



Townson Road Upgrade between Jersey Road and Burdekin Road – Stage 2

Review of Environmental Factors

Transport for NSW | May 2022

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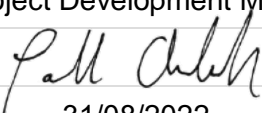
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Document controls

Approval and authorisation

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Signed:	
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Executive summary

The proposal

A four-lane divided road is proposed along Townson Road and Burdekin Road corridor linking Richmond Road, Marsden Park in the west with Burdekin Road, Schofields in the east. The proposal forms Stage 2 of the overall program and is about two kilometres in length involving the construction of a new road between the Stage 1 tie-in and Burdekin Road. The length of the overall program of work is about 3.6 kilometres.

Key features of the proposal include:

- Construction of a new four lane road (two lanes in each direction) with a central median connecting Townson Road Stage 1 in the west with Burdekin Road in the east
- New signalised intersection at Aerodrome Drive (formerly known as Veron Road) with pedestrian crossing facilities
- New 2.5 metre wide shared path for pedestrians and cyclists on the southern side of Townson Road up to Aerodrome Drive and then a 1.5 metre footpath to Burdekin Road
- New 1.5 metre wide footpath on the northern side of Townson Road along the entire length of Stage 2
- Severing the connection of Burdekin Road and Railway Terrace and constructing a cul-de-sac at the end of Railway Terrace. Cul-de-sac will be located near Stoke Street
- Construction of a 300 metre long bridge over Eastern Creek
- New bridge over the Blacktown to Richmond rail line for motorists and pedestrians, linking Townson Road to Burdekin Road.

Need for the proposal

The proposal is located within a NSW Government Priority Growth Area and would support predicted population 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.

East-west access within the North West Growth Area is currently restricted by the T1 Western Line (Richmond rail line), which runs north-south through the area. Existing crossings of the rail line are limited, with only two grade separated crossings at Schofields Road and Westminster Bridge, and two at-grade, level crossings at Garfield Road and Bandon Road. There is also a private level crossing north of Garfield Road. This barrier limits access for residents to key facilities either side of the railway line and restricts commuters from modifying their route to avoid incidents or congestion on Richmond Road. The need for further east-west corridors has been identified as part of the transport infrastructure strategy for the North West Growth Area.

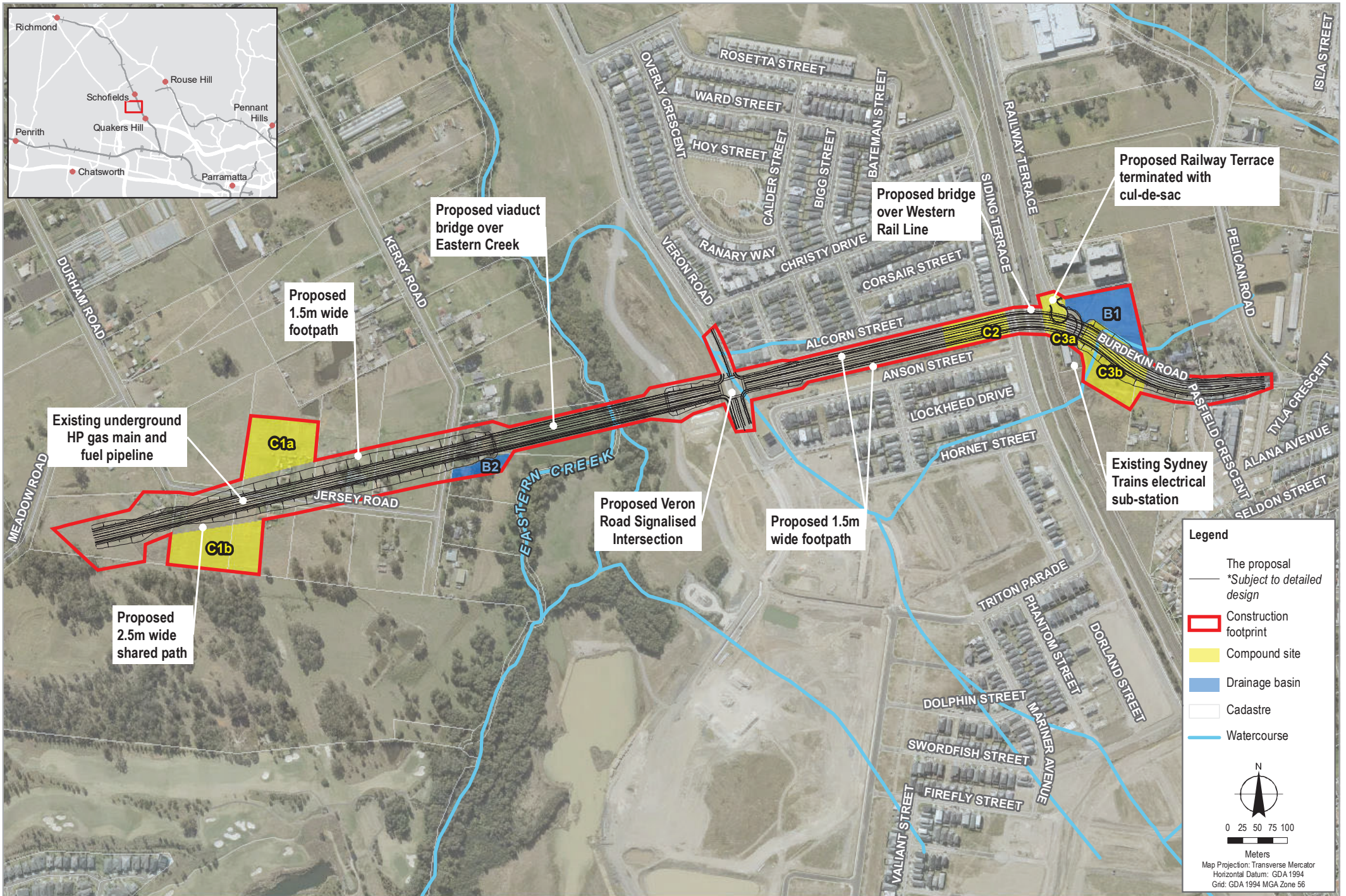


Figure E1 The Stage 2 proposal

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 the new road.
- Option 2 – ‘Central option with full width 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 – Not applicable, relevant only to Stage 1
- Option 4 – ‘Reduced 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 5 – ‘Alignment south of rail substation’ – this option considered an alignment running to the south of the substation, where Burdekin Road and Railway Terrace merge.

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 (Transport and Infrastructure) 2021 is to facilitate the effective delivery of infrastructure across NSW. Section 2.108 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 the roads authority. It can therefore be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*.

Community and stakeholder consultation

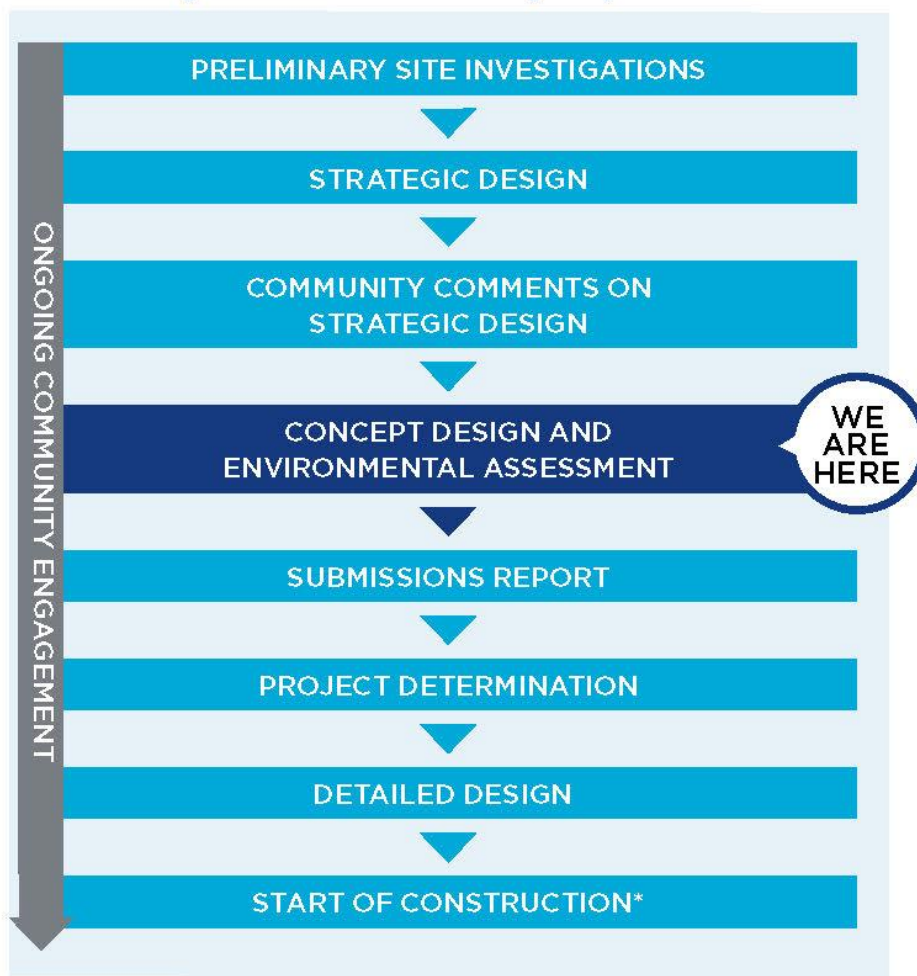
Transport for NSW consulted with the community and stakeholders who have an interest in the proposal or may be impacted by the proposal. This includes the local community, the Aboriginal community, government agencies, public authorities including Blacktown City Council and utility providers.

In November 2014, the North West Growth Area road network plan was released for public consultation, followed by a public announcement, community update and four community information sessions.

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 with the community and stakeholders. Workshops were held for local businesses in October 2019.

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 and a require a detour to re-route traffic away from the construction of the rail overbridge at Burdekin Road. Traffic Management Plans will be developed during construction to ensure access for road users, including the local community and construction workers. Guidance will also be provided for site traffic control, response plans, and the cumulative impact of traffic due to other construction work in the vicinity.

Using the land-use data available at the time, the traffic modelling of the operational phase demonstrated that the four-lane Townson Road would accommodate the predicted traffic by the forecast year 2036; however, additional capacity might be required at the Townson Road and Aerodrome Drive (Veron Road) intersection. An additional assessment was undertaken of the proposed closure of Railway Terrace.

The analysis indicated that during peak periods in 2036, up to 1,500 vehicles will be diverted from Railway Terrace to the local network, mainly onto Aerodrome Drive (Veron Road), Grima Street, Alex Avenue and Hambledon Road. As the analysis indicated that the Aerodrome Road (Veron Road) intersection would see an increase of traffic due to the closure of the Railway Terrace connection, it also showed a reduction of 500 trips along Townson Road west of Railway Terrace which is expected to offset the increase at the Aerodrome Drive (Veron Road) intersection.

Noise and vibration

The majority of construction would be undertaken during standard construction hours. However, working outside standard construction hours would be necessary to reduce traffic disruptions along Townson Road. The predicted results indicate that up to 54 residential receivers exceed the sleep disturbance criteria during night construction. Within the study area, 23 buildings have been identified to fall within the 20-metre safe working distance for vibratory rolling works and may be impacted by vibration from construction.

Based on the operational road traffic noise modeling, noise criteria are exceeded at 381 residential receivers. Low noise road pavements and noise barriers have been considered as mitigation to reduce the number of impacted receivers. A preliminary noise barrier analysis has been undertaken along the eastbound and westbound carriageways. From a noise perspective, noise barriers would be considered a reasonable mitigation option along the alignment through the Altrove (north) and Akuna Vista (south) developments. Further assessment would be carried out during detailed design.

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 include ongoing monitoring and consultation with sensitive receivers.

Hydrology and flooding

Eastern Creek is a tributary of South Creek and lies within the Hawkesbury River catchment. Eastern Creek drains a catchment of 118 square kilometres to the confluence with South Creek. During periods of heavy rainfall within the Eastern Creek catchment, there is potential for the capacity of the various creek channels to be exceeded, leading to inundation of the adjoining floodplain. Flood modeling has been carried out to confirm the 1 in 100-year 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. It was found that during a 1 in 100-year flood level event, the proposal would result in impacts of up to 0.24 metres on the western floodplain of Eastern Creek and 0.40 metres at the Burdekin Road connection.

The flood level increases to the west can be accommodated as part of future development. The proposed West Schofields Precinct land use for the flood-impacted area has been identified as either a proposed drainage, park or environmental conservation area. However, the predicted flood level increase near Burdekin Road will need to be mitigated as part of the detailed design by providing adequately sized drainage and basin infrastructure. This mitigation will need to be coordinated as the undeveloped area to the north and south of Burdekin Road is developed per the lane use identified in the Alex Avenue Precinct plan.

East of Aerodrome Drive (Veron Road), significant stormwater flow is conveyed along Townson Road's northern and southern sides. The impacts need further investigation and may need to be managed with the adjoining Altrove Estate residential development drainage system. Predicted velocity increases of flood water are limited to the bridge abutments, culvert inlets and outlets where scour protection would be required.

Biodiversity

The proposal is located within the North West Growth Area and largely consists of land certified under the State Environmental Planning Policy (Precincts – Central River City) 2021). The proposal would remove a total of 0.35 hectares of River-flat Eucalypt Forest EEC and up to 0.21 hectares of Cumberland Plain Woodland CEEC from within non-certified land.

No threatened flora was identified in the construction footprint during surveys and therefore would not impact threatened flora species, populations, or their habitats.

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

- Removal of 0.56 hectares of known foraging habitat for the Grey-headed Flying-fox and Little Bent-winged Bat
- Removal of 0.21 hectares of potential habitat for the Cumberland Plain Land Snail
- Removal of 0.56 hectares of potential foraging habitat for five threatened tree-roosting microbats
- Removal of 0.56 hectares of potential foraging habitat for three threatened culvert-roosting microbats
- Potential indirect impacts to foraging habitat for Southern Myotis
- Removal of 0.56 hectares of potential habitat for a number of woodland birds and owls.

No habitat for threatened aquatic fauna is listed in the construction footprint or immediately downstream of the proposal, and vegetation to be impacted is not considered an important habitat for any migratory species.

Offsets are required under the Biodiversity Certification Order (Minister for the Environment 2007) for the removal of 0.20 hectares of 'existing native vegetation' from non-certified land within the construction footprint

Landscape character and visual impacts

This part of Western Sydney is undergoing a process of rapid development, with areas of bushland and farmland making way for residential development. Therefore, a level of change is generally anticipated and accepted from within and around new residential areas. Overall, the visual impact is expected to be moderate to high for most of the proposal's alignment.

The most significant visual impact would occur along Alcorn Street, where the vertical alignment elevates and crosses the rail line within 20 metres of existing residential dwellings. This elevated part of the proposal would comprise a reinforced soil wall, bridge, and noise walls. Planting has been included as a mitigation measure, where feasible.

There will be a loss of views across green open areas, as well as a loss of perceived public open space; however, this can be mitigated through careful design of the bridge and opening up the structure and exposing the substructure undercroft area, providing long views through and an opportunity for social infrastructure and community benefit.

In consultation with Council, urban design treatments have been designed to respond to the major landscape character and visual impact by preserving or reinstating roadside vegetation consistent with tall tree species and other vegetation that is endemic to the area.



Artist's impression of the proposed reinforced soil wall, rail bridge and indicative planting, looking north-east from Anson Street.



Artist's impression of the proposal crossing the rail line, looking south from Siding Terrace.

Property and land use

Eight existing residential properties and three lots which are within residential development land have the potential to be fully or partially acquired as a result of the proposal. Due to the rapidly changing built environment and the proposed future precinct planning, the extent of property impacts would be refined and confirmed during detailed design in consultation with the property owners. In addition, property adjustment plans would be developed for partial acquisitions in consultation with the property owner.

Leasing requirements would include the need for construction compound sites and strips of land alongside the alignment to accommodate the work area. The need for lease arrangements would be confirmed by the contractor, and negotiations would be undertaken with the identified landowners prior to work commencing. It is currently anticipated that leasing requirements could impact 18 private properties; these include the eight existing residential properties; this will be confirmed at detailed design. Leasing requirements would be temporary until the undeveloped land adjacent to the proposal is developed to levels nearer to the roadway, designed to the required flood immunity levels.

All compensation would be conducted in accordance with the road authority policies, and compensation would be based on the requirements of the Land Acquisition (Just Terms) Compensation Act 1991.

Due to the rapidly changing built environment and the proposed future precinct planning, the design has not presented access arrangements to some properties off Burdekin Road, Jersey Road and Kerry Road. However, access to all existing properties impacted by the proposal will be provided during construction. At detailed design, access arrangements will be reviewed and revised to accommodate the built environment at that time. Property adjustment plans would be developed in consultation with affected property owner

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 through provision of pedestrian and shared paths
- The proposal would result in improved flood resilience and access to flood evacuation routes.

If the proposal did not proceed, there would not be an improved east-west link to facilitate the anticipated residential growth and improve network efficiency across the North West Growth Area. There would not be a connection with other roads in the local network or an additional crossing of the rail corridor, 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 environmental factors

The REF will be displayed for stakeholder feedback and comments for 28 days.

The public display period will be advertised in the community update which will be distributed to the local community and include details of two community information sessions that will be held during the display period of the REF to allow the community to speak to members of the project team directly.

Internet

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

Copies by request

Copies of the REF are available by contacting our project team at NWGA@transport.nsw.gov.au or 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
- NWGA@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*](https://www.transport.nsw.gov.au/about-us/transport-privacy) or by contacting [*privacy@transport.nsw.gov.au*](mailto: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. All comments received will be recorded and addressed in a Submissions Report detailing how each issue raised would be considered in finalising the proposal design. The Submissions Report will be made available to the public on the project's webpage on the Transport for NSW website.

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, the roads authority will be responsible for future community consultation and engagement.

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1. Introduction

1.1 Proposal identification

A four-lane divided road is proposed along the Townson Road/Burdekin Road corridor linking Richmond Road, Marsden Park in the west with Burdekin Road, Schofields in the east. The length of the overall program of work is about 3.6 kilometres.

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. This stage is being delivered within an interim and final phase, subject to a separate planning approval.
- Stage 2 is about two kilometres in length involving the construction of a new road between the Stage 1 tie-in and Burdekin Road (referred to as 'the proposal' for the purposes of this assessment).

Stage 2 of the proposal is located within the North West Growth Area which is about 37 kilometres north-west of the Sydney central business district and three kilometres south-west of Schofields. Key features of the proposal would include:

- Constructing a new median separated dual carriageway around two kilometres in length connecting Stage 1 in the west with Burdekin Road in the east
- Providing a signalised intersection at Aerodrome Drive (Veron Road) with pedestrian crossing facilities
- Providing a 2.5 metre wide shared path for pedestrians and cyclists on the southern side of the carriageway up to Aerodrome Drive (Veron Road), then 1.5 metre footpath to Burdekin Road
- Providing a 1.5 metre wide footpath on the northern side of the carriageway along the length of the proposal
- Railway Terrace would be terminated with a cul-de-sac
- Constructing a 300 metre long viaduct over Eastern Creek
- Constructing a vehicular and pedestrian bridge over the T1 Western Line to tie into Burdekin Road.

The roads authority is the proponent of the proposal. Transport for NSW has prepared the concept design and the roads authority will prepare the detailed design and will construct 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. Section 3 describes the proposal in more detail.

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

East-west access within the NWGA is currently restricted by the T1 Western Line (Richmond rail line), which runs north-south through the area. Existing crossings of the rail line are limited, with only two grade separated crossings at Schofields Road and Westminster Bridge, and two at-grade, level crossings at Garfield Road and Bandon Road. There is also a private level crossing north of Garfield Road. This barrier limits access for residents to key facilities either side of the railway line and restricts commuters from modifying their route to avoid incidents or congestion on Richmond Road. The need for further east-west corridors has been identified as part of the transport infrastructure strategy for the NWGA. It is anticipated that the construction of the proposal would commence in late 2026 and would be open to traffic in 2028.



Figure 1-1 Location of the proposal

Data source: MetroMap - Imagery (date extracted: 16/12/2021), General topography - LPI 2015 - Created by: eibbertson
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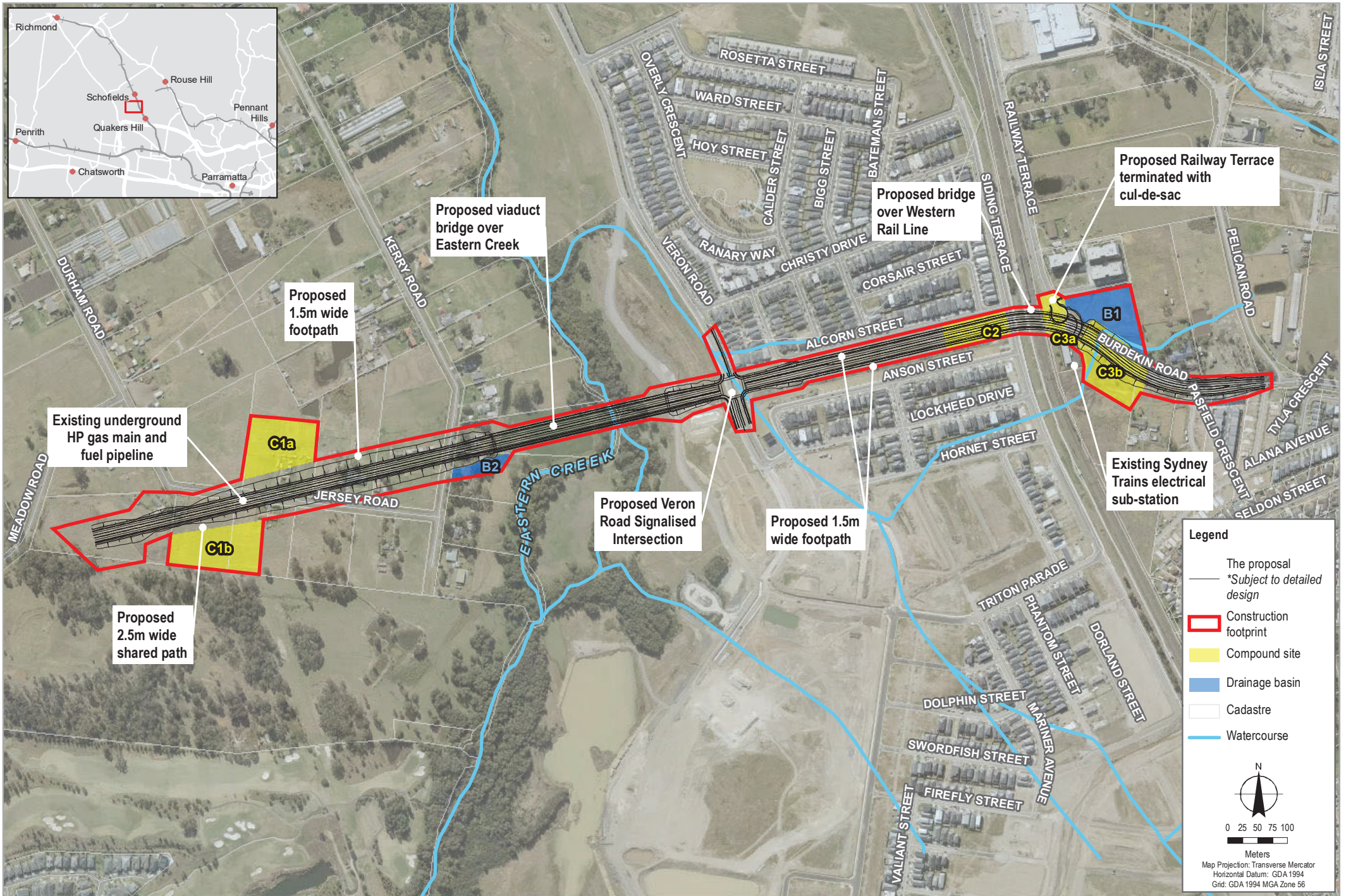


Figure 1-2 The Stage 2 proposal

Data source: MetroMap - Imagery (date extracted: 26/10/2021) - General topography - DPI 2015, Roads - DSFI 2019 - Created by: eibbertson
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Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

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

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, the roads authority is the proponent 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 section 171 of the Environmental Planning and Assessment Regulation 2021, 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)* (DoP, 1995/1996), *Roads and Related Facilities EIS Guideline* (DoP, 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 construction compounds.
- 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

Priority Growth Areas (formerly Growth Centres) were established by the NSW Government under the 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. The North West Growth Area (NWGA) is one of these areas, predominantly within the Blacktown LGA, Hawkesbury LGA and The Hills Shire LGA. To allow for a balanced release of land, the NWGA was divided into 16 precincts. The Growth Centres SEPP has been repealed and consolidated as of 1 March 2022. State Environmental Planning Policy (Precincts—Central River City) 2021, now applies to the Sydney Growth Centres referred to below.

The proposal is located within the NWGA, within the following three precincts (see Figure 2-1):

- Schofields Precinct Plan (2012)
- West Schofields Precinct Plan (draft, 2018). This plan remains in draft and is not yet covered by the Central River City SEPP, however it is included in this assessment as it remains applicable to the study area
- Alex Avenue Precinct Plan (2010).

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. East-west access within the North West Growth Area is currently restricted by the T1 Western Line (Richmond rail line), which runs north-south through the area. Existing crossings of the rail line are limited, with only two grade separated crossings at Schofields Road and Westminster Bridge, and two at-grade, level crossings at Garfield Road and Bandon Road. There is also a private level crossing north of Garfield Road. This barrier limits access for residents to key facilities either side of the railway line and restricts commuters from modifying their route to avoid incidents or congestion on Richmond Road. The need for further east-west corridors has been identified as part of the transport infrastructure strategy for the NWGA.

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 via 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 that 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 Townson Road Stage 1 and 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 a sustainable future
- The proposal would result in improved flood resilience and access to flood evacuation routes.

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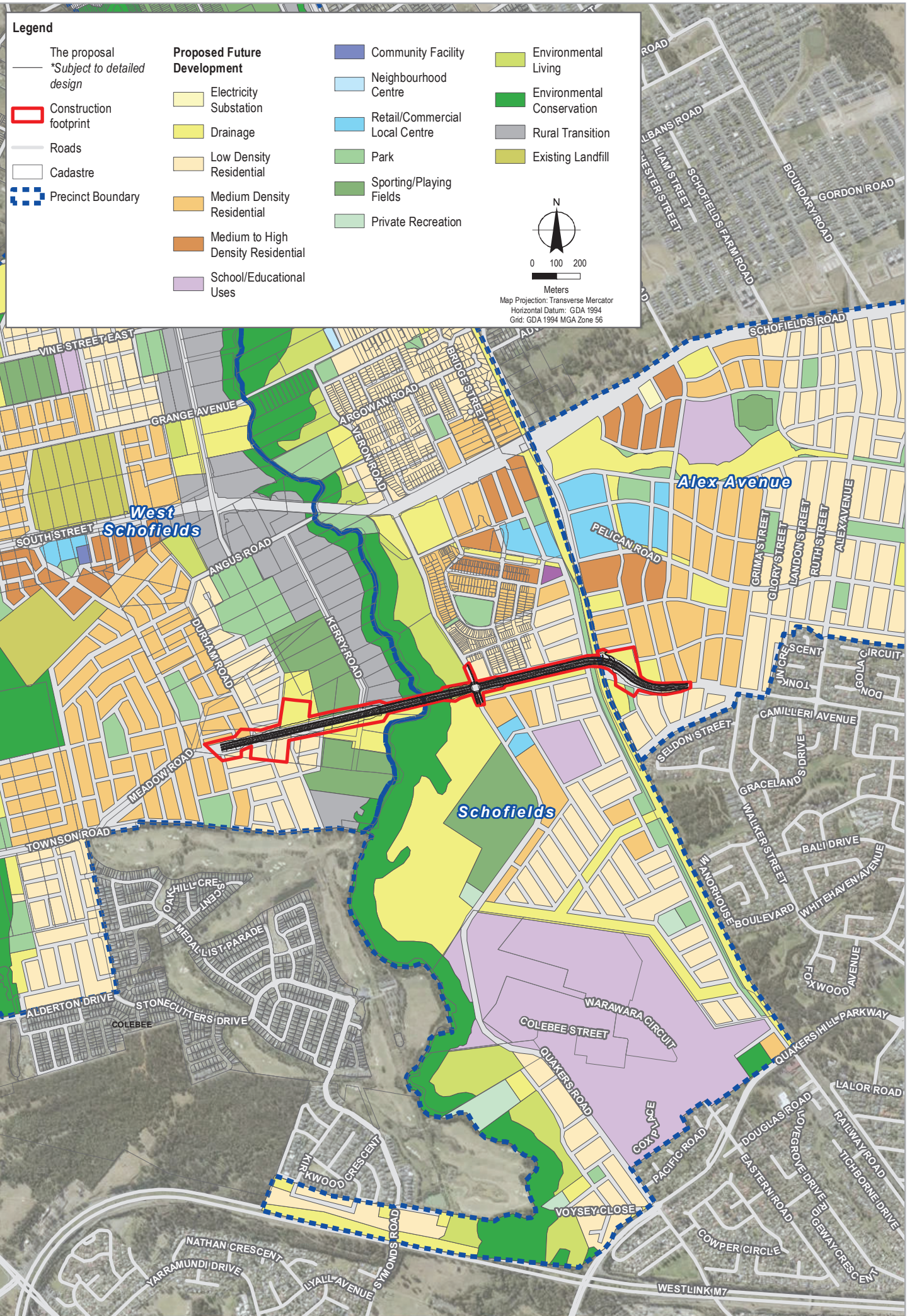


Figure 2-1 Indicative layout plans: West Schofields, Schofields and Alex Avenue Precinct

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 State and Premier's Priorities relating to social issues (provided at: <https://www.nsw.gov.au/premiers-priorities>) 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 principal priority relating to the proposal is 'well-connected communities with quality local environments'.

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, 2017), 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 T1 Western 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 proposed rail crossing would provide the linkage between Burdekin Road and Townson Road. Therefore, the proposal 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, 2017) 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 Burdekin Road and Townson Road and provision of an additional grade separated rail crossing of the T1 Western 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 6-1. A summary of existing traffic volumes is provided in section 6.1.

2.2.1 Townson Road

Townson Road is located to the west of the proposal. It currently comprises a sealed, local road about 800 metres in length with unsealed shoulders. 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 km/h speed limit.

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.

Stage 1 of the overall program would upgrade the existing Townson Road. The delivery of Stage 1 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. 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.

It is anticipated that Stage 1 would be completed prior to the construction of the proposal commencing.

2.2.2 Local roads

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

Meadow Road is located to the west of the proposal. Durham Road, Jersey Road and Kerry Road intersect with the western end of the study area. These roads form a residential ring road west of Eastern Creek. Meadow Road connects Townson Road with rural residential land surrounding the ring road which connects to Camarvon Road and South Street, Schofields.

These local roads are sealed, with a posted speed limit of 60 kilometres per hour. There is no existing street lighting other than one light at the intersection with Durham Road. There are no pedestrian facilities provided.

2.2.3 Aerodrome Drive (Veron Road), Alcorn Street, Anson Street and Siding Terrace

Veron Road (recently the road's name has been changed to Aerodrome Drive), Alcorn Street, Anson Street and Siding Terrace are relatively new local roads within a new residential area being developed as part of the NWGA. These comprise undivided roads with one lane in each direction, with no line marking. Posted speed limits are 40 kilometres per hour.

2.2.4 Burdekin Road and Railway Terrace

Burdekin Road and Railway Terrace are located at the eastern side of the study area. Railway Terrace is around one kilometre in length extending from Schofields Road to the north till it merges into Burdekin Road. Burdekin Road then extends east for around two kilometres.

These roads are sealed, with a posted speed limit of 60 kilometres per hour. These comprise undivided roads with two lanes in each direction, line marking and street lighting. Railway Terrace narrows into one lane in each direction plus an overtaking lane towards its northern end.

2.2.5 Parking

Parking is generally unrestricted along the local roads on the western side of the proposal corridor. There are no designated parking areas on Burdekin Road and the southern end of Railway Terrace. Street parking is available at the northern end of Railway Terrace along its eastern side.

There is an informal parking area on Railway Terrace, across from the intersection at Stoke Street. This is estimated to provide around 35 parking spaces. It is likely that commuters travelling from Schofields Station utilise this area as a car park when the formal commuter car park spaces are fully occupied.

2.2.6 Bus services

Bus route 742 is the main service operating along Townson Road and Meadow 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 west of the study area on the northern side of Hollinsworth Road and one north of the study area at the Meadow Road and Durham Road intersection (Stop ID 276237).

Bus route 734, Riverstone to Blacktown via Schofields operates along Burdekin Road and Railway Terrace, servicing Schofields Station. There are several bus stops on Burdekin Road east of the study area the closest being Stop ID 2763165.

2.2.7 Railway facilities

The T1 Western Line (Richmond rail line) crosses through the proposal area. Schofields Station is located on Railway Terrace around 800 metres north of the proposal site. Quakers Hill Station is around two kilometres south of the proposal site.

A Sydney Trains substation is located at the intersection of Railway Terrace and Burdekin Road. This location includes Sydney Trains gates providing access into the substation site and the rail corridor.

2.2.8 Pedestrian and cyclist facilities

There is no pedestrian and cyclist infrastructure along the local roads on the western side of the proposal corridor.

A pedestrian footpath is provided along the length of Burdekin Road on the eastern side and along most of Railway Terrace on its western side.

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 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
- Rail line and rail infrastructure within the proposal
- 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, 2017). Although the alignment was set, Transport for NSW undertook a strategic assessment and design to inform the preferred option.

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 satisfied 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 2.4.5.

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 the *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 Stage 1 and this proposal of the overall program of work. This was because Stage 1 and this proposal 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 – 'Central option with full width corridor'
- Option 3 – Not applicable to Stage 2
- Option 4 – 'Reduced width option'
- Option 5 – 'Alignment south of rail substation'.

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 in further detail 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 – Central option with full width corridor option

Option 2 utilises most of the corridor reservation shown in the Department of Planning, Industry and Environment precinct plans. This option was developed with Blacktown City Council and consists of a landscaped central median (7.2 metres in width) and wide road corridor (34.8 metres wide) 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 (Aerodrome Drive) and a new road proposed to the east of the quarry to the north of Townson Road. A cross section of this option is provided in Figure 2-2.

