



Denmark Link Road

Review of Environmental Factors

November 2020

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Approval and authorisation

Title:	Denmark Link Road Review of Environmental Factors
Accepted on behalf of transport for NSW by:	Yvonne Tsukame Project Development Manager Western Sydney Project Office, Sydney Project Delivery Infrastructure & Place
Signed:	
Dated:	11 November 2020

Executive summary

The proposal

Transport for NSW proposes to build a local link road from the intersection of Garfield Road West and Denmark Road, Riverstone to the Westminster Street bridge, Schofields (the proposal). The proposal involves upgrading existing local roads and the building of new sections of road to complete the link which is about 1.5 kilometres long.

Key features of the proposal would include:

- A new right-turn bay along Garfield Road West eastbound for traffic waiting to enter Denmark Road at Riverstone
- Improvements to the existing Denmark Road including new road pavement widening, resurfacing and kerbing at the northern extent, and a new section of road at the southern extent
- A new two-lane link road (one lane in each direction) about 320 metres long between Denmark Road and Carlton Street
- Improvements to Carlton Street between the new link to the south and Trevithick Street to the north, including new road pavement and kerbing
- Improvements to Trevithick Street between Carlton Street and West Parade, including new road pavement widening, resurfacing and kerbing
- Two new T-intersections for the new link at Denmark Road and Carlton Street, and modifications to three existing T-intersections
- Improvements to West Parade south of Trevithick Street, including new pavement widening, resurfacing and kerbing, and a new section of road to connect to Bridge Street (near the Westminster Street Bridge) at Schofields
- Street lighting at all intersections
- Drainage works including sections of kerb, open drainage and a new reinforced concrete box culvert at the crossing of the Eastern Creek tributary on West Parade
- New line marking and signage (including signage to assist wayfinding).

Additional features of the proposal include:

- Utility adjustments (primarily minor power pole relocations)
- Minor property adjustments such as reforming of driveway accesses and relocation of property fences
- Temporary ancillary facilities including a site compound on the south-east corner of the Garfield Road West / Denmark Road intersection
- Rehabilitation of disturbed areas following construction.

Need for the proposal

The proposal is consistent with several strategic planning documents including Future Transport 2056, the Western City District Plan, West Schofields Precinct Draft Masterplan and the North West Growth Centre Road Network Strategy. The proposal has been developed in consideration of proposed zoning and land use changes in the area.

The proposal is one of the identified short-term works in the North West Growth Centre Road Network Strategy and would:

- Reduce the congestion and delays that are currently being experienced at the Garfield Road railway level crossing at Riverstone
- Provide a local road connection for motorists wishing to use the Westminster Street Bridge, alleviating congestion on Garfield Road.

Proposal objectives

The objectives of the proposal are:

- Objective 1 – Improve the traffic flow by providing an additional local road connection between Garfield Road West, Riverstone and Westminster Street Bridge, Schofields
- Objective 2 – Provide infrastructure complimentary to the ultimate road network in the North West Growth Area
- Objective 3 – Minimise adverse operational, environmental and social impacts
- Objective 4 – Provide a safe environment for all road users
- Objective 5 – Improve amenity, accessibility and efficiency for all road users.

Options considered

Three corridor options and five proposal options were considered.

Denmark Road was selected as the preferred corridor over Creek Street and Carlton Street as the Denmark Road / Garfield Road West intersection would be less likely to be affected by eastbound traffic queues on Garfield Road West. This corridor would also complement a proposed new traffic light controlled intersection at Garfield Road West / Denmark Road / Riverstone West Precinct Spine Road, shown in the Riverstone West Precinct Development Control Plan. This will support and provide access to the Riverstone West Precinct development (proposed by others).

Between Denmark Road and West Parade, a proposal option involving an extension of Denmark Road, a new east-west road link to Carlton Street and improvements to Trevithick Street was selected as the preferred option. This option would:

- Provide a traffic calming outcome (compared to other options) due to the inclusion of additional intersections forcing traffic to slow down
- Minimise operational environmental and social impacts by avoiding the most populated areas including Riverstone Park (an area of playing fields), while also reducing property acquisition and severance
- Provide a preferential outcome that minimises ecological, land use and flood effects
- Minimise property acquisition.

No alternative alignment options were considered for West Parade / Bridge Street as there is an existing road reserve in this location. The existing road reserve is the most direct route and using it would reduce the need for private property acquisition.

Statutory and planning framework

The proposal is development for a road and is being carried out by or on behalf of a public authority. Under clause 94 of State Environmental Planning Policy (Infrastructure) 2007, 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 *Environmental Planning and Assessment Act 1979* (EP&A Act) and development consent from the relevant local councils is not required.

Transport for NSW is the determining authority for the proposal. This Review of Environmental Factors (REF) fulfils 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.

Community and stakeholder consultation

Transport for NSW (then Roads and Maritime Services) initially sought community feedback on the Denmark Link Road in November and December 2015. Transport for NSW carefully considered all the submissions received from the community and prepared a consultation report which is available on the project webpage nswroads.work/DenmarkRd.

In July 2019 community consultation was carried out for the whole North West Growth Area to inform the community of future road plans in the area, which included Denmark Link Road.

Transport for NSW carried out two rounds of consultation with registered Aboriginal parties (in 2017 and 2019). The cultural knowledge provided during this consultation helped determine the cultural heritage significance of Aboriginal sites in the area.

The REF will be publicly displayed for comment from mid-November to mid-December 2020. Following the public display of the REF, all comments received would be recorded and addressed in a Submissions Report detailing how each issue raised would be considered in finalising the proposal design. The Submissions Report would be made available to the public on the project webpage on the Transport for NSW website.

Environmental impacts

Detailed technical investigations have been carried out to identify, assess, manage and minimise the proposal's potential impacts. The following outlines the proposal's main impacts on the environment and surrounding community. The safeguards and mitigation measures identified in this REF would help minimise the expected adverse impact.

Traffic and transport

During construction there is the potential for some delays to traffic on both Garfield Road West and the local road network due to lane closures and reduced speed limits.

The connection of Bridge Street with the proposed Denmark Link Road corridor would cause a change in trip-distribution from Garfield Road West and various local roads to the new link. This is expected to be about 1,400 vehicles/day/two-way by 2026 and subsequently increasing to the local road capacity of 2,000 vehicles/day/two-way.

The proposal would help reduce delays for people travelling to the southern part of Riverstone with an estimated average travel time saving of more than 2.5 minutes.

There is potential for some queuing along Bridge Street (both north and south) with the addition of Denmark Link Road traffic. This will be investigated further as proposal development progresses..

Noise and vibration

During construction, the noise intensive type of work required and close proximity of surrounding residential properties means that the proposal would result in high noise levels. Management of these impacts would need to include a range of measures including consultation with affected people, careful selection of plant, modified work practices and respite periods.

Construction plant would be selected to ensure minimum safe working distances set by the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016) are complied with where possible, in relation to cosmetic damage, heritage structures and human response to vibration. If minimum safe working distances cannot be complied with, additional measures including vibration monitoring would be implemented.

Due to the introduction of additional traffic, residential receivers along the new link road would experience an increase in operational road traffic noise. A total of 24 residential receivers have been identified for consideration of feasible and reasonable noise mitigation measures due to predicted exceedances of road traffic noise criteria.

Non-Aboriginal heritage

The following direct physical impacts to the locally significant Hebe Farm have been identified:

- Reduction in the existing heritage curtilage of Hebe Farm. The impact of this would be the reduction of undeveloped land around Hebe Cottage
- Removal of all existing structures and features within the development footprint. This includes c. 1980s farm/livestock fencing and part of the tree lined avenue which dates to the 1990s
- Removal of all surviving archaeological resources at Hebe Farm within the proposal footprint.

The potential for historical archaeological resources to survive across the study area, and therefore be affected by the proposal, was assessed as ranging from nil to moderate.

Aboriginal cultural heritage

One Aboriginal archaeological site (Denmark Road AFT 1) is partially located within the proposal footprint and would be partially impacted by the proposal. An application for an Aboriginal Heritage Impact Permit (AHIP) will be made under section 90A of the *National Parks and Wildlife Act 1974* in relation to these impacts and measures have been proposed to minimise impacts on adjacent areas.

Biodiversity

About one hectare of native vegetation composed of mature trees with a heavily weed-infested understorey would be removed (of which about 0.68 hectares is identified Existing Native Vegetation under the Growth Centres Biodiversity Certification Order). This would include about 0.5 hectares of River-flat Eucalypt Forest (*Biodiversity Act 2016* Endangered) and 0.25 hectares of Cumberland Plain Woodland (*Biodiversity Act 2016* Critically Endangered). Impacts to these threatened ecological communities were assessed as not significant.

A total of 21 hollow-bearing trees (hollow diameter up to 15 centimetres) were observed during the investigation; these potentially occupied by threatened microbat species. Impacts on threatened microbat species were assessed as not significant due to the extent of suitable habitat in the surrounding area. Safeguards have been proposed to avoid injury to fauna during removal of vegetation.

Cumberland Plain Land Snail (*Meridolum corneovirens*) and Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) (both listed by the *Biodiversity Conservation Act 2016*) were identified within or adjacent to the proposal footprint. Recognising the small amount of habitat for these species that would be affected and the limited habitat connectivity, impacts were assessed as not significant.

Migratory species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were identified as having a low likelihood of occurrence within the study area due to the lack of suitable habitat.

Safeguards and mitigation measures have been proposed to address potential biodiversity impacts. This includes minimising the number of affected hollow bearing trees.

Landscape character and visual amenity

The temporary impacts on visual amenity during construction activities would be confined to the road corridor and immediately adjacent areas. Following the completion of construction, the impacts associated with construction equipment and facilities would be removed and disturbed areas restored.

Overall, operation of the proposal would have a wide range of landscape character impacts, from high to negligible. The overall setting is considered highly sensitive and therefore impacts are either high or moderate to high. Two of the eight zones have been identified with a high landscape character impact, Zones 2 (Creek Street / Carlton Street) and 4 (Hebe Farm). The high impact is mainly due to the proposal creating a fundamental change to the current setting. In both cases the scenic quality of each zone would be generally retained, yet its character would be transformed into a more urbanised setting, changing its identity and sense of place.

In terms of visual impact, most viewpoints resulted in a low to moderate or moderate visual impact. Two of the assessed viewpoints resulted in a high impact (on Denmark Road and the new link) and another with a moderate to high impact (Trevithick Street). Although the proposal would result in some high visual impacts, the number of viewers is very low.

Air quality

Potential air quality impacts associated with the proposal during construction include minor emissions from machinery (e.g. delivery vehicles, construction plant) and dust. Emissions from construction vehicles/equipment would be minor and short term. Safeguards and mitigation measures have been proposed to address these impacts.

Air quality screening assessment predictions for carbon monoxide, nitrogen dioxide and particulate matter concentrations during operation of the proposal at opening were all compliant with the relevant EPA criteria, including concentrations at the kerb. Compliance would also be achieved should traffic on the link grow to the capacity of 2,000 vehicles per day. This suggests that operational air quality impacts are at an acceptable level and further, more detailed assessment is not required.

Soils, contamination and water quality

Potential water quality impacts would mainly relate to soil loss from erosion of exposed soils and stockpiles, and potential sedimentation of surrounding land and waterways, including the tributaries of Eastern Creek which cross the proposal footprint.

The overall risk of contamination was assessed to be low. There is potential for complete exposure pathways to human and ecological receptors should soil and surface water contamination exist and further, more detailed, investigations are proposed. There is also a higher level risk of contamination from waste items having been illegally dumped in the bushland between West Parade and Bridge Street.

Hydrology and flooding

The proposal would result in a modest increase in impermeable surfaces (and therefore some additional runoff) due to the construction of widened and additional road surfaces. The new and widened road formations would cross minor watercourses and drainage lines. The drainage design (longitudinal and cross drainage) is adequate to address these issues and scour protection at drainage outlets would be provided as required.

The proposal would result in only minor changes to minor tributary flooding and affected areas are currently undeveloped. In relation to major tributary flooding, the proposal would increase peak one per cent AEP flood levels (i.e. a one percent or one in 100 chance of occurring in any one year) by up to 100 millimetres near the existing dwelling north east of the Garfield Road West and Denmark Road intersection. This impact would be investigated further during detailed design.

The proposal would have a negligible impact on peak flood levels resulting from backwater flooding from the Hawkesbury-Nepean River.

Socio-economic

The proposal would potentially have some negative socio-economic impacts including:

- Property acquisition (while acquisition would not affect any dwellings, there could be some impact on the way owners / occupiers are able to use the land)

- Impacts on the amenity of properties including construction noise and road traffic noise during operation
- Local amenity impacts due to the introduction of through traffic to the residential area south of Garfield Road West
- Impacts on areas valued by the community including the locally significant Hebe Farm and one Aboriginal site
- Impacts on the semi-rural character of the area which includes the Riverstone Paceway and the periodic movement of horses between the stables and the paceway.

The environmental management measures in Chapter 6 of the REF have been proposed to address these impacts.

While proposal would result in several negative socio-economic impacts as identified above, it would also provide socio-economic benefits. These would include:

- Reduced congestion on Garfield Road near the Riverstone railway level crossing
- Temporary positive revenue impact is expected during construction due to the presence of construction personnel and the likelihood they would spend money at local businesses
- Lower traffic volumes (than without the proposal) adjacent Riverstone Park which would improve safety and access.

Justification and conclusion

The proposal has been developed to address congestion on Garfield Road West caused by the railway level crossing and limitations in the connectivity of the local road network.

The proposal is being assessed 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.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some visual, heritage, noise, traffic and socio-economic impacts. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. On balance the proposal is considered justified.

Display of the review of environmental factors

This REF is on display for comment for 28 calendar days. Communication and consultation activities planned to coincide with the public display of the REF include a community update, online community consultation and advertising in local newspaper.

Internet

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

Copies by request

Printed and electronic copies are available by contacting the project team on 1300 367 561.

How can I make a submission?

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

Denmark Link Road
Transport for NSW
PO Box 973
Parramatta NSW 2124

NWGC@transport.nsw.gov.au

Submissions must be received by the close of consultation.

What happens next?

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

After this consideration, Transport for NSW will determine whether or not the proposal should proceed as proposed and will inform the community and stakeholders of this decision. If the proposal is determined to proceed, Transport for NSW will continue to consult with the community and stakeholders prior to and during construction.

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Appendix B – Statutory consultation checklists

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Appendix D – SREP 20 matters for consideration

Appendix E – Cultural Heritage Assessment Report

Appendix F – Operational and Construction Noise and Vibration Assessment

Appendix G – Statement of Heritage Impact

Appendix H – Biodiversity Assessment Report

Appendix I – Landscape Character and Visual Impact Assessment

Appendix J – Phase 1 Preliminary Site Investigation (contamination)

Appendix K – Socio-economic Assessment

1 Introduction

1.1 Proposal identification

Transport for NSW proposes to build a local link road from the intersection of Garfield Road West and Denmark Road, Riverstone to the Westminster Street Bridge, Schofields (the proposal). The proposal involves upgrading existing local roads and the building of new sections of road to complete the link which is about 1.5 kilometres long.

Key features of the proposal would include:

- A new right-turn bay along Garfield Road West eastbound for traffic waiting to enter Denmark Road at Riverstone
- Improvements to the existing Denmark Road including new road pavement widening, resurfacing and kerbing at the northern extent, and a new section of road at the southern extent
- A new two-lane link road (one lane in each direction) about 380 metres long between Denmark Road and Carlton Street
- Improvements to Carlton Street between the new link to the south and Trevithick Street to the north, including new road pavement and kerbing
- Improvements to Trevithick Street between Carlton Street and West Parade, including new road pavement widening, resurfacing and kerbing
- Two new T-intersections for the new link at Denmark Road and Carlton Street, and modifications to three existing T-intersections
- Improvements to West Parade south of Trevithick Street, including new pavement widening and kerbing, and a new section of road to connect to Bridge Street (near the Westminster Street Bridge) at Schofields
- Street lighting at all intersections
- Drainage works including sections of kerb, open drainage and a new reinforced concrete box culvert at the crossing of the Eastern Creek tributary on West Parade
- New line marking and signage (including signage to assist wayfinding).

Additional features of the proposal include:

- Utility adjustments (primarily minor power pole relocations)
- Minor property adjustments such as reforming of driveway accesses and relocation of property fences
- Temporary ancillary facilities including a site compound on the south-east corner of the Garfield Road West / Denmark Road intersection
- Rehabilitation of disturbed areas following construction.

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

The proposal is within the Blacktown local government area and spans the suburbs of Riverstone and Schofields. The Richmond Railway Line (part of the T1 North Shore and Western Line) is located to the east as is the Riverstone Town Centre and Riverstone Railway Station. The Riverstone Paceway and Eastern Creek are located to the west. Chapter 6 describes the existing environment relevant to the proposal in more detail.



Figure 1-1: Location of the proposal

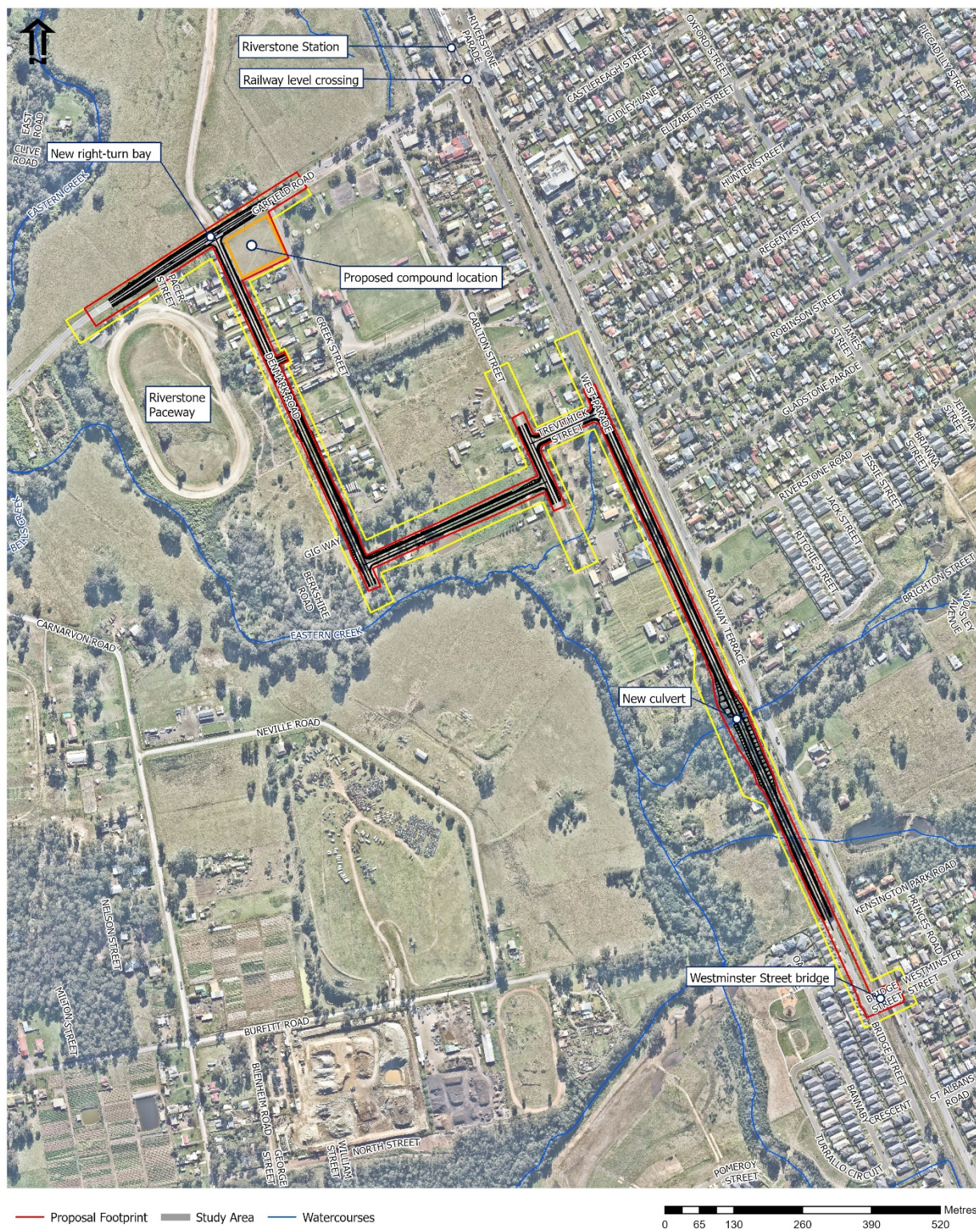


Figure 1-2: The proposal

1.2 Purpose of the report

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

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

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the factors in Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979 (Is an EIS required? guidelines) (DUAP, 1995/1996), Roads and Related Facilities EIS Guideline (DUAP 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Commonwealth *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 and Public Spaces under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement 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 Agriculture, Water and the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

2.1 Strategic need for the proposal

2.1.1 Strategic plans and policy

The proposal is consistent with a number of strategic plans and policy documents as outlined in the following sections.

Future Transport Strategy 2056

The NSW Future Transport Strategy 2056 (Transport for NSW, 2018) outlines a clear framework to address transport challenges in NSW over the next 40 years and is an update of the NSW Long Term Transport Master Plan released in 2012. It integrates planning for roads, freight and all other modes of transport and sets out initiatives, solutions and actions to meet NSW transport challenges.

Future Transport 2056 outlines six state-wide outcomes to guide investment, policy and reform and service provision. They provide a framework for planning and investment aimed at harnessing rapid change and innovation to support a modern, innovative transport network. The proposal would directly support the following two outcomes:

- **Successful places** – The liveability, amenity and economic success of communities and places are enhanced by transport – The proposal supports this outcome by addressing a local connectivity issue
- **Safety and performance** – Every customer enjoys safe travel across a high performing, efficient network – The proposal supports this outcome reducing the congestion and delays that are currently being experienced at the Garfield Road railway level crossing at Riverstone.

Movement and place framework

Future Transport Strategy 2056 introduces the movement and place framework which aims to allocate road space in a way that improves the liveability of places.

The framework identifies the need to prioritise different customer groups, depending which street environment they are travelling. These environments are described in Figure 2-1. The proposal would provide local connectivity via upgraded and new local streets but would also improve Garfield Road West (movement corridor) by helping to alleviate congestion on this corridor in the short to medium term.

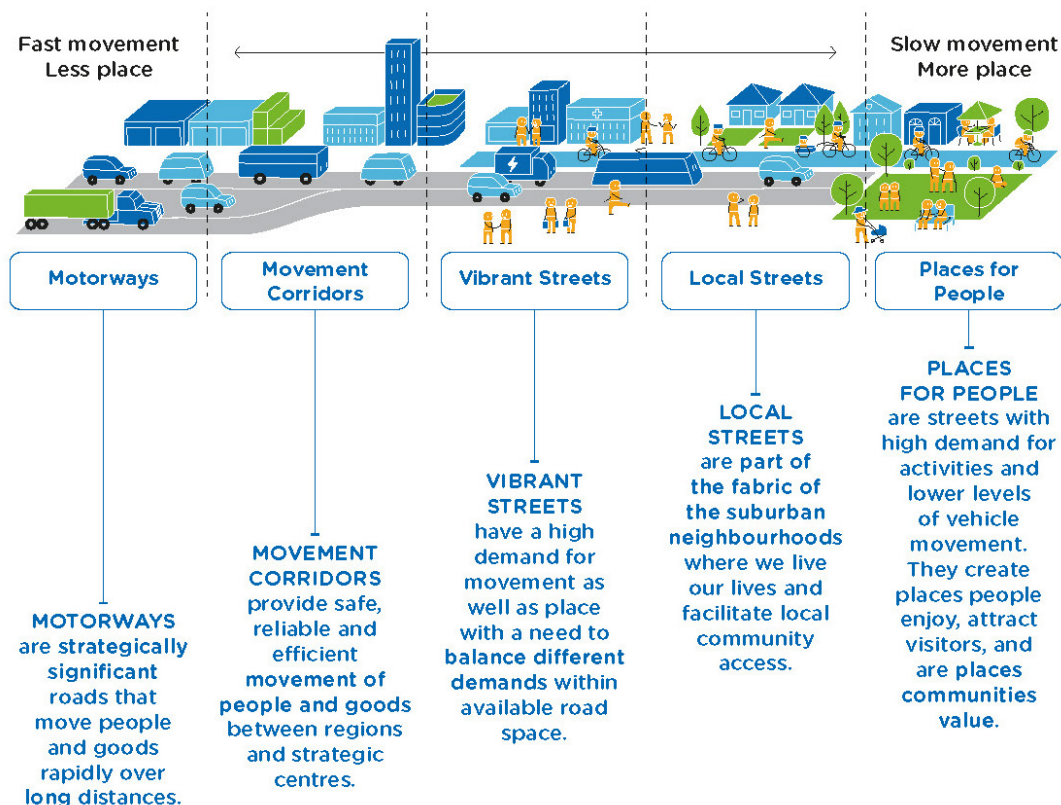


Figure 2-1: Movement and place framework

Western City District Plan

The Western City District Plan (Greater Sydney Commission, 2018) is a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision of Greater Sydney. It is a guide for implementing the Greater Sydney Region Plan – A Metropolis of Three Cities (Greater Sydney Commission, 2018), at a district level and is a bridge between regional and local planning.

Western City District Plan sets a number of planning priorities, objectives and actions. The proposal supports Planning Priority W1 (Planning for a city supported by infrastructure) and the following associated objectives:

- Objective 1 Infrastructure supports the three cities – The proposal supports this objective by enhancing local connectivity within the Western Parkland City and reducing congestion
- Objective 3 Infrastructure adapts to meet future needs – In the short-term the proposal would improve local connectivity and reduce congestion, while in the longer term it would form part of the layout for the West Schofields Precinct

North West Growth Centre Road Network Strategy

The North West Growth Centre Road Network Strategy was developed considering the precinct plans for the North West Growth Area that existed at the time (with subsequent precinct plans taking the strategy into account). A principal objective of the strategy is to identify the number and location of crossing points over the Riverstone railway line needed to effectively support the development of the North West Growth Area. Network upgrades included in the strategy are:

- New traffic lights at Westminster Street and Railway Terrace intersection to improve traffic flow and access to the Westminster Street bridge – in the short-term (completed in September 2016)

- Completing construction of Schofields Road between Windsor Road and Richmond Road in 2018 to link the Rouse Hill and Marsden Park town centres
- Planning to build a link road from the intersection of Garfield Road West and Denmark Road, Riverstone to the Westminster Street Bridge, Schofields – in the short-term
- Planning for the Bandon Road underpass of the railway line and a new road connection between Richmond and Windsor roads
- Planning for the upgrade of Garfield Road between Richmond Road and Windsor Road
- Planning for a grade-separated railway crossing at Riverstone.

The proposal is specifically identified as a short-term work as noted above and as shown on the North West Growth Centre Road Network Strategy map in Figure 2-2.

