backfilling and vehicle movements over exposed soil
- An increase in sediment loads entering the stormwater system and/or local runoff, and therefore nearby receiving waterways including Bells Creek.

Along the length of the proposal, major earthworks are required to provide an adequate vertical alignment. These earthworks would result in large quantities of material being excavated and transported within the study area for the purposes of reuse or stockpiling.

Additional work elements which have the potential to expose soils include:

- Vegetation removal
- Excavations for bridge construction
- Vehicle movements
- Stockpiling
- Landscaping.

The mitigation measures provided in section 6.5.3 would be implemented to manage the potential for erosion and sedimentation impacts during construction. The potential for water quality impacts due to sedimentation is considered in section 6.4.3 while the potential for air quality impacts due to dust generation is considered in section 6.10.

Contamination

Any soil contaminants present may pose a risk to human health including excavation workers and construction workers in the vicinity of the site during excavation work. If not managed appropriately, contaminants also have the potential to be spread into nearby lands or watercourses. Based on the findings of the DSI, widespread contamination was not identified in the study area. Where contamination above criteria was noted (in groundwater and surface water samples) this was considered to be representative of background conditions or pre-existing water quality issues. However, there is always the potential to encounter previously unknown contamination during construction. An approach to managing any unexpected contaminated material that may be uncovered would be specified in the CEMP.

There is potential for chemical and fuel spills to occur during construction which may result in localised contamination of soils.

These impacts are considered to be minimal with the implementation of safeguards and management measures outlined in section 6.5.3.

Operation

Operation of the proposal is not likely to result in any significant impacts on soils, landscape, topography or geology. The risk of soil erosion during operation would be minimal as all areas impacted during construction would be sealed or rehabilitated and landscaped to prevent soil erosion from occurring.

Saline soils can have a detrimental effect on vegetation growth and impact on infrastructure such as roads, pipes and cables. Salinity also has the potential to make soils unsuitable for reuse and may have implications on the suitability of plants for landscaping. The potential for salinity to damage infrastructure and the suitability of excavated material for reuse as fill would be considered during detailed design.

6.5.3 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 Soil and Water Management Plan. 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	Core standard safeguard E2 Section 2.2 of QA *G38 Soil and Water Management*
Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the TfNSW Environment Manager and/or EPA.	Contractor	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 Roads and Maritime *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 (including TfNSW and EPA officers).	Contractor	Detailed design/Pre-construction	Section 4.3 of QA *G36 Environment Protection*
Storage of materials	Hazardous materials such as fuel and chemicals will be stored in suitably located bunded areas, in accordance with DECC's *Storing and Handling Liquids: Environmental Protection Participants Manual* (DECC, 2007).	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Excess spoil	Excess spoil not required or able to be used for backfilling would be stockpiled in a suitable location before being reused or removed from the site, and disposed of at an appropriately licensed facility.	Contractor	Construction	Additional safeguard
Use of water for construction	Should surface or groundwater be used during construction, further assessment and analysis of potential contamination will be undertaken prior to its adequate use and disposal.	Contractor	Construction	Additional safeguard

Other safeguards and management measures that would address soil impacts are identified in section 6.4.4.

6.6 Biodiversity

6.6.1 Methodology

The methodology to assess the biodiversity of the proposal was conducted via database reviews to identify threatened flora and fauna species, populations and ecological communities (biota) under the BC Act, FM Act and MNES under the EPBC Act.

Field surveys were conducted on 13-14 November and 4 December 2019 to identify the vegetation types, presence and extent of threatened species and ecological communities within the study area and undertake an assessment of the value of habitats present in the study area.

This section summarises the results of the Biodiversity Assessment of the proposal undertaken by GHD. A full copy of the report is provided in **Appendix J**.

6.6.2 Existing environment

Vegetation

The majority of the study area has been modified in the past by vegetation clearing, establishment of residential and industrial areas, and roads and infrastructure construction. Remaining native vegetation in the study area is largely restricted to the riparian corridor of Bells Creek within non-certified lands to the north and south of Townson Road and some larger patches within certified lands north and south of Meadow Road.

Part of the study area is located within the NWGA and therefore comprises land certified under the Growth Centres SEPP. Bio-certification removes the need to undertake threatened species assessments or prepare species impact statements for species and communities listed under the BC Act. However it does not apply to threatened biota listed under the FM Act. As such, there is a requirement to assess impacts with respect to this Act in both certified and non-certified land.

Vegetation within the construction footprint and study area has been previously mapped as Shale Plains Woodland and Alluvial Woodland.

There are two native plant community types (PCT) within the study area:

- Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT ID 849)
- Forest Red Gum – Rough-barked Apple grassy woodland (PCT ID 835).

The native vegetation within the site is in a range of conditions, likely as a result of past and ongoing land uses in surrounding areas.

Mature and hollow-bearing trees are scattered throughout native vegetation within the study area, and there is regeneration of all canopy species evident within all stands of native vegetation. There are a number of weed species present, with higher numbers and densities in the most disturbed parts of the study area.

Two exotic vegetation zones (gardens and landscaped areas and exotic pasture) were also identified in the study area, which do not conform to any native PCT.

Details of plant community types are shown on Figure 6.4.

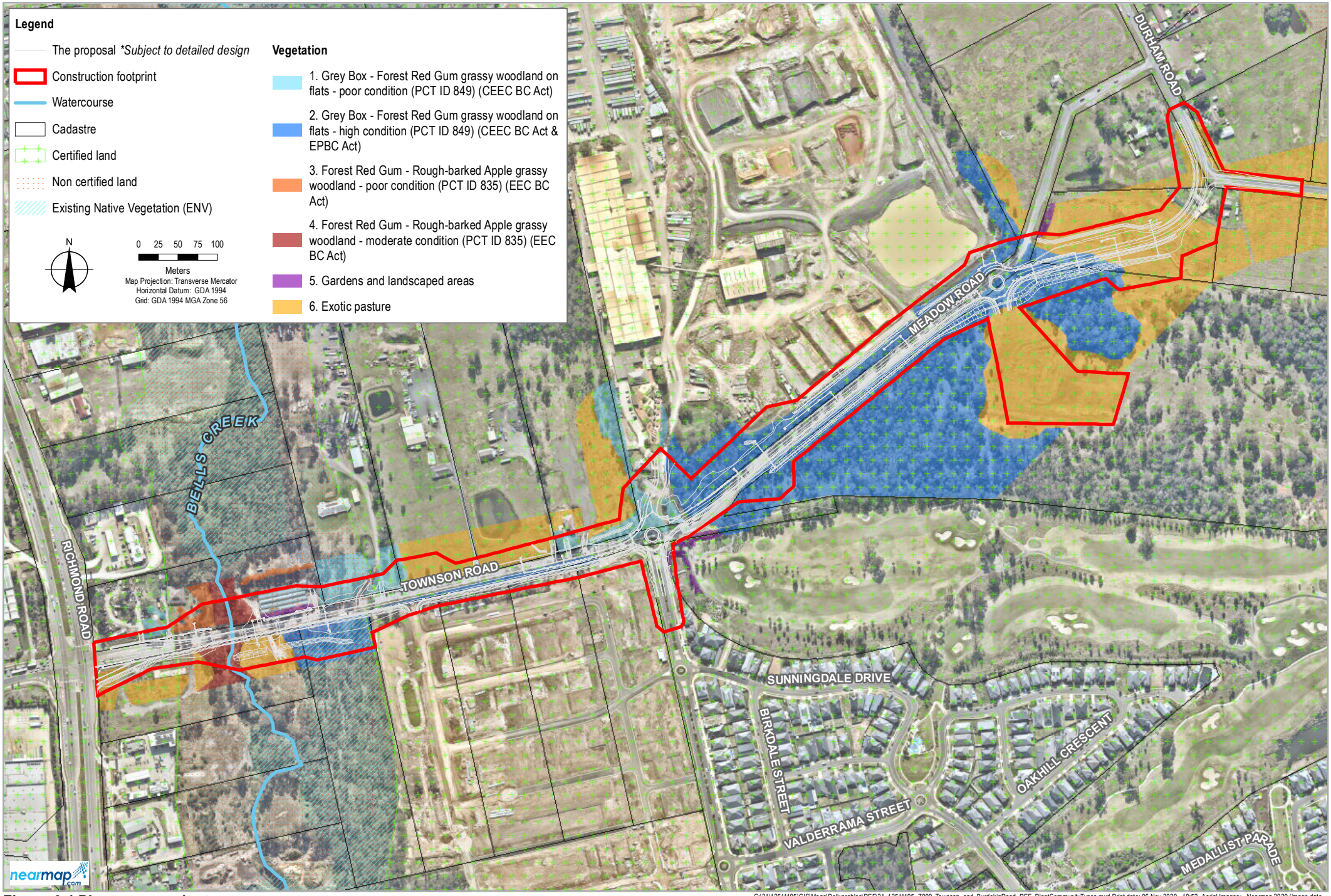

Figure 6.4 Plant community types

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Fauna

Fifty-two species of fauna were recorded during the survey, of which 34 were bird species. Species recorded during surveys were ones typically found in modified rural-residential areas, ones which are capable of persisting in fragmented and modified landscapes. Five introduced species were identified and four threatened species were identified during field survey.

Habitat for terrestrial fauna are present within the construction footprint including cleared agricultural land, planted trees, occasional hollow-bearing trees, remnant/regenerating vegetation, dams, creek lines and culverts.

Bells Creek is the only waterway intersecting the construction footprint. The waterway is not classified as Key Fish Habitat under the DPI Key Fish Habitat Mapping (DPI, 2019) and *Policy and guidelines for fish habitat conservation and management* (DPI, 2013). The creek line and riparian zone potentially provide habitat for aquatic species such as aquatic macroinvertebrates, fish, birds, microbats, reptiles and amphibians. The proposed construction area does not contain any defined watercourses or waterbodies that could provide suitable habitat for threatened fish species under the FM Act.

Threatened species

Fauna

Four threatened fauna species were observed or positively recorded during the field surveys, as follows:

- Southern Myotis – a maternity colony was located within the existing culverts in Bells Creek. This species may forage throughout native vegetation in the construction footprint and wider study area.
- Cumberland Plain Land Snail – located within high condition PCT 849 within certified land, however all occurrences of high condition PCT 849 provide suitable habitat for this species within the construction footprint and study area.
- Grey-headed Flying-fox – observed foraging throughout the study area, in certified and non-certified land. All native vegetation in the construction footprint and wider study area provides suitable foraging habitat for this species, however there is no camp site present.
- Little Bent-winged Bat – tentatively identified via Anabat call recording in PCT 835 in non-certified land within the study area. A conservative approach has been taken and it is assumed that this species is present within the construction footprint. This species may roost in culverts in the study area but would not breed within the study area or construction footprint.

Flora

One threatened flora species was recorded in high numbers across the construction footprint; *Grevillea juniperina subsp. juniperina*. There were no individuals recorded in non-certified land. About 889 individuals of this species were recorded within the construction footprint, within certified land and 12 individuals from within non-certified lands. This is from a total of 3,067 individuals counted across the wider study area.

A test of significance pursuant to Section 7.3 of the BC Act (see Appendix J) has been prepared to assess the potential impact on this species. This assessment concluded that the proposal is unlikely to have a significant impact on this species. Consequently, a species impact statement or Biodiversity Development Assessment Report would not be required for this species.

Broadly suitable habitat exists within high condition PCT 849 for two threatened flora species and one threatened flora population, however these species were not identified within the construction footprint despite targeted surveys by experienced ecologists, and any impact to these species is likely to be very low, should they occur. Given a very small area of potential habitat would be impacted (0.33 hectares) and there are no known occurrences of these species within the construction footprint, no assessments of significance have been completed for threatened flora species.

No flora species listed under the EPBC Act were identified during the field survey. There are no critical habitat or areas of outstanding biodiversity as listed under the BC Act or EPBC Act.

Wildlife connectivity corridors are limited within the area due to the surrounding lands being heavily modified and disturbed by agriculture and clearing for development. The Bells Creek corridor provides an important connectivity pathway for fauna and flora despite the patchy and fragmented vegetation. It is one of the only remaining vegetated corridors in the locality, particularly for the threatened microbats recorded to be present in the area to move between foraging and roosting habitat.

Records of threatened species are shown on Figure 6.5. Threatened ecological communities within the study area are shown in Figure 6.6.

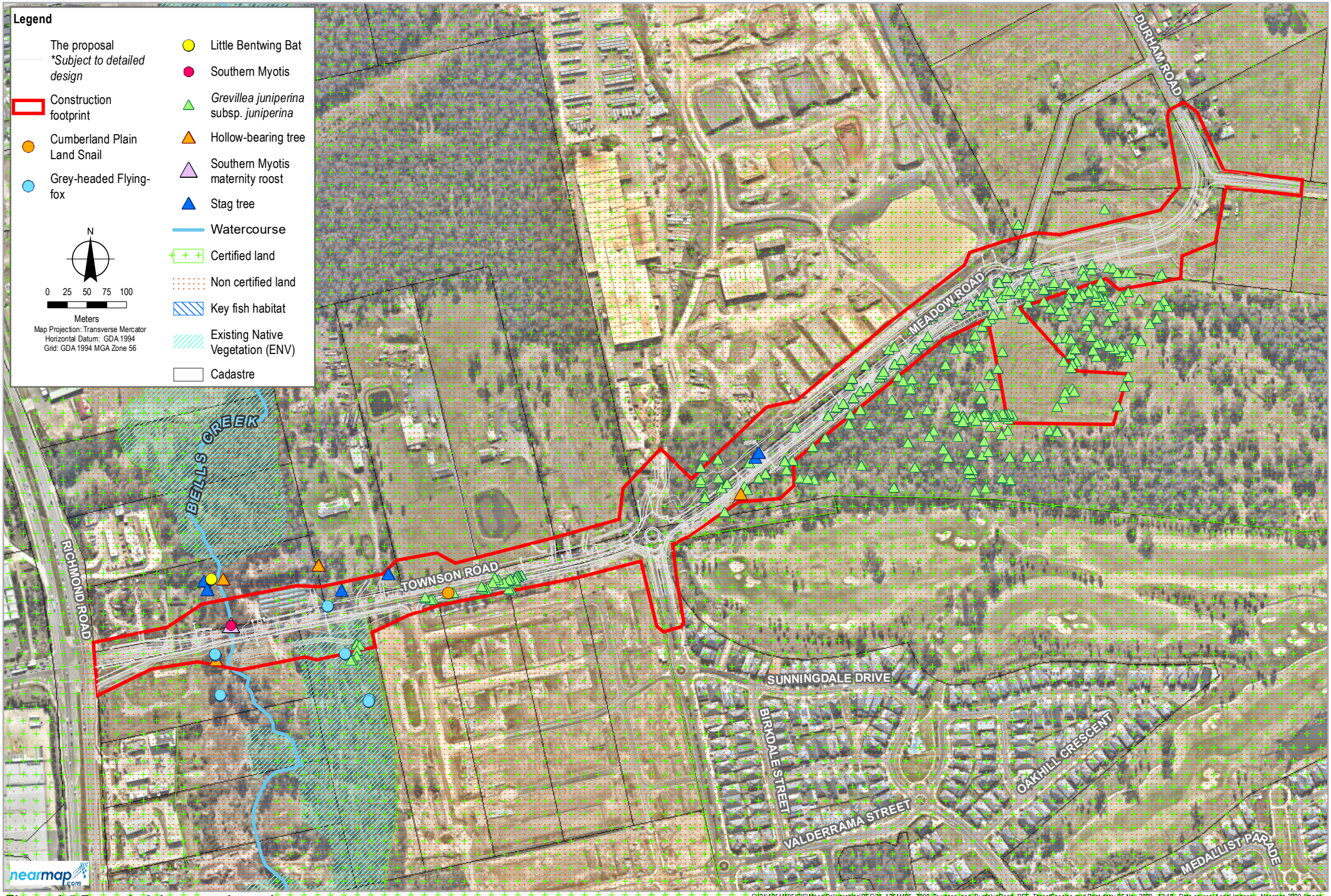

Figure 6.5 Recorded threatened species

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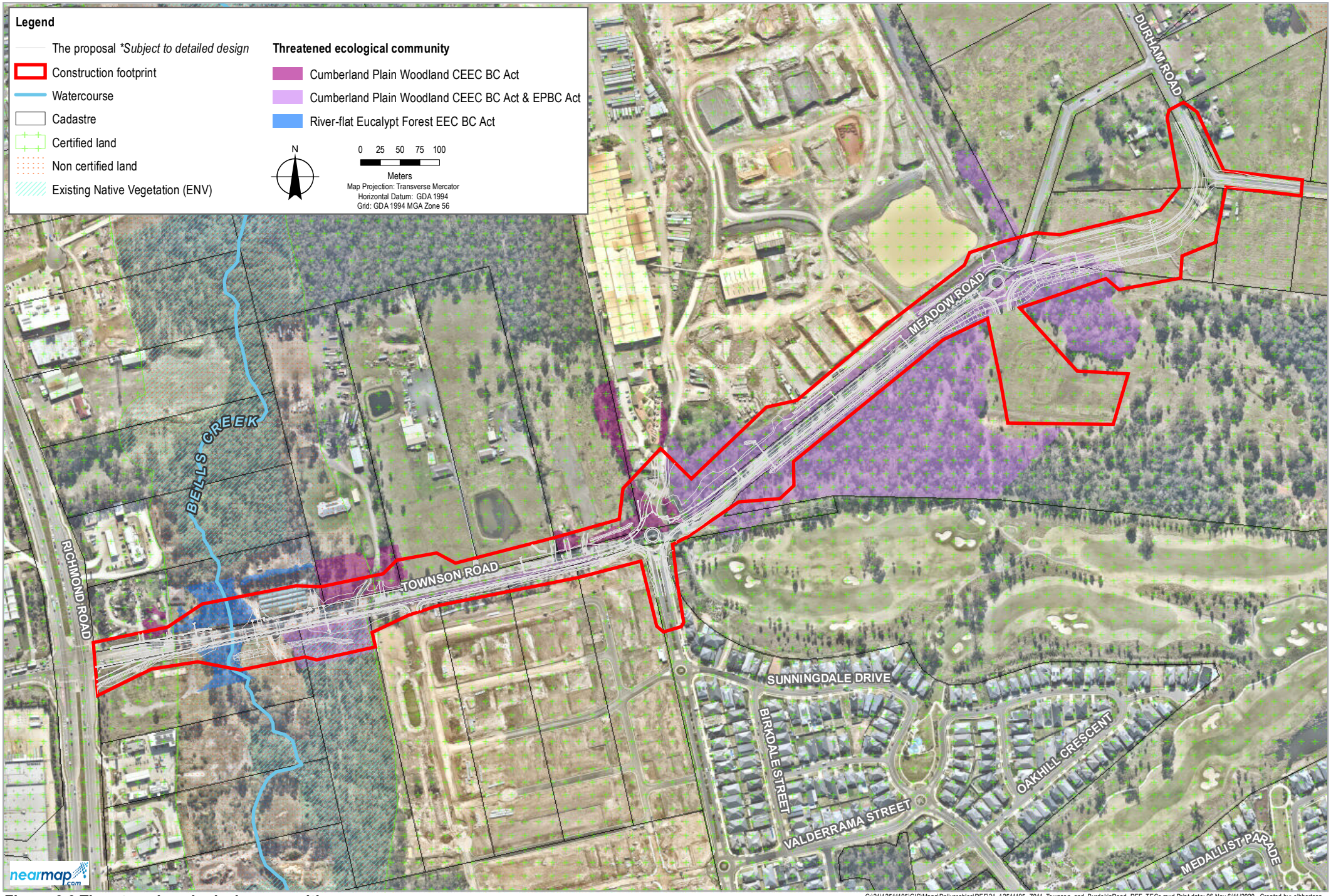

Figure 6.6 Threatened ecological communities

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6.6.3 Potential impacts

Construction

Vegetation

The proposal would result in around 4.79 hectares of native vegetation being cleared and around 13.78 hectares overall within the construction footprint. Of these areas, about 1.0 hectare of native vegetation would be removed from non-certified lands, and about 3.79 hectares would be removed from certified lands. Impacts to native vegetation are summarised in Table 6.19.