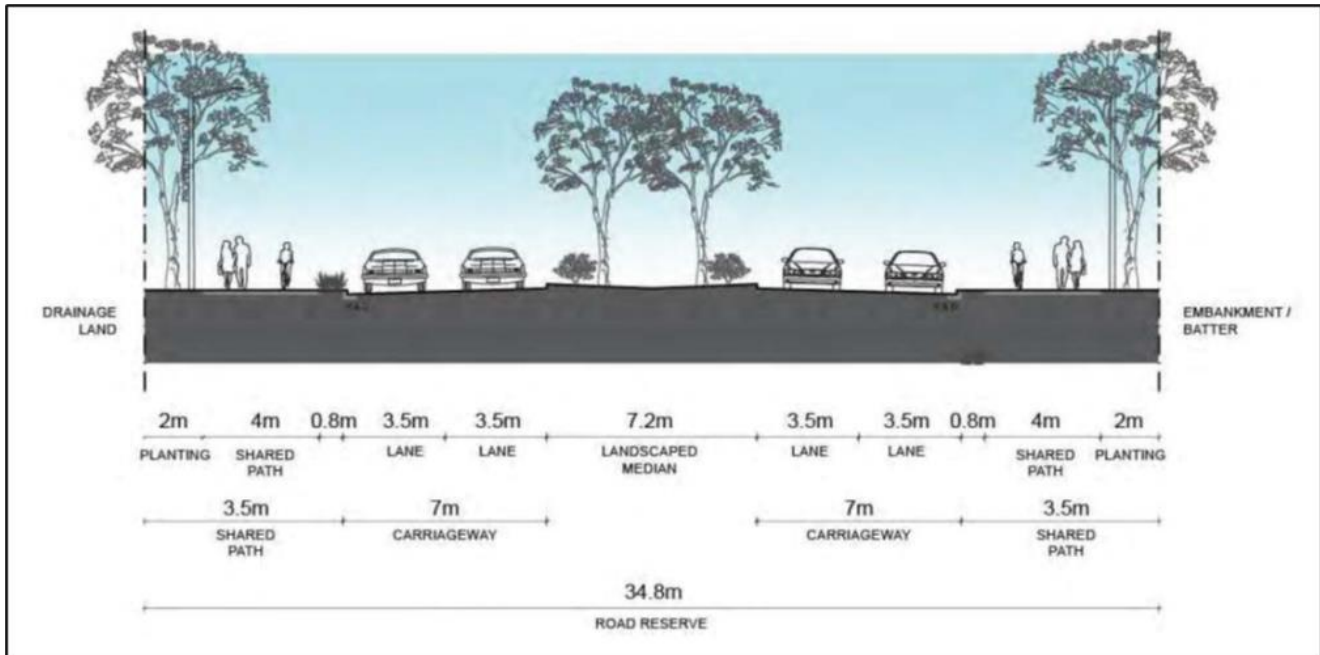


Figure 2-2: Option 2 – Central option with full width corridor

Option 4 – Reduced width corridor

The road has a corridor set in the Precinct Plans for the region that is 35 metres wide. This corridor is wide enough to fit the full width of the original cross section, however it does not allow room to accommodate batters and retaining walls.

Option 4 is similar to option 2 but involves reducing the width of the central median from 7.2 metres to 4.8 metres wide to allow for constructability of the proposal. The shared path on one side of the road would also be reduced. Figure 3-2 provides a cross section of this option.

Option 5 – Alignment south of rail substation

Department of Planning and Environment (DPE) planned that the NWGA corridor alignment at the eastern part would be constrained at the rail crossing, which is situated south of Schofields train station. The planned corridor would require a tight radius curve at the crossing to tie in with Burdekin Road.

Option 5 therefore considered an alignment running to the south of the substation, where Burdekin Road and Railway Terrace merge. This option provides a better outcome for road geometry, and potentially reduces construction complexity and thus overall costs.

2.4.3 Design options

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

- Bridge options – bridge lengths and additional culvert options were reviewed for the Eastern Creek viaduct to achieve flood immunity and bridge beam types were reviewed to reduce span lengths over the T1 Western Line
- Connectivity options – options were investigated to allow through movements from Railway Terrace to Burdekin Road
- Limiting traffic – restricting traffic flows to minimise potential ‘rat running’ and congestion from Schofields Road to Richmond Road.

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

2.4.4 Consultation of options

The central option with full width corridor (Option 2) was developed between Transport for NSW and Blacktown City Council. Further design reviews considered the purpose of the proposed median width 7.2 metres. It was unclear where the requirement for a wider median had originated and through further discussion between Transport for NSW and Blacktown City Council Option 4 was developed with the reduced median width.

2.4.5 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 5 all meet the need for the proposal as well as achieving the objectives and development criteria to a similar extent overall.

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 – ‘Central option with full width corridor’	Yes	Yes. The corridor reservation did not consider the footprint required for construction and earthworks.	No additional property impacts than that proposed.
Option 4 – ‘Reduced width option’	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.

Option	Meets proposal objectives	Significant constructability issues	Significant property impacts
Option 5 – Alignment south of rail substation	Yes	No. Provides a better outcome for road geometry, and potentially reduces construction complexity and thus overall costs.	<p>Yes. Development of the Defence Housing Australia property located to the west of the T1 Western Line has progressed.</p> <p>The precinct of Schofields, which includes this portion of the alignment has already been rezoned and the development application for this land has already been approved.</p> <p>To accommodate this option, significant rework of the existing development approval would be required, including impacts on construction that has already commenced.</p>

Table 2-2 summarises the analysis of design options provided in the options report and additional refinements to the design that has been developed. The final design options developed for the proposal are described in section 2.6.

Table 2-2: Analysis of design options

Meets proposal objectives	Significant constructability issues	Significant property impacts
Bridges		
Yes – meets all proposal and urban design objectives.	<p>Culverts can be cheaper than bridges, however due to the required apron structures at the openings additional constructability issues and costs may occur.</p> <p>Bridge lengths and additional culvert options were reviewed for the Eastern Creek viaduct to achieve flood immunity.</p>	<p>Due to the required apron structures at the openings of culverts, additional property acquisition on both sides of the road would be required.</p> <p>Replacing existing culverts with a bridge minimised property impacts.</p>
Connectivity option		
Yes – meets all proposal and urban design objectives.	<p>Maintaining a connection between Railway Terrace and Burdekin Road would require extensive vertical regrading of Railway Terrace to raise it to meet the height of the new road crossing over the rail corridor.</p> <p>Terminating Railway Terrace into a cul-de-sac minimises earthwork requirements.</p>	<p>Property impacts would have occurred from the extensive earthworks required to elevate Railway Terrace.</p> <p>Terminating Railway Terrace into a cul-de-sac minimises property impacts.</p>

Meets proposal objectives	Significant constructability issues	Significant property impacts
Traffic limitation		
No – does not meet all proposal and urban design objectives.	Terminating Railway Terrace into a cul-de-sac restrict traffic flows to minimise potential ‘rat running’ and congestion from Schofields Road.	To limit the traffic volumes using the road, a suggestion to include a bus only section across the rail line or Eastern Creek was investigated. However, this would artificially block local access to Schofields local centre and the train station. This would not align with one of the objectives of the project. Hence other options were considered.

Options 2 to 5 all meet to a similar extent the need for ecologically sustainable development (ESD). These designs were developed with an objective of minimising potential impacts on the surrounding environment. The design has sought to minimise impacts on 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 met the proposal objectives, development criteria and urban design objectives. This option 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 consulted included:

- Blacktown City Council
- DPE
- Luxeland Developer
- CSR Brickworks Developer.

Sydney Trains and utility providers, including Jemena, Endeavour Energy, Sydney Water, Telstra, NBN and Caltex have been informed of the proposal.

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:

- Update the design to provide the shared path to the southern side of Townson Road up to the Aerodrome Drive (Veron Road) intersection
- Provide maintenance access to the Sydney Trains sub-station
- Bridge over Eastern Creek reduced to 300 metres in length with 2.0 metre wide outside shoulder to remove surface water flow into traffic lane
- Review and upgrade of drainage, including provision of two sedimentation basins
- Concrete safety barrier positioned between road and footway on approach to and through the rail overbridge
- Median width increased on approach and through the rail overbridge to future proof bridge if median separation barrier is retrofitted.

3. Description of the proposal

3.1 The proposal

The proposal is about two kilometres in length involving the construction of a new road between the Stage 1 tie-in, just west of Jersey Road to Burdekin Road. The key features of the proposal are described in section 3.1.1. The staged approach to construction is discussed in section 3.3.2.

3.1.1 Key features

Key features of the proposal and the existing environmental context, as described in section 1, are shown in Figure 1-2.

Key features of the proposal would include the following:

- Constructing a new median separated dual carriageway that is around two kilometres in length connecting Stage 1 in the west with Burdekin Road in the east
- Providing a signalised intersection at Aerodrome Drive (Veron Road) with pedestrian crossing facilities
- Providing a 2.5 metre wide shared path for pedestrians and cyclists on the southern side of the carriageway up to Aerodrome Drive (Veron Road), then 1.5 metre footpath to Burdekin Road
- Providing a 1.5 metre wide footpath on the northern side of the carriageway along the length of the proposal
- Railway Terrace would be terminated with a cul-de-sac
- Constructing a 300 metre long viaduct over Eastern Creek
- Constructing a vehicular and pedestrian bridge over the T1 Western Line to tie into Burdekin Road.

An indicative cross section showing the parameters of the road corridor are shown in Figure 3-1. A typical cross section of the proposal in fill is shown in Figure 3-2.

Where sight lines are restricted, vegetation in the central median would be restricted to ground level plantings to maintain safety as shown in Figure 3-1.

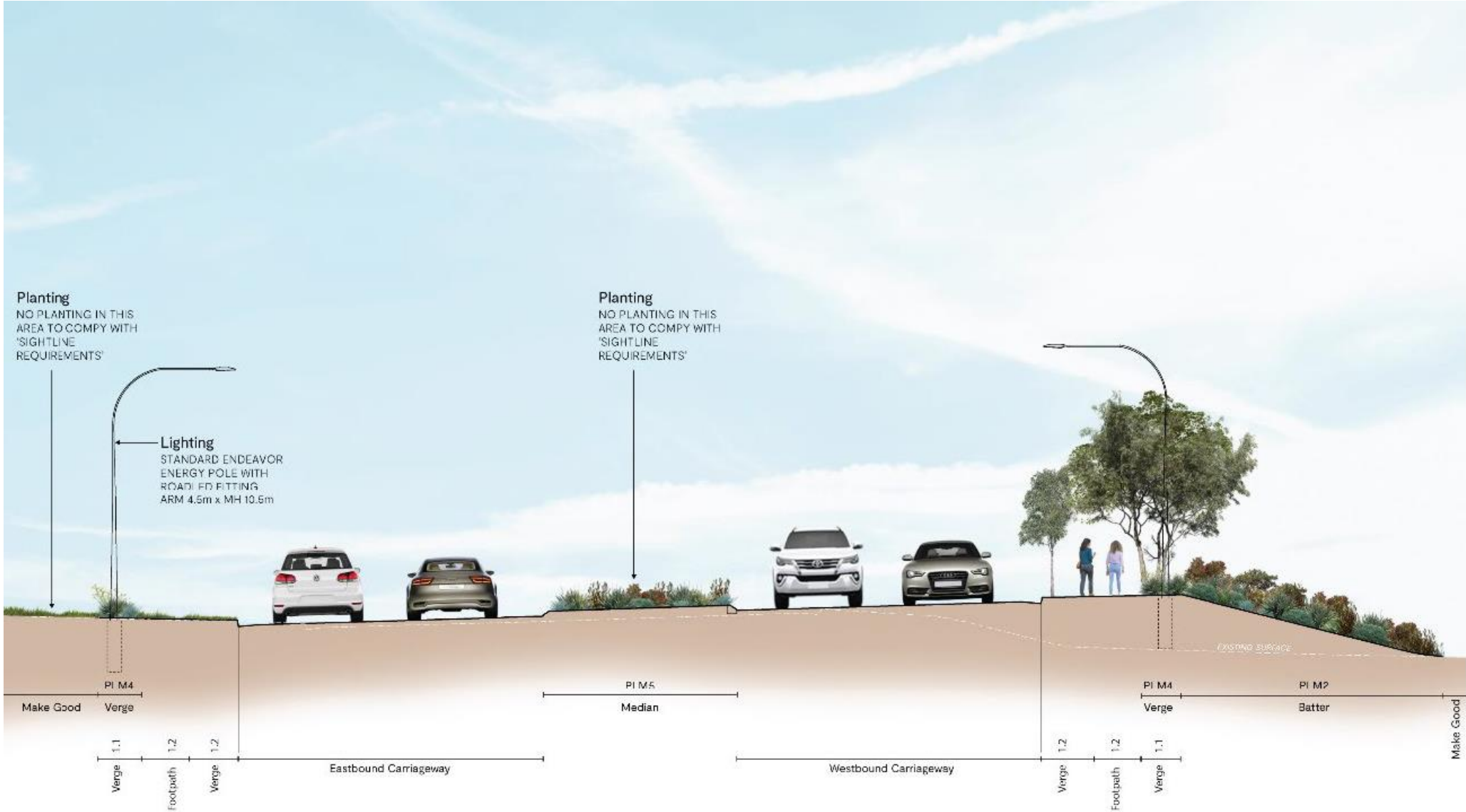


Figure 3-1: Indicative cross sections of the proposal

3.2 Design

This section provides a detailed description of the concept design of the proposal. Concept design plans are provided 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

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. An indicative cross section of the alignment is shown in Figure 3-1.

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

Table 3-1: Design criteria

Criteria	Requirement
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 local roads
Design vehicle	26 m long B-Double or a 19 m long semi-trailer
Width of lanes	3.5 m
Median width	4.8 m narrowing to 1.5 m to allow for turning lanes at intersections. Side roads include a 3 m wide median.
Pavement type and grade	Transport for NSW and Blacktown City Council has confirmed full depth asphalt pavement (AC design) for Townson Road. The side roads will comprise thin asphalt surfacing on granular layers with a minimum pavement of 300 mm.
Safety barriers	As agreed with Council and Transport for NSW barriers would be provided at the outer extent at the Eastern Creek bridge and between road and footpath on the bridge over the T1 Western Line.
Provisions for pedestrians, cyclists and buses	See section 3.2.3
Batter slopes	4:1 ratio for low cuttings or low fill embankments 2:1 ratio for deep cuttings or high fill embankments
Landscaping	See section 3.2.3

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	As the growth area precinct has not been fully developed and finalised, the overall network strategy for utilities within the area has not been determined however, any existing overhead utilities would be relocated underground where possible. It is anticipated any future utilities required to follow the road corridor would be accommodated within the shared path and footpath allocation and would be built into both the large viaduct structure over Eastern Creek and the T1 Western Line bridge. This eliminates the constraints of the poles and the associated clear zones.
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, Transport for NSW and the roads authority.
Flooding risk	Bridge lengths and additional culvert options were reviewed for the Eastern Creek viaduct to achieve flood immunity. This reduces the risk of flooding to nearby properties or proposed areas of development.
Adjacent developments	Maintaining a connection between Railway Terrace and Burdekin Road would require extensive vertical regrading of Railway Terrace to raise it to meet the height of the new road crossing over the rail corridor. Terminating Railway Terrace into a cul-de-sac minimises earthwork requirements and impacts onto adjacent properties.

3.2.3 Major design features

Road construction

The proposal involves the construction of a new road through greenfield lots about two kilometres in length between Stage 1 (south of Jersey Road) in the west to Burdekin Road in the east. The proposal would include two traffic lanes 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).

An indicative cross section showing the parameters of the road corridor are shown in Figure 3-1. A typical cross section of the proposal in fill is shown in Figure 3-2.

Where sight lines are restricted, vegetation in the central median would be selected to maintain safety as shown in Figure 3-1.

Townson Road would tie into the existing alignment of Burdekin Road, just west of the Burdekin Road / Pelican Road intersection.

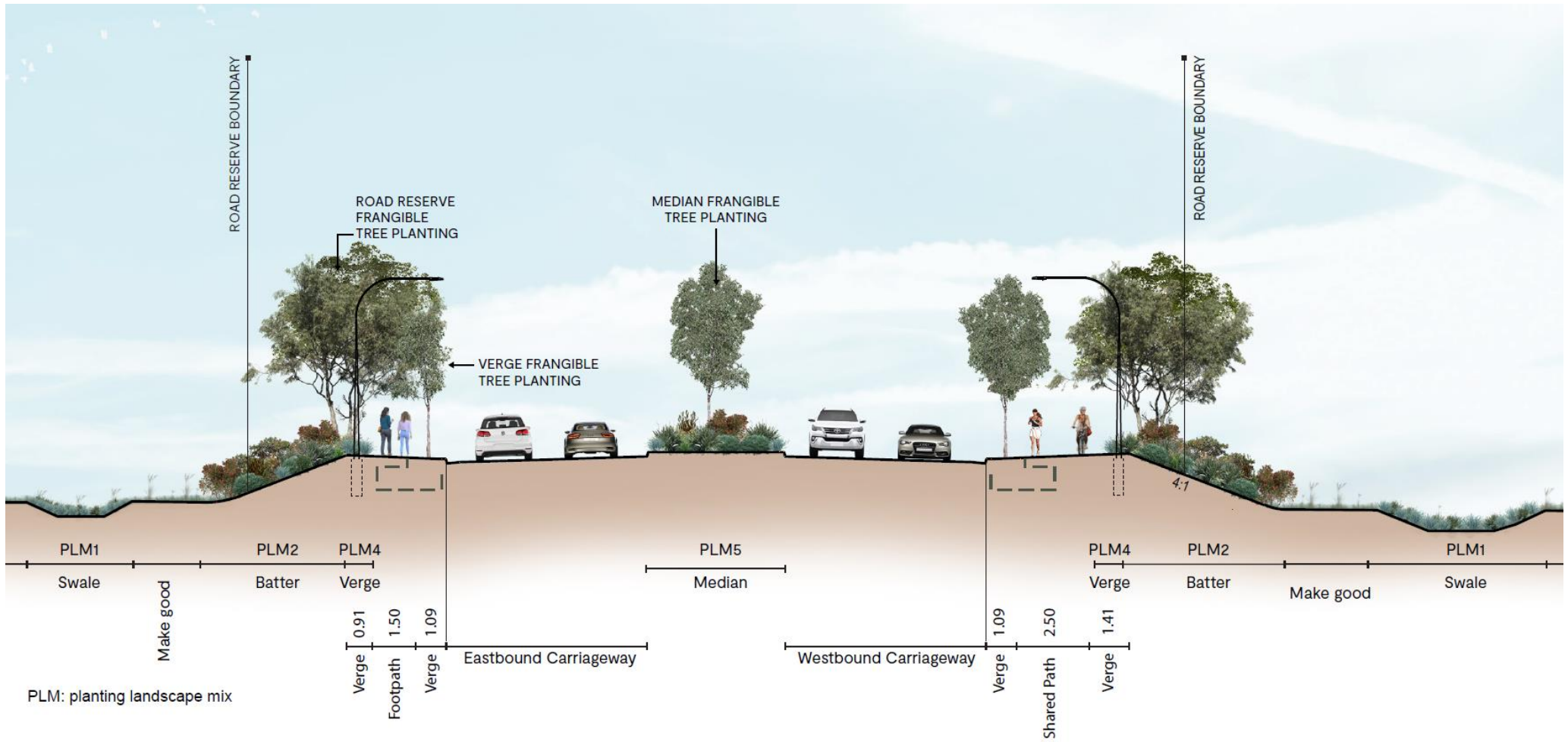


Figure 3-2: Typical section through the proposal in fill

Intersections upgrades and road closures

Aerodrome Drive (Veron Road)

A new intersection is proposed at Aerodrome Drive (formally known as Veron Road) to allow for access to future developments to the north and south of the proposal. This new intersection would be signalised and provide pedestrian crossing facilities to each leg of the new intersection. The Aerodrome Drive (Veron Road) tie-in would feature one lane in each direction with adjustments to the existing central median to accommodate dedicated right turn lanes onto Townson Road.

A plan view showing the new intersection is provided in Figure 3-3.

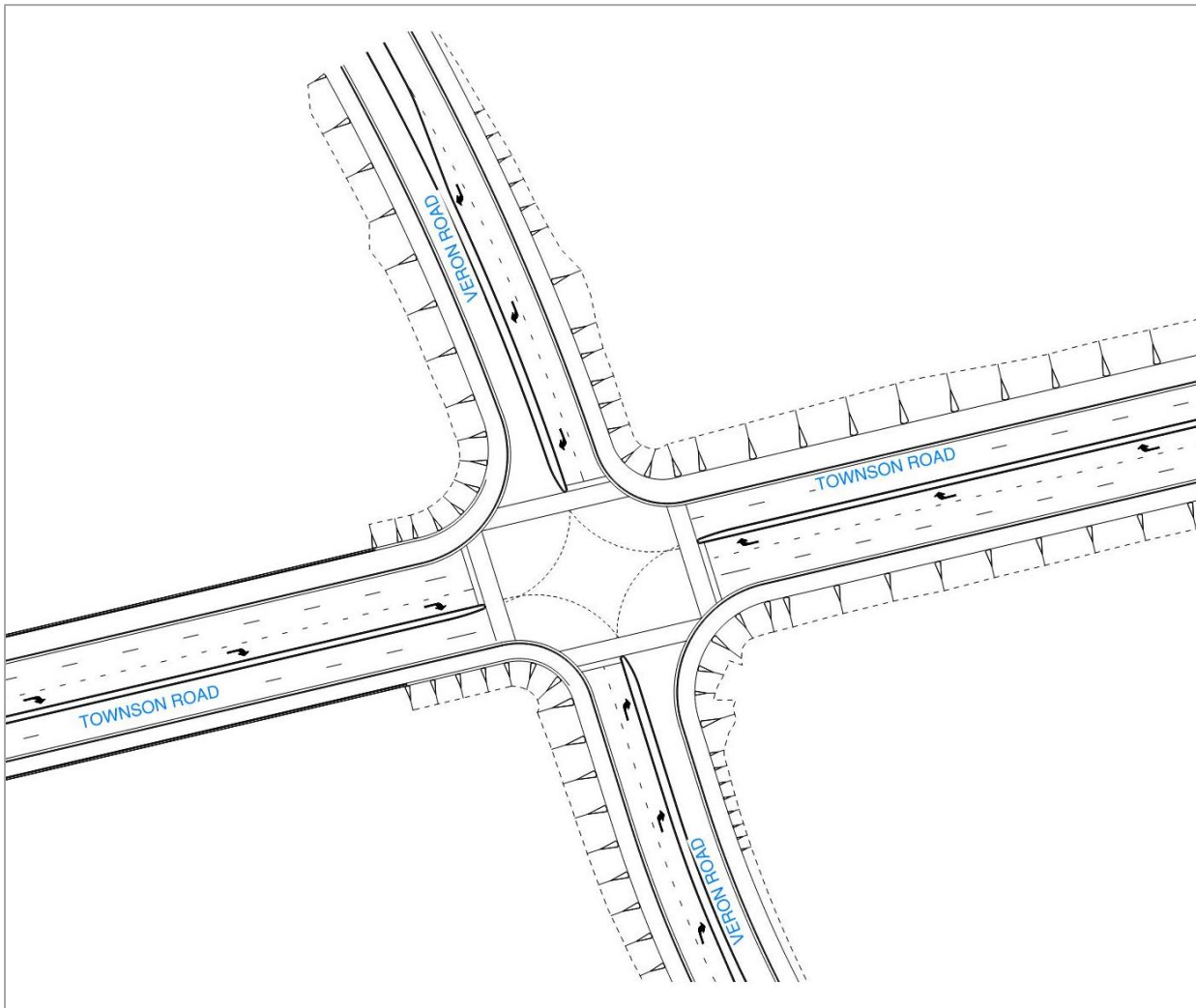


Figure 3-3: Plan view of the Vernon Road intersection

Railway Terrace

Railway terrace would be terminated with a cul-de-sac turn head arrangement just south of Stoke Street. The turn head would also act as an access point to the Sydney Trains electrical sub-station located directly south of the rail bridge.

Jersey Road

With the proposed alignment, Jersey Road would be dissected and essentially would be removed as part of the growth area precinct plan.

Kerry Road

Similar to Jersey Road, Kerry Road would be dissected and removed as part of the growth area precinct plan.

Bridges

The proposal includes the construction of two new bridges, one over Eastern Creek and one over the T1 Western Line.

The proposed Eastern Creek bridge would be a viaduct 300 metres in length and would comprise of concrete span deck superstructures with concrete piers. The bridge has a maximum height of around 6.5 metres over Eastern Creek. The piers of the bridge would be around 1050 millimetres in width. All piers would be positioned outside of the low flow main creek channel, with pier 6 and 7 located either side of the creek around 31 metres apart. Due to the expanse of the existing flood zone in the area, a number of piers would be located within the 100 year flood event. The concept design cross section for the bridge is shown in Figure 3-4. Detailed concept design drawings are provided in Appendix C which show the location of the piers.

The bridge over the T1 Western Line is about 143 metres long. It would comprise of concrete span deck superstructures with concrete piers with a reinforced soil wall on either side of the rail corridor. The bridge has a maximum height of around 10.1 metres and about 6.5 metres over the rail lines. The bridge spans have been designed to allow access to the Sydney Trains electrical sub-station via the turn-head cul-de-sac at Railway Terrace.

The concept design cross section for the bridge is shown in Figure 3-5 and an illustration showing the reinforced soil wall and bridge over the rail line is shown in Figure 3-6.

Utility services would be predominately placed within the footpath of the bridges. As the NWGA precinct plans are not finalised and as this is concept design phase, it is unknown what services would be required and as such space allocation has been incorporated into the structures for future confirmed services.

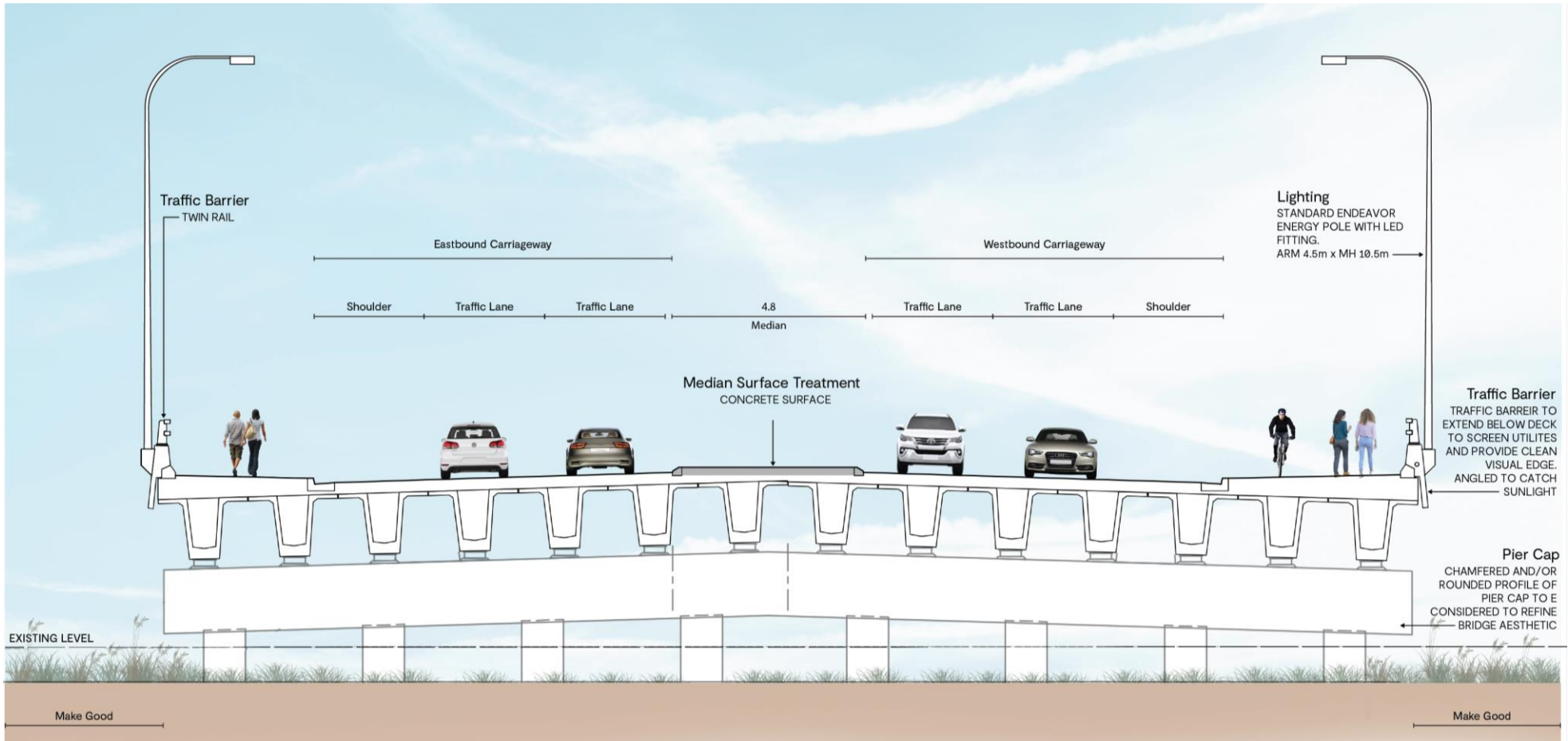


Figure 3-4: Section through the proposal at Eastern Creek viaduct

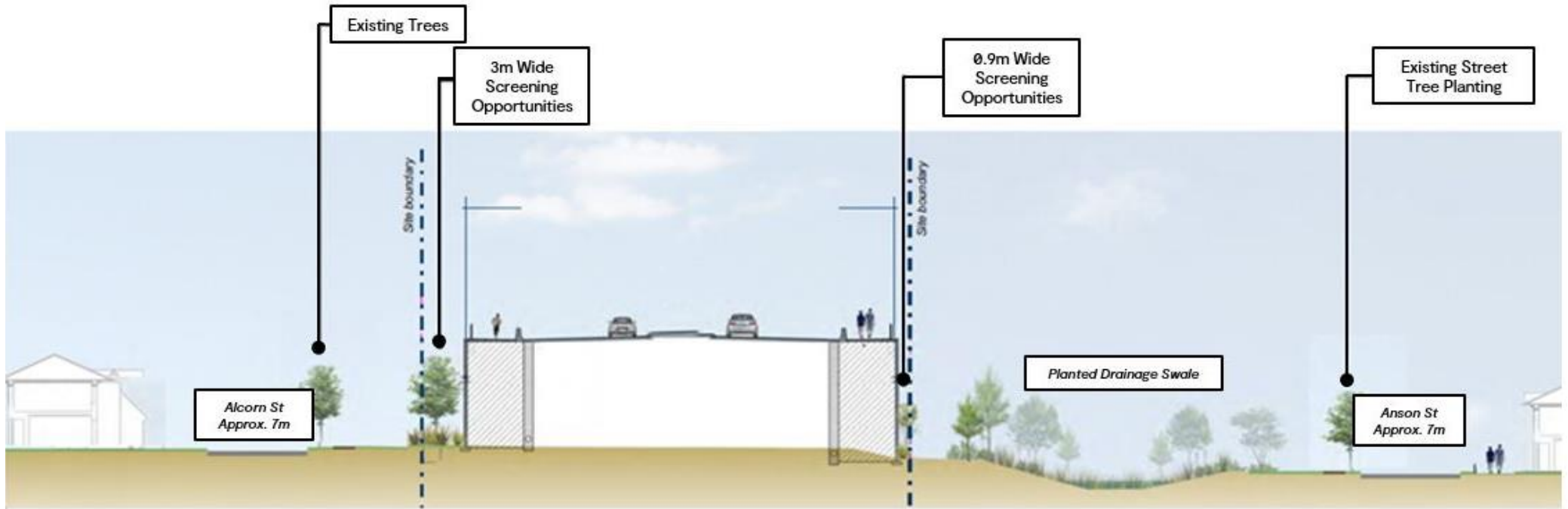


Figure 3-5: Typical cross section through the rail bridge reinforced soil wall embankment



Figure 3-6: Illustration of the reinforced soil wall bridge and rail bridge looking north-east from Anson Street with indicative screen planting

Noise barrier

The Noise Mitigation Guideline (Roads and Maritime, 2015) states that noise barriers such as mounds or walls, should be considered where there are four or more closely spaced sensitive receivers, impacted by the proposal. A barrier analysis was undertaken in accordance with the provisions of the guidelines. This is discussed in section 6.2.4 and Appendix F.

Noise mounds were not considered to be feasible for the proposal as there is insufficient space to construct noise mounds.

Two noise walls have been considered as part of this study; one along the eastbound carriageway and one along the westbound carriageway on the reinforced soil wall embankment and bridge over the rail line.

Additional feasible and reasonable considerations would be assessed at detailed design to determine the final barrier height that could be constructed. These include:

- Constructability of a barrier on a viaduct. This may require a review of the wind loads and maintenance requirements of the barrier.
- Visual impacts.

An image of what a noise wall could look like at this location is provided in Figure 3-7.



Figure 3-7: Image of a perspex noise wall

Pedestrian and cyclist facilities

A 2.5 metre wide shared user path for pedestrians and cyclists is proposed along the southern side of Townson Road up to Aerodrome Drive (Veron Road). From there a 1.5 metre footpath is proposed to the tie in at Burdekin Road.

A 1.5 metre wide footpath extending the entire length is proposed along the northern side of Townson Road.

3.2.4 Urban design and landscaping

An urban design strategy was prepared by GHD to inform the concept design. Key elements of the design were used to inform the landscape character and visual impact assessment which 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 new road and new bridge structures sensitively into the natural and suburban setting. Figure 3-8 illustrates how the elevated section of Townson Road could be incorporated into the Altrove development.



Figure 3-8: Illustration of Townson Road crossing the rail line, looking south from Siding Terrace

A naturalised character to the landscaping design would be introduced adjacent to creek crossings and areas adjacent to existing vegetation. A more formal landscaping design would be provided in residential areas including street trees and planting beds.

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.

3.2.5 Ancillary activities

Drainage and water quality

The proposal would include various drainage structures including longitudinal and transverse drains, catch drainage and table drains, sub surface drainage 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 500 metres east of the Stage 1 tie-in at Chainage 1920. The culverts consist of eight (8) 3.6 metre wide by 1.5 metre high box culverts with connecting headwalls. The culvert structure has been sized to ensure that peak water levels upstream do not exceed the design criteria for the adopted storm event.

Two drainage basins would be provided for the operation of the project. The location of these are shown in Figure 1-2.

Drainage basin 1 located to the east of Burdekin Road is designed to cater for the road run-off and capture existing overland run-off from the north. It is anticipated the basin would be re-sized during detailed design once the overall growth area precinct is fully ascertained.

Drainage basin 2 located south of the road alignment just to the east of Kerry Road is designed to cater for the road run-off and it is anticipated the basin would be re-sized during detailed design once the overall growth area precinct is fully ascertained.

Both basins would be managed and maintained by the roads authority.

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.

With the inclusion of a signalised intersection at Aerodrome Drive (Veron Road), the Transport for NSW Intelligent Transport System (ITS) network would require provision of a CCTV camera. ITS underground conduits would generally follow the southern extent of the alignment commencing at the tie-in with Stage 1 and ending at the work limit at Burdekin Road. Communications and electrical conduit pits would be installed to maintain the ITS route for the new conduits.

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.

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 2:1.

Cuttings and embankments

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

In constrained areas or where the fill embankment rises to meet structures fill slopes have been steepened to 2:1. In these areas fill embankments rise to a height of up to six metres are proposed near the bridges at the eastern end of Townson Road.

From Aerodrome Drive (Veron Road) to the rail bridge the alignment passes through a narrow corridor which requires the inclusion of a vertical reinforced soil wall to avoid impacts over the road corridor. This reinforced soil wall would rise to a maximum height of 11 metres.

Transitional area between Stage 1 and the proposal

Connection of the proposal with Townson Road Stage 1 would be the final element of the construction program. The proposal would connect into the eastern road stub of Stage 1.

Once connection is completed the temporary road connecting Stage 1 with Jersey Road would be removed and the property returned to the original property owner.

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.

A key consideration for construction planning is the proposed temporary closure of Railway Terrace to construct the Burdekin Road tie-in to the rail bridge. Access for substation and local businesses along Burdekin Road would be maintained throughout construction, and existing traffic and construction traffic would be diverted via Alex Avenue and Hambledon Road connecting to Schofields Road. Further information on the proposed diversion is provided in section 3.3.8.