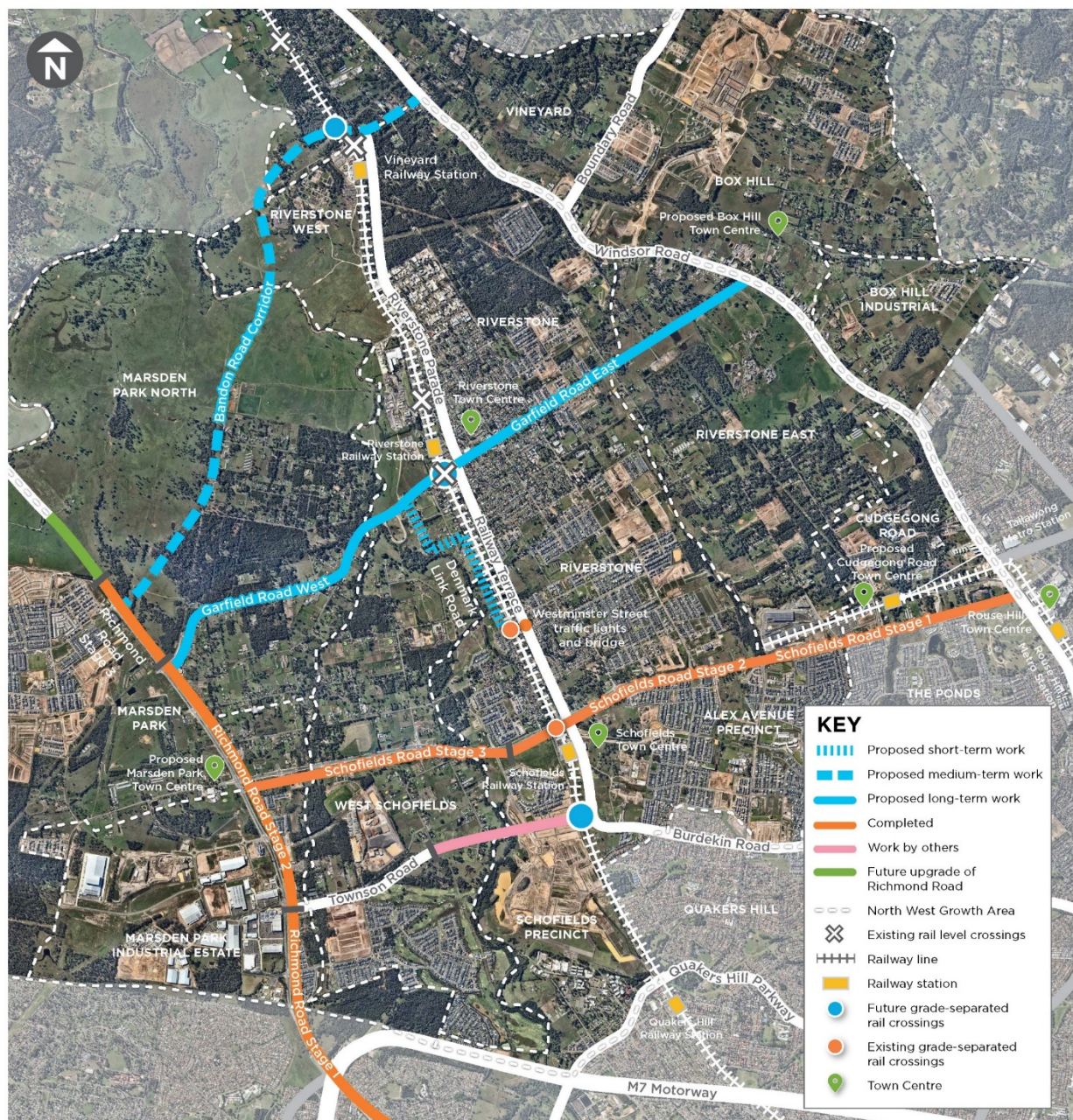


Figure 2-2: North West Growth Centre Road Network Strategy map

West Schofields Precinct Draft Masterplan and Draft Indicative Layout Plan

West Schofields is a new precinct planned for Sydney's North West Growth Area. The West Schofields Draft Masterplan (Department of Planning and Environment, 2018), which was publicly exhibited during August and September 2018, proposes a range of new homes close to local parks, playing fields and a local centre to support a thriving, connected community. The draft masterplan also sets out strategies to protect the environment and manage flooding, to guide the area's revitalisation as a safe and attractive place for people to live, work and play. The area to the south of Garfield Road West and north-east of Eastern Creek is identified for future playing fields.

The associated West Schofields Draft Indicative Layout Plan identifies a future land use and road network structure for the precinct and specifically includes the Denmark Link Road.

Sydney's Green Grid

The NSW Government Architect has identified a network of high-quality green space that connects town centres, public transport hubs, and major residential areas – the Sydney Green Grid. The Sydney Green Grid documentation (for West Central District) notes that as existing rural residential areas are converted into large areas of suburban development in the North West Growth Area, the opportunity exists to ensure that the benefits offered by a well-integrated open space network is maximised. It also emphasises the need to increase access to open spaces. The proposal supports these directions by improving local connectivity and in the long-term would provide access to important active open space areas envisaged by the West Schofields Draft Indicative Layout Plan.

Five Million Trees for Greater Sydney

Five Million Trees for Greater Sydney is a NSW Government initiative which involves working with local councils and the community to plant five million trees by 2030 (growing the tree canopy from 16.8 per cent to 40 per cent). Opportunities to support this initiative would be explored during detailed design and part of the development of the landscape design for the proposal. This would include consultation with Blacktown City Council.

NSW Premiers Priorities – Greening our city

The NSW Premier has set a priority to increase the tree canopy and green cover across Greater Sydney by planting one million trees by 2022. The priority recognises green canopy enhances the amenity of local parks and streets and is crucial in providing vital shade that reduces ambient temperatures and mitigates the urban heat island effect. Opportunities to support this initiative would be explored during detailed design and as part of the development of the landscape design for the proposal. This would include consultation with Blacktown City Council.

Road Safety Plan 2021

The Road Safety Plan 2021 (Transport for NSW, 2018) outlines how the NSW Government will work towards the State Priority Target of reducing fatalities by 30 per cent by 2021 (compared to average annual fatalities over 2008–2010). It also aligns the Towards Zero vision with Future Transport 2056, which aims to have a NSW transport network with zero trauma by 2056.

The expansion and development of the North West Growth Area means that there will be more traffic in the area. Inherently this means that the accident risk will increase. The proposal would be implemented under a safety-in-design strategy which would ensure safe geometric design and would minimise risks associated with turning movements at intersections. The proposal would also help reduce congestion related crashes and includes as one of its objectives the provision of a safe environment for all road users.

2.1.2 Need for the proposal

The continuing development of the North West Growth Area will rely on improving the road infrastructure in the area. This is being developed under the North West Growth Centre Road Network Strategy as confirmed by Transport for NSW in July 2015. The strategy includes plans for five links that would provide connectivity between Richmond Road and Windsor Road, with each link including a grade-separated crossing of the Richmond rail line.

Currently there are only three locations to cross the Richmond railway line in the North West Growth Area, connecting Richmond Road and Windsor Road: a level crossing on Garfield Road in the Riverstone Town Centre, a bridge crossing at Westminster Street and an underpass at Schofields Road. The Garfield Road level crossing at Riverstone currently experiences traffic congestion and delays.

The most congested of these crossings is the Garfield Road level crossing at Riverstone as it is used by local, regional and heavy vehicle traffic, with more than 900 vehicles crossing it during the PM peak. At these volumes, the amount of traffic exceeds the capacity the road was designed to carry, which is the cause of the congestion and delays.

Delays are also experienced throughout the day when the level crossing boom gates lower to allow scheduled trains to pass. This can result in a delay of almost six minutes in the AM peak and over four minutes in the PM peak period (when the crossing operates for trains running in both directions). When the level crossing boom gates lower queues on Garfield Road West have been identified as extending beyond 550 metres.

Several crashes have also occurred locally over the past few years as a result of these traffic volumes in the area. In the five year period between 1 January 2014 and 31 December 2018 there were 19 crashes on Garfield Road (between Denmark Road and Oxford Street), on Oxford Street and on Railway Terrace (the roads likely to benefit from the proposal). Of these six were serious injury crashes, three were moderate injury crashes, four were minor injury crashes and six were non-casualty crashes. Reducing congestion and providing a right-turn lane at Denmark Road would help reduce the risk of some of these crashes.

Transport for NSW is currently planning the short, medium and long-term projects needed to implement the North West Growth Centre Road Network Strategy. The proposal is one of the identified short-term works and would:

- Reduce the congestion and delays that are currently being experienced at the Garfield Road railway level crossing at Riverstone
- Provide an additional local road connection for motorists wishing to use the Westminster Street Bridge, alleviating congestion on Garfield Road.

2.2 Limitations of existing infrastructure

Limitations of existing infrastructure at the proposal site include:

- Congestion at the Garfield Road West / Garfield Road East / Riverstone Parade and Railway Terrace intersection
- Operation of the Riverstone level crossing which further contributes to delays and extensive queuing on Garfield Road West
- No provision for vehicles turning right from Garfield Road West into Denmark Road resulting in through vehicles needing to use the shoulder to pass the turning vehicle
- Lack of connectivity on the local road network including between West Parade and Bridge Street (this connection is already a publicly owned 'paper road' but has not been constructed)

- Narrow and deteriorating pavements (or unsealed sections), no line marking and no shoulders on the local road network including Denmark Road, Carlton Street, Trevithick Street and West Parade.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- Objective 1 – Improve the traffic flow by providing a local road alternative connection between Garfield Road West, Riverstone and Westminster Street Bridge, Schofields
- Objective 2 – Provide infrastructure complimentary to the ultimate road network in the North West Growth Area
- Objective 3 – Minimise adverse operational, environmental and social impacts
- Objective 4 – Provide a safe environment for all road users
- Objective 5 – Improved amenity, accessibility and efficiency for all road users.

2.3.2 Development criteria

The development criteria for the proposal include:

- Designing the proposal in a manner that is informed by environmental investigations to minimise any adverse impact while maximising environmental benefits
- Satisfying the technical and procedural requirements of Transport for NSW and other stakeholders with respect to the design of the proposal
- Optimising the design to ensure that the proposal can be practically and efficiently constructed and maintained while meeting all other proposal objectives
- Planning temporary arrangements that minimise disruption to local and through traffic
- Developing, implementing and maintaining effective management systems for quality, work health and safety, environmental, proposal reporting, risk management, value management and value engineering, constructability assessment, safety audits and community participation.

2.3.3 Urban design objectives

The urban design objectives for the proposal include:

- Keep road footprint to a minimum
- Develop a simple and unified range of construction elements and details that are easily maintained
- Ensure clear and open sightlines and minimise visual clutter
- Use materials and plantings that are consistent with the surrounding urban and landscape context
- Ensure that the design responds to the visual context and provides a good fit with its surroundings
- Considers other NSW Government Strategies, including five million trees for Greater Sydney initiative and the greening our city Premier's priority.

2.4 Alternatives and options considered

2.4.1 Methodology for selecting the preferred option

Option evaluation for the proposal occurred in 2015 and is documented in the Denmark Link Road between Garfield Road West, Riverstone and the Westminster Street Bridge Schofields Options Report (Roads and Maritime Services, 2015) (refer to Appendix C).

The options evaluation process started by identifying the need for the proposal, which was then followed by the identification and development of three corridors to deliver the proposal. From these three corridors, a preferred corridor was selected with reference to their respective advantages and disadvantages.

Options within the preferred corridor were evaluated with reference to a range of operational, environmental, and social considerations in the following categories:

- Landform, geology and soils (including salinity and contamination)
- Hydrology and flooding
- Biodiversity
- Socio-economic and land use
- Aboriginal and non-Aboriginal heritage
- Noise and vibration
- Air quality
- Landscape character and visual amenity
- Utilities and services
- Traffic and transport.

Rankings were assigned to each option based on the likelihood of the issue becoming a constraint to development (likelihood) and the consequence of the constraint becoming a material consideration (magnitude) (refer to the Options Report in Appendix C for further detail). The outcomes were then summarised into a comparison of options with reference to their respective advantages and disadvantages.

2.4.2 Identified corridor options

A do nothing option was discounted prior to options evaluation process as it would not address the identified need or the project objectives. Three corridor options were evaluated as described below (refer also to Figure 2-3):

- Carlton Street / Trevithick Street corridor – using Carlton Street / Trevithick Street and West Parade
- Creek Street corridor – using Creek Street and West Parade
- Denmark Road corridor – using Denmark Road and West Parade.

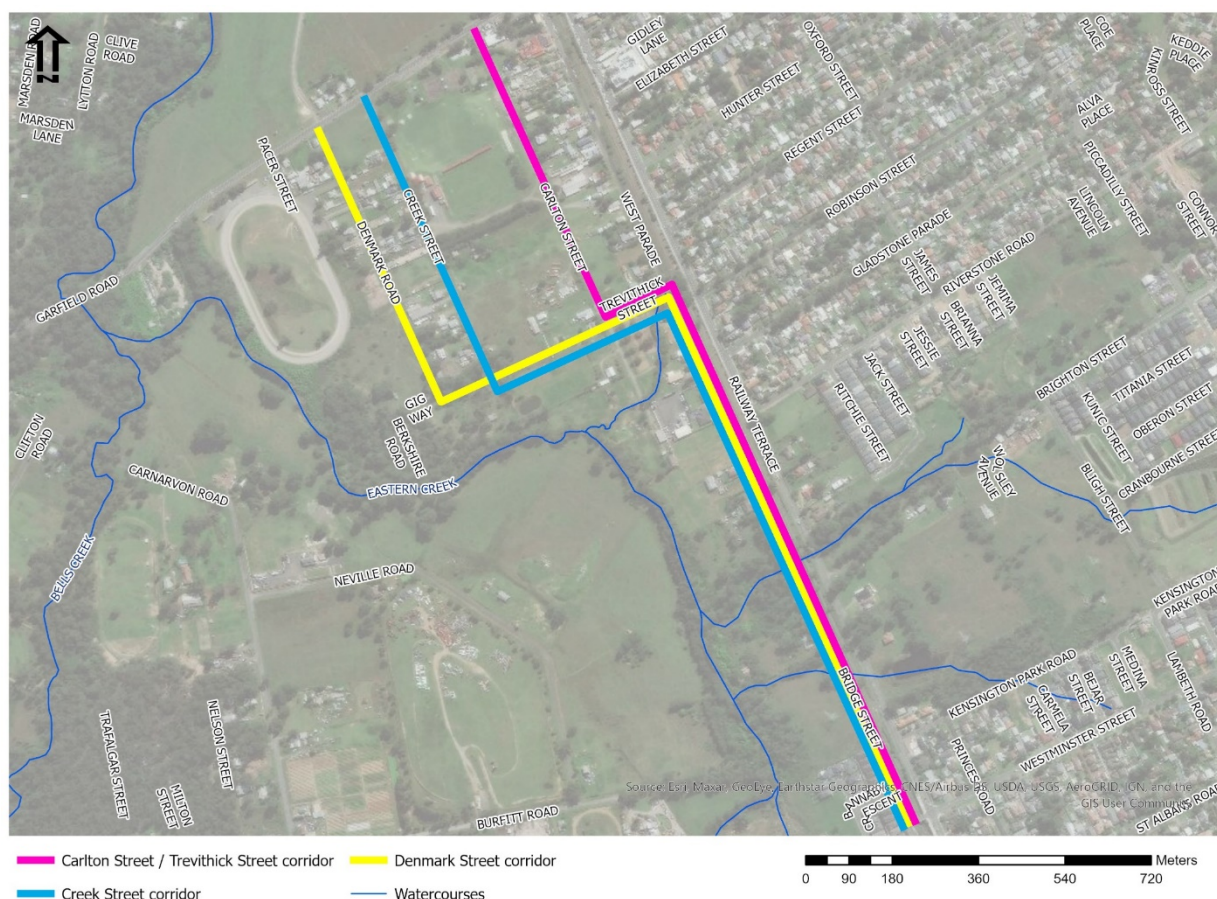


Figure 2-3: Corridor options

2.4.3 Analysis of corridor options

The advantages and disadvantages of each corridor option is summarised in Table 2-1.

Table 2-1: Corridor options evaluation summary

Option	Advantages	Disadvantages
Carlton Street / Trevithick Street	<ul style="list-style-type: none"> Shortest route Makes best use of existing roads where possible Minimises requirement for property acquisition 	<ul style="list-style-type: none"> Route is adjacent to existing playing fields which could affect amenity Carlton Street / Garfield Road West intersection is already affected by traffic queuing on the approach to the Riverstone town centre Does not connect with the future Riverstone West spine road as shown on the Riverstone West Precinct Indicative Layout Plan (therefore not consistent with third proposal objective).
Creek Street	<ul style="list-style-type: none"> Shorter route than Denmark Road 	<ul style="list-style-type: none"> Route is adjacent to existing playing fields which could affect amenity Creek Street / Garfield Road West intersection is already affected by traffic queuing on the approach to the Riverstone town centre Does not connect with the future Riverstone West spine road as shown

Option	Advantages	Disadvantages
		on the Riverstone West Precinct Indicative Layout Plan <ul style="list-style-type: none"> Property acquisition.
Denmark Road	<ul style="list-style-type: none"> Least likely to be affected by queuing on Garfield Road West due to the distance from the railway level crossing Connects with the future Riverstone West spine road as shown on the Riverstone West Precinct Indicative Layout Plan. 	<ul style="list-style-type: none"> Longest route Property acquisition.

Based on the above evaluation, the Denmark Road corridor was selected as the preferred corridor as it would provide sufficient distance from the existing Richmond railway line level crossing in the Riverstone town centre and would be less likely to be affected by eastbound traffic queues on Garfield Road West. Also, this corridor would complement a proposed new traffic light controlled intersection at Garfield Road West / Denmark Road / Riverstone West Precinct Spine Road, shown in the Riverstone West Precinct Development Control Plan.

While the Denmark Road corridor was considered as the preferred solution, it was also recognised that this corridor would have its impacts, which include: increasing the volume of traffic on Denmark Road and West Parade; requiring property acquisition; the potential need to rearrange property accesses in certain locations; and potential to impact upon biodiversity and heritage conservation values. Overall, the benefits of this corridor option were considered to outweigh the potential impacts.

2.4.4 Identified proposal options within the preferred corridor

With the Denmark Road corridor confirmed as the preferred corridor, a suite of options was developed that considered the design requirements and objectives for the proposal.

It was recognised that the following design requirements needed to be common to all options:

- Tie into Garfield Road West at the Denmark Road intersection
- Upgrade West Parade east of Trevithick Street and to connect into Bridge Street at the Westminster Street Bridge
- Provide a route that would be safe for local traffic use
- Avoid riparian (river corridor) habitat wherever possible.

It was on this basis that five options were developed as described below. All options share the same alignment along the southern part of West Parade / Bridge Street.

Option A

Option A (refer to Figure 2-4) would provide a less direct connection between Denmark Road and West Parade along Denmark Road, then east on an unnamed existing track that connects to Creek Street before making a right and left turn onto a second unnamed existing track located to the south of Riverstone Park. The route would then turn right onto Carlton Street, left onto Trevithick Street and right onto West Parade. This option would involve the upgrade of the two unnamed streets/tracks. It would also need traffic priorities to be set on Creek Street, Carlton Street and Trevithick Street to promote traffic flows along the route to favour the link road over other local traffic access.

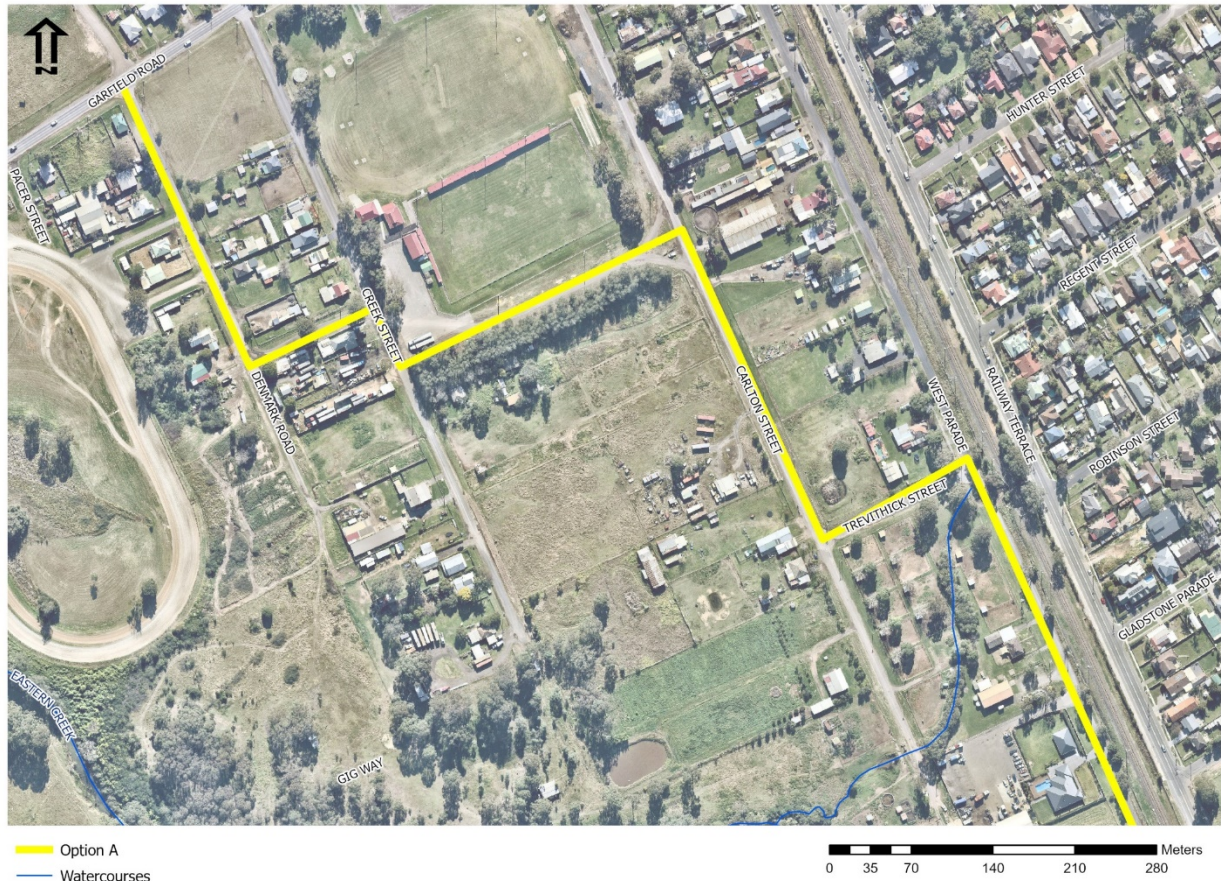


Figure 2-4: Option A

Option B

Option B (refer to Figure 2-5) would provide a connection between Denmark Road and West Parade travelling along the length of Denmark Road before making a 90-degree left-turn and following a new road that runs parallel to Trevithick Street. The new road section would connect into West Parade south of Trevithick Street. This option would include the construction of intersections, at the end of Denmark Road, Carlton Street (formed across an existing section of road) and at West Parade. It would also require traffic priority to be set on Carlton Street and West Parade to favour the use of the link road.



Figure 2-5: Option B

Option C

Option C (refer to Figure 2-6) would follow a similar alignment to Option B. It would differ just to the west of Carlton Street where it would deviate generally north-east to a tie-in point at the existing intersection of Trevithick Street and West Parade. As with Option B, it would involve the creation of a new intersection at the end of Denmark Road, and Carlton Street while traffic would use the existing intersection at Trevithick Street and West Parade. As with Option B, the new section of road would intersect Carlton Street and West Parade intersections. It would also require traffic priority to be set on to favour the link road.

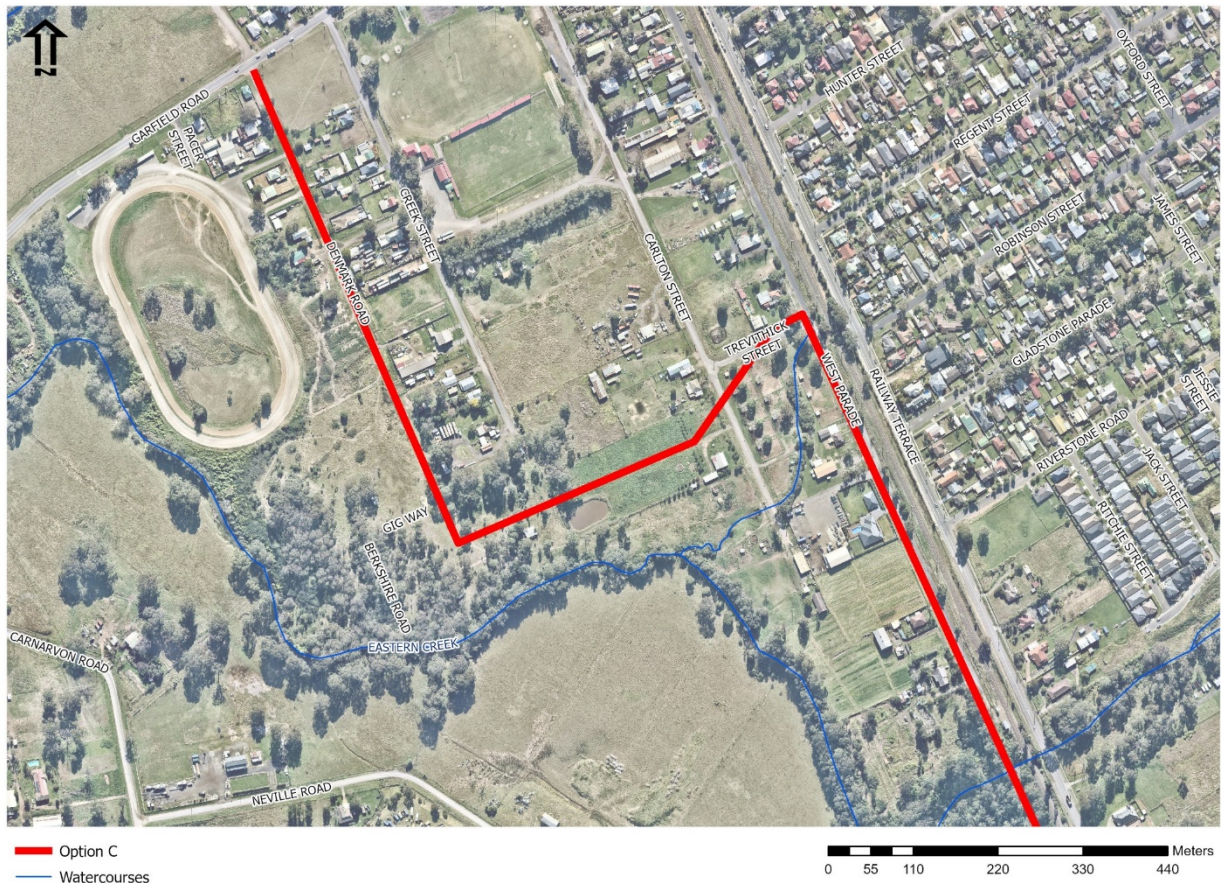


Figure 2-6: Option C

Option D

Option D (refer to Figure 2-7) would follow a similar alignment to Option B. The only difference to Option B is the tie-in to West Parade. This would be achieved by creating a tight 90-degree curve that would deviate from Carlton Street and tie into West Parade opposite Gladstone Parade. This option would avoid needing to create or use an intersection on West Parade and would therefore assist in improving journey travel times. However, creating the curve would truncate West Parade and restrict traffic from being able to travel along its full length. Traffic would need to divert onto Carlton Street and turn right onto Trevithick Street before turning left onto the truncated section of West Parade. This option would include a new intersection with Carlton Street.



Figure 2-7: Option D

Option E

Option E (refer to Figure 2-8) would follow a similar alignment to Option D. The only point of difference from Option D is its tie into Denmark Road. This alternative removes the proposed intersection at the end of Denmark Road and replaces it with another curve to create an s-curve link. This would avoid needing to create or use an intersection either on West Parade or Denmark Road. Traffic would still need to divert onto Carlton Street and Trevithick Street to be able to continue to use West Parade. A sub-option of this would be to create an intersection on the curve to connect back into West Parade to avoid traffic needing to use the above streets. This sub-option is not shown on Figure 2-8. This option includes a new intersection with Carlton Street.



Figure 2-8: Option E

2.4.5 Analysis of proposal options within the preferred corridor

The advantages and disadvantages of each proposal option is summarised in Table 2-2.