Table 6.19: Impacts to native vegetation

Plant community type (PCT)	Status		Construction footprint (hectares/m)			Per cent cleared in CMA[1]
	TSC Act	EBBC	Non-certified land	Certified land	Total	
Grey Box - Forest Red Gum grassy woodland on flats - poor condition (PCT ID 849)	CEEC	-	0.13	0.51	0.64	93
Grey Box - Forest Red Gum grassy woodland on flats - high condition (PCT ID 849)	CEEC	CEEC	0.47	3.28	3.75	93
Forest Red Gum - Rough-barked Apple grassy woodland - poor condition (PCT ID 835)	EEC	EEC	0.10	0.00	0.10	93
Forest Red Gum - Rough-barked Apple grassy woodland - moderate condition (PCT ID 835)	EEC	EEC	0.30	0.00	0.30	93
Total	-	-	1.00	3.79	4.79	-

Note: 1. CMA - Catchment Management Authority

About 4.39 hectares of Cumberland Plain Woodland CEEC would be removed with 3.75 hectares meeting the condition criteria for the community under the EPBC Act from certified and non-certified lands. Up to 0.40 hectares of River-flat Eucalypt Forest EEC would also be removed, all from non-certified lands. These vegetation types occur as modified patches of vegetation, subject to historical clearing and existing edge effects.

As the majority of the proposal is located along existing roads and adjacent to areas already cleared for agricultural and residential land these areas contain little native vegetation cover and thus has limited habitat value for native plants. Vegetation required to be removed in these areas would result in a small number of non-threatened native plant and noxious and environmental weeds individuals being cleared.

The proposal would result in the following impacts to threatened fauna species within non-certified land:

- Removal of the culverts that house the maternity colony of Southern Myotis
- Removal of 0.47 hectares of occupied habitat for the Cumberland Plain Land Snail
- Removal of 1.0 hectares of foraging habitat for the Southern Myotis, Grey-headed Flying-fox and Little Bent-winged Bat
- Removal of 1.0 hectares of potential foraging habitat for four threatened hollow-dependant microbats with the potential to occur
- Removal of 1.0 hectares of potential habitat for a number of woodland birds and owls with the potential to occur
- Removal of potential roost habitat for the Little Bent-winged Bat through the removal of culverts
- Removal of one stag tree and one hollow-bearing tree, which provides potential roosting habitat for threatened hollow-dependant microbats.

There is no habitat for threatened aquatic fauna listed under the FM Act in the indicative construction area or immediately downstream of the proposal. Mitigation measures are proposed to avoid any indirect impacts on aquatic habitats or species (refer to section 6.6.4. There are unlikely to be any operational impacts on aquatic habitats.

Conclusion on significance of impacts

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

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

6.6.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction management	A Flora and Fauna Management Plan will be prepared in accordance with the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • Requirements set out in the Landscape Guideline (RTA, 2008) • Pre-clearing survey requirements • Procedures for unexpected threatened species finds and fauna handling in accordance with the Unexpected Threatened Species Find Procedure in the Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process) and Biodiversity Guidelines - Guide 9 (Fauna Handling) • Procedures addressing relevant matters specified in the Policy and guidelines for fish habitat conservation and management (DPI Fisheries, 2013) • Protocols to manage weeds and pathogens in accordance with *Biodiversity Guidelines - Guide 6 (Weed Management).*	Contractor	Detailed design/ pre-construction	Core standard safeguard B1 Section 4.8 of QA *G36 Environment Protection*
Vegetation removal	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Contractor	Detailed design/ pre-construction	Core standard safeguard B2

Impact	Environmental safeguards	Responsibility	Timing	Reference
Impact to connectivity	Bridge design will consider the provision of dry passage under the structure, to allow for improved connectivity for terrestrial species, where possible. Bridge design should also include features such as fauna furniture (eg ledges, bolted poles etc) to allow safe passage of fauna species along the bridge structure.	Contractor	Detailed design	Additional safeguard
Removal of threatened species habitat and habitat features	A Bat Management Plan is required to manage impacts on the maternity colony of the Southern Myotis in the Bells Creek culverts. This will be developed with the input of an industry specialist in bat management, and will include the following measures at a minimum: • Appropriate timing of construction to avoid disruption of breeding, with no work to be undertaken during the breeding season • Management of removal of culverts to avoid mortality of roosting bats (eg exclusion of bats at night prior to demolition of the existing culverts) • Provision of alternative roosting habitat (eg bat boxes) in retained vegetation outside of the construction footprint • Construction of the new bridge structure in a timely manner so as to minimise the length of time that the species would have to find alternative roost sites • Inclusion of bat-friendly features into the design of the new bridges (eg dedicated recesses cast into the slabs to provide roost sites etc).	TfNSW	Pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Removal of threatened plants	A protocol should be developed for the removal of the threatened *Grevillea juniperina subsp. juniperina* in conjunction with industry experts on threatened flora management, such as collection of seed or fertile material for use in propagating the species off site, to maintain the genetic diversity of the local population. Experts from the Save our Species program and Royal Botanic Gardens should be consulted as part of this process.	Contractor	Prior to construction	Additional safeguard

Other safeguards and management measures that would address biodiversity impacts are identified in section 6.4 (surface water and groundwater) 6.5 (soils and contamination) and section 6.9 (landscape character and visual amenity).

6.6.5 Biodiversity offsets

Impacts in non-certified lands have been qualified and the Transport for NSW triggers for offset considered, are shown in Table 6.20.

Table 6.20: Offset thresholds

Description of activity or impact	Consider offsets or supplementary measures	Requirement for offset?
Work involving clearing of national or NSW listed critically endangered ecological communities (CEEC)	Where there is any clearing of an CEEC in moderate to good condition	Yes. 0.47 ha of Cumberland Plain Woodland (in high condition) listed under the BC Act would be removed from non-certified land.
Work involving clearing of nationally listed threatened ecological community (TEC) or nationally listed threatened species habitat	Where clearing >1 ha of a TEC or habitat in moderate to good condition	No. Less than 1 ha of Cumberland Plain Woodland (EPBC Act) would be removed from non-certified land (0.47 ha). No other EPBC Act-listed TECs occur within the study area. The total area of clearing of vegetation (and hence, threatened species habitat) in moderate or good condition (or higher) from non-certified lands is 0.77 ha – 0.47 ha of Cumberland Plain Woodland and 0.30 ha of River-flat Eucalypt Forest.
Work involving clearing of NSW endangered or vulnerable ecological community	Where clearing > 5 ha or where the ecological community is subject to an SIS	No. Less than 1 ha of River-flat Eucalypt Forest would be removed from non-certified land (0.40 ha).
Work involving clearing of NSW listed threatened species habitat where the species is a species credit species as defined in the OEH Threatened Species Profile Database (TSPD)	Where clearing > 1 ha or where the species is the subject of an SIS	Yes. A total of 1.00 ha of vegetation that supports potential roosting sites (ie tree hollows) for the Southern Myotis would be removed from non-certified lands, containing one known hollow-bearing tree and one stag. There would be minimal impact to foraging habitat for this species. Within the study area, known breeding habitat for this species (culverts) would also be removed. This species is a species credit species as defined in the TSPD. Provision of alternative/artificial roost habitat is more beneficial than offsetting vegetation.

Description of activity or impact	Consider offsets or supplementary measures	Requirement for offset?
		No areas of potential habitat greater than 1.00 ha for any threatened fauna species that are species credit species as per the TSPD would be removed. Several of the microbat species with the potential to occur on site are dual species credit/ecosystem credit species, but there would not be any impact greater than 1 ha to breeding habitat (and hence, species credit habitat) for these species. No areas of potential habitat greater than 1.00 ha for any threatened flora species that are species credit species as per the TSPD would be removed.
Work involving clearing of NSW listed threatened species habitat and the species is an ecosystem credit species as defined in OEH's Threatened Species Profile Database (TSPD)	Where clearing > 5 ha or where the species is the subject of an SIS	No. 1.0 ha of native vegetation would be removed from non-certified land.
Type 1 or Type 2 key fish habitats (as defined by NSW Fisheries)	Where there is any net loss of habitat	No.

The proposal would remove about 0.34 ha of ENV from within non-certified land within the construction footprint. Offsets in line with the Biodiversity Certification Order at the ratio specified within this order would therefore be required.

6.7 Aboriginal cultural heritage

6.7.1 Methodology

An Aboriginal Cultural Heritage Assessment Report (ACHAR) was prepared by Kelleher Nightingale Consulting Pty Ltd (KNC) to support the environmental assessment and accompany the AHIP application for Aboriginal objects within the proposal. The ACHAR is provided in **Appendix K**.

The Aboriginal heritage assessment methodology was based on Stages 2 and 3 of the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) and consisted of:

- Desktop searches
- Consultation with registered Aboriginal stakeholders regarding Transport for NSW activities and their potential for impact on Aboriginal cultural heritage
- Selection of the study area for the assessment. This encompassed the existing Townson Road corridor between Richmond Road and Victory Road, as well as a portion of the existing Meadow Road corridor between Victory Road and Jersey Road/Durham Road
- Preparation of an Aboriginal archaeological survey report
- An archaeological test excavation program within three areas of the construction footprint
- The preparation of an ACHAR.

The results of this assessment are summarised in the following sections.

6.7.2 Existing environment

Historical context

The study area is located within a region that was important to and intensively used by Aboriginal people in the past. Members of the contemporary Aboriginal community continue to experience connection with the area through cultural and family associations.

Early historic accounts note potential campsite locations related to seasonal changes in climate and access to food resources. Many traditional campsites and hunting and gathering resources were lost to Aboriginal peoples as British settlers expanded throughout the Cumberland Plain and claimed arable and resource rich areas for their own.

Several Aboriginal guides took part in expeditions organised by state officials such as Governor Macquarie, in the early 19th Century. Two of the guides, Colebee and Nurragingy, were rewarded for their service with a 30 acre land grant along Bells Creek. This site is contained within a reserve approximately 1.2 kilometres south of the current study area. The historical and cultural value of the grant area remains significant.

Governor Macquarie later established the Native Institution of NSW in Parramatta. This Institution was moved adjacent to Colebee and Nurragingy's Land Grant in 1823, and remained in use there until 1833. The Institution is highly culturally significant both to Aboriginal people and to the European settlement history of Sydney, and it played a key role in the history of colonial assimilation policies and race relations. The site of the Institution is approximately 1.7 kilometres to the southwest of the study area.

A full description of the historical context for the study area is provided in section 3 and 4 of the ACHAR

Database and results from other studies

An extensive search of the Aboriginal Heritage Information System (AHIMS) database was undertaken for the study area in January 2020. There are 82 registered sites located within or adjacent to the study area. Of the 82 previously recorded sites, artefacts are the predominant site feature.

AHIMS records show that there are three previously registered sites (AHIMS 45-5-3998, 45-5-0827 and 45-5-5241) located within the construction footprint. One of these (AHIMS 45-5-3998) has been destroyed according to the AHIMS register. These are listed in Table 6.21.

Table 6.21: Registered sites located within the construction footprint

Site Name	AHIMS ID	Site Feature
Schofields 2	45-5-0827	Artefact
TRU AFT 1	45-5-5241	Artefact

No Aboriginal heritage sites were found within or near the construction footprint during searches of the Australian World Heritage Places List, Commonwealth Heritage List, National Heritage List, Register of the National Estate (non-statutory) and National Trust Register (non-statutory).

Other sources of information including heritage registers and lists were also searched for known Aboriginal heritage in the vicinity of the study area. No Aboriginal archaeological sites or Aboriginal heritage items were recorded on these databases within the study area.

Several archaeological investigations have been undertaken within and around the study area as part of other infrastructure and precinct development projects. These studies showed that archaeological sites in the region generally occurred as surface artefact scatters and isolated artefacts that have been identified across the various landforms, geologies and soil landscapes within the study area.

Field survey and test excavations

The study area was subject to field survey and found to be located within a landscape with varying levels of natural and human disturbance including the construction of roads, utilities and structures in addition to earthworks, landscaping and natural process such as erosion and fluvial activity. Within such disturbed contexts Aboriginal objects are considered unlikely to survive in situ and the archaeological potential of such sites is generally low.

The archaeological field survey confirmed the high levels of previous disturbance within the construction footprint. The majority of the study area had been disturbed to varying degrees by historic and contemporary land use practices, residential and light industrial development, and the construction of the Meadow Road and Townson Road corridors.

Archaeological investigations were undertaken in 2019 at the location of the two registered Aboriginal archaeological sites, which are within the construction footprint (refer to Table 6.21).

An additional test area (TRU AFT 2) was selected in Lot 3 DP 232574 south of Meadow Road where the proposed compound site is to be located. This is to confirm the extent of subsurface disturbance and assess the likelihood of any intact archaeological deposit at this location.

The investigations confirmed the presence of these sites at these locations:

- TRU AFT 1 was identified on a slope landform associated with the previously registered (now destroyed) site TR3 along the northern side of Townson Road, approximately 430 metres from the Richmond Road intersection.
- Schofields 2 was recorded inside the main access gate to the mini bike club south of Meadow Road, and is associated with the flattened area of the upper to mid-slope running east from Plumpton Ridge down to the Eastern Creek floodplain.
- TRU AFT 2 is approximately 200 metres north east of Schofields 2 and is the location of the proposed construction compound for the proposal.

The significance of each of the sites is described in Table 6.22.

Table 6.22: Summary of archaeological significance

Site Name	AHIMS number	Assessed significance
Schofields 2	AHIMS 45-5-0827	Low significance
TRU AFT 1	AHIMS 45-5-5241	Low significance
TRU AFT 2	AHIMS tbc	Low significance

The three archaeological sites displayed low archaeological significance. The sites have previously been and continue to be impacted by historical and contemporary land use and natural processes, resulting in a mixed and dispersed deposit of Aboriginal objects lacking meaningful archaeological context. The sites do not warrant salvage excavation.

6.7.3 Potential impacts

Construction

The proposed construction work has the potential to impact on the three Aboriginal archaeological sites identified above. Proposed impacts to sites identified within the study area are detailed in Table 6.23.

Table 6.23: Proposed impact to Aboriginal archaeological sites within the study area

Site Name	AHIMS	Description	Significance	Type/ Degree of Harm	Consequence of Harm
Schofields 2	45-5-0827	Very low density surface artefact scatter located within a disturbed context on a slope landform	Low	Direct/ Partial	Partial loss of value
TRU AFT 1	45-5-5241	Low density surface scatter with low-moderate density dispersed subsurface objects on elevated landform adjacent to Bells Creek	Low	Direct/ Total	Total loss of value
TRU AFT 2	tbc	Low density dispersed surface and subsurface artefacts in severely disturbed context on a slope landform	Low	Direct/ Total	Total loss of value

The three Aboriginal archaeological sites are of low significance, exhibit minimal archaeological value and low cultural value. Impacts to sites of low significance do not warrant avoidance or mitigation. Although the three sites identified within the construction footprint are of low significance, an AHIP is required for impacts to these sites/objects prior to the commencement of pre-construction or construction activities.

Operation

No impacts to Aboriginal heritage are anticipated during operation of the proposal.

6.7.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction management	An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the Procedure for Aboriginal cultural heritage consultation and investigation (Roads and Maritime, 2012) and Standard Management Procedure - Unexpected Heritage Items (Roads and Maritime, 2015) and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage. The AHMP will be prepared in consultation with all relevant Aboriginal groups.	TfNSW	Detailed design/pre-construction	Section 4.9 of QA *G36 Environment Protection*
Unexpected finds	• *The Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains is found during construction. This applies where TfNSW 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*
Aboriginal heritage	An application for an AHIP will be made under section 90A of the *National Parks and Wildlife Act 1974* for three Aboriginal archaeological sites. The application will be prepared in accordance with the Department of Planning, Industry and Environment (DPIE) *Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants* (OEH, 2011b).	TfNSW/ Blacktown City Council	Pre-Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal heritage	The portion of Schofields 2, AHIMS number 45-5-0827 (outside of the construction and AHIP boundary) will be marked as an environmentally sensitive “no-go zone” on the CEMP.	Contractor	Pre-Construction	Additional safeguard
Aboriginal heritage	Temporary fencing will be installed around the edge of the AHIP area prior to construction.	Contractor	Pre-Construction	Additional safeguard
Aboriginal heritage	Workers will be inducted as to appropriate Aboriginal heritage protection measures.	Contractor	Pre-Construction	Additional safeguard

6.8 Non-Aboriginal heritage

6.8.1 Methodology

A non-Aboriginal heritage assessment was undertaken by specialist heritage consultants KNC and is provided in **Appendix L** of this REF.

The assessment included:

- Background research, including a search of statutory and non-statutory registers and review the available history of the study area and ascertain if any listed items may be impacted by the proposed activities
- Selecting the study area for this assessment. This encompassed the existing Townson Road corridor between Richmond Road and Victory Road and a portion of the existing Meadow Road corridor between Victory Road and Jersey Road/Durham Road
- Carrying out an archaeological site inspection and assessment of the entire construction footprint in October and December 2019
- Assessing the impact of the proposal on the cultural heritage significance within the study area
- Providing management recommendations to avoid, minimise or mitigate against impacts to any identified cultural heritage values of the study area.

6.8.2 Existing environment

Historical context

The broader region of Colebee, Marsden Park and Schofields historically was established in the early 19th century by early explorers and settlers. Land grants provided around this time were for the purposes of land cultivation, livestock grazing and settlement in the area and included:

- The area surrounding Richmond Road to Burdekin Road
- Land lying between Bells Creek and Eastern Creek identified as ‘Iron Bark Range’
- South of present-day Townson Road
- To the west and north of Townson Road.

Subdivision of the land took place in the late 1800s with land changing ownership a few times throughout the late 1800s and early 1900s. Land clearing and cultivation occurred in the area around Eastern Creek and Bells Creek during that period with crop and dairy farming coming into operation.

Schofield Aerodrome to the south east of Meadow Road was in operation for military and civil purposes until 1942. North of Meadow Road a quarry was established between 1960 and 1977, which has seen significant disturbance of the area associated with shale extraction and brick making.

A review of historical aerial photographs indicate that prior to 1947 the disappearance of buildings associated with land uses on the historically known Ivory Farm south of Meadow road. More recent use of the land has seen extensive and significant disturbance from cultivation, excavation and subsequent use of the land as a mini bikes club.

Database and document review results

There are no historical (non-Aboriginal) heritage items listed on statutory heritage registers or planning instruments (both active and repealed) within the study area.

A review of historical records, parish maps and plans was carried out to identify potential archaeological remains. This identified the likelihood of survival of any archaeological remains to be minimal to low.

The draft Schedule 9 of *Blacktown City Council Growth Centre Precincts Development Control (DCP) Plan July 2018* identified one area described as “moderate potential to contain archaeological heritage”, within the study area. This area is associated with Ivory Farm located south of Meadow Road. An assessment of this site found the likelihood of survival of items in this area to be low.

Field survey results

During the site inspection, no non-Aboriginal historical items or areas of potential were identified. The previously identified area of archaeological potential, highlighted in the draft *Schedule 9 of Blacktown City Council Growth Centre Precincts DCP July 2018* associated with the Ivory property, was found to have been subject to extensive and severe disturbance. Very low to no potential for subsurface historical archaeology was identified within the study area.

To the south of the proposed compound location, some potential was identified in a treed area of higher ground adjoining the golf course. This area appeared less disturbed and was considered more likely to retain any subsurface remains relating to earlier land use. If present, these would be of local heritage significance. This area of better potential is located outside of the construction footprint and would not be impacted by the proposal.

The remainder of the study area displayed very low potential for non-Aboriginal historical heritage items or subsurface archaeology to be present. No heritage items, fabric/materials or areas of archaeological potential were identified during background research or the site inspection.

Parts of the study area retain a low level of local heritage significance due to their contribution to the historical and increasingly rare semi-rural character of the local landscape, and association with property owned by prominent colonial personages.

6.8.3 Potential impacts

The study area does not contain any historical archaeological items or relics of heritage significance at the local, State or Commonwealth levels. The study area displays minimal to nil subsurface archaeological potential for historical heritage items of local significance.

Whilst the study area displays some general values of low local heritage significance (historical and associative), the proposed work would have a negligible impact upon those values, whose significance lies in the contribution they makes as a component of the larger cultural landscape within the local area. No material evidence or heritage items relating to these values has been identified within the study area.

The proposed work would not have an impact upon any known or likely items of archaeological significance or potential.

6.8.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non-Aboriginal heritage	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	Section 4.10 of QA *G36 Environment Protection*

6.9 Landscape character and visual impacts

6.9.1 Methodology

This section summarises the results of the Urban Design Landscape Character and Visual Impact Assessment undertaken by GHD for the proposal. A full copy of the assessment is provided in **Appendix D**.

The assessment was prepared in accordance with the *Environmental impact assessment practice note EIA-N04 - Guideline for landscape character and visual impact assessment, Version 2.1* (Roads and Maritime, 2018).

The assessment involved:

- Review of key planning designations, policies and guidance and relevant urban design objectives and principles
- Landscape character assessment and visual impact assessment
- Development of specific urban design objectives and principles for the proposal (refer to section 2.3.3)
- Provision of mitigation measures to minimise the potential for negative impacts and enhance the potential for positive impacts of the proposal.