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 sites
- Utility relocations
- Vegetation clearing and grubbing
- Stripping, stockpiling and management of topsoil and unsuitable material
- Earthworks preparation
- Bulk earthworks
- Structural work, including reinforced soil wall and bridges

- Drainage work
- Pavement and median construction
- Landscaping
- Installation of permanent traffic control signals
- Finishing work including installation of safety barriers, noise walls, fencing, pavement marking, signposting, and street lights
- Finalising of the connection with Stage 1 and removal of the Stage 1 temporary connection with Jersey Road
- Removal of construction compounds 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 works	<ul style="list-style-type: none"> • 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 • Minor clearing works • Minor topsoil stripping • 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
Site establishment	<ul style="list-style-type: none"> • Construction of access roads for main alignment • Establishment of on-site compounds • Clearing of vegetation and stockpiling of mulch materials • 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	<ul style="list-style-type: none"> • Stripping topsoil and stockpiling for reuse in batter stabilisation • 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

Construction activity	Typical activities
Drainage and structures	<ul style="list-style-type: none"> • 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
Utilities and ITS	<ul style="list-style-type: none"> • Relocation and protection of utilities to suit staging • Installation of backbone conduit and pit network
Bridge construction	<ul style="list-style-type: none"> • Establishment of bridge satellite work compounds • 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	<ul style="list-style-type: none"> • Construction of base and sub-base pavement layers • Construction of pavement drainage including kerb and gutter as required • Construction of pavements both rigid and flexible • Construction of medians and barriers • Construction of pavement wearing course
Finishing Work	<ul style="list-style-type: none"> • Final pavement line marking • Installation of noise walls • Signposting • Street lighting • Landscaping and tree planting • Reinstatement of disturbed surfaces (eg Construction compounds) • Demobilisation

3.3.2 Staging

The overall methodology for staging works would generally be to construct off-line to minimise impacts to traffic along existing Townson Road (Stage 1) and Aerodrome Drive (Veron Road). Where works on existing roads are required these would either be constructed under contraflow traffic management or under night work closures.

The exception to this would be the construction of the overbridge crossing over the T1 Western Line, where a site compound would be required to store and lift the bridge into place and construct the high earth embankment. To achieve this, Railway Terrace to Burdekin Road would need to be closed and diversions in place.

An outline of staging assumptions is provided in Table 3-4.

Table 3-4: Staging assumptions

Description	Criteria
Jersey Road	Jersey Road closed where it meets the proposal. Tie in from Stage 1 to the connection with the proposal to be built at night. To be used as site access by contractor.
Kerry Road	Kerry Road to be closed where it meets the proposal. To be used as site access by contractor.
Veron Road intersection	Aerodrome Drive (Veron Road) intersection would be constructed as either nightworks or contraflow during the day (to be confirmed with external stakeholders). Aerodrome Drive (Veron Road) to be utilised for new road alignment and for site access to both Eastern Creek bridge and rail bridge construction.
Siding Terrace (between Alcorn Street and Anson Street)	Siding Terrace to be closed between Alcorn Street and Anson Street due to road/bridge construction.
Railway Terrace / Burdekin Road	Railway Terrace to be closed and access for substation to be maintained throughout construction. Private access for local businesses located on Burdekin Road and Railway Terrace to be maintained throughout construction. Once construction works commence on Burdekin Road, Railway Terrace will be terminated in a cul-de-sac and through traffic would be stopped. Railway Terrace traffic would be required to seek an alternative route.
Main alignment – through lanes	Three metres (minimum) or to match existing where existing is less than three metres.
Other roads	Three metres (minimum) or match existing where existing is less than three metres.
Shoulders (nearside and offside)	0.5 metres (minimum).
Design Speed	Varies dependent on location of works. Maximum 40 kilometres per hour where workers are exposed to live traffic.

3.3.3 Construction workforce

The construction workforce is expected to fluctuate depending on the stage of construction and associated activities. The workforce is expected to peak at about 80 personnel per day. The final number of construction workers would be identified by the construction contractor.

3.3.4 Construction duration and hours

Construction of the proposal is anticipated to start in 2026, opening to traffic in 2028. Construction is anticipated to take approximately 78 weeks, during this time it is anticipated that approximately 150,000 personnel hours would be required to complete the project.

Standard work hours

Standard construction hours would be adopted in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) as shown in Table 3-5. Most construction activities would be undertaken during this time.

Table 3-5: 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 for the following:

- The delivery of materials such as oversize plant and large construction equipment required outside approved construction hours by the police or other authorities for the safety of road users and the public
- Bridge work such as the lifting and setting of bridge spans
- Road tie-in works required at the eastern and western connections (road pavement, medians, final wearing course and pavement marking)
- Traffic management to reduce any potential delays to road users and to provide increased safety for construction personnel
- Utility relocation adjacent to the existing roadways to avoid and minimise disruptions for utility customers, reduce delays to road users and provide an increased safety to construction personnel.

Construction of the rail bridge would be carried out during rail possession periods which would also include out-of-hours work.

If required, out-of-hours work times would be confirmed by the contractor, and are likely to be between Monday to Friday 8 pm to 5 am. Weekend work may be required, subject to permitted road occupancy licences, construction staging and rail possessions. 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.

3.3.5 Plant and equipment

A range of plant and equipment would be used during construction. The final equipment and plant requirements would be identified by the construction contractor. An indicative list of plant and equipment is provided in Table 3-6.

Table 3-6: 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
Rockbreakers	Compacters

3.3.6 Earthworks source and quantity of materials

The proposal would involve earthworks. The estimated quantities of materials associated with earthworks are provided in Table 3-7.

Table 3-7: Indicative earthwork quantities

Material	Volume (cubic metres)
Spoil (removal)	7,000
Imported select material	150,000

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 road pavement and infrastructure
- Construction of Townson Road, new road pavement, footings, drainage, kerbs and footpaths
- Construction of the rail bridge embankment.

The proposal would mainly require fill to be imported from outside of the site as there is very little cut within the design. The small amount of soil from cut in the construction footprint is assumed suitable for reuse as general fill, apart from top soil which would be reused for landscape areas, where possible. 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.

The following structures would require demolition:

- The Stage 1 temporary Jersey Road connection
- The existing Burdekin Road connection.

3.3.7 Temporary drainage and water management

Temporary sediment basins would be installed near Eastern Creek to detain and treat stormwater prior to release to Eastern 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.

3.3.8 Traffic management and access

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 final 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 is a section of existing pedestrian facilities along Burdekin Road within the construction footprint. There are also other pedestrian and shared paths alongside the proposal site along Alcorn Street, Anson Street and Siding Terrace which would be crossed by the proposal. Appropriate wayfinding signage would be used to guide pedestrians through the construction area, including temporary footpaths, if required.

Traffic management

A Traffic Management Plan (TMP) would be prepared in accordance with Transport for NSW *Traffic Control at Work Sites* (TfNSW, 2020) 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, Aerodrome Drive (Veron Road), Railway Terrace and Burdekin Road.

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

Table 3-4 outlines indicative staging for the construction program. This indicates the period that roads would be temporarily and permanently closed for the project.

Durham Road would remain open to traffic throughout the construction works, until completion of proposal; then traffic is moved onto the proposal once construction is completed.

Changes to bus routes 734 and N71 would be required as a result of the permanent closure of Railway Terrace which would commence during the construction phase. Other road traffic would also need to seek alternative routes once construction at the Burdekin Road / Railway Terrace location commences.

Rail possessions

A vehicular and pedestrian bridge would be constructed over the T1 Western Line. This would include associated retaining walls and embankments before tying into Burdekin Road.

Work over the rail line would be carried out during rail possession periods. This would require several possessions to complete lifting and placing the girders and to lay the deck slabs for the new bridge.

This would be carried out in consultation with Sydney Trains.

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 3-8.

Table 3-8: Construction traffic estimates

Vehicle type	Total number of vehicles per day (average)	Total vehicle movements per day (average)
Employee cars	40	80
Light construction vehicles and utilities	24	96
Heavy vehicles and trucks	10	40

3.4 Ancillary facilities

Potential construction compound site locations have been identified in Table 3-9 and are shown on Figure 1-2.

Table 3-9: Proposed compound sites

Site name	Activities and facilities	Point of access
CA	<ul style="list-style-type: none"> • Buildings, office, toilets/amenities • Workforce parking • Potential storage of chemicals and fuels • Stockpile and laydown areas. 	Kerry Road and Jersey Road
C1b	<ul style="list-style-type: none"> • Buildings, office, toilets/amenities • Workforce parking • Potential storage of chemicals and fuels • Stockpile and laydown areas. 	Kerry Road and Jersey Road
C2	<ul style="list-style-type: none"> • Temporary compound that would be established specifically for works relating to construction of the rail bridge. 	Aerodrome Drive (Veron Road) and Siding Terrace
C3a	<ul style="list-style-type: none"> • Buildings, office, toilets/amenities • Workforce parking • Potential storage of chemicals and fuels • Stockpile and laydown areas. 	Railway Terrace and Burdekin Road
C3b	<ul style="list-style-type: none"> • Buildings, office, toilets/amenities • Workforce parking • Potential storage of chemicals and fuels • Stockpile and laydown areas. 	Burdekin Road

The establishment of the compound sites 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 Transport for NSW *Stockpile Site Management Guideline* (Roads and Maritime, 2015) and the Transport for NSW 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 Eastern Creek and rail 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, where feasible:

- At least 40 metres away from the nearest waterway
- Of low ecological and heritage conservation significance
- At least 40 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 Senior Environmental Officer 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 3-10.

Table 3-10: Identified utilities in close proximity to the proposal

Utility	Utility provider	Description
Electricity/street lighting	Endeavour Energy	New steel standard streetlights would be required throughout the project to bring street lighting up to current standards and to light the wider carriageway.
Gas	Jemena	There is a 500 mm transmission gas main located at the western end of the proposal site. It is proposed to design a slab to protect this asset combined with the Caltex fuel line in-situ.
Fuel	Caltex	There is an existing fuel line located at the western end of the proposal site in the same easement as the Jemena gas main. It is proposed to design a slab to protect this asset combined with the Jemena gas main in-situ
Phone/internet	Telstra, NBN	There is not a large amount of Telstra assets with most areas having one 100 mm duct.
Water/sewer	Sydney Water Council Private	<p>The following potable water assets have been identified in the project area. The majority of these assets require relocation to either the new footpath or clear of the earthworks.</p> <ul style="list-style-type: none"> • 500 mm CICL • 450 mm DICL • 250 mm uPVC/DICL/CICL • 180 mm PE • 150 mm CICL/oPVC • 100 mm CICL/mPVC. <p>There are a number of sewer and water mains affected by the works. The works may also necessitate raising the surface fittings of the maintenance pits located in Aerodrome Drive.</p>

Utility	Utility provider	Description
Intelligent Transport Systems (ITS)	Transport for NSW	Electrical and communication conduits to provide the ITS for the proposed signalised traffic control systems at Aerodrome Drive (Veron Road) intersection. These will be located within the shared path.

3.6 Property acquisition

Eight existing residential properties and three lots which are within residential development land, have the potential to be fully or partially acquired as a result of the proposal.

Properties impacted by acquisition are listed in Table 3-11. 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 property owners.

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

Table 3-11: Proposed property acquisition

Description	Lot and DP	Area of acquisition (m ³)	Full / partial acquisition	Current owner
42 Jersey Road Schofields	27/12076	1347	Partial	Private- residential
32 Jersey Road Schofields	26/12076	920	Partial	Private- residential
25 Jersey Road Schofields	B/376106	1553	Partial	Private- residential
15 Jersey Road Schofields	C/376106 A	3514	Partial	Private- residential
9 Jersey Road Schofields	D/376106	3855	Partial	Private- residential
87 Kerry Road Schofields	21/12076	887	Partial	Private- residential
82 Kerry Road Schofields	20/12076	8730	Partial	Private- residential
181A Burdekin Road Schofields	B/377217	1005	Partial	Private- residential
Townson Road reservation subdivision, Nirimba Fields	217/1241538	22293	Partial	Government
Un-numbered development land, Burdekin Road Quakers Hill	2/846728	223	Partial	Private- residential
Un-numbered development land, Burdekin Road Quakers Hill	4/837354	269	Partial	Private- residential

Description	Lot and DP	Area of acquisition (m ³)	Full / partial acquisition	Current owner
Un-numbered development land, Burdekin Road Quakers Hill	5/837354	27	Partial	Private- residential

The property listed in Table 3-12 is to be acquired for the temporary road connection between the Townson Road Stage 1 proposal and Jersey Road. This temporary road connection would be removed as part of the proposal and would be returned to its original owner.

Table 3-12: Proposed return of 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	Previously RU4

In addition to the proposed location for the compound site (refer to Figure 1-2), Table 3-13 lists the properties alongside the proposal site where additional land would need to be leased to support the construction activities. Leasing requirements would generally comprise a small strip of land along side the proposal to accommodate the construction works.

Leasing requirements, such as the area of land required are preliminary at this stage, but would be as small as possible. The need for lease arrangements would be confirmed by the contractor and consultation regarding agreements would be undertaken with the identified landowners prior to work commencing.

Table 3-13: Proposed leasing requirements

Description	Lot and DP	Current owner	Activity required for	Preliminary lease area (m ²)
42 Jersey Road Schofields	27/12076	Private-residential	Construction work area	2,466
32 Jersey Road Schofields	26/12076	Private-residential	Construction work area	1822
20 Jersey Road Schofields	25/12076	Private-residential	Construction work area	176
61 Durham Road, Schofields	A/376106	Private-residential	Construction work area	215
25 Jersey Road Schofields	B/376106	Private-residential	Construction work area	2533
15 Jersey Road Schofields	C/376106	Private-residential	Construction work area	3992

Description	Lot and DP	Current owner	Activity required for	Preliminary lease area (m ²)
9 Jersey Road Schofields	D/376106	Private-residential	Construction work area	5035
87 Kerry Road Schofields	21/12076	Private-residential	Construction work area	2304
82 Kerry Road Schofields	20/12076	Private-residential	Construction work area	2125
Un-numbered development land, Aerodrome Drive Nirimba Fields	218/1241538	Private-residential	Construction work area	3682
Un-numbered development land, Aerodrome Drive Nirimba Fields	219/1241538	Private-residential	Construction work area	2202
Un-numbered development land,, Aerodrome Drive Nirimba Fields	215/1241538	Private-residential	Construction work area	132
Roadside verge, Aerodrome Drive Nirimba Fields	216/1241538	Government	Construction work area	1822
Roadside verge, Aerodrome Drive Nirimba Fields	591/1241538	Government	Construction work area	15
Roadside verge, Aerodrome Drive Nirimba Fields	590/1241538	Government	Construction work area	308
138 Burdekin Road Schofields (veterinary centre)	7/652627	Private-residential/Commercial	Temporary leasing of a strip of land in this property adjacent to Burdekin Road would be required for utilities work. This would impact the properties car park area and access. Leasing requirements, duration and construction works would be discussed with the landowner. Construction work area	1155

Description	Lot and DP	Current owner	Activity required for	Preliminary lease area (m ²)
134 Burdekin Road, Schofields	11/31797	Private-residential	Temporary leasing of a strip of land in this property adjacent to Burdekin Road would be required for utilities work. Construction work area	1005
181A Burdekin Road Schofields	B/377217	Private-residential	Construction work area	1441
Un-numbered development land, Burdekin Road Quakers Hill	2/846728	Private-residential	Construction work area	959
Un-numbered development land, Burdekin Road Quakers Hill	4/837354	Private-residential	Construction work area	925
Un-numbered development land, Burdekin Road Quakers Hill	5/837354	Private-residential	Construction work area	263
191 Burdekin Road, Schofields	2/1142477	Government	Construction work area	3088
Un-numbered, infrastructure	11/1190259	Government	Location for utilities and Sydney Trains access road	3507
279D Burdekin Road, Schofields	12/1190259	Government	Location for replacement sedimentation basin.	4996
Un-numbered, Burdekin Road Quakers Hill (Sydney Trains substation)	1/1142477	Government	Leasing arrangements would be developed in consultation with Sydney Trains but would not impact the substation compound ie the area within the security fencing and the three metre buffer boundary.	803

3.7 Detailed design

The proposal assessed in this REF is based upon the concept design. Further refinement of the proposal would be developed during detailed design. This will consider submissions received on the REF from the community and stakeholders and continued consultation with Blacktown Council and other Agencies. The following aspects of the proposal would be developed during detailed design:

- The rail bridge including its proximity to Siding Terrace in terms of clear zones
- Extent of tie-ins to local roads and private property access impacted by the proposal, to accommodate the rapidly changing built environment surrounding the proposal
- Shared path connectivity at Burdekin Road
- Updated traffic analysis impacting the layout of the Aerodrome Drive (Veron Road) intersection
- Final drainage and basin design
- Further assessment of the feasibility and details of noise walls.

4. Statutory planning framework

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

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

Section 2.108 of the Transport and Infrastructure SEPP 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 the roads authority, it can be assessed under Division 5.1 of the EP&A Act.

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

Part 2.2 of the Transport and Infrastructure SEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by the Transport and Infrastructure SEPP (where applicable), is discussed in section 5 of this REF.

Central River City SEPP

The Central River City SEPP is the legal instrument that establishes the planning rules and objectives for the designated Central River 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 Area.

Biocertification

Under section 126G of the now repealed *Threatened Species Conservation Act 1995*, the Minister applied the principle of Biodiversity Certification to the Central River City 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 Central River City 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 construction footprint comprise non-certified lands, areas not previously assessed. This comprises predominately riparian areas along Eastern Creek. The non-certified areas include 0.21 hectares of Cumberland Plain Woodland critically endangered ecological communities (CEEC), which corresponds to the BC Act community listing. There is a total of 0.35 hectares of River-flat Eucalypt Forest EEC (as listed under the BC Act) within the proposal site that is within non-certified land. There would be no impact to any vegetation which corresponds to threatened ecological communities listed under the EPBC Act.

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 'existing native vegetation' (ENV) within non-certified lands.

Some areas of vegetation in the study area are identified as ENV. Patches of ENV comprising River-flat Eucalypt Forest EEC occur within the Eastern Creek corridor and comprise around 0.20 hectares 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 trigger consultation requirements under section 3.24 of the Central River City SEPP as it would involve clearing of native vegetation on land that is not subject land.

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.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

The proposal is located on land to which the State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) applies. The proposal does not require consent under the Biodiversity and Conservation SEPP, however, under section 9.3(1)(b), the matters listed under sections 9.4 and 9.5 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 the Biodiversity and Conservation SEPP

Consideration	Comment
Section 9.4	
9.4(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.
9.4(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.
9.4(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.
9.4(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.
Section 9.5	
9.5(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 3.4 and 3.3.7) with the future development of the catchment in mind.
9.5(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 sections 6 and 7, would be implemented to minimise impacts on environmentally sensitive areas such as waterways (refer to section 6.4 for further detail).
9.5(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).

Consideration	Comment
9.5(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.
9.5(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 sections 6.7 and 6.8.
9.5 (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.
9.5(7) The scenic quality of the riverine corridor must be protected.	The proposal would not impact on the scenic quality of the Nepean River.
9.5(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 Table 3-11. Measures identified in this REF would help minimise impacts to surrounding land uses including agriculture.
9.5(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.
9.5(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.
9.5(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.
9.5(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 RU4 (Primary Production Small Lots). The construction footprint also crosses and impacts on land zoned SP2 (Infrastructure), E4 (Environmental living) and 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 of 1 March 2022, the State Environmental Planning Policy (Infrastructure) 2007 has been consolidated and repealed into the Transport and Infrastructure SEPP. As the proposal is permitted without consent under Transport and Infrastructure SEPP, 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
<i>Protection of the Environment Operations Act 1997</i> (POEO Act)	<p>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.</p> <p>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.</p>	<p>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 10,000 tonnes of material.</p> <p>As such, an EPL would not be required.</p>

Act	Potential approval requirement	Relevance to the proposal
<i>Biodiversity Conservation Act 2016 (BC Act)</i>	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) or Biodiversity Development Assessment Report (BDAR) is required.	The proposal would not result in significant impacts to any listed flora, fauna or communities, and a SIS or BDAR 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.
<i>Fisheries Management Act 1994 (FM Act)</i>	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 Eastern 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.
<i>Biosecurity Act 2015</i>	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.
<i>National Parks and Wildlife Act 1974</i>	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 partially impact on two Aboriginal sites. Further information is provided in section 6.7.

Act	Potential approval requirement	Relevance to the proposal
<i>Heritage Act 1977</i>	<p>Approval under section 60 is required for work to a place, building, work, relic, moveable object, precinct, or land listed on the State Heritage Register.</p> <p>An excavation permit is required under section 139 to disturb or excavate any land containing or likely to contain a relic.</p>	<p>No listed items would be impacted by the proposal.</p> <p>Further information is provided in section 6.8.</p>
<i>Roads Act 1993 (Roads Act)</i>	<p>Section 138 of the Roads Act requires that a person must not carry out 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.</p>	<p>Burdekin Road and Railway Terrace are unclassified roads managed by Blacktown City Council.</p> <p>The proposal would be constructed by the roads authority. Council is exempt under Section 138 from needing to obtain consent or a road occupancy licence for work on an unclassified road.</p>

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 section 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 section 6.6 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. Section 6.6 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 affect 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 section 2.108 of the Transport and Infrastructure SEPP 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.

The roads authority is the proponent for the proposal. Construction of the proposal would be managed by the roads authority. This REF fulfills the road authorities 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 Eastern 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 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
- Consultation with local businesses was carried out in October 2019 introducing the proposal (Stage 1 and Stage 2 of the Townson Road Upgrade) and inviting business owners to a 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
- Socio-economic impact assessment-specific consultation was undertaken with Blacktown City Council, NSW Ambulance and NSW Fire and Rescue to confirm the social baseline including community values and character, and to discuss the potential socio-economic impacts 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	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 sections 3.6, 6.11 and 6.12.
	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	Concern about access to properties during operation.	Operational traffic arrangements and impacts are discussed in sections 3.2 and 6.1.
	Has traffic modelling been done to assess the current uses of the road and the impact of heavy vehicles on the road?	Traffic modelling has been undertaken as part of the REF for the proposal. Further traffic modelling will be carried out at detailed design to account for the progress of the proposed precinct developments. Section 6.1 discusses the traffic and transport impact assessment.
	Are there any pedestrian crossings along the new road?	Crossings are provided at Aerodrome Drive (Veron Road) at all four approaches. Pedestrian access would be maintained along Siding Terrace, under the new bridge. The road design is discussed in section 3.2 and shown in Appendix C
	Can there be an underpass instead of an overpass?	No, an underpass has been explored as part of the design. However, there are potential significant flooding issues if there was an underpass due to the road level relative to Eastern Creek and surrounding areas The road design is discussed in section 3.2 and shown in Appendix C.
	Will Stage 1 and Stage 2 be built together?	If funding for Stage 2 is confirmed in time then yes, although it is unlikely.
Is this required to facilitate the new development in Schofields?	This project is part of a wider North West Growth Area transport strategy to support development in the region. The need for the proposal is discussed in section 2.1.	

Group	Issue raised	Response/where addressed in REF
	Will the Bridge over Eastern Creek be even higher than Schofields Road bridge?	Yes, the road would be higher than Schofields bridge under the current design proposed. The road design is discussed in section 3.2 and shown in Appendix C.
	What is the impact of the overpass traffic on local traffic / is it an overpass like at Quakers Hill?	Traffic modelling has been carried out as part of the REF to determine impacts on the road network. Section 6.1 discusses the traffic and transport impact assessment.
	How high will the overpass in Stage 2 be?	The overpass would be around 10 metres in height. In addition, the bridge would include infrastructure such as safety barriers and noise walls. The road design is discussed in section 3.2 and shown in Appendix C.

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

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, who developed the concept design on behalf of the roads authority, invited Aboriginal stakeholders who hold knowledge relevant to determining the cultural heritage significance of Aboriginal objects and Aboriginal places in the proposal area, 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 Kelleher 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 should be provided for consultation with relevant stakeholders six months prior to application for an AHIP. Consultation would need to be undertaken again if it is outside of the six month window. All registered Aboriginal stakeholders would be provided with a 28 day period for review. Stakeholders would also be invited to attend a meeting during the review period to discuss the draft report and assessment findings.

5.4 Transport and Infrastructure SEPP consultation

Sections 2.10 to 2.16 of the Transport and Infrastructure SEPP 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 (section 2.15) or development that impacts on:

- Council related infrastructure or services (section 2.10)
- Flood liable land (section 2.12).

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 Transport and Infrastructure SEPP .

A letter was issued to Council in June 2021. 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 worked with Blacktown City Council to develop the proposal. Transport for NSW has developed the concept design on behalf of the roads authority and therefore also led the consultation activities during this period of proposal development.

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 section 3.24 of the Central River City SEPP, Transport for NSW must give written notice to DPE 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.

Table 5-3: Summary of stakeholder feedback

Agency	Issue raised	Response
Utility providers	<ul style="list-style-type: none"> Concerns with the complexity of relocating some utilities. Consultation is required with utility owners if any adjustments required. 	<p>The proposed utility adjustments are discussed in section 3.5. This includes consultation requirements and any required relocations. Mitigation measures are provided in section 7.</p>
Blacktown City Council	<ul style="list-style-type: none"> 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. 	<p>The proposal design is discussed in section 3. Proposed landscaping options are discussed in section 3.2.4. Blacktown City Council would continue to be consulted as the design progresses and landscaping options are confirmed.</p>
	<ul style="list-style-type: none"> There is a lack of transport infrastructure including roads and public transport in Marsden Park. Some developers have provided a shuttle bus to connect new residents to public transport. 	<p>The strategic need for the proposal is discussed in section 2.1 and the proposal objectives are outlined in section 2.3.1.</p>
	<ul style="list-style-type: none"> The proposal area has a rural character, and the surrounding areas are currently undergoing significant change. It is likely the resident profile will change due to development. 	<p>A socio-economic impact assessment has been carried out for the proposal. This is provided in Appendix N and summarised in section 6.12.</p>
	<ul style="list-style-type: none"> Some families in the area have been living there for several years. Change may be difficult for some residents, however, Council does not expect a proposal of this nature raising significant community concern. There is potential that new residents moving into developments will not be aware of the proposal, which has the potential to affect local amenity and character. There is potential for these residents to be concerned about the proposal. 	

Agency	Issue raised	Response
NSW Ambulance	<ul style="list-style-type: none"> Agency notes that 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	<ul style="list-style-type: none"> Agency notes that it is 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.

5.6 Consultation of the REF

Transport for NSW would continue to consult with the community and relevant stakeholders during development of the concept design of the proposal. The REF would be placed on public display for comments. 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.

5.7 Ongoing and future consultation

The roads authority will develop the detailed design and manage the property acquisition process and construction of the proposal. The roads authority will therefore continue the consultation process through these phases. Key consultation activities would include:

- Prepare and implement a stakeholder engagement and community engagement strategy during detailed design
- Consult with businesses through the detailed design phase to ensure that businesses are given notice of any design features and construction activities that may impact their business operations

- Consult with impacted property owners. Property adjustment plans would be developed in consultation with the affected property owners
- Consult with key stakeholders such as Sydney Train and utility companies.

At detailed design, property access arrangements for properties impacted by the proposal, will be reviewed and revised to accommodate the built environment at that time.

6. Environmental assessment

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 principle of the design requires the proposed intersections in the proposal corridor to accommodate the future traffic growth when the connection to Burdekin Road is implemented, forming an east-west corridor south of Schofields Road. The intersection analysis considered the new Townson Road and Aerodrome Drive (Veron Road) intersection.

An intersection analysis has been carried out for the proposed Townson Road / Aerodrome Drive (Veron Road) intersection. This assessment considered average delay and level of service (LOS) during key peak travel times. Where LOS is categorised as: 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.

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 the roads authority. 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. The signposted speed limit is 60 kilometres per hour.

At the time of construction of the proposal, Townson Road would have been upgraded and extended as shown in Figure 6-1. This would include pedestrian and shared paths and additional intersection into planned future development areas.

Local Roads

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

Meadow Road is located to the west of the proposal. Durham Road, Jersey Road and Kerry Road intersect with the western end of the study area. These roads form a residential ring road west of Eastern Creek. Meadow Road connects Townson Road with rural residential land surrounding the ring road which connects to Carnarvon Road and South Street, Schofields.

These local roads are sealed, with a posted speed limit of 60 kilometres per hour. There is no existing street lighting other than one light at the intersection with Durham Road. There are no pedestrian facilities provided.

Aerodrome Drive (Veron Road), Alcorn Street, Anson Street and Siding Terrace

Aerodrome Drive (Veron Road), Alcorn Street, Anson Street and Siding Terrace are relatively new local roads within the Altrove Estate a new residential area being developed as part of the NWGA. These comprise undivided roads with one lane in each direction, with no line marking. Posted speed limits are 60 kilometres per hour.

Burdekin Road and Railway Terrace

Burdekin Road and Railway Terrace are located at the eastern side of the study area. Railway Terrace is around one kilometre in length extending from Schofields Road to the north till it merges into Burdekin Road. Burdekin Road then extends east for around two kilometres.

These roads are sealed, with a posted speed limit of 60 kilometres per hour. These comprise undivided roads with two lanes in each direction, line marking and street lighting. Railway Terrace narrows into one lane in each direction plus an overtaking lane towards its northern end.

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.



Legend

- The proposal *Subject to detailed design
- ▭ Construction footprint (Stage 2)
- The proposal (Stage 1) *Subject to detailed design
- ▭ Construction footprint (Stage 1)
- ⊕ Train Station
- Roads
- Railway
- ▭ Cadastre

N

0 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Figure 6-1 Traffic and transport network

Whilst every care has been taken to prepare this map, GHD (and Neamap) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

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 – total per hour		Heavy vehicles – total per hour	
	Morning Peak (7.15 – 8.15)	Evening Peak (4.45 – 5.45)	Morning Peak (7.15 – 8.15)	Evening Peak (4.45 – 5.45)
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

Schofields Station and Quakers Hill Station are the two railway stations which are closest to the Townson Road to Burdekin Road Corridor. The stations are serviced by the T1 Western Line and the T5 Cumberland Line, providing trains to the City and Leppington respectively, via Blacktown and Parramatta.

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 the existing Townson Road and Bus route 734 that operates along Burdekin Road.

Table 6-3: Bus services operating from Schofields Station

Route	Coverage	Frequency
734	Riverstone to Blacktown via Schofields interchange (using Burdekin Road to access Schofields Station)	Weekday 37 services Weekend 17 services
	Blacktown to Riverstone via Schofields interchange (using Burdekin Road to access Schofields Station)	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 services Weekend 6 services
	Rouse Hill to Marsden Park	Weekday 15 services Weekend 6 services
748	Marsden Park to Rouse Hill, via Schofields interchange (using South Street/Railway Terrace to access Schofields Station)	Weekday 49 services Weekend 34 services
	Rouse Hill to Marsden Park, via Schofields interchange (using South Street/Railway Terrace to access Schofields Station)	Weekday 49 services Weekend 34 services
N71	Richmond to City Town Hall via Schofields interchange (using Burdekin Road to access Schofields Station)	Weekday 5 services Weekend 5 services
	City Town Hall to Richmond via Schofields interchange (using Burdekin Road to access Schofields Station)	Weekday 5 services Weekend 5 services

Source: TfNSW 2019

Pedestrian and cyclist facilities

There are no pedestrian or cycleway provisions along the existing Townson Road. However, the Stage 1 Townson Road upgrade includes pedestrian and shared path facilities which would be completed prior to the proposal being constructed.

Towards the east of the proposal site, an off-road shared path is available on the northern side of Burdekin Road. The shared path begins at where Burdekin Road connects with 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.

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

An estimate of construction traffic volumes is provided in Table 3-8. The expected volume of construction personnel trips is low and is not expected to impact the operation of the adjoining road network. The increases in traffic movements are considered to be low and fall within typical daily fluctuations. Heavy vehicle movements are not expected to impact the operation of the adjoining road network.

Parking

It is anticipated that parking for construction personnel would be restricted to the designated compound sites 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.

Construction of the proposal would result in the loss of about 35 informal parking spaces on Railway Terrace, across from the intersection at Stoke Street. It is likely that commuters travelling from Schofields Station utilise this area as a car park when the formal commuter car park spaces are fully occupied. The loss of this parking space would likely reduce parking availability for some commuters. This may increase the time taken to find parking.

Public transport

Bus routes N71 and 734 both access Schofields Station interchange using Burdekin Road. This route would be closed when Railway Terrace is closed to change it into a cul-de-sac.

Due to the rapidly changing built environment surrounding the proposal, local bus routes should be reviewed again during detailed design of the proposal as existing bus routes may have changed to accommodate the new residential developments.

Work over the rail line would be carried out during routine rail possession periods. No additional rail possessions would be required specifically for this proposal. Therefore, no additional impacts to the rail network are anticipated.

Operation

Intersection analysis

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	14720	1310	1360
	Medium Density Residential	Schofields Road	940	90	90
Altrove	Medium Density Residential	Aerodrome Drive (Veron Road) South	940	90	90
	High Density Residential	Internal local street to Schofields Road	2280	290	230
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	7700	680	710
	Medium Density Residential	planned new road North Aerodrome Drive (Veron Road) North	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

The proposed layout of the Aerodrome Drive (Veron Road) intersection is shown in Figure 3-3. The modelled layout of Townson Road and Aerodrome Drive (Veron Road) intersection used for the traffic assessment was a preliminary design of this intersection. The assessment was based on the following configuration:

- Northbound approach left and through lane converted to a left, through and right-turn lane, with original short 70-metre right-turn lane
- Southbound approach full-length through and left lane converted to a through lane and left turn slip lane, with original short 70-metre right-turn lane
- Both eastbound and westbound approaches have two full-length through lanes (one is a shared through and left turn lane) and a short-150 metre right-turn lane.

Pedestrian crossings were included on all approaches with staged crossings on eastern and western approaches and full crossings on northern and southern approaches.

Table 6-6 shows the predicted performance of the Townson Road / Aerodrome Drive (Veron Road) intersection for 2026. This considers average delay in seconds (s) and LOS during key peak travel times.

Table 6-6: Performance of the Townson Road / Aerodrome Drive (Veron Road) intersection 2026

Intersection	AM peak 6:15 - 7:15 am		AM peak 7:15 - 8:15 am		PM peak 3:45 - 4:45 pm		PM peak 4:45 - 5:45 pm	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Southbound	52	D	92	F	121	F	139	F

Intersection	AM peak		AM peak		PM peak		PM peak	
	6:15 - 7:15 am		7:15 - 8:15 am		3:45 - 4:45 pm		4:45 - 5:45 pm	
Eastbound	39	C	45	D	30	C	29	C
Northbound	38	C	51	D	203	F	201	F
Westbound	40	C	41	C	32	C	31	C
Total	41	C	52	D	64	E	66	E

Table 6-7: Performance of the Townson Road / Aerodrome Drive (Veron Road) intersection 2036

Intersection	AM peak		AM peak		PM peak		PM peak	
	6:15 - 7:15 am		7:15 - 8:15 am		3:45 - 4:45 pm		4:45 - 5:45 pm	
Direction of travel	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Southbound	121	F	139	F	223	F	204	F
Eastbound	37	C	48	D	29	C	29	C
Northbound	54	D	108	F	202	F	207	F
Westbound	61	E	65	E	36	C	36	C
Total	62	E	76	F	73	F	71	F

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

The Aerodrome Drive (Veron Road) / Townson Road intersection was assessed in forecast year 2026 and 2036. It has been predicted to operate at a LoS C and Los E, for the AM and PM peaks, respectively, by 2026 or upon opening.