Table 2-2: Proposal options evaluation summary

Option	Advantages	Disadvantages
Option A	<ul style="list-style-type: none"> • Uses existing tracks and roads • Requires the least property acquisition • On balance has the lowest likely impact to biodiversity and heritage values • Does not encourage high-speed through traffic due to the number of turns forcing traffic to slow down in comparison to Option D and Option E. 	<ul style="list-style-type: none"> • Creates a very convoluted route with up to nine turning movements • Traffic routes through the most populated part of the area • Potential to increase traffic congestion on Garfield Road West due to motorists wanting to turn right on to Carlton Street, or exiting from Carlton Street (more direct route) • Creates driver uncertainty due to the number of turning movements • Is likely the slowest route • Number of turns and slow progress would potentially deter drivers from using the link road • Would require traffic management priorities to be set where the route intersects with Carlton Street and Creek Street, which may disadvantage local traffic

Option	Advantages	Disadvantages
		<ul style="list-style-type: none"> May not achieve the objective of reducing traffic queues and delays on Garfield Road West.
Option B	<ul style="list-style-type: none"> Minimal property acquisition needed Less amenity impact compared with Option A being located away from the more populated parts of the locality Provides a traffic calming outcome due to the inclusion of additional intersections forcing traffic to slow down Potential for a reduced operational noise impact compared to Option A due to being the farther away from sensitive receivers on Creek Street and Carlton Street. 	<ul style="list-style-type: none"> More property acquisition than Option A Results in the need to construct new crossing of the unnamed creek near Trevithick Street Requirement to construct in the main part of the floodplain Requirement to construct close to/within the Eastern Creek riparian corridor Creates an additional intersection near the Trevithick Street and West Parade intersection Increased risk of Aboriginal heritage impacts.
Option C	<ul style="list-style-type: none"> Slightly reduced property acquisition compared to Option B by tying back into Trevithick Street Less amenity impact compared with Option A being located away from the more populated parts of the locality Provides traffic calming due to the use of intersections forcing traffic to slow down Potential for a reduced operational noise impact due to being the farther away from sensitive receivers near Garfield Road Potential to use part of Trevithick Street removing the need to construct an additional intersection with West Parade. 	<ul style="list-style-type: none"> More property acquisition than Option A Requirement to construct in the main part of the floodplain Requirement to construct close to/within the Eastern Creek riparian corridor Increased risk of Aboriginal heritage impacts Potential closure of part of West Parade or Trevithick Street that would become redundant.
Option D	<ul style="list-style-type: none"> No impact on Trevithick Street Improves travel time Provides for an effective tie into West Parade through the use of a curve Less amenity impact compared with Option A being located away from the more populated parts of the locality Potential for less operational noise impact due to being the farther away from a larger number of sensitive receivers Provides traffic calming due to the creation of an intersection at the southern end of Denmark Road forcing traffic to slow down. 	<ul style="list-style-type: none"> Potential speed management issue by including curve, which removes the need for people to slow down Requires the construction of two intersections close to each other on Trevithick Street and Creek Street More property acquisition required Requirement to construct in the main part of the floodplain Requirement to construct close to/within the Eastern Creek riparian corridor Increased risk of Aboriginal heritage impacts

Option	Advantages	Disadvantages
		<ul style="list-style-type: none"> Requirement to truncate West Parade increasing people's journey times that want to travel its length Requirement to construct a new crossing of the unnamed creek adjacent to Trevithick Street.
Option E	<ul style="list-style-type: none"> No impact on Trevithick Street Would result in the fastest travel time for people by removing two intersections, introducing curves and not including an intersection back into West Parade Provides for a smooth flow of traffic along the Link Road by reducing the need to stop at intersections Improved geometry between West Parade and Denmark Road Less amenity impact compared with Option A being located away from the more populated parts of the locality Slightly reduced impact on the riparian corridor of Eastern Creek Potential for the lowest operational noise impact compared to the options due to being the farthest away from a larger number of sensitive receivers. 	<ul style="list-style-type: none"> Potential speed management issue by including two curves, which removes the need for people to slow down Requirement to construct two intersections close to each other on Trevithick Street and Creek Street Requirement to construct in the main part of the floodplain Increased risk of Aboriginal heritage impacts Highest potential property acquisition of all the options Requirement to construct a new crossing of the unnamed creek adjacent to Trevithick Street Requirement to truncate West Parade increasing journey times for people that want to travel its length More property acquisition than Option A, B or C.

2.5 Preferred option

The evaluation concludes that the southern options (Option B to Option E) would provide better operational community outcomes than Option A. Option A was discarded first as it may not adequately address the proposal objectives.

Of the southern options (Option B to Option E), Option B was identified as the preferred option as it would:

- Reduce congestion and delays that are currently being experienced on Garfield Road East and Garfield Road West caused by the Richmond railway line level crossing in the Riverstone town centre
- Provide a straight alignment for the link road with appropriate intersections that would provide local motorists with a good alternative to Garfield Road
- Minimise operational environmental and social impacts by avoiding the most populated areas including Riverstone Park (an area of playing fields), while also reducing property acquisition and severance
- Provide a preferential outcome that minimises ecological, land use and flood effects
- Support the short-term need to reduce traffic congestion in the area, while providing a link road that would be consistent with long-term road network
- Provide a traffic calming outcome due to the inclusion of additional intersections forcing traffic to slow down.

2.6 Design refinements

Following the selection of the preferred option, the design was refined to improve safety and reduce property acquisition. Instead of passing through Lot 201 DP 1196800, the refined Option B uses Trevithick Street to connect to West Parade.

The refined Option B is shown in Figure 2-9 and would:

- Serve to slow traffic by requiring two additional turning movements
- Avoid the need to acquire the whole or part of Lot 201 DP 1196800
- Minimises impacts on a tributary of Eastern Creek which traverses Lot 201 DP 1196800.

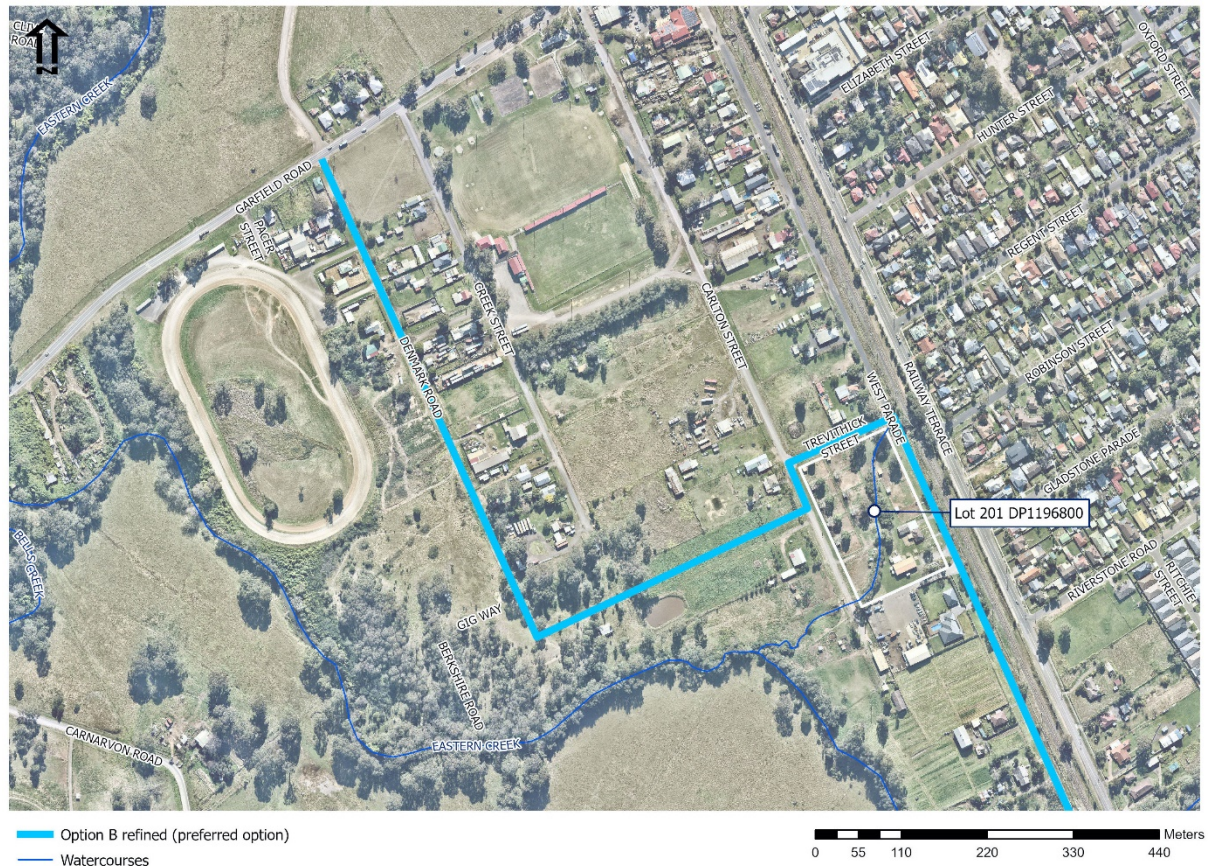


Figure 2-9: Option B (refined)

The preferred option is the basis for the proposal, which is described in detail in Chapter 3. The preferred option (Option B – refined) has been included in the West Schofields Precinct Draft Masterplan which was publicly exhibited during August and September 2018.

3 Proposal description

3.1 The proposal

Transport for NSW proposes to build a local link road from the intersection of Garfield Road West and Denmark Road, Riverstone to the Westminster Street Bridge, Schofields (the proposal). The proposal involves upgrading existing local roads and the building of new sections of road to complete the link which is about 1.5 kilometres long. The proposal is shown in Figure 1-2 and Figure 3-1 to Figure 3-4.

Key features of the proposal would include:

- A new right-turn bay along Garfield Road West eastbound for traffic waiting to enter Denmark Road at Riverstone
- Improvements to the existing Denmark Road including new road pavement widening, resurfacing and kerbing at the northern extent, and a new section of road at the southern extent
- A new two-lane link road (one lane in each direction) about 320 metres long between Denmark Road and Carlton Street
- Improvements to Carlton Street between the new link to the south and Trevithick Street to the north, including new road pavement and kerbing
- Improvements to Trevithick Street between Carlton Street and West Parade, including new road pavement widening, resurfacing and kerbing
- Two new T-intersections for the new link at Denmark Road and Carlton Street, and modifications to three existing T-intersections
- Improvements to West Parade south of Trevithick Street, including new pavement widening, resurfacing and kerbing, and a new section of road to connect to Bridge Street (near the Westminster Street Bridge) at Schofields
- Street lighting at all intersections
- Drainage works including sections of kerb, open drainage and a new reinforced concrete box culvert at the crossing of the Eastern Creek tributary on West Parade
- New line marking and signage (including signage to assist wayfinding).

Additional features of the proposal include:

- Utility adjustments (primarily minor power pole relocations)
- Minor property adjustments such as reforming of driveway accesses and relocation of property fences
- Temporary ancillary facilities including a site compound on the south-east corner of the Garfield Road West / Denmark Road intersection
- Rehabilitation of disturbed areas following construction.



Figure 3-1: Proposal description – map 1



Figure 3-2: Proposal description – map 2



Figure 3-3: Proposal description – map 3



Figure 3-4: Proposal description – map 4

3.2 Design

3.2.1 Design criteria

Design guides and policies used during the development of the proposal included:

- Austroads Guide to Road Design Part 1: Introduction to Road Design (Austroads, 2015)
- Austroads Guide to Road Design Part 2: Design Considerations (Austroads, 2019)
- Austroads Guide to Road Design Part 3: Geometric Design (Austroads, 2020)
- Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (Austroads, 2017)
- Transport for NSW supplements to the Austroads Guide to Road Design (Roads and Maritime Services, 2015)
- Austroads Guide to Traffic Management Part 10: Traffic Control and Communication Devices (Austroads, 2016).

Design criteria adopted for the proposal are identified in Table 3-1.

Table 3-1: Key design criteria

Design aspect	Criterion
Posted speed limit	Garfield Road West 60 km/h Local Roads 50 km/h (Denmark Link Road)
Design speed	Garfield Road West 60 km/h Local Roads 60 km/h
Minimum general lane width	Garfield Road West 3.5 metres Local Roads 4.5 metres
Shoulder width	Garfield Road West 2.0 metres Local Roads N/A
Local road load limit	5 tonnes
Design vehicle (most heavy vehicles)	Blacktown City Council garbage truck
Checking vehicle (may use local road network to access property)	Semi-trailer (checking vehicle)
New pavements on Denmark Road, new link road and West Parade extension	70 to 210mm Asphaltic Concrete (14mm size) Strain alleviating membrane seal 240mm heavily bound base
Widened pavements on Garfield Road West	50mm Asphaltic Concrete (14mm size) 220mm Asphaltic Concrete (20mm size) 300mm Densely Graded Subbase (20mm size) 300mm Select Material Zone
Widened pavements on Denmark Road, Carlton Street, Trevithick Street and West Parade	70 to 210mm Asphaltic Concrete (14mm size) Strain alleviating membrane seal 240mm heavily bound base

Typical cross sections for the proposal are shown in Figure 3-5 to Figure 3-11.

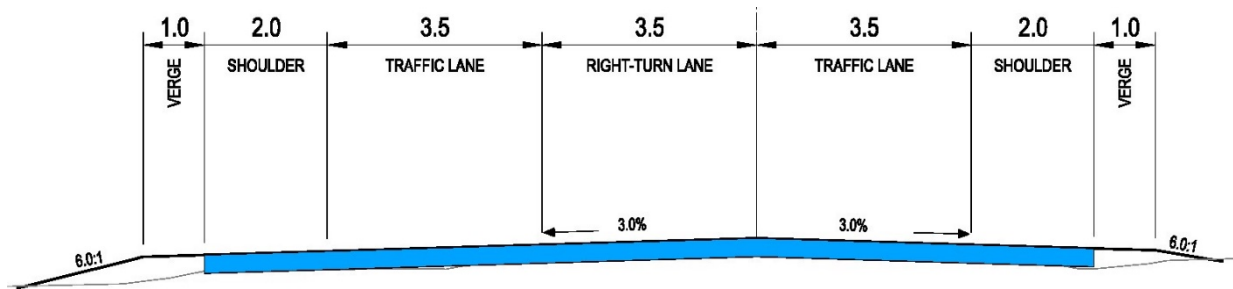


Figure 3-5: Typical cross section – Garfield Road West at Denmark Road

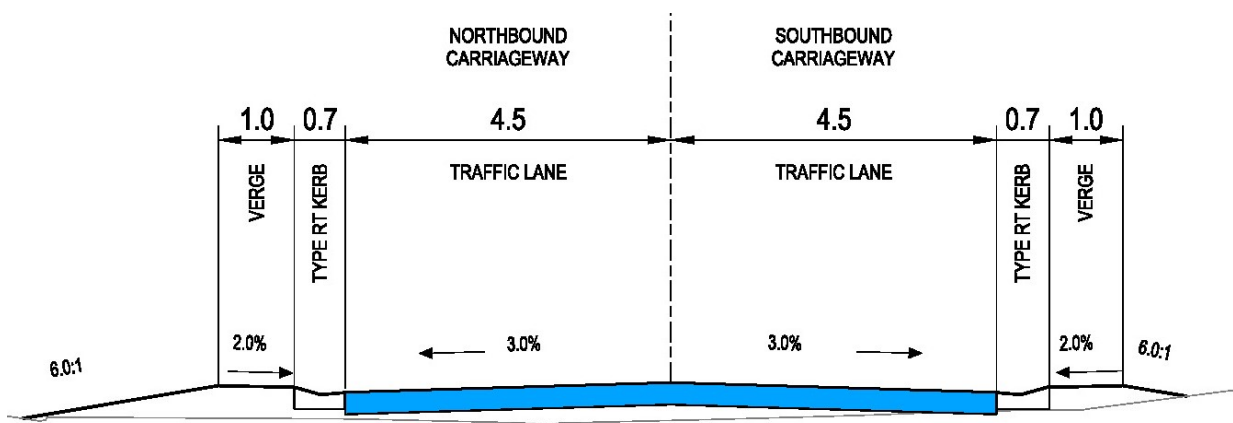


Figure 3-6: Typical cross section – Denmark Road, Carlton Street, Trevithick Street

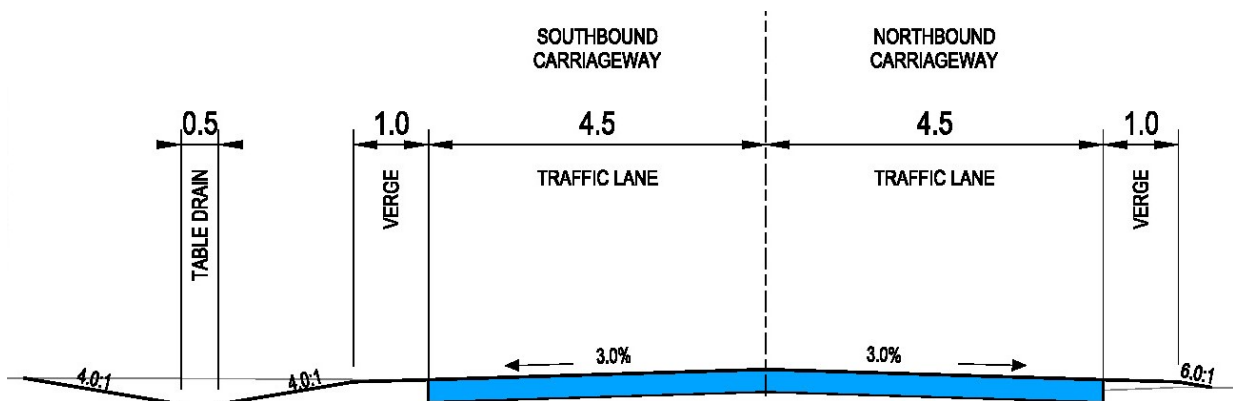


Figure 3-7: Typical cross section – Denmark Road, southern section

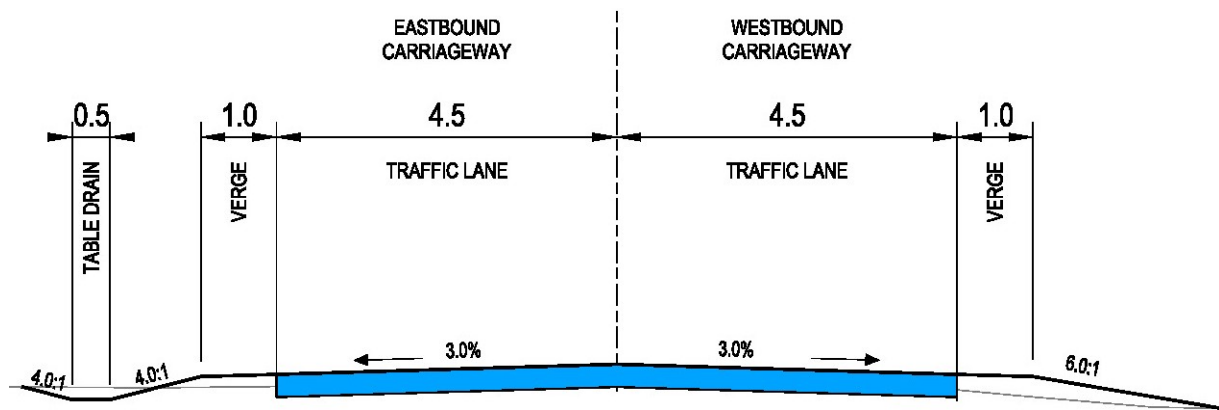


Figure 3-8: Typical cross section – New link road (eastern section) between Denmark Road and Carlton Street

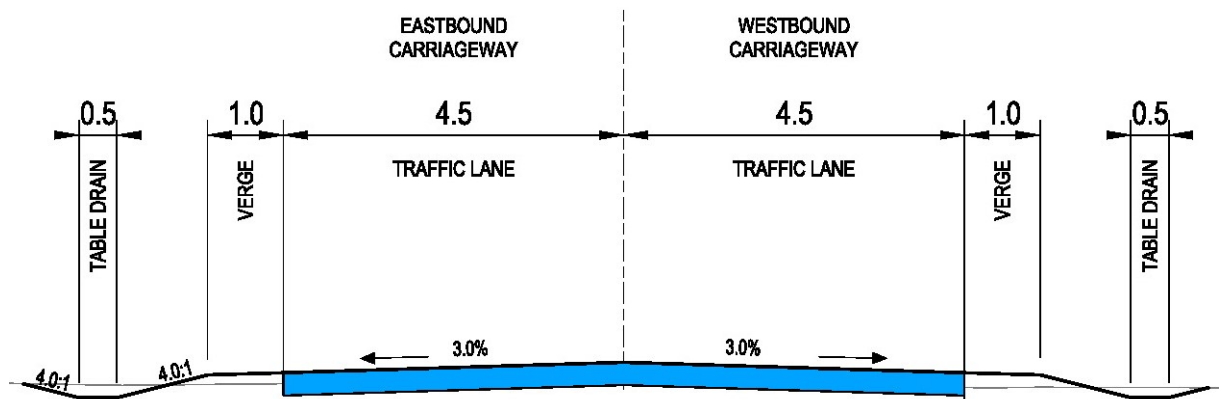


Figure 3-9: Typical cross section – New link road (western section) between Denmark Road and Carlton Street

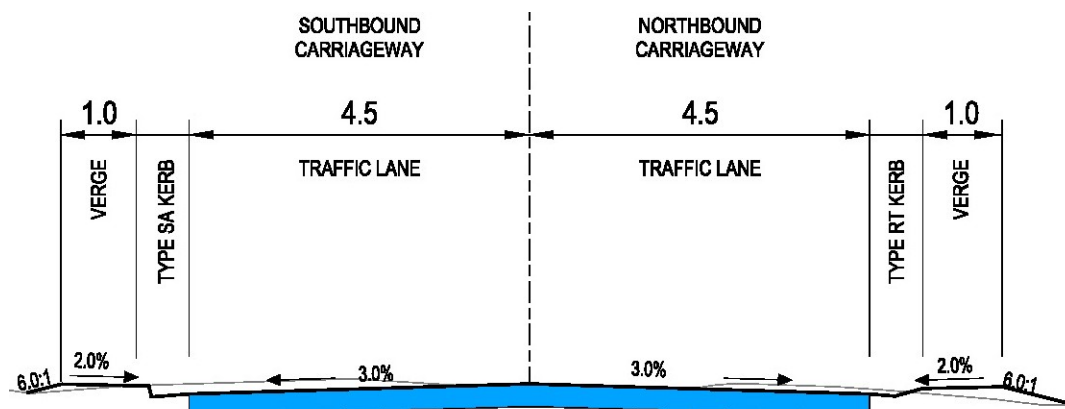


Figure 3-10: Typical cross section – West parade

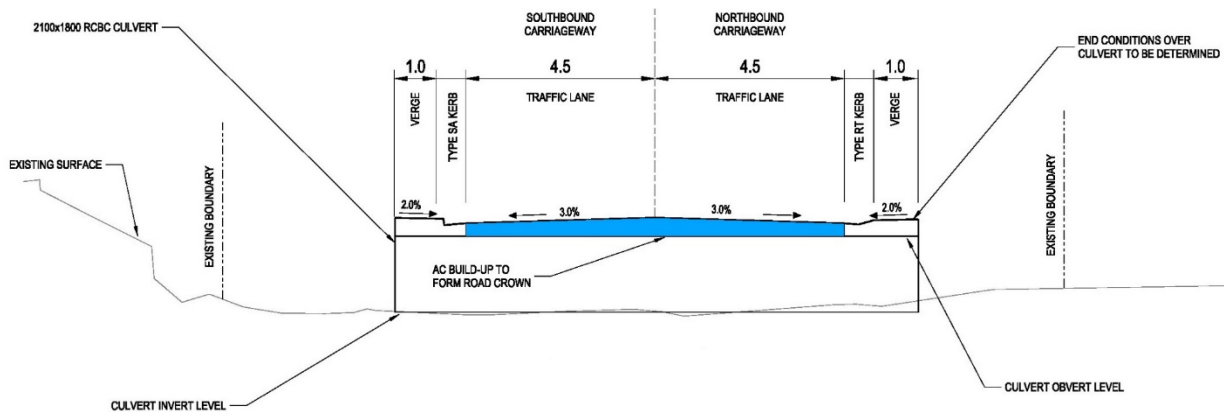


Figure 3-11: Typical cross section – West Parade at Eastern Creek tributary

3.2.2 Engineering constraints

The proposal has several engineering related constraints as detailed below:

- Need to minimise acquisitions of private land and to use the existing road boundaries along Denmark Road and West Parade as much as possible
- Need to avoid acquisition and decommissioning of a farm dam located between Denmark Road and Carlton Street
- Need to minimise impacts on utilities and maintain required clearance to the 330kV electricity transmission lines that traverse the southern part of the proposal footprint
- Requirement to maintain through traffic and turning movements on Garfield Road West during construction
- Requirement to maintain access to adjacent properties during construction
- Requirement to maintain access to the rail corridor (including access gates located on West Parade)
- Requirement to maintain existing flooding conditions at the proposed new culvert crossing of the Eastern Creek tributary and for private property adjacent to the proposed road link
- Flood prone land.

3.2.3 Major design features

Intersections

The proposal includes modification to the intersection between Garfield Road West and Denmark Road to include a dedicated right-turn lane for eastbound traffic on Garfield Road West turning right to Denmark Road. This requires widening of the road formation on both sides of Garfield Road West and the construction of additional pavement. Refer to Figure 3-12.

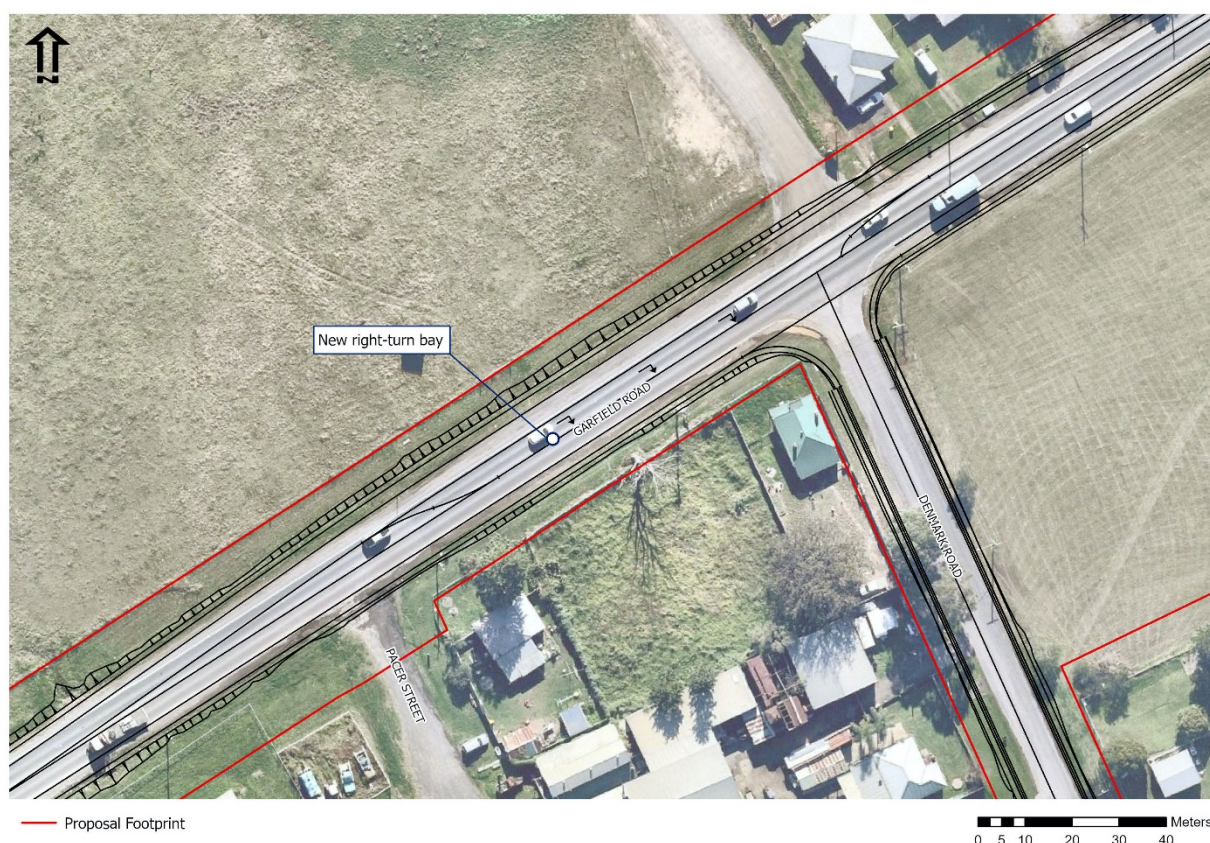


Figure 3-12: Garfield Road West intersection treatment

In addition to the above, at-grade non-signalised intersections are proposed at the following locations:

- Denmark Road and access lane to Creek Street – modification of existing intersection
- Denmark Road and new link road to Carlton Street – new T-intersection
- Carlton Street and new link road to Denmark Road – new T-intersection
- Carlton Street and Trevithick Street – modification of existing intersection
- Trevithick Street and West Parade – modification of existing intersection.