A landscape baseline assessment was undertaken to determine the existing natural and cultural features within the study area. This includes the determination of key landscape and spatial elements, features and values. Landscape character impacts refer to the relative capacity of the landscape to accommodate changes to the physical landscape through the introduction of new features or loss/modification of existing features.

A visual baseline assessment was also undertaken to establish key views, the proposal viewshed and other visual features within the study area. Assessment of visual impacts is in relation assessing the magnitude of change to the landscape (views) in combination with the sensitivity of the receptor.

The location of landscape character areas and key views are shown on Figure 6.7.

6.9.2 Existing environment

The landscape and visual environment of the construction footprint is strongly influenced by the Bells Creek and Eastern Creek floodplains and associated riparian and rural lands. Features contributing to the visual appearance include open rural land with large pockets of developed and still developing urban land, stands of vegetation including trees and grassland and cultural paintings within private properties.

Landscape character zones

The impacted landscape character zones (LCZ) were defined based on the existing natural and cultural influences on the urban landscape. These are areas with similar landscape and physical qualities. Eight LCZ were identified, of which six were identified as potentially being impacted by the proposal. The key elements of the six LCZ are summarised in Table 6.24 and shown in Figure 6.7.

Table 6.24: Landscape character zones

LCZ	Description
1 - Industrial and Commercial	LCZ 1 primarily consists of Sydney Business Park, which occupies the area along Hollingsworth Road on the western side of Richmond Road. This area is characterised by large format industrial and commercial buildings such as IKEA, Bunnings, Aldi, Bing Lee and Costco. This zone is a vehicle dominated environment with minimal landscaping compared with the large expanses of car parking and warehouse buildings.
2 - Bushland/ Open Space	LCZ 2 is characterised by areas of dense, tall native vegetation or open grass fields that have not been developed. This zone is sporadically distributed throughout the study area but has been identified as important for habitat connectivity along the Western Sydney Parklands corridor. Visibility in and out of these areas is often constrained by vegetation.
3 - Residential	LCZ 3 comprises areas that have been subdivided and developed into residential allotments with traditional single and double story detached dwellings. The closest identified residential area to the proposal is located approximately 100 metres to the south of the intersection of Townson Road and Victory Road.
4 - Future residential	LCZ 4 comprises areas of bushland or farmland within Western Sydney making way for residential development. The main future residential development comprises the 'Luxeland' development which is located on the south side of Townson Road between Victory Road and Bells Creek. Another residential area undergoing development is located on the eastern side of Richmond Road, to the south of Harmony Avenue. Large tracts of vegetation have been cleared for the development which would abut Townson Road.
5 - Semi-Rural/ Residential	LCZ 5 consists of large residential allotments with multiple structures in addition to the main dwelling. Features such as fences, sheds, dams, farming equipment and vehicles, livestock and other elements associated with a rural landscape are also typical elements. This zone has been identified along the construction footprint and in north eastern corner of the study area.
6 - Extractive industry	LCZ 6 is typified by dams and earthen mounds interspersed with service roads. This zone is located on the northern side of Meadow Road and has been extensively quarried for the production of bricks, pavers, tiles and other masonry products. The site has a display area on the south western corner and storage and handling facilities along the western boundary.

Key viewpoints

The extent from which the proposal would be visible from adjoining areas varies along the length of the construction footprint. It is influenced by topography, vegetation, land uses and associated buildings.

Eight key viewpoints were identified along the construction footprint, these are listed in Table 6.25 and shown in Figure 6.7.

Visual receivers were considered in terms of the views they were likely to obtain from within the study area including consideration of any key vantage points, such as lookouts, where there is particular interest in the view.

The sensitivity of each viewpoint was based on:

- Importance of the view, its existing scenic qualities and the presence of other existing man-made elements in the view
- Type of visual receiver and their likely interest in the view.

Generally, viewers with the highest sensitivity include:

- Occupiers of residential properties at home or going to and from with long viewing periods, within close proximity to the proposed development
- Communities that place value upon urban landscape and enjoyment of views of their setting.

Viewers with lower sensitivity were most likely to be:

- Viewers from locations where there is screening by vegetation or structures where only screened views are available with short viewing times
- Road users in motor vehicles, trains or transport routes that are passing through/adjacent to the study area with partially screened views and short viewing times.

Table 6.25: Description of key viewpoints

View	Location	Description	Visual receptors	View type
1	Richmond Road (east adjacent to Lot 43 DP 1175138)	Located round 75 m north-west of the intersection of Richmond Road and Townson Road	Motorists, cyclists and pedestrians	Foreground view
2	Richmond Road (east adjacent to Lot 44 DP 1175138)	Located around 75 m south of the intersection of Richmond Road and Townson Road	Motorists, cyclists and pedestrians	Foreground view
3	Richmond Road and Townson Road intersection (north eastern corner)	Located on the north eastern corner of the intersection of Richmond Road and Townson Road	Motorists, cyclists and pedestrians	Foreground view

View	Location	Description	Visual receptors	View type
4	Townson Road (adjacent to Lot 9 DP 17048)	Located around 425 m north-east from the intersection of Townson Road and Richmond Road	Residents and motorists	Foreground to mid distance view
5	Victory Road and Sunningdale Drive intersection	Located around 160 m south-east of the intersection of Victory Road and Townson Road	Residents, users of Stonecutters Ridge Golf Course, motorists, pedestrians	Foreground view
6	Meadow Road	Located around 250 m north-east from the intersection of Townson Road and Victory Road	Motorists	Foreground view
7	Meadows Road (north adjacent to Lot 29 DP 12076)	Located around 120 m south-west of the intersection of Meadow Road and Durham Road	Residential and motorists	Foreground view
8	Durham Road (east adjacent to Lot 29 DP 12076)	Located around 90 m south-east of the intersection of Meadow Road and Durham Road	Residential and motorists	Foreground view

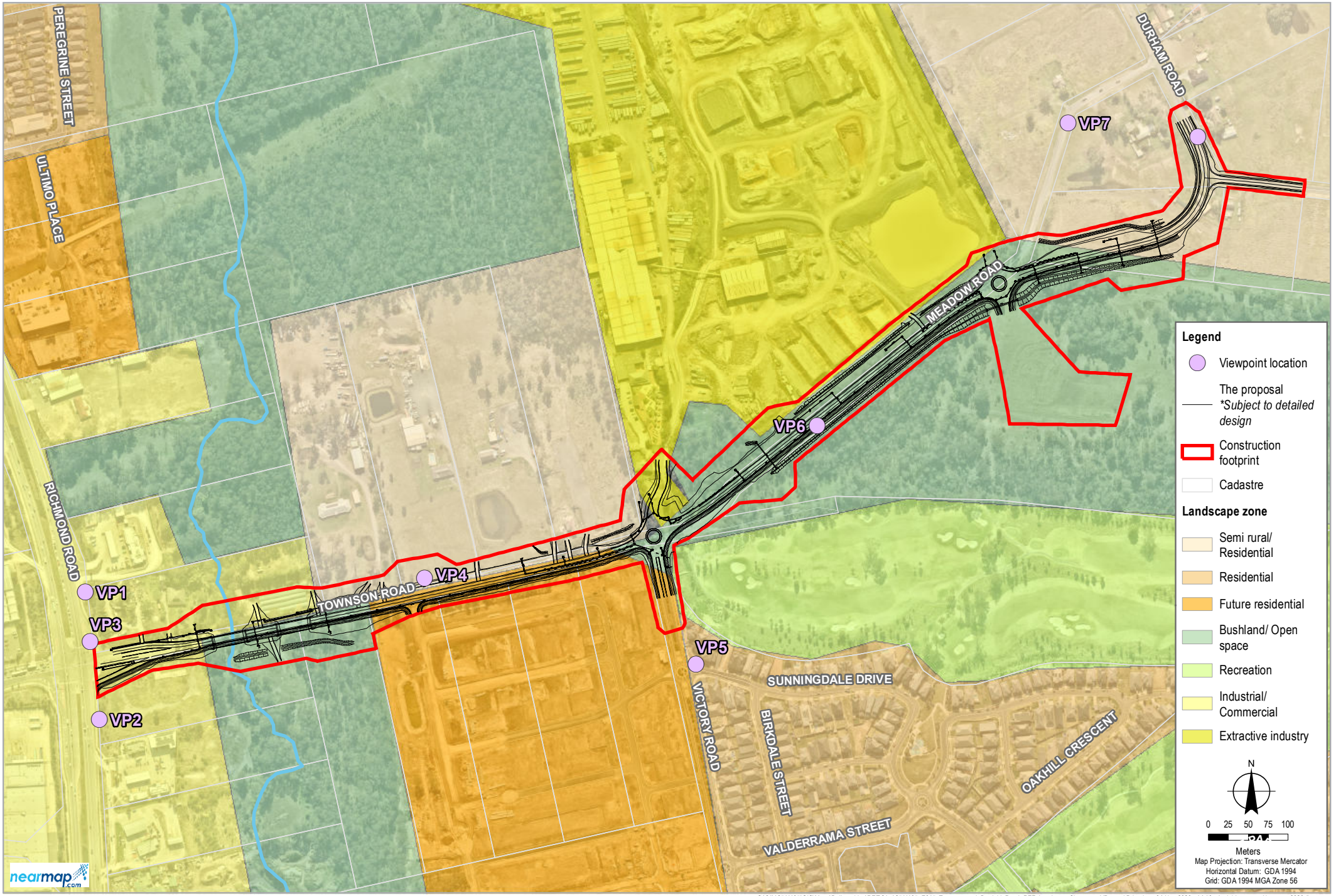

Figure 6.7 Location of landscape character areas and viewpoints

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6.9.3 Potential impacts

Construction

There would be two constructions phases, one associated with the interim phase and one associated with the ultimate phase of the proposal. During construction, a work crew, vehicles and machinery would be seen moving along the construction footprint as they construct the new widened section of the road. This would be within view of motorists and properties adjacent to the construction footprint and would result in minor, temporary visual impacts. There would be one compound site which may result in a temporary visual change to the landscape, particularly where the compound site is adjacent to the main road and close to residential receivers. There may also be the additional dust generated during the construction work resulting minor temporary visual impacts.

The proposal would require the removal or trimming of some vegetation within the boundaries of the construction footprint for construction laydown areas, temporary access tracks and other construction related activities. This would change existing viewpoints by opening up views and removing buffer vegetation.

Potential landscape character and visual impacts during construction would be minimised through implementation of the safeguards and management measures outlined in section 6.9.4.

Operation

In general, the impacts of the proposal on the landscape and visual environment would vary along the length of the proposal. The majority of changes resulting from the proposal would affect residents, pedestrians, cyclists and motorists.

Landscape character impact

The greatest impacts on the landscape character generally occur where the sensitivity to change is greatest. For this proposal, this occurs in LCZ 2 ‘Bushland/Open space’. For other zones, the magnitude of change and the sensitivity to change are lower resulting in less impact.

The potential impacts on each LCZ are summarised in Table 6.26.

Table 6.26: Impacts to landscape character

LCZ	Impact summary	Sensitivity	Magnitude of impacts	Impact rating
1 - Industrial and Commercial	**Interim** The magnitude of change as a result of the interim phase would be low. At the intersection of Townson Road and Richmond Road, both roads are comprised of two lanes in each direction. There are slip lanes on south bound lane of Richmond Road, so further modifications of the road intersection would not constitute a significant change to the landscape. **Ultimate** Townson Road and Richmond Road are comprised of two lanes in each direction. A new southbound sliplane from Townson Road would be provided	Low – due to its highly built up and modified environment	Low	Low
2 - Bushland/ Open Space	**Interim** The magnitude of change is relatively low given that only a minor portion of the trees would be removed at the interface to Townson Road and Meadow Road. **Ultimate** There would be no change from the interim phase.	High – due to minor removal of trees even with relative scarcity of bushland within this part of Western Sydney	Low	Moderate
3 - Residential	No development would be completed within residential areas	Moderate – due to the landscape character elements being in reasonably good condition and no predicted change in landscape character	Negligible	Negligible

LCZ	Impact summary	Sensitivity	Magnitude of impacts	Impact rating
4 - Future residential	No development would be completed within residential areas.	Low – due to average conditions of landscape character elements and absence of distinctive local features.	Negligible	Negligible
5 - Semi-Rural/ Residential	**Interim** The anticipated change in this area would include a planned new road alignment which may include the acquisition of some of the semi-rural residential properties in the vicinity of Meadow Road and Jersey Road. The interim phase would include a two lane carriageway with 2.5 m shoulder to the southern section of the planned new road alignment. **Ultimate** The anticipated change in this area would include the addition of the two east bound lanes to the planned new road alignment.	Moderate-Low – due to the landscape character elements being in reasonably good condition meaning potential impacts would be mitigated and magnitude.	Low	Moderate-Low
6 - Extractive industry	No development would be completed within residential areas.	Negligible – due to the highly modified nature of the landscape.	Negligible	Negligible

Visual Impacts

A summary of the results of the visual impact assessment in relation to the potential impacts on visual receivers is provided in Table 6.27. The impact rating is based on a combination of the sensitivity of the receptor and the magnitude of the potential impacts.

In summary:

- No viewpoints would have high visual impacts
- Two viewpoints would have high to moderate visual impacts
- One viewpoint would have moderate visual impacts
- Two viewpoints would have moderate to low visual impacts
- Three viewpoints would have low visual impacts
- No viewpoints would have negligible visual impacts.

The greatest visual impact of the proposal would occur along Townson Road at the interface of the new residential development as well as at the interface of the quarry site. This is because of the likely requirement for the removal of roadside trees which could result in greater exposure of the adjacent land uses.

Table 6.27: Impact to visual amenity

View	Impact discussion	Photo of view point	Sensitivity to change	Magnitude of impact	Impact rating
1 – Richmond Road #1	**Interim** Changes would include minor modifications to the intersection. These changes to the road footprint are in a highly modified and vehicle dominated environment. **Ultimate** Changes would involve minor changes to the road footprint, in a highly modified and vehicle dominated environment.		Low – visual receptors are passing through and have short-term views and involves only minor changes to the road footprint.	Low	Low
2 – Richmond Road #2	**Interim** Minor changes would be made to the road footprint, in a highly modified and vehicle dominated environment. Some vegetation would need to be removed for the construction of the slip lane, however this would not represent a substantial change to the view. **Ultimate** The magnitude of the impact would be low, given that it involves minor changes to the road footprint, in a highly modified and vehicle dominated environment.		Low – visual receptors are passing through and have short-term views and involves only minor changes to the road footprint.	Low	Low

View	Impact discussion	Photo of view point	Sensitivity to change	Magnitude of impact	Impact rating
3 – Townson Road #1	**Interim** Impacts would be minor as this is an existing road corridor that would be widened and would not be uncharacteristic within the existing view. **Ultimate** Impacts would be minor as this is an existing road corridor that would be widened. There would be a minor alteration to the view with the introduction of median and shared use paths that may be visible but would not be uncharacteristic within the existing view.		Low – visual receptors are passing through and have short-term views and involves the widening of an existing road corridor.	Low	Low
4 – Townson Road #2	**Interim** Impacts would be minor as this is an existing road corridor that would be widened and would not be uncharacteristic within the existing view. There may be some additional removal of vegetation but this has not been confirmed. **Ultimate** Changes would involve road widening and upgrading, providing a central median, incorporating a footpath and shared path and a new bridge over Bells Creek. Vegetation would be removed.		High – adjacent residential property occupants are within close proximity with long viewing periods.	Low	Moderate

View	Impact discussion	Photo of view point	Sensitivity to change	Magnitude of impact	Impact rating
5 – Victory Road	**Interim** Impacts would be minor as there would be views to the existing road corridor that would be widened. Vegetation would be removed. **Ultimate** Changes would involve road widening and upgrading, introduction of signalised intersection, removal of the existing roundabout.		Moderate – as recreation users of the golf course are within close proximity but viewing periods are limited; occupiers of residential properties along Victory Road would have long viewing periods although are at a distance from the proposal.	Low	Moderate-Low
6 – Meadow Road #1	**Interim** Impacts would be minor as this is an existing road corridor that would be widened. There would be some removal of vegetation that would open up views to the quarry site. **Ultimate** The existing road would be widened with minor alterations through the introduction of median and shared use paths.		Low – visual receptors are passing through and have short-term views and involves the widening of an existing road corridor.	Low	Low

View	Impact discussion	Photo of view point	Sensitivity to change	Magnitude of impact	Impact rating
7 – Meadow Road #2	**Interim** There would be discernible changes in the existing view due to the addition of the planned new road alignment. **Ultimate** Changes would involve road widening and upgrading, providing a central median, incorporating a footpath and shared path and removal of buildings. Vegetation would also be removed.		High – adjacent residential property occupants are within close proximity, with long viewing periods.	Moderate	High-moderate
8 – Durham Road	**Interim** There would be a discernible change in the existing view due to the addition of the planned new road alignment and the removal of existing vegetation and buildings. **Ultimate** Changes would involve road widening and upgrading, providing a central median, incorporating a footpath and shared path and removal of buildings.		High – adjacent residential property occupants are within close proximity, with long viewing periods.	Moderate	High-moderate

6.9.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual impact	An Urban Design Plan will be prepared to support the detailed design and will be implemented as part of the CEMP. The Urban Design Plan will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for: • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls, bridges and noise walls • Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape work taking account of related environmental controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas. The Urban Design Plan will be prepared in accordance with relevant guidelines, including: • *Beyond the Pavement urban design policy, process and principles* (Roads and Maritime, 2014) • *Landscape Guideline* (RTA, 2008) • *Bridge Aesthetics* (Roads and Maritime 2012)	Contractor	Detailed design/pre-construction	Standard safeguard V1

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• *Noise Wall Design Guidelines* (RTA, 2006) • *Shotcrete Design Guideline* (RTA, 2005).			
Existing views from sensitive receiver locations	Ongoing consultation on visual impacts with relevant stakeholders will continue throughout the proposal.	TfNSW/ Blacktown City Council	Construction and operation	Additional safeguard
Views from the construction work on sensitive receiver locations	Vegetation buffers will be maintained between site compounds and public roads wherever practicable.	Contractor	Construction	Additional safeguard
Views from the construction work on sensitive receiver locations	All waste material generated during construction will be reused or recycled where practicable, or collected and transported by licensed contractors for disposal at appropriately licensed facilities and in accordance with local government requirements.	Contractor	Construction	Additional safeguard
Views from the construction work on sensitive receiver locations	The hoarding of construction materials will be minimised as far as practicable.	Contractor	Construction	Additional safeguard
Changes to view from vegetation loss	The approved clearing extent, including environmental features within the construction footprint, will be identified with flagging, marking tape or similar.	Contractor	Construction	Additional safeguard
Views from the construction work on sensitive receiver locations	All temporary above ground infrastructure will be removed at the completion of construction.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Light spill	Light generated during construction will be managed in general accordance with the requirements in *Australian Standard AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting*. Generally, lighting would be designed to minimise off site light spill.	Contractor	Construction	Additional safeguard
Landscape character	Reinstatement of access roads and construction site compounds will commence progressively post construction and will be undertaken as soon as practicable.	Contractor	Operation	Additional safeguard

6.10 Air quality

6.10.1 Overview and methodology

This section provides the results of an air quality impact assessment of the proposal undertaken by GHD. The assessment involved:

- Review of existing information – a review of all relevant information in the local area was undertaken including NSW Department of Planning, Industry and Environment air quality monitoring data. Background air quality data from the Prospect air quality monitoring site was used for this assessment.
- Selection of criteria – the relevant criteria relating to air quality was identified in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (EPA, 2016).
- Assessment of impacts:
  - A qualitative construction assessment was undertaken based on typical construction activities and management measures.
  - A screening level quantitative operational air quality assessment was undertaken using the Transport for NSW assessment *Tool for Roadside Air Quality* (TRAQ). The assessment estimated pollution emission rates and concentrations due to road traffic on Townson Road.

Assessment criteria

Assessment criteria are established based on those outlined in the Approved Methods. These criteria are to be assessed against 'at existing' or 'future' off-site sensitive receptors. The criteria shown in Table 6.28 are used to assess cumulative impacts. In order to assess the total air quality impact, the predicted impact of the proposal (incremental) is added to the existing levels (background).

Table 6.28: Air quality impact assessment criteria

Pollutant	Averaging period	Criteria (µg/m^3)	Source
PM_{10}	Annual	25	DoE 2016
	24 hours	50	DoE 2016
$PM_{2.5}$	Annual	8	DoE 2016
	24 hours	25	DoE 2016
Nitrogen dioxide (NO_2)	Annual	62	NEPC 1998
	1 hour	246	NEPC 1998
Carbon monoxide (CO)	8 hours	10,000	NEPC 1998
	1 hour	30,000	WHO 2000

6.10.2 Existing environment

The existing air quality within and surrounding the study area is typical of an urban environment in close proximity to major transport corridors. The air quality in the study area would be heavily influenced by emissions from motor vehicles using the road network. Other local sources of air emissions would include residential and commercial land uses. No significant emitters or air pollutants are located within the vicinity of the study area.