Under the current projection, the intersection is anticipated to marginally exceed capacity by 2036 resulting in a 76 second delay, which is classified as LoS F. This is under the assumption that growth continues to be substantial for traffic generated from the development and the future mode-shift toward public transport is low. The current land use assumptions and the adopted traffic generation rates are considered conservative, and acknowledged to have space to be reduced, providing better connectivity with public transport for future residents along the Townson Road corridor. This may include provision of a Metro station or extended bus operations. It is anticipated the travel mode of the study area has a propensity to change and impact in favour of the operational performance at this intersection over the long term, due to the following reasons:

- The assessment was undertaken based on a conservative approach that 80 per cent of the traffic from the Altrove development and private properties would access Townson Road via Aerodrome Drive (Veron Road). Provided an additional 10 per cent of traffic from the new development would utilise Schofields Road in the north, the intersection would operate within capacity by 2036.
- The predicted traffic delay was around 76 seconds, or six seconds beyond the threshold of Level of Service F, by 2036 for the AM peak. Assessment based on a linear traffic growth indicated that it would only exceed the capacity by 2034, mainly due to the traffic from Aerodrome Drive (Veron Road) whilst Townson Road would maintain LoS C. When required, an additional short right turn lane at the northbound approach on Aerodrome Drive (Veron Road) could be provided. If delivered by 2034, it is predicted to enable this intersection to operate within capacity at 2036.
- The future interconnectivity of Quakers Road to Townson Road and the future local network is anticipated to absorb and redistribute a proportion of the peak demand, suggesting an opportunity to extend the design life and serviceable capacity of the Townson Road / Aerodrome Drive (Veron Road) intersection.

Local Road network and access

A number of changes to the local road network would result from the proposal. These are discussed in section 3.2.3. In summary, Railway Terrace would be terminated with a cul-de-sac turn head arrangement just south of Stoke Street and Jersey Road and Kerry Road would be dissected by the proposal as part of the growth area precinct plan.

At the time of undertaking traffic modelling to assess the operational impacts, the closure of Railway Terrace was not considered. Additional high-level assessment was undertaken in March 2021, based on the strategic modelling plots provided by Transport for NSW. The analysis indicated that during peak periods (two hours) in 2036 up to 1,500 vehicles will be diverted from Railway Terrace to the local network. These vehicles would mainly use Aerodrome Drive (Veron Road), Grima Street, Alex Avenue and Hambledon Road. The network traffic model would be reviewed at detailed design to confirm and update the network capacity and flow assumptions for an accurate representation of network performance.

Parking

The proposal would result in the loss of about 35 informal parking spaces on Railway Terrace, across from the intersection at Stoke Street. It is likely that commuters travelling from Schofields Station utilise this area as a car park when the formal commuter car park spaces are fully occupied. The loss of this parking space would likely reduce parking availability for some commuters. This may increase the time taken to find parking.

Property access

Due to the rapidly changing built environment and the proposed future precinct planning, the design has not presented access arrangement to some property locations off Burdekin Road, Jersey Road and Kerry Road. Access to all existing properties impacted by the proposal, at the time of construction would be provided. At detailed design, access arrangements will be reviewed and revised to accommodate the built environment at that time. Property adjustment plans would be developed in consultation with the affected property owners.

6.1.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	<p>A revised traffic assessment will be prepared prior to detailed design to account for the changes to the built environment and road network. This should include:</p> <ul style="list-style-type: none"> • Review of the network traffic model to confirm and update the network capacity and flow assumptions into the intersection modelling for an accurate representation of intersection performance • New traffic counts • Review and revise if necessary, the opening and future scenario years • Review the Aerodrome Drive (Veron Road) intersection arrangement • Consider if the study area should extend further east of the proposal area. 	Roads authority	Detailed design	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	<p>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:</p> <ul style="list-style-type: none"> • 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	Additional safeguard
Emergency services access	<p>Consultation with emergency service authorities will be undertaken during development of the detailed design and maintained throughout construction as the proposal progresses.</p>	Roads authority/ 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: <ul style="list-style-type: none"> • Vehicle types/maximum size which can negotiate the road network • Coordination to prevent queuing or double parking. 	Contractor	Construction	Additional safeguard
Worker parking	Provision of parking within the compound sites for workers and construction vehicles.	Contractor	Construction	Additional safeguard
Road closures	<ul style="list-style-type: none"> • Traffic guidance schemes (TGS) 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	Core standard safeguard T3
Pedestrian and cyclists	<ul style="list-style-type: none"> • 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 2022 (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, 2020)
- 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.

It is noted that there are significant residential developments within the study area which will likely be constructed prior to the approval of this proposal. This scope of this assessment has only considered properties that have been constructed prior to February 2021.

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
- Assessing the potential construction vibration impacts to sensitive receivers
- Providing mitigation measures where required.

Construction traffic haulage routes have not been finalised at the time of this assessment. Construction traffic noise impacts have therefore not been included within this assessment.

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 baseline assessment year (2019), opening year (2028) and the future design year (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
- Identifying where mitigation measures, such as a noise wall or at property treatments may be required.

The operational study area considers all structures located within 600 metres from the centreline of the outermost lane of traffic on each side of the proposal. This assessment does not consider increased traffic noise impacts on the surrounding road network outside the operational study area. Traffic data for these roads was not available at the time of the assessment.

6.2.2 Existing environment

Sensitive receivers

The study area has been categorised into six separate noise catchment areas (NCAs). The 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 6-2 and summarised in Table 6-8.

Table 6-8: Sensitive receivers within 600 metres of the proposal

NCA	Location	Description	Land Use Zones	Sensitive receiver buildings
NCA03	Stonecutters Ridge estate	Medium density residential development, Stonecutters Ridge Golf course and Sunningdale Reserve	RE1 RE2 R3 W1	429 residential 5 active recreation
NCA04	Jersey Road / Durham Road / Kerry Road	Mainly homesteads on large rural properties	RU4 SP2	51 residential
NCA05	Altrove Estate, north of Alcorn Street	Medium density residential development; Altrove Estate	SP2 B2 R3 R2 RE1 E4 E2	484 residential

NCA	Location	Description	Land Use Zones	Sensitive receiver buildings
NCA06	New residential development, south of Anson Street	Some newly constructed residential developments, still under construction	E2 SP2 RE1 B2 R2	114 residential
NCA07	North of Burdekin Road between Railway Terrace and Hambledon Road	Medium density suburban residences, some industrial and commercial land uses	B2 B4 SP2 R3 RE1 R2	813 residential 4 industrial 14 commercial
NCA08	South of Burdekin Road between railway line and Hambledon Road	Medium density suburban residences, some commercial use, 2 schools (Goodstart Early Learning Quakers Hill and Hambledon Public School), and 1 medical facility	SP2 RE1 R2 E2	778 residential 1 commercial 14 educational institutes 1 medical facility

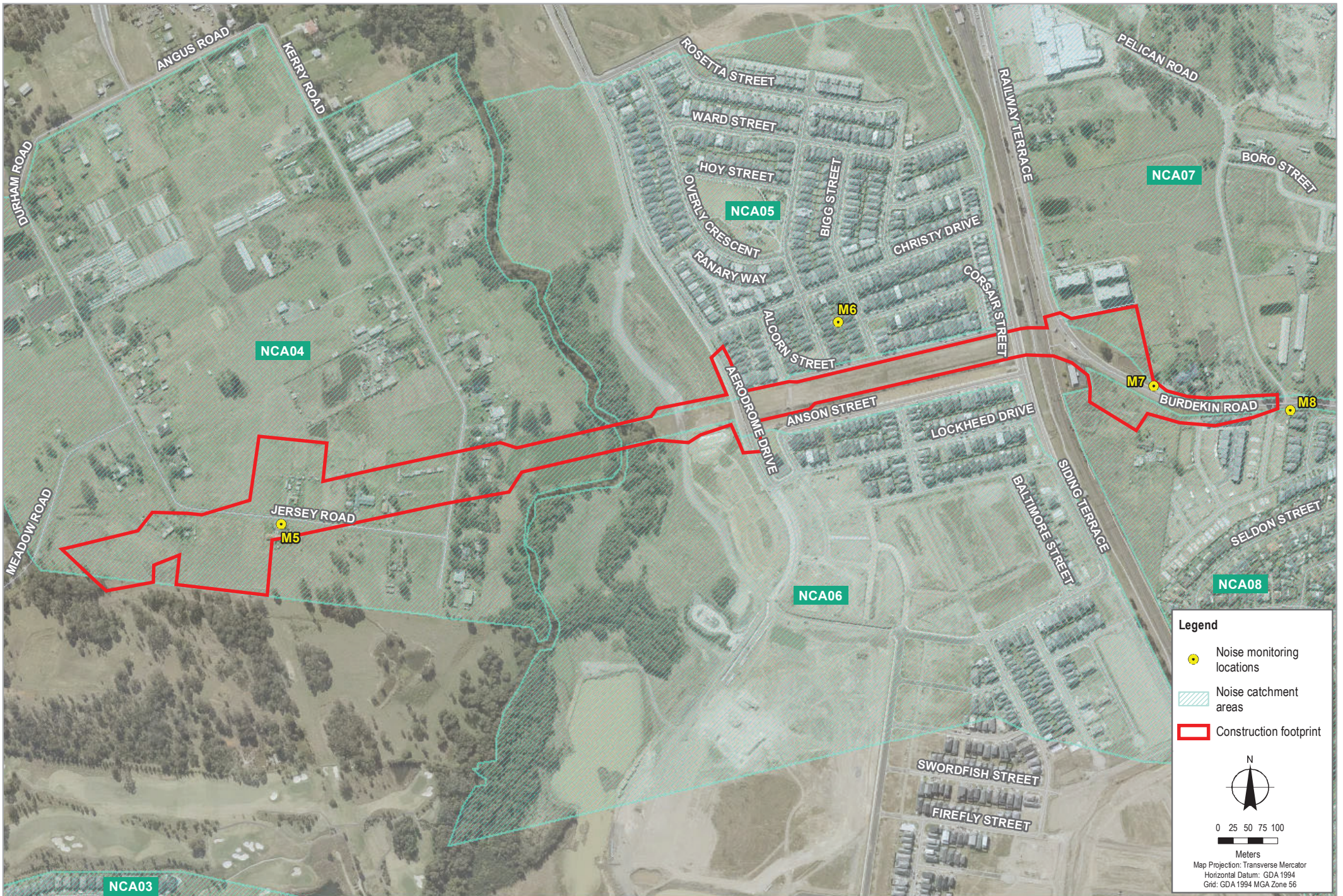


Figure 6-2 Sensitive receivers and noise catchment areas

Data source: MetroMap - Imagery (date extracted: 2/11/2021), General topography - DPI 2015. . Created by: eibbertson
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Existing noise environment

The study area comprises mainly low to medium residential development, commercial and industrial land uses. Monitoring locations are listed in Table 6-9 along with the NCA they represent. 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 6-9 and the location of the monitoring is shown on Figure 6-2.

Table 6-9: Summary of noise monitoring results, dBA

Monitoring location and address	NCA represented	Background noise descriptors ¹			Road traffic noise descriptors – full week			
		Day	Evening	Night	7 am to 10 pm	10 pm to 7 am	7 am to 10 pm	10 pm to 7 am
M3 - 66 Sunningdale Drive	NCA03 NCA05 NCA06	43	38	37	50	46	50	48
M4 - 75 Townson Road	-	41	37	37	62	56	64	60
M5 - 32 Jersey Road	NCA04	38	36	31	53	48	55	51
M7 - Quakers Hill Veterinary Hospital, 38 Burdekin Road	NCA07	44	43	30	66	60	67	64
M8 - 13 Tyla Crescent	NCA08	50	46	30	68	62	69	66

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 and public holidays; Night: 10 pm to 7 am, Monday to Saturday; 10 pm to 8 am Sunday and 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).

The proposal specific construction noise management levels and sleep disturbance criteria are provided in Table 6-10.

Table 6-10: 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 (NCA03, NCA05 and NCA06)	53	75	48	43	42	65
Residential (NCA04)	48	75	43	41	36	65
Residential (NCA07)	54	75	49	48	35	65
Residential (NCA08)	60	75	55	51	35	65
Educational institute	55 (External noise level)					
Medical facility	55 (External noise level)					
Commercial premises	70 (External noise level)					
Industrial premises	75 (External noise level)					
Active recreation	65 (External noise level)					

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 6-11 summarises the accepted and maximum value for human comfort impacts by intermittent vibration assessed using the vibration dose value.

Table 6-13 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.’

Table 6-11: 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 6-12.

Table 6-12: 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 6-13 shows the vibration levels in this standard for building damage criteria due to construction activities.

Table 6-13: Transient vibration guide values–minimal risk of cosmetic damage to buildings

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 NMG provides three triggers where a receiver may qualify for consideration of noise mitigation (beyond the adoption of road design and traffic management measures). These are:

- The predicted noise level exceeds the NCG controlling criterion and the noise level increase due to the proposal is greater than 2 dBA
- The predicted noise level is 5 dBA or more above the criteria and the receiver is significantly influenced by proposal road noise, regardless of the incremental impact of the project
- Where the cumulative limit does not apply, if the noise level contribution from the proposal is acute daytime 65 dB or higher, or night-time 60 dB or higher then it qualifies for consideration of noise mitigation even if noise levels are dominated by another roads.

6.2.4 Potential impacts

Construction

The construction activities have been grouped into 11 possible scenarios of the proposal. Table 6-14 provides a summary of the predicted exceedances of the construction noise criteria for each construction scenario. Table 6-14 lists exceedances for the separate construction scenario during standard working hours and Table 6-15.

Construction would result in a short-term increase in localised noise levels, particularly for residences close to the construction footprint. The predicted levels indicate that the noise management levels will be exceeded during both standard hours and out of hours works (night works). The results provided in Table 6-14 indicate that, without mitigation, construction noise may exceed the noise management levels at up to 673 sensitive residential receivers during standard construction hours. Table 6-15 indicate that up to 54 residential receivers are anticipated to exceed the sleep disturbance criteria during night pavement works.

It should be noted that the magnitude of off-site noise impacts associated with construction will be dependent upon a number of factors including the intensity and location of construction activities, the type of equipment used by the contractor, existing background noise levels, intervening local structures and the prevailing weather conditions. The predicted noise levels are considered worst-case and will decrease as the construction activity moves along the road corridor, away from affected receivers.

Table 6-14: Predicted number of exceedances of the Noise Management Level for the proposal

Receiver type	Number of exceedances above the NML (standard work hours) for each construction activity										
	CS01	CS02	CS03	CS04	CS05	CS06	CS07	CS08	CS09	CS10	CS11
Residential – Total	462	520	673	647	391	533	673	277	245	428	202
Residential – NCA03	1	2	7	2	1	2	7	0	0	1	1
Residential – NCA04	33	35	48	45	28	43	48	33	29	30	31
Residential – NCA05	239	250	307	279	212	334	307	144	126	228	84
Residential – NCA06	111	111	112	112	107	101	112	51	44	111	73
Residential – NCA07	43	81	147	157	22	34	147	19	19	29	10
Residential – NCA08	35	41	52	52	21	19	52	30	27	29	3
Residential – Highly noise affected > 75 dBA	51	67	100	102	31	13	100	15	14	45	12
Commercial	4	4	4	4	4	2	4	3	3	4	2
Industrial	0	0	1	2	0	0	1	0	0	0	0
Education, medical facility, active recreation	0	0	0	0	0	0	0	0	0	0	0

CS01-Enabling works / property demolition; CS02-Site establishment; CS03-Bulk earthworks; CS04-Utilities adjustment; CS05-Drainage and structures; CS06-Bridge construction; CS07-Pavement works - standard hours; CS08-Pavement works at tie-ins with demolition; CS09-Night pavement works (assessed for standard work hours); CS10-Finishing works; CS11-Construction compounds.

Table 6-15: Number of exceedances – outside standard construction hours, night period

Receiver type	Number of exceedances above the NML,	Sleep disturbance impacts > 65 dBA,
Residential – NCA03	298	0
Residential – NCA04	51	3
Residential – NCA05	419	34
Residential – NCA06	112	9
Residential – NCA07	780	2
Residential – NCA08	753	6
Residential – Highly noise affected > 75 dBA	14	1

Construction traffic

At the time of this assessment construction traffic haulage routes have not been finalised. As such, a construction traffic noise impact assessment has not been undertaken as part of this report. When the detailed construction staging of this proposal has been finalised, it is recommended that a construction traffic noise assessment is undertaken.

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 construction works, 23 buildings within the study area have been identified to 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.

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 (2028) and the design year (2038) for both build and no build options.

The controlling criterion from the NCG are predicted to be exceeded at 381 sensitive receivers who would therefore be considered for additional mitigation measures.

A breakdown of the extent and number of exceedances and the mitigation type are presented in Table 6-17 and shown on Figure 6-3. A detailed breakdown for each receiver is provided in Appendix I of Appendix F. The at-property treatment type (architectural treatment packages) relates to the level of exceedance in accordance with the *At-Receiver Noise Treatment Guideline* (Roads and Maritime, 2017).

A review of the feasibility of property treatments are therefore recommended for all impacted 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 and recommended architectural treatment type

At property mitigation type ¹	Exceedance of NCG criteria, dBA	Number of qualifying residences
Type 1	1-5	265
Type 2	6-8	83
Type 3	9-11	27
Type 4	12-14	3
Type 5	>14	0

Sleep disturbance

Sleep disturbance impacts are likely to be dependent on the following:

- Maximum noise level of an event
- Number of occurrences
- Duration of the event
- Level above background or ambient noise levels.

There is an expected increase in maximum noise level/sleep disturbance for all NCA as the new or upgraded road will increase traffic through each area. Impacts at NCA5 and NCA6 are expected to be the greatest due to the existing noise levels being low. Most receivers may be exposed to more frequent maximum noise events due to the increased traffic volumes on the road. A total of 109 additional receivers are predicted to experience potential maximum noise level impacts.



Figure 6-3 Receivers exceeding operational noise criteria

Data source: MetroMap - Imagery (date extracted: 4/05/2022), General topography - DPI 2015. . . Created by: eibbertson
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Pedestrian crossing operation noise

Operational noise impacts from the installation of pedestrian audio tactile devices at residential receivers has been assessed. As part of the signalised intersection at the Townson Road / Aerodrome Drive (Veron Road) intersection pedestrian crossing lights will be installed.

The results indicate that based on a standard crossing signal modelled in accordance with *AS2353-1999 Pedestrian push-button assemblies Clause 3.3.6*, up to three residential receivers are predicted to exceed the sleep disturbance criteria. The settings of the crossing correspond to high, normal and low output and represented a volume adjustment potential of 6 dBA. If a maximum volume adjustment of 6 dBA is incorporated, then a residual exceedance of 3 dBA above the criteria is predicted at only one receiver. All other receivers are predicted to experience noise levels below the criteria with the volume adjustment.

Operational vibration

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

Low noise road pavements and noise barriers

Following completion of the noise assessment further design options were reviewed to identify measures to reduce the number of receivers impacted by operational noise.

Design measures would be considered in locations where there are four or more closely spaced receivers that trigger noise mitigation. Groups of four or more closely spaced receivers were identified along the proposal within the study area. These are located along the eastbound and westbound alignments of the proposed new section of Townson Road, between its intersection with Aerodrome Drive (Veron Road) and the tie-in with Burdekin Road.

Low noise pavement is not considered feasible for bridge sections between Aerodrome Driveway (Veron Road) and the tie-in with Burdekin Road.

Noise mounds are not considered feasible for the project as there is insufficient space to construct noise mounds.

Noise walls have been investigated as part of this noise assessment. Two walls have been considered as part of this study; one along the eastbound alignment and one along the westbound alignment through the Altrove development. Additional feasible and reasonable considerations would be taken into account to determine the final barrier height that would be constructed. These include:

- Constructability of a wall on a viaduct. This may require a review of the wind loads and maintenance requirements of the barrier
- Visual impacts.

Inclusion of noise walls would reduce the number and extent of sensitive receivers impacted that are shown on Figure 6-3 and listed in Table 6-17. The change would be dependent on the position and height of these features, to be determined at detailed design.

6.2.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction traffic noise	When the detailed construction staging of this proposal has been finalised, it is recommended that a construction traffic noise assessment is undertaken.	Roads authority Contractor	Detailed design	Additional safeguard
Noise and vibration	An Addendum Noise and Vibration Impact Assessment will be prepared to capture any newly constructed residential developments since this publication of this report, for inclusion in the assessment and consideration for mitigation treatments where required. The assessed buildings would be reviewed during detailed design to ensure impacts at structures that have been constructed or approved prior to approval of the proposal have been considered.	Roads authority / Contractor	Detailed design	Additional safeguard
Operational noise	Consideration of noise walls will be further assessed during detailed design. This would determine the feasible and reasonable position, extent and height of structures.	Roads authority /Contractor	Detailed design	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and vibration	<p>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 <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> • All potential significant noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented, taking into account <i>Beyond the Pavement: Urban design approach and procedures for road and maritime infrastructure planning, design and construction</i>, (TfNSW 2020) • 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 <i>Environment Protection</i>
Community consultation	<p>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 ENMM Practice Note (vii) provides community consultation procedures for road work outside normal working hours. The notification will provide details of:</p> <ul style="list-style-type: none"> • The proposal • The construction period and construction hours • Contact information for proposal 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
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	<p>All employees, contractors and subcontractors are to receive an environmental induction. The induction must include:</p> <ul style="list-style-type: none"> • 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	<p>Management of construction related traffic or traffic reroutes should as a minimum include the following controls:</p> <ul style="list-style-type: none"> • Scheduling and routing of vehicle movements • Speed of construction related heavy vehicles should be limited to 40 km/hr along haul routes on local roads • 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 from machinery and equipment	<p>The use and selection of machinery and equipment will:</p> <ul style="list-style-type: none"> • 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	Additional safeguard
Hours of construction activity	<p>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.</p> <p>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.</p>	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Extended duration of noise and vibration activity	<p>Where receivers are highly noise affected, 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.</p> <p>Where receivers are highly noise affected, 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.</p>	Contractor	Construction	Additional safeguard
Road noise	<p>The NMG recommends noise mitigation in the following order of preference:</p> <ul style="list-style-type: none"> • Quieter road pavement surfaces • Noise mounds • Noise barriers (noise walls) • At-property treatments. 	Contractor	Detailed design	Additional safeguard
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	Detailed design	Additional safeguard
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.	Roads authority	Operation	Additional safeguard

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 assess 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

Eastern Creek is a tributary of South Creek and lies within the Hawkesbury River catchment. Eastern Creek drains a catchment of 118 square kilometres to the confluence with South Creek. The catchment area of Eastern Creek comprises an area of 93 square kilometres upstream of the proposal. The catchment extends 17 kilometres to the south and rises from 15 metres Australian Height Datum (AHD) at Townson Road to 155 metres AHD at Horsley Park at the southern extents in the Western Sydney Parklands. The location of water bodies is shown on Figure 6-5.

The catchment contains a mixture of urban, commercial and rural land uses. Further regional development is planned in the vicinity of the proposal as part of the North West Priority Growth Area and Western Sydney Employment Area proposals. This regional development would include residential and commercial development which may impact on the hydrology of the broader Eastern Creek catchment.

Flooding

During periods of heavy rainfall within the Eastern Creek catchment, there is potential for the capacity of the various creek channels to be exceeded leading to inundation of the adjoining floodplain. During large floods, a separate flood runner forms on the west side of the Eastern Creek floodplain.

In the existing 1 in 100 year flood event (one per cent Annual Exceedance Probability flood), the floodwater in the area of the proposal extends to around Kerry Road in the west and to the boundary with the Altrove Estate residential development on the eastern side of the floodplain. In addition, an unnamed tributary of Eastern Creek is located near Burdekin Road to the east of the Altrove Estate and rail line.

The modelled flood level of Eastern Creek in the area of the proposal varies from 17.85 metres AHD on the western edge of the floodplain to 18.13 metres AHD on the eastern side. The unnamed tributary of Eastern Creek located near Burdekin Road is modelled at 28.04 metres AHD.

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. 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 towards 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

Flood levels

Impacts are predicted on the flood behaviour of Eastern Creek and the general hydrology of the study area during the operational phase of the proposal. In the 1 in 100 year flood event, modelling predicts increases from around 0.02 metres to 0.4 metres due to the new structures being proposed across the floodplain. This is an increase from the existing flood levels.

The maximum flood level 1 in 100 year event impacts on the western side of the floodplain is 0.24 metres and occurs near Kerry Road. On the eastern side of the floodplain the maximum flood level impact is 0.4 metres and is near the Burdekin Road connection. Elsewhere impacts are generally around or below 0.1 metre.

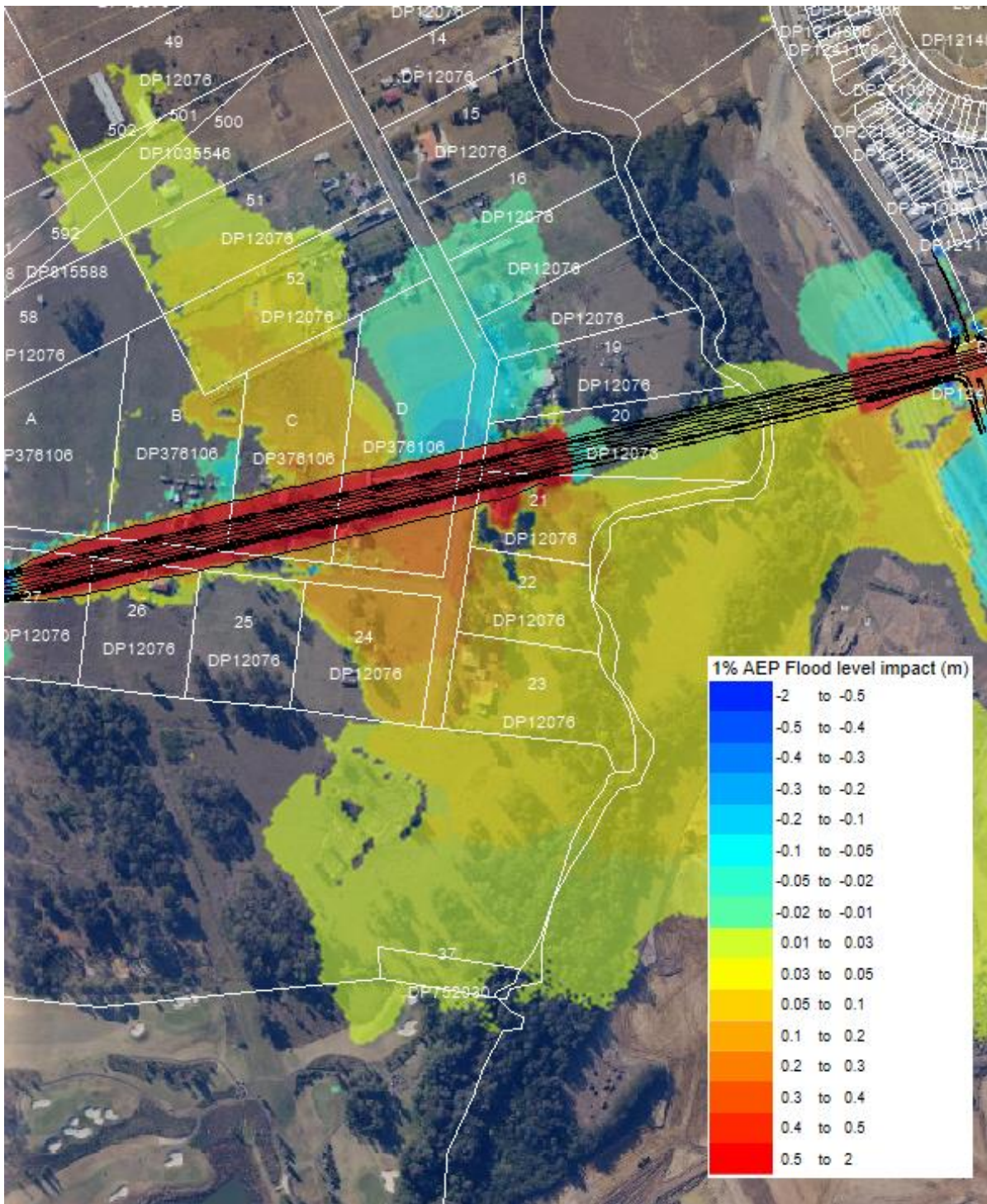


Figure 6-4: Eastern Creek western floodplain, predicted 1 in 100 year flood event impacts

The predicted flood level increase near Burdekin Road would be mitigated as part of the detailed design by providing adequately sized basin outlet works which would be designed to reduce the increase to an acceptable impact.

East of Aerodrome Drive (Veron Road) stormwater is conveyed towards Eastern Creek in a grass lined channel that runs parallel to Townson Road with a culvert under Aerodrome Drive (Veron Road) discharging to the creek. Flows from the development on north side of Townson Road are conveyed to this channel by a culvert which has been constructed across the Townson Road corridor. The detailed design would accommodate this culvert under the Townson Road embankment. The design would make allowance for major flows that exceed the culvert capacity to be conveyed along the north side of Townson Road and across Aerodrome Drive (Veron Road) to Eastern Creek.

Currently there are a number of properties that may be impacted by increased flood levels upstream and downstream of Townson Road on the western floodplain. The predicted flood level increase on the western floodplain occurs in land that is proposed to be rezoned as drainage land as shown in West Schofields Precinct Plan (draft, 2018). Properties currently located within the land affected by flood level increases would be acquired prior to construction of the proposal.

Property floor level surveys would be carried out by Transport for NSW prior to the detailed design phase to identify the potential for adverse flood impacts to existing buildings affected by flood level increases. Following this a review of the proposed future West Schofields precinct land use zonings would be carried out along with the development of an acquisition strategy to ensure that appropriate development controls are in place prior to construction of the proposal.

Flood evacuation routes

Blacktown City Council Growth Centre Precincts Development Control Plan 2010 requires that all road systems in the Schofields precinct affected by the maximum flood level have a safe evacuation route. The proposal will not alter the opportunity for evacuation to higher ground during either a local or regional flood.

Other routes that could be used for evacuation would not be affected.

Velocity impacts and scour

Velocities in Eastern Creek for the 1 in 100 year event reach a maximum of 2.5 metres per second (m/s) in the main channel and generally up to 1.5 m/s on the floodplain. The modelling predicts no discernible increases in velocity across the floodplain, other than at the bridge abutments and in the vicinity of the culvert inlets and outlets. Scour protection in the form of rip rap would be limited to the bridge abutments and culvert inlets and outlets in close proximity to the project with the extent of scour protection required to be determined as part of the detailed design stage.

Climate change impacts

Climate change impacts have been assessed using Australian Rainfall and Runoff 2019 (ARR 2019) guidelines (Reference 2). The ARR 2019 guidelines recommend that climate change should be considered for the design of significant infrastructure.

For this assessment, a 15 per cent increase in rainfall intensities due to climate change has been considered to assess how flooding conditions may alter in future along Bells Creek.

The assessment shows that flood levels for the 1 in 100 year event could increase by up to 0.13 metres over the area assessed. Townson Road would remain trafficable for the 1 in 100 year event.

6.3.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Drainage design	<p>Ensure appropriate integration with Council’s stormwater network. Design will include:</p> <ul style="list-style-type: none"> 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. 	Roads authority /Contractor	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.	Roads authority/ Contractor	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 creek channel.	Roads authority/ Contractor	Detailed design	Additional safeguard
Western floodplain impact	If the road is planned to be constructed prior to the rezoning and property acquisition on the western floodplain, the design will include mitigation measures to prevent unacceptable flood level increases at existing properties. Existing buildings will be surveyed prior to commencement of the detailed design to enable design of suitable flood mitigation works should these be required.	Roads authority/ TfNSW	Pre-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

Impact	Environmental safeguards	Responsibility	Timing	Reference
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
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) <i>Guidelines for controlled activities on waterfront land – Riparian corridors (2018)</i> .	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 I.

6.4.1 Methodology

The potential impacts of the proposal were assessed by collating data from public data sources and previous studies. A number of tasks were undertaken to assess the potential impacts and involved:

- 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 and 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 construction footprint is located within the Eastern Creek Catchment which flows from a south to north direction. The Eastern Creek catchment ultimately flows into South Creek and the Hawkesbury River in the broader Hawkesbury-Nepean surface water 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 products and tourism resources for the Sydney Metropolitan area.

The assessment includes review of groundwater and surface water receptors across a study area which extends around two kilometres from the construction footprint.

Surface Water

The closest surface water body to the proposal is Eastern Creek, in the central area of the construction footprint. Eastern Creek is a tributary of South Creek and flows from prospect reservoir, in the south, and eventually draining into the Hawkesbury River about 13 kilometres north of the proposal. The Eastern Creek catchment has an area of about 36 square kilometres. Recent assessment of the riparian vegetation in the creek indicates both native species and invasive weeds (Blacktown City Council 2018). A significant length of the creek is located within natural reserve areas and parkland.

The *Waterway Health Report Card 2017-2018* (Blacktown City Council 2018) shows that the existing health of the northern extent of the Eastern Creek waterway has generally been considered good (grade B) since 2014 but has fallen to fair (grade C) in 2018. This has been due to an observed reduction in water quality and associated waterbug diversity indicating the creek may have been affected by water pollution.

The existing waterway health of the southern extent of Eastern Creek has generally been considered good or fair (grade B or C) since 2014 and remains at good (grade B) in 2018 (BBC 2018). Water quality has been reported to be variable for the year 2018 however the waterbug community is generally consistent with good diversity and abundance

Land uses within the Eastern Creek catchment include medium density residential buildings, commercial and industrial development, small scale agriculture, sports fields and nature reserves areas. The proposal is located approximately in the middle of the catchment area and will intersect with Eastern Creek.

Surface water features are shown on Figure 6-5.

Groundwater

A review of existing groundwater borehole records identified 21 groundwater bores located within two kilometres of the construction footprint (refer to Figure 6-5). All were registered as monitoring bores with the exception of five where the registered purpose was not listed. The depth of the bores ranged between 6.0 metres and 20.5 metres. The closest borehole to the proposal is about 547 metres north west of the site with a standing water level not recorded.

It appears that groundwater use is limited with the exception of providing a base flow to waterways. Although there is no existing data, the Department of Infrastructure, Planning and Natural Resources (2003) predicts that high salinity potential is expected in the vicinity of Eastern Creek and moderate salinity potential for the remainder of the construction footprint.

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 6-5.

A conceptual groundwater model was prepared based on the available data for the study area. The groundwater level has been conservatively assumed to be 1.3 metres below ground level. It is assumed to flow northerly towards Bells Creek or Eastern Creek. Groundwater quality data is limited in existing boreholes.