Drainage

Longitudinal drainage (i.e. running parallel to the road) would be either table drains or concrete kerbing as shown on the cross sections in Section 3.2.1. Table 3-2 provides details of existing and proposed cross drainage structures while Figure 3-13 shows the location of these structures.

Table 3-2: Existing and proposed cross drainage structures

ID	Existing	Proposed
EXD01	2 x 375mm reinforced concrete pipes	2 x 450mm reinforced concrete pipes
EXD02	1 x 450mm reinforced concrete pipe	Retain existing
EXD03	1 x 450mm reinforced concrete pipe	3 cell 1200mm x 300mm reinforced concrete box culvert
XING01	Natural depression	1 x 450mm reinforced concrete pipe
XING02	Table drain	1 x 450mm reinforced concrete pipe

ID	Existing	Proposed
EXD04	1 x 2100mm x 1200mm reinforced concrete box culvert	1 x 3000mm x 900mm reinforced concrete box culvert
EXD05	1 x 375mm reinforced concrete pipe	Retain existing
XING03	Defined watercourse	1 x 2100mm x 1800mm reinforced concrete box culvert
EXD06	1 x 450mm reinforced concrete pipe	1 x 600mm reinforced concrete pipe
PXD01	-	1 x 375mm reinforced concrete pipe
PXD02	-	1 x 600mm x 300mm reinforced concrete box culvert

3.3 Construction activities

3.3.1 Work methodology

Construction activities would be guided by a construction environmental management plan (CEMP). The general sequence of construction activities is identified below. The sequence is indicative and may need to be modified following the appointment of a construction contractor.

The site establishment stage would include:

- Survey and further utility investigations
- Establishment of site compound including fencing
- Implementing traffic management measures
- Installing environmental controls
- Relocation of power poles and installation of street lighting where required
- Clearing of vegetation
- Property adjustments, including driveway adjustments, relocation of property fences.

Drainage work would include:

- Formation of table drains where specified
- Installation of headwalls, pipes, pits and kerbs
- Construct base slabs, headwalls and wingwalls for the precast concrete box culvert
- Install precast concrete box culvert at the crossing of the Eastern Creek tributary
- Sealing of box culvert joints and lifting holes and cutting of lifting hooks.

Road and pavement work would include:

- Subgrade preparation
- Lay gravel base / sub-base layers for new pavements (where required)
- Construct road pavements.

Finishing work would include:

- Installation of line markings, signs and guideposts
- Decommission temporary facilities (such as site compounds)
- Clean up the site and dispose of all surplus waste materials
- Removal of construction traffic management and opening of the proposal to traffic.

3.3.2 Construction workforce

Construction of the proposal is expected to require up to 80 workers during peak construction times. Workers would be distributed between the worksite and the site compound depending on the activities occurring and the time of day.

3.3.3 Construction hours and duration

Subject to approval, construction is anticipated to commence in early 2022 and take about 12 months to complete, weather permitting.

Construction work would be carried out during standard hours, where possible:

- Monday to Friday: 7am to 6pm

- Saturday: 8am to 1pm
- Sunday: No work
- Public holidays: No work

However, to minimise disruption to traffic, some work may need to be carried out outside these hours. For work required outside standard hours, feasible and reasonable work practices to minimise noise nuisance (nominally set at 5 dB(A) above background noise levels) would be planned and implemented through a construction noise management plan. This would include notifying potentially affected residents and businesses. For further details refer to section 6.2.5 of this REF.

3.3.4 Plant and equipment

Plant and equipment to be used for construction would be confirmed during the construction planning process, but an indicative list of equipment expected to be used on site during construction of the proposal includes:

- Asphalt pavers
- Asphalt profiling machines
- Concrete agitator
- Concrete saws
- Extrusion machine
- Backhoes or small excavators
- Elevated work platforms
- Mobile crane
- Mulcher and chainsaw
- Portable lights
- Line marking equipment
- Generators and air compressors
- Trucks
- Hand tools
- Water pumps
- Utes and light vehicles.

3.3.5 Earthworks

Earthworks would generally involve stripping of topsoil and grading for new road / pavement sections, formation of embankments, placement of subgrade material and excavation for signage and power pole footings. The estimated quantities of materials associated with earthworks are provided in Table 3-3.

Table 3-3: Indicative earthworks quantities

Proposal element	Approximate quantity (or area)
Cut volume (excluding topsoil stripping)	3,190 cubic metres
Fill (excluding topsoil)	5,230 cubic metres

Proposal element	Approximate quantity (or area)
Topsoil	3,720 cubic metres
Asphalt overlay – Garfield Road West	390 cubic metres
Asphalt Overlay – West Parade	260 cubic metres
New pavements (area) – Garfield Road West	2,705 square metres
New pavements (area) – local roads	21,495 square metres

3.3.6 Source and quantity of materials

The proposal would require moderate quantities of concrete and select materials. The quantities of material required would not result in a regional or local supply shortage, and none are likely to be in short supply in the foreseeable future. Materials would be sourced from local commercial suppliers where available.

Non-renewable resources such as petroleum fuels would not be used in large quantities.

3.3.7 Traffic management and access

The proposal is expected to generate up to 40 heavy and 40 light construction vehicle movements per day at the peak of construction activity, mainly associated with:

- Movement of construction workers
- Delivery of construction materials
- Spoil and waste removal
- Delivery and removal of construction equipment and machinery.

Access to the proposal footprint would generally occur directly from Garfield Road West, with a smaller proportion of vehicles using Bridge Street to access the southern extent of the works.

All existing traffic movements would be maintained during construction; however, some temporary lane closures would be required on Garfield Road West and the local road network. These would occur in accordance with a Traffic Management Plan (TMP) and, where necessary, a Road Occupancy Licence (ROL).

Standard traffic management measures would be used to minimise the short-term traffic impacts during construction. These measures would be identified in TMP for the proposal and would be developed in accordance with the Traffic Control at Works Sites Technical Manual (Roads and Maritime Services, 2018) and Transport for NSW Specification G10 – Control of Traffic.

During all stages of construction, access to businesses and other private property would be maintained. Pedestrian and cyclist routes would be managed daily to suit construction activities.

3.4 Ancillary facilities

A construction compound (with an area about 5,000 square metres) would be established next to the Garfield Road West / Denmark Road intersection (refer to Figure 3-14). The subject area (which is vacant and owned by Blacktown City Council) would be used, subject to agreement with Council, for the following during construction:

- Site office
- Worker amenities

- Equipment and materials storage
- Temporary stockpiling.

The compound would be accessed either from Garfield Road West, with left in left out movements only, or from Denmark Road.



Figure 3-14: Proposed construction compound

3.5 Public utility adjustment

No major public utility relocations, adjustments or protection works are required for the proposal.

Minor relocations of some power poles are expected to be needed as follows:

- Garfield Road West – seven power poles
- Carlton Street – four power poles
- Trevithick Street – one power pole
- West Parade – eight power poles.

Carlton Street and West Parade each have existing sewer maintenance holes that would need to be modified to suit the new road levels.

Minor adjustments to water mains on most of the affected roads as well as sewer mains on Carlton Street and Trevithick Street may be required.

Garfield Road West has Telstra communications pits on the northern side that would need relocating as part of the road widening for the right-turn bay.

Additional surveys would be carried out prior to the start of work to determine any additional utility impact. Consultation with public utility providers for the proposal is ongoing.

3.6 Property acquisition

Some property acquisition is required for the proposal as identified in Table 3-4 and shown by Figure 3-15. Property acquisition would be in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.

Table 3-4: Proposed property acquisition

Area ID	Description	Total area (approx.)	Acquisition type	Current owner	Lot / DP	Zoning
1	Denmark Road	290m ²	Whole	NSW Government	97/1485	RU4 Primary Production Small Lots
2	Denmark Road	290m ²	Whole	NSW Government	98/1485	RU4 Primary Production Small Lots
3	Denmark Road	290m ²	Whole	NSW Government	99/1485	RU4 Primary Production Small Lots
4	Creek Street	290m ²	Whole	NSW Government	78/1485	RU4 Primary Production Small Lots
5	Creek Street	290m ²	Whole	NSW Government	79/1485	RU4 Primary Production Small Lots
6	Creek Street	290m ²	Whole	NSW Government	80/1485	RU4 Primary Production Small Lots
7	Creek Street	2,300m ²	Part	Private	10/712	RU4 Primary Production Small Lots
8	Carlton Street	2,300m ²	Part	Private	14/712	RU4 Primary Production Small Lots
9	West Parade	350m ²	Part	Private	6/523809	RU4 Primary Production Small Lots
10	West Parade / Bridge Street	483m ²	Part	Private	1/527115	E2 Environmental Conservation



Figure 3-15: Proposed property acquisition

4 Statutory planning framework

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

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

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

As the proposal is for a road and road infrastructure facilities and is to be carried out by Transport for NSW, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Development consent from council is not required.

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

Part 2 of ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development.

Consultation, including consultation as required by ISEPP (where applicable), is discussed in Chapter 5 of this REF.

State Environmental Planning Policy (Sydney Region Growth Centres) 2006

Under State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (Growth Centres SEPP), the investigation area is within the North West Growth Area.

Clause 18A of the Growth Centres SEPP confirms that public utility undertakings (which would include the proposal) may be undertaken without development consent. Clause 18A also requires notification of the Department of Planning, Industry and Environment in relation to the clearing of native vegetation on land that is within a growth area but not subject to biodiversity certification. Most of the land within the proposal footprint is not biocertified and the required notification has been provided (refer to Section 5.5).

Under the Growth Centres SEPP, the proposal footprint traverses the West Schofields and Schofields precincts. Only land within the Schofields precinct is currently zoned under the Growth Centres SEPP. Table 4-1 identifies the objectives for each of the affected zones and considers the consistency of the proposal with those objectives. Refer also to Figure 4-1.

Table 4-1: Consistency with zone objectives – Growth Centres SEPP (Schofields precinct)

Zone	Objective	Comment
R2 Low Density Residential	<ul style="list-style-type: none">• To provide for the housing needs of the community within a low density residential environment• To enable other land uses that provide facilities or services to meet the day to day needs of residents• To allow people to carry out a reasonable range of activities from their homes, where such activities are not likely to adversely affect the living environment of neighbours	The proposal would not affect provision for housing needs. It would provide local connectivity available for use by residents.

Zone	Objective	Comment
	<ul style="list-style-type: none"> To support the well-being of the community, by enabling educational, recreational, community, religious and other activities where compatible with the amenity of a low density residential environment. 	
E2 Environmental Conservation	<ul style="list-style-type: none"> To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values To prevent development that could destroy, damage or otherwise have an adverse effect on those values. 	The proposal has been developed to minimise impacts on environmental values.
SP2 Infrastructure	<ul style="list-style-type: none"> To provide for infrastructure and related uses To prevent development that is not compatible with or that may detract from the provision of infrastructure. 	The proposal relates to the provision of infrastructure and is therefore consistent with the first SP2 zone objective.

Development for the purposes of roads is permitted with development consent in the above zones. As noted above, the ISEPP operates to remove these consent requirements.

Draft amendments to the Growth Centres SEPP (for the West Schofields precinct) exhibited September 2018 show draft zoning changes and the Garfield Road transport corridor. Under the changes the northern part of the proposal footprint would be zoned as follows:

- SP2 Infrastructure
- RE1 Public Recreation
- RU6 Transition
- E2 Environmental Conservation.

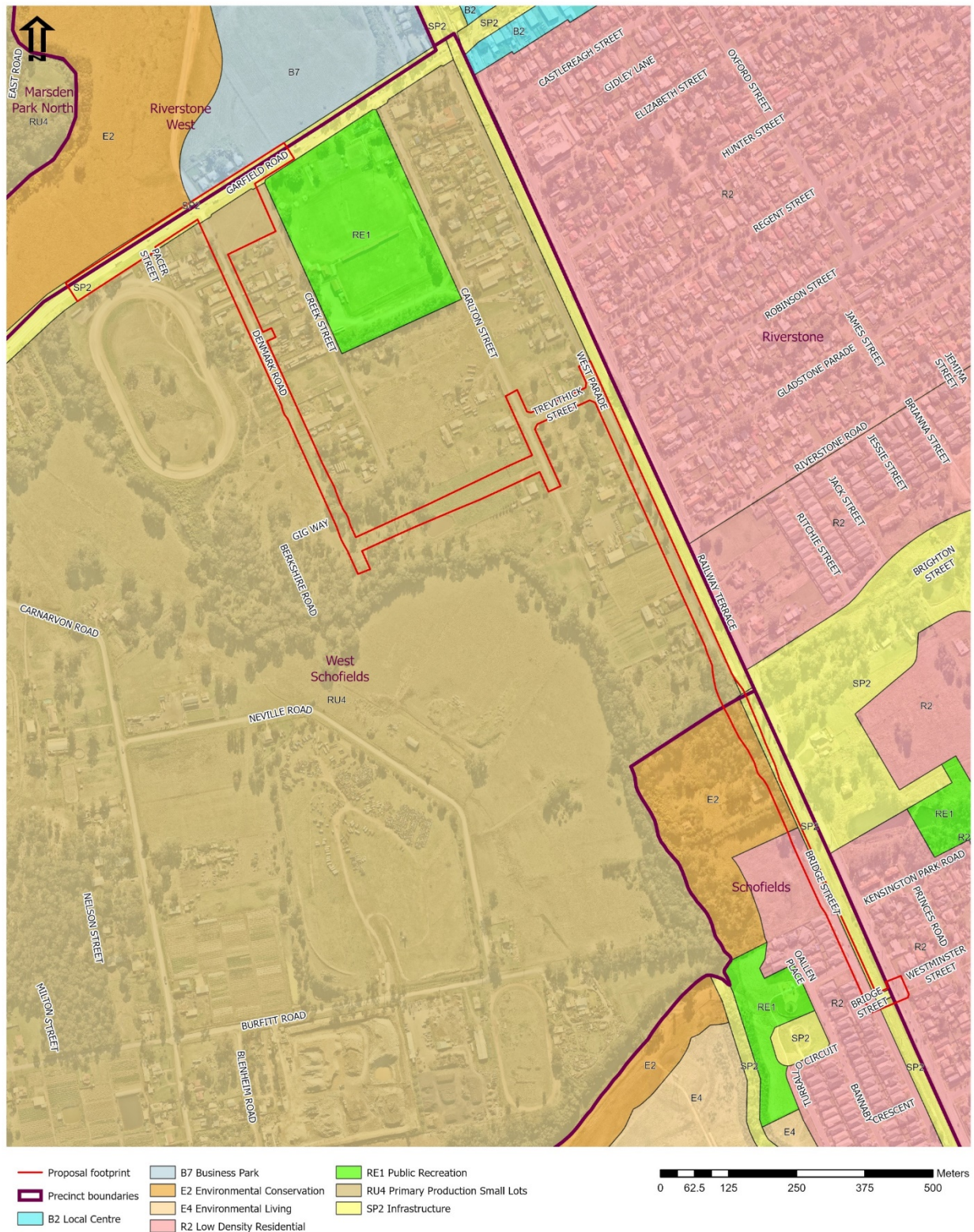


Figure 4-1: Zoning of the proposal footprint

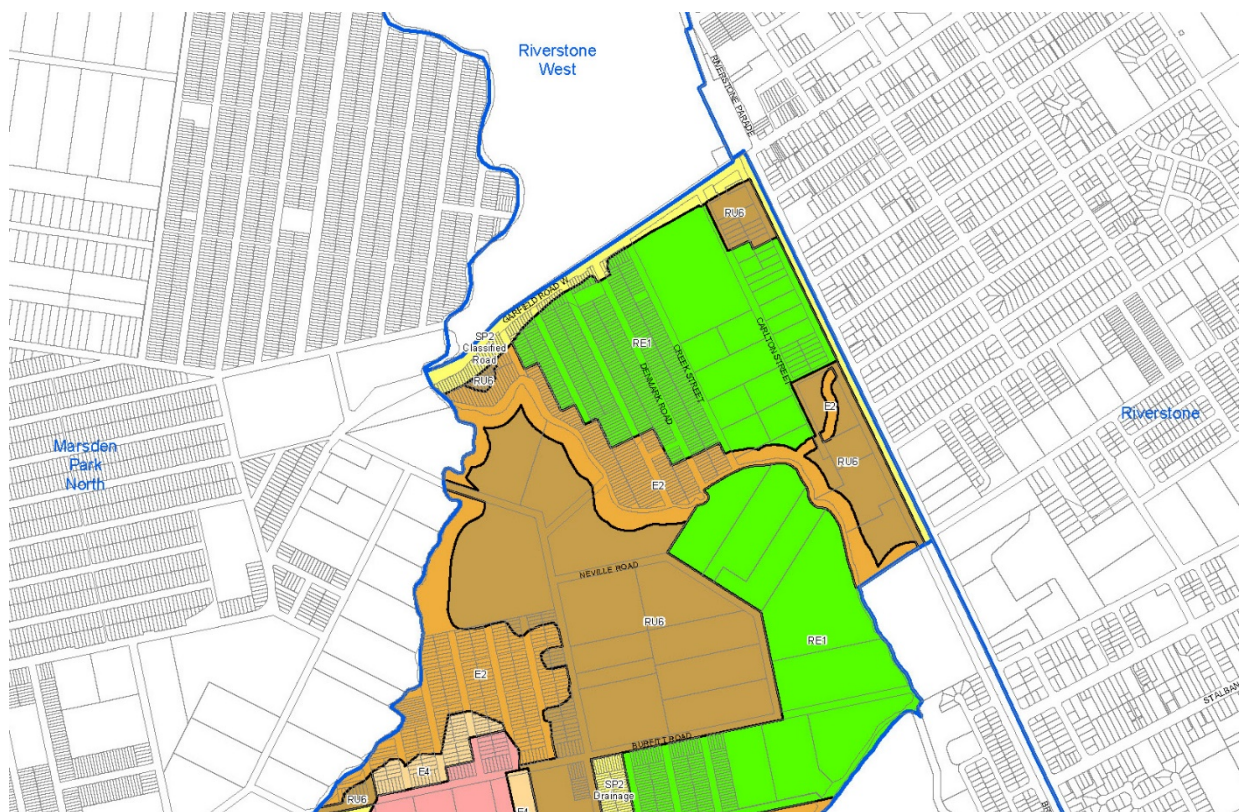


Figure 4-2: Draft West Schofields Precinct land zoning

Sydney Regional Environmental Plan No.20 – Hawkesbury-Nepean River (No 2 – 1997)

Sydney Regional Environmental Plan No. 20 – Hawkesbury-Nepean River (No 2 – 1997) (SREP 20) is a deemed State Environmental Planning Policy.

SREP 20 aims 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. It adopts a twofold approach to achieving that aim: (1) the setting of the general planning considerations, specific planning policies and recommended strategies; and (2) the imposition of specific development controls. The proposal is located on land identified on the SREP 20 Map (within the South Creek sub-catchment).

Clauses 5 and 6 of SREP 20 set out general planning considerations and specific planning policies and recommended strategies respectively. Clause 4 requires that those considerations, policies and recommended strategies be taken into consideration by consent authorities and by public authorities proposing to undertake development that does not require consent. These matters are reviewed in Appendix D.

4.1.2 Local Environmental Plans

Blacktown Local Environmental Plan 2015

Table 4-2 identifies the objectives for each of the affected zones under the Blacktown Local Environmental Plan 2015 (Blacktown LEP) (within the West Schofields precinct) and considers the consistency of the proposal with those objectives. Refer also to Figure 4-1.

Table 4-2: Consistency with zone objectives – Blacktown LEP

Zone	Objective	Comment
SP2 Infrastructure	<ul style="list-style-type: none"> To provide for infrastructure and related uses To prevent development that is not compatible with or that may detract from the provision of infrastructure To ensure that development does not have an adverse impact on the form and scale of the surrounding neighbourhood. 	This is the current zoning of Garfield Road West. The proposal relates to the provision of infrastructure and is therefore consistent with the first SP2 zone objective.
RU4 Primary Production Small lots	<ul style="list-style-type: none"> To enable sustainable primary industry and other compatible land uses To encourage and promote diversity and employment opportunities in relation to primary industry enterprises, particularly those that require smaller lots or that are more intensive in nature To minimise conflict between land uses within this zone and land uses within adjoining zones To ensure that development does not prejudice the orderly and economic development of future urban land To ensure that development is sympathetic to the ecological attributes of the area. 	<p>During proposal development property acquisition requirements have been minimised and the proposal primarily follows existing road reserves.</p> <p>The proposal is consistent with future planning as set out in the draft Schofields West Interim Layout Plan.</p>
E2 Environmental conservation	<ul style="list-style-type: none"> To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values To prevent development that could destroy, damage or otherwise have an adverse effect on those values To provide for passive recreational activities that are compatible with the land's environmental constraints. 	The proposal has been developed to minimise impacts on environmental values.

Development for the purposes of roads is permitted with development consent in the above zones. As noted above, the ISEPP operates to remove these consent requirements.

4.2 Other relevant NSW legislation

4.2.1 Protection of the Environment Operations Act 1997

Part 3.2 of the *Protection of the Environment Operations Act 1997* (POEO Act) requires an environmental protection licence for scheduled development work and the carrying out of scheduled activities (as set out in Schedule 1 of the POEO Act), which includes road construction. The proposal does not trigger these requirements.

Section 148 of the POEO Act requires immediate notification of pollution incidents causing or threatening material harm to the environment to each relevant authority. An Incident Management Plan would be included in the environmental management documentation for the proposal, to be prepared during the detailed design phase.

4.2.2 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) provides protection for items of state heritage significance that are listed on the State Heritage Register. Under Section 57(1) of the Heritage Act, the approval of the Heritage Council of NSW is generally required for development within a site included on the State Heritage Register, including works to the grounds or structures. The proposal would not affect a State Heritage Register listed item.

An excavation permit is required to disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. A permit is also required to disturb or excavate any land on which the person has discovered or exposed a relic. For works within the curtilage of the locally listed 'Hebe Farm' it is proposed that an Exception 1B application be lodged under section 139(4) of the Heritage Act. This exception category relates to excavation or disturbance of land that will have a minor impact on archaeological relics including the testing of land to verify the existence of relics without destroying or removing them.

4.2.3 National Parks and Wildlife Act 1974

The harming or desecrating of Aboriginal objects or places is an offence under Section 86 of the *National Parks and Wildlife Act 1979*. Under Section 90, an Aboriginal Heritage Impact Permit (AHIP) may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

Aboriginal objects would be affected by the proposal and Transport for NSW would therefore apply for an AHIP. Refer to Section 6.4 for further details.

4.2.4 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) seeks to conserve biological diversity and promote ecologically sustainable development; to prevent extinction and promote recovery of threatened species, populations and ecological communities; and to protect areas of outstanding biodiversity value.

The BC Act provides a listing of threatened species, populations and ecological communities, areas of outstanding biodiversity value, and key threatening processes.

Part 7 of the BC Act requires that the significance of the impact on threatened species, populations and endangered ecological communities listed under the BC Act or *Fisheries Management Act 1994*, are assessed using a five-part test. Where a significant impact is likely to occur, a Species Impact Statement or Biodiversity Development Assessment Report (BDAR) must be prepared.

Under Part 8 of the BC Act an activity proposed to be carried out on biodiversity certified land is taken to be an activity that is not likely to significantly affect any threatened species. The Growth Centres SEPP has received biodiversity certification; however, only small parts of the proposal footprint on West Parade and Bridge Street are on biocertified land.

An assessment of the potential impact on biodiversity is provided in Section 6.5.

4.2.5 Biosecurity Act

Under the *Biosecurity Act 2015*, which came into effect on 1 July 2017 and repealed the *Noxious Weeds Act 1993*, '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'.

Of those introduced plant species recorded within the proposal footprint, the following plants are listed in Schedule 3 of the Biosecurity Regulation 2017:

- Blackberry (*Rubus fruticosus* agg. spp.)
- Bridal Creeper (*Asparagus asparagoides*)
- Green Cestrum (*Cestrum parqui*)
- Lantana (*Lantana camara*).

The potential impacts and relevant safeguards are discussed further in Section 6.5. Appropriate biosecurity controls would be put in place for the proposed works to minimise the risk of weed transfer.

4.2.6 Fisheries Management Act 1994

The *Fisheries Management Act 1994* aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.

Section 199 of the *Fisheries Management Act 1994* provides that:

(1) A public authority (other than a local government authority) must, before it carries out or authorises the carrying out of dredging or reclamation work:

(a) give the Minister written notice of the proposed work, and

(b) consider any matters concerning the proposed work that are raised by the Minister within 21 days after the giving of the notice (or such other period as is agreed between the Minister and the public authority).

Notice under Section 199 is typically only required in relation to mapped Key Fish Habitat. The proposal site would not affect Key Fish Habitat.

Section 219 of the *Fisheries Management Act 1994* includes a prohibition on the blocking of fish passage. Fish passage would not be blocked on any of the tributaries of Eastern Creek during construction and/or operation (refer to Section 6.5).

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

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

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

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

Findings – matters of national environmental significance

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

4.3.2 Native Title Act 1993

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

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 road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of ISEPP the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

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

A referral to Australian Government Department of Agriculture, Water and the Environment under the EPBC Act is not required.

5 Consultation

5.1 Consultation strategy

The consultation strategy for the proposal involves several engagement tools which would be used to consult with the community and identified stakeholders. These include:

- Project notifications and project updates for nearby residents, businesses and stakeholders
- Facebook live event
- Letters, emails, social media posts and targeted correspondence
- Updates on the Transport for NSW website: www.rms.nsw.gov.au/projects.

The REF will be displayed on the Transport for NSW website. A community update will be letterbox dropped to residents and businesses, and additional stakeholders will receive the community update with a covering email/letter.

5.2 Community involvement

Transport for NSW initially sought community feedback on the Denmark Link Road (prior to the refinement discussed in Section 2.6) in November and December 2015. During the consultation period, 18 submissions were received. The key issues raised were:

- Current traffic congestion and delay times for motorists around Garfield Road railway level crossing
- Traffic changes and impacts for motorists around the Westminster Street Bridge
- Heavy vehicles using the Denmark Link Road
- Request for alternative design solutions and use of existing road networks
- Concern about potential impacts on property and the environment
- Concern about access to the Riverstone Trotting Track
- Impact to local businesses in Riverstone Town Centre.

Transport for NSW carefully considered all the submissions received from the community and prepared a consultation report which is available on the project webpage

<https://www.rms.nsw.gov.au/projects/north-west-growth-centre-strategy/denmark-link-road.html>.

Transport for NSW also held several community sessions in July and August 2019 to help inform the community about future road upgrade plans in the North West Growth Area, including the Denmark Link Road. The community information sessions held were:

- Saturday 27 July 2019, Schofields Community Centre, 65 Railway Terrace, Schofields between 10am and 2pm
- Tuesday 30 July 2019, Schofields Community Centre, 65 Railway Terrace, Schofields between 4pm and 7pm
- Thursday 1 August 2019, Riverstone Sports Centre, 15 Hamilton Street, Riverstone between 4pm and 7pm.

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 5-1.

Table 5-1: Summary of Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation

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

The proposal is currently at Stage 3 as described above. Transport for NSW carried out two rounds of consultation for the proposal. Both were advertised in local media and potential Aboriginal stakeholders identified from government agency notification responses were contacted. Transport for NSW invited Aboriginal people who hold knowledge relevant to determining the cultural heritage significance of Aboriginal objects and Aboriginal places in the area in which the proposed activity is to occur to register an interest in a process of community consultation. Consultation has occurred with a total of 28 Aboriginal community groups and individuals and has included:

- Advertising for registered Aboriginal parties
- Government agency notification letters
- Notification of closing date for registration
- Ongoing compilation of registrants list
- Provision of project information
- Provision of proposed archaeological and cultural heritage report assessment methodology (allowing 28 day review) outlining the proposed methodology for the test excavation and the methodology to prepare the Cultural Heritage Assessment Report
- Aboriginal Focus Group meeting held on 14 November 2017 to discuss the archaeological assessment methodology and Cultural Heritage Assessment Report methodology. Registered Aboriginal parties were also invited to identify individuals they regarded as knowledge holders for the area
- Provision of initial draft Cultural Heritage Assessment Report for review (allowing a 28 day review period, ending on 28/03/2018) then provision of updated report in late 2019
- Ongoing consultation with the local Aboriginal community including regular project updates.