Monitoring data shows that background concentrations of common pollutants such as carbon monoxide (CO), lead, nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) are all consistently below the respective national standards in most areas of NSW. Concentrations of some pollutants, including particulate matter (PM_{10} and $PM_{2.5}$) can exceed national standards, in both rural and urban areas (EPA, 2016).

The nearest monitoring station with available long-term data is located at Prospect, about 9.8 kilometres south east of the study area. Monitoring data for 2018 shows an elevated annual average background $PM_{2.5}$ concentration (7.3 µg/m^3) when compared to the criteria of 8 µg/m^3.

6.10.3 Potential impacts

Construction

There would be two construction phases, one associated with the interim works and one associated with completion of the proposal, ultimate works.

Construction of the proposal may have short-term localised impacts on air quality as a result of:

- Vegetation clearing
- Compound site establishment
- Stripping, stockpiling and managing of topsoil
- Earthworks, including:
  - Excavations for road widening, construction of the road and shared path
  - Excavations for the construction of bridges
  - Excavations for the installation of drainage pits and utility adjustments
- Road sub-grade preparation and road pavement work
- Transport and handling of soil and materials to and from the construction footprint
- Use of construction vehicles leading to the creation of exhaust fumes
- Spray painting of the road for line marking.

Potential air quality impacts during construction would be predominantly associated with the generation of dust. Dust settlement may impact on adjacent properties. Substantial dust generation could result in health impacts to nearby receivers. Air quality impacts as a result of dust generation are considered to be minor as they would be limited to the construction phase only, and would be minimised through the implementation of the safeguards and management measures outlined in section 6.10.4.

Machinery and other construction vehicles would emit exhaust fumes. The impact of these emissions would be limited to the duration of the construction phase. Odours may be generated during the application of asphalt and line marking. However, the construction period be would temporary and there would be no long-term odour impacts for nearby receivers.

Overall, potential air quality impacts during construction would be short-term in nature and appropriate mitigation measures outlined in section 6.10.4 would be implemented.

Operation

The Transport for NSW assessment tool, TRAQ, was used to predict the air quality impacts from the proposal during operation. TRAQ assesses the potential impacts on air quality from vehicles using a new or existing road. TRAQ is a first pass screening assessment to estimate pollutant emission rates due to road traffic and subsequently, pollutant ground level concentrations at a selected distance from the road.

The TRAQ model is completed for the Townson Road segment with the highest predicted traffic volumes for each scenario and therefore represents the worst-case scenario.

The assessment used worst-case peak traffic volumes for current year and the following forecast years:

- 2023 – opening year for interim phase
- 2028 – opening year for ultimate phase
- 2038 – opening year + 10 for the proposal.

The vehicle fleet database year used was 2026, which is the most advanced database available in the TRAQ model. The assessment tool uses the worst-case weather conditions occurring all year, which is considered a conservative approach.

Table 6.29 includes the modelling scenarios used in the TRAQ assessment.

Table 6.29: Overview of modelling scenarios assessed

Scenario number	Scenario	Daily traffic volume
1	No build scenario (current, 2023, 2028, 2038)	2,762 (eastbound) 3,501 (westbound)
3	2023 interim 'build' scenario	4,705 (eastbound) 5,926 (westbound)
5	2028 interim 'build' scenario	9,015 (eastbound) 10,231 (westbound)
6	2028 ultimate 'build' scenario	16,580 (eastbound) 18,084 (westbound)
8	2038 ultimate 'build' scenario	17,137 (eastbound) 18,085 (westbound)

The TRAQ model predicts CO, NO_2 and PM_{10} concentrations. $PM_{2.5}$ has been determined using a ratio based on background measurements undertaken near the road. Predicted pollutant concentrations for the five assessed scenarios are summarised in Table 6.30.

Table 6.30: Predicted pollutant concentration 10 metres from the Townson Road kerb

Pollutant and averaging period						Assessment criteria
Scenario	**1**	**2**	**3**	**4**	**5**	
Maximum 8 hour average CO (mg/m^3)	1.25	1.25	1.35	1.4	1.4	10
Maximum 1 hour average NO_2 (ug/m^3)	52	54	58	63	63	246
Annual average NO_2 (ug/m^3)	15	16	16	17	17	62
Maximum 24 hour average PM_{10} (ug/m^3)	25	26	29	32	32	50
Annual average PM_{10} (ug/m^3)	15	16	17	18	18	25
Maximum 24 hour average $PM_{2.5}$ (ug/m^3)	15	16	17	19	19	25
Annual average $PM_{2.5}$ (ug/m^3)	7.8	8.1	8.6	9.3	9.3	8

The predicted concentrations of pollutants for each of the scenarios remain below the assessment criteria with the exception of the annual average $PM_{2.5}$ concentration which is predicted to be above the 8 µg/m^3 criteria for all build scenarios and up to 9.3 µg/m^3 for the 2038 'build' scenario (scenario 5).

When considering cumulative impacts for all assessed scenarios, $PM_{2.5}$ is predicted to be the limiting (worst-case) pollutant. This is largely due to the significantly elevated annual average background $PM_{2.5}$ concentration measured at Prospect air quality monitoring station (7.3 µg/m^3). The disproportionate relationship between the background $PM_{2.5}$ concentration and the $PM_{2.5}$ criteria is demonstrated through the fact that predicted worst-case PM_{10} concentrations are significantly below the criteria.

The TRAQ assessment methodology assumes that worst-case daily traffic emissions, and meteorological conditions occur for all days of the year which is considered to lead to a highly conservative estimate of air quality impacts from traffic impacts.

Consequently, the exceedance of the $PM_{2.5}$ criteria on an annual average basis is not considered to be a true representation of the air quality risk associated with the build. It is expected that predicted impact would be reduced where a sophisticated air quality impact assessment methodology is applied.

6.10.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
General air quality impacts	An air quality management plan will be prepared as part of the CEMP. The plan will include but not be limited to: • A map identifying locations of sensitive receivers • Identification of potential risks/impacts due to the work/activities as dust generation activities • Management measures to minimise risk including a progressive stabilisation plan • A process for monitoring dust on-site and weather conditions • A process for altering management measures as required.	Contractor	Pre-Construction	Core standard safeguard AQ1 Section 4.4 of QA G36 Environment Protection
Dust emissions	• Dust suppression measures will be implemented as per the air quality management plan. • Stockpiled materials will be covered, stabilised or stored in areas not subject to high wind. • All trucks will be covered when transporting material to and from the site. • Work activities will be reprogrammed if the mitigation measures are not adequately restricting dust generation.	Contractor	Construction	Core standard safeguard A1
Exhaust emissions	• Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality. • Plant and machinery will be turned off when not in use.	Contractor	Construction	Additional safeguard
Impacts on sensitive receivers	Local residents will be advised of hours of operation and duration of work and supplied with a contact name and number for queries regarding air quality.	Contractor	Pre-Construction	Additional safeguard

Other safeguards and management measures that would address air quality impacts are identified in section 6.5.

6.11 Property and land use

6.11.1 Existing environment

The construction footprint is located within a semi-rural area bordered by the suburbs of Marsden Park, Schofields and Colebee. The broader area comprises industrial, business, rural and residential land uses with further residential development occurring in the vicinity. Existing land use zones and key land uses in the area surrounding the construction footprint are shown in Figure 6.8.

Land uses within and immediately surrounding the construction footprint include rural, rural residential and infrastructure (roads). There are also commercial properties such as Bravo Nursery and PGH Bricks and Pavers (the quarry). The quarry is being redeveloped as medium density residential properties, subject to re-zoning.

Other land uses include the following:

- General and light industrial, business and business development land uses to the west of the construction footprint and Richmond Road
- Recreation/community – Stonecutters Ridge Golf Club to the south of the construction footprint.

Other land uses in the broader area include:

- Nirimba Education Precinct – located to the south and includes Western Sydney University, TAFE NSW and two secondary schools.
- Sydney Business Park – located along Richmond Road in Marsden Park, the business park generates up to 17,000 jobs with opportunities for office, warehouse, distribution, manufacturing and retail operations. The business park includes Bunnings Warehouse, ALDI, IKEA, and Costco.
- Former Naval Air Station HMAS Nirimba – located alongside Burdekin Road, this existing defence land is being developed by Defence Housing Australia to provide 1,000 residential lots for Defence members and their families.

Existing land uses and their zoning are shown on Figure 6.8.

Future land uses

As noted in section 2.1, the proposal is identified in the *North West Priority Growth Area Land Use and Infrastructure Implementation Plan (Department of Planning and Environment, 2015).* Over the next ten years, 33,000 homes will be provided and the growth area will be home to around 92,400 people. The construction of the proposal would serve as a sub-arterial road through Schofields and West Schofields precincts and connect Marsden Park Business Park with the Schofields Centre and associated public transport services. The proposed indicative future land use when the area is fully developed is shown on Figure 6.9. The West Schofields indicative layout plan is also shown on Figure 2.1.

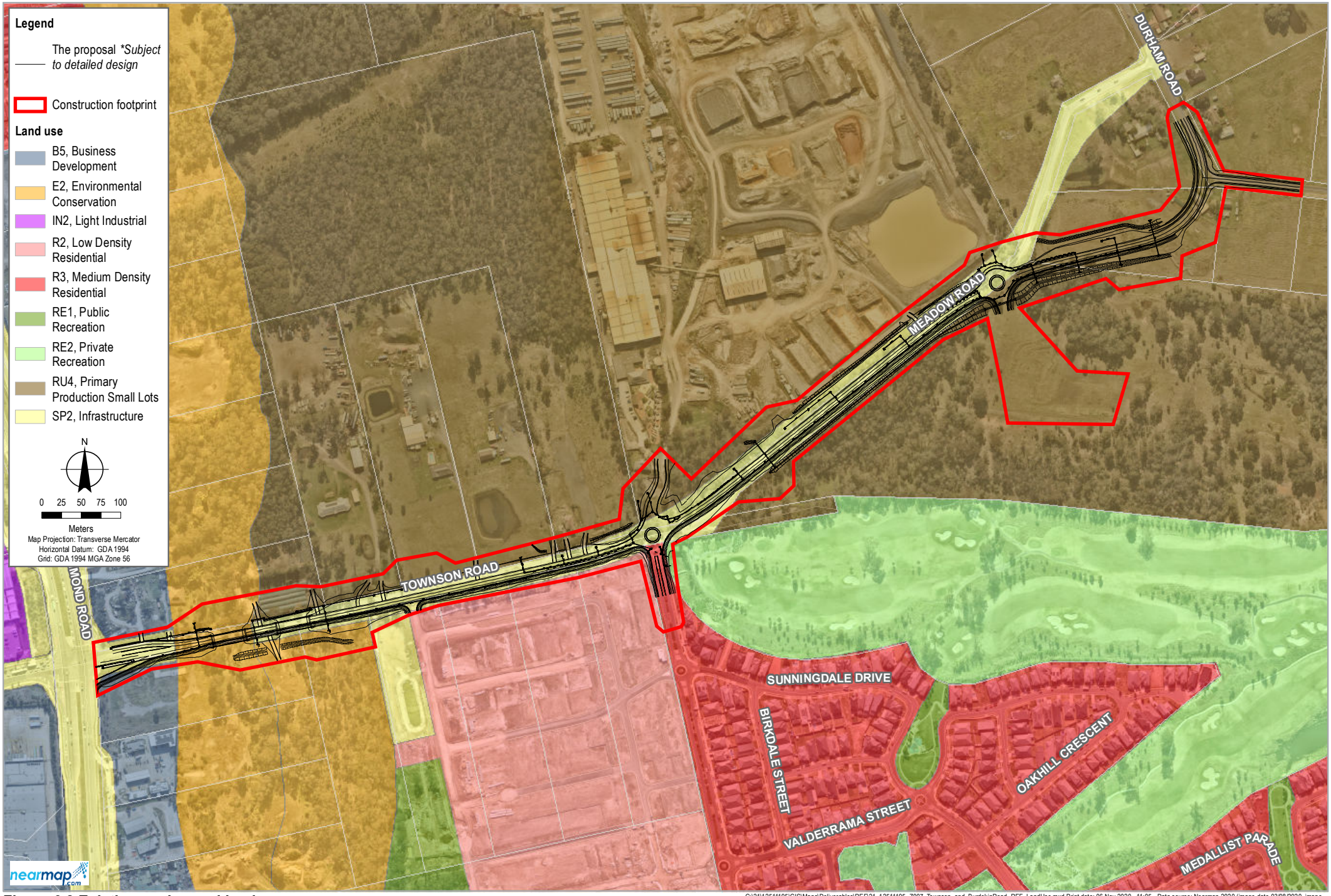

Figure 6.8 Existing zoning and land use

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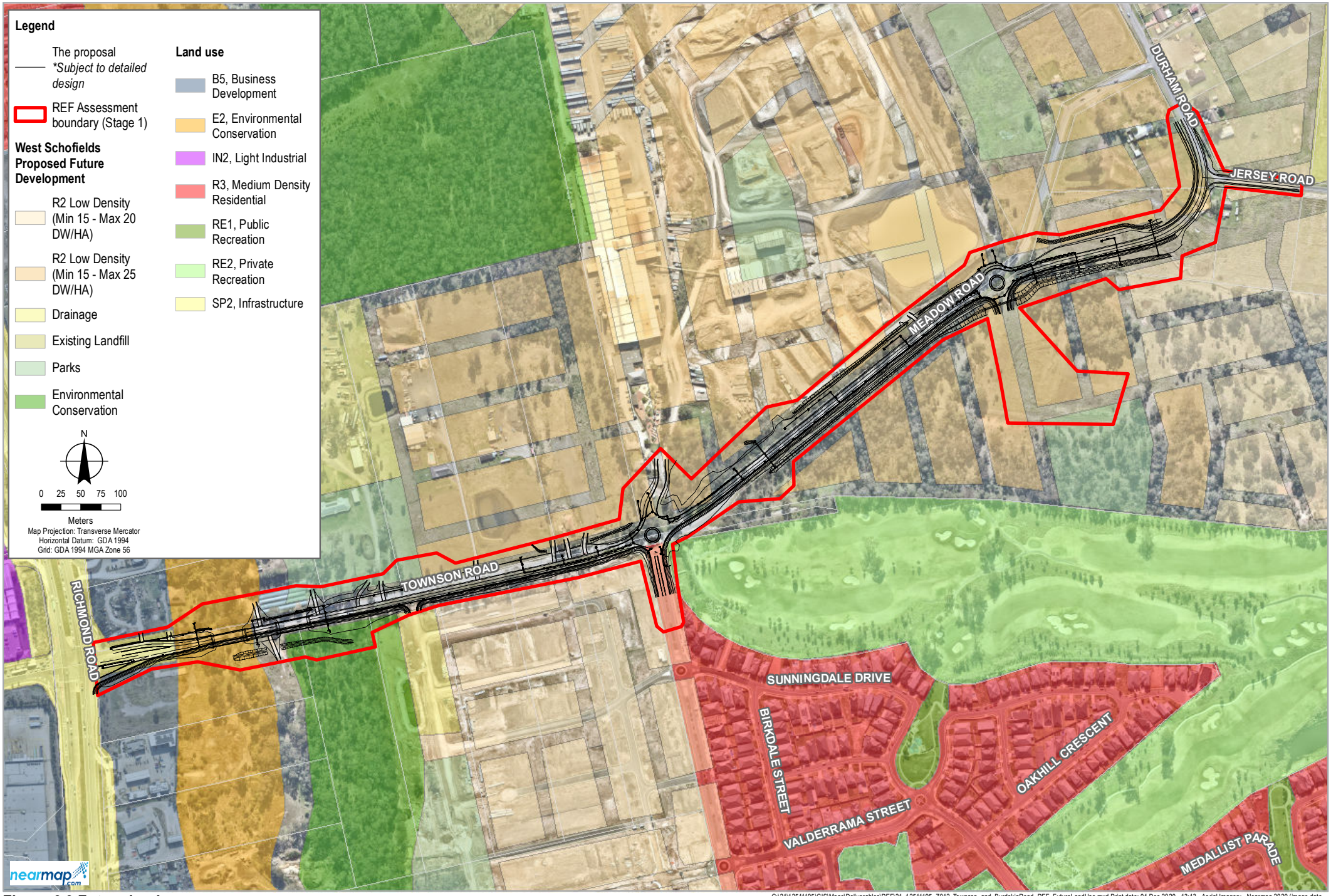

Figure 6.9 Future land use

G:\21\12511195\GIS\Maps\Deliverables\REF\21_12511195_Z012_Townson_and_BurdekinRoad_REF_FutureLandUse.mxd Print date: 04 Dec 2020 - 13:13 - Aerial Imagery - Nearmap 2020 (image date 03/08/2020 . Created by: eibbertson

6.11.2 Potential impacts

Pre-construction

As noted in section 3.6, The proposal would require the full acquisition of one existing residential property. In addition, partial acquisition would be required of four residential properties, two commercial properties, one mixed use residential/commercial property and one property owned by a developer, planned for future residential development. Properties impacted by acquisition or adjustments are listed in Table 3.9.

Leasing requirements are unknown at this stage and would be identified during detailed design of the proposal.

Impacts associated with partial property acquisition and adjustment include amongst other things, the need to relocate property boundary fencing, driveway adjustments, impacts to dams, roadside trees and landscaped areas. Property adjustment plans would be developed in consultation with the affected property owners.

All land acquisitions would be conducted in accordance with Blacktown City Council policy and the *Land Acquisition (Just Terms) Compensation Act 1991*.

The proposal has the potential to directly or indirectly impact farm dams. During detailed design, consultation would be undertaken with the owners of these properties regarding the potential impacts on the dams and the preferred options to mitigate these impacts (such as modification or relocation of the dam).

The potential socio-economic impacts of property acquisition are considered in section 6.12.

Construction

Direct impacts on land use during construction would mainly relate to the short-term presence of work within the construction footprint and use of the compound site. Potential traffic and access impacts are considered in section 6.1. As discussed in section 3.4, a possible compound site has been identified near the intersection of Victory Road and Townson Road. The selection of the preferred site would be subject to key criteria as outlined in section 3.4.

Construction activities have the potential to impact on existing utilities and services, in particular underground services such as electricity, gas, and telecommunications. The proposed strategies for adjustment and/or protection of each utility (based on initial consultation with utility providers) are provided in section 3.5.

Operation

Short-term

The use of land acquired for and occupied by infrastructure associated with the proposal would change from rural/rural residential to infrastructure (road). Following the completion of construction, for properties subject to full acquisition, land not required for the proposal may be available for redevelopment subject to Council's land use and development controls.

Long-term

The existing land uses in the vicinity of the construction footprint would remain consistent with the current zoning, until such time as the West Schofields precinct is fully released for planning and the areas surrounding the construction footprint are rezoned.

In addition, as noted in section 2.1, over the next ten years, 33,000 homes will be provided and the NWGA will be home to around 92,400 people. The proposal would provide the east-west connectivity in this area by providing a link between Richmond Road in the west and Windsor Road via Sunnyholt Road in the east.

Potential impacts due to the proposal include a maximum flood level impact increase of 0.2 metres on the western side of the floodplain. This increase would occur on existing commercial land that is adjoined by and forms part of the Bells Creek floodplain, immediately south of Townson Road. This increased flood level is not expected to impact existing buildings on this land. The adjacent proposed residential development, located to the east of the floodplain on the south side of Townson Road includes a stormwater retarding basin constructed on the fringe of the floodplain. The performance of the basin would not be impacted by the proposal and the building floor levels of the residential lots that form the development are set above the probable maximum flood levels.

6.11.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Property acquisition	All property acquisition will be carried out in accordance with Blacktown City Council policy and the *Land Acquisition (Just Terms Compensation) Act 1991.*	Blacktown City Council	Pre-construction and construction	Core standard safeguard
Property adjustment	Property adjustment plans would be developed in consultation with the affected property owners.	TfNSW	Pre-construction	Additional safeguard

Other safeguards and management measures that would address property and land use impacts are identified in section 6.12.4.

6.12 Socio-economic

A Socio-economic impact assessment (SEIA) was undertaken by GHD and is provided in Appendix M of this REF.

6.12.1 Methodology

The SEIA provides an analysis of the existing socio-economic profile of the local area and communities that would be impacted, as well as the regional context. This assessment includes:

- Outcomes from consultation with residents, businesses and key stakeholders
- Identification of potential socio-economic benefits and impacts from the proposal
- Mitigation strategies for each identified impact.