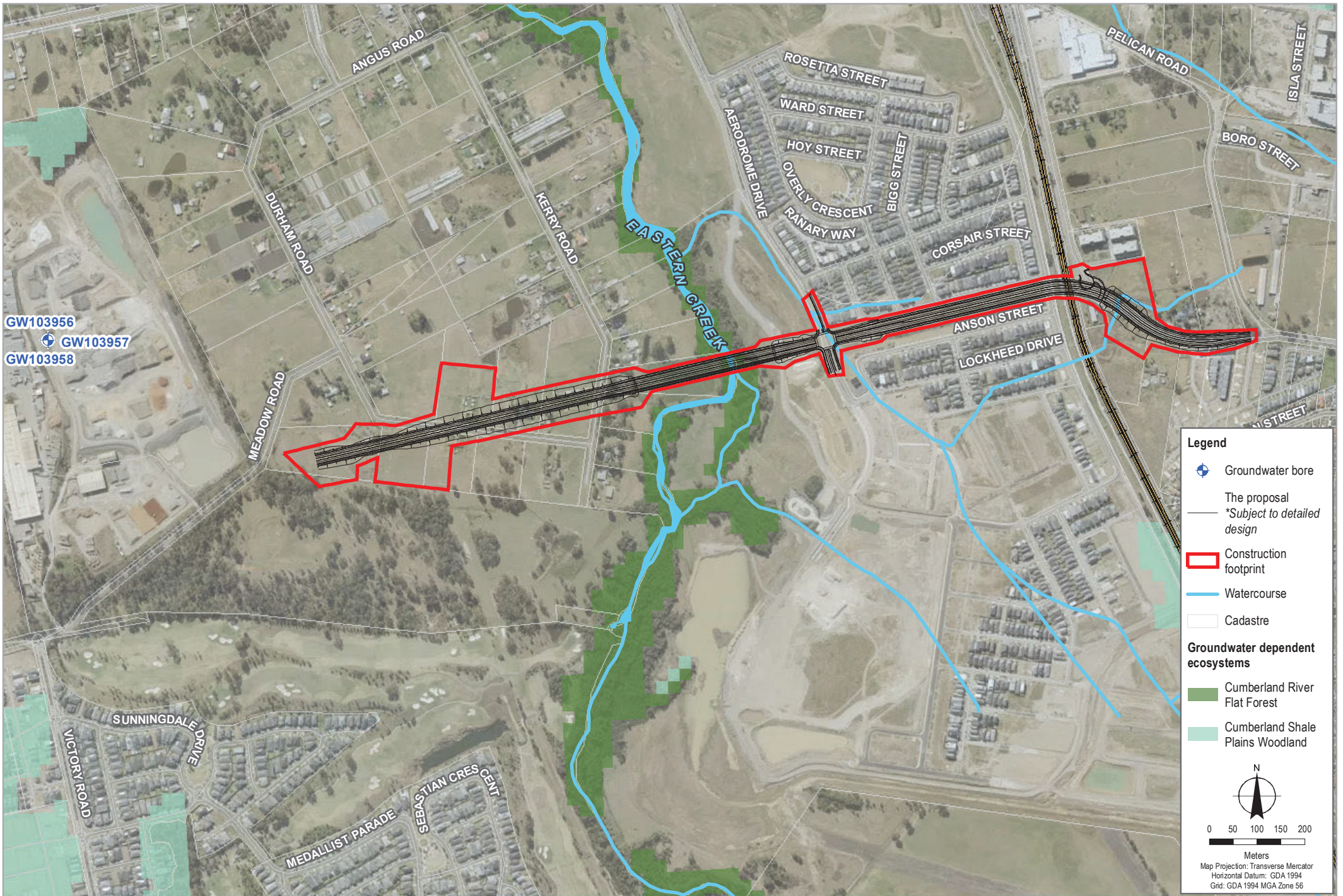


Figure 6-5 Surface water features, groundwater bores and groundwater dependent ecosystems

Data source: MetroMap - Imagery (date extracted: 26/10/2021), General topography - DPI 2015, Roads - DSFI 2021, Created by: eilbertson
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Print date: 26 Oct 2021 - 11:32

Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

6.4.3 Potential impacts

Construction

Surface water

Construction activities have the potential to impact on water quality within local receiving waters, including Eastern 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.

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.

The construction of a new length of Townson Road – Burdekin Road corridor would increase impervious areas. This could result in increased generation of surface runoff, thereby increasing the rate at which litter and other pollutants are conveyed to receiving waterways. The contamination of waterways by these pollutants can result in habitat degradation and negatively impact on the health of aquatic flora and fauna species. The increase in impervious area due to the proposal is small considering the catchments of the receiving watercourses are already significantly impervious. Consequently, there is expected to be little impact on the overall catchment water quality. Where practical and where space allows, the adoption of water sensitive urban design guidelines and the construction of drainage basins would minimise pollutants reaching the surrounding watercourses.

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 1.3 metres below the existing ground level. However, there is potential for construction to encounter and impact groundwater with work near the Vernon Road intersection, stormwater basin pits, and service relocation pits. 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 1.3 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 nine 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 Eastern Creek viaduct 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 3.2.5. 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 3.2.5). Two drainage basins would be provided for the operation of the project, to cater for the road run-off and capture existing overland run-off. It is anticipated the basins would be re-sized during detailed design once the overall growth area precinct is fully ascertained.

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

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.

The proposal includes the provision of two stormwater basins. It is predicted that even under worst case conditions that any interception of groundwater is likely to be very minor and extremely localised. Installation of impermeable liners or redesign during detailed design to a shallower depth where they may intercept groundwater would minimise further potential risks to groundwater ingress.

6.4.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Erosion and sedimentation	<p>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:</p> <ul style="list-style-type: none"> 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). <p>The SWMP would detail the following as a minimum:</p> <ul style="list-style-type: none"> 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	<p>Core standard safeguard SW2</p> <p><i>QA G38 Soil and Water Management</i></p>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> 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. 			
Erosion and sedimentation	Existing natural soils or reused dispersive materials adjacent to or beneath drainage lines or culverts should be stabilised with gypsum. Additional treatments to prevent erosion such as rock armour or rip-rap at culvert inlets/outlets should also be considered and designed according to the recommended standards (Austroads 2013, Catchments and Creeks 2014, 2015, 2017).	Contractor	Pre-construction and construction	Additional safeguard
Water quality monitoring	A monitoring program of surface water and groundwater quality will be included as part of the CEMP to measure water quality outcomes against the ANZECC (2000b) and ANZG (2018) guidelines.	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
Spills	Further, existing open swale drains and any other open drainage channels provided through construction areas will help provide an opportunity to cut off, via emergency bunding where required, any spills and leaks that may begin running off-site or into underground stormwater drainage networks. This would be in the unlikely event of chemical spills or leaks occurring within the construction footprint.	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

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, 2003) 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 (CSIRO, 2007) 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 January 2021 for the suburbs of Schofields, Colebee and Quakers Hill. No listed contaminated sites were identified within, or in the vicinity of the construction footprint. The EPA notified sites list was searched on 22 January 2021 for the suburbs of Schofields, Colebee, and Quakers Hill. Three sites were identified, with the closest being about 1.7 kilometres north west of the proposal.

A search of the EPA POEO Act Register identified one current license 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	780 metres west

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

- 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 and 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 copper were also detected in surface water samples collected from Eastern Creek, which exceeded the adopted ecological freshwater criteria. 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 3.3.6, around 150,000 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 7,000 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 of the road would generally follow the existing terrain for much of the proposal boundary. The proposed rail bridge and reinforced soil wall through the Altrove Estate would introduce a new structure at this location.

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 Eastern 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 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	<p>A site specific Erosion and Sediment Control Plan will be prepared and implemented as part of the Soil and Water Management Plan.</p> <p>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.</p>	Contractor	Pre-construction	<p>Core standard safeguard E2</p> <p>Section 2.2 of <i>QA G38 Soil and Water Management</i></p>
Contaminated land	<p>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 roads authority Environment Manager and/or EPA.</p>	Contractor	Construction	<p>Section 4.2 of <i>QA G36 Environment Protection</i></p>
Accidental spill	<p>A site specific emergency spill plan will be developed, and include spill management measures in accordance with the <i>Roads and Maritime Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Blacktown City Council and EPA officers).</p>	Contractor	Pre-construction and construction	<p>Section 4.3 of <i>QA G36 Environment Protection</i></p>
Storage of materials	<p>Hazardous materials such as fuel and chemicals will be stored in suitably located bunded areas, in accordance with DECC's <i>Storing and Handling Liquids: Environmental Protection Participants Manual</i> (DECC, 2007).</p>	Contractor	Construction	<p>Additional safeguard</p>

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, 4 December 2019 and 5 May 2021 to identify the vegetation types, presence and extent of threatened species and ecological communities the study area. The field surveys focussed on the verification of vegetation types and extent of threatened ecological communities within the study area, identification and mapping of threatened species, and an assessment of the value of habitats present for threatened biota, with a particular focus on portions of the construction footprint in non-certified land. Rapid aquatic habitat assessments were also carried out.

The proposal is located within the NWGA, and largely consists of land certified under the Central River City SEPP. Biocertification removes the need to undertake threatened species assessments or prepare a species impact statement under the BC Act.

Activities in biocertified land have already been offset, and a determining authority is not required to consider the effect on biodiversity values of the activity in certified areas. This assessment therefore focuses on areas of non-certified land, which for this proposal are generally associated with the riparian zone along Eastern Creek.

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 K.

6.6.2 Existing environment

Vegetation

The construction footprint primarily comprises the existing roads and road reserve, as well as scattered patches of native vegetation and portions of rural residential blocks which have largely been cleared of native vegetation. Land uses within the construction footprint are typical for the area, which has been subject to historical broad scale vegetation clearing for agriculture.

There are some small market gardens, and land in the central portion of the study area was once part of the RAAF Schofields Aerodrome. Land surrounding this portion of the study area is now subject to substantial residential development as defence housing.

The majority of the area surrounding the proposal 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 land along the Eastern Creek riparian corridor.

The construction footprint occurs within the Cumberland IBRA (Interim Biogeographic Regionalisation for Australia) subregion of the Sydney Basin IBRA bioregion. Vegetation within the construction footprint is mapped as Shale Plains Woodland and Alluvial Woodland and is broadly in line with observations made in the field survey.

There are two native plant community types (PCT) within the construction footprint and proposal 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 study area is in a range of conditions, likely as a result of past and ongoing land uses in adjoining areas. Mature trees are scattered throughout stands of native vegetation within the study area, and there is regeneration of all canopy species evident within all stands of native vegetation. No hollow-bearing trees were recorded. There are a number of weed species, 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.

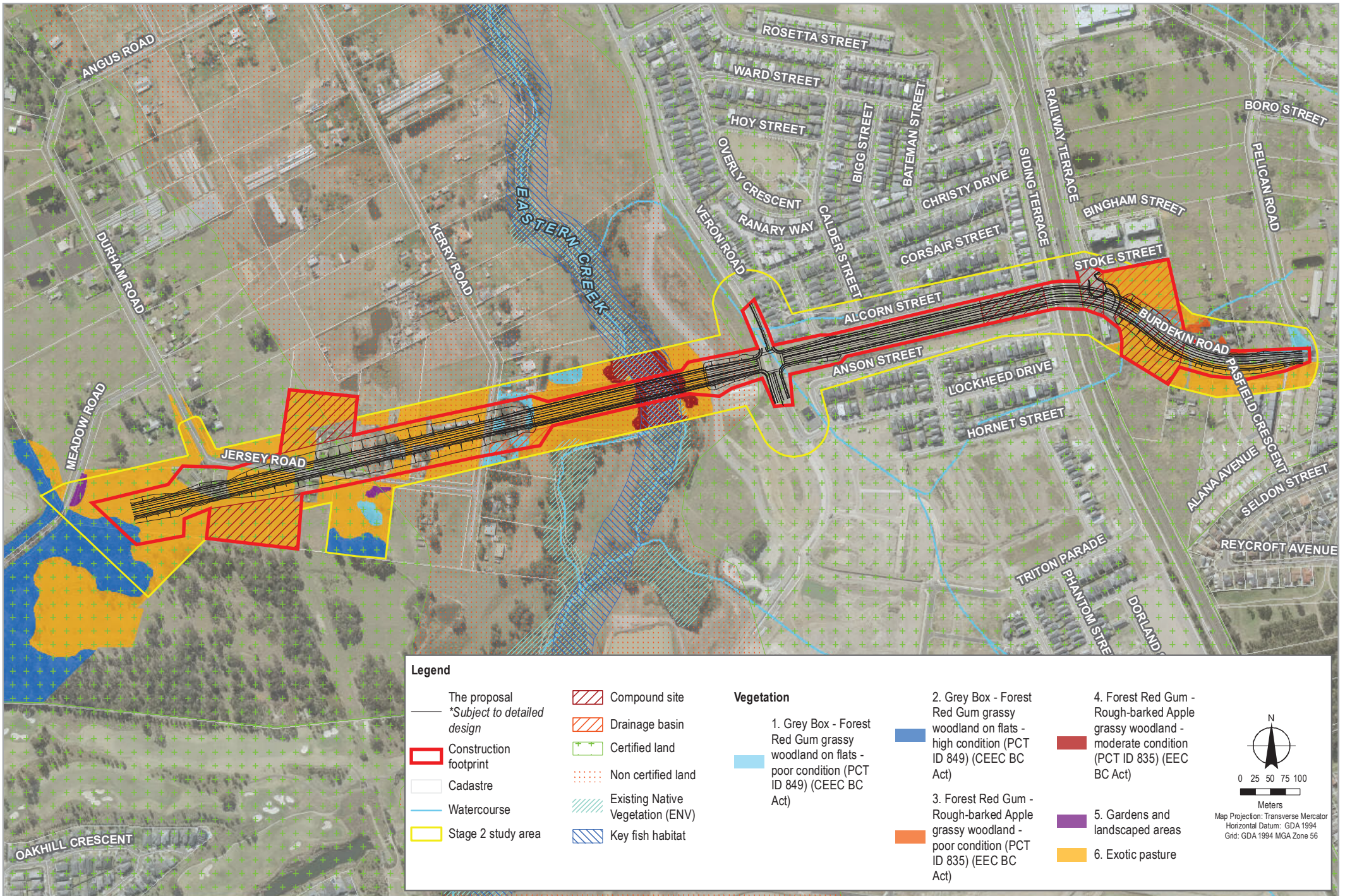
Details of plant community types are shown on Figure 6-6.

Fauna

Sixty-one species of fauna were recorded during the survey, of which thirty-six 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. Seven introduced species (five bird species and two mammal species) and two threatened species were recorded during the survey.

Habitat for terrestrial fauna is present within the construction footprint including cleared agricultural land, grassland, planted trees, scattered canopy trees some noted to be starting to form hollows (no hollow bearing trees observed), remnant/regenerating vegetation, dams, creek lines and culverts.

Eastern Creek is the only waterway intersecting the construction footprint. The waterway is 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. Previous surveys were completed about 750 metres north of the current construction footprint, along Eastern Creek. These surveys recorded 21 macroinvertebrate species, with very low numbers of species that are sensitive to changes in their environment, suggesting that the condition of the creek line was degraded at the time of the survey (GHD, 2013). 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.



Legend

- The proposal
**Subject to detailed design*
- Construction footprint
- Cadastre
- Watercourse
- Stage 2 study area
- Compound site
- Drainage basin
- Certified land
- Non certified land
- Existing Native Vegetation (ENV)
- Key fish habitat

Vegetation

- 1. Grey Box - Forest Red Gum grassy woodland on flats - poor condition (PCT ID 849) (CEEC BC Act)
- 2. Grey Box - Forest Red Gum grassy woodland on flats - high condition (PCT ID 849) (CEEC BC Act)
- 3. Forest Red Gum - Rough-barked Apple grassy woodland - poor condition (PCT ID 835) (EEC BC Act)
- 4. Forest Red Gum - Rough-barked Apple grassy woodland - moderate condition (PCT ID 835) (EEC BC Act)
- 5. Gardens and landscaped areas
- 6. Exotic pasture

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Figure 6-6 Plant Community Types

Data source: MetroMap - Imagery (date extracted: 26/10/2021) . General topography - DPI 2015, Roads - DSFI 2019, Key fish habitat, ENV, biocertification, threatened flora/fauna - OEH... Created by: eibertson

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Threatened species

Fauna

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

- 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.
- The Little Bent-wing Bat – tentatively identified via Anabat call recording within non-certified lands. The Little Bent-wing Bat would not breed within the study area as it uses specific nursery caves for breeding. This species is likely to forage along riparian corridors and amongst other patches of native vegetation.

Flora

Based on the results of the desktop review, thirty-nine threatened flora species or populations have been previously recorded in the locality or are predicted to occur (DPIE 2021a; DAWE, 2021). There is a large population of *Grevillea juniperina* subsp. *juniperina* immediately to the west of the Stage 2 construction footprint, within the Stage 1 construction footprint, however no individuals of this easily identifiable species occur within the Stage 2 construction footprint.

Broadly suitable habitat exists within high condition PCT 849 for one endangered population and one threatened flora species, 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 (0.63 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.

There are no areas of critical habitat or areas of outstanding biodiversity value (AOBV) as listed under the BC Act or EPBC Act of relevance to the study area.

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 Eastern 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 and threatened ecological communities within the study area are shown on Figure 6-7.

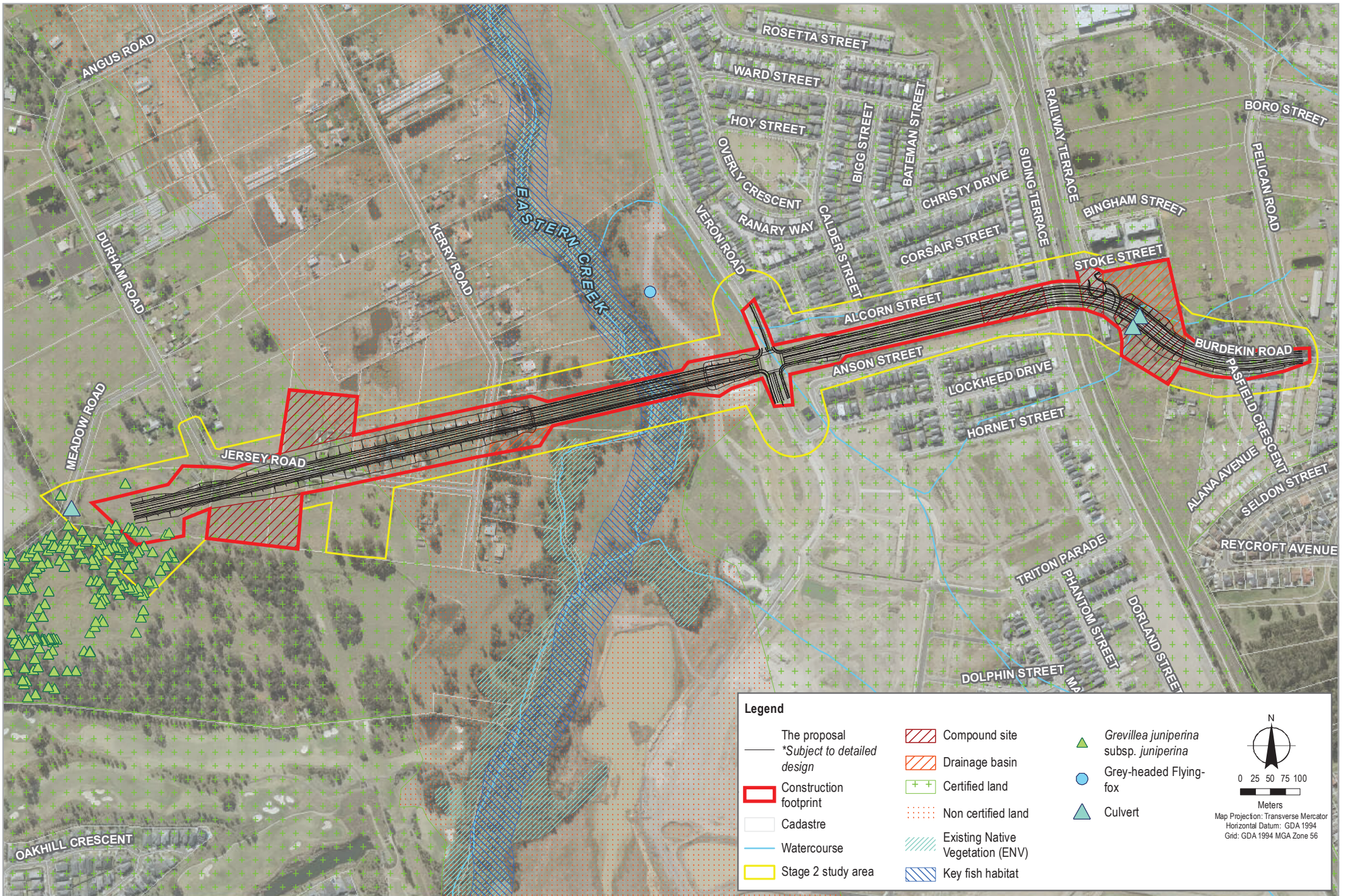


Figure 6-7 Recorded threatened species and threatened ecological communities

Legend

The proposal *Subject to detailed design	Compound site	<i>Grevillea juniperina</i> subsp. <i>juniperina</i>
Construction footprint	Drainage basin	Grey-headed Flying-fox
Cadastre	Certified land	Culvert
Watercourse	Non certified land	
Stage 2 study area	Existing Native Vegetation (ENV)	
	Key fish habitat	

0 25 50 75 100
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Data source: MetroMap - Imagery (date extracted: 26/10/2021) , General topography - DPI 2015, Roads - DSFI 2019, Key fish habitat, ENV, biocertification, threatened flora/fauna - OEH... Created by: eibertson

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6.6.3 Potential impacts

Construction

Vegetation

The proposal would result in around 0.63 hectares of native vegetation, in varying conditions, being cleared within an overall construction footprint of 14.17 hectares. Of these areas, about 0.56 hectares of native vegetation would be removed from non-certified lands, and about 0.07 hectares would be removed from certified lands. Up to 0.20 hectares of River-flat Eucalypt Forest EEC would be removed. This vegetation occurs within non-certified lands in the construction footprint, is in moderate condition and meets the definition of 'Existing Native Vegetation' (ENV) as specified in the Central River City SEPP.

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
	BC Act	EPBC	Non-certified land	Certified land	Total	
Grey Box - Forest Red Gum grassy woodland on flats - poor condition (PCT ID 849)	CEEC	-	0.21	0.04	0.25	93
Grey Box - Forest Red Gum grassy woodland on flats - high condition (PCT ID 849)	CEEC	-	0	0	0	93
Forest Red Gum - Rough-barked Apple grassy woodland - poor condition (PCT ID 835)	EEC	-	0	0.03	0.03	93
Forest Red Gum - Rough-barked Apple grassy woodland - moderate condition (PCT ID 835)	EEC	-	0.35	0	0.35	93
Total	-	-	0.56	0.07	0.63	

Note: 1. CMA - Catchment Management Authority

Given the existing levels of disturbance and impacts from various anthropogenic sources, the study area does not support habitat suitable for many native threatened species. All of the native vegetation that occurs within the study area is modified floristically and structurally, with understorey areas dominated by exotic perennial grasses, and a dominance of exotic species in the midstorey, that favour common generalist fauna species such as Noisy Miners.

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

- Removal of 0.56 hectares of known foraging habitat for the Grey-headed Flying-fox and Little Bent-winged Bat, potential foraging habitat for five threatened tree-roosting and three threatened culvert-roosting microbats, and a number of woodland birds and owls
- Removal of 0.21 hectares of broadly suitable, poor condition habitat for the Cumberland Plain Land Snail
- Removal of farm dams and impacts to Eastern Creek which represent broadly suitable, poor condition habitat for the Green and Golden Bell Frog
- Removal of a small amount of dam foraging habitat for the Southern Myotis. Indirect impacts to Eastern Creek.

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).

The proposal would result in the removal of a dam off Burdekin Road from within the construction footprint, within certified land. This dam would be replaced with a drainage basin. The proposed drainage basin is likely to continue to provide foraging resources for species such as the Southern Myotis and several frog species, as well as possible water sources for macropods, birds, and bats. No dams are proposed to be removed within non-certified land. Mitigation measures are proposed to avoid any indirect impacts on aquatic habitats or species (refer to section 6.6.4).

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	<p>A Flora and Fauna Management Plan will be prepared in accordance with the <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas Requirements set out in the Landscape Guideline (RTA, 2008) Pre-clearing survey requirements Surveys for the Cumberland Plain Land Snail are to be completed within areas of potentially suitable habitat in non-certified land in the construction footprint. 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 - <i>Guide 6 (Weed Management)</i>. <p>Erosion and sediment control measures would be established prior to construction in accordance with the principles and guidelines included in <i>Managing Urban Stormwater: Soils and Construction - Volume 1</i> (Landcom, 2004) and <i>Volume 2D of Managing Urban Stormwater: Soils and Construction</i> (DECC 2008).</p>	Contractor	Pre-construction	<p>Core standard safeguard B1</p> <p>Section 4.8 of QA G36 <i>Environment Protection</i></p>

Impact	Environmental safeguards	Responsibility	Timing	Reference
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.	Roads authority/ Contractor	Detailed design/ pre-construction	Core standard safeguard B2
Impact to connectivity	<p>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 and consider 'bat friendly' roost designs.</p> <p>Detailed design of bridge structures should consider ways to minimise the impacts of shading on adjacent native vegetation and aquatic habitats.</p> <p>The design of the detention basins will consider the planting of semi-aquatic emergent vegetation, to recreate artificial wetland habitats in the locality.</p>	Roads authority/ Contractor	Detailed design	Additional safeguard
Removal of threatened species habitat and habitat features	Aquatic habitat will be protected in accordance with <i>Guide 10: Aquatic habitats and riparian zones</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) and Section 3.3.2 <i>Standard precautions and mitigation measures</i> of the <i>Policy and guidelines for fish habitat conservation and management Update 2013</i> (DPI (Fisheries NSW) 2013).	Roads authority/ Contractor	Pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Removal of threatened plants	<p>Pre-clearing surveys will be undertaken in accordance with <i>Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).</p> <p>The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) if threatened flora species, not assessed in the biodiversity assessment, are identified in the construction footprint.</p>	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.

None of the triggers are exceeded and as such, there is no requirement for offsets in non-certified lands.

Table 6-20: Offset thresholds

Description of activity or impact	Consider offsets or supplementary measures	Requirement for offset?
Activities in accordance with Roads and Maritime Services <i>Environmental assessment procedure: Routine and Minor Works</i> (RTA 2011)	No	No
Works on cleared land, plantations, exotic vegetation where there are no threatened species or habitat present	No	No
Works involving clearing of vegetation planted as part of a road corridor landscaping program (this includes where threatened species or species comprising listed ecological communities have been used for landscaping purposes)	No	No
Works 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	No. 0.21 ha of poor condition Cumberland Plain Woodland listed under the BC Act would be removed from non-certified land. As it is in poor condition, no offset would be required.
Works 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. River-flat Eucalypt Forest and Cumberland Plain Woodland in the construction footprint do not meet the condition thresholds for the EPBC-Act listed form of these communities. Less than 1 ha of any potential habitat for threatened species listed under the EPBC Act would be required.

Description of activity or impact	Consider offsets or supplementary measures	Requirement for offset?
Works involving clearing of NSW endangered or vulnerable ecological community	Where clearing > 5 ha or where the ecological community is subject to an SIS	No. 0.35 ha of River-flat Eucalypt Forest would be removed from non-certified land.
Works involving clearing of NSW listed threatened species habitat where the species is a species credit species as defined in the DPE Threatened Species Profile Database (TSPD)	Where clearing > 1 ha or where the species is the subject of an SIS	No. No areas of potential habitat for any threatened flora species would be removed. The proposal would result in the removal of only 0.56 ha of potential foraging habitat for threatened microbats and a number of woodland birds and owls with the potential to occur in the construction footprint, from non-certified land. The proposal would remove 0.56 ha of known foraging habitat for the Grey-headed Flying-fox.
Works involving clearing of NSW listed threatened species habitat and the species is an ecosystem credit species as defined in DPE's Threatened Species Profile Database (TSPD)	Where clearing > 5 ha or where the species is the subject of an SIS	No. A total of only 0.56 ha of potential habitat for any threatened ecosystem credit species would be removed.
Type 1 or Type 2 key fish habitats (as defined by NSW Fisheries)	Where there is any net loss of habitat	No. While Eastern Creek is classified as Type 1 Key Fish Habitat (DPI 2013). The location of bridge piers has been designed to avoid the low-flow channel of Eastern Creek.

The proposal would remove about 0.20 hectares 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.

As the proposal is unlikely to result in a significant impact on any threatened biota, no offsets under the Biodiversity Offsets Scheme are 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. The ACHAR is provided in **Appendix L**. The proposal overlaps areas that have been previously assessed for Aboriginal cultural heritage values and are already covered under existing AHIPs (AHIP #C0003695, #C0002622, #C0002445 and #C00002451). The Aboriginal heritage assessment methodology was based on Stages 2 and 3 of the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) and the *Heritage NSW Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* and consisted of:

- A desktop review of previous archaeological investigations
- A desktop assessment of heritage registers and databases
- Consultation between Transport for NSW and the AHIP holders indicated that the proposed works may be completed under existing AHIPs, provided that work is undertaken in accordance with the AHIP conditions
- Selection of the study area for the assessment. This encompassed land between Burdekin Road and Meadow Road within West Schofields, Alex Avenue and Schofields precincts, including a portion of the existing Siding Terrace, Aerodrome Driveway, Kerry Road and Jersey Road/Durham Road
- Preparation of an Aboriginal archaeological survey report
- An archaeological test excavation program within 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 two 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 provided in **Appendix L**.

Database and results from other studies

An extensive search of the Aboriginal Heritage Information System (AHIMS) database was undertaken for the study area in February 2021. There are 52 registered sites located within or adjacent to the study area. Of the 52 previously recorded sites, artefacts are the predominant site feature.

AHIMS records show that there are two previously registered sites (AHIMS 45-5-5454 - potential archaeological deposits (PAD) and 45-5-4614- Artefact) located within the construction footprint. These are listed in Table 6-21 and shown on Figure 6-8.

Table 6-21: Registered sites located within the construction footprint

Site Name	AHIMS ID	Site Feature
Kerry Road Eastern Creek PAD 1	45-5-5454	Potential Archaeological Deposit
Schofields 3	45-5-4614	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 and subsurface artefact scatters and isolated finds across varied landforms, geologies and soil landscapes within the study area.

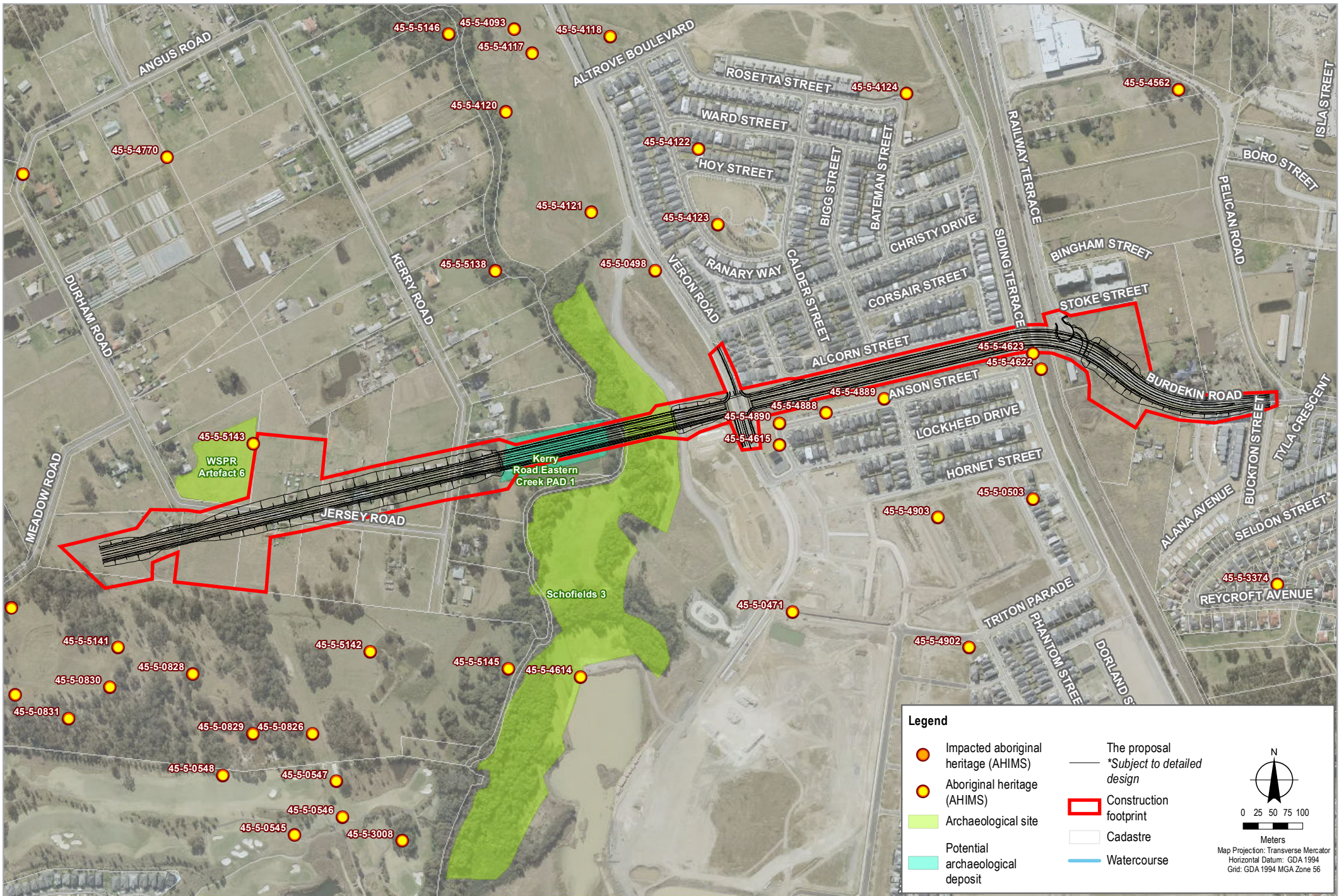


Figure 6-8 AHIMS and sites of archaeological potential

Data source: AHIMS - OEH 2021, Archaeology - digitised from Kelleher Nightingale report, 2021, MetroMap - Imagery (date extracted: 16/12/2021), General topography - DPI 2015, Roads - DSFI 2019, G:\21112511195\GIS\IMaps\Deliverables\REF\21_12511195_Z026_Stage2REF_Archaeology\SiteMap.mxd
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Field survey and test excavations

The study area was subject to an archaeological field survey and found to be located within a landscape containing varying levels of natural and human disturbance related to the construction of roads, utilities and structures, earthworks, landscaping and natural processes such as erosion and fluvial activity.

The survey revisited and reassessed one previously recorded archaeological site (Schofields 3) and identified one new archaeological site (Kerry Road Eastern Creek PAD 1) within the study area (see Figure 6-8). One additional site, WSPP Artefact 6, was identified bordering, but not within the study area.

The majority of the study area had been disturbed to varying degrees by historic and contemporary land use practices and residential development.

Archaeological investigations were undertaken in December 2020 at the location of the two registered Aboriginal archaeological sites, which are within the construction footprint (refer to Table 6-21). Due to restricted access at the time, test excavation could not be undertaken at Kerry Road Eastern Creek PAD 1. Further archaeological assessment and mitigation would be required for the site prior to any proposed works.

The purpose of the investigations was to collect information about the presence/absence, nature, extent and condition of subsurface Aboriginal objects and assess the likelihood of any intact archaeological deposit at this location.

The investigations confirmed the presence of the following:

- Schofields 3 comprises a large, high density open artefact site situated on a raised flat landform next to the eastern bank of Eastern Creek. The site was located along the western boundary of the former Schofield Aerodrome between the runways and Eastern Creek. Three additional surface artifacts were recorded about 10-20 metres northeast of an old creek channel and 75 metres east of the active Eastern Creek channel. The terrace landform displayed moderate-high potential for further archaeological deposit in areas located above flood effects.
- Excavation of eighteen test squares of 50 cm x 50 cm recovered 94 stone artifacts from a total sample of 4.5 square metres. The overall assemblage appeared to have varying degrees of heat damage which affected the majority of artefacts.

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
Kerry Road Eastern Creek PAD 1	45-5-5454	Moderate
Schofields 3	45-5-4614	Moderate

The two archaeological sites displayed moderate archaeological significance. Kerry Road Eastern Creek PAD 1 site has relatively low levels of localised visible disturbance. Significant archaeological deposit may remain in less disturbed portions of the site. Kerry Road Eastern Creek PAD 1 has the potential to offer scientific insight into past Aboriginal activities on Eastern Creek and the lithic resources common around Plumpton Ridge and potentially important information about the deposition and survivability of archaeological material on less elevated landforms adjacent to the creek.

Schofields 3 comprised a high-density artefact scatter containing surface and subsurface archaeological deposit identified on the terrace bordering Eastern Creek. Test excavation of the site revealed a relatively intact archaeological deposit, with the site displaying low levels of disturbance from historic land use and natural fluvial or erosional processes. For the north western Cumberland Plain, open artefact scatters with stratigraphic integrity provide the most archaeological research potential.