Full details of the consultation with registered Aboriginal parties and the feedback received is provided in the Cultural Heritage Assessment Report included in Appendix E.

5.4 ISEPP consultation

Blacktown City Council and the State Emergency Service have been consulted about the proposal as per the requirements of clauses 13 (council infrastructure and services), 14 (local heritage) and 15AA (development with impacts on flood liable land) of the ISEPP.

Table 5-2: Issues raised through ISEPP consultation

Agency	Issues raised	Response / where addressed in REF?
State Emergency Service	The State Emergency Service noted the findings of the flooding assessment and expressed support for further investigations during detailed design to minimise flooding impacts on property. The proposal was identified as having a minimal risk to State Emergency Service response operations.	Section 6.9
Blacktown City Council	Maintenance of the table drains will be an issue for Council. Council noted that design longitudinal grades are less than the 0.7 per cent minimum grade specified in Council's engineering guide. Council indicated that it would provide further comments on the drainage design.	Transport for NSW is continuing to liaise with Council regarding the design for the proposal.

5.5 Growth Centres SEPP consultation

The Department of Planning, Industry and Environment has been consulted about the proposal as per the requirements of Clause 18A of the Growth Centres SEPP. The Department's response was received on 6 October 2020 and noted no objection to the proposed vegetation removal subject to Transport for NSW meeting any offset obligations under the biodiversity certification order. Biodiversity offsets are discussed in Section 6.5.5.

The Department also requested notification when the vegetation has been removed and the provision of spatial data showing the extent of vegetation removal.

5.6 Government agency and stakeholder involvement

Blacktown City Council and the Department of Planning, Industry and Environment were involved in options development, assessment and selection of the preferred option in 2015, and were also consulted in relation to the subsequent refinement of the preferred option.

Transport for NSW worked with Department of Planning Industry and Environment in developing the West Schofields Draft Precinct Plan, which identified the need to make minor modification to the proposal between Carlton Street and West Parade. The revised proposal follows the existing road corridor and was displayed as part of the West Schofields Draft Precinct Plan in September 2018.

Transport for NSW and Blacktown City Council have continued to work together to develop the concept design for the Denmark Link Road.

5.7 Ongoing or future consultation

This REF will be placed on public exhibition for stakeholder and community comment. All comments received will be considered when finalising the proposal design. The community would be kept informed of any further changes to the proposal resulting from this and any future consultation process.

Following the public display of the REF, all comments received would be recorded and addressed in a submissions report detailing how each issue raised would be considered in finalising the proposal design. The Submissions Report would be made available to the public

on the project webpage on the Transport for NSW website. A community update will be distributed to advise the availability of the submissions report.

If the proposal is approved, ongoing consultation activities would occur with the affected community including nearby landholders, businesses and road users during detail design and construction. Ongoing communications and notifications may include:

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

6 Environmental assessment

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

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the guidelines Is an EIS required? (Department of Planning, 1995) as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000 and the Roads and Related Facilities EIS Guideline (Department of Urban Affairs and Planning, 1996). The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix A.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

The environmental assessment has considered both the proposal footprint (the area that would be directly impacted by the proposal) and the study area (the larger area that has been the focus of environmental investigations). These boundaries are shown on Figure 1-2.

6.1 Transport and traffic

6.1.1 Methodology

Operational traffic was considered by reviewing existing traffic movements and identifying likely changes in traffic movements associated with the proposed new road link. The capacity of the new Denmark Link Road was identified as 2,000 vehicles per day (consistent with its status as a local road) and considering the capacity of the Bridge Street / Westminster Street / Railway Terrace intersection.

Intersection modelling of the Bridge Street / Westminster Street / Railway Terrace intersection was also carried out to determine its serviceable limit (the point at which the level of service deteriorates to E or F). Level of service is a measure of average delay across all movements as described below in Table 6-1.

Table 6-1: Level of service

Level of service	Average delay per vehicle (seconds)	Description
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Near capacity
E	57 to 70	At capacity
F	Greater than 70	Extra capacity required

The assessment also considers construction related traffic impacts on general traffic, buses, pedestrians and cyclists. Parking impacts, both temporary and permanent, are also assessed.

6.1.2 Existing environment

Road network

Key roads in the area near the proposal footprint are described below and shown on Figure 6-1:

- Garfield Road West and Garfield Road East are both classified roads under the *Roads Act 1993* (Main Road 546) and together form a regional route connecting the Riverstone Town Centre to Richmond Road in the west and Windsor Road in the east. These roads generally have one lane in each direction. The speed limit is 60 to 80 kilometres per hour except through the built-up areas of Riverstone where the speed limit is 50 kilometres per hour and school zones
- Railway Terrace and Riverstone Parade run parallel to and on the eastern side of the rail line, and form part of a north south route running through Riverstone Town Centre. These roads generally have one lane in each direction and are collector roads that serve a distributor function and have a speed limit of 60 kilometres per hour. Riverstone Parade provides access to the Riverstone Railway Station. Railway Terrace connects to Westminster Street Bridge and further south to Schofields Road
- Denmark Road, Creek Street, Carlton Street, Trevithick Street and West Parade are all local roads with a speed limit of 50 kilometres per hour and have no lanes marked. These roads provide access from Garfield Road West to residences, the Riverstone Trotting Track and Riverstone Park (playing fields) to the south. None of these roads have a through traffic function and there is currently no connection to the Schofields local road network to the south.
- Bridge Street is a local road running along the western side of the rail line in Schofields, has a speed limit of 50 kilometres per hour and has no lanes marked. It is connected via a bridge to the eastern side of the rail line at Westminster Street.

The intersection of Garfield Road West / Garfield Road East / Railway Terrace / Riverstone Parade at the Riverstone Town Centre is an offset four-way intersection that is controlled by traffic lights and includes the rail level crossing. The intersection accommodates all turning movements. Delays are experienced at this intersection throughout the day when the level crossing boom gates lower to allow scheduled trains to pass. This can result in a delay of almost six minutes in the AM peak and over four minutes in the PM peak period (when the crossing operates for trains running in both directions). When the level crossing boom gates lower, queues on Garfield Road West have been identified as extending beyond 550 metres.

The Bridge Street / Westminster Street / Railway Terrace intersection is controlled by traffic lights and accommodates all turning movements.



Figure 6-1: Road network

Traffic volumes

The average 2019 daily traffic at the railway level crossing intersection in Riverstone (on all approaches) was 40,000 vehicles. Figure 6-2 shows the volumes and distribution of traffic for the Garfield Road West / Garfield Road East / Railway Terrace / Riverstone Parade on a typical day in August 2019.

Traffic counts also show that a substantial proportion of eastbound traffic on Garfield Road West has a destination in the locality to the south-east. The traffic counts show the following:

- During the AM peak about 65 per cent of eastbound traffic on Garfield Road West travels straight through the intersection, about 4 per cent turns right onto Railway Terrace and about 31 per cent turns left onto Riverstone Parade
- During the PM peak about 58 per cent of eastbound traffic on Garfield Road West travels straight through the intersection, about 8 per cent turns right onto Railway Terrace and about 34 per cent turns left onto Riverstone Parade
- Of the eastbound traffic that travels straight through the intersection in the AM peak, about 73 per cent continues east on Garfield Road East while about 27 per cent turns right onto Oxford Street
- Of the eastbound traffic that travels straight through the intersection in the PM peak, about 79 per cent continues east on Garfield Road East while about 21 per cent turns right onto Oxford Street
- On a daily basis about 10 per cent of total Garfield Road eastbound traffic turn right from Garfield Road onto either Railway Terrace or Oxford Street.

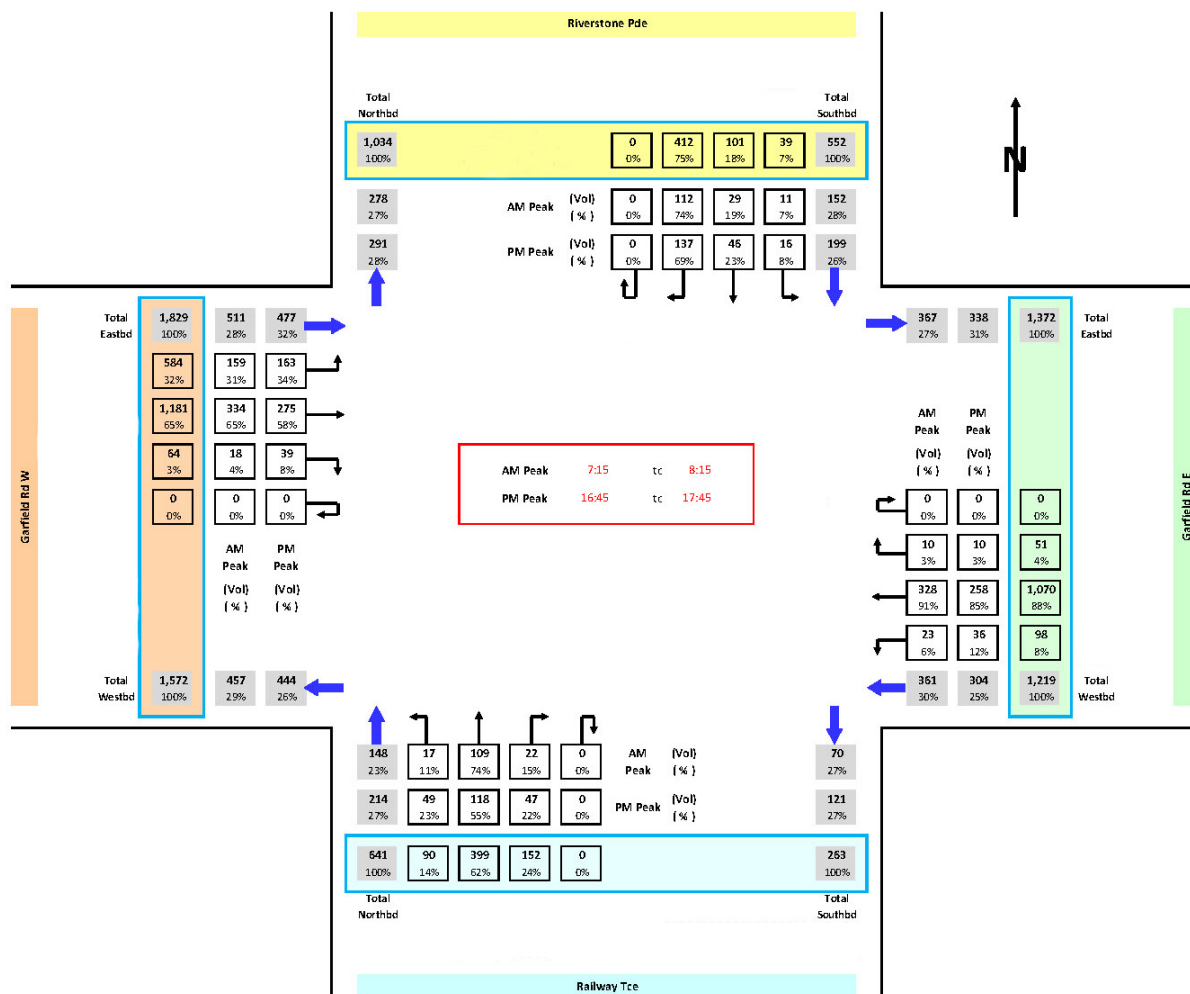


Figure 6-2: Railway crossing intersection peak movements

Intersection performance

Congestion is currently experienced on Garfield Road West due to the constraints of the rail level crossing and the volume and composition of the traffic. Modelling of the intersection during the options evaluation process in 2015 confirmed that the intersection had reached capacity and has substantial traffic delays. The results are provided in Table 6-2.

Table 6-2: Railway crossing intersection – modelling results (2015)

Intersection approach	Average delay per vehicle (seconds) AM peak	Level of service (AM peak)	Average delay per vehicle (seconds) PM peak	Level of service (PM peak)
Garfield Road West	184	F	85	F
Riverstone Parade	94	F	108	F
Garfield Road East	55	D	57	E
Railway Terrace	55	D	77	F

Modelling of the Bridge Street / Westminster Street / Railway Terrace intersection in 2019 shows that all legs of this intersection are currently operating at a satisfactory or better level of

service. The results are provided in Table 6-3 while the intersection layout is provided in Figure 6-3.

Table 6-3: Bridge Street / Westminster Street / Railway Terrace intersection – modelling (2019)

Intersection approach	Average delay per vehicle (seconds) AM peak	Level of service (AM peak)	Average delay per vehicle (seconds) PM peak	Level of service (PM peak)
Bridge Street (NW)	8	A	8	A
Bridge Street (SE)	5	A	5	A
Bridge Street (SW)	26	B	27	B
Railway Terrace (SE)	29	C	30	C
Westminster Street (NE)	33	C	32	C
Railway Terrace (NW)	16	B	16	B

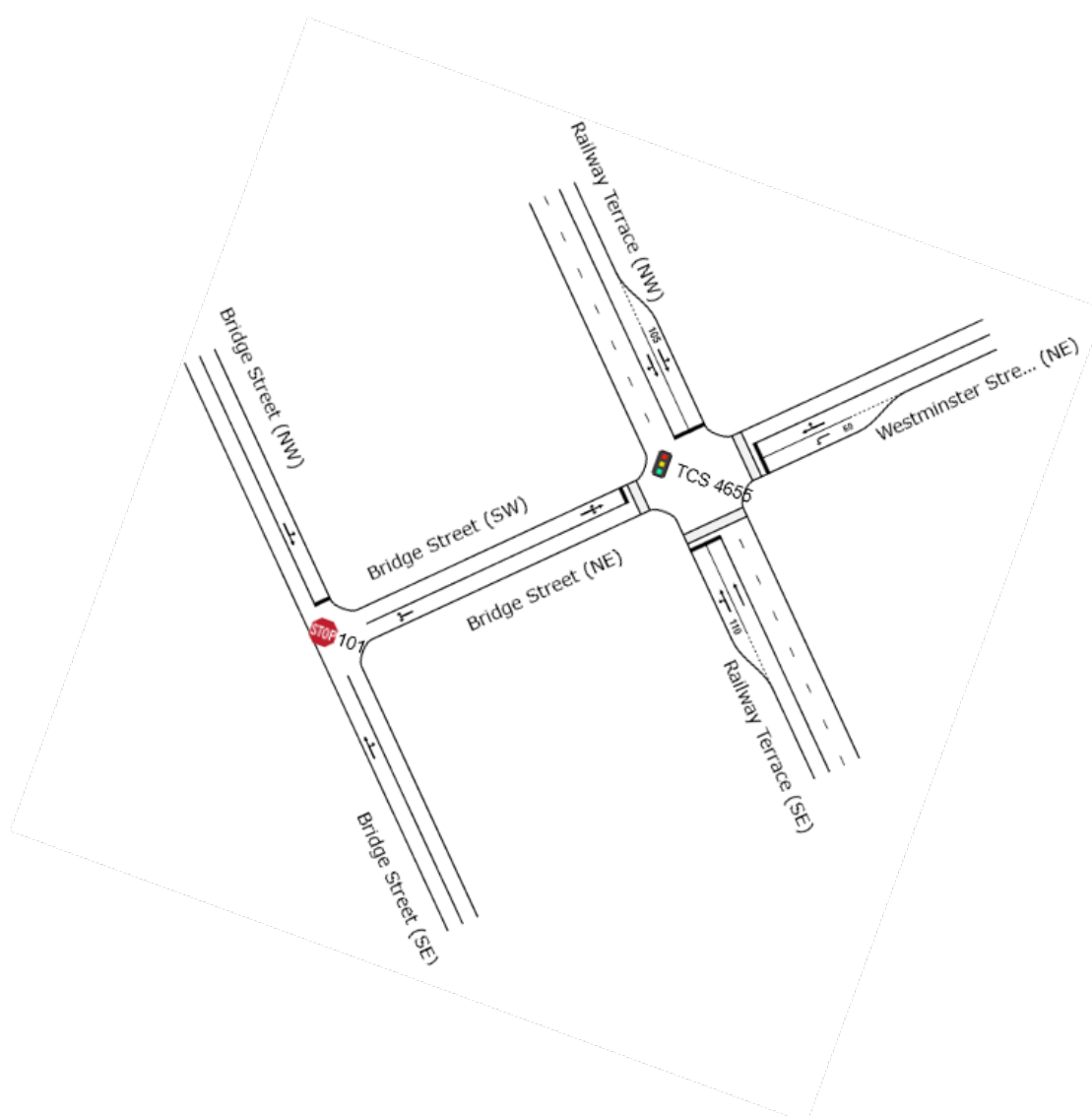


Figure 6-3: Bridge Street / Westminster Street / Railway Terrace – intersection layout

Road safety

In the five year period between 1 January 2014 and 31 December 2018 there were 19 crashes on Garfield Road (between Denmark Road and Oxford Street), on Oxford Street and on Railway Terrace (the roads likely to benefit from the proposal). Of these six were serious injury crashes, three were moderate injury crashes, four were minor injury crashes and six were non-casualty crashes.

Public transport

The Riverstone Railway Station (on the Richmond Line – part of the T1 North Shore and Western Line) is located to the north of the proposal footprint. During weekdays and on weekends, trains depart every half hour to the City or Richmond.

The following bus services operate near the proposal footprint:

- 671 Riverstone to Windsor via McGraths Hill and Vineyard
- 734 Riverstone to Blacktown via Schofields
- 747 Marsden Park to Rouse Hill via Riverstone
- 757 Riverstone to Mount Druitt via Marsden Park and Rooty Hill
- N71 Richmond to City Town Hall (Night Service).

Key elements of the public transport network near the proposal footprint, including bus stops, are shown in Figure 6-4.



Figure 6-4: Public transport network

Active transport

There is limited provision for pedestrians and cyclists within and adjacent to the proposal footprint. Denmark Road, Carlton Street, Trevithick Street and West Parade (south of Trevithick Street) do not have footpaths and pedestrian and cyclist access is via the road or road verge. There are also no footpaths on Bridge Street.

The traffic lights at the railway level crossing and Bridge Street / Westminster Street / Railway Terrace include provision for pedestrians.

There is a footpath along the eastern side of Railway Terrace between Garfield Road East and Westminster Street and beyond. Off-road provision for cyclists (in the form of a shared path) is provided on the western side of Railway Terrace between Garfield Road East and Riverstone Street. The section to the south towards Westminster Street is identified by Blacktown City Council Bike Plan (2016) as a developer funded cycleway.

Parking

Unrestricted on street parking is available within the proposal footprint (typically on the road verge) along Denmark Road, Carlton Street, Trevithick Street and West Parade.

6.1.3 Potential impacts

Construction

Construction vehicles and lane closures

There is the potential for some delays to traffic on both Garfield Road West and the local road network due to lane closures and reduced speed limits. Construction staging would be refined to minimise delays and traffic control under a traffic management plan would be required. Full road closures and associated detour arrangements are not expected to be needed.

As noted in Section 3.3.7 the proposal is expected to generate up to 40 heavy and 40 light construction vehicle movements per day at the peak of construction activity. Most of these movements would occur outside morning and evening peak periods on the road network. Impacts on network performance due to construction traffic would therefore be minor.

Pedestrians and cyclists

Pedestrians and cyclist access through the proposal site would be maintained during construction. Pedestrians and cyclists may experience some small delays resulting from minor diversions or directives from traffic controllers.

Buses

Buses (which use Garfield Road West) are likely to be affected similarly to general traffic. During the night period when lane closures are expected, buses would generally be running at a lower frequency, and it is expected that construction would have a negligible impact on the overall operation of these services and the customers using them.

A minor adjustment to the position of bus stop 276550 (on the northern side of Garfield Road West) and its associated shelter would be required to ensure it is away from works. This would not appreciably affect the convenience of this bus stop for bus customers.

Emergency vehicles

Impacts on emergency service vehicles are expected to be minor provided ongoing consultation occurs, and a traffic management plan is implemented. Traffic management arrangements during construction would be designed to ensure larger NSW Fire and Rescue vehicles can negotiate the intersection during construction.

Parking

There would be localised reductions in on-street parking within the proposal footprint during construction. On site observations indicate that there is sufficient parking capacity elsewhere on the local road network to address this minor and temporary impact.

Operation

Traffic performance

The connection of Bridge Street with the proposed Denmark Link Road corridor, would cause a change in trip-distribution from Garfield Road West and various local roads to the new link. This is expected to be about 1,400 vehicles/day/two-way by 2026 and subsequently increasing to the local road capacity of 2,000 vehicles/day/two-way.

The proposal would help reduce delays for motorists travelling to the southern part of Riverstone with analysis suggesting an average travel time saving of more than 2.5 minutes. Actual travel time savings would be greater during those periods when the railway level crossing is operating. There would also be reduced delays for eastbound traffic on Garfield Road West as a result of some traffic using the new link road.

Traffic modelling indicates that the Bridge Street / Railway Terrace / Westminster Street intersection can accommodate (in the year 2030) up to 200 vehicles from the new link (160 left, 40 through) during peak periods before reaching capacity. Notwithstanding, there is potential for some queuing along Bridge Street (both north and south) with the addition of Denmark Link Road traffic.

Pedestrians and cyclists

The proposal does not include new footpaths, shared paths or cycleways. Pedestrians and cyclists would still be able to use the local road network similar to the current situation.

Public transport

The proposal would not require changes to any bus routes. A minor adjustment to the position of bus stop 276550 (on the northern side of Garfield Road West) and its associated shelter may be needed, but this would not appreciably affect the convenience of this bus stop for bus customers. Buses using Garfield Road West may benefit from reduced delays at the railway crossing intersection (due to the diversion of some traffic to the new link road).

Emergency vehicles

Emergency vehicles would not be affected by the proposal. The changes to the affected intersections would be designed to adequately accommodate larger NSW Fire and Rescue vehicles.

Connectivity and access

The proposal would improve connectivity between Garfield Road West and the southern part of Riverstone, providing an alternative to crossing at the Riverstone railway level crossing.

Access to property along the route would be retained. The proposal includes reforming of driveway accesses where required.

Parking

The proposal would affect the overall supply of on-street parking along the new link as there would be insufficient space for the proposed new lanes and parking on both sides of the roads. Observations on site indicate that there is sufficient parking supply on the local road network (and within adjacent properties) to accommodate current levels of parking demand.

6.1.4 Safeguards and management measures

Table 6-4: Traffic and transport environmental management measures

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 Traffic Control at Work Sites Manual (Roads and Maritime, 2018) and QA Specification G10 Control of Traffic (Roads and Maritime, 2008). 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 traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic monitoring, review and amendment mechanisms. 	Contractor	Pre-construction	Section 4.8 of QA G36 Environment Protection
Traffic and transport	The operation of the Bridge Street / Railway Terrace / Westminster Street intersection will be reviewed following the opening of the Denmark Link Road.	Transport for NSW	Operation	Additional measure

6.2 Noise and vibration

This section describes the existing noise environment, identifies noise sensitive receivers and assesses the potential construction and operation noise and vibration impacts of the proposal. The Operational and Construction Noise and Vibration Assessment (Appendix E) carried out by Muller Acoustic Consulting has been used to inform this chapter.

6.2.1 Methodology

The noise and vibration impact assessment methodology involved:

- Identifying and classifying sensitive receivers. Receivers were classified using a combination of recent aerial and ground photography, web-based information sources and cadastral data and site inspection
- Carrying out background noise monitoring to identify existing noise levels. Background noise was measured at locations on Denmark Road, Carlton Street and West Parade using calibrated, industry standard, Type 1 noise loggers
- Validation of noise models using noise logger
- Establishing proposal specific construction noise management levels in accordance with the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009)
- Modelling of construction noise using construction sound power levels as per the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016) and construction scenarios which assume worst-case scenarios for construction activities, such as sources operating concurrently, minimum offset distances between source and receiver and no mitigation measures
- Modelling of operational road traffic noise using the Calculation of Road Traffic Noise (CoRTN) method, which is widely accepted in Australia
- Assessment of construction and operational noise predictions against applicable criteria
- Identification of feasible and reasonable environmental management measures.

6.2.2 Existing environment

Residential receivers have been grouped into two Noise Catchment Areas (NCAs) based on receivers with similar levels of background noise. These NCAs are shown in Figure 6-5 along with noise monitoring locations and non-residential receivers (commercial, places of worship and active recreations areas).

The noise environment surrounding the proposal site is typical of a rural environment on a suburban fringe, with dominant sources including road traffic noise from Garfield Road West and Railway Terrace, rail noise from the passage of trains, and general urban hum. Measured background noise levels are provided in Table 6-5.

Table 6-5: Existing background noise levels (RBL, dBA)

Location	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
L1	38	39	34
L2	42	41	34
L3	39	40	33

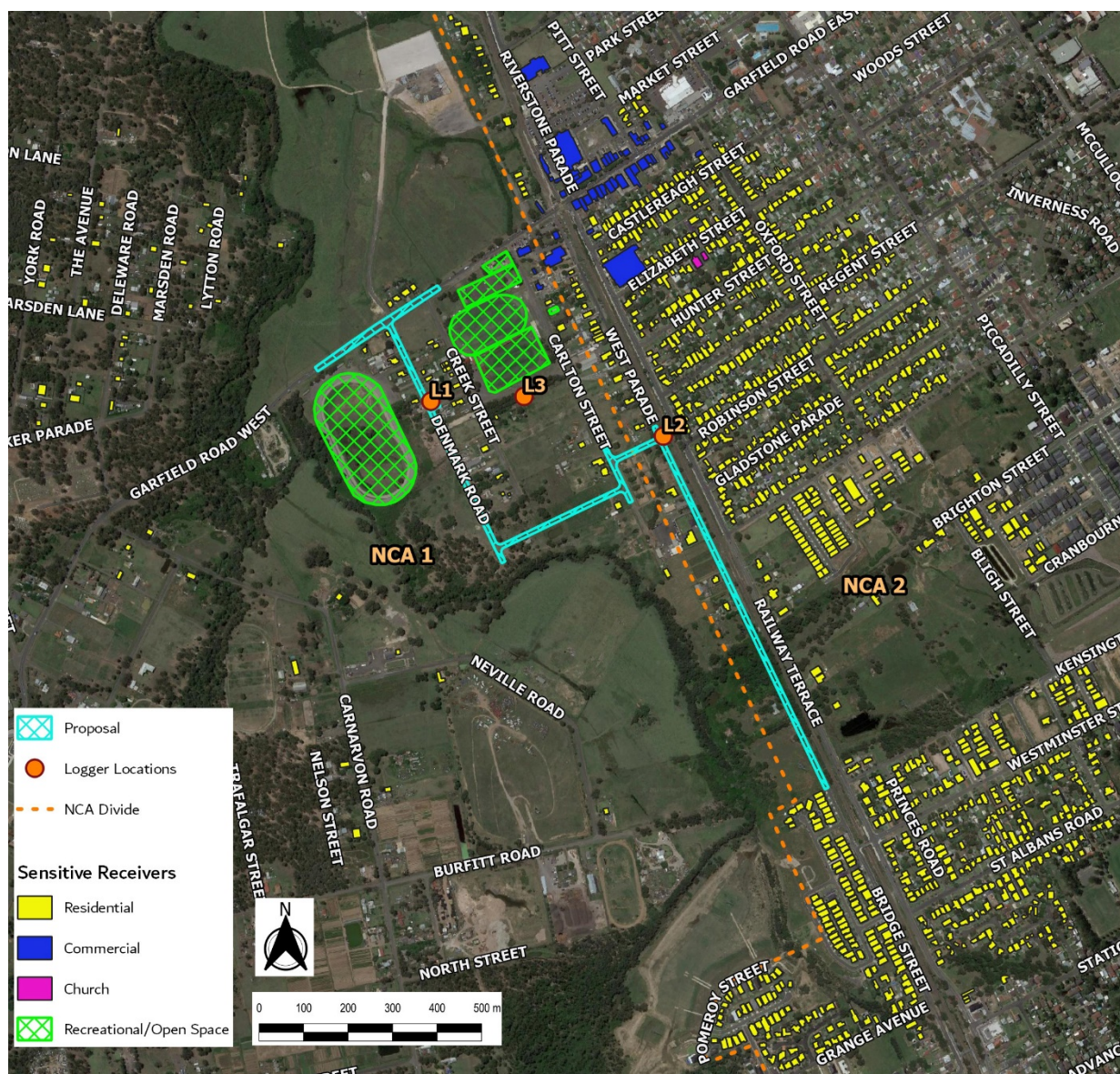


Figure 6-5: NCAs, sensitive receivers and noise monitoring locations

6.2.3 Criteria

Construction noise criteria

Noise management levels (NMLs) for the proposal were established in accordance with the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009). The guideline prescribes noise management goals for receivers. As a guide, construction noise for residential receivers should not exceed the background noise levels by more than 10 dB(A) during standard hours, and by more than 5 dB(A) out-of-hours (that is, for evening and night-time work). The level of 75 dB(A) is identified as the point above which there may be a strong community reaction to construction noise.