This SEIA has been prepared in accordance with a moderate assessment under the *Environmental Impact Assessment Practice Note Socio-economic assessment* (Transport for NSW, 2020). It has also given consideration to the *Social Impact Assessment Guidelines for State significant mining, petroleum production, and extractive industry development* (NSW Department of Planning and Environment, 2017) and the *Social impact assessment principles and methods endorsed by the International Association for Impact Assessment* (Vanclay, 2003 and Vanclay F, et al, 2015).

The regional study area comprises the Blacktown Local Government Area (LGA), which provides an overview of the broader population that may be influenced by the proposal. The local study area, comprises the following statistical areas intersected by the proposal:

- Schofields
- Colebee
- Marsden Park.

6.12.2 Existing environment

Regional study area

In 2016, Blacktown LGA population was 349,050 people, and is predicted to grow by 49 per cent to 521,450 people by 2036 (NSW Department of Planning and Environment, 2016).

Community values refer to tangible and intangible characteristics and aspects of a community such as amenity and character, lifestyle, access, connectivity, community cohesion and community safety. The following community values have been identified in the LGA:

- **Social cohesion** – Blacktown residents value the diversity of the community, with some residents noting Blacktown LGA is a destination of choice for new migrants. Although some residents did note they sometimes experienced discrimination, others also noted their strong feelings of belonging in the community.
- **Character and amenity** – residents in the North-West Precinct value the quiet, peaceful and rural feel of the area.

- **Access and connectivity** – Whilst well serviced by road infrastructure and the new Sydney Metro, transportation is still a challenge in the LGA. The M7 and other key transport routes play an important role in connecting Blacktown to other parts of Sydney. Residents expressed the need for improved road safety, more cycle and pedestrian paths and transport networks that connect the LGA for vehicle and non-vehicles users.

Marsden Park

Marsden Park has been identified as an emerging centre. The suburb is currently undergoing rezoning, with plans for the development of low-density residential lots, community infrastructure and businesses across the suburb (Department of Planning, Industry and Environment, 2018). As a result of new residential development, the population of Marsden Park is expected to increase from a population of 1,008 people in 2016, to 32,521 people by 2036 (Forecast.id, 2016).

- **Character and land use** – Marsden Park is characterised by a mix of large areas of undeveloped agricultural land, suburban residential areas, and commercial areas.
- **Access and connectivity** – Richmond Road is the major road, congested during peak hour periods, that runs through Marsden Park, connecting the suburb to the Blacktown CBD and its surrounding suburbs including Colebee.
- **Economy and business** – Marsden Park Industrial Precinct is the main commercial hub in Marsden Park, and includes a mix of employment generating uses such as general and light industrial and commercial uses. The top occupations of Marsden Park residents are: clerical and administrative (18.3 per cent); technicians and trades workers (16.6 per cent); and machinery operators and drivers (13.3 per cent).
- **Demographic profile** – Overall, compared to Blacktown LGA, Marsden Park has an older age profile (40 years compared to 33 years). There is also a much higher proportion of one person households (31 per cent) when compared to the LGA (15 per cent). Marsden Park also displays a relatively high level of socio-economic disadvantage.

Colebee

In 2016 the suburb had a population of 1,931 people and was one of several areas identified as having a growing population in the *Blacktown Social Profile 2016*. In line with the broader growth and change of the region much of the suburb has been rezoned to allow for the development of mostly low-density residential dwellings.

- **Character and land use** – Colebee is characterised by low density residential lots, areas of bushland, and areas of vacant land.
- **Access and connectivity** – Richmond Road and Westlink M7 are the two major roads in Colebee which connect the suburb to the rest of the LGA. Richmond Road is located along the western border of the suburb and experiences heavy congestion. The Westlink M7 runs along the southern border of the suburb, and provides residents with access to other parts of Sydney.

- **Economy and business** – Greenway Village is the main shopping centre in Colebee. Located on Richmond Road, the centre includes a supermarket, medical centre, several retail stores and a large ground level car park for customers. Another cluster of businesses are located further north along Richmond Road near the corner of Townson Road, including two petrol stations, take away food stores, a café and a gym. The top occupations of Colebee residents are: professionals (30.1 per cent); clerical and administrative (17 per cent); and managers (16.1 per cent).
- **Demographic profile** - Colebee demonstrate high levels of socio-economic advantage compared to the rest of Australia. The suburb is mostly made up of family households with young children.

Schofields

In 2016, the population of the suburb was 4,983 people. Similar to Marsden Park and Colebee, Schofields is undergoing significant residential and commercial development to support growth of the Sydney's North West Growth Area.

- **Character and land use** – Land use in Schofields can be characterised by a mix of large rural residential properties in the western section of the suburb, and suburban residential areas in the eastern part of the suburb. This results in the western portion of Schofields having a strong rural feel and the eastern areas having a suburban character.
- **Access and connectivity** – The main roads in Schofields are Railway Terrace which runs north to south, and Schofields Road which runs east to west. Railway Terrace links up to the Westlink M7 in the south. Schofields Road connects the commercial centres of Rouse Hill to the east and Marsden Park to the west.
- **Economy and business** – The closest major retail centre to Schofields is Marsden Park in the west and Rouse Hill to the east, which are both connected by Schofields Road. A supermarket is located next to Schofields Station on Railway Terrace.
- **Demographic profile** – Over half of households in Schofields are family households, and almost a third of the population are under 18 years old.

6.12.3 Potential impacts

Construction

This section summarises the potential construction impacts as a result of the proposed development. The potential impacts include:

- Property and land use – full and partial acquisition of residential and commercial properties.
- Changes to amenity and character including impact from noise and vibration, air quality, visual amenity and landscape character.
- Access and connectivity including changes to roads and traffic, public transport, active transport and parking.
- Economy, business and employment including changes to economic and employment opportunities and changes to access.

As noted in section 3.6, The proposal would require the full acquisition of one existing residential property, 46 Durham Road, Schofields. In addition, partial acquisition would be required of four residential properties, two commercial properties, one mixed use residential/commercial property and one new residential subdivision, planned for future residential development, the Luxeland Development.

The assessment of potential socio-economic impacts is presented in Table 6.31 and considers the implementation of mitigation measures.

Table 6.31: Assessment of socio-economic impacts during construction

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
Property and land use						
Full acquisition of the property at 46 Durham Road, Schofields	Acquisition and relocation processes would generate demand on time for residents and their families. People may also not be able to relocate to a similar property in the same neighbourhood, depending on their individual circumstances. However, there are similar properties available in the local study area for sale and rent, with a higher vacancy rate in Schofields, therefore there is potential for the affected residents to relocate locally. If relocating out of the area, residents may experience a loss of the social ties, and may need to travel further to access employment, services and facilities.	Negative Direct Long-term	Residents of property being acquired	Low	Moderate	Moderate - low

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
Partial acquisition of existing residential properties and the residential property which comprises a mixed use residential/commercial property	Partial acquisition may reduce resident's enjoyment of these spaces, decrease a residents pride in their properties and a loss of privacy during construction.	Negative Direct Long-term	Residents of properties being partially acquired	Low	Low	Low
Partial acquisition of the Bravo Nursery property that would result in relocation of the business	Relocation of the business locally may increase the workload and potentially lead to stress for business owner and employees.	Negative Direct Short-term	Business owner and employees	Moderate	Moderate	Moderate
	Relocation of the business outside the local area may deter customers and lead to a loss of business income. This may place stress on the business owner and employees.	Negative Direct Long-term	Business owner	Moderate	High	High - Moderate

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
Amenity and character						
Increased noise and vibration levels as a result of construction activities during the daytime at properties adjacent to the construction footprint	43 buildings during the interim phase and 38 buildings during the construction of the ultimate phase are within the study area and fall within a 20 metre safe working distance for vibratory rolling works. These buildings include up to seven existing and 36 new residential properties that will be built in the Luxeland Development and a commercial site. Where vibration is perceptible it is likely to last for short durations when equipment such as rock breakers are operating nearby.	Negative Direct Temporary	Local residents	Low	Low	Low
	Increased noise during the day may be a nuisance to some residents, and may lead to reduced amenity affecting people's lifestyle (ie spending less time outside).	Negative Direct Temporary	Local residents	Low	Low	Low
	There is potential for some residents, including vulnerable residents to be more sensitive to	Negative Direct	Vulnerable residents	Moderate - high	Low	Moderate - low

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
	an increase in noise and less likely to be able to absorb or adapt to amenity changes.	Temporary				
Increased noise levels as a result of construction activities during night time	73 residential receivers are predicted to exceed the sleep disturbance criteria during the construction of the Victory Road intersection. The majority of which would be located in the Luxeland Development. A Construction Noise and Vibration Management Plan would identify noise sensitive locations and management measures and practices to minimise noise impacts.	Negative Direct Temporary	Residents	Moderate	Low	Moderate - low
	Vulnerable residents may be particularly sensitive to increased noise levels as a result of construction activities during night time, affecting amenity and disturbing sleep,	Negative Direct Temporary	Vulnerable residents	Moderate - low	Low	Moderate - low

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
Dust generated from construction activities may impact air quality on nearby residential areas	Increase in dust can lead to some residents altering behaviour, including spending less time outdoors, and spending more time cleaning.	Negative Direct Temporary	Local residents	Low	Negligible	Negligible
	People who may be more sensitive to dust include vulnerable groups such as older people, children and people with medical conditions such as asthma. Impacts include altering behaviour, including spending less time outdoors, and spending more time cleaning.	Negative Direct Temporary	Vulnerable groups	Moderate to High	Negligible	Negligible
Changes to visual surrounds as a result of construction activities	Residents of properties along Townson Road, some properties along Victory Road and properties adjacent to the Durham Road and Meadow Road intersection would be able to view construction of the proposal. This may lead to reduced amenity and affecting people's lifestyle (ie spending less time outside).	Negative Direct Temporary	Local residents	Low	Low	Low

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
Access and connectivity						
Delays to bus route 742 due to construction activities and lane closures	Bus route 742 is likely to be impacted while Townson Road is closed for six months during construction of the interim phase of the proposal. During this time, bus services would be required to use the diversion via Alderton Drive and Victory Road to access Townson Road. This may result in a small increase in travel time of around three minutes which would slightly increase bus passengers travel time. The Hollingsworth Road and Townson Road bus stop would also be temporarily relocated around 70 metres from its current location along Richmond Road. The increased walking distance for bus passengers is expected to result in a negligible increase in travel time.	Negative Direct Temporary	Bus passengers	Moderate	Low	Moderate - low

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
	Vulnerable bus passengers may be particularly sensitive to increased time spent on the bus.	Negative Direct Temporary	Vulnerable bus passengers	Moderate - high	Low	Moderate – moderate low
Economy, business and employment						
Increased construction workforce may increase patronage of local businesses and services	Potential increase in patronage of businesses and services in close proximity to construction work (local food and beverage, retail and recreation services).	Positive Indirect Temporary	Business owners	N/A	N/A	N/A
Reduced amenity for businesses near the construction footprint due to increased noise and reduced visual amenity	Construction activities resulting in decreased amenity due to increased noise and a change in the visual landscape may be a nuisance to users of the Stonecutters Ridge Golf Course.	Negative Direct Temporary	Users of the Stonecutters Ridge Golf Course	Low	Low	Low

Operation

This section summarises the potential operational impacts as a result of the proposed development. The potential impacts include:

- Changes to amenity and character including impact from noise and vibration, air quality, visual amenity and landscape character
- Access and connectivity including changes to roads and traffic, public transport and active transport
- Economy, business and employment including changes to amenity and character of business areas and changes to access.

The assessment of potential socio-economic impacts presented in Table 6.32 is based on the methodology provided in section 6.12.1, and considers the implementation of mitigation measures.

Table 6.32: Assessment of socio-economic impacts during operation

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
Amenity and character						
Increase in traffic related noise during operation of the proposal	Increased noise may be noticeable to residents and could potentially lead to some people spending less time outdoors in backyards or on balconies, or closing windows while indoors.	Negative Direct Long-term	Local residents	Low	Low	Low
	There is potential for some residents, including vulnerable residents to be more sensitive to an increase in noise and less likely to be able to absorb or adapt to amenity changes.	Negative Direct Long-term	Vulnerable groups	Moderate - high	Low	Moderate - low
Reduced air quality for residents near the proposal during operation	Reduced air quality during operation of the proposal may impact residents living along Townson Road, Meadow Road and Jersey Road. A minor decrease in air quality is generally not noticeable to most people and is not expected to deter people from daily activities.	Negative Direct Long-term	Local residents	Low	Negligible	Negligible
	Vulnerable residents may be more sensitive to air quality changes. This may include young children, aged residents, or people with asthma.	Negative Direct Long-term	Vulnerable groups	Moderate - high	Negligible	Negligible

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
Changes to visual landscape due to a widened road corridor, new carriageway and the removal of vegetation	Changes to the visual environment of the Townson Road corridor would include the presence of new road infrastructure within a widened corridor, a footpath, shared path and the removal of some vegetation along the road corridor. This is likely to change the overall visual environment for the residents of properties along Townson Road, Victory Road and those adjacent to the Meadow Road and Durham Road intersection.	Negative Direct Long-term	Local residents	Low	Low	Low
	Residents who value the existing rural character of area, or live near the Meadow Road and Durham Road intersection would be more sensitive to changes to their visual environment due to the operation of a planned new road and the impact on the existing rural character of the area.	Negative Direct Long -erm	Local residents	Moderate - low	Moderate - low	Moderate - low

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
Access and connectivity						
Improved safety for pedestrian due to signalised crossing and signalised intersections	The proposal would result in changes to the intersection at Townson Road and Victory Road, upgrading it from a roundabout to a signalised intersection, resulting in the removal of U-turn movements. This may improve safety for pedestrians, and may remove perceived barriers for pedestrians crossing the road. This would particularly benefit vulnerable groups, including those who rely on active travel and people with mobility difficulties.	Positive Direct Long-term	Pedestrians and vulnerable groups	N/A	N/A	N/A
Improved accessibility for active transport users due to new-shared path	This would improve connectivity for pedestrians and cyclists. The pedestrian footpath, shared path and new signalised intersections are expected to increase safety and connectivity for pedestrians and cyclists and improve opportunities for active transport in the local area.	Positive Direct and indirect Long-term	Active transport users	N/A	N/A	N/A

Change as a result of the proposal	Summary of potential impact	Nature, type and duration of impact	Affected stakeholder	Sensitivity	Magnitude	Significance of impact
Economy, business and employment						
Increased traffic noise along Townson Road impacting Stonecutters Golf Course	Increased noise levels could potentially affect people's enjoyment of the golf course and may decrease usage of those areas closer to the road but is unlikely to deter anyone from using the golf course.	Negative Direct Long-term	Users of Stonecutters Ridge Golf Course	Low	Low	Low
Slight improvement to travel times and safety for road users accessing Stonecutters Golf Course	The Stonecutters Golf Course may benefit slightly due to improved travel times and safer journeys for customers, employees and deliveries.	Positive Direct Long-term	Users of Stonecutters Ridge Golf Course	N/A	N/A	N/A

6.12.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for complaints. The CP will be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008). This will include protocols for managing construction fatigue.	Contractor	Construction	Core standard safeguard SE1
Property and land acquisition	Consultation will be carried out with each landowner and resident throughout the acquisition process, in accordance with Blacktown City Council policy and the *Land Acquisition (Just Terms Compensation) Act 1991*.	Blacktown City Council	Pre construction	Additional safeguard

Other safeguards and management measures that would address traffic and transport impacts are identified in section 6.1.4, section 6.2.5, section 6.9.4, section 6.10.4 and section 6.11.3.

6.13 Resource use and waste

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:

- Avoidance of unnecessary resource consumption
- Resource recovery (including reuse, reprocessing, recycling and energy recovery)
- Disposal.

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, as outlined in section 8.2.1 of this REF.

6.13.1 Potential impacts

Construction

Potential impacts from waste relate to contamination of the surrounding environment (such as pollution of waterways, attracting pest fauna) through improper waste handling, storage and transport practices. The significance of these impacts is predicted to be low, as proposed safeguards and management measures would manage potential impact pathways into the surrounding environment.

Resource use

Construction of the proposal would require the use of a number of resources, including:

- Resources associated with the operation of construction machinery and motor vehicles (this includes the use of diesel and petrol)
- Material required for road surface and pavements (road base, asphalt, spray seal, sand, concrete, aggregate etc)
- Material required for bridge construction (concrete, steel etc)
- Fill required to meet design levels
- Materials required for road signage, street lighting and traffic signals
- Construction water (for concrete mixing and dust suppression).

The estimated quantities of these materials required for the proposal are provided in section 3.3.5.

The materials required for construction of the proposal are not currently limited in availability. However, materials such as metal and fuel are non-renewable and would be used conservatively. Excess spoil, not suitable for reuse, would be disposed of in accordance with safeguards and mitigation measures outlined in section 6.13.2.

The amount of water required for construction is currently unknown, but would be sourced from Sydney Water supply.

The management measures outlined in section 6.13.2 to reuse waste on-site would assist in minimising the amount of resources required for construction.

Waste generation

The proposal has the potential to generate waste from the following activities:

- Vegetation (native, exotic and noxious) to be removed as part of the proposal
- Demolition of the existing Bells Creek culverts
- Earthworks for constructing the bridges, road widening and new footpaths
- Utility adjustments.

Waste streams likely to be generated during construction of the proposal include:

- Excess spoil – about 27,500 cubic metres of spoil is expected be generated by the proposal, the majority of this would relate to construction of the interim phase. Spoil would be reused as fill on-site, with only small amounts removed off site.
- Green waste as a result of vegetation clearing. Weed material would be separated from native green waste
- Roadside materials (fencing, guide posts, guard rails etc)
- Packaging and general waste from staff (lunch packaging, portable toilets etc)
- Chemicals and oils
- Waste water from wash-down and bunded areas
- Redundant erosion and sediment controls.

The potential to reuse materials would be investigated during detailed design.

Excess cut material that cannot be used on-site and unsuitable material would be classified in accordance with the *NSW EPA Waste Classification Guidelines* (2014) and disposed of at an approved materials recycling or waste disposal facility. Final waste classification is required once the volumes of waste requiring offsite disposal during construction are confirmed.

Operation

Wastes during operation would be similar to existing wastes that currently occur along the road. Long-term waste impacts are not anticipated.

6.13.2 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Demand on resources	Procurement will endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.	Contractor	Pre-construction	Additional safeguard
Waste management	A resource and waste management plan will be prepared and included in the CEMP. The plan will include the following (as a minimum): • The type, classification and volume of all materials to be generated and used on-site including identification of recyclable and non-recyclable waste in accordance with NSW EPA Waste Classification Guidelines (2014) • Quantity and classification of excavated material generated as a result of the proposal (refer Roads and Maritime Service's Waste Management Fact sheets 1-6, 2012) • Interface strategies for cut and fill on-site to ensure re-use where possible • Strategies to 'avoid', 'reduce', 'reuse' and 'recycle' materials • Classification and disposal strategies for each type of material • Destinations for each resource/waste type either for on-site reuse or recycling, offsite reuse or recycling, or disposal at a licensed waste facility • Details of how material will be stored and treated on-site • Identification of available recycling facilities on and off-site • Identification of suitable methods and routes to transport waste	Contractor	Pre-construction	Core standard safeguard W1 Section 4.2 of QA G36 Environment Protection

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• Procedures and disposal arrangements for unsuitable excavated material or contaminated material • The types of waste collected, amounts, date/time and details of disposal are to be recorded in a waste register • Site clean-up for each construction stage.			
	Garbage receptacles will be provided and recycling of materials encouraged. Rubbish will be transported to an appropriate waste disposal facility.	Contractor	Construction	Additional safeguard
	All wastes will be managed in accordance with the POEO Act.	Contractor	Construction	Additional safeguard
	Portable toilets will be provided for construction workers and will be managed by the service provider to ensure the appropriate disposal of sewage.	Contractor	Construction	Additional safeguard
	Weeds removed during work will be managed in accordance with the *Biosecurity Act 2015* requirements that relate to its classification status.	Contractor	Construction	Additional safeguard
	Site inductions will occur and be recorded by a Site Supervisor to ensure staff are aware of waste disposal protocols.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste minimisation	The following resource management hierarchy principles will be followed: • Avoid unnecessary resource consumption as a priority • Avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery) • Disposal will be undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*).	Contractor	Construction	Core standard safeguard M2
Demand on resources	Excavated material will be reused on-site for fill where feasible to reduce demand on resources.	Contractor	Construction	Additional safeguard
	Where additional fill material is required this will be sourced from appropriately licensed facilities and/or other projects wherever possible.	Contractor/ Blacktown City Council	Construction	Additional safeguard
Management of green waste	Clearing and grubbing, including mulching, will be undertaken. Where possible, mulch will be used on-site.	Contractor	Construction	Additional safeguard
Spoil management	Excavated material will be reused on adjoining projects where feasible to reduce waste.	Contractor	Construction	Additional safeguard
Spoil management	Excess excavated material will be disposed of at an appropriate facility or reused appropriately for fill.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Spoil management	Excess soil requiring waste disposal will first be assessed against the *Waste Classification Guidelines- Part 1: Classifying Waste* (EPA 2014). Soil samples will be taken from stockpiled material and analysed. Transportation will be undertaken by a licensed contractor capable of transporting the waste and waste will be disposed of at an appropriately licensed waste facility with supporting waste classification documentation.	Contractor	Construction	Additional safeguard
Generation of construction waste	A post-construction land assessment will be undertaken of land that was used for ancillary construction purposes (compounds, storage, parking, etc) to determine the suitability for hand-back to the landowner. The assessment will be prepared in accordance with the *Roads and Maritime Environmental Procedure - Management of Wastes* on TfNSW land. Where the land is privately owned, a copy of the assessment will be provided to the landowner.	Contractor	Construction	Additional safeguard
Wastewater contamination of soils and water	A dedicated concrete washout facility will be provided during construction so that run-off from the washing of concrete machinery and equipment can be collected and disposed of at an appropriate waste facility.	Contractor	Construction	Additional safeguard

6.14 Sustainability and climate change

This section provides the sustainability assessment undertaken for the proposal. It describes an overall approach to the consideration of sustainability during design, construction and operation of the proposal, along with some specific objectives and initiatives.