6.7.3 Potential impacts

Construction

The proposed construction work has the potential to impact on the two 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
Kerry Road Eastern Creek PAD 1	45-5- 5454	PAD area identified on raised landform located on the Eastern Creek floodplain.	Moderate	Direct / Partial	Partial loss of value
Schofields 3	45-5- 4614	High density artefact scatter located on terrace bordering Eastern Creek	Moderate	Direct / Partial	Partial loss of value

The entirety of the construction footprint may be impacted by the proposed works. The proposal overlaps areas that have been previously assessed for Aboriginal cultural heritage values and are already covered under existing AHIPs (AHIP #C0003695, #C0002622, #C0002445 and #C00002451). Any works related to the current proposal undertaken within existing AHIP areas will be required to comply with the existing AHIP conditions. The two sites identified within the construction footprint are of moderate significance, an AHIP is required for impacts to these sites/objects prior to the commencement of pre-construction or construction activities. Safeguards and management measures are provided in Section 6.7.4.

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.	Roads authority	Pre-construction	Section 4.9 of QA G36 <i>Environment Protection</i>
Unexpected finds	<ul style="list-style-type: none"> • <i>The Standard Management Procedure - Unexpected Heritage Items</i> (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 <i>Environment Protection</i>
Aboriginal heritage	An application for an AHIP will be made under section 90A of the <i>National Parks and Wildlife Act 1974</i> for the two Aboriginal archaeological sites. The application will be prepared in accordance with the Department of Planning and Environment (DPE) <i>Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants</i> (OEH, 2011).	Roads authority	Pre-Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal heritage	The non-impacted portion of sites Kerry Road Eastern Creek PAD 1 and Schofields 3 (outside of construction and AHIP boundary) will be marked on the Construction Environmental Management Plan prior to construction activities to ensure these parts of the sites are avoided and not impacted by the proposed works. The site areas will be marked as an environmentally sensitive “no-go zone”.	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 M 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 proposed activities
- Selecting the study area for this assessment to determine whether any historic sites or places are located within or adjacent to the study area, to record any sites located and determine the potential for archaeological deposits to exist within the construction footprint
- Assessing the impact of the proposal on the cultural heritage significance of 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. Common land and land grants provided around this time were for the purposes of land cultivation, livestock grazing and settlement in the area and included:

- Prospect Hill – generally corresponding the present-day Blacktown Municipal area
- Land between Bells Creek and Eastern Creek (previously known as 'Iron Bark Ridge')
- The area around Eastern Creek and Breakfast Creek
- Land surrounding Schofields Road
- Land to the northeast of the construction footprint, the present-day Riverstone
- Land extending from 'Iron Bark Ridge' to Present Day Burdekin 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 southeast of Meadow Road was in operation for military and civil purposes from 1942 until 1994.

A review of historical aerial photographs indicates that prior to 1955 the entirety of the area within the construction footprint had been cleared excepting a small strip of thicker vegetation bordering Eastern Creek. The majority of the area appeared uncultivated and likely used for grazing during this time.

Meadow Road, Jersey Road, Kerry Road and Burdekin Road were established circa 1955.

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. Further clearing and development around Burdekin Road, Kerry Road and Jersey Road around this time included residences, small-lot agriculture, and market gardens.

By 1986 there is evidence of disturbance associated with land uses on the historically known Ivory's Farm south of Meadow Road, around 100 metres south west of the construction footprint. Drainage earthworks associated with the construction of dams at the northern boundary of the property are also seen.

Increased cultivation of the floodplain area between Kerry Road and Eastern Creek is seen up to 1994 with further tracks and buildings within the aerodrome site.

More recent use of the land has seen frequent waterlogging and flooding within the former cultivation paddock to the south of the construction footprint.

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.

Schedule 5 of the *Queensland Heritage Act 2017* identified three heritage items that are within or in proximity to the construction footprint. These include Pye Farm former cottage/orchard, Schofields Runways and former walking tracks. These items have been destroyed and do not pose a constraint to the current project.

The draft Schedule 9 of the *Queensland Heritage Act 2017* identified two areas described as "moderate potential to contain archaeological heritage", within the construction footprint. One is located around Kerry Road, north of the intersection with Jersey Road, and intersects the construction footprint. The other is located south of Jersey Road within Lot 25 DP 12076 and does not intersect the construction footprint. An assessment of these sites found the likelihood of survival of items in this area to be low.

Field survey results

During the site inspection no historical items, relics, fabric, materials or areas of potential were identified. The previously identified area of archaeological potential, highlighted in the draft *Queensland Heritage Act 2017*, associated with the former Pye cottage site was found to be disturbed, with low potential for intact or significant subsurface deposits. The area west of Eastern Creek, retains a low level of local heritage significance due to its contribution to the historical, aesthetic and increasingly rare semi-rural character of the local landscape. The likelihood of survival of intact subsurface deposits is assessed as low due to the intervening centuries of agricultural use and cultivation, construction/demolition of structures, clearing and ongoing flooding associated with Eastern Creek.

The remainder of the construction footprint displayed very low to minimal potential for 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.

6.8.3 Potential impacts

The study area does not contain any listed historical items with heritage significance at the local, State or Commonwealth levels. The area associated with the former Pye cottage site displays low archaeological potential for fragmentary and disturbed remains associated with this former land use. If present, these would be of local significance. The remainder of the study area displays minimal to nil archaeological potential due to a long history of land use disturbance and agriculture.

Whilst the study area displays some general values of low local heritage significance (historical and aesthetic), the proposed works would have a negligible impact on these values, whose significance lies in the contribution they make as a component of the larger cultural landscape within the local area. No material evidence or heritage items relating to these values have 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	<p>The <i>Standard Management Procedure - Unexpected Heritage Items</i> (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.</p> <p>Work will only re-commence once the requirements of that Procedure have been satisfied.</p>	Contractor	Construction	Section 4.10 of QA G36 <i>Environment Protection</i>

6.9 Landscape character and visual impacts

6.9.1 Methodology

This section summarises the results of the 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 *Guideline for landscape character and visual impact assessment: Environmental impact assessment practice note EIA-N04 Version 2.2* (Transport for NSW, 2020).

The assessment involved:

- Review of key planning designations, policies and guidance and relevant urban design objectives and principles
- Desktop analysis of the proposal, urban, landscape and visual resources
- Landscape character assessment and visual impact assessment
- Site inspection to assess the landscape character, identify landscape and sensitive visual receiver locations, and undertake site photography
- 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 comprises assessing the magnitude of change to the landscape (views) in combination with the sensitivity of the receptor.

6.9.2 Existing environment

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. Three LCZ were identified and are shown in Figure 6-10. The key elements of the LCZ are summarised in Table 6-24.

Table 6-24: Landscape character zones

LCZ	Description
1 – Semi-rural / residential	<p>LCZ 1 primarily consists of large rural residential properties, within an open landscape with long views across paddock, towards a backdrop of mature trees.</p> <p>This area is characterised by farm structures such as sheds and water storage generally located around a large main dwelling.</p> <p>Other visual elements typically include fences, hedgerows, stables, dams, farming equipment, polytunnels, vehicles, livestock and other elements associated with a rural residential landscape.</p>
2 – Residential and transport infrastructure	<p>LCZ 2 comprises an area undergoing a process of rapid development. With area of bushland and farmland making way for residential development. It is characterised by areas that have been subdivided and developed into residential allotments of single and double storey detached dwellings. Associated transport infrastructure includes the existing road network as well as the visually prominent rail corridor.</p>
3 – Bushland/ open space or future wetland	<p>LCZ 3 is located along the Eastern Creek corridor and comprises areas of dense, tall native vegetation and open grassy fields that are absent of developed built form.</p> <p>Visibility in these areas is usually filtered by vegetation.</p>

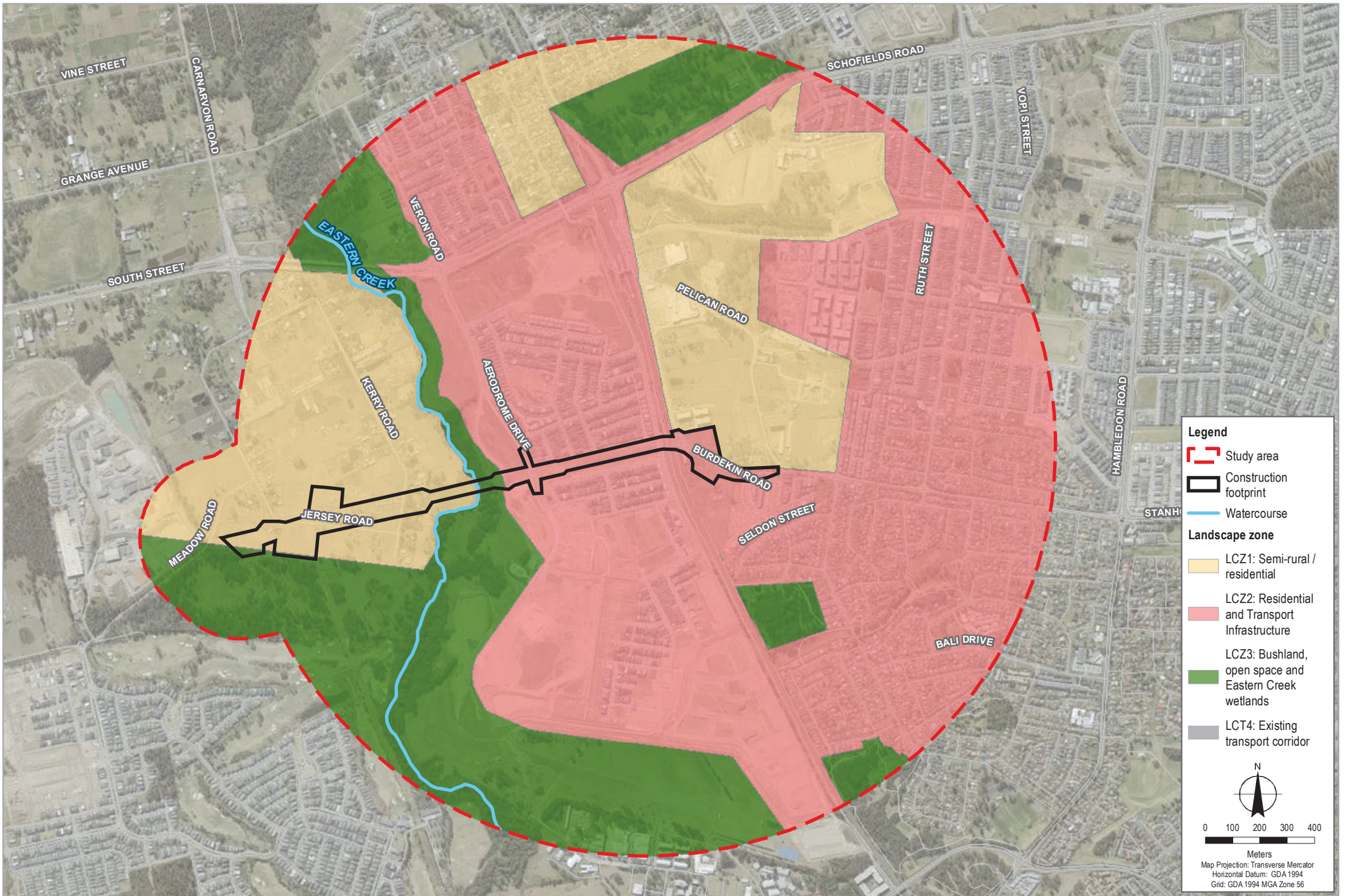


Figure 6-9 Landscape character zones

Data source: MetroMap - Imagery (date extracted: 2/11/2021) . General topography - DPI 2015, Roads - DSFI 2019 . Created by: eibbertson
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 Print date: 02 Nov 2021 - 08:47

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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 6-10. This figure also shows the indicative area the proposal would be visible from.

On the eastern side, the construction footprint is mostly surrounded by townhouses to the north and the south. This provides visual enclosure and defines the viewing corridor. In the central area, the vegetation of the Eastern Creek corridor defines the visual envelope and to the western side, the visual experience is characterised by longer views across rural lands and open paddocks to the road corridor. From areas of higher elevation in the northeast of the study area, more distant views can be experienced to the south over lower topography.

When the proposal is at-grade (or close to the existing landform levels), the viewing envelope is smaller and generally confined to a 200 metre visual catchment distance. Where the proposed road is elevated over the rail corridor at a height of approximately 15 metres, longer more open views can be experienced within the wider area.

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	Kerry Road	Located at the intersection of Jersey Road, looking north and west	Residents	Foreground view
2	Aerodrome Drive	Located 10 m west of Aerodrome Drive near the intersection with Lockheed Drive, looking west.	Residents, future residents, road users and pedestrians.	Foreground view
3	Alcorn Street	Located on the south of Alcorn Street near the intersection with the construction footprint, looking south and east.	Residents	Foreground to far distance view
4	Anson Street	Located on Anson Street near the intersection with Mariner Avenue and the construction footprint, looking north and east.	Residents	Foreground to far distance view
5	Anson Street	Located on Anson Street near the intersection of Siding Terrace looking north and east.	Residents	Foreground to far distance views. Elevated views
6	Sliding Terrace	Located on Sliding Terrace, about 60 m north of Alcorn Street, looking South.	Residents	Foreground view
7	Stoke Street	Located on Stoke Street, about 80 m north-east of Burdekin Road/Railway Terrace, looking south-west	Residents	Elevated foreground view
8	West of Alana Avenue	Located 150 m north-west of Alana Avenue, looking north and west	Future residents	Far distance views

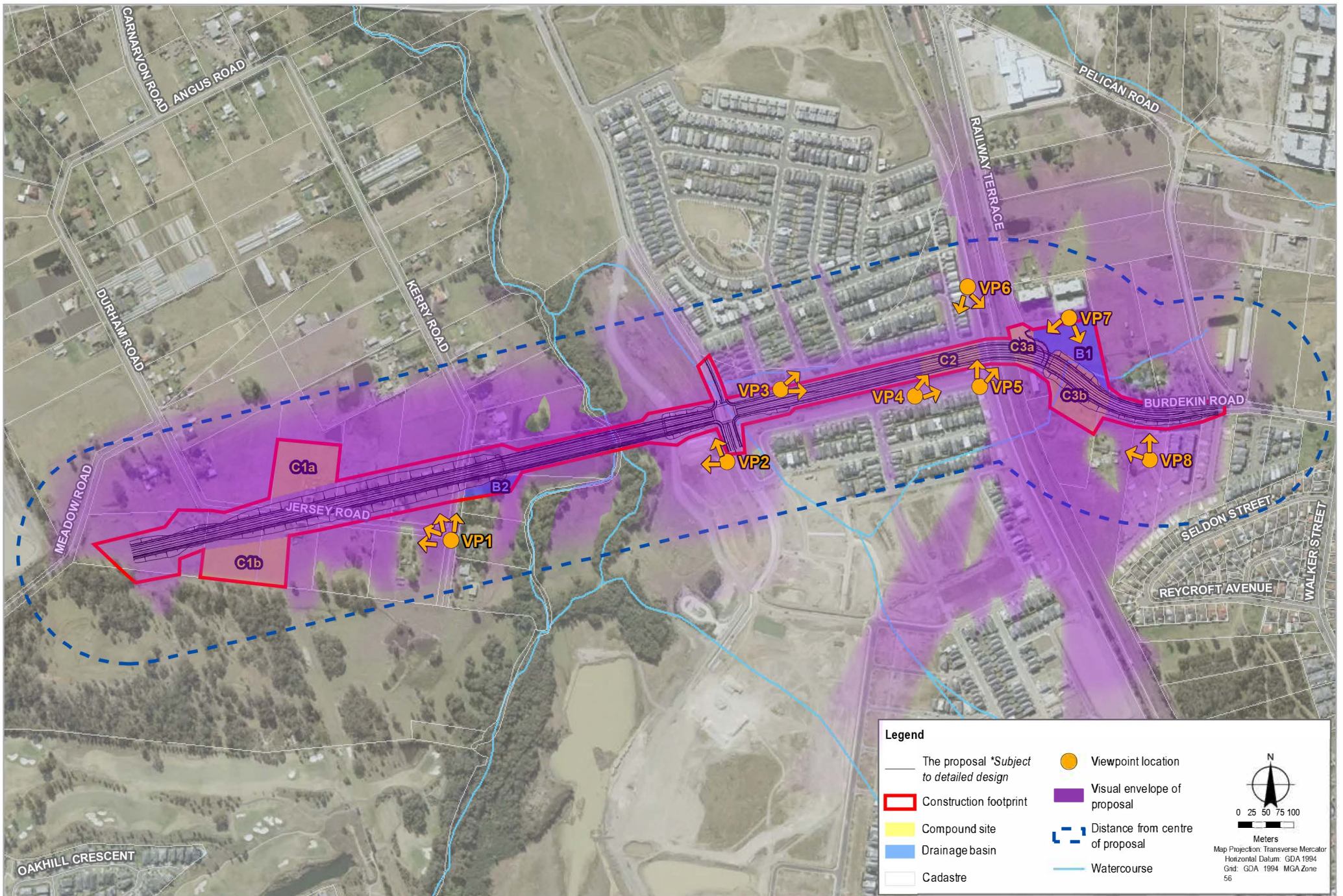


Figure 6-10 Location of viewpoints

Date source: MetroMap - Imagery (date extracted: 16/12/2021). General topography - DPI 2015. Created by: oibertson
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Print date: 16 Dec 2021 - 13:48

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6.9.3 Potential impacts

Construction

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 several compound sites which may result in a temporary visual change to the landscape, particularly where the compound site is adjacent to a road and close to residential receivers. There may also be the additional dust generated during the construction work resulting in minor temporary visual impacts. Temporary visual impacts would arise from the presence of cranes during construction of the elevated bridge structures.

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 and road users. An illustration of the proposal is provided in Figure 3-6 and Figure 3-8. Further illustrations are provided in Appendix D.

Landscape character impact

The greatest impacts on the landscape character generally occur where the sensitivity to change is higher. For this proposal, this occurs in LCZ1 (Semi Rural Residential) and LCZ2 (Residential and transport infrastructure) and LCZ3 ('Bushland/Open space').

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 – Semi-rural residential	The anticipated change in this area would include a new road alignment and the acquisition of some of the semi-rural residential properties in the vicinity of Jersey Road and Kerry Road.	Semi-rural residential LCZ has a High sensitivity to change due to the long open views across the rural character area. This character is of high aesthetic value and change caused by the proposed development would be likely to have an adverse effect on the landscape character, condition or value, that could not be mitigated.	The magnitude of change would be Medium. The introduction of the road corridor components would not be uncharacteristic within the existing landscape character, however the width and scale of them would be uncharacteristic.	High-Medium
2 – Residential and transport infrastructure	Development within LCZ 2 includes the proposal at-grade to the west, rising to an elevated road structure over the railway, approximately 15 metres above ground level and within 20 metres of dwellings. Dwellings on Alcorn street face onto the proposal corridor and views from within the character area will be impacted. The anticipated change to the eastern end of Alcorn Street will be the most significant change.	Residential areas are typically sensitive to changes in the surrounding landscape. LCZ 2 has a High sensitivity to change due to the proximity of the proposal to the residential area, particularly the elevated section over the railway adjacent to Alcorn Street.	The magnitude of change would be High.	High
3 – Bushland/open space	Areas of riparian vegetation will need to be removed where the elevated bridge structure goes over Eastern Creek.	This LCZ would have a High sensitivity to change given the relative scarcity of bushland (particularly riparian bushland) within this part of Western Sydney.	The magnitude of change is relatively High given that a large section of bushland would be removed to construct the new road bridge, which is built element within this natural landscape character.	High

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:



- Four viewpoints would have high visual impacts
- Three viewpoints would have high to moderate visual impacts
- One viewpoint would have low to moderate visual impacts.

The greatest visual impact of the proposal would occur along Alcorn Street, when the proposal is elevated over the rail line, 20 metres from residential dwellings. This is because of the proximity of the new structure to the existing dwellings, the height and scale of the new structure and the lack of space to plant screening vegetation to mitigate the visual impacts. The assessment has considered inclusion of an acrylic panel design for the noise wall as shown in Figure 3-7.


Table 6-27: Impact to visual amenity


View	Impact discussion	Sensitivity to change	Magnitude of impact	Impact rating
<p>1 – Kerry Road</p>	<p>Changes to the view would include the construction of a new section of road about 300 metres long across the middle of the view. The new road is likely to be constructed on an embankment, to the elevated Eastern Creek bridge. Some dwellings, buildings, structures and vegetation are likely to be removed.</p> <p>The new road would dissect the existing road network south-east of the junction of Durham Road and Jersey Road, and north of the junction of Jersey road and Kerry Road. It is anticipated that a new linking road will connect Jersey road to the south (to be constructed via another project).</p> <p>Noise walls may also be present on both sides of the alignment in this location (subject to detailed design and acoustic modelling).</p>	<p>High – The occupants of the residences next to the proposal would have close views with long viewing periods</p>	<p>Moderate</p>	<p>High-Moderate</p>
				

View	Impact discussion	Sensitivity to change	Magnitude of impact	Impact rating
<p>2 – Aerodrome Drive</p>	<p>Changes to the view would include the construction of a new section of road about 200 metres long across the middle of the view. The new road will connect to Aerodrome Drive, at grade, with a signalised intersection. The new road is likely to be constructed on an embankment near the Eastern Creek bridge and long views to the creek line and its riparian vegetation will be obstructed. An area of creek vegetation will also be removed. Noise walls may also be present on both sides of the alignment in this location (subject to detailed design and acoustic modelling).</p>	<p>High – Open space users and pedestrians, and vehicles passing through would view the development in close view.</p> <p>Future residences would also view the development in close view.</p>	<p>Moderate</p>	<p>High-Moderate</p>
				

View	Impact discussion	Sensitivity to change	Magnitude of impact	Impact rating
3 – Alcorn Street	<p>Changes to the view would include the construction of a new section of road about 200 metres long across the middle of the view. There would be 1.2 metre wide footpaths on the northern and southern sides and the roadway would be mostly at-grade in the foreground, rising up to an elevated bridge in the far distance (near Siding Terrace and the rail line). Noise walls may also be present on both sides of the alignment in this location (subject to detailed design and acoustic modelling).</p> 	High – The receivers in this area are residents facing onto the proposal and have long term views.	High	High
4 – Anson Street middle	<p>Changes to the view would include the construction of a new section of road across the middle of the view. There would be 1.2 metre wide footpaths on the northern and southern sides and the roadway would be on embankment, rising up to an elevated bridge in the far distance (near Siding Terrace and the rail line). Noise walls may also be present on both sides of the alignment in this location (subject to detailed design and acoustic modelling).</p> 	High – The receivers in this area are residents facing onto the proposal and have long term views.	Moderate	High - Moderate

View	Impact discussion	Sensitivity to change	Magnitude of impact	Impact rating	
5 – Anson Street East	<p>Changes to the view would include the construction of a new section of road about 200 metres long across the middle of the view. There would be 1.2 metre wide footpaths on the northern and southern sides and the roadway would be rising up to an elevated bridge in the distance (near Siding Terrace and the rail line). Noise walls may also be present on both sides of the alignment in this location (subject to detailed design and acoustic modelling).</p>	<p>High – The receivers in this area are residents facing onto the proposal and have long term views</p>	<p>High</p>	<p>High</p>	
	6 – Siding Terrace	<p>Changes to the view would include the construction of a new road bridge structure elevated over the rail line. The bridge would be approximately 15 metres high with large retaining walls within 20 metres proximity to dwellings on Alcorn Street.</p>	<p>High – as the new road bridge structure and retaining walls of about 15 metres high will block long views from dwellings on Alcorn Street and Siding Terrace.</p>	<p>High</p>	<p>High</p>
					

View	Impact discussion	Sensitivity to change	Magnitude of impact	Impact rating
7 – Stoke Street	<p>Changes to the view would include the construction of a new elevated road about 300 metres long, on a bridge going over the rail line.</p> <p>The new road would connect into Burdekin Road and Railway terrace would culminate in a cul-de-sac. There would be 1.5 metre wide footpaths on both sides of the elevated new road.</p> <p>Due to the proposed drainage basin adjacent to Stoke Street, there may be insufficient land for mitigation planting to screen the proposal from the residents at this location. Noise walls may also be present on both sides of the alignment in this location (subject to detailed design and acoustic modelling).</p>	High – adjacent residential property occupants are within close proximity, with long viewing periods.	High	High
				

View	Impact discussion	Sensitivity to change	Magnitude of impact	Impact rating
8 – Alana Avenue	<p>Changes to the view would include the construction of a new section of elevated road in the background of the view. The roadway would be rising up to an elevated bridge in the distance (over the rail line). Noise walls may also be present on both sides of the alignment in this location (subject to detailed design and acoustic modelling).</p>	<p>Low – Future residents would view the development from afar, however these views may be blocked by future development.</p>	<p>Moderate</p>	<p>Low - Moderate</p>
				

6.9.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual impact	<p>An Urban Design Plan will be prepared to support the detailed design and will be implemented as part of the CEMP.</p> <p>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:</p> <ul style="list-style-type: none"> • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls, bridges and noise walls • Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape work taking account of related environmental controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas. <p>The Urban Design Plan will be prepared in accordance with relevant guidelines, including:</p> <ul style="list-style-type: none"> • <i>Beyond the Pavement: Urban design approach and procedures for road and maritime infrastructure planning, design and construction, (TfNSW 2020)</i> • <i>Landscape Design Guideline (TfNSW 2018)</i> • <i>Bridge Aesthetics (TfNSW 2019)</i> 	Roads authority /Contractor	Detailed design/pre-construction	Standard safeguard V1

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> Design guideline to improve the appearance of noise walls in NSW, (TfNSW 2021) <i>Shotcrete Design Guideline</i> (TfNSW 2016). Relevant BCC council guidelines including Blacktown Local Environmental Plan and Blacktown City Council Growth Centre Precincts Development Control Plan 2010.			
Visual impact from the rail bridge	<p>During detailed design visual impact from the reinforced soil wall will be minimised through the use of different materials/colours/textures.</p> <p>Consider wall treatment opportunities such as public art to improve aesthetic quality of the structure.</p>	Roads authority	Detailed design	Additional safeguard
Visual impact from the rail bridge	<p>Consider a continuous bridge structure on piers with minimal rammed earth walls, to mitigate the proposed visual barrier the walls would create between two residential areas, and allow for the retention of long views under the road bridge, reducing the visual impact to residents on Alcorn Street, Siding Terrace and Anson Street. Opening the bridge structure and undercroft could also generate opportunities for open space for community benefit.</p>	Roads authority	Detailed design	Additional safeguard
Visual impact from signage	<p>Position signs in a non-visually obtrusive way and sensitively locate to consider views from residential areas, where possible.</p>	Roads authority	Detailed design	Additional safeguard
Consultation on urban design	<p>Recommendations from the Council's Design Review Panel would be considered at all relevant stages of the project.</p>	Roads authority	Detailed design, Construction and operation	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
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	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
Light spill	Light generated during construction will be managed in general accordance with the requirements in <i>Australian Standard AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting</i> . Generally, lighting would be designed to minimise off site light spill.	Contractor	Construction	Additional safeguard
Landscape character	Reinstatement of construction site compounds will commence progressively post construction and will be undertaken as soon as practicable.	Contractor	Construction	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) and the *National Environmental Protection (Ambient Air Quality) Measure (NEPC, 2021)* (NEPM AAQ)
- 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

The *Approved Methods* outlines impact assessment criteria which are concentration levels to be met at all 'existing' or 'future' off-site sensitive receptors. The criteria are shown in Table 6-28, and relate to cumulative impacts (project plus background). In order to assess the total air quality impact, the predicted impact of the proposal (incremental) is added to the existing levels (background).

The NEPM AAQ was updated in May 2021 and included revised air quality objectives for key pollutants, including those relevant to this project, comprising PM_{2.5} and NO₂.

Table 6-28: Air quality impact assessment criteria

Pollutant	Averaging period	Criteria /goals (µg/m ³)	
		Approved Methods	NEPM AAQ
PM ₁₀	Annual	25	25
	24 hours	50	50
PM _{2.5}	Annual	8	7
	24 hours	25	20
Nitrogen dioxide (NO ₂)	Annual	62	31
	1 hour	246	164

Pollutant	Averaging period	Criteria /goals ($\mu\text{g}/\text{m}^3$)	
Carbon monoxide (CO)	8 hours	10,000	10,000
	1 hour	30,000	-

Note: NEPM AAQ goals for PM_{2.5} are those presented in Table 2 'Goal for Particles as PM_{2.5} from 2025'

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 (NO₂) and sulphur dioxide (SO₂) are all consistently below the respective national standards in most areas of NSW. Concentrations of some pollutants, including particulate matter (PM₁₀ 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 10 kilometres south east of the study area. Monitoring data for 2018 shows an elevated annual average background PM_{2.5} concentration (7.3 $\mu\text{g}/\text{m}^3$) when compared to the objectives outlined in Table 6-28.

6.10.3 Potential impacts

Construction

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

- Vegetation clearing
- Compound sites 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 would be 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 following model scenarios were completed:

- 2021 current – existing traffic on existing roads within network
- 2028 no-build - expected traffic in 2028 within network where the project is not built
- 2028 build - expected traffic in 2028 within network where the project is built
- 2038 no-build - expected traffic in 2038 within network where the project is not built
- 2038 build - expected traffic in 2038 within network where the project is built.

The TRAQ model is completed for each Townson Road Stage 2 scenario, using the segment with the highest predicted traffic volumes for each and therefore represents the worst-case scenario.

The vehicle fleet databases used were 2021 for S1, 2026 for S2-S3 and 2036 for S4-S5. The traffic make-up for each scenario was based on the default for an arterial road. 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 and the respective worst-case segment as well as daily traffic volumes.

Table 6-29: Overview of modelling scenarios assessed

No.	Scenario	Section	Daily traffic volume	Speed
1	Existing scenario (2021 current)	Townson Road to Schofields Road	9,104 (total) 5,479 (NB) 3,625 (SB)	60 km/h
2	2028 no build	Townson Road to Schofields Road	9,741 (total) 5,863 (NB) 3,878 (SB)	60 km/h

No.	Scenario	Section	Daily traffic volume	Speed
3	2028 build	Aerodrome Driveway to Burdekin Road	34,103 (total) 17,317 (NB) 16,786 (SB)	60 km/h
4	2038 no build	Townson Road to Schofields Road	10,652 (total) 6,411 (NB) 4,241 (SB)	60 km/h
5	2038 build	Aerodrome Driveway to Burdekin Road	44,563 (total) 24,175 (NB) 20,388 (SB)	60 km/h

The TRAQ model predicts CO, NO₂ and PM₁₀ concentrations. PM_{2.5} has been determined using a ratio based on background measurements undertaken near an arterial 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
	1	2	3	4	5	
Scenario						
Maximum 8 hour average CO (mg/m ³)	1.4	1.4	1.6	1.4	1.5	10
Maximum 1 hour average NO ₂ (ug/m ³)	54	53	60	52	61	164
Annual average NO ₂ (ug/m ³)	16	15	17	15	17	31
Maximum 24 hour average PM ₁₀ (ug/m ³)	26	26	32	26	34	50
Annual average PM ₁₀ (ug/m ³)	16	15	17	15	17	25
Maximum 24 hour average PM _{2.5} (ug/m ³)	16	16	18	16	19	20
Annual average PM_{2.5} (ug/m³)	8.0	8.1	9.2	8.1	9.6	7

Note: The assessment criteria are the most stringent of those presented in Table 6-28.

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 7 µg/m³ criteria for all scenarios and up to 9.6 µg/m³ 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/m³).

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	<p>An air quality management plan will be prepared as part of the CEMP. The plan will include but not be limited to:</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 Schofields, Colebee and Quakers Hill. 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 6-11. The construction footprint would predominantly directly impact the following land use zones:

- RU4 Primary production and small lots
- SP2 Infrastructure.
- E4 Environmental living.

Land uses within and immediately surrounding the construction footprint include residential, infrastructure (roads and rail), recreation (parks) and local centre properties including supermarkets. There are also commercial properties and social infrastructure in the immediate vicinity of the proposal, including:

- Oz Firewood
- Chamber Civil Construction
- ONTRACK Earthmoving and Demolition
- Akuna Vista Sales Office
- Quakers Hill Veterinary Hospital
- Hopskotch Kindergarden
- Schofields Village shopping centre
- Woolworths Schofields complex
- Bright Beginnings family day care
- Schofields Station.

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, 2017)*. 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 6-11.