The project specific NMLs for the sensitive receivers identified for the proposal are provided in Table 6-6. Relevant noise management levels for non-residential receivers are also provided.

Table 6-6: Noise management levels

Receiver	Assessment period	RBL (db LA ₉₀)	NML (db LA _{eq})
NCA 1	Standard hours	39	49
NCA 1	Out-of-hours Period 1 ¹	40	45
NCA 1	Out-of-hours Period 1 ²	33	38
NCA 2	Standard hours	42	52
NCA 2	Out-of-hours Period 1 ¹	41	46
NCA 2	Out-of-hours Period 1 ²	34	39
Commercial	When in use	N/A	70
Industrial	When in use	N/A	75
School classrooms	When in use	N/A	55 ³
Places of worship	When in use	N/A	55 ³
Community centre	When in use	N/A	50
Active recreation	When in use	N/A	65

¹ Out-of-hours Period 1: Monday to Friday 6pm to 10pm, Saturday 7am to 8am and 1pm to 10pm, Sunday / Public Holiday 8am to 6pm

² Out-of-hours period 2: Monday to Friday 10pm to 7am, Saturday 10pm to 8am, Sunday / Public Holiday 6pm to 7pm

³ Assumed equivalent external noise level with windows open.

Construction traffic noise criteria

When construction related traffic moves onto the public road network, vehicle movements are regarded as additional road traffic and are assessed under the Road Noise Policy (RNP) (Department of Environment Climate Change and Water, 2011). An initial screening test is applied by evaluating if noise levels would increase by more than 2 dB (an increase in the number vehicles of approximately 60 per cent) due to construction traffic or a temporary detour due to a road closure.

Construction vibration criteria

As a guide, safe working distances for the proposed items of vibration intensive plant are provided in the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016). Safe working distances to achieve the DIN 4150.3 criteria for heritage structures are about double the safe working distance for cosmetic damage.

Table 6-7: Minimum working distances for relevant vibration intensive plant

Plant item	Rating / description	Cosmetic damage (BS7385)	Heritage item (DIN 4150)	Human response
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5m	10m	15m to 20m
	< 100 kN (Typically 2-4 tonnes)	6m	12m	20m
	< 200 kN (Typically 4-6 tonnes)	12m	24m	40m
	< 300 kN (Typically 7-13 tonnes)	15m	30m	100m

Plant item	Rating / description	Cosmetic damage (BS7385)	Heritage item (DIN 4150)	Human response
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2m	4m	7m
Jackhammer	Hand held	1m nominal	2m	2m

Sleep disturbance

Based on the Noise Policy for Industry (Environment Protection Authority, 2017) trigger levels for transient noise events that have the potential to cause sleep disturbance have been set as follows:

- L_{Aeq} (15 minute) – 40 dB
- L_{Amax} 52 dB.

Operational road traffic noise criteria

In constructing the bypass beyond the existing road corridor the proposal is deemed to be a new road development type under the Road Noise Policy (Department of Environment, Climate Change and Water, 2011). The applicable road traffic noise assessment criteria for residential land uses for the proposal are presented in Table 6-8.

Table 6-8: Road traffic noise assessment criteria for residential receivers

Road	Type of proposal	Land use	Day (7am-10pm)	Night (10pm - 7am)
Freeway/arterial/ sub-arterial road*	Existing residences affected by noise from new freeway / arterial / sub arterial road corridors	Residential	55 dB(A) $L_{Aeq}(15hr)$	50 dB(A) $L_{Aeq}(9hr)$

* For administrative purposes, the Denmark Link Road would be a local road.

The Road Noise Policy also states that where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB, which is generally accepted as the threshold at which a change in noise level can be perceived.

In addition to meeting the above assessment criteria, any substantial increase in total traffic noise at receivers must be considered. Receivers experiencing increases in total traffic noise levels above those presented in Table 6-9 are considered for mitigation.

Table 6-9: Relative increase criteria for residential land uses

Road	Type of proposal	Day (7am-10pm)	Night (10pm - 7am)
Freeway / arterial / sub-arterial road*	New road corridor / redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic L_{Aeq} (15hr) +12 dB (external)	Existing traffic L_{Aeq} (15hr) +12 dB (external)

* For administrative purposes, the Denmark Link Road would be a local road.

When the total noise level in the build year is 5 dB(A) or more above the traffic noise criterion it is considered to have exceeded the cumulative limit. Receivers where the exceedance occurs qualify for consideration of noise mitigation. The cumulative limit does not apply if the contribution from the road project is less than 2.0 dB(A) in the build year. Instead, consideration should then be given to whether the noise levels are 'acute' at the receiver.

The road traffic noise levels are considered to be ‘acute’ where predicted noise levels at the receiver is greater than or equal to 65 dB $LA_{eq(15hr)}$ (day) or 60 dB $LA_{eq(9hr)}$ (night). Residential receivers exposed to ‘acute’ noise levels as part of a road proposal are considered for mitigation regardless of the increase associated with the proposal.

6.2.4 Potential impacts

Construction

Construction noise levels at most affected receivers

The results of the construction noise assessment for the most affected residential receivers are provided in Table 6-10. The results of the assessment show that $LA_{eq(15min)}$ noise levels would be above the relevant NMLs for residential receivers during each stage of construction, with $LA_{eq(15min)}$ noise levels of up to 83 dB at the most affected residential receiver (54 Carlton Street) during the daytime ‘local road works’ scenario.

The construction noise levels are predicted to meet the NMLs for all commercial receivers and places of worship during each of the assessed construction scenarios. Noise levels are predicted to exceed the NML for active recreation areas at the Riverstone Trotting Track during local road works along Denmark Road. Noise levels at all other active recreation areas, including the nearby Riverstone Trotting Track are predicted to remain below the relevant NML for the remaining scenarios.

For most receivers, exceedances of NMLs would be for short periods as construction works occur at different locations within the proposal footprint.

Table 6-10: Construction noise assessment results – most affected receivers

Receiver type	Period	NML (dB LA_{eq})	Compound establishment	Local road works	Asphalt paving	Road furniture
Residential	Day	49	70	83	78	66
	Evening	44	N/A	N/A	73	66
	Night	38	N/A	N/A	73	66
Commercial	When in use	70	51	59	52	47
Places of worship	When in use	45	<30	41	<30	<30
Active recreation	When in use	65	62	70	59	57

Note: NML exceedances shown in **bold**

Construction noise levels – establishment of compound site

Table 6-14 shows $LA_{eq(15min)}$ noise emissions are predicted to be above the standard hours NML for nearby residential receivers during establishment of the compound site. The highest predicted noise levels of up to 70 dB(A) are expected at 47 Garfield Road and 5 Creek Street. Noise levels associated with compound establishment would be experienced for up to about four weeks at the start of the construction period.

Table 6-11: Affected distances – Compound establishment

Receiver type	Period	NML (dB LA _{eq})	Affected distance	Number of receivers
Residential	Day	49	Approx. 250 metres	Approx. 18
Residential	Evening	44	N/A	N/A
Residential	Night	38	N/A	N/A
Residential	Highly affected	75	Approx. 15 metres	0

Construction noise levels – local road work

Table 6-12 shows LA_{eq(15min)} noise levels are predicted to be above the standard hours NML for nearby residential receivers during local road works, with the highest predicted noise levels of up to 83 dB(A) at 54 Carlton Street. Furthermore, noise levels are anticipated to exceed the active recreation areas NML at the nearby Riverstone Trotting Track for works occurring on Denmark Road.

Table 6-12: Affected distances – Local road works

Receiver type	Period	NML (dB LA _{eq})	Affected distance	Number of receivers
Residential	Day	49	Approx. 820 metres	Approx. 470
Residential	Evening	44	N/A	N/A
Residential	Night	38	N/A	N/A
Residential	Highly affected	75	Approx. 50 metres	Approx. 13

Construction noise levels – asphalt paving

Table 6-13 shows LA_{eq(15min)} noise levels are predicted to be above the standard hours NML for nearby residential receivers during asphalt paving works, with the highest predicted noise levels at 47 Garfield Road of up to 78 dB(A) during standard hours and up to 73 dB(A) during the evening and night periods.

Table 6-13: Affected distances – Asphalt paving

Receiver type	Period	NML (dB LA _{eq})	Affected distance	Number of receivers
Residential	Day	49	Approx. 540 metres	Approx. 215
Residential	Evening	44	Approx. 530 metres	Approx. 40
Residential	Night	38	Approx. 825 metres	Approx. 100
Residential	Highly affected	75	Approx. 15 metres	Approx. 7

Construction noise levels – road furniture installation

Table 6-14 LA_{eq(15min)} noise levels are predicted to be above the standard hours NML for nearby residential receivers during road furniture installation, with the highest predicted noise levels at 47 Garfield Road and 5 Creek Street of up to 66 dB(A) during standard hours and OOH work periods.

Table 6-14: Affected distances – Road furniture installation

Receiver type	Period	NML (dB LA _{eq})	Affected distance	Number of receivers
Residential	Day	49	Approx. 175 metres	Approx. 70
Residential	Evening	44	Approx. 250 metres	Approx. 22
Residential	Night	38	Approx. 515 metres	Approx. 60
Residential	Highly affected	75	N/A	0

Construction noise levels – sleep disturbance

Out of hours construction activities occurring during the night-time (i.e. at the Garfield Road West / Denmark Road intersection) have the potential to generate noise emissions that may cause sleep disturbance at receivers near the proposal footprint. Modelling identified that noise emissions have the potential to be above the maximum noise trigger level at residential receivers located within about 170 metres of the proposal site (about 12 in total).

Construction traffic noise

The assessment of construction road traffic noise levels assumed a worst case of 80 workers on average per shift. On this basis modelling indicates that construction generated road traffic noise would be negligible for the day period and up to 0.1 dB LA_{eq(9hr)} for the night period. This is negligible when compared against existing traffic volumes on Garfield Road West.

Construction noise impact on horses

Assessment of construction noise levels at the Riverstone Trotting Track indicates that at the most affected point of the trotting track, LA_{eq(15min)} noise levels of up to 70 dB are anticipated to occur. It is also noted that horses may be stabled at properties near the Riverstone Trotting Track, including on Denmark Road.

Road traffic noise levels for the 'no build option' at opening year are predicted in excess of 65dB LA_{eq(15hr)}. It is therefore considered that the noise environment in the locality of the Riverstone Trotting Track is representative of a high noise environment, and adverse impacts on the wellbeing of horses due to the proposal are unlikely.

Construction vibration

The main potential source of construction vibration would be vibratory rollers. Generally, rolling would take place along the alignment prior to road resurfacing, or when relocation of services has occurred. Peak levels of vibration from rolling typically occurs as the roller stops to change direction and a resonance is created as the roller (and vibrator) is stationary.

Construction plant would be selected to ensure minimum safe working distances set by the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016) are complied with where possible, in relation to cosmetic damage, heritage structures and human response to vibration. This would mean 2-4 tonne or smaller vibratory rollers (or static rollers) would be selected where possible. If minimum safe working distances cannot be complied with, additional measures including vibration monitoring would be implemented.

Specific consideration would be given to any vibration intensive activities occurring near the brick culverts under the railway line on Bridge Street (refer to Section 6.3 as this culvert has heritage significance), on West Parade near Trevithick Street and near the operating rail line.

Operation

The operational road traffic noise assessment identifies that due to the introduction of additional traffic, residential receivers along the new link road would experience an increase

road traffic noise. The Noise Mitigation Guideline (Roads and Maritime Services, 2015) indicates that once noise has been minimised by feasible and reasonable methods during the corridor planning and road design stages, receivers with residual exceedances of the criteria can be assessed to determine if they qualify for noise mitigation. The Noise Mitigation Guideline provides three triggers where a receiver may qualify for consideration of noise mitigation. These are:

- Trigger 1 – The total noise level at the receiver in the build scenario is 5 dB or greater than the criterion, and the total noise level at the receiver in the build scenario minus the contribution from only existing roads in the build scenario at the receiver is greater than 2 dB
- Trigger 2 – The total noise level at the receiver in the build scenario is greater than the criterion, and the total noise level at the receiver in the build scenario minus the total noise level at the receiver in the no-build scenario is greater than 2 dB
- Trigger 3 – The total noise level at the receiver in the build scenario is above the acute noise level and the dominant noise at the receiver is due to the proposal.

Based on the above triggers, 24 residential receivers would qualify for consideration of feasible and reasonable noise mitigation measures due to the proposal. No non-residential receivers qualify for consideration of noise mitigation. A summary of the noise predictions for residential receivers qualifying for consideration of mitigation measures is presented in Table 6-15 and Figure 6-6. No non-residential receivers qualify for consideration of noise mitigation.

Table 6-15: Predicted changes in road traffic noise levels

Receiver	Opening noise (dBA)				10 years after opening (dBA)				Criteria (dBA)		Criteria exceeded		Opening Change in noise (dBA)		10 years after opening Change in noise (dBA)	
	No build		Build		No build		Build						Opening	Design	Opening	Design
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
R3	72.4	66.7	72.5	66.8	75.6	69.8	75.3	69.6	55	50	Yes	Yes	0.1	0.1	-0.3	-0.2
R4	73.1	67.3	73.3	67.7	76.3	70.4	76.2	70.5	55	50	Yes	Yes	0.2	0.4	-0.1	0.1
R6	69.1	63.2	69.2	63.4	72.1	66.6	72.5	66.8	55	50	Yes	Yes	0.1	0.2	0.4	0.2
R7	61.9	56.2	62.5	56.7	64.9	59.3	66.2	60.5	55	50	Yes	Yes	0.6	0.5	1.3	1.2
R8	59.8	54.2	61.0	55.1	62.9	57.3	65.1	59.5	55	50	Yes	Yes	1.2	0.9	2.2	2.2
R9	53.9	48.3	58.6	52.2	56.9	51.2	64.0	58.3	55	50	Yes	Yes	4.7	3.9	7.1	7.1
R10	55.3	49.6	57.8	51.7	58.4	52.7	63.1	57.4	55	50	Yes	Yes	2.5	2.1	4.7	4.7
R11	52.8	47.2	56.7	50.4	55.9	50.2	62.6	56.9	55	50	Yes	Yes	3.9	3.2	6.7	6.7
R24	53.4	47.7	57.4	50.4	54.4	48.7	63.1	57.4	55	50	Yes	Yes	4.0	2.7	8.7	8.7
R25	53.9	48.2	57.9	51.4	55.0	49.3	63.5	57.9	55	50	Yes	Yes	4.0	3.2	8.5	8.6
R26	53.8	48.2	56.6	50.7	55.1	49.4	61.0	55.3	55	50	Yes	Yes	2.8	2.5	5.9	5.9
R29	51.6	46.0	52.5	46.8	53.0	47.4	55.4	49.7	55	50	Yes	Yes	0.9	0.8	2.4	2.3
R32	61.6	55.9	62.4	56.5	62.6	56.9	64.8	59.2	55	50	Yes	Yes	0.8	0.6	2.2	2.3
R34	62.0	56.3	63.2	57.1	62.9	57.2	66.1	60.5	55	50	Yes	Yes	1.2	0.8	3.2	3.3
R35	61.9	56.3	63.3	57.2	62.9	57.2	66.3	60.7	55	50	Yes	Yes	1.4	0.9	3.4	3.5
R36	62.0	56.4	63.4	57.3	63.0	57.3	66.4	60.8	55	50	Yes	Yes	1.4	0.9	3.4	3.5

Receiver	Opening noise (dBA)				10 years after opening (dBA)				Criteria (dBA)		Criteria exceeded		Opening Change in noise (dBA)		10 years after opening Change in noise (dBA)	
	No build		Build		No build		Build						Opening	Design	Opening	Design
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
R37	62.2	56.6	63.8	57.6	63.2	57.5	67.0	61.3	55	50	Yes	Yes	1.6	1.0	3.8	3.8
R38	62.2	56.6	63.7	57.6	63.2	57.5	66.8	61.2	55	50	Yes	Yes	1.5	1.0	3.6	3.7
R39	62.2	56.7	63.7	57.6	63.3	57.6	66.7	61.0	55	50	Yes	Yes	1.5	0.9	3.4	3.4
R40	61.0	55.6	62.8	56.7	62.3	56.6	66.0	60.3	55	50	Yes	Yes	1.8	1.1	3.7	3.7
R41	60.6	55.3	62.8	56.6	61.9	56.2	66.3	60.7	55	50	Yes	Yes	2.2	1.3	4.4	4.5
R42	60.2	54.9	63.4	56.8	61.5	55.8	67.4	61.8	55	50	Yes	Yes	3.2	1.9	5.9	6.0
R43	59.6	54.2	61.8	55.4	60.9	55.1	65.2	59.6	55	50	Yes	Yes	2.2	1.2	4.3	4.5
R44	58.8	53.5	59.9	54.0	60.1	54.4	62.1	56.5	55	50	Yes	Yes	1.1	0.5	2.0	2.1

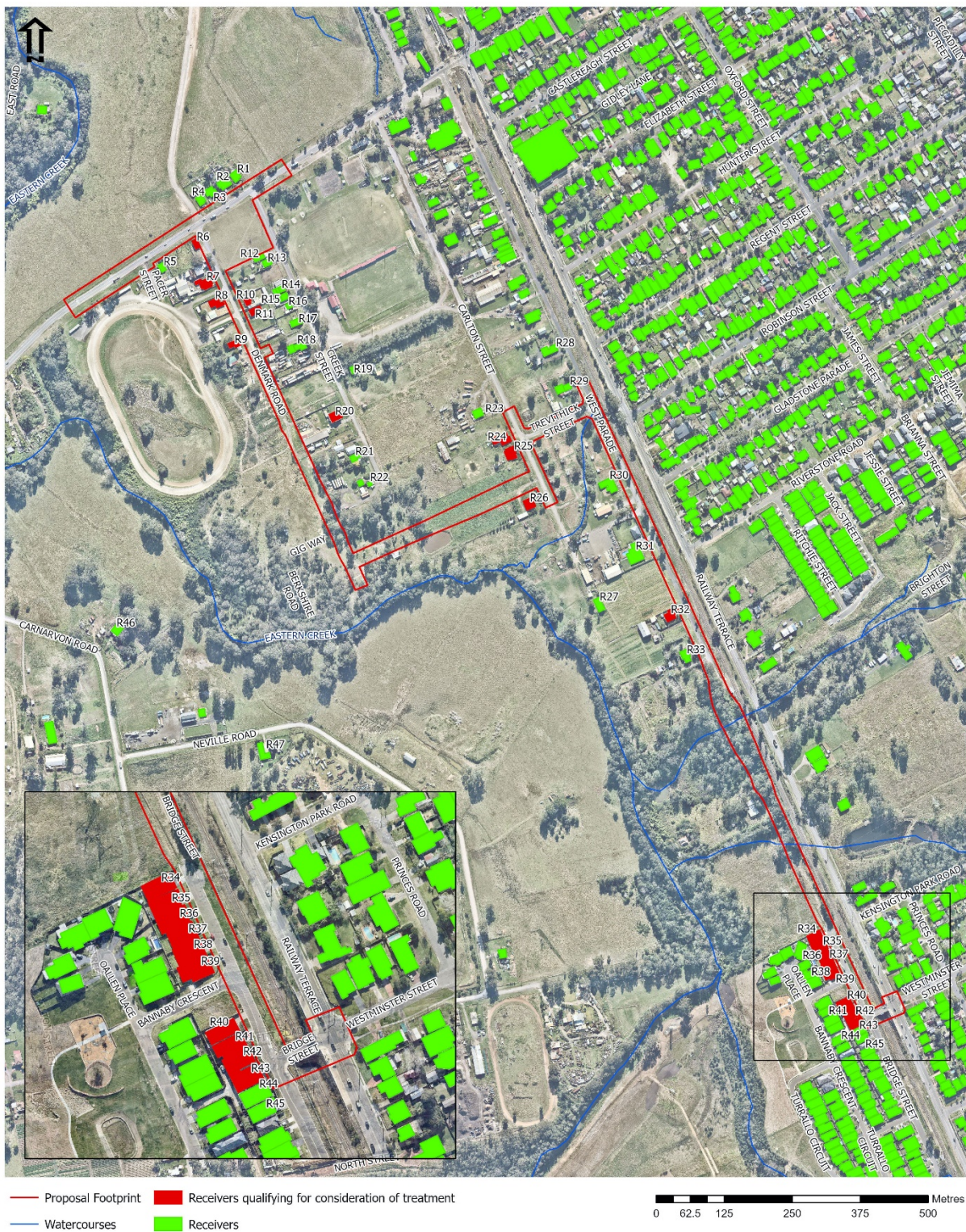


Figure 6-6: Receivers to be considered for noise mitigation

Sleep disturbance

Noise from trucks that exceeds the $L_{Aeq(1hr)}$ noise level by at least 15 dBA and which 65 dBA L_{Amax} could lead to sleep disturbance impacts.

The proposal would increase the number of vehicles passing existing receivers along the proposed alignment, which is anticipated to result in an increase in the number of maximum noise level events (L_{Amax}). Up to 26 receivers on Denmark Road (R6 to R9, R11), Carlton Street (R24 to R26), West Parade (R29 to R33) and Bridge Street (R34 to R45) would likely experience L_{Amax} noise levels above 65dBA L_{Amax} when a truck (less than five tonne) passes. However, the frequency of truck movements at night is expected to be relatively low and therefore the potential to cause sleep disturbance at night is also likely to be low.

6.2.5 Safeguards and management measures

Table 6-16: Noise and vibration environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP.</p> <p>The NVMP will generally follow the approach in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) and the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016) and identify:</p> <ul style="list-style-type: none">• Key potential noise and vibration generating activities associated with the activity• Feasible and reasonable mitigation measures to be implemented• A monitoring program to assess performance against relevant noise and vibration criteria• A review process scheduling and assessing out-of-hours activities including consideration of alternatives to out-of-hours work, plant selection, work locations and screening to minimise impacts• A working schedule which records respite periods for extended out-of-hours works• Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures	Contractor	Pre-construction	Section 4.6 of QA G36 Environment Protection

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 			
Construction vibration	<p>Where vibration intensive plant such as vibratory rollers are used, vibration must be managed to minimise disturbance to building occupants and to avoid damage to buildings and other structures (including heritage fabric). This includes adhering to the recommended minimum working distances for vibration intensive plant identified in Section 7.1 of the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016).</p> <p>If recommended minimum working distances cannot be met by selecting smaller plant, vibration monitoring will occur to quantify and help manage vibration. If necessary, trial vibration measurements will be conducted to further assess any possible impacts and buffer distances that may be required.</p>	Contractor	Construction	Additional measure
Construction noise and vibration	<p>All sensitive receivers likely to be affected will be notified at least five working days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of:</p> <ul style="list-style-type: none"> The proposal The construction period and construction hours Contact information for project management staff Complaint and incident reporting How to obtain further information. 	Contractor	Pre-construction	Standard measure
Operational road traffic noise	Property treatments for residually affected receivers will be considered where feasible and reasonable.	Transport for NSW	Detailed design	Additional measure

6.3 Non-Aboriginal heritage

A Statement of Heritage Impact for the proposal was carried out by Artefact. The main findings of that assessment are summarised below while the full report is included in Appendix G.

6.3.1 Methodology

The methodology used for the Statement of Heritage Impact is in accordance with the principles and definitions as set out in the guideline The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (Burra Charter) (Australia ICOMOS, 2013).

If an item meets one of the seven heritage criteria (Table 6-17), and retains the integrity of its key attributes, it can be considered to have heritage significance.

Table 6-17: NSW Heritage Assessment Criteria

Criteria	Description
A – Historical Significance	An item is important in the course or pattern of the local area's cultural or natural history.
B – Associative Significance	An item has strong or special associations with the life or works of a person, or group of persons, of importance in the local area's cultural or natural history.
C – Aesthetic or Technical Significance	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in the local area.
D – Social Significance	An item has strong or special association with a particular community or cultural group in the local area for social, cultural or spiritual reasons.
E – Research Potential	An item has potential to yield information that will contribute to an understanding of the local area's cultural or natural history.
F – Rarity	An item possesses uncommon, rare or endangered aspects of the local area's cultural or natural history.
G – Representativeness	An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places of cultural or natural environments (or the cultural or natural history of the local area).

The significance of an item or potential archaeological site can then be assessed as being of local or State significance. The following definitions have been provided by the NSW Heritage Office:

- 'State heritage significance' – in relation to a place, building, work, relic, moveable object or precinct, means significance to the State in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.
- 'Local heritage significance' – in relation to a place, building, work, relic, moveable object or precinct, means significance to an area in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.

Impact on heritage items are assessed in relation to both direct physical impacts and indirect visual impacts.

Historical archaeological potential is defined as the potential of a study area/proposal site to contain historical archaeological relics, as classified under the *Heritage Act 1977*.

'Archaeological potential' refers to the likelihood that an area contains physical remains associated with an earlier phase of occupation, activity or development. The physical remains within an area may vary in terms of intactness and/or survival integrity, for example due to (un)favourable environmental conditions or disturbance from subsequent development. The following grading of archaeological potential has guided the assessment.

Table 6-18: Grades of archaeological potential

Grades	Description
High	Archaeological resource is known to exist and/or has strong potential for intactness/survival
Moderate	Reasonable potential for archaeological resource intactness/survival
Low	Limited potential for archaeological resource intactness/survival
Nil	No archaeological resource is anticipated

6.3.2 Existing environment

Listed heritage items within the proposal site

There is one listed heritage item within and immediately adjacent to the proposal footprint (refer to Figure 6-7). Hebe Farm listed by the Growth Centres SEPP and has been assessed as having local significance for a range of heritage values. The significance assessment for Hebe Farm is provided in Table 6-19.

Table 6-19: Significance assessment of Hebe Farm

Criteria	Description
A – Historical Significance	<p>Hebe Farm Cottage has historical significance to the Schofields area as one of the older farm cottages, dating from the early Victorian era. The cottage also has significance as the home of the one family for an extended period of at least 80 years.</p> <p>Hebe Farm has significance at a local level under this criterion.</p>
B – Associative Significance	<p>Hebe Farm Cottage is associated with Robert Dawson who was involved in the earliest steel making in the Colony. This is represented in the steel work within the building.</p> <p>Hebe Farm has significance at a local level under this criterion.</p>
C – Aesthetic or Technical Significance	<p>Hebe Farm Cottage demonstrates a high quality of detail, for a farm cottage reflecting the early Victorian aesthetic sensibilities and skills of the owners who were blacksmiths and foundry workers. This is reflected in the ironwork and filigree to the verandas as well as the fireplaces. Interiors and Exteriors are significant in reflecting the early Victorian brick cottages styling.</p> <p>Hebe Farm has significance at a local level under this criterion</p>
D – Social Significance	<p>Hebe Farm does not have a strong or special association with a particular community or cultural group.</p> <p>Hebe Farm does not meet the threshold of significance under this criterion.</p>

Criteria	Description
E – Research Potential	<p>The farm grounds of Hebe Farm. Due to occupation and use from 1814 as part of a pastoral grant and then more intensely from 1872 as a farm homestead and small family farm, has the potential to reveal archaeological and garden remains from the early Victorian era onwards.</p> <p>Hebe Farm has significance at a local level under this criterion.</p>
F – Rarity	<p>Hebe Farm does not possess uncommon or rare aspects of the local area's or NSW's cultural history.</p> <p>Hebe Farm does not meet the threshold of significance under this criterion.</p>
G – Representativeness	<p>Hebe Farm is representative of the second wave of early Victorian development in the Riverstone Area when the larger land grants were subdivided and developed into smaller farmlets.</p> <p>Hebe Farm has significance at a local level under this criterion.</p>



Figure 6-7: Heritage items – proposal site

Unlisted item of potential heritage significance

A brick culvert of later 19th century/early 20th century exists at the base of the embankment within the rail corridor, adjacent to Hebe Farm (refer to Figure 6-7). The culvert has an arched barrel-vault design style with headers at the façade and has potential local heritage significance.