The purpose of this section is to:

- Outline how environmental sustainability, as defined in the *Roads and Maritime Services Environmental Sustainability Strategy 2019-2023* (the strategy) (Roads and Maritime Services, 2019), would be considered throughout all stages of the proposal
- Identify significant physical risks to the proposal from extreme weather events related to climate change
- Identify relevant environmental sustainability aspects and climate change related challenges that needed to be addressed as the proposal progresses.

This section is intended to be read in conjunction with, and to be distinct from, the considerations of ecologically sustainable development as described in section 8.2.1 of this document.

6.14.1 Methodology

Environmental sustainability

This section of the REF was prepared by reviewing the strategy in order to:

- Identify targets that could or should be considered in the concept design
- Identify targets that should or opportunities that could be addressed at a later stage of design.

This assessment was undertaken as a desktop review of the concept design documentation, other studies prepared as part of this REF, and the strategy. This was supported by consultation with technical specialists and review of relevant background information.

The outcomes of this desktop review should inform the subsequent stages of design and construction.

Climate risk screening

GHD undertook a climate risk screening for the purposes of identifying reasonably foreseeable physical risks to the proposal from the known effects of climate change. The intent of this approach was to provide a high level appreciation of potential climate impacts that may have a material impact on the proposal and identify the need for or value of performing more detailed risk assessments in the future.

The climate risk screening is consistent with the *Transport for NSW Climate Risk Assessment Guidelines version 3.1* (Transport for NSW, 2018) (the Transport for NSW Guidelines). The climate risk pre-screening checklist in section 3.1.1 of the document was used to identify potential climate risks. This could include acute shocks or chronic stresses from extreme weather events. These events could include increased incidence or risk of heatwaves, bushfires, extreme precipitation and flooding, storm surges or storms and strong winds.

It is noted that the climate risk screen does not constitute a full Climate Risk Assessment as defined in the Transport for NSW Guidelines or associated Australian Standards (eg AS-5334).

6.14.2 Environmental sustainability

The strategy demonstrates a strong commitment to environmental sustainability. This includes:

- Minimising energy use and reducing carbon emissions without compromising the delivery of services to customers
- Designing and constructing transport infrastructure to be resilient or adaptable to climate change impacts
- Minimising the air quality impacts of road projects and supporting initiatives that aim to reduce transport-related air emissions
- Improving outcomes for biodiversity by avoiding, mitigating, or offsetting the potential impacts of road and maritime projects on plants, animals, and their environment
- Managing and conserving cultural heritage according to its heritage significance and contributing to the awareness of the past.

The strategy outlines a plan for the achievement of the sustainability objectives. This includes the implementation of initiatives into projects and programs. However, it is recognised that individual projects may target an alternative approach to the implementation of the strategy to meet project specific requirements or statutory requirements.

The strategy is structured to link initiatives to individual 'focus areas' considered most important. These focus areas are:

- Energy and carbon management
- Climate change resilience
- Air quality
- Resource use and waste management
- Pollution control
- Biodiversity
- Heritage – Aboriginal and non-Aboriginal
- Liveable communities
- Sustainable procurement
- Corporate sustainability.

In addition to prescribed initiatives, the strategy assigns specific targets to each focus area. Table 6.33 identifies targets from within each focus area that are considered relevant to the proposal.

Table 6.33: Applicable targets from the strategy (Roads and Maritime Services, 2019)

Target identifier	Target description	Applicable to the concept design	Applicable at later stages
Energy and Carbon Management			
EC1	Reduce operational energy consumption as measured against level of activity by 15 per cent by 2023	X	X
EC2	Improve year-on-year construction energy efficiency on all State significant infrastructure projects		
EC3	Install energy efficient LED light sources into all new and end-of-life replacement street lights owned by Roads and Maritime	X	X
EC4	Complete a feasibility study on sourcing operational electricity from carbon neutral or zero carbon energy sources by end of 2019. Implement feasible options by end of 2021		
EC5	Improve year-on-year supply chain carbon emissions intensity (including embodied energy in materials) when sourcing construction materials for State significant infrastructure projects		
EC6	Purchase new light vehicles with a minimum fuel efficiency standard that is at least the market average for that vehicle category where fit for purpose		
EC7	Improve the year-on-year average CO2 emissions score for our fleet of light vehicles up to 3.5 tonnes		X
Climate Change Resilience			
CC1	Assess climate change risks for all potentially affected projects and programs	X	X
CC2	Address all identified climate change risks ranked as high or above during project planning		X

Target identifier	Target description	Applicable to the concept design	Applicable at later stages
Air Quality			
AQ1	Projects and operations will identify and apply best practice controls and initiatives for in-tunnel network and ambient air quality	X	X
AQ2	Construction activities will identify and apply best practice air emissions controls	X	X
Resources use and waste management			
RW1	100 per cent beneficial reuse of virgin excavated natural material		X
RW2	100 per cent recovery of clean concrete for beneficial reuse		X
RW3	100 per cent recycling of clean reclaimed asphalt pavement		X
RW4	Minimum of 10 per cent cement replacement material (when locally available), measured by mass, used in concrete during construction		X
RW5	Minimum of 10 per cent recycled content (when locally available) by volume in road base and sub base		X
RW6	Prior to disposal of waste or wastewater an assessment of viable reuse or recycling options must be carried out		X
Pollution control			
PC1	100 per cent of environmental incidents are reported and tracked in incident reporting systems		X
PC2	100 per cent of Category 1 (significant) incidents are self-reported		X
PC3	Schedule and complete environmental compliance audits on 100 per cent of sites that incur a formal penalty notice or financial penalty from a regulator		X

Target identifier	Target description	Applicable to the concept design	Applicable at later stages
Biodiversity			
BD1	100 per cent of applicable projects will apply the Roads and Maritime Biodiversity Management Guidelines	X	X
BD2	All connectivity and mitigation measures will be monitored for effectiveness post implementation		X
Heritage – Aboriginal and non-Aboriginal			
HG1	All identified heritage assets must be assessed in early project planning stages to allow appropriate consideration of potential impacts and solutions	X	X
Liveable communities			
LC1	Meet the objectives of the Roads and Maritime Beyond the Pavement policy on all projects	X	X
LC2	In the Greater Sydney Region and major regional cities, complete road development projects with no net loss of tree canopy cover	X	X
Sustainable procurement			
SP1	All tendered procurement must include non-price selection criteria that assess relevant sustainability and social procurement measures		X
SP2	We will not procure from suppliers known to be applying poor labour practices		X
SP3	Where fit for purpose, 100 per cent of timber and timber products will be sourced from sustainably managed forests which have obtained Forest Management Certification		X
Corporate sustainability			
CS1	All employees are to be provided with sustainability training at a level commensurate with their responsibilities by the end of 2020		X

Target identifier	Target description	Applicable to the concept design	Applicable at later stages
CS2	100 per cent of all paper purchased by Roads and Maritime to be high recycled content paper (50 per cent or more recycled content) by end of 2020		X
CS3	Minimum NABERS Energy and Green Star standards ratings for new buildings or refurbished offices (>1000m2) are to be 5 stars		
CS4	Phase out purchase of single use kitchen items by end of 2020		

Each initiative described in the strategy relates to one or more of the targets described in Table 6.33 above. Transport for NSW and/or construction contractor would aim to employ the relevant initiatives from the strategy which correspond to each applicable target.

6.14.3 Climate Risk screening

The climate risk pre-screening exercise has sourced information and data to inform responses to set questions defined in the Transport for NSW Guidelines The results of the climate risk screening are provided in Table 6.34 below.

Table 6.34: Climate risk pre-screening

Relevant pre-screening question		Conclusion and supporting information
Exposure	**Impact**	
Does the site include areas that have been impacted by extreme events in the past?	Have past extreme events caused physical damage or impacted the operations and maintenance of similar assets or supporting infrastructure within the proposal location? To what extent?	Severe storms and extreme rainfall in late 2018 impacted road operation throughout Sydney. The construction footprint is located in a flood plain increasing the risk of flash flooding during heavy periods of rainfall (McGown, 2018). The risk of screening did not identify recent evidence of extreme winds, heatwaves or bushfire prone land causing potential physical damage to similar assets at the construction footprint (Department of Planning, 2019). However, there is a significant area classified Vegetation Category 1 to the west of the site. Smoke from bushfires may also cause complications to the operation.

Relevant pre-screening question		Conclusion and supporting information
Exposure	**Impact**	
		According to available hazard mapping, the construction footprint is not subject to landslide risk or cyclones (Department of Planning, 2019)
Does the mode of transport selected contain an inherent level of tolerance to extreme events or is it likely that service levels will be impacted in extreme events?	-	Of the types of extreme events investigated, the proposal would be most susceptible to extreme rainfall and localised flooding events which may cause operation complications. However, relative to other forms of mass transit (ie light rail, heavy rail) roads are considered inherently tolerant to certain extreme weather events due to the ability of the infrastructure to be bypassed if needed.
What past or current trends can be observed regarding frequency and intensity of extreme events?	If any past or current impacts from extreme events have been identified, consider whether projected changes in the climate might worsen in the future and the potential impact this may have on the proposal.	A summary of current trends in the frequency and intensity of extreme events includes: • 11.6 per cent increase in maximum one day rainfall for a 20 year ARI event (Dowdy, 2015). This could result in an increase in frequency of inundation of the site and disruption to service. • Severe fire danger days up from 1.5 to 1.6 days per year (Dowdy, 2015). Extreme fire danger can damage the asset and disrupt services, however this is unlikely given the site's location in an area not prone to bushfire risk (Department of Planning, 2019).
-	If the proposal location has previously recorded impacts, to what extent is it anticipated that the future proposal design would avoid or mitigate the risks from those impacts, and can adaptation responses be cost effectively retrofitted in future?	The risk of screening identified more frequent and severe localised inundation as a consequence of storm events as a major risk to the functionality and life of the asset. Design inputs to mitigate these impacts should be addressed with a detailed risk assessment and adaptation work during detailed design.

A summary of current extreme weather trends that could have a significant impact on the construction and operation of the proposal include:

- Severe storms (eg hail storms, extreme rainfall, high winds)
- Localised/flash flooding.

These climate risks can cause high operational impact along the proposed road, which would increase the safety and security of the road. At times of very high wind, heavy rain and dense fog, road operation conditions slow the travelling speed of vehicles. Additionally, if the road is deemed to be unsafe, the route can be forced to close, thus greatly adding to congestion to the wider area.

6.14.4 Safeguards and management measures

To effectively meet the sustainability targets set out in the strategy, the key initiatives should be implemented (as shown in Table 6.33).

A full climate risk assessment is recommended to be completed during detailed design. A risk assessment will provide the next level of examination, including a more detailed assessment of the impacts identified in this climate risk pre-screening. It is important to undertake this climate risk assessment early in the design process.

If undertaken, the climate risk assessment will follow the Australian Standard *AS 5334-2013 Climate change adaptation for settlements and infrastructure – a risk based approach* and Section 3.2 of the Transport for NSW Guidelines (Transport for NSW, 2018). These documents provide principles and generic guidelines on the management of the risks the proposal will face as a result of climate change.

6.15 Cumulative impacts

Cumulative environmental impacts have the potential to arise from the interaction of individual elements within the proposal and the additive effects of other external projects. Transport for NSW is required under clause 228(2)(o) of the Environmental Planning and Assessment Regulation 2000 to take into account potential cumulative impacts as a result of the proposal.

6.15.1 Study area

The proposal is located in the NWGA which is subject to extensive development. Nearby projects were considered part of the general development of the area. However, any projects in close proximity to Townson Road (adjoining or requiring utilisation of the road) were considered as part of the cumulative assessment.

6.15.2 Broader program of work

The proposal is part of a broader program of work to upgrade Townson Road and Burdekin Road corridor linking Richmond Road, Marsden Park in the west and Burdekin Road, Schofields in the east. This broader program of work consists of two stages:

- The proposal involves an upgrade of about 1.6 kilometres of road extending from Richmond Road to south of Jersey Road. This stage would include an interim and ultimate phase of work

- Stage 2 is about two kilometres in length involving the construction of a planned new road between the proposal tie-in and Burdekin Road.

The proposal is also part of a broader program of strategic planning as identified in section 2.1.

6.15.3 Other projects and developments

In consultation with Transport for NSW, the adjoining or nearby projects identified for a cumulative assessment are identified in Table 6.35.

Table 6.35: Past, present and future projects

Project	Construction impacts	Operational impacts
Commercial development - Kennards		
The project involves building one take away food and drink premise and one Kennard's hire facility at 6 Townson Road on the corner of Richmond Road and Townson Road. Construction dates are not yet known.	Construction impacts may include: • Increased noise • Reduced air quality • Increased construction job opportunities available to residents within the regional study area • Economic activity generated by concurrent construction projects in the region.	Operation impacts may include: • Visual impacts of the new buildings • Additional commercial patrons using on-site and street parking.
Alderton Drive, Colebee residential subdivision development (Luxeland development)		
The project involves the development of 240 low density residential dwellings to the south of Townson Road. Construction for the project began in 2019. Completion of the project is likely to be staggered, with 115 lots for completion by May 2020 and another 125 lots by the end of 2020 or early 2021.	Construction impacts from this proposal may include: • Increased noise for residents living along or close to the proposal • Increased traffic affecting Townson Road and Richmond Road during standard construction hours • Reduced air quality for residents living along or close to the proposal • Further increased construction job opportunities available to residents within the regional study area.	Operation impacts from this proposal may include: • Visual impacts of the new buildings • An increase in traffic on Townson Road and associated road traffic noise • Additional residences patrons using street parking.

Project	Construction impacts	Operational impacts
Alltove development		
The project involves building 2,200 dwellings, this includes a mixture of houses, townhouses and apartments. To date, 381 houses and 142 townhouses have been completed. It is expected that 90 townhouses will be built in 2022, an additional 74 townhouse by 2026 and 1,500 apartments between 2027 and 2035. This project is located near Burdekin Road and is not within the construction footprint of the proposal.	Construction impacts from this proposal may include: • Further increased construction job opportunities available to residents within the regional study area • Economic activity generated by concurrent construction projects in the region • Increased traffic affecting Townson Road and Richmond Road during standard construction hours.	Operation impacts from this proposal may include: • Visual impacts of the new buildings • An increase in traffic on Townson Road and Richmond Road and associated road traffic noise • Additional residences patrons using street parking.
Proposed future residential subdivision development (on CSR owned land)		
The existing quarry to the north of Meadow Road and the site proposed for the construction compound is identified for a future residential subdivision development as part of the West Schofields precinct plan. The residential development project is proposed to be undertaken in stages once the zoning and approvals are undertaken. It is located south of Meadow Road and would consist of around 450 lots. Once the quarry is relocated, a around an additional 1,600 lots would be developed (Stage 2).	Construction impacts from this proposal may include: • Vegetation clearing • Increased duration of noise for residents living along or close to the proposal • Increased traffic affecting Townson Road and Richmond Road during standard construction hours • Reduced air quality for residents living along or close to the proposal.	Operation impacts from this proposal may include: • Visual impacts of the new buildings • An increase in traffic on Townson Road and associated road traffic noise.

6.15.4 Potential impacts

The potential cumulative impacts which may arise from the proposal in combination with one or more of the projects listed in Table 6.35, are assessed in Table 6.36 below.

Table 6.36: Cumulative impact assessment

Environmental factor	Construction	Operation
Noise and vibration	The Luxeland development and Alltove development (see section 6.15.3) are anticipated to be constructed at a similar time to the proposal. Noise impacts from the combined construction work in the area may impact upon the same existing sensitive receivers would need to be mitigated in accordance with the relevant guidelines and safeguards.	With completion of construction, operational noise levels from the completed developments in combination with the proposal are not expected to exceed noise criteria.
Traffic and transport	There may be additional construction traffic within the surrounding road network as a result of combined construction work in the area. Traffic management plans for each project would contain measures to minimise impacts of construction traffic on the surrounding road network. TfNSW Traffic Management Centre would manage the impacts of construction traffic and road closures through road occupancy licence approvals so that the traffic impacts and work stages are staggered.	The objective of the proposal is to facilitate the anticipated residential growth in the NWGA and improve network efficiency across the NWGA during operation of the proposed residential development in the surround area. Cumulatively therefore the proposal would provide network benefits to the planned residential developments. Other network upgrades being investigated and planned as part of the NWGA Road Network Strategy including Stage 2 of the overall program of work could improve the intersection capacity on the Townson Road corridor. Improvements being considered include the Richmond Road Upgrade project involving additional through lanes on the north/south approaches to the layout at Richmond Road and Townson Road intersection. These projects would improve intersection performance within the local road network.

Environmental factor	Construction	Operation
Landscape	The existing environment is currently undergoing development. Some areas of vegetation have already been cleared, and views are impacted from construction machinery. The proposal would add to this impact however this would not have as great an impact as compared to a relatively stable landscape.	The landscape in this part of Western Sydney is undergoing a process of continuous development with areas of bushland and farmland making way for residential and other developments. Within this context of continuous change, any subsequent development, such as the proposal, would not have as great an impact as compared to a relatively stable landscape.
Biodiversity	The proposal would contribute to a general increase in traffic and noise which could have indirect impacts on biodiversity and result in direct impacts from an increase in removal of native vegetation, habitat features and threatened biota habitat (see section 4.3 of Appendix J for detailed impacts).	The proposal would contribute to indirect operational impacts from a general increase in traffic, light spill and noise. This could increase disturbance and mortality rates of fauna species (see section 4.3 of Appendix J).
Flooding and hydrology	The proposal in combination with other planned development would contribute to increased temporary activities within the Bells Creek floodplain. This would include the need to provide for minor localised catchment diversions around the compound and stockpile in accordance with standard construction stormwater management practices.	The proposal would result in a loss of flood plain storage across Bells Creek floodplain as a result of widening of the road formation within land that currently contributes to flood storage during major floods. Additionally, the proposal would contribute to increased runoff to Bells Creek as result of pavement widening and the conversion of pervious surfaces to impervious surfaces (see section 6.3.3 and Appendix G). Further regional development is planned in this area and may also impact on the hydrology of Bells Creek and the broader Eastern Creek catchment.

6.15.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative construction impacts	The Contractor's Environmental Management Plan will be revised as required to consider potential cumulative impacts from surrounding development activities as they become known. This will include consultation with the proponent and/or lead contractor.	Contractor	Pre-construction and construction	Additional safeguard

7 Environmental management

This chapter describes how the proposal would be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the 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 also listed.

7.1 Environmental management plans (or system)

A number of 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 Project Environmental Management Plan (PEMP) and CEMP will be prepared to describe the safeguards and management measures identified. These plans 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 Officer, Western Sydney Project Office prior to the commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. 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).*

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed work on the surrounding environment. The safeguards and management measures are summarised in Table 7.1.