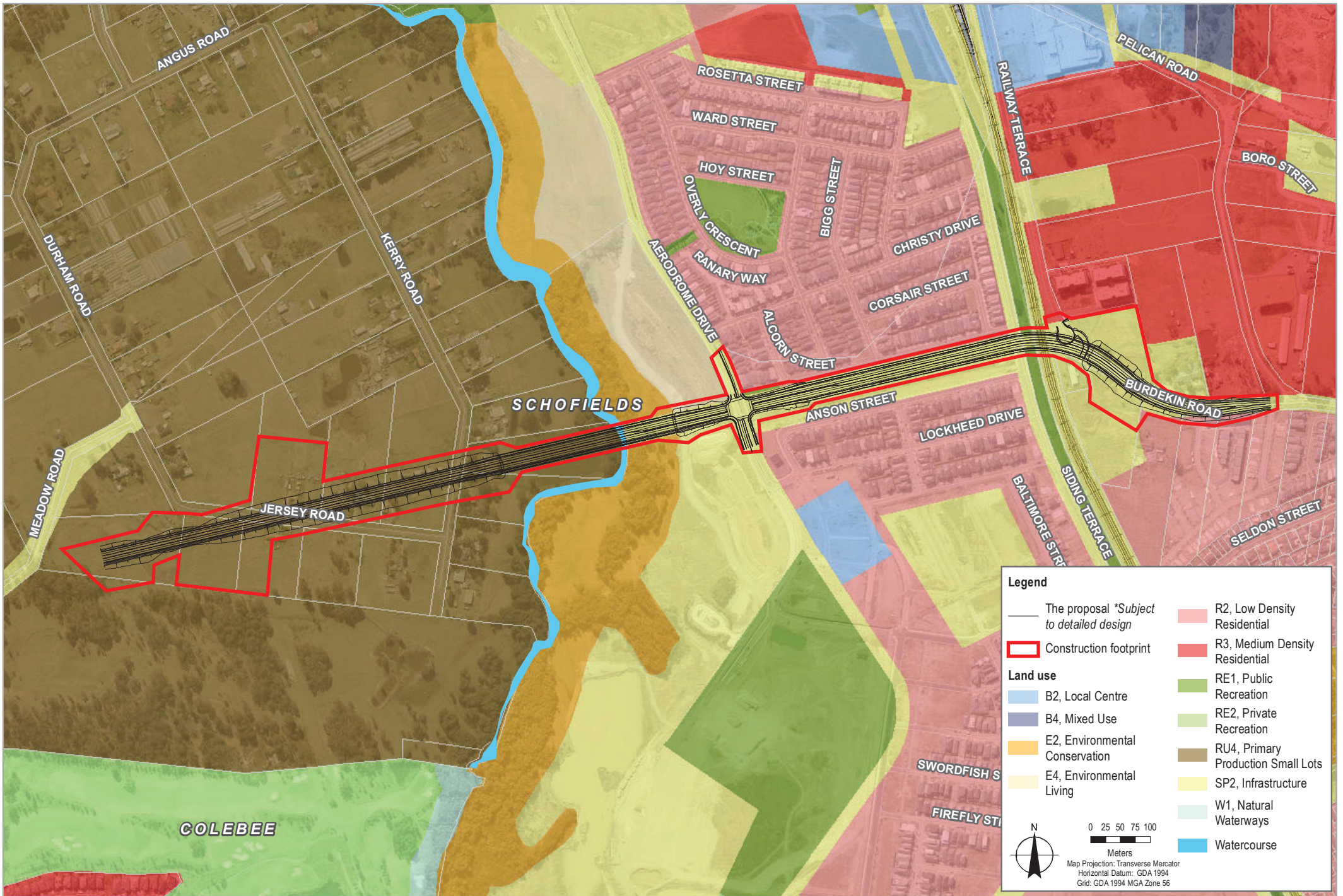


Figure 6-11 Existing land use zoning

Data source: MetroMap - Imagery (date extracted: 27/10/2021) , General topography - DPI 2015, Land zoning - OEHLPI 2018 . . Created by: eibbertson
 G:\21112511195\GIS\Maps\Deliverables\REF\21_12511195_2019_Stage2REF_LandUse.mxd
 Print date: 27 Oct 2021 - 10:24

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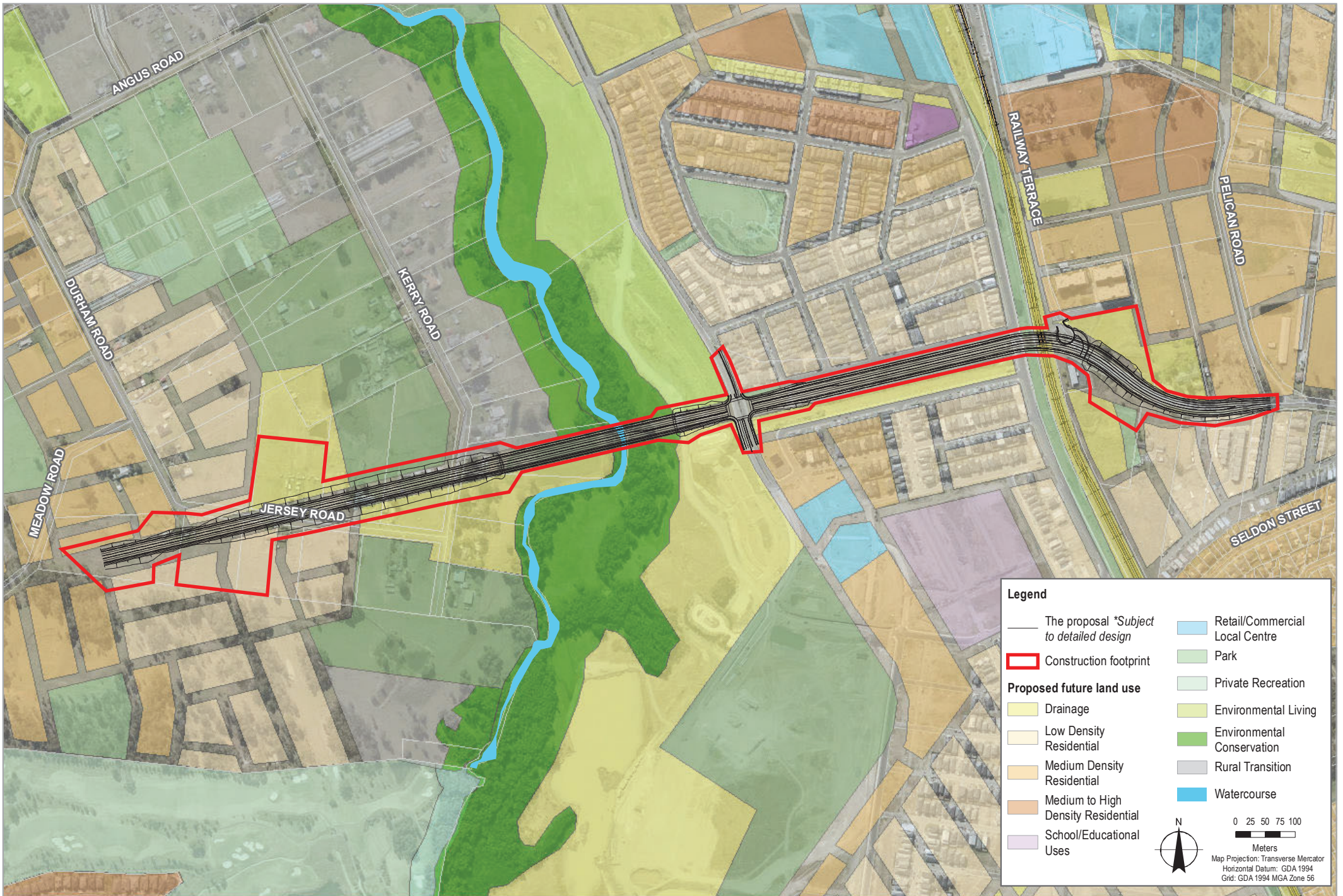


Figure 6-12 Proposed future land use based upon precinct plans

Data source: MetroMap - Imagery (date extracted: 27/10/2021). General topography - DPI 2015. Future precinct developments - DPIE 2018-2021. Created by: eibbertson
G:\2111251195\GIS\Maps\Deliverables\REF\21_1251195_2021_Stage2REF_FutureLandUse.mxd
Print date: 27 Oct 2021 - 10:43

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6.11.2 Potential impacts

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 sites. Potential traffic and access impacts are considered in section 6.1. As discussed in section 3.4, several compound sites are proposed. 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.

Leasing requirements are preliminary at this stage and would be identified during detailed design of the proposal. Preliminary requirements are outlined in Table 3-13.

Operation

As noted in section 3.6, The proposal would require the full and partial acquisition of some properties. Properties impacted by acquisition or adjustments are listed in Table 3-11.

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.

Due to the rapidly changing built environment and the proposed future precinct planning, the proposal has not presented access arrangements to some property locations off Burdekin Road, Jersey Road and Kerry Road. Access to all existing properties impacted by the proposal, at the time of construction will be provided. At detailed design, access arrangements will be reviewed and revised to accommodate the built environment at that time.

Property adjustment plans would be developed in consultation with affected property owners. All land acquisitions would be conducted in accordance with the roads authority policy and the *Land Acquisition (Just Terms) Compensation Act 1991*.

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

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

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.

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.

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 the roads authority policy and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Roads authority	Pre-construction and construction	Core standard safeguard
Property access	At detailed design, property access arrangements for properties impacted by the proposal, will be reviewed and revised to accommodate the built environment at that time.	Roads authority	Detailed design	Additional safeguard
Property adjustment	Property adjustment plans would be developed in consultation with affected property owners.	Roads authority	Pre-construction	Additional safeguard
Future land use	A review of the proposed future West Schofields precinct land use zoning will be carried out along with an acquisition strategy to ensure that appropriate development controls are in place prior to construction of the proposal.	Roads authority	Detailed design, 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 *Transport for NSW, 2020*). It has also given consideration to the *REF* and the *REF* (Vanclay, 2003 and Vanclay F, et al, 2015).

It is acknowledged that socio-economic impacts are not contained within statistical or geographical boundaries, because people can travel across different geographic areas as part of their day-to-day lives. As a result, the study area includes:

- Local study area – including the suburbs of Schofields and Quakers Hill
- Regional study area – including Blacktown Local Government Area (LGA).

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).

The North West Growth Area comprises multiple precincts which have, or will undergo strategic planning to ensure that infrastructure planning aligns with planned growth for the area (Department of Planning, Industry and Environment). The proposal is located across the following precincts in the North West Growth Area:

- Schofields Precinct: The Schofields Precinct was rezoned in May 2021 and new planning controls were introduced to enable urban development and the delivery of local amenities close to transport options. The proposed redevelopment is outlined in the Schofields Precinct Plan (2018) and includes the introduction of conservation land, open space and recreation areas, retail space and upgrades to key roads.
- Alex Avenue Precinct: The Alex Avenue precinct will see the introduction of up to 6,300 new homes and the delivery of local amenities close to transport options, including new schools, upgrades to roads and improved connections to encourage active transport. The proposed redevelopment will be guided by the Alex Avenue Precinct Plan (2010).
- West Schofields Precinct: Planning for the West Schofields precinct is currently underway, and will be guided by the West Schofields Precinct Plan (2018).

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 Growth Area 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.

Local study area

Schofields

In 2016, the population of the suburb was 4,983 people. Schofields, as part of the North West Growth Area, is currently undergoing strategic planning and redevelopment to cater for the planned population growth.

The proposal is located across three precincts which are currently undergoing, or will undergo, substantial change over the next 20 years. The existing conditions of the study area have the potential to be easily outdated in the fast growing precincts and quickly changing landscape.

Land use in Schofields can be characterised as 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 leads to a strong rural feel in the west and a feeling of suburban character in the east. Key features of the suburb include Eastern Creek, which runs north-south through the centre of the suburb and Western Sydney University Nirimba Campus, which is located in the south-east corner of the suburb.

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, while, Schofields Road connects to the commercial centres of Rouse Hill to the east and Marsden Park to the west. Schofields train station is located in the centre of the suburb on Railway Terrace. Further details of the transport network are provided in section 6.1.2.

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. Schofields Road also provides access to the Woolworths Schofields shopping complex located on Railway Terrace. Woolworths Schofields and other shops within the complex (see Table 4.1) would likely be frequented by users of Schofields Station and residents of the local study area. Schofields Village Shopping Centre is currently under construction and is also located on Railway Terrace. It will include a Coles supermarket, Liquorland and a childcare centre, amongst other variety stores. Commercial properties in close proximity to the proposal are listed in section 6.11.1.

Quakers Hill

Quakers Hill is located south-east of Schofields, in the centre of the LGA. In 2016, the suburb had a population of 27,080 people. It surrounds the North West Growth Area which is undergoing significant urban renewal, residential and commercial development.

In addition to undergoing housing development, there is also the delivery of priority rail infrastructure, such as the Sydney Metro Northwest, which is a duplication of the T1 Western Line (Richmond to Sydney CBD) between Quakers Hill Station and Schofields Station. This infrastructure is a key contribution to the further planning and investment by the NSW Government.

Quakers Hill is primarily characterised by suburban residential areas and open space. Western Sydney University Nirimba campus is located on the northern border of the suburb in Schofields. The suburb is home to numerous primary and secondary schools, and educational institutions. Other key community facilities include the Quakers Hill Masjid, The Church of Jesus Christ of Latter Day Saints and the Quakers Hillside Care Community.

The West Link M7 runs east-west through the southern end of the suburb, while the Quakers Hill railway link runs north-south through the centre of the suburb and connects to Quakers Hill Station. Burdekin Road forms part of the northern border of the suburb between Quakers Hill and Schofields and is mostly made up of low-density residential lots. Further details of the transport network are provided in section 6.1.2.

The main shopping mall in Quakers Hill is Quakers Court which is located on the corner of Quakers Road and Falmouth Road to the M7. Other shops including takeaway restaurants and conveniences are scattered through the suburb. The Quakers Hill Veterinary Hospital, located on Burdekin Road.

6.12.3 Potential impacts

Construction

This section summarises the potential construction impacts of the proposal. The potential impacts include:

Property and land use

As noted in section 3.6, eight existing residential properties and three lots which are within residential development land, have the potential to be fully or partially acquired as a result of the proposal.

The involuntary nature of acquisition of residential properties under the *Land Acquisition (Just Terms Compensation) Act 1991* and subsequent relocation of residents is likely to result in lifestyle disruption for individuals and households. A review of rental vacancy rates and properties for sale and rent in the local study area (i.e., the suburbs of Schofields and Quakers Hill) indicate that there is potential for residents affected by property acquisition to find an alternative property in the area, particularly in Schofields which has a higher rental vacancy rate. Residents of rural residential properties may be unable to relocate to a similar property located nearby, and therefore may be required to relocate outside of the local and regional study area, particularly given the redevelopment that is occurring in neighbouring areas. Generally, people who have lived at the same residence for over five years would have stronger links and attachment to the area and there may be a loss of social ties.

Most residents are likely to have a moderate-low level of sensitivity. Vulnerable residents may have less capacity to absorb or adapt to changes, therefore may have a moderate-high level of sensitivity. While the impact would be experienced by residents of eight households, the magnitude of the impact for these residents would be moderate-high as it would be clearly noticeable over the medium term, particularly if the residents have a strong attachment to their property, and if they are unable to remain in the local study area.

Leasing requirements, such as the area of land required are preliminary at this stage, but would be as small as possible. The need for lease arrangements would be confirmed by the roads authority and consultation regarding agreements would be undertaken with the identified landowners prior to work commencing. In addition to the proposed location for the compound site (refer to Figure 1-2), Table 3-13 lists the properties alongside the proposal site where additional land would need to be leased to support the construction activities and utility work. Leasing requirements would generally comprise a small strip of land along side the proposal to accommodate the construction works. The land would be reinstated and returned to the landowner following completion of construction works.

Temporary leasing of land at Quakers Hill Veterinary Hospital would have the potential to impact the driveways of the property, and available parking space for customers and employees in the short term.

Amenity and character

Construction noise and vibration would be sporadic and would move along the proposal alignment. Therefore, residents are not expected to be affected by noise and vibration at all times. Most residents are expected to have a moderate to low level of sensitivity to daytime noise and vibration, as they have the potential to have some areas of vulnerability and a high ability to absorb or adapt to these changes. Vulnerable residents may be particularly sensitive to increase noise and vibration levels. Section 6.2.4 identifies the receivers impacted by noise and which would be considered for noise mitigation measures.

Daytime construction noise and vibration may be a nuisance to these residents. This could potentially lead people to spend less time outdoors or engaging in recreational activities or relaxation and closing windows whilst indoors. It also has the potential to disturb day to day activities for some people, including people who work from home.

Night time construction works have the potential to cause sleep disturbance. Impacts are predicted to be highly intrusive at some residences. Disturbance to people's night-time peacefulness, relaxation or sleep can lead to tiredness which can affect people's moods, ability to concentrate on work and other activities, increase irritation and therefore potentially add to strain on personal relationships.

As discussed in the air quality assessment provided in section 6.10.3, potential air quality impacts during construction would be predominantly associated with the generation of dust. Air quality impacts as a result of dust generation are considered to be minor as they would be minimised through the implementation of the safeguards and management measures. During these periods nuisance dust may lead to some residents altering their way of life, such as closing windows of houses or vehicles, or spending limited time in front yards, backyards or on balconies. People may also need to spend more time cleaning indoor or outdoor surfaces due to settling dust. The construction of a new road, which would be elevated in various locations, would result in visual changes. Potential social impacts which may result from visual changes associated with the new road are discussed in section 6.9.3. Visual impacts are likely to be particularly noticeable in the suburb of Schofields, including in the rural-residential and residential areas along Alcorn Street, Anson Street, Kerry Road and Jersey Road, and the bushland and open space areas surrounding Eastern Creek. Most residents are expected to have a low level of sensitivity to visual changes during construction, as they are likely to have a high ability to absorb or adapt to these temporary changes particularly as the local study area is currently undergoing urban development, which is contributing to the overall change in character.

Access and connectivity

Construction of the proposal would result in permanent property access adjustments to some residences and businesses located along Burdekin Road, Jersey Road, Kerry Road and Railway Terrace. Due to the rapidly changing built environment and the proposed future precinct planning, the design of the proposal has not included access arrangements for these properties. Access arrangements will be reviewed and revised to accommodate the built environment at the time of detailed design to ensure access is provided at the time of construction. Property adjustment plans would be developed in consultation with affected property owners.

Construction of the proposal would result in the closure of Railway Terrace and Burdekin Road, just south of Stoke Street as Railway Terrace is converted into a permanent cul-de-sac and Burdekin Road is connected to Townson Road. There are two options for alternative routes for road users travelling from the south and west to destinations such as the Schofields Station, the shopping villages on Railway Terrace, and surrounding areas. These options include Hambledon Road and Schofields Road for those travelling from the west (e.g., The Ponds) or Alex Avenue and Jerralong Drive for those travelling from the south (e.g., Quakers Hill). Similarly, those travelling south and east from Schofields Station and surrounds would also need to use these alternative routes. It is expected these changes would result in increased traffic along these roads and some road users would experience an increase in travel times.

Changes to bus routes 734 and N71 would be required as a result of the permanent closure of Railway Terrace which would commence during the construction phase. This might cause delays for buses and increase time spent for passengers travelling or waiting for the bus. These delays could be an inconvenience to some bus passengers.

Temporary closure and diversions to footpaths and shared paths may act as actual or perceived barriers for travel along Burdekin Road. This may lead to people avoiding the area even with diversions and signage in place or result in actual or perceived safety concerns. There is potential for some members of the community (eg older people, people who need assistance, parents with prams, young children, people with mobility difficulty) to be more sensitive to such changes to footpaths as changes may be more difficult to navigate.

Construction of the proposal would result in the loss of about 35 informal parking spaces on Railway Terrace, across from the intersection at Stoke Street. It is likely that commuters travelling from Schofields Station utilise this area as a car park when the formal commuter car park spaces are fully occupied. The loss of this parking space would likely reduce parking availability for some commuters. This may increase the time taken to find parking.

Economy, business and employment

Construction work would result in direct employment opportunities for skilled workers from the region including roles such as engineers, designers and construction workers. Construction may provide opportunities for local businesses to supply goods and services to the construction workforce such as retail and food services close to the proposal.

Shops and businesses within the Woolworth Schofields shopping complex and the Schofields Village Shopping Centre have the potential to be affected as customers travelling from Burdekin Road would be redirected via Alex Avenue and Jerralong Drive. This may lead to some business owners, employees or customers changing their routine, such as taking an alternative route. Changes to access arrangements and travel routes could also impact passing trade for some businesses. This may lead to loss of income for some businesses.

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						
Acquisition of 8 residential properties and three lots which are within residential development land to accommodate the proposal.	Acquisition and relocation process would generate demands on time, for residents and their families. This could reduce the time that people can spend with family or engaging in leisure activities.	Negative Direct Temporary	Residents of properties being acquired	Moderate-low	Moderate-high	Moderate-low
			Vulnerable residents of properties being acquired	Moderate-high	Moderate-high	Moderate-high
Temporary leasing of land from 17 private, seven Government owned properties and Quakers Hills Veterinary Hospital to enable the placement of underground services and/or construction works to occur	Temporary leasing may reduce resident's enjoyment of these spaces, decrease a residents pride in their properties, and loss of privacy during construction.	Negative Direct Temporary	Residents of property being partially leased	Moderate-low	Low	Moderate-low
			Customers and employees of Quakers Hill Veterinary Hospital	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
Amenity and character						
Increased noise and vibration levels due to daytime construction activities at residential properties	Construction noise may be a nuisance to some residents. This may lead to individuals changing their behaviours, spending more time indoors and closing windows.	Negative Direct Temporary	Local residents	Moderate-low	Moderate-low	Moderate-low
	Vulnerable residents may be more sensitive to noise and may find it harder adapt to amenity changes.		Vulnerable residents	Moderate-high	Moderate-low	Moderate-low
Increased noise levels as a result of construction activities during night time	A construction management plan would identify noise sensitive locations and management measures and practices to minimise noise impacts for the residents.	Negative Direct Temporary	Local residents	Moderate	Moderate-low	Moderate-low
	Vulnerable residents may be sensitive to increased noise levels because of construction activities during night time.		Vulnerable residents	Moderate-high	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
Dust generated from construction activities may impact air quality on nearby residential areas.	Increase in dust can lead to some residents altering their way of life, including spending less time outdoors, and spending more time cleaning.	Negative Direct Temporary	Residents	Low	Low	Moderate-low
	People who may be more sensitive to dust include vulnerable groups such as older people, children and people with medical conditions such as asthma.		Vulnerable residents	Moderate-high	Low	Moderate-low to Moderate
Changes to visual surrounds due to construction activities.	Residents close to the proposal, particularly Anson Street, Alcorn Street, Kerry Road and Jersey Road, and the bushland and open space areas surrounding Eastern Creek, Schofields, would be able to view construction of the proposal. This may lead to some residents reducing use or enjoyment of outdoor areas, including balconies, or reducing time or enjoyment looking out of windows.	Negative Direct Temporary	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						
Increased travel times for road users in the local study area.	People would be required to allow for additional travel time to make trips. Increase time spent travelling may cause delays in getting home, to work, or other commitments.	Negative Direct Temporary	Road users	Moderate-low	Moderate	Moderate-low
			Vulnerable road users	Moderate-high	Moderate	Moderate-high
Delays to public transport services due to construction activities and road closures.	Increase in time spent on the bus, and a decrease in the reliability of local bus services due to construction activities or road closure in the proposal corridor. This may be an inconvenience to some bus passengers.	Negative Direct Temporary	Bus passengers	Moderate-low	Low	Moderate-low
Cancellations of some train services due to rail possession periods	Decrease in the reliability of train services due to rail possession periods during construction. This may be an inconvenience to some train passengers. It should be noted that the need for additional possessions (outside of scheduled possessions), has not been identified for the proposal.	Negative Direct Temporary	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
Change to pedestrian facilities along Burdekin Road, Alcorn Street, Anson Street and Siding Terrace	This may lead to an increase in travel times for pedestrians and may require them to alter their original route.	Negative Direct Temporary	Local residents	Low	Low	Low
	Vulnerable groups may find changes to pedestrian crossings or footpaths confusing and difficult to navigate. This may deter some people from using these paths or actual or perceived safety concerns. This may result in social isolation or difficulties in undertaking daily tasks like going to the shops.	Negative Direct Temporary	Vulnerable pedestrians	Moderate	Low	Moderate-Low
Loss of informal parking spaces on Railway Terrace, across from the intersection at Stoke Street	Reduction in parking availability for some commuters may increase the time taken to find parking. Some commuters may alter their daily commute to either arrive at the station earlier, or find an alternate station which could have additional parking	Negative Direct Temporary	Users of informal parking spaces	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
Economy, business and employment						
Increased construction workforce	Potential increase in employment due to demand for up to 80 construction workers.	Positive Direct Temporary	Job seekers	N/A	N/A	N/A
Increased opportunities for local businesses to supply goods and services to the construction workforce	Potential demand for local food and beverage and retail services close to the proposal to increase due to construction workers spending their wages. Businesses that are likely to benefit include retail and food and beverage shops and services located near Schofields station.	Positive Direct Temporary	Businesses owners	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
Reduced amenity for businesses within close proximity to the construction footprint due to changes to amenity	Construction activities resulting in decreased amenity due to increased noise, decreased air quality and a change in the visual landscape may be a nuisance to customers and employees who visit businesses within close proximity to the construction footprint.	Negative Direct Temporary	Customers and employees of businesses within close proximity to the construction footprint	Moderate-low	Low	Moderate-low
			Customers and employees of Akuna Vista Sales Office Brolen Homes Display Home and Quakers Hill Veterinary Hospital	Moderate-low	Moderate-high	Moderate-high
Potential increase in travel times for some business owners, employees or customers travelling towards the Woolworth Schofields shopping complex and the Schofields Village Shopping Centre	Potential increase in travel time for business owners and employees. This may cause employees to change their behaviours and daily routines.	Negative Direct Temporary	Business owners and employees	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
	Increased travel time for customers accessing businesses for goods and services. This may deter some customers, who may choose to visit a different business in a more convenient area. Changes in access routes may also impact passing trade for some businesses, this may lead to loss of income.	Negative Direct Temporary	Customers	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
Changes to access for some businesses located along Jersey Road, Kerry Road and Railway Terrace	Construction activities resulting in permanent access changes for Chambers Civil Construction and ONTRACK Earthmoving & Demolition which may increase travel time for customers and employees and become an inconvenience. Shops and businesses within the Woolworth Schofields shopping complex and the Schofields Village Shopping Centre also have the potential to be affected as customers travelling from Burdekin Road would be redirected via Alex Avenue and Jerralong Drive. This may be an inconvenience for employees and customers.	Negative Direct Permanent	Customers and employees	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
Changes to access, impact to the driveways and available parking space for customers and employees of Quakers Hill Veterinary Hospital	<p>Construction activities resulting the permanent access changes for this business which may increase travel time for customers and employees and become an inconvenience.</p> <p>Loss of land at this business due to construction activities would also have the potential to impact the driveways of the property, and available parking space for customers and employees in the short term. This may be an inconvenience for employees and customers and may result in impacts to business operations.</p>	<p>Negative Direct Temporary</p>	Customers and employees	Moderate-high	Low	Moderate

Operation

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

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.

Property and land use

Social impacts as a result of permanent property and land acquisition are assessed above in the construction impact assessment.

Amenity and character

During operation, increased traffic related noise would have the potential to be noticeable for residents in areas close to the proposal where there is currently little, or no existing traffic in a worst-case scenario and without at-source mitigation measures. These areas would include the rural-residential and residential areas along Alcorn Street, Anson Street, Kerry Road and Jersey Road. Increases in noise levels may disturb daily activities and sleep, therefore affecting quality of life for some residents. Section 6.2.4 identifies the receivers impacted by noise and which would be considered for noise mitigation measures.

As discussed in the air quality assessment provided in section 6.10.3, most pollutants would remain below the assessment criteria in a worst-case scenario, with the exception of one concentration which would exceed the criteria. While the decrease in air quality would generally not be noticeable to most people, some people may be more vulnerable to potential health effects associated with reduced air quality. This may include young children, elderly residents, or people with asthma.

The presence of a new road, road infrastructure including a new bridge over the rail line, shared pathways and footpaths, and the removal of some vegetation would change the overall visual environment for the residents of properties close to the proposal, and most notably those located along Alcorn Street, Anson Street and Stoke Street. Direct views of the road may lead to some residents from spending less time outdoors or on balconies, or reduce their enjoyment of views from windows. It also may reduce feelings of privacy or safety for some residents.

Access and connectivity

Social impacts as a result of converting Railway Terrace into a permanent cul-de-sac just south of Stoke Street as Railway Terrace would include road users needing to use alternative routes. These routes are discussed above as they would be the same as during construction. It is expected these changes would result in increased traffic along these roads and some road users would experience an increase in travel times. Changes to bus routes 734 and N71 would also be required as a result of the permanent closure of Railway Terrace. This might cause delays for buses and increase time spent for passengers travelling or waiting for the bus. These delays could be an inconvenience to some bus passengers.

The proposal would deliver benefits to the regional study area through an improved east-west connection between Townson Road and Burdekin Road. This would have the potential to alleviate eastbound traffic which is currently required to travel via either Schofields Road or Quakers Hill Parkway, improving travel time reliability and overall traffic flow. The proposal would also improve the local road network within the vicinity of the primary access point of the Sydney Business Park in Marsden Park which is the primary employment centre in the North-West Growth Area.

The proposal would include a vehicular and pedestrian bridge over the rail line which would tie-in with Burdekin Road. It would also include a shared path for pedestrians and cyclists, and footpaths at two additional locations along the alignment. This would improve pedestrian connectivity for people travelling east-west. This could also improve feelings of safety for more vulnerable pedestrians, including those who rely on active travel and people with mobility difficulties.

Economy, business and employment

Shops and businesses within the Woolworth Schofields shopping complex and the Schofields Village Shopping Centre have the potential to be affected from the permanent closure of Railway Terrace, as customers travelling from Burdekin Road would be redirected via Alex Avenue and Jerralong Drive. This may lead to some business owners, employees or customers changing their routine, such as taking an alternative route. Changes to access arrangements and travel routes could also impact passing trade for some businesses. This may lead to loss of income for some businesses.

Operation of the proposal would have the potential to affect amenity along Alcorn Street, Anson Street, Kerry Road, Jersey Road and Burdekin Road. This may be a nuisance to employees and customers to Quakers Hill Veterinary Hospital, Akuna Vista Sales Office, Brolen Homes Display Home, Oz Firewood, Chamber Civil Construction and ONTRACK Earthmoving & Demolition.

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						
Increased traffic related noise during operation of the proposal.	Increased noise would have the potential to 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. This impact may be less noticeable in some areas due to existing road traffic noise (near Burdekin Road). 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	Local residents	Low	Low	Low
			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
Reduced air quality for residents near the proposal during operation.	Reduced air quality during operation of the proposal may impacts residents living within proximity to the proposal. A 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	Moderate-low	Moderate-low
	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 residents	Moderate-high	Moderate-low	Moderate-high

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 the visual environment due to the presence of a new road, road infrastructure, new bridge over the railway line at Schofields at approximately 15 metres above ground level,, shared pathways and footpaths and the removal of some vegetation	During operation, the proposal would change the visual environment of the local study area and most notably for residences located along Alcorn Street, Anson Street and Stoke Street. Residents who value the existing rural character of area would be more sensitive to changes to their visual environment due to the operation of a new road and the impact on the existing rural character of the area.	Negative Direct Long term	Local residents	Low	High	Moderate
			Residents who value the existing rural character of area	Moderate-low	High	Moderate-high

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 east-west connection between Townson Road and Burdekin Road	This would have the potential to alleviate eastbound traffic, improving travel time reliability and overall traffic flow. This is expected to alleviate some stress and frustration that may result from existing traffic congestion.	Positive Direct Long term	Community members	N/A	N/A	N/A
Improved travel times and reliability in the bus network as a result of overall traffic flow improvements	This would have the potential to benefit people travelling through the area, as well as community members from the local study area.	Positive Direct Long term	Community members	N/A	N/A	N/A
Improved accessibility for active transport users due to new vehicular and pedestrian bridge and shared paths and footpaths at two additional locations along the alignment.	This has the potential to improve connectivity for people travelling east-west and improve feelings of safety for more vulnerable pedestrians, including those who rely on active travel and people with mobility difficulties.	Positive Direct Long term	Pedestrians, active transport users and vulnerable groups	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 related noise which has the potential to impact Chambers Civil Construction, ONTRACK Earthmoving & Demolition and Quakers Hill Veterinary Hospital	<p>Increased road traffic noise levels could potentially be a nuisance to employees and customers to Chambers Civil Construction, ONTRACK Earthmoving & Demolition, Akuna Vista Sales Office and Quakers Hill Veterinary Hospital which may result in a decrease in income for these businesses.</p> <p>However it is considered less likely that customers would choose not to visit Akuna Vista Sales Office and Brolen Homes Display Home as a result of these changes to amenity.</p>	<p>Negative Direct Permanent</p>	Customers and employees of Chambers Civil Construction and ONTRACK Earthmoving & Demolition	Moderate-low	Moderate	Moderate
			Customers and employees of Quakers Hill Veterinary Hospital and Akuna Vista Sales Office	Moderate-low	Moderate	Moderate

6.12.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Impact to businesses	An assessment based upon traffic modelling will be carried to identify the effects of the closure of Railway Terrace on local businesses.	Transport for NSW	Concept design	Additional safeguard
Socio-economic	<p>Prepare and implement a stakeholder engagement and community engagement strategy during detailed design which would include the following key actions:</p> <ul style="list-style-type: none"> • Consultation with residents, landholders and businesses in close proximity to the proposal area to notify them about the proposal design, construction activities and timing of construction works. • Communication with residents in the local study area to provide an overview of the proposal, the likely nature, extent and duration of amenity and access changes as a result of construction. Particular attention would be given to ensuring vulnerable groups are appropriately consulted, including culturally and linguistically diverse communities. This would align with Construction Traffic Management Plan which would include other measures such as managing traffic staging during construction and maintaining safety and efficient travel for the public. • Communication with general community members about road and pedestrian access changes and bus stop changes, such as roadside signage and web-based information. • Targeted communication with businesses. • Targeted communication with emergency services regarding access and traffic changes. 	Roads authority	Pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<p>Protocols for responding to construction fatigue experienced by residents, businesses and general community members. Methods would be provided to ensure community members can contact the project team to raise any concerns regarding amenity and access changes (e.g. 24 hour phone number).</p>			
<p>Impacts on businesses</p>	<p>Ongoing consultation with businesses should occur throughout the detailed design phase to ensure that businesses are given notice of any design features and construction activities that may impact their business operations.</p> <p>Engagement with affected business owners and employees should be undertaken to:</p> <ul style="list-style-type: none"> • Understand and address specific business impacts • Identify potential changes to customer behaviours as a result of the proposal Manage potential vehicle access changes • Identify potential parking constraints, including reliance on on-street parking • Scope opportunities for social procurement 	<p>Roads authority</p>	<p>Pre-construction</p>	<p>Additional safeguard</p>

Other safeguards and management measures that would address traffic, noise, landscape character and visual amenity, air quality and property 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

The proposal would be designed and constructed to ensure the responsible management of unavoidable waste and promote the reuse of such waste in accordance with the resource management hierarchy principles outlined in the *Waste Avoidance and Resource Recovery Act 2001*. The 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, the proposal would include 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 and through improper waste handling, storage and transport practices leading to issues such as pollution of waterways and attracting pests. 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, including the use of diesel and petrol
- Material required for road surface and pavements, such as road base, asphalt, spray seal, sand, concrete, aggregate etc
- Material required for bridge construction, such as concrete, steel etc
- Fill required to meet design levels
- Material required for fencing
- Materials required for road signage, street lighting and traffic signals
- Construction water, such as for concrete mixing and dust suppression.

The estimated quantities of these materials required for the proposal are provided in section 3.3.6.

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 number of resources required for construction.

Waste generation

The proposal has the potential to generate waste from the following activities:

- Vegetation, to be removed as part of the proposal
- Demolition of the several buildings
- 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 – indicative earthwork quantities are provided in Table 3-7. 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
- Demolition waste from existing buildings and structures removed from the construction footprint
- Roadside materials, such as 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 comprise standard road waste created during maintenance of infrastructure and management of road side vegetation. 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	<p>A resource and waste management plan will be prepared and included in the CEMP. The plan will include the following (as a minimum):</p> <ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> 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.			
Waste management	Waste receptacles will be provided and recycling of materials encouraged. Rubbish will be transported to an appropriate waste disposal facility.	Contractor	Construction	Additional safeguard
Waste management	All wastes will be managed in accordance with the POEO Act.	Contractor	Construction	Additional safeguard
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
Waste management	Weeds removed during work will be managed in accordance with the <i>Biosecurity Act 2015</i> requirements that relate to its classification status.	Contractor	Construction	Additional safeguard
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

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste minimisation	<p>The following resource management hierarchy principles will be followed:</p> <ul style="list-style-type: none"> • 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 <i>Waste Avoidance and Resource Recovery Act 2001</i>). 	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
Fill management	Where additional fill material is required this will be sourced from appropriately licensed facilities and/or other projects wherever possible.	Contractor	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 <i>Waste Classification Guidelines- Part 1: Classifying Waste</i> (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	<p>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.</p> <p>The assessment will be prepared in accordance with the <i>Roads and Maritime Environmental Procedure - Management of Wastes on TfNSW land</i>. Where the land is privately owned, a copy of the assessment will be provided to the landowner.</p>	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 guidelines 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	Flooding impacts and drainage design has assessed against key guidelines (refer to section 6.3 Appendix H). A climate change screening exercise has been carried out and summarised in section 6.14.3.	X

Target identifier	Target description	Applicable to the concept design	Applicable at later stages
CC2	Address all identified climate change risks ranked as high or above during project planning	-	X
Air Quality			
AQ1	Projects and operations will identify and apply best practice controls and initiatives for in-tunnel network and ambient air quality	An air quality assessment has been completed (refer to section 6.10) considering ambient air quality. Mitigation measures have been developed to minimise impact during construction (refer to section 6.10.4).	X
AQ2	Construction activities will identify and apply best practice air emissions controls	Air quality assessment mitigation measures have been developed to minimise impact during construction (refer to section 6.10.4).	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

Target identifier	Target description	Applicable to the concept design	Applicable at later stages
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
Biodiversity			
BD1	100 per cent of applicable projects will apply the Roads and Maritime Biodiversity Management Guidelines	-	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	An Aboriginal cultural heritage assessment (refer to Appendix L) and a Non-Aboriginal (historic heritage) assessment (refer to Appendix M) were completed at the concept design stage.	X
Liveable communities			
LC1	Meet the objectives of the Roads and Maritime Beyond the Pavement policy on all projects	In accordance with the policy (TfNSW 2020), the proposed urban design objectives and principles were defined by the urban design team and identified. This is summarised in Appendix D Landscape character and visual impact assessment and provided in detail in the Urban Design Report.	X
LC2	In the Greater Sydney Region and major regional cities, complete road development projects with no net loss of tree canopy cover	The biodiversity assessment (Appendix K) assessed the loss of non-certified vegetation. Statutory and non-statutory off sets are detailed in section 6 of Appendix K.	X

Target identifier	Target description	Applicable to the concept design	Applicable at later stages
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
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 National Australian Built Environment Rating System Energy and Green Star standards ratings for new buildings or refurbished offices (>1000m ²) are to be 5 stars	-	X
CS4	Phase out purchase of single use kitchen items by end of 2020	-	X

Each initiative described in the strategy relates to one or more of the targets described in Table 6-33 above. The roads authority 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?	<p>The risk 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.</p> <p>According to available hazard mapping, the construction footprint is not subject to landslide risk or cyclones (Department of Planning, 2019)</p>
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?	-	<p>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.</p> <p>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.</p>
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.	<p>A summary of current trends in the frequency and intensity of extreme events includes:</p> <ul style="list-style-type: none"> • 11.6 per cent increase in maximum one day rainfall for a 20 year ARI event (CSIRO 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 (CSIRO 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).