The four dwellings on the northern side of Garfield Road West between Denmark Road and Creek Street may also have heritage significance. These dwellings would not be directly impacted by the proposal while any indirect impacts would be minor.

Archaeology

The Statement of Heritage Impact identifies three phases of historical land use that assist consideration of archaeological potential of the proposal footprint. Table 6-20 describes these phases.

Table 6-20: Historical land use within the study area

Phase and dates	Land use activity
Phase 1: Riverstone Estate (1788-1859)	Land granted to Mary Putland and Maurice O'Connell. No evidence of land clearance or associated activity throughout much of the study area during this phase.
Phase 2: Subdivisions (1859-c.1910)	<p>Study area subdivided by Andrew McCulloch. Northern portions subdivided and roads (including Denmark Road) established in c. 1881.</p> <p>Robert Dawson purchased land that overlaps with the southern portion of the study area and built Hebe Farm; including the cottage, likely outbuildings, and agricultural use.</p>
Phase 3: Suburbanisation (c.1910-present)	<p>Subdivisions and land sold, cadastral boundaries established, and 20th century housing developed, some dating to the Inter-War and Post-War periods. Several buildings throughout study area demolished and others built during this phase. Sheds and other structures built and demolished in individual yards.</p> <p>Modern development within Hebe Farm (i.e. sheds, fences).</p>

6.3.3 Potential impacts

Northern part of proposal footprint

The archaeological and heritage values of the northern part of the proposal footprint are not considered to meet the threshold of local or State significance, and therefore the impacts are considered overall as negligible.

Hebe Farm

Direct impacts on heritage fabric

The following direct physical impacts to Hebe Farm have been identified:

- Reduction in the existing heritage curtilage of Hebe Farm. The impact of this would be the reduction of undeveloped land around Hebe Cottage, the removal of all extant structures, features, archaeology and vegetation within the development footprint
- Removal of all existing structures and features within the development footprint. This includes c. 1980s farm/livestock fencing and part of the tree lined avenue which dates to the 1990s
- Removal of all surviving archaeological resources at Hebe Farm within the proposal footprint.

The Hebe Farm curtilage is about 39,987 square metres. With an impact area from the proposal of about 3,286 square metres, it is calculated that about eight per cent of the Hebe Farm curtilage would be physically impacted.

The proposal is located within a road reserve and is therefore in keeping with the intended use of this portion of the Hebe Farm curtilage. However, the road reserve through Hebe Farm has not previously been formalised through construction of fences or a paved surface, and the proposal would therefore result in the first clear delineation of this corridor. Overall, it is assessed the works would result in minor to moderate physical impacts to Hebe Farm through modification of the curtilage and formalisation of the road corridor.

The reduction of curtilage through construction of the road link would not result in direct impacts on the Cottage and the primary significance values of the listing. Therefore, the proposal is not likely to result in an overall reduction in significance for the Hebe Farm item.

The proposed works are unlikely to directly impact the brick culvert situated beneath the railway line at Hebe Farm.

Indirect impacts

The proposed work would not impact the current visual setting of Hebe Farm as the view of Hebe Cottage is shielded on all sides by overgrown vegetation and is set adjacent to Eastern Creek and about 120 metres from the proposal footprint. Only sections of the Cottage roof or chimney are visible from limited areas within the proposal footprint. However, the vista would change and likely upgrade in significance if the clearing and removal of long grasses, shrubs and tall trees around and leading up to the cottage was undertaken. In this case, although the road would not obscure views to/from Hebe Cottage, eastern views from the Cottage would take in the proposed new road and this would be at odds with the historic landscape and vista of the property. The proposed road would also result in a reduction to the heritage curtilage and therefore the size of undeveloped land around the Cottage.

Overall, from a heritage perspective, it is assessed that the works would result in minor to moderate visual (indirect) impacts to Hebe Farm.

Archaeology

The potential for historical archaeological resources to survive across the study area is assessed as ranging from nil to moderate as summarised in Table 6-21.

Table 6-21: Archaeological potential within the study area by land use

Phase	Section of proposal footprint	Potential archaeological remains	Potential
Phase 1 Riverstone Estate (1788-1859)	All	Land clearing activity (i.e. tree boles etc.); demarcation activity (i.e. fencing etc.)	Nil
Phase 2 Subdivisions (1859-c.1910)	North	Land clearing activity (i.e. tree boles etc.); demarcation activity (i.e. fencing etc.); route/access activity (i.e. road levelling surfaces etc.)	Nil to low
Phase 2 Subdivisions (1859-c.1910)	South (Hebe Farm)	Agriculture/cultivation activities (i.e. irrigation, drainage); railway-related features (i.e. culvert drainage channel etc.); occupation/domestic activities (i.e. artefact-yielding deposits, privies etc.)	Low to moderate

Phase	Section of proposal footprint	Potential archaeological remains	Potential
Phase 3 Suburbanisation (c.1910-present)	North	Occupational or domestic activities (i.e. yard features, access ways and demarcation etc.)	Nil to low
Phase 3 Suburbanisation (c.1910-present)	South (Hebe Farm)	Agriculture/cultivation activities (i.e. irrigation, drainage, pens, outbuildings etc.); route/access activity (i.e. path-/track-way surfaces etc.)	Low

6.3.4 Heritage Act 1977, Section 139 exemption notification

For works within the curtilage of the locally listed 'Hebe Farm' it is proposed that an Exception 1B application be lodged under section 139(4) of the Heritage Act. This exception category relates to excavation or disturbance of land that will have a minor impact on archaeological relics including the testing of land to verify the existence of relics without destroying or removing them.

6.3.5 Safeguards and management measures

Table 6-22: Non-Aboriginal heritage environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non-Aboriginal heritage	<p>A Non-Aboriginal Heritage Management Plan will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to non-Aboriginal heritage and will include:</p> <ul style="list-style-type: none"> • Site inductions which cover significant heritage fabric and protection requirements • Specific protection measures including fencing and maintenance of buffer areas • Tailored construction methods for works near significant heritage fabric (such as use of hand tools only). 	Contactors	Detailed design Pre-construction	QA G36 Environment Protection
Non-Aboriginal heritage	The later 19th century brick culvert and the open cut drainage channel under the railway line on the eastern boundary of the proposal footprint at Hebe Farm will be protected during construction.	Contactors	Construction	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non-Aboriginal heritage	An archaeological testing program will be submitted as an Exception 1B under section 139(4) of the <i>Heritage Act 1977</i> . Test trenches will target zones of archaeological potential within the development footprint at Hebe Farm, notably the area bordering the brick culvert and drainage channel, which runs into the property. Archival recording of any 'works' uncovered will also be undertaken as part of the testing program.	Transport for NSW	Detailed design	Additional measure
Non-Aboriginal heritage	A Photographic Archival Recording will be prepared for the portion of Hebe Farm within the project footprint prior to impact.	Transport for NSW	Detailed design	Additional measure
Non-Aboriginal heritage	The Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime Services, 2015) will be followed in the event 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.	Contactor	Construction	Section 4.10 of QA G36 Environment Protection

Other safeguards and management measures that would address non-Aboriginal heritage impacts are identified in Section 6.2.5 (noise and vibration).

6.4 Aboriginal cultural heritage

An Aboriginal Cultural Heritage Assessment for the proposal was carried out by Kelleher Nightingale Consulting and included the involvement of registered Aboriginal parties. The main findings of that assessment are summarised below while the full report is included in Appendix E.

6.4.1 Methodology

The Cultural Heritage Assessment Report has been prepared in accordance with the Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (Office of Environment and Heritage, 2011) and the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime Services, 2011).

The Cultural Heritage Assessment Report builds on the results of previous investigations and consultation with registered Aboriginal parties. This includes an archaeological test excavation program carried out by Kelleher Nightingale Consulting and registered Aboriginal stakeholder representatives in December 2017, in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (Office of Environment and Heritage, 2010).

6.4.2 Existing environment

Landscape context

Bordering Eastern Creek, a large part of the proposal footprint is within the fluvial South Creek soil landscape. South Creek soils are characterised by deep to very deep layered alluvial sediments of sands, silts and clays over older relict soils or bedrock. Being on an active floodplain, this soil landscape is dynamic with multiple and frequent episodes of both erosion and deposition. Areas near permanent water sources such as Eastern Creek are often likely to contain high-density Aboriginal archaeological sites indicative of more frequent or more intensive Aboriginal landscape use as the area would have provided a relatively stable environment throughout the year for resource gathering. The context and stratigraphic integrity of archaeological evidence of this landscape use (i.e. Aboriginal objects) is variably affected by disturbance from flood episodes. Aboriginal sites within low lying areas adjacent to Eastern Creek are likely to be highly disturbed low-density scatters exposed by erosion and/or redeposited by flooding events while Aboriginal sites within landforms elevated above the extent of most flooding events are likely to retain more intact archaeological deposits.

Road and rail corridors have modified the landscape by creating cuttings and artificial embankments in addition to modifying the course of several waterways. Below ground utilities have also been constructed and where trenching has taken place this has modified the landscape and disturbed subsurface deposits. The properties within the study area are mainly cleared of native vegetation. Low density residential and agricultural structures are also present in the study area. The associated construction activities are likely to have modified the landscape and disturbed subsurface deposits.

Ethnohistoric context

No direct ethnographic recordings relate to the specific study area; however, it is clear that the variety of resources available in and around the Riverstone area would have made it attractive and it is known that past Aboriginal people and families occupied the area. The value of the Riverstone area and surrounds to both the past and the present Aboriginal community is also underscored by the ongoing cultural connection expressed by the contemporary Aboriginal community.

Archaeological context

Aboriginal archaeological assessment identified two Aboriginal archaeological sites located within the study area (named Denmark Road AFT 1 and Bridge Street AFT 1). Both sites comprised open context artefact sites located on marginally elevated landforms adjacent to Eastern Creek. Refinement of the proposal footprint has enabled the avoidance of any impact to Bridge Street AFT 1. Denmark Road AFT 1 is partially located within the proposal footprint.

The archaeological test excavation program carried out in December 2017 identified artefacts comprising mainly unmodified silcrete debitage (waste material from making of implements) but also a range of other raw materials and artefact types, including cores, a hammerstone, backed artefacts and utilised/retouched flakes and flake tools.

Significance assessment determined that the site displays moderate-high archaeological significance, based on intactness, representativeness and research potential of the site within the landscape along Eastern Creek. Previous assessments have determined that similar landforms along Eastern Creek contain significant archaeological deposits where disturbance levels are low.

6.4.3 Potential impacts

The entirety of the proposal footprint would be impacted by construction and associated works. In total, one Aboriginal archaeological site (Denmark Road AFT 1) is partially located within the proposal footprint and would be partially impacted by the proposal.

The significance of harm to the portion of the site within the proposal footprint is considered moderate, given the site's overall moderate-high archaeological significance. Remaining areas to the north and west would not be impacted and it is noted that artefact densities within this site were highest to the west of the proposal footprint closer to Eastern Creek.

Table 6-23: Impacted Aboriginal sites

Name	AHIMS ID	Description	Significance	Type of harm	Consequence of harm
Denmark Road AFT 1	45-5-5011	Surface artefact scatter and moderate to high density archaeological deposit located on terrace flat adjacent to Eastern Creek	Moderate-high	Direct / Partial	Partial loss of value

6.4.4 Safeguards and management measures

Table 6-24: Aboriginal cultural heritage environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal cultural heritage	An application for an Aboriginal Heritage Impact Permit (AHIP) will be made under section 90A of the <i>National Parks and Wildlife Act 1974</i> for the land and associated objects within the boundaries of the study area.	Transport for NSW	Detailed design	Additional measure
Aboriginal cultural heritage	The non-impacted portion of site Denmark Road AFT 1 (outside of construction and AHIP boundary) will be identified in the Construction Environmental Management Plan (CEMP) prior to construction activities to ensure this part of the site is avoided and not impacted by the proposal. The site area should be marked as an environmentally sensitive "no-go zone".	Contractor	Construction	Additional measure
Aboriginal cultural heritage	Workers will be inducted as to appropriate Aboriginal heritage protection measures.	Contractor	Construction	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal cultural heritage	The Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime Services, 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 Transport for NSW does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	Section 4.9 of QA G36 Environment Protection
Aboriginal cultural heritage	Archaeological salvage excavation will be required for the impacted portion of site Denmark Road AFT 1 (partial impact on site of moderate significance). Salvage excavation must be completed prior to any activities which may harm Aboriginal objects at this site location, including all construction and pre-construction works. Salvage excavation activities would be undertaken in accordance with the methodology provided in the Cultural Heritage Assessment Report.	Transport for NSW	Pre-construction	Additional measure

6.5 Biodiversity

A Biodiversity Assessment for the proposal was carried out by Lesryk Environmental. The main findings of that assessment are summarised below while the full report is included in Appendix H.

6.5.1 Methodology

Desktop assessment

Prior to carrying out any fieldwork, previous studies conducted in the region and relevant databases were consulted to identify the diversity of ecological communities, flora and fauna species known for, or potentially occurring in, the study region (10 kilometre radius around the proposal site). The results informed the identification of appropriate field surveys. The following databases and information sources were consulted:

- Department of Agriculture, Water and Environment Protected Matters Search Tool – accessed on 18 June 2020 using a 10-kilometre buffer
- Department of Primary Industries WeedWise database – accessed June 2020 (Greater Sydney)
- Bionet Atlas of NSW Wildlife – accessed June 2020 with a 10-kilometre buffer

- Areas of Outstanding Biodiversity Value register (formerly Critical Habitat Register – accessed July 2020)
- Department of Agriculture, Water and Environment Register of Critical Habitat – accessed July 2020.

The conservation significance of those ecological communities, plants and animals recorded was made with reference to:

- Rare or Threatened Australian Plants (RoTAP) list
- EPBC Act, BC Act and/or Fisheries Management Act
- Remnant Vegetation of the western Cumberland subregion, 2013 Update
- BioNet Vegetation Classification database.

Field survey

Field investigations were carried out on 28 July 2020 and 21 September 2020. The purpose of the field survey was to identify those vegetation communities, fauna habitats, plants and animals present within, and near, the proposal footprint that are of State and/or national conservation significance.

While conducting the habitat assessments, efforts were made to identify features such as known vegetation associations, geological features, feed trees, mature trees with hollows, connectivity of fauna corridors, aquatic environments and other habitat features important to the lifecycle requirements of those threatened plants and animals previously recorded in the study region.

The survey methods employed during the field investigations were:

- Identification of vascular plants, including any areas affected by direct and indirect impacts
- Identification of the structure of those vegetation communities and fauna habitats present at the site
- Direct observation of those fauna species present within, next to, or in close proximity to the subject site
- Diurnal call identifications of fauna species, with all calls being identified in the field
- Identification of any indirect evidence such as tracks, scats, scratchings and diggings that would suggest the presence of a particular fauna species
- Leaf litter and ground debris searches for sheltering reptiles and amphibians, and the NSW listed Cumberland Plain Land Snail (*Meridolum corneovirens*)
- A 0.1 hectare Biodiversity Assessment Method survey plot in the part of the proposal footprint between Denmark Road and Carlton Street.

As parts of the proposal would be carried out within and/or near three drainage lines, an aquatic study was broadly performed in accordance with Aquatic Ecology in Environmental Impact Assessment (Lincoln-Smith, 2003).

The investigation involved traversing those accessible portions of each drainage line present, with notes taken on the; habitats observed within the sections being 'disturbed', the structure of their banks, the riparian communities, their course, and the presence of any snags or other features important to the lifecycle requirements of those aquatic species present, or considered likely to occur.

6.5.2 Existing environment

The proposal footprint includes remnant bushland, existing roads and rural residential land uses. Vegetation within the proposal footprint includes slashed exotic grassland with orchard trees and isolated Eucalypts to the west of Carlton Street and woodland at the southern end of the proposed link between Denmark Road and Carlton Street. Between West Parade and Bridge Street, there is woodland that supports Eucalypts 10-20 metres high with understorey comprising a medium to high density of exotics and groundcover consisting of a high density of weeds and vines. At the northern end of Bridge Street, grassland is present along with planted Casuarinas near the rail line.

One permanent waterbody, Eastern Creek, is located south and west of the proposal site. At its nearest point the creek is about five metres wide, with earthen banks lined by Casuarinas and Eucalypts. The understorey is comprised of weeds while the groundcover is either earth or a medium density of weeds. Leaf litter and ground debris is common, with some large woody debris present within the creek. The surrounding area is grazed by horses.

Three of tributaries of Eastern Creek are near the proposal footprint on West Parade. These watercourses contain no aquatic vegetation or instream woody debris.

Plant community types

Plant community types identified within the proposal footprint are identified in Table 6-25.

Table 6-25: Plant community types

PCT ID	Name	Comment	Conservation status	Area within proposal footprint
835	Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin (Cumberland riverflat forest).	Occurs either side of the tributary of Eastern Creek that traverses the West Parade road corridor in the south-east of the study area. The vegetation condition is poor with the small tree, shrub and groundcover strata dominated by weeds.	River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (BC Act Endangered)	0.5 hectares
849	Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Occurs in the unformed section of Denmark Road, the adjacent land and upslope of the tributary of Eastern Creek that traverses the West Parade road corridor in the south-east.	Cumberland Plain Woodland in the Sydney Basin Bioregion (BC Act Critically Endangered)	0.25 hectares
N/A	Exotic grassland / disturbed environment	Slashed road verges, unnamed sections of road and previously cleared farmland	Not applicable	Remainder of proposal footprint

The mapped extent of Plant Community Type (PCT) 835 and PCT 849 is shown by Figure 6-8. During field surveys it was identified that PCT 849 is not as extensive as depicted by the vegetation mapping, with areas near the Eastern Creek tributary instead being PCT 835.

The canopy species in PCT 835 were identified as Forest Red Gum (*Eucalyptus tereticornis*) and Cabbage Gum (*E. amplifolia*) while introduced species were identified at the small tree, shrub and groundcover levels.

The canopy species in PCT 849 were identified as Forest Red Gum (*Eucalyptus tereticornis*) and Grey Box (*E. moluccana*). Blackthorn (*Bursaria spinosa*) was identified at the shrub level with largely introduced species forming the groundcover.

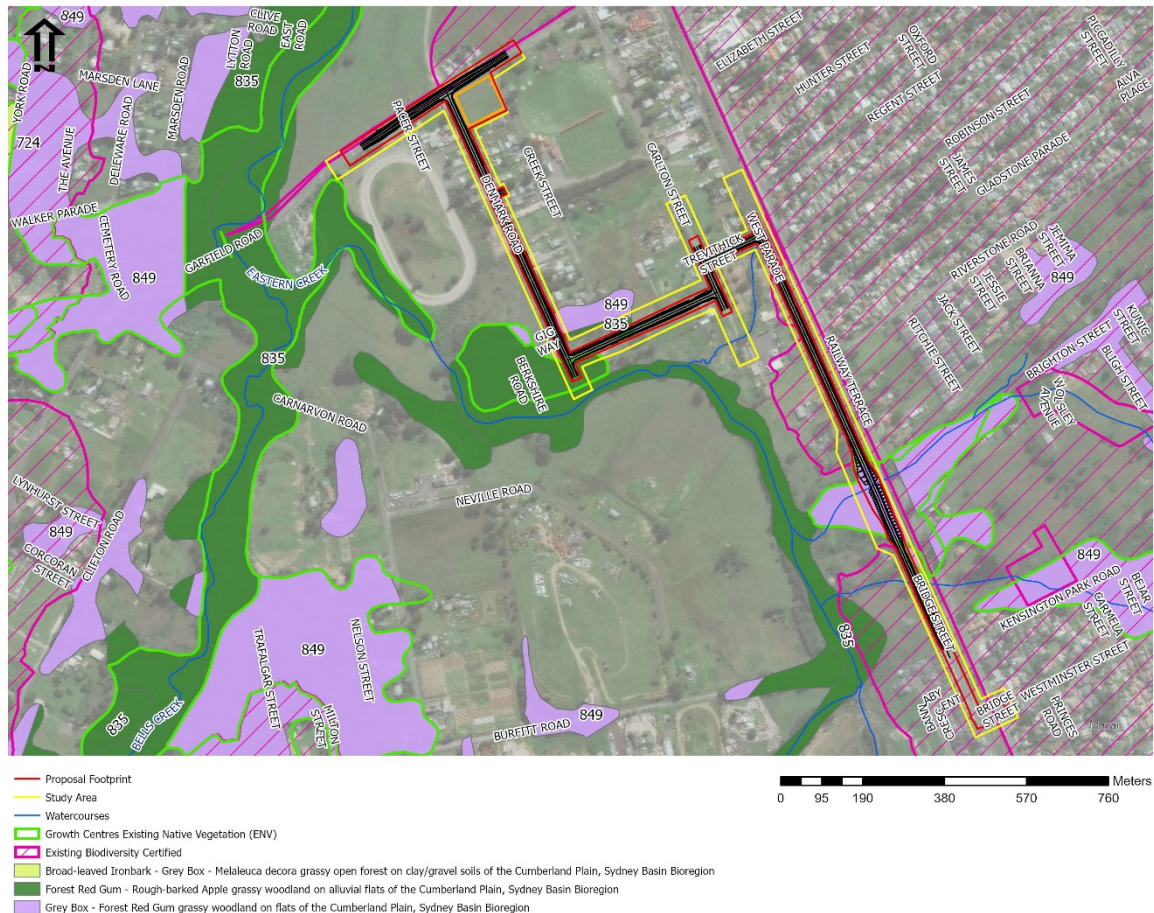


Figure 6-8: Plant community types near the proposal footprint

Source: Remnant Vegetation of the western Cumberland subregion, 2013 Update

Threatened ecological communities

With reference to the BioNet Vegetation Classification system:

- PCT 835 is a component of River-flat Eucalypt Forest (RFEF) on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, listed as an Endangered Ecological Community under the BC Act
- PCT 849 is a component of the BC Act listed Critically Endangered Cumberland Plain Woodland.

Occurrences of PCT 849 in the study area do not meet the condition threshold to be considered components of the EPBC Act listed Critically Endangered Cumberland Plain Shale Woodlands and Shale/Gravel Transition Forest.

Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Terrestrial GDEs ecosystems rely on the subsurface presence of groundwater, while aquatic GDEs rely on the

surface expression of groundwater (this includes surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs).

With reference to the Bureau of Meteorology Groundwater Dependant Ecosystems Atlas, it is noted that no aquatic GDEs occur within the proposal site. High potential Terrestrial GDEs occur within the proposal site these being:

- Cumberland River Flat Forest (located at the southern end of Denmark Road)
- Cumberland Shale Plains Woodland (located near the location of the proposed culvert at the southern end of West Parade).

Flora

Several native and exotic plants were recorded during the field surveys. Refer to the Biodiversity Assessment in Appendix H for a list of species.

Of those plants recorded, none are:

- Listed, or currently being considered for listing by the EPBC Act or BC Act
- Identified on the list of Rare or Threatened Australian Plants.

Fauna

By the completion of the field survey, one native mammal, 24 native birds, one reptile, two amphibians and two native snails (the identification of which was provided/confirmed by the Australian Museum) were recorded within, or near, the proposal footprint.

Two of the species recorded during the current investigation are listed as vulnerable under the Schedules to the BC Act, these being the:

- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)
- Cumberland Plain Land Snail (*Meridolum corneovirens*).

A small flock of Dusky Woodswallows were seen flying over the site between West Parade and Bridge Street. Several discarded Cumberland Plain Land Snail shells were collected within the area between Bridge Street and West Parade. These shells were collected from under a sheet of synthetic material (a plastic tarpaulin). Though targeted, no living Cumberland Plain Land Snails were recorded within this portion of the study area.

During surveys nine hollow-bearing trees that may be used by hollow-dependent species (i.e. microbats) known to occur in the surrounding region and which are of conservation significance, were observed; these primarily located along the proposed alignment between West Parade and Bridge Street.

The Grey-headed Flying-fox (*Pteropus poliocephalus*) (BC Act and EPBC Act Vulnerable) could periodically fly across the proposal site; however, this species would not be reliant upon those environments to be disturbed by the proposal for any of its lifecycle requirements and its likelihood of occurrence was assessed as low.

Migratory species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were identified as having a low likelihood of occurrence at the proposal site due to the lack of suitable habitat.

One introduced animal, the Rabbit, was recorded within the proposal site. Other pest species that may be present include the Feral Cat (*Felis catus*), Dog (*Canis lupus familiaris*) and European Red Fox (*Vulpes vulpes*).

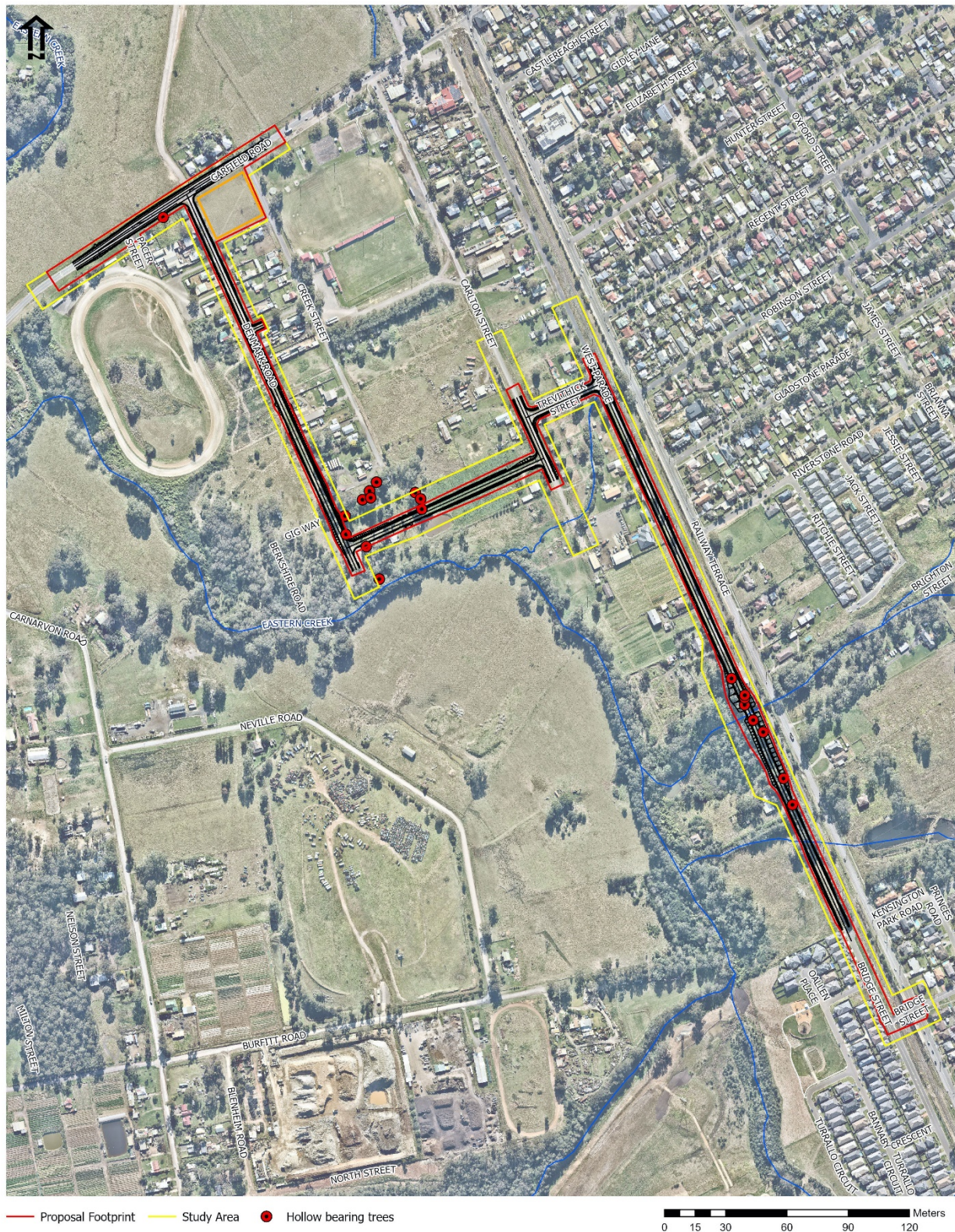


Figure 6-9: Hollow bearing trees within or near the proposal footprint

No fish were observed within any of the drainage lines surveyed. Similarly, no large bird nests indicative of the breeding behaviour of raptors were seen.