Table 7.1: Summary of safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
General					
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • Any requirements associated with statutory approvals • Details of how the proposal will implement the identified safeguards outlined in the REF • Issue-specific environmental management plans • Roles and responsibilities • Communication requirements • Induction and training requirements • Procedures for monitoring and evaluating environmental performance, and for corrective action • Reporting requirements and record-keeping • Procedures for emergency and incident management • Procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor/ Blacktown City Council	Pre-construction/detailed design	Core standard safeguard GEN1

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN2	General - notification	All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor/ Blacktown City Council	Pre-construction	Core standard safeguard GEN2
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular 'toolbox' style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include: • Areas of Aboriginal heritage sensitivity • Threatened species habitat and areas of ecological sensitivity and requiring protection • Adjoining residential areas requiring particular noise management measures.	Contractor/ Blacktown City Council	Pre-construction/ detailed design	Core standard safeguard GEN3
Traffic and transport					
T1	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 Roads and Maritime Traffic Control at Work Sites Manual (RTA, 2010). The TMP will include: • Confirmation of haulage routes • Measures to maintain access to local roads and properties	Contractor	Detailed design/ Pre-construction	Core standard safeguard TT1 Section 4.8 of QA G36 Environment Protection

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms.			
T2	Emergency services access	Consultation with emergency service authorities will be undertaken during development of the detailed design and maintained throughout construction as the proposal progresses.	Contractor	Detailed design and Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
T3	Access during construction	Current traffic movements and property accesses are to be maintained during the work. Any disturbance is to be minimised to prevent unnecessary traffic delays and businesses/residences informed.	Contractor	Construction	Core standard safeguard T1
T4	Management of heavy vehicles	An assessment of heavy vehicles from construction and through traffic (on diversion routes) will consider: • Vehicle types/maximum size which can negotiate the road network. In particular Alderton Drive and Victory Road due to restricted manoeuvrability of longer vehicles • Coordination to prevent queuing or double parking.	Contractor	Construction	Additional safeguard
T5	Worker parking	Provision of parking with compound and work sites for workers and construction vehicles.	Contractor	Construction	Additional safeguard
T6	Road closures	• TCPs will be developed in accordance with *Roads and Maritime Traffic Control at Work Sites manual* (2018) and *AS1742.3 – Traffic Control for Works on Roads* • Residences and businesses in the local area will be notified on any road closures.	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
T7	Pedestrian and cyclists	• Safe pedestrian and cyclist access around and past the work site will be provided. Pedestrians will be clearly directed to utilise formed paths where possible or temporary paths will be provided as a short- term measure • Clear visibility at the site egress along the road network and the pedestrian pathway will be maintained.	Contractor	Construction	Additional safeguard
Noise and vibration					
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, taking into account *Beyond the Pavement: urban design policy, process and principles* (Roads and Maritime, 2014) • 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	Detailed design/ pre-construction	Core standard safeguard NV1 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	Noise and vibration	All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least 7 days prior to commencement of any work associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The project • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information.	Contractor	Detailed design/ pre-construction	Core standard safeguard NV2
NV3	Community consultation	All sensitive receivers (eg schools, local residents) likely to be affected will be notified prior to commencement of any work associated with the activity that may have an adverse noise or vibration impact. The ENMM Practice Note (vii) provides community consultation procedures for road work outside normal working hours. The notification will provide details of: • The project • The construction period and construction hours	Contractor	Detailed design/ pre-construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Contact information for project management staff • Complaint and incident reporting • How to obtain further information.			
NV4	Building vibration	Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage.	Contractor	Pre-construction	Additional safeguard
NV5	Construction noise from inappropriate practices	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All relevant project specific and standard noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Construction traffic routes • Site opening/closing times (including deliveries) • Environmental incident procedures.	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV6	Construction traffic noise	Management of construction related traffic or traffic reroutes should as a minimum include the following controls: • Scheduling and routing of vehicle movements • Speed of construction related heavy vehicles should be limited to 40 km/hr along Alderton Drive, Victory Road and Townson Road • Driver behaviour and avoidance of the use of engine compression brakes • Ensuring vehicles are adequately silenced before allowing them to access the site • Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work • Loading and unloading of materials/deliveries is to occur as far as possible away from sensitive receivers • Select site access points and roads as far as possible away from sensitive receivers • Dedicated loading/unloading areas to be shielded if close to sensitive receivers • Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible • Avoid or minimise out of hours movements where possible.	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV7	Construction noise form machinery and equipment	The use and selection of machinery and equipment will: • Use quieter and less vibration emitting construction methods where reasonable and feasible. • The noise levels of plant and equipment must have operating sound power or sound pressure levels compliant with the criteria in Appendix H of the CNVG. Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturer's specifications or Appendix H of the CNVG. • The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 2 of the CNVG. • The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site.	Contractor	Construction	

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV8	Hours of construction activity	Where reasonable and feasible, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. Further to this, it is recommended that the use of mulchers, jack hammers, concrete saws, rock breakers, compaction or other equipment used in very close proximity to the receivers should be limited where feasible and reasonable to the standard construction hours.	Contractor	Construction	
NV8	Extended duration of noise and vibration activity	If highly noise affected impacts are predicted high noise and vibration generating activities may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block. If highly noise affected impacts are predicted no more than four consecutive nights of high noise and/or vibration generating work may be undertaken over any seven-day period, unless otherwise approved by the relevant authority.	Contractor	Construction	
NV9	Road noise	The NMG recommends noise mitigation in the following order of preference: • Quieter road pavement surfaces • Noise mounds • Noise barriers (noise walls) • At-property treatments.	Contractor	Construction	

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV10	Audio tactile device noise at pedestrian crossings	Noise mitigation measures applicable to the audio tactile devices to reduced potential sleep disturbance impacts should include volume adjustment limiting the devices to a sound pressure level of 68 dBA at 1 metre. These mitigation measures would also need to consider health and safety requirements.	Contractor	Construction	
NV11	Post construction monitoring	To confirm that the noise level targets are achieved, the NMG refers to the ENMM Practice Note 8 which recommends that a post-construction noise monitoring program be undertaken.	Blacktown City Council	Operation	
Hydrology and flooding					
FL1	Drainage design	Consult with Council during detailed design to ensure appropriate integration with Council's stormwater network. Design will include: • The reinstatement of local scour protection work in unlined channels, where present. • Ensuring stormwater network alternatives are in place prior to any disconnection or diversion of stormwater infrastructure.	TfNSW	Detailed design	Additional safeguard
FL2	Stormwater runoff	Detailed design to result in no net increase in stormwater runoff rates in all storm events, unless it can be demonstrated that increased runoff rates as a result of the proposal would not increase downstream flood risk.	TfNSW	Detailed design	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
FL3	Piers in waterway	Where feasible and reasonable, the bridge is to be designed to ensure piers and associated scour protection are not constructed within the waterway.	TfNSW	Detailed design	Additional safeguard
FL4	Flood hazard	As part of the CEMP, a flood risk management plan will be prepared that details the processes for monitoring of flood alerts. The plan will specify the steps to be taken in the event a flood warning is issued including removal or securing of loose material in the floodplain and removal or securing of all fuels and chemicals.	Contractor	Pre-construction and Construction	Additional safeguard
FL5	Flood hazard	Storage of excess materials within the floodplain, including within compound areas will be minimised. As far as is practical materials are to be ordered on, or, as close as possible to, an as needs basis.	Contractor	Construction	Additional safeguard
FL6	Flood hazard	Install drainage work prior to or concurrent with road formation construction to minimise potential adverse impacts upstream and/or downstream of site.	Contractor	Construction	Additional safeguard
FL7	Management of water bodies	Work within or near the creek will be undertaken with consideration given to the NSW Department of Primary Industries (Water) *Guidelines for controlled activities on waterfront land – Riparian corridors* (2018).	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
Surface water and groundwater					
SW1	Erosion and sedimentation	A Soil and Water Management Plan will be prepared as part of the CEMP in accordance with the requirements of TfNSW contract specification G38. The SWMP would address the following: • TfNSW Code of Practice for Water Management, the Roads and Maritime Services' Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 'the Blue Book' (Landcom, 2004) and Volume 2 (DECC, 2008) • Technical Guideline: Temporary Stormwater Drainage for Road Construction (Roads and Maritime Services, 2011) • Technical Guideline: Environmental Management of Construction Site Dewatering (Roads and Maritime Services, 2011). The SWMP would detail the following as a minimum: • Identification of catchment and sub-catchment areas, high risk areas and sensitive areas including separation of on-site and off-site water • Erosion and sediment control measures	Contractor	Pre-construction	Core standard safeguard SW2 QA *G38 Soil and Water Management*

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Dewatering plan (including a map) which includes process for monitoring, flocculating and dewatering water from site (ie sediment basin and sumps) • Details of the management of groundwater in-flow during construction • Include progressive site specific erosion and sedimentation control plans to be updated fortnightly, as a minimum • Identify high risk activities (such as the bridge construction) and the details required for work method statements to be developed and signed by TfNSW prior to construction • The process for monitoring potential wet weather and identification of controls to be implemented in the event of wet weather with controls shown on the erosion and sedimentation control plans • Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.			
SW2	Water quality monitoring	A surface water and groundwater quality monitoring program will be developed as part of the soil and water management plan. The monitoring program will be prepared in accordance with the requirements of the *Townson Road to Burdekin Road Stage 1 Surface Water And Groundwater Assessment* (GHD, 2020).	Contractor	Pre-construction and construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
SW3	Impacts to GDEs	Where excavation activities are likely to occur in close proximity to GDEs and groundwater is likely to be intercepted, groundwater elevations will be monitored. This will be reported as part of the surface water and groundwater quality monitoring program.	Contractor	Construction	Additional safeguard
Soils and contamination					
SC1	Soil and water	A site specific Erosion and Sediment Control Plan will be prepared and implemented as part of the Soil and Water Management Plan. 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	Core standard safeguard E2 Section 2.2 of QA *G38 Soil and Water Management*
SC2	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the TfNSW Environment Manager and/or EPA.	Contractor	Detailed design/Pre-construction	Section 4.2 of QA *G36 Environment Protection*

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
SC3	Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime *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 (including TfNSW and EPA officers).	Contractor	Detailed design/Pre-construction	Section 4.3 of QA *G36 Environment Protection*
SC4	Storage of materials	Hazardous materials such as fuel and chemicals will be stored in suitably located and bunded areas, in accordance with DECC's *Storing and Handling Liquids: Environmental Protection Participants Manual* (DECC, 2007).	Contractor	Construction	Additional safeguard
SC5	Excess spoil	Excess spoil not required or able to be used for backfilling would be stockpiled in a suitable location before being reused on adjacent TfNSW projects or removed from the site, and disposed of at an appropriately licensed facility.	Contractor	Construction	Additional safeguard
SC6	Use of water for construction	Should surface or groundwater be used during construction, further assessment and analysis of potential contamination will be undertaken prior to its adequate use and disposal.	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity					
BIO1	Construction management	A Flora and Fauna Management Plan will be prepared in accordance with the *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • Requirements set out in the Landscape Guideline (RTA, 2008) • Pre-clearing survey requirements • Procedures for unexpected threatened species finds and fauna handling in accordance with the Unexpected Threatened Species Find Procedure in the Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process) and Biodiversity Guidelines - Guide 9 (Fauna Handling) • Procedures addressing relevant matters specified in the Policy and guidelines for fish habitat conservation and management (DPI Fisheries, 2013) • Protocols to manage weeds and pathogens in accordance with *Biodiversity Guidelines - Guide 6 (Weed Management).*	Contractor	Detailed design/pre-construction	Core standard safeguard B1 Section 4.8 of QA *G36 Environment Protection*

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
BIO2	Vegetation removal	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Contractor	Detailed design/pre-construction	Core standard safeguard B2
BIO3	Impact to connectivity	Bridge design will consider the provision of dry passage under the structure, to allow for improved connectivity for terrestrial species, where possible. Bridge design should also include features such as fauna furniture (eg ledges, bolted poles etc) to allow safe passage of fauna species along the bridge structure.	Contractor	Detailed design	Additional safeguard
BIO4	Removal of threatened species habitat and habitat features	A Bat Management Plan is required to manage impacts on the maternity colony of the Southern Myotis in the Bells Creek culverts. This will be developed with the input of an industry specialist in bat management, and will include the following measures at a minimum: • Appropriate timing of construction to avoid disruption of breeding, with no work to be undertaken during the breeding season • Management of removal of culverts to avoid mortality of roosting bats (eg exclusion of bats at night prior to demolition of the existing culverts) • Provision of alternate roosting habitat (eg bat boxes) in retained vegetation outside of the construction footprint	Contractor	Pre-construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Construction of the new bridge structure in a timely manner so as to minimise the length of time that the species would have to find alternate roost sites • Inclusion of bat-friendly features into the design of the new bridges (eg dedicated recesses cast into the slabs to provide roost sites etc).			
BIO5	Removal of threatened plants	A protocol should be developed for the removal of the threatened *Grevillea juniperina subsp. juniperina* in conjunction with industry experts on threatened flora management, such as collection of seed or fertile material for use in propagating the species off site, to maintain the genetic diversity of the local population. Experts from the Save our Species program and Royal Botanic Gardens should be consulted as part of this process.	Contractor	Pre-construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal cultural heritage					
AH1	Construction management	An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the Procedure for Aboriginal cultural heritage consultation and investigation (Roads and Maritime, 2012) and Standard Management Procedure - Unexpected Heritage Items (Roads and Maritime, 2015) and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage. The AHMP will be prepared in consultation with all relevant Aboriginal groups.	Contractor	Detailed design/pre-construction	Section 4.9 of QA *G36 Environment Protection*
AH2	Unexpected finds	• *The Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains is found during construction. This applies where TfNSW 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	Detailed design/pre-construction	Section 4.9 of QA *G36 Environment Protection*

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
AH3	Aboriginal heritage	An application for an AHIP will be made under section 90A of the *National Parks and Wildlife Act 1974* for three Aboriginal archaeological sites. The application will be prepared in accordance with the DPIE *Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants* (OEH, 2011b).	TfNSW/ Blacktown City Council	Pre-Construction	Additional safeguard
AH4	Aboriginal heritage	The portion of Schofields 2, AHIMS number 45-5-0827 (outside of the construction and AHIP boundary) will be marked as an environmentally sensitive “no-go zone” on the CEMP.	Contractor	Pre-Construction	Additional safeguard
AH5	Aboriginal heritage	Temporary fencing will be installed around the edge of the AHIP area prior to construction.	Contractor	Pre-Construction	Additional safeguard
AH6	Aboriginal heritage	Workers will be inducted as to appropriate Aboriginal heritage protection measures.	Contractor	Pre-Construction	Additional safeguard
Non-Aboriginal heritage					
H1	Non-Aboriginal heritage	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) 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	Detailed design/ pre-construction	Section 4.10 of QA *G36 Environment Protection*

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual amenity					
LV1	Landscape character and visual impact	An Urban Design Plan will be prepared to support the detailed design and will be implemented as part of the CEMP. The Urban Design Plan will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for: • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls, bridges and noise walls • Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape work taking account of related environmental controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas.	Contractor	Detailed design/pre-construction	Standard safeguard V1

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		The Urban Design Plan will be prepared in accordance with relevant guidelines, including: • *Beyond the Pavement urban design policy, process and principles* (Roads and Maritime, 2014) • *Landscape Guideline* (RTA, 2008) • *Bridge Aesthetics* (Roads and Maritime 2012) • *Noise Wall Design Guidelines* (RTA, 2006) • *Shotcrete Design Guideline* (RTA, 2005).			
LV2	Existing views from sensitive receiver locations	Ongoing consultation on visual impacts with relevant stakeholders will continue throughout the proposal.	TfNSW/Blacktown City Council	Construction and operation	Additional safeguard
LV3	Views from the construction work on sensitive receiver locations	Vegetation buffers will be maintained between site compounds and public roads wherever practicable.	Contractor	Construction	Additional safeguard
LV4	Views from the construction work on sensitive receiver locations	All waste material generated during construction will be reused or recycled where practicable, or collected and transported by licensed contractors for disposal at appropriately licensed facilities and in accordance with local government requirements.	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
LV5	Views from the construction work on sensitive receiver locations	The hoarding of construction materials will be minimised as far as practicable.	Contractor	Construction	Additional safeguard
LV6	Changes to view from vegetation loss	The approved clearing extent, including environmental features within the construction footprint, will be identified with flagging, marking tape or similar.	Contractor	Construction	Additional safeguard
LV7	Views from the construction work on sensitive receiver locations	All temporary above ground infrastructure will be removed at the completion of construction.	Contractor	Construction	Additional safeguard
LV8	Light spill	Light generated during construction will be managed in general accordance with the requirements in *Australian Standard AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting*. Generally, lighting would be designed to minimise off site light spill.	Contractor	Construction	Additional safeguard
LV9	Landscape character	Reinstatement of access roads and construction site compounds will commence progressively post construction and will be undertaken as soon as practicable.	Contractor	Operation	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality					
AQ1	General air quality impacts	An air quality management plan will be prepared as part of the CEMP. The plan will include but not be limited to: • A map identifying locations of sensitive receivers • Identification of potential risks/impacts due to the work/activities as dust generation activities • Management measures to minimise risk including a progressive stabilisation plan • A process for monitoring dust on-site and weather conditions • A process for altering management measures as required.	Contractor	Pre-Construction	Core standard safeguard AQ1 Section 4.4 of QA G36 Environment Protection
AQ2	Dust emissions	• Dust suppression measures will be implemented as per the air quality management plan. • Stockpiled materials will be covered, stabilised or stored in areas not subject to high wind. • All trucks will be covered when transporting material to and from the site. • Work activities will be reprogrammed if the mitigation measures are not adequately restricting dust generation.	Contractor	Construction	Core standard safeguard A1

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
AQ3	Exhaust emissions	• Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality. • Plant and machinery will be turned off when not in use.	Contractor	Construction	Additional safeguard
AQ4	Impacts on sensitive receivers	Local residents will be advised of hours of operation and duration of work and supplied with a contact name and number for queries regarding air quality.	Contractor	Pre-Construction	Additional safeguard
Property and land use					
P1	Property acquisition	All property acquisition will be carried out in accordance with Blacktown City Council policy and the *Acquisition (Just Terms Compensation) Act 1991.*	Blacktown City Council	Pre-construction and construction	Core standard safeguard
P2	Property adjustment	Property adjustment plans would be developed in consultation with the affected property owners.	TfNSW	Pre-construction	Additional safeguard
Socio-economics					
S1	Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): • mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • contact name and number for complaints.	Contractor	Detailed design/pre-construction	Core standard safeguard SE1

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		The CP will be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008). This will include protocols for managing construction fatigue.			
S2	Property and land acquisition	Consultation will be carried out with each landowner and resident throughout the acquisition process, in accordance with Blacktown City Council policy and the Land Acquisition (Just Terms Compensation) Act 1991.	Blacktown City Council	Pre construction	Additional safeguard
Resource use and waste					
RW1	Demand on resources	Procurement will endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.	Contractor	Pre-construction	Additional safeguard
RW2	Waste management	A resource and waste management plan will be prepared and included in the CEMP. The plan will include the following (as a minimum): • The type, classification and volume of all materials to be generated and used on-site including identification of recyclable and non-recyclable waste in accordance with *NSW EPA Waste Classification Guidelines* (2014) • Quantity and classification of excavated material generated as a result of the proposal (refer Roads and Maritime Service's Waste Management Fact sheets 1-6, 2012)	Contractor	Pre-construction	Core standard safeguard W1 Section 4.2 of QA G36 Environment Protection

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Interface strategies for cut and fill on-site to ensure re-use where possible • Strategies to 'avoid', 'reduce', 'reuse' and 'recycle' materials • Classification and disposal strategies for each type of material • Destinations for each resource/waste type either for on-site reuse or recycling, offsite reuse or recycling, or disposal at a licensed waste facility • Details of how material will be stored and treated on-site • Identification of available recycling facilities on and off-site • Identification of suitable methods and routes to transport waste • Procedures and disposal arrangements for unsuitable excavated material or contaminated material • The types of waste collected, amounts, date/time and details of disposal are to be recorded in a waste register • Site clean-up for each construction stage.			