Relevant pre-screening question		Conclusion and supporting information
-	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?	<p>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.</p> <p>Design inputs to mitigate these impacts should be addressed with a detailed risk assessment and adaptation work during detailed design.</p>

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 targets applicable to the concept design should be implemented (as shown in Table 6-33) and where applicable taken forward to detailed design.

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 the latest version of the Transport for NSW Guidelines. 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 the proposal (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 the 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:

- Stage 1 involved an upgrade of about 1.6 kilometres of road extending from Richmond Road to south of Jersey Road. This stage included an interim and ultimate phase of work. These stages are anticipated to be completed prior to construction of the proposal.
- The proposal is about two kilometres in length involving the construction of a new road between the tie in of Stage 1 of the proposal and Burdekin Road.

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. Due to the large amount of ongoing development within the vicinity of the project, this assessment has considered the substantial developments. Cumulative impacts from single dwelling improvements and subdivisions would be inconsequential compared to the overall development in area.

Table 6-35: Past, present and future projects

Project	Construction impacts	Operational impacts
Townson Road Upgrade between Richmond Road and Jersey Road – Stage 1		
<p>The project involves widening and upgrading about 1.6 kilometres of Townson Road, between Richmond Road and Durham Road/Jersey Road. This includes a bridge across Bells Creek and two new intersections at Victory Road and a proposed new road.</p> <p>The project is to be delivered in phases – interim and ultimate. The delivery of the project 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.</p> <p>It is anticipated the ultimate phase of the project would be completed prior to construction of the proposal</p>	<p>Assessment of the construction works identified the following key impacts</p> <ul style="list-style-type: none"> • Disruption to the local traffic network • Noise • Improvements to the flooding regime through the bridge over Bells Creek and a second floodplain relief bridge • Removal of non-certified vegetation • Property impacts. <p>Benefits would be gained from increased or continued construction job opportunities and economic benefits available to residents within the regional study area.</p>	<p>The project would contribute to the overall program benefits to facilitate growth and development in the NWGA.</p>

Project	Construction impacts	Operational impacts
Alderton Drive, Colebee residential subdivision development (Luxeland development)		
<p>The project involves the development of around 240 low density residential dwellings to the south of Townson Road.</p> <p>Construction for the project began in 2019. It is anticipated the majority of the development would be completed prior to construction of the proposal.</p> <p>Located 0.5 kilometres south-west of proposal</p>	<p>Construction impacts from this proposal may include:</p> <ul style="list-style-type: none"> • Increased noise for residents living along or close to the project • Increased traffic affecting Townson Road, local roads and Richmond Road during standard construction hours • Reduced air quality for residents living close to the project • Further increased construction job opportunities available to residents within the regional study area. 	<p>Operation impacts from this project may include:</p> <ul style="list-style-type: none"> • Visual impacts of the new buildings • An increase in traffic on Townson Road, local roads and associated road traffic noise • Additional residences patrons using street parking.
Altrove Estate developments		
<p>The project involves building around 2,200 dwellings, this includes a mixture of houses, townhouses and apartments.</p> <p>Construction of the project is expected to continue until around 2035, and therefore it is anticipated there will be some overlap with the construction period of the proposal.</p> <p>This project is located near Burdekin Road.</p>	<p>Construction impacts from this project may include:</p> <ul style="list-style-type: none"> • 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. 	<p>Operation impacts from this project may include:</p> <ul style="list-style-type: none"> • 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.

Project	Construction impacts	Operational impacts
Proposed future residential subdivision development (on CSR owned land)		
<p>The existing quarry to the north of Meadow Road is identified for a future residential subdivision development as part of the West Schofields precinct plan.</p> <p>The residential development project is anticipated to be constructed 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, around an additional 1,600 lots would be developed. Rehabilitation of the quarry has already been completed.</p>	<p>Construction impacts from this project may include:</p> <ul style="list-style-type: none"> • Vegetation clearing • Increased duration of noise for residents living along or close to the project • Increased traffic affecting Townson Road and Richmond Road during standard construction hours • Reduced air quality for residents living along or close to the project. 	<p>Operation impacts from this project may include:</p> <ul style="list-style-type: none"> • Visual impacts of the new buildings • An increase in traffic on Townson Road and associated road traffic noise.
Landcom – Proposed future residential subdivision development (on council owned land)		
<p>The residential development project is proposed to be undertaken as a staged subdivision that would provide 143 dwellings and would include new public roads, landscaping and civil works.</p> <p>Construction works are proposed to be ongoing from 2021. It is expected that this project would be completed prior to commencement of the proposal.</p> <p>The site is located east of Pelican Road, off Burdekin Road, around 100 metres east of the proposal.</p>	<p>The proposed development will have minimal impacts on surrounding properties. It is believed that the proposed development would have minor impacts during construction related to reduced amenity.</p>	<p>Operational impacts from this project may include:</p> <ul style="list-style-type: none"> • 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	<p>The Altrove development and the future residential subdivision development (on CSR owned land (see section 6.15.3) are anticipated to be constructed at a similar time to the proposal.</p> <p>The construction works for Stage 1 are anticipated to be completed prior to construction of the proposal. There may however, be construction fatigue within the local community, particularly from residences close to both projects from ongoing noise impact.</p> <p>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.</p>	<p>With completion of construction, operational noise levels from the completed developments in combination with the proposal are not expected to exceed noise criteria.</p> <p>The proposal and Stage 1 would contribute to the overall program benefits to facilitate growth and development in the NWGA. With the combination of both projects there will be additional traffic noise within the road corridor of the overall program.</p>
Traffic and transport	<p>There may be additional construction traffic within the surrounding road network as a result of combined construction work in the area from the Altrove and CSR developments.</p> <p>The construction works for Stage 1 are anticipated to be completed prior to construction of the proposal. There may however, be construction fatigue within the local community due to ongoing disruption to the local road network.</p> <p>Traffic management plans for each project would contain measures to minimise impacts of construction traffic on the surrounding road network.</p> <p>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.</p>	<p>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. In combination with Stage 1 of the Townson Road Upgrade the proposal would contribute to provide network benefits to the planned residential developments.</p> <p>Other network upgrades being investigated and planned as part of the NWGA Road Network Strategy including the proposal could improve the intersection capacity on the Townson Road/Burdekin Road corridor.</p>

Environmental factor	Construction	Operation
Landscape	<p>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.</p>	<p>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.</p> <p>The proposal would contribute to significant visual impacts within the study area, including from the addition of a new bridge, which being elevated, cannot be mitigated through revegetation.</p>
Biodiversity	<p>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 Appendix J for detailed impacts).</p>	<p>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 Appendix J).</p>
Flooding and hydrology	<p>The proposal in combination with other planned development would contribute to increased temporary activities within the Eastern 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.</p>	<p>The proposal would increase 1 in 100 year flood events by up to 0.24 metres on the western floodplain of Eastern Creek and 0.40 metres at the Burdekin Road Connection. Additionally, the proposal would contribute to increased runoff to as result of pervious surfaces to impervious surfaces (see Section 6.3.3 and Appendix G).</p> <p>Further regional development is planned in this area and may also impact on the hydrology of the broader Eastern Creek catchment. The flood level increases to the west can possibly be accommodated as part of future development.</p>

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 roads authority 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	<p>A CEMP will be prepared and submitted for review and endorsement of the roads authority Environment Manager prior to commencement of the activity.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> • Any requirements associated with statutory approvals • Details of how the proposal will implement the identified safeguards outlined in 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. <p>The endorsed CEMP will be implemented during the undertaking of the activity.</p>	Contractor/ Roads authority	Pre-construction/detailed design	Core standard safeguard GEN1
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/ Roads authority	Pre-construction	Core standard safeguard GEN2

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN3	General – environmental awareness	<p>All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular ‘toolbox’ style briefings.</p> <p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include:</p> <ul style="list-style-type: none"> • Areas of Aboriginal heritage sensitivity • Threatened species habitat and areas of ecological sensitivity and requiring protection • Adjoining residential areas requiring particular noise management measures. 	Contractor/ Roads authority	Pre-construction/ detailed design	Core standard safeguard GEN3

Traffic and Transport

T1	Traffic and transport	<p>A revised traffic assessment will be prepared prior to detailed design to account for the changes to the built environment and road network. This should include:</p> <ul style="list-style-type: none"> • Review of the network traffic model to confirm and update the network capacity and flow assumptions into the intersection modelling for an accurate representation of intersection performance. • New traffic counts • Review and revise if necessary, the opening and future scenario years • Review the Aerodrome Drive (Veron Road) intersection arrangement 	Roads authority	Detailed design	Additional safeguard
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No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> Consider if the study area should extend further east of the proposal area. 			
T2	Traffic and transport	<p>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:</p> <ul style="list-style-type: none"> 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	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
T3	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.	Roads authority/ Contractor	Detailed design and Construction	Additional safeguard
T4	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
T5	Management of heavy vehicles	An assessment of heavy vehicles from construction and through traffic (on diversion routes) will consider: <ul style="list-style-type: none"> • Vehicle types/maximum size which can negotiate the road network. • Coordination to prevent queuing or double parking. 	Contractor	Construction	Additional safeguard
T6	Worker parking	Provision of parking within the compound sites for workers and construction vehicles.	Contractor	Construction	Additional safeguard
T7	Road closures	<ul style="list-style-type: none"> • Traffic guidance schemes (TGS) 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	Core standard safeguard T3

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
T8	Pedestrian and cyclists	<ul style="list-style-type: none"> 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	Construction traffic noise	When the detailed construction staging of this proposal has been finalised, it is recommended that a construction traffic noise assessment is undertaken.	Roads authority / Contractor	Detailed design	Additional safeguard
NV2	Noise and vibration	An Addendum Noise and Vibration Impact Assessment will be prepared to capture any newly constructed residential developments since this publication of this report, for inclusion in the assessment and consideration for mitigation treatments where required. The assessed buildings would be reviewed during detailed design to ensure impacts at structures that have been constructed or approved prior to approval of the proposal have been considered.	Roads authority/ Contractor	Detailed design	Additional safeguard
NV3	Operational noise	Consideration of noise walls will be further assessed during detailed design. This would determine the feasible and reasonable position, extent and height of structures.	Roads authority/ Contractor	Detailed design	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV4	Noise and vibration	<p>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 <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> • 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 approach and procedures for road and maritime infrastructure planning, design and construction, (TfNSW 2020) • 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	<p>Core standard safeguard NV1</p> <p>Section 4.6 of QA G36 <i>Environment Protection</i></p>

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV5	Community consultation	<p>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 ENMM Practice Note (vii) provides community consultation procedures for road work outside normal working hours. The notification will provide details of:</p> <ul style="list-style-type: none"> • The proposal • The construction period and construction hours • Contact information for proposal management staff • Complaint and incident reporting • How to obtain further information. 	Contractor	Pre-construction / Construction	Core standard safeguard NV2
NV6	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

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV7	Construction noise from inappropriate practices	<p>All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include:</p> <ul style="list-style-type: none"> • 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
NV8	Construction traffic noise	<p>Management of construction related traffic or traffic reroutes should as a minimum include the following controls:</p> <ul style="list-style-type: none"> • Scheduling and routing of vehicle movements • Speed of construction related heavy vehicles should be limited to 40 km/hr along haul routes on local roads • Driver behaviour and avoidance of the use of engine compression brakes • Ensuring vehicles are adequately silenced before allowing them to access the site 	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> • 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 <p>Avoid or minimise out of hours movements where possible.</p>			
NV9	Construction noise from machinery and equipment	<p>The use and selection of machinery and equipment will:</p> <ul style="list-style-type: none"> • 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 	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> 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. 			
NV10	Hours of construction activity	<p>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.</p> <p>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.</p>	Contractor	Construction	Additional safeguard
NV11	Extended duration of noise and vibration activity	<p>Where receivers are highly noise affected, 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.</p> <p>Where receivers are highly noise affected, 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.</p>	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV12	Road noise	<p>The NMG recommends noise mitigation in the following order of preference:</p> <ul style="list-style-type: none"> • Quieter road pavement surfaces • Noise mounds • Noise barriers (noise walls) • At-property treatments. 	Contractor	Detailed design	Additional safeguard
NV13	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	Detailed design	Additional safeguard
NV14	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.	Roads authority	Operation	Additional safeguard
Hydrology and flooding					
FL1	Drainage design	<p>Ensure appropriate integration with Council's stormwater network. Design will include:</p> <ul style="list-style-type: none"> • 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. 	Roads authority/ Contractor	Detailed design	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
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.	Roads authority / Contractor	Detailed design	Additional safeguard
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 creek channel.	Roads authority/ Contractor	Detailed design	Additional safeguard
FL4	Western floodplain impact	If the road is planned to be constructed prior to the rezoning and property acquisition on the western floodplain, the design will include mitigation measures to prevent unacceptable flood level increases at existing properties. Existing buildings will be surveyed prior to commencement of the detailed design to enable design of suitable flood mitigation works should these be required.	Roads authority/ TfNSW	Pre-detailed design	Additional safeguard
FL5	Provision of additional road pavement	Runoff from Townson Road will be conveyed directly to Eastern Creek, where feasible. Transverse culverts will be designed so that impacts on flood hydraulics are minimised. The impact of increased runoff to minor drainage lines will be investigated further as part of the detailed design phase and appropriate mitigation measures will be incorporated into the design.	Roads authority / Contractor	Detailed design	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
FL6	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
FL7	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
FL8	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
FL9	Management of water bodies	Work within or near the creek will be undertaken with consideration given to the NSW Department of Primary Industries (<i>Water Guidelines for controlled activities on waterfront land – Riparian corridors</i> (2018)).	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
Surface and groundwater					
SW1	Erosion and sedimentation	<p>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:</p> <ul style="list-style-type: none"> 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). <p>The SWMP would detail the following as a minimum:</p> <ul style="list-style-type: none"> 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) 	Contractor	Pre-construction	<p>Core standard safeguard SW2</p> <p><i>QA G38 Soil and Water Management</i></p>

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> • 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 <p>Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.</p>			
SW2	Erosion and sedimentation	Existing natural soils or reused dispersive materials adjacent to or beneath drainage lines or culverts should be stabilised with gypsum. Additional treatments to prevent erosion such as rock armour or rip-rap at culvert inlets/outlets should also be considered and designed according to the recommended standards (Austroads 2013, Catchments and Creeks 2014, 2015, 2017).	Contractor	Pre-construction and construction	Additional safeguard
SW3	Water quality monitoring	A monitoring program of surface water and groundwater quality will be included as part of the CEMP to measure water quality outcomes against the ANZECC (2000b) and ANZG (2018) guidelines.	Contractor	Pre-construction and construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
SW4	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
SW5	Spills	Further, existing open swale drains and any other open drainage channels provided through construction areas will help provide an opportunity to cut off, via emergency bunding where required, any spills and leaks that may begin running off-site or into underground stormwater drainage networks. This would be in the unlikely event of chemical spills or leaks occurring within the construction footprint.	Contractor	Construction	Additional safeguard
Soils and contamination					
SC1	Soil and water	<p>A site specific Erosion and Sediment Control Plan will be prepared and implemented as part of the Soil and Water Management Plan.</p> <p>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.</p>	Contractor	Pre-construction	<p>Core standard safeguard E2</p> <p>Section 2.2 of QA G38 <i>Soil and Water Management</i></p>

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
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 road authorities Environment Manager and/or EPA.	Contractor	Construction	Section 4.2 of QA <i>G36 Environment Protection</i>
SC3	Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the <i>Roads and Maritime Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including the roads authority and EPA officers).	Contractor	Pre-construction and construction	Section 4.3 of QA <i>G36 Environment Protection</i>
SC4	Storage of materials	Hazardous materials such as fuel and chemicals will be stored in suitably located bunded areas, in accordance with DECC's <i>Storing and Handling Liquids: Environmental Protection Participants Manual</i> (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 or removed from the site, and disposed of at an appropriately licensed facility.	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
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
Biodiversity					
BIO1	Construction management	<p>A Flora and Fauna Management Plan will be prepared in accordance with the <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas Requirements set out in the Landscape Guideline (RTA, 2008) Pre-clearing survey requirements surveys for the Cumberland Plain Land Snail are to be completed within areas of potentially suitable habitat in non-certified land in the construction footprint. 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) 	Contractor	Pre-construction	<p>Core standard safeguard B1</p> <p>Section 4.8 of QA G36 <i>Environment Protection</i></p>

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> • Protocols to manage weeds and pathogens in accordance with Biodiversity Guidelines - <i>Guide 6 (Weed Management)</i>. <p>Erosion and sediment control measures would be established prior to construction in accordance with the principles and guidelines included in <i>Managing Urban Stormwater: Soils and Construction - Volume 1</i> (Landcom, 2004) and <i>Volume 2D of Managing Urban Stormwater: Soils and Construction</i> (DECC 2008).</p>			
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	<p>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 and consider 'bat friendly' roost designs.</p> <p>Detailed design of bridge structures should consider ways to minimise the impacts of shading on adjacent native vegetation and aquatic habitats.</p> <p>The design of the detention basins will consider the planting of semi-aquatic emergent vegetation, to recreate artificial wetland habitats in the locality.</p>	Contractor	Detailed design	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
BIO4	Removal of threatened species habitat and habitat features	Aquatic habitat will be protected in accordance with <i>Guide 10: Aquatic habitats and riparian zones</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) and Section 3.3.2 <i>Standard precautions and mitigation measures</i> of the <i>Policy and guidelines for fish habitat conservation and management Update 2013</i> (DPI (Fisheries NSW) 2013).	Roads Authority/ Contractor	Pre-construction	Additional safeguard
BIO5	Removal of threatened plants	Pre-clearing surveys will be undertaken in accordance with <i>Guide 1: Pre-clearing process</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011). The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) if threatened flora species, not assessed in the biodiversity assessment, are identified in the construction footprint.	Contractor	Prior to 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.	Roads Authority	Pre-construction	Section 4.9 of QA G36 Environment Protection
AH2	Unexpected finds	<ul style="list-style-type: none"> <i>The Standard Management Procedure - Unexpected Heritage Items</i> (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
AH3	Aboriginal heritage	An application for an AHIP will be made under section 90A of the <i>National Parks and Wildlife Act 1974</i> for the two Aboriginal archaeological sites. The application will be prepared in accordance with the Department of Planning and Environment (DPE) <i>Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants</i> (OEH, 2011).	Roads Authority	Pre-Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
AH4	Aboriginal heritage	The non-impacted portion of sites Kerry Road Eastern Creek PAD 1 and Schofields 3 (outside of construction and AHIP boundary) will be marked on the Construction Environmental Management Plan prior to construction activities to ensure these parts of the sites are avoided and not impacted by the proposed works. The site areas will be marked as an environmentally sensitive “no-go zone”.	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 <i>Standard Management Procedure - Unexpected Heritage Items</i> (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 <i>Environment Protection</i>

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual amenity					
LV1	Landscape character and visual impact	<p>An Urban Design Plan will be prepared to support the detailed design and will be implemented as part of the CEMP.</p> <p>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:</p> <ul style="list-style-type: none"> • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls, bridges and noise walls • Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape work taking account of related environmental controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas. 	Roads Authority/ Contractor	Detailed design/pre-construction	Standard safeguard V1

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<p>The Urban Design Plan will be prepared in accordance with relevant guidelines, including:</p> <ul style="list-style-type: none"> • Beyond the Pavement: Urban design approach and procedures for road and maritime infrastructure planning, design and construction, (TfNSW 2020) • Landscape Design Guideline (TfNSW 2018) • Bridge Aesthetics (TfNSW 2019) • Design guideline to improve the appearance of noise walls in NSW, (TfNSW 2021) • Shotcrete Design Guideline (TfNSW 2016). • Relevant BCC council guidelines including Blacktown Local Environmental Plan and Blacktown City Council Growth Centre Precincts Development Control Plan 2010. 			
LV2	Visual impact from the rail bridge	<p>During detailed design visual impact from the reinforced soil wall will be minimised through the use of different materials/colours/textures.</p> <p>Consider wall treatment opportunities such as public art to improve aesthetic quality of the structure.</p>	Roads Authority	Detailed design	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
LV3	Visual impact from the rail bridge	Consider a continuous bridge structure on piers with minimal rammed earth walls, to mitigate the proposed visual barrier the walls would create between two residential areas, and allow for the retention of long views under the road bridge, reducing the visual impact to residents on Alcorn Street, Siding Terrace and Anson Street. Opening the bridge structure and undercroft could also generate opportunities for open space for community benefit.	Roads Authority	Detailed design	Additional safeguard
LV4	Visual impact from signage	Position signs in a non-visually obtrusive way and sensitively locate to consider views from residential areas, where possible.	Roads Authority	Detailed design	Additional safeguard
LV5	Consultation on urban design	Recommendations from the Design Review Panel would be considered at all relevant stages of the project.	Roads Authority	Detailed design, Construction and operation	Additional safeguard
LV6	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

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
LV7	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
LV8	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
LV9	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
LV10	Light spill	Light generated during construction will be managed in general accordance with the requirements in <i>Australian Standard AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting</i> . Generally, lighting would be designed to minimise off site light spill.	Contractor	Construction	Additional safeguard
LV11	Landscape character	Reinstatement of construction site compounds will commence progressively post construction and will be undertaken as soon as practicable.	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality					
AQ1	General air quality impacts	<p>An air quality management plan will be prepared as part of the CEMP. The plan will include but not be limited to:</p> <ul style="list-style-type: none"> • 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	<p>Core standard safeguard AQ1</p> <p>Section 4.4 of QA G36 Environment Protection</p>
AQ2	Dust emissions	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> 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 the roads authorities policy and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Roads Authority	Pre-construction and construction	Core standard safeguard
P2	Property access	At detailed design, property access arrangements for properties impacted by the proposal, will be reviewed and revised to accommodate the built environment at that time.	Roads Authority	Detailed design	Additional safeguard
P3	Property adjustment	Property adjustment plans would be developed in consultation with the affected property owners.	Roads Authority	Pre-construction	Additional safeguard
P4	Future land use	A review of the proposed future West Schofields precinct land use zoning will be carried out along with an acquisition strategy to ensure that appropriate development controls are in place prior to construction of the proposal.	Roads Authority	Detailed design, pre-construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
Socio-economics					
S1	Impact to businesses	An assessment based upon traffic modelling will be carried to identify the effects of the closure of Railway Terrace on local businesses.	Transport for NSW	Concept design	Additional safeguard
S2	Socio-economic	<p>Prepare and implement a stakeholder engagement and community engagement strategy during detailed design which would include the following key actions:</p> <ul style="list-style-type: none"> • Consultation with residents, landholders and businesses in close proximity to the proposal area to notify them about the proposal design, construction activities and timing of construction works. • Communication with residents in the local study area to provide an overview of the proposal, the likely nature, extent and duration of amenity and access changes as a result of construction. Particular attention would be given to ensuring vulnerable groups are appropriately consulted, including culturally and linguistically diverse communities. This would align with Construction Traffic Management Plan which would include other measures such as managing traffic staging during construction and maintaining safety and efficient travel for the public. • Communication with general community members about road and pedestrian access changes and bus stop changes, such as roadside signage and web-based information. • Targeted communication with businesses. 	Contractor / Roads Authority	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> Targeted communication with emergency services regarding access and traffic changes. Protocols for responding to construction fatigue experienced by residents, businesses and general community members. Methods would be provided to ensure community members can contact the project team to raise any concerns regarding amenity and access changes (e.g. 24 hour phone number). 			
S3	Impacts on businesses	<p>Ongoing consultation with businesses should occur throughout the detailed design phase to ensure that businesses are given notice of any design features and construction activities that may impact their business operations.</p> <p>Engagement with affected business owners and employees should be undertaken to:</p> <ul style="list-style-type: none"> Understand and address specific business impacts Identify potential changes to customer behaviours as a result of the proposal Manage potential vehicle access changes Identify potential parking constraints, including reliance on on-street parking Scope opportunities for social procurement 	Contractor / Blacktown City Council	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
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	<p>A resource and waste management plan will be prepared and included in the CEMP. The plan will include the following (as a minimum):</p> <ul style="list-style-type: none"> • 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 	Contractor	Pre-construction	<p>Core standard safeguard W1</p> <p>Section 4.2 of QA G36 Environment Protection</p>

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> • 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. 			
RW3	Waste management	Waste 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 <i>Biosecurity Act 2015</i> 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

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
RW8	Waste minimisation	<p>The following resource management hierarchy principles will be followed:</p> <ul style="list-style-type: none"> • 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 <i>Waste Avoidance and Resource Recovery Act 2001</i>). 	Contractor	Construction	Core standard safeguard M2
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	Fill management	Where additional fill material is required this will be sourced from appropriately licensed facilities and/or other projects wherever possible.	Roads Authority/ Contractor	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.	Contractor	Construction	Additional safeguard

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
RW14	Spoil management	Excess soil requiring waste disposal will first be assessed against the <i>Waste Classification Guidelines- Part 1: Classifying Waste</i> (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
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 <i>Roads and Maritime Environmental Procedure - Management of Wastes</i> 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

No	Impact	Environmental safeguards	Responsibility	Timing	Reference
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
<i>Fisheries Management Act 1994 (s199)</i>	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.
<i>National Parks and Wildlife Act 1974 (s90)</i>	Aboriginal heritage impact permit from NSW Heritage.	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, 2017). 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, 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
<p>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.</p>	<p>The proposal involves work for the purpose of a road and would involve vegetation clearance and the partial and full property acquisition. Acquisition is listed in Table 3-11. Impacts are discussed throughout section 6.</p> <p>Appropriate mitigation measures would be implemented to minimise any environmental, economic and social impacts associated with the proposal. Reduced travel time and east west connectivity would provide an economic benefit to road users and the local communities.</p>
<p>1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.</p>	<p>Ecologically sustainable development is considered in section 8.2.1 below.</p>
<p>1.3(c) To promote the orderly and economic use and development of land.</p>	<p>The proposal would maximise linkage with existing road corridors and improve traffic conditions and connectivity along the Townson Road to Burdekin Road corridor. The new road and intersections, development of continuous footpaths and bridge work would benefit road users and active transport users. The proposal also minimises ongoing congestion and capacity issues associated with the future growth of the area.</p>
<p>1.3(d) To promote the delivery and maintenance of affordable housing.</p>	<p>Not relevant to the project.</p>
<p>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.</p>	<p>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.</p>
<p>1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).</p>	<p>The proposal would not impact non-Aboriginal heritage. Two Aboriginal archaeological sites of moderate significance would be partially impacted. Refer to sections 6.7 and 6.8.</p>
<p>1.3(g) To promote good design and amenity of the built environment.</p>	<p>Not relevant to the proposal.</p>
<p>1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.</p>	<p>Not relevant to the proposal.</p>

Object	Comment
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 business 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 proposed to minimise potential impacts. These safeguards would be implemented during construction and operation of the proposal.

A CEMP would be prepared before construction starts. This requirement would ensure the proposal achieves a high-level of environmental performance.

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 Transport for NSW. 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

The roads authority proposes to construct a two kilometre length of new road between the Stage 1 tie-in and Burdekin Road. 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 options assessment and concept design development. The proposal as described in the REF best meets the project objectives but would still result in some impacts on visual amenity, noise and biodiversity. The proposal would require the acquisition from a number of residential properties. 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.

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.

K Yale

GHD Senior Environmental Scientist

Date: 6 May 2022



I have examined this review of environmental factors and accept it on behalf of Transport for NSW.

Todd Chebuk

Project Development Manager

Western Sydney Project Office

Date:

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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	<i>Biodiversity Conservation Act 2016 (NSW).</i>
Biodiversity and Conservation SEPP	State Environmental Planning Policy (Biodiversity and Conservation) 2021
CEEC	Critically Endangered Ecological Communities
CEMP	Construction environmental management plan
Central River City SEPP	State Environmental Planning Policy (Precincts – Central River City) 2021
CNVG	Construction Noise and Vibration Guideline
CO2	Carbon Dioxide
CP	Communication Plan
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DPI	Department of Primary Industries
DPE	Department of Planning and Environment
DUAP	Department of Urban Affairs and Planning
EEC	Endangered Ecological Communities

Term/Acronym	Description
EIA	Environmental impact assessment
EIS	Environmental impact statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW.
EPA	Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
GDE	Groundwater Dependent Ecosystem
IBRA	Interim Biogeographic Regionalisation for Australia
ICNG	Interim Construction Noise Guideline
KNC	Kelleher Nightingale Consulting Pty Ltd
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 <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
NBN	National Broadband Network
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
NWGA	North West Growth Area
OEH	Office of Environment and Heritage
PACHCI	<i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation</i>

Term/Acronym	Description
PAD	Potential Archaeological Deposits
PCT	Plant community type
PEMP	Project Environmental Management Plan
POEO Act	<i>Protection of the Environment Operations Act</i>
Priority Growth Areas	Formerly Growth Centres. These were established by the NSW Government under the State Environmental Planning Policy (Precincts – Central River City) 2021
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
TGS	Traffic guidance schemes, formally known as traffic control plans.
TfNSW	Transport for NSW
Transport and Infrastructure SEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021

Appendix A

Consideration of section 171 factors and matters of national environmental significance and Commonwealth land

Section 171 Checklist

In addition to the requirements of the *Is an EIS required?* guideline (Department of Planning 1995) and the *Roads and Related Facilities EIS Guideline* (Department of Planning 1996) as detailed in the REF, the following factors, listed in section 171(2) of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
<p>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.</p>	<p>Short-term negative</p> <p>Long-term positive</p>
<p>b) Any transformation of a locality? The proposal is located within the 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.</p>	<p>Long-term positive</p>
<p>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 Grey Box Forest Red gum and Forest Red Gum Rough Barked Apple Grassy Woodland and listed as endangered under the BC Act. All recorded in poor to moderate condition 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. The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act. The implementation of safeguards and management measures outlined in Table 7-1 would minimise the potential biodiversity impacts.</p>	<p>Long-term minor negative</p>
<p>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.</p>	<p>Short-term negative</p> <p>Long-term negative</p>

Factor	Impact
<p>In operation the proposal would result in high visual impacts from seven viewpoints, high to moderate impact from four viewpoints and low to moderate impacts from one viewpoint. The greatest visual impact of the proposal would occur along Alcorn Street, Anson Street, Siding Terrace and Stoke Street where residential dwellings face onto the proposal corridor. This is because the road and bridge construction will be a significant visual change from existing views.</p>	
<p>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? Two Aboriginal archaeological sites would be impacted. sites identified within the construction footprint are of moderate significance, an AHIP is required for impacts to these sites/objects prior to the commencement of pre-construction or construction activities. Safeguards and management measures are provided in Section 6.7.4.</p> <p>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).</p> <p>There are no sites of non-Aboriginal signification within the construction footprint (see section 6.8).</p>	<p>Long-term minor negative</p>
<p>f) Any impact on the habitat of protected fauna (within the meaning of the <i>Biodiversity and Conservation Act</i>)? 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 Grey-headed Flying-fox and Little Bent-winged and hollow-dependant and culvert roosting microbats. Removal of a small amount of dam foraging habitat for the Southern Myotis. The implementation of safeguards and management measures outlined in Table 7-1 would minimise the potential biodiversity impacts.</p>	<p>Long-term minor negative</p>
<p>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.</p>	<p>Nil</p>
<p>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.</p>	<p>Long-term positive Long-term minor negative</p>

Factor	Impact
<p>i) Any degradation of the quality of the environment? The proposal would require substantial earthworks and the removal of vegetation. This would have visual impacts on sensitive receivers. 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.</p>	<p>Long-term minor negative</p>
<p>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.</p>	<p>Short-term negative Long-term minor positive</p>
<p>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.</p>	<p>Short-term negative</p>
<p>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.</p>	<p>Short-term negative</p>
<p>m) Any environmental problems associated with the disposal of waste? The proposal would result in the generation of minor volumes of wastes from demolition and 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.</p>	<p>Short-term negative</p>
<p>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.</p>	<p>Nil</p>

Factor	Impact
<p>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.</p> <p>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.</p> <p>Other network upgrades being investigated and planned as part of the NWGA Road Network Strategy including Stage 1 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>	<p>Short-term negative</p> <p>Long-term positive</p> <p>Long-term positive</p>
<p>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.</p>	<p>Nil</p>
<p>q) Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1</p>	<p>Short-term negative</p> <p>Long-term positive</p>
<p>r) Other relevant environmental factors</p>	<p>Nil</p>

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 Agriculture, Water and the Environment.

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

Transport and Infrastructure SEPP

Council related infrastructure or services

Issue	Potential impact	Yes/No	If 'yes' consult with	Section
Stormwater	Is the work likely to have a • à•œ œœ impact on the stormwater management services which are provided by council?	No	Blacktown City Council	s 2.10(1)(a)
Traffic	Is the work likely to generate traffic to an extent that will • œœ the capacity of the existing road system in a local government area?	No	Blacktown City Council	s 2.10(1)(b)
Sewerage system	Will the work involve connection to a council owned sewerage system? If so, will this connection have a • à•œ œœ impact on the capacity of any part of the system?	No	Blacktown City Council	s 2.10(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 • à•œ œœ volume of water?	No	Blacktown City Council	s 2.10(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 { œœ / / or œœ & / } •^~^ œœ disruption to pedestrian or vehicular flow?	Yes	Blacktown City Council	s 2.10(1)(e)
Road and footpath excavation	Would the work involve more than { œœ / / or œœ & / } •^~^ œœ excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Blacktown City Council	s 2.10(1)(f)

Council related infrastructure or services

Issue	Potential impact	Yes/No	If 'yes' consult with	Section
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the work? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than <i>minor</i> or <i>inconsequential</i> ?	No	Blacktown City Council	s 2.11

Flood liable land

Issue	Potential impact	Yes/No	If 'yes' consult with	Section
Flood liable land	Is the work located on flood liable land? If so, would the work change flood patterns to more than a <i>minor</i> extent?	Yes	Blacktown City Council	s 2.12
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	s 2.13

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

Public authorities other than councils

Issue	Potential impact	Yes/No	If 'yes' consult with	Section
National parks and reserves	Is the work adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> , or on land acquired under that Act?	No	Office of Environment and Heritage	s 2.15 (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	s 2.15 (2)(b)
Navigable waters	Is the work development comprising a fixed or floating structure in or over navigable waters?	No	Transport for NSW	s 2.15 (2)(c)

Issue	Potential impact	Yes/No	If 'yes' consult with	Section
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	s 2.15 (2)(d)
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	s 2.15 (2)(e)
Mine subsidence land	Is the work on land in a mine subsidence district within the meaning of the <i>Mine Subsidence Compensation Act 1961</i> ?	No	Mine Subsidence Board	s 2.15 (2)(f)

Central River City SEPP

Issue	Potential impact	Yes/No	If 'yes' consult with	Section
Clearing native vegetation	Does the work involve clearing native vegetation (as defined in the <i>Local Land Services Act 2013</i>) on land that is not subject land (as defined in clause 17 of schedule 7 of the <i>Threatened Species Conservation Act 1995</i>)?	Yes	Department of Planning and Environment	section 3.24