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
RW3	Waste management	Garbage receptacles will be provided and recycling of materials encouraged. Rubbish will be transported to an appropriate waste disposal facility.	Contractor	Construction	Additional safeguard
RW4	Waste management	All wastes will be managed in accordance with the POEO Act.	Contractor	Construction	Additional safeguard
RW5	Waste management	Portable toilets will be provided for construction workers and will be managed by the service provider to ensure the appropriate disposal of sewage.	Contractor	Construction	Additional safeguard
RW6	Waste management	Weeds removed during work will be managed in accordance with the *Biosecurity Act 2015* requirements that relate to its classification status.	Contractor	Construction	Additional safeguard
RW7	Waste management	Site inductions will occur and be recorded by a Site Supervisor to ensure staff are aware of waste disposal protocols.	Contractor	Construction	Additional safeguard
RW8	Waste minimisation	The following resource management hierarchy principles will be followed: • Avoid unnecessary resource consumption as a priority • Avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery)	Contractor	Construction	Core standard safeguard M2

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Disposal will be undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*).			
RW9	Demand on resources	Excavated material will be reused on-site for fill where feasible to reduce demand on resources.	Contractor	Construction	Additional safeguard
RW10	Demand on resources	Where additional fill material is required this will be sourced from appropriately licensed facilities and/or other projects wherever possible.	Contractor/ Blacktown City Council	Construction	Additional safeguard
RW11	Management of green waste	Clearing and grubbing, including mulching, will be undertaken. Where possible, mulch will be used on-site.	Contractor	Construction	Additional safeguard
RW12	Spoil management	Excavated material will be reused on adjoining projects where feasible to reduce waste.	Contractor	Construction	Additional safeguard
RW13	Spoil management	Excess excavated material will be disposed of at an appropriate facility or reused appropriately for fill on the construction footprint.	Contractor	Construction	Additional safeguard
RW14	Spoil management	Excess soil requiring waste disposal will first be assessed against the *Waste Classification Guidelines- Part 1: Classifying Waste* (EPA 2014). Soil samples will be taken from stockpiled material and analysed. Transportation will be undertaken by a licensed contractor capable of transporting the waste and waste will be disposed of to an appropriately licensed waste facility with supporting waste classification documentation.	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
RW15	Generation of construction waste	A post-construction land assessment will be undertaken of land that was used for ancillary construction purposes (compounds, storage, parking, etc) to determine the suitability for hand-back to the landowner. The assessment will be prepared in accordance with the *Roads and Maritime Environmental Procedure - Management of Wastes* on TfNSW land. Where the land is privately owned, a copy of the assessment will be provided to the landowner.	Contractor	Construction	Additional safeguard
RW16	Wastewater contamination of soils and water	A dedicated concrete washout facility will be provided during construction so that run-off from the washing of concrete machinery and equipment can be collected and disposed of at an appropriate waste facility.	Contractor	Construction	Additional safeguard
Cumulative impacts					
C1	Cumulative construction impacts	The Contractor's Environmental Management Plan will be revised as required to consider potential cumulative impacts from surrounding development activities as they become known. This will include consultation with the proponent and/or lead contractor.	Contractor	Pre-construction and construction	Additional safeguard

7.3 Licensing and approvals

Prior to construction commencing, licences, permits, approvals or statutory consultation is required as detailed in Table 7.2.

Table 7.2: Summary of licensing and approvals required

Instrument	Requirement	Timing
Fisheries Management Act 1994 (s199)	Notification to the Minister for Primary Industries prior to any dredging or reclamation work.	A minimum of 28 days prior to the start of work.
National Parks and Wildlife Act 1974 (s90)	Aboriginal heritage impact permit from the Chief Executive of OEH.	Prior to start of the activity.

8 Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

8.1 Justification

The proposal is located within the NWGA. Over the next ten years, 33,000 homes will be provided and the growth area will be home to around 92,400 people. The Townson Road to Burdekin Road corridor was identified in the *North West Priority Growth Area Land Use and Infrastructure Implementation Plan* (Department of Planning and Environment, 2015). The proposal is part of a program of work to develop a key east-west transport link in the NWGA. The corridor would provide a link between Richmond Road in the west and Windsor Road via Sunnyholt Road in the east.

The proposal is in a key location for access to important residential, commercial and social developments within the NWGA. The provision of high quality road infrastructure would make the local area a more desirable place to live and work, leading to economic growth and subsequent increase in value of the area.

The proposal allows for an increase in free flowing traffic and greater connectivity in the NWGA. Completion of the proposal would assist in spreading Sydney's growing population through increased connectivity, relieving the traffic burden from the wider Sydney area.

In 2015, the NSW Government published the *North West Growth Centre Road Network Strategy* to support the forecast growth in the NWGA. The Townson Road to Burdekin Road upgrade overall program of work is one of the projects in planning as part of this strategy.

Benefits of the overall program of work, including both the proposal and Stage 2 would include:

- A road network with increased capacity for future traffic growth
- The road upgrade would support the proposed development initiatives in the area by providing access and improved road infrastructure
- The road upgrade would provide an improved east-west link
- The road upgrade would support the urban development initiatives in the area by providing better access to public transport
- The proposal would support active transport to promote sustainable future
- The proposal would result in improved flood resilience and access to flood evacuation routes.

The proposal has been developed as an outcome of an extensive option development and assessment process. The 'do nothing' option would result in traffic congestion on existing Townson Road and other connecting roads leading to delays in travel times and undesirable safety outcomes. This option was dismissed as it did not meet strategic planning needs and would not support the predicted growth in the NWGA. The proposal was identified as the preferred option due to constructability benefits and reduced property impacts.

Although the proposal would result in some environmental impacts, they have been avoided or minimised where possible through the design and site-specific safeguards and mitigation measures summarised in section 7.2. The positive benefits of the proposal are considered to outweigh any adverse impacts.

8.2 Objects of the EP&A Act

Object	Comment
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 involves work for the purpose of a road and would involve vegetation clearance and the permanent full acquisition of one property, the partial acquisition of four existing residential properties, two commercial properties, one mixed use residential/commercial property and one new residential subdivision. Partial acquisition of one further property would occur for the duration of the interim phase but returned to the property owner following completion of Stage 2. Impacts are discussed throughout section 6. Appropriate mitigation measures would be implemented to minimise any environmental, economic and social impacts associated with the proposal. Reduced travel time would provide an economic benefit to road users.
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 below.
1.3(c) To promote the orderly and economic use and development of land.	The proposal would maximise the use of an existing road corridor and improve traffic conditions and connectivity along Townson Road. The road widening, upgrade of the intersections, development of continuous footpaths and bridge work would benefit all road users and pedestrians. The proposal also minimises ongoing congestion and capacity issues associated with the future growth of the area.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the project.
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.	Construction of the proposal would require clearing of some native vegetation. These impacts on native vegetation, plants and threatened species, population and ecological communities are discussed in section 6.6.

Object	Comment
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposal would not impact non-Aboriginal heritage. Three Aboriginal archaeological sites of low significance would be impacted. Refer to sections 6.7 and 6.8.
1.3(g) To promote good design and amenity of the built environment.	Not relevant to the proposal.
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.	During development of the proposal, consultation with the community and relevant government agencies and asset owners was undertaken. Details of this consultation can be found in section 5. Consultation would continue during detailed design and the construction stages.

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 proposal.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during options development (refer to section 2). The precautionary principle has guided the assessment of environmental impacts for this REF and the development of mitigation measures.

Evaluation and assessment of alternative options have aimed to reduce the risk of serious and irreversible impacts on the environment. Stakeholder consultation considered issues raised by stakeholders and a range of specialist studies were undertaken for key issues to provide accurate and impartial information to assist in the evaluation of options.

Best available technical information, environmental standards and measures have been used to minimise environmental risks. These include a number of safeguards have been proposed to minimise potential impacts. These safeguards would be implemented during construction and operation of the proposal. No safeguards have been postponed as a result of lack of scientific certainty.

A CEMP would be prepared before construction starts. This requirement would ensure the proposal achieves a high-level of environmental performance. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations.

The proposal would cater for the future population and traffic growth in the NWGA. The proposal addresses the expected future increases in traffic volumes and traffic congestion associated with the movements of traffic with the NWGA. While the proposal would have some adverse impacts, they were not considered to be of a nature or extent that would result in disadvantage to any specific section of the community or to future generations.

Should the proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower level of service associated with the performance of the Townson Road corridor.

Conservation of biological diversity and ecological integrity

The environment in which the proposal would be undertaken is a modified semi-rural residential environment. A thorough assessment of the existing local environment was undertaken to identify and manage any potential impacts of the proposal on local biodiversity. Site selection criteria were established for construction phase facilities that include minimising native vegetation clearance

The proposal would not have a significant impact on biological diversity and ecological integrity. A biodiversity assessment and appropriate site-specific safeguards are provided in section 6.6.

Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a project, including air, water, land and living things.

The REF has examined the environmental consequences of the proposal and identified mitigation measures to manage the potential for adverse impacts. The requirement to implement these mitigation measures would result in an economic cost to TfNSW. The implementation of mitigation measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

The concept design has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates that the proposal is being developed with an environmental objective in mind.

8.3 Conclusion

Transport for NSW proposes to widen and upgrade about 1.6 kilometres of Townson Road, between Richmond Road and Durham Road/Jersey Road, Schofields. The proposal is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (as relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on traffic, noise and biodiversity. The proposal would require the full acquisition of one existing residential property. In addition, partial acquisition would be required of five residential properties, two commercial properties, one mixed use residential/commercial property and one new residential subdivision. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also maximise the use of an existing road corridor and improve traffic conditions and connectivity in the study area, as well as improving road safety for motorists and pedestrians. On balance the proposal is considered justified and the following conclusions are made.

8.3.1 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 and 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.

8.3.2 Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Government Department of the Environment and Energy 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.

Karen Yale

Senior Environmental Scientist

GHD

Date: 5 February 2021

I have examined this review of environmental factors and accept it on behalf of Transport for NSW.

Matty Mathivanar

Project Development Manager

Western Sydney Project Office

Date: 9 February 2021

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Terms and acronyms used in this REF

Term/Acronym	Description
ACHAR	Aboriginal Cultural Heritage Assessment Report
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
Alignment	The vertical and horizontal location of the road
ANZECC	Australia and New Zealand Environment and Conservation Council
ARI	Average recurrence interval
BC Act	*Biodiversity Conservation Act 2016* (NSW).
BOM	Bureau of Meteorology
CEEC	Critically Endangered Ecological Communities
CEMP	Construction environmental management plan
CNVG	Construction Noise and Vibration Guideline
CO^2	Carbon Dioxide
CP	Communication Plan
CRA	Climate Risk Assessment
DA	Development Application
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Communities
EIA	Environmental impact assessment
EIS	Environmental impact statement
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPA	Environment Protection Authority

Term/Acronym	Description
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)
GDE	Groundwater Dependent Ecosystem
ICNG	Interim Construction Noise Guideline
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
KNC	Kelleher Nightingale Consulting Pty Ltd
LCVIA	Landscape Character and Visual Impact Assessment
LCZ	Landscape Character Zones
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area
MNES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
NABERS	NABERS Energy and Green Star standards ratings for new buildings or refurbished offices
NBN	National Broadband Network
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NWGA	North West Growth Area
NWQMS	*National Water Quality Management Strategy*
OEH	Office of Environment and Heritage
PACHCI	*Procedure for Aboriginal Cultural Heritage Consultation and Investigation*
PCT	Plant community type
POEO ACT	*Protection of the Environment Operations Act*
Priority Growth Areas	Formerly Growth Centres. These were established by the NSW Government under the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (Growth Centres SEPP).

Term/Acronym	Description
QA Specifications	Specifications developed by Transport for NSW for use with road work and bridge work contracts let by Transport for NSW.
REF	Review of Environmental Factors
RMS	NSW Roads and Maritime Services
RTA	Roads and Traffic Authority
SEIA	Socio-economic impact assessment
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SWMP	Soil and Water Management Plan
TEC	Threatened ecological communities
TfNSW	Transport for NSW

Appendix A

Consideration of clause 228(2) factors and matters of national environmental significance and Commonwealth land

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline (DUAP 1995/1996) and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in clause 228(2) of the Environmental Planning and Assessment Regulation 2000, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
a) Any environmental impact on a community? Construction of the proposal would result in short-term negative impacts on the local community, as discussed in section 6. Potential impacts include road closures and detours, construction noise and vibration, changes to amenity and accessibility. These impacts would be managed through the implementation of safeguards outlined in section 7. The proposal would have a positive benefit on the local and wider community by improving the efficiency of the Townson Road corridor. The proposal would also provide the local community with upgraded footpaths and bridges.	Short-term negative Long–term positive
b) Any transformation of a locality? The proposal is located within the Marsden Park Industrial, West Schofields and Schofields precincts of the North West Growth Area and is therefore currently under development with further development planned for the future. The proposal is part of this planned development to provide the required future transport network. Negative impacts resulting from construction of the proposal would be managed through the implementation of safeguards and management measures outlined in Table 7.1.	Long-term positive
c) Any environmental impact on the ecosystems of the locality? The majority of the proposal is located along existing roads, with adjacent areas dominated by already cleared agricultural and residential land. The proposal would result in the removal of native vegetation including *Grevillea juniperina* subsp. *juniperina*, listed as vulnerable under the BC Act. The proposal would also result in impacts on some threatened fauna species which would be a result of habitat clearance. This includes impact to the maternity colony of Southern Myotis, Cumberland Plain Land Snail and hollow-dependant and cave/culvert dwelling microbats. The implementation of safeguards and management measures outlined in Table 7.1 would minimise the potential biodiversity impacts.	Long-term minor negative
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? During construction, the proposal would result in a short-term reduction in the aesthetic quality of the locality as a result of dust generation, noise, visual and traffic congestion. The implementation of safeguards and management measures outlined in Table 7.1 would minimise these impacts.	Short-term negative

Factor	Impact
The proposal would result in a minor reduction in the aesthetic quality of the locality due to the removal of vegetation and the increase in road infrastructure, however with landscaping this impact is expected to be managed. Overall amenity in the vicinity of the proposal is not considered to be substantially reduced as a result of the proposal.	
e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? Three Aboriginal archaeological sites would be impacted. These are of low significance, exhibit minimal archaeological value and low cultural value. Impacts to sites of low significance do not warrant avoidance or mitigation. Although the three sites identified within the construction footprint are of low significance, an AHIP is required for impacts to these sites/objects prior to the commencement of pre-construction or construction activities (see section 6.7). There are no sites of non-Aboriginal signification within the construction footprint (see section 6.8).	Long-term minor negative
f) Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974)?* The proposal is not located on land reserved under *the National Parks and Wildlife Act 1974*. The proposal would result in the removal of native vegetation and trees from the road reserve. The proposal would also result in impacts on some threatened fauna species as a result of habitat clearance. This includes impact to the maternity colony of Southern Myotis, Cumberland Plain Land Snail and hollow-dependant and cave/culvert dwelling microbats. The implementation of safeguards and management measures outlined in Table 7.1 would minimise the potential biodiversity impacts.	Long-term minor negative
g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal would not endanger any species of animal, plant or other form of life.	Nil
h) Any long-term effects on the environment? Long-term positive impacts would include an increase in the road operational efficiency and improved safety for all road users. Minor negative long-term impacts are expected such as the removal of vegetation however this would be minimised through the implementation of the management measures and safeguards outlined in Table 7.1.	Long-term positive Long-term minor negative
i) Any degradation of the quality of the environment? The proposal would require earthworks and the removal of vegetation. The safeguards and management measures in Table 7.1 would minimise the long-term impacts of these activities. Air quality, noise, traffic and visual impacts would result from construction of the proposal. These impacts would be minimised through the implementation of safeguards outlined in Table 7.1.	Long-term minor negative

Factor	Impact
j) Any risk to the safety of the environment? There is potential for road safety impacts to road vehicles and pedestrians during construction due to traffic management and changed conditions including lane closures and detours. Traffic management safeguards outlined in Table 7.1, including the preparation of a traffic management plan which would address safety risks. The proposal would improve safety for road users during operation by improved intersection operational efficiency and new shared paths.	Short-term negative Long-term minor positive
k) Any reduction in the range of beneficial uses of the environment? During construction, minor traffic impacts due to an increase in heavy vehicle movements and interruptions to traffic flow would temporarily reduce the beneficial use of the local road network.	Short-term negative
l) Any pollution of the environment? The proposal would result in minor air pollution for the duration of construction from plant and machinery, including the generation of dust. There is the potential for chemical and fuel spills to occur during construction. Pollution risks associated with the construction of the proposal would be managed through the implementation of the safeguards and management measures outlined in Table 7.1.	Short-term negative
m) Any environmental problems associated with the disposal of waste? The proposal would result in the generation of minor volumes of wastes from road construction. While no environmental problems would be expected with the disposal of construction waste, the safeguards and management measures outlined in Table 7.1 would minimise the environmental impacts associated with waste on the proposal.	Short-term negative
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposal would not increase demands on resources (natural or otherwise) that are, or are likely to become, in short supply.	Nil
o) Any cumulative environmental effect with other existing or likely future activities? Construction activities undertaken for the proposal may overlap with the construction activities associated with neighbouring residential developments as part of the precinct development. Local residents and motorists using the adjoining local roads would be exposed to noise, construction traffic and other construction impacts associated with the projects. The objective of the proposal is to facilitate the anticipated residential growth in the NWGA and improve network efficiency across the NWGA during operation of the proposed residential development in the surrounding area. Cumulatively therefore the proposal would provide network benefits to the planned residential developments.	Short-term negative Long-term positive Long-term positive

Factor	Impact
Other network upgrades being investigated and planned as part of the NWGA Road Network Strategy including Stage 2 of the overall program of work could improve the intersection capacity on the Townson Road corridor. Improvements being considered include the Richmond Road Upgrade project involving additional through lanes on the north/south approaches to the layout at Richmond Road and Townson Road intersection. These projects would improve intersection performance within the local road network.	
p) 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 therefore would not result in any impact on coastal processes and coastal hazards.	Nil

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 the Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment and Energy.

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

Factor	Impact
a) Any impact on a World Heritage property? No world heritage listed properties are located within a one kilometre radius of the proposal site.	Nil
b) Any impact on a National Heritage place? No National Heritage places are identified within a one kilometre radius of the proposal site.	Nil
c) Any impact on a wetland of international importance? The proposal would not impact on a wetland of international importance. There are no wetlands of international importance within a one kilometre radius of the proposal site.	Nil
d) Any impact on a listed threatened species or communities? The proposal would not result in significant impacts on any threatened species or communities.	Refer to Section 6.6
e) Any impacts on listed migratory species? The proposal is considered unlikely to impact upon migratory species due to the lack of suitable habitat in the vicinity of the proposal.	Section 6.6
f) Any impact on a Commonwealth marine area? The proposal would not have any impact on a Commonwealth marine area.	Nil
g) Does the proposal involve a nuclear action (including uranium mining)? The proposal does not involve a nuclear action.	Nil
h) Additionally, any impact (direct or indirect) on the environment of Commonwealth land? There is one parcel of Commonwealth land located within one kilometre of the proposal site. The proposal is not located within and would not impact Commonwealth land.	Nil

Appendix B

Statutory consultation checklists

Infrastructure SEPP

Council related infrastructure or services

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Stormwater	Is the work likely to have a *substantial* impact on the stormwater management services which are provided by council?	No	Blacktown City Council	ISEPP cl.13(1)(a)
Traffic	Is the work likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area?	No	Blacktown City Council	ISEPP cl.13(1)(b)
Sewerage system	Will the work involve connection to a council owned sewerage system? If so, will this connection have a *substantial* impact on the capacity of any part of the system?	No	Blacktown City Council	ISEPP cl.13(1)(c)
Water usage	Would the work involve connection to a council owned water supply system? If so, would this require the use of a *substantial* volume of water?	No	Blacktown City Council	ISEPP cl.13(1)(d)
Temporary structures	Would the work 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, would this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	No	Blacktown City Council	ISEPP cl.13(1)(e)
Road & footpath excavation	Would the work involve more than *minor* or *inconsequential* excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Blacktown City Council	ISEPP cl.13(1)(f)

Council related infrastructure or services

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
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 work? 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	Blacktown City Council	ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Flood liable land	Is the work located on flood liable land? If so, would the work change flood patterns to more than a *minor* extent?	Yes	Blacktown City Council	ISEPP cl.15
Flood liable land	Is the work located on flood liable land? (to any extent). If so, does the work comprise more than minor alterations or additions to, or the demolition of, a building, emergency work or routine maintenance	No	State Emergency Services	ISEPP cl.15AA

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

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
National parks and reserves	Is the work 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	Office of Environment and Heritage	ISEPP cl.16(2)(a)
National parks and reserves	Is the work on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Office of Environment and Heritage	ISEPP cl. 16(2)(b)
Aquatic reserves	Is the work adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 2014*?	No	Department of Industry	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Is the work in the Sydney Harbour Foreshore Area as defined by the *Place Management NSW Act 1998?*	No	Property NSW	ISEPP cl.16(2)(d)
Bush fire prone land	Is the work for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	ISEPP cl.16(2)(f)
Artificial light	Would the work increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	ISEPP cl.16(2)(g)

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Defence communications buffer land	Is the work on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	Secretary of the Commonwealth Department of Defence	ISEPP cl. 16(2)(h)
Mine subsidence land	Is the work on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	Mine Subsidence Board	ISEPP cl. 16(2)(i)

Growth Centres SEPP

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Clearing native vegetation	Does the work involve clearing native vegetation (as defined in the *Local Land Services Act 2013)* on land that is not **subject land** (as defined in clause 17 of schedule 7 of the *Threatened Species Conservation Act 1995)?*	Yes	Department of Planning and Environment	SEPP 18A