Areas of Outstanding Biodiversity Value

None of the Areas of Outstanding Biodiversity Value listed under Part 3 of the Biodiversity Conservation Regulation 2017 occur within, or near the proposal footprint. Similarly, reference

to the Critical Habitat register (Department of Agriculture, Water and the Environment) indicated no such area occurs in or near to the proposal footprint.

Wildlife connectivity corridors

The proposal site is not part of a significant vegetation corridor; the site being partially located within an existing road network and a highly fragmented landscape. Isolated stands of woodland and parcels of bushland within the surrounding area provide a fragmented link to conservation areas within the region (over 15 kilometres beyond the site).

When combined with the urbanised nature of the landscape (i.e. existing road and rail infrastructure), there are limited opportunities for the dispersal and movement needs of ground dwelling, arboreal or gliding mammals. The main area offering fauna connectivity within the proposal site is a vegetated corridor that exists along Eastern Creek and which then extends north and south of the proposal footprint.

Weeds

Of those introduced plant species recorded within the proposal footprint, the following are listed on Schedule 3 of the Biosecurity Regulation 2017:

- Blackberry (*Rubus fruticosus* agg. spp.) – also a priority weed for the Greater Sydney Region and a Weed of National Significance
- Bridal Creeper (*Asparagus asparagoides*) – also a priority weed for the Greater Sydney Region and a Weed of National Significance
- Green Cestrum (*Cestrum parqui*) – also a priority weed for the Greater Sydney Region
- Lantana (*Lantana camara*) – also a priority weed for the Greater Sydney Region and a Weed of National Significance.

6.5.3 Potential impacts

Construction

Removal of native vegetation

About one hectare of native vegetation composed of mature trees with a heavily weed-infested understorey would be removed (of which about 0.68 hectares is identified Existing Native Vegetation under the Growth Centres Biodiversity Certification Order). This would include about 0.5 hectares of River-flat Eucalypt Forest (BC Act Endangered) and about 0.25 hectares of Cumberland Plain Woodland (BC Act Critically Endangered).

Assessments of impact significance in accordance with the BC Act found that there would not be a significant impact on either of the affected threatened ecological communities.

Removal of threatened fauna habitat

A total of 21 hollow-bearing trees (hollow diameter up to 15 centimetres) were observed during the investigation; these potentially occupied by threatened microbats. It is expected that at least 11 of these trees would require removal. Adopting a precautionary approach, threatened microbats were assumed to be present and an assessment of significance under the BC Act was conducted. The assessment concluded that impacts on threatened microbats would not be significant noting the extent of suitable habitat outside the proposal footprint that would not be affected.

At the site where the Cumberland Plain Land Snail shells were identified a limited amount of woodland habitat would be cleared. This woodland is present along the eastern edge of a vegetated band, with no connectivity (for this species) to the east. Establishment of the proposed road would not fragment or isolate any habitat for the Cumberland Plain Land Snail, its primary impact being a slight reduction in the overall area available to this species. West of

the area to be impacted by the proposal are larger areas of woodland and habitat for this species.

The proposal would not remove any resources important to any of the threatened species with a likelihood of occurring at the site, nor is it expected to limit the diversity of any foraging, sheltering or breeding sites for these species. The proposal would not fragment or isolate any of these species' habitats, nor present any barriers to their breeding or movement requirements. None of the threatened species that could occur at the site would be solely reliant upon the resources present within, or close to, the proposal footprint such that the proposal would have a significant impact on the local or regional viability of these species, or their habitats.

Removal of threatened flora

No threatened plants were recorded or considered likely to occur within the area investigated; as such, the proposal is not expected to have an adverse impact on any threatened plant species.

Injury and mortality

The proposal would require the removal of numerous trees and would also affect groundcover and understorey vegetation that is dominated by introduced plant species.

There is the potential that animals sheltering in the trees to be removed could be injured during works. Though no living individuals were recorded, the clearing of vegetation also has the potential to cause injury and mortality to any Cumberland Plain Land Snail individuals that may be present at ground level.

General construction disturbance (including noise) could also cause animals to move and increase the risk of them being injured or killed by vehicles during construction

Beyond current levels of impact due to the existing presence of the road network and the volume of traffic that uses it, the construction of the proposal is not expected to substantially increase the risk of injury to or mortality of fauna.

Operation

Wildlife connectivity and habitat fragmentation

Given the proposal footprint is partially located within an existing road network and a highly fragmented landscape, there is currently only limited connectivity between isolated stands of woodland and those parcels of bushland and the vegetated corridor that exists along Eastern Creek that eventually link to conservation areas within the region.

The proposal is not considered to further fragment any habitat areas or erect any additional barriers to the movement and dispersal patterns of flying species (i.e. birds, bats), nor any gliding arboreal mammals, that may be currently negotiating the study area. Ground traversing species, including nocturnal mammals, if currently doing so, would remain able to negotiate the roadways.

Edge effects on adjacent native vegetation and habitat

Weeds are already prevalent throughout the proposal footprint and adjacent area. The proposal is not expected to exacerbate the current situation such that the integrity of the native vegetation communities in nearby areas would be compromised.

Injury and mortality

Beyond current levels of impact due to the existing presence of the road network and the volume of traffic that uses it, the construction of the proposal is not expected to substantially increase the risk of injury to or mortality of fauna.

Invasion and spread of weeds

With the implementation of appropriate safeguards, the proposal is not expected to result in the further spread of weeds at the site.

Invasion and spread of pests

Beyond existing levels, the proposal is unlikely to increase the presence of pest species within the study area.

Invasion and spread of pathogens and disease

There is a risk that the proposal would introduce, spread or exacerbate the plant diseases *Phytophthora cinnamomi* and Myrtle Rust (*Puccinia psidii*). These diseases are most likely introduced or spread through the importation or movement of soil, water and landscaping materials, either directly or through incidental attachment to machinery.

Changes to hydrology

The proposal would result in only minor changes to hydrology. While one permanent water body, Eastern Creek, is present south and west of the proposal footprint, and three of its tributaries occur close to the work proposed near, none of these would be significantly affected by the proposed work such that the hydrology and water quality of Eastern Creek would be affected.

Noise, light and vibration

During construction, activities associated with the proposal would cause additional noise and vibration; however, given the presence and proximity of the existing road network, it is not considered that the proposal would result in changes to existing levels of noise, vibration and light from the existing road network and surrounding environment such that there would be a significant impact to native fauna species.

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.

6.5.4 Safeguards and management measures

Table 6-26: Biodiversity environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity impacts	<p>A Flora and Fauna Management Plan will be prepared in accordance with Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (RTA, 2011) and will be implemented as part of the CEMP.</p> <p>The Flora and Fauna Management Plan 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	Contractor	Pre-construction	Section 4.8 of QA G36 Environment Protection

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<p>exclusion zones, protected habitat features and revegetation areas</p> <ul style="list-style-type: none"> • Pre-clearing survey requirements • Procedures for unexpected threatened species finds and fauna handling • Procedures in the event of injury to native fauna • Protocols to manage weeds and pathogens. 			
Biodiversity impacts	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal (including hollow bearing trees) will be investigated during detailed design and implemented where practicable and feasible.	Transport for NSW	Detailed design	Additional measure
Biodiversity impacts	<p>Pre-clearing survey will be conducted and will:</p> <ul style="list-style-type: none"> • Confirm clearing boundaries, exclusion zones, protected habitat features and revegetation areas prior to starting work • Identify, in toolbox talks, where biodiversity controls are located on the site. 	Contractor	Pre-construction	Additional measure
Spread of weeds	<p>Weed management will occur in accordance with Biodiversity Guidelines, Guide 6 (Roads and Maritime, 2016) and include:</p> <ul style="list-style-type: none"> • The Identification of weeds on site (confirmed during pre-clearing survey) • Weed management priorities and objectives Exclusion zones, protected habitat features and revegetation areas prior to starting work within or directly next to the site • The location of weed infested areas • Weed control methods • Measures to prevent the spread of weeds, including machinery hygiene procedures and disposal requirements 	Contractor	Pre-construction	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> A monitoring program to measure the success of weed management Communication with local Council noxious weed representative. 			
Spread of diseases affecting plants	Management measures will be implemented to control and/or prevent the introduction and/or spread of disease-causing agents such as bacteria and fungi in accordance with the Biodiversity Guidelines, Guide 7 (Roads and Maritime, 2016)	Contractor	Construction	Additional measure
Unexpected threatened species finds	If unexpected flora or fauna are discovered on site stop work immediately and implement the Roads and Maritime Unexpected Threatened Species Find Procedure in the Biodiversity Guidelines, Guide 1 (Roads and Maritime, 2016).	Contractor	Construction	Additional measure

6.5.5 Biodiversity offsets

With reference to Table 1, within Section 4.2 of the Guideline for Biodiversity Offsets (Roads and Maritime Services, 2016) it is noted that the proposal would not result in impacts to greater than one hectare of a threatened ecological community or habitat for threatened species which cannot withstand a loss.

However, under the Order to confer biodiversity certification on the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 there are additional offsetting requirements where clearing of defined 'existing native vegetation' is cleared in non-biocertified areas.

The proposal would require the clearing of 0.68 hectares of defined 'existing native vegetation'. Under Condition 11 of the Order:

Where there are essential infrastructure proposals... that involve clearing of existing native vegetation in the non-certified areas and that do not require development consent under the SEPP, such clearing must be offset by applying the same requirements specified in condition 8 above.

In this case the offsets may be located outside of the Growth Centres (but within the Cumberland Plain of Western Sydney, as defined in condition 32) if the GCC is satisfied that there are no practicable offset options within the Growth Centres and all other requirements of condition 8 will be met.

Under Condition 8 of the Order, the relevant offset requirements are:

- a. the protection of an equal or greater area of existing native vegetation elsewhere in the Growth Centres; and/or*
- b. the revegetation and/or restoration of an area of land elsewhere in the Growth Centres, subject to satisfying the following,*

- i. that the clearance of existing native vegetation in the non-certified areas will not affect the capacity to achieve overall improvement or maintenance of biodiversity values for threatened species, populations and ecological communities and their habitats,
- ii. the revegetated and/or restored areas will be protected,
- iii. the extent of revegetation and/or restoration compared to clearing of existing native vegetation must be undertaken at a ratio of at least 3:1 (to reflect the greater ecological risks relative to retaining existing native vegetation),
- iv. areas subject to revegetation and/or restoration must be of a suitable boundary configuration and design to support long-term management,
- v. revegetation and/or restoration of the proposed areas would not be undertaken under another scheme or regulatory requirement already in operation at the time that the clearing is approved (this includes but is not limited to any approvals, and associated conditions of such approvals, that may be required under the Rivers and Foreshores Improvement Act 1948 and Water Management Act 2000),
- vi. revegetation and/or restoration will be undertaken by suitably qualified and experienced persons using indigenous plant stock, and
- vii. sufficient resources will be made available to undertake the revegetation and/or restoration and any necessary follow-up maintenance and monitoring for a minimum period of 5 years following the commencement of the revegetation and/or restoration.

Transport for NSW will address the above offset requirements in consultation with the Department of Planning, Industry and Environment.

6.6 Landscape character and visual amenity

A Landscape Character and Visual Impact Assessment for the proposal was carried out by Ki Studio. The main findings of that assessment are summarised below while the full report is included in Appendix I.

6.6.1 Methodology

The methodology used for the visual impact assessment is consistent with the Environmental Impact Assessment Practice Note: Guidelines for Landscape Character and Visual Impact Assessment (Transport for NSW, 2020).

The guidelines establish an assessment process with reference to the sensitivity of an area and magnitude of the proposal in that area.

		MAGNITUDE			
		HIGH	MODERATE	LOW	NEGLIGIBLE
SENSITIVITY	HIGH	HIGH	HIGH - MODERATE	MODERATE	NEGLIGIBLE
	MODERATE	HIGH - MODERATE	MODERATE	MODERATE - LOW	NEGLIGIBLE
	LOW	MODERATE	MODERATE - LOW	LOW	NEGLIGIBLE
	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE

Figure 6-10: Landscape character and visual impact assessment matrix

Landscape character assessment

The landscape character assessment determines the impact of the proposal on the area's character and sense of place by:

- Identifying the site's landscape character zones

- Assessing how sensitive the landscape character zones are to the proposed changes and the capacity to absorb change
- Assessing the magnitude of change
- Providing an overall assessment based on the measures of sensitivity and magnitude, as shown in Figure 6-10.

Visual impact assessment

The visual impact assessment determines the impact of the proposal on key existing views by:

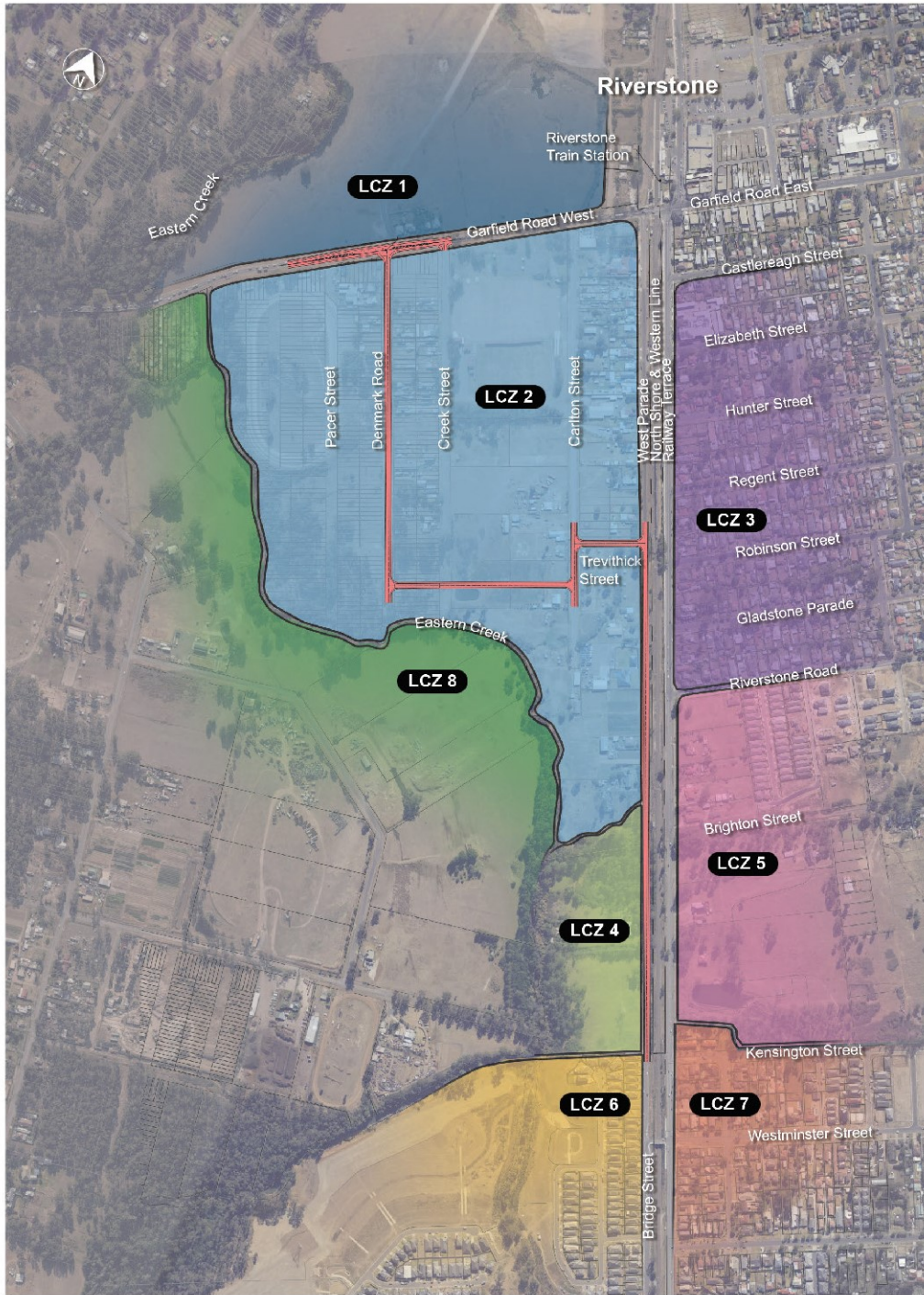
- Selecting the key views within the visual catchment
- Assessing how sensitive the views are considering the capacity to absorb change, type and number of viewers and length of exposure to that view
- Identifying changes to each view as a result of the proposal
- Assessing the magnitude of change
- Providing an overall assessment based on the measures of sensitivity and magnitude, as shown in Figure 6-10.

6.6.2 Existing environment

Landscape character zones

The following eight landscape character zones were identified as relevant to the proposal (refer to Figure 6-11). The sensitivity of each zone is discussed below:

- Landscape Character Zone 1 (Pasture lands) – The sensitivity of this area is high. Its open character with vistas to Eastern Creek defined by skyline trees contribute to the somewhat scenic quality of the area. The sensitivity rating is further underpinned by the residential pocket within this zone which would be sensitive to change
- Landscape Character Zone 2 (Semi rural) – The sensitivity of this area is considered high due to the residential land use and its somewhat scenic semi-rural character contributing to its sense of place
- Landscape Character Zone 3 (Riverstone residential) – The sensitivity of this area is considered high due to its residential land use
- Landscape Character Zone 4 (Hebe Farm) – The sensitivity of this area is considered high. The high rating is driven by the heritage values and the scenic qualities of the setting providing a strong sense of greenery
- Landscape Character Zone 5 (Semi rural large plots) – The sensitivity of this area is considered high due to its residential land use and scenic quality
- Landscape Character Zone 6 (Growth Centre residential) – The sensitivity of this area is considered high due to its residential land use being sensitive to change
- Landscape Character Zone 7 (Schofields residential) – The sensitivity of this area is considered high due to the dominant residential land use
- Landscape Character Zone 8 (Floodplain) – The sensitivity of this area is considered moderate. This is driven on the one hand by its land use and isolated character, whilst on the other its scenic qualities make it more susceptible to change.



Legend

Landscape Character Zone

LCZ 1 SRGC- Pasture Lands

LCZ 2 Semi-Rural

LCZ 3 Riverstone Residential

LCZ 4 Hebe Farm

LCZ 5 Semi-Rural Large Plots

LCZ 6 Growth Centre Residential

LCZ 7 Schofields Residential

LCZ 8 Floodplain

Project



Proposal







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Figure 6-11: Landscape character zones

Viewpoints and visual sensitivity

The visual impact assessment has been based on selecting representative viewpoints from the immediately surrounding visually exposed areas. A total of 10 viewpoints were selected from various locations as shown in Figure 6-12 and as described in Table 6-27.

Table 6-27: Description of assessed viewpoints

ID	Description	Image	Sensitivity
01	View looking east from the corner of Denmark Road and Garfield Road West.		Moderate; although the land use is sensitive, the setting fronts a busy road, thereby limiting its appeal to visually interface with the setting for prolonged viewing periods.
02	View looking southeast along Denmark Road. Note the informal verges of the streetscape.		Moderate; the setting has a limited visual appeal and the combination of commercial and residential use limits the visual sensitivity, allowing for a higher absorption capacity.
03	View looking south at the end of Denmark Road. In the distance the riparian corridor of Eastern Creek can be seen.		High; the scenic setting with vistas towards Eastern Creek, combined with the residential land use, makes this viewpoint more sensitive. Hence the high rating.
04	View looking south along Carlton Street, north of Trevithick Street. Residences flank Carlton Street.		Low; the setting has a limited scenic quality albeit its semi-rural character. This, in combination with the transient nature of the viewpoint, limits the sensitivity rating.

ID	Description	Image	Sensitivity
05	View looking east along Trevithick Street. In the foreground is Carlton Street.		Moderate; the setting has a limited scenic quality albeit its semi-rural character. This, in combination with the limited interface of the residence with the streetscape makes the viewpoint less sensitive compared to viewpoint 03.
06	View looking west from Carlton Street along the proposed new alignment.		High; the semi-rural character and the somewhat secluded location makes this viewpoint more sensitive. This, underpinned by the scenic green character, reinforces the high rating.
07	View along West Parade in the vicinity of Riverstone Road, looking north.		Moderate; the residences focus would likely be away from the street and railway corridor, thereby limiting these viewing periods. Hence a moderate sensitivity rating.
08	View looking at the bushland setting from the end of West Parade.		The visual quality of the setting is considered high and the historic value of the property contributes to a high sensitivity rating, even if the viewpoint is of a transient nature with few viewers.

ID	Description	Image	Sensitivity
09	View from the cul-de-sac at Bridge Street looking north towards the Hebe Farm.		Low; limited number of viewers on a primary production landscape. Viewing periods may be of a moderate duration, hence the low rating. Vegetation screens Hebe Farm buildings.
10	View from Bridge Street looking north towards the cul-de-sac.		Moderate; there is limited visual interface of the properties with the viewscape as these homes do not face out towards the street.



Legend

 Proposal

 Viewpoint

Figure 6-12: Viewpoints

6.6.3 Potential impacts

Construction

Visual impacts

The proposal would result in a temporary visual impact on the road corridor as a result of construction activities. The viewpoints for road users, residential properties adjoining the site and users of nearby public domain area would be impacted by:

- Compound facilities and stockpile/material storage
- Construction plant and equipment
- Temporary safety barriers and traffic control equipment including signage
- Temporary construction lighting – this would primarily affect residences near the Garfield Road West intersection works.

The temporary impacts on visual amenity during construction activities would be confined to the road corridor and immediately adjacent areas. Following the completion of construction, the impacts associated with construction equipment and facilities would be removed and disturbed areas restored.

Operation

Landscape character impacts

The outcomes of the landscape character assessment are summarised in Table 6-28. Overall, the proposal would have a wide range of impacts, from high to negligible. The overall setting is considered highly sensitive and therefore impacts are either high or moderate to high. Two of the eight zones have been identified with a high landscape character impact, Zones 2 and 4. The high impact is mainly due to the proposal creating a fundamental 'shift' to the current setting. In both cases the general scenic quality of each zone would be generally retained, yet its character would be transformed into a more urbanised setting, changing its identity and sense of place.

Table 6-28: Landscape character assessment

Zone	Sensitivity	Magnitude	Impact
1	High: scenic setting with open vistas and a pocket of established residences.	Low: the magnitude of impact to most of this zone is negligible, yet the pocket of residences fronting Garfield Road West would likely experience a low magnitude of impact. This is due to the widening of the road and the formalisation of the intersection, creating a more urban environment. Hence a low rating has been assigned to this zone.	Moderate. The proposal would have no major impact on the functioning, identity or general character of the area. It should be noted that Garfield Road West is a busy road.

Zone	Sensitivity	Magnitude	Impact
2	High: sensitive land use combined with a somewhat scenic semi-rural quality.	High: the functioning, sense of place and identity of this zone would change from a quiet informal road to a somewhat busy thoroughfare with formalised kerbs and gutter. This would strongly reinforce the urbanity of the area. Sections of the new road would be built where there are currently paddocks, thereby fragmenting the current land use. Street lighting would contribute to the urbanity of the area.	High. A major impact is expected towards the southern precinct of this zone, resulting in a high impact. The additional traffic will change the general quiet setting this area currently has.
3	High: Sensitive environs driven by the residential land use and well established character, giving this neighbourhood its identity.	Negligible: the proposal would provide a beneficial effect by reducing the traffic volume along Railway Terrace.	Negligible. The overall effect is considered beneficial, with the streetscape quality along Railway Terrace slightly improving. The overall sense of place would not dramatically change.
4	High: This zone is highly sensitive, driven by the heritage value of the Hebe Farm and the visual qualities of the bushland setting. The bushland provides a strong backdrop to surrounding areas. This zone is environmentally sensitive to change.	High: the proposal would interface with this zone, changing its character and isolation. Even though sections within this zone would be retained, its proximity to the proposal would influence its identity, character and environmental functioning. Only the most eastern extent of the Hebe Farm would be directly impacted by the proposal.	High. The character of this zone would be greatly transformed. However, its visual quality would become more present to road users using the new road. The zone would be fragmented into a smaller bushland/pastureland section and the integrity of the Hebe Farm would be impacted.
5	High: this zone's identity with large lots and a green outlook provides a less urban character compared to other zones.	Low: the proposal would have two effects. One benefiting its sense of place by reducing traffic volume and the other partially losing the current green outlook to the west due to the removal of mature vegetation within Landscape Character Zone 4. Hence a low rating since the magnitudes are both beneficial and detrimental.	Moderate. The character and functioning of the area will be retained. Its visual quality would be compromised whilst the noise pollution in the area would be reduced.

Zone	Sensitivity	Magnitude	Impact
6	High: recently established residential area. Its land use is sensitive to change, situated in a quiet cul-de-sac. Hence the high rating.	Moderate: the amenity of the streetscape would be changed by it becoming a throughway with increased traffic numbers. This would result in additional noise and change the perceived safety of the streetscape.	Moderate to high. Although the functioning of the area would not be dramatically changed, the character of the streetscape would.
7	High: well established residential neighbourhood	Negligible: there would be a reduction in traffic volume along Railway Terrace resulting in a noise reduction. The outlook to some residences along the northern end of this zone may change due to impacts to Landscape Character Zone 4 in relation to vegetation loss. This however is considered minor.	Negligible. The overall identity, character and functioning of this zone would remain. The change in the road environment is considered beneficial to this zone.
8	Moderate: open pastureland within a scenic setting.	Low: the magnitude of impact would be very limited with minor noise pollution influencing the sense of place within this zone. Its functioning and visual character would be fully retained.	Low to moderate: the sense of place would not be greatly impacted.

Visual impacts

The assessed level of visual impact for each viewpoint is summarised in Table 6-29.

Table 6-29: Visual Impact assessment

View	Sensitivity	Magnitude	Impact	Comment
01	Moderate	Low	Low-Moderate	Limited visual impact. The wider intersection would have a marginal effect on the setting.
02	Moderate	Moderate	Moderate	The moderate visual impact is driven by the visual change from a quiet street to a thoroughfare and the wider road. The limited visual sensitivity of the viewer contributes to this moderate rating.
03	High	High	High	The introduction of a new road in this sensitive setting results in a high visual impact. The impact would also be experienced at night time with glare from through traffic, highly contrasting with the existing situation.

View	Sensitivity	Magnitude	Impact	Comment
04	Low	Moderate	Low-Moderate	Although not a fundamental change, the visual quality of the viewpoint would be altered with a more formal streetscape.
05	Moderate	High	Moderate-High	The streetscape would be more formal and the additional traffic visually detract from the existing situation. In addition, night time glare from vehicles travelling down Trevithick Street would interface with the residence.
06	High	High	High	The interface of the property (in particular the residence) and the new road is important to mitigate visual impacts. Visual screening is considered critical to achieve a buffer zone. The proposed street lighting has been considered in the magnitude rating.
07	Low	Low	Low	The visual quality of the setting would not fundamentally change, however, the widening of the road, formalisation of the verges with a roll top kerb and additional traffic contribute to the moderate rating.
08	High	High	High	The nature and visual quality of the setting would be changed. The removal of stands of mature trees and impact to Hebe Farm would contribute to the high rating.
09	Low	High	Moderate	Even though the proposal would introduce a contrasting element, the limited visual sensitivity of the site limits the visual impact. For the Hebe Farm, it is the limited visual exposure that contributes to limiting the visual impact.
10	Moderate	Low	Low-Moderate	The visual effect of the proposal is limited, predominantly driven by the additional traffic volume

6.6.4 Safeguards and management measures

Table 6-30: Landscape character and visual environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual impact	<p>An Urban Design Plan (including detailed urban design drawings and landscape plans) will be prepared to support the final detailed project design.</p> <p>The Urban Design Plan will present an integrated urban design for the project, providing further practical detail on the application of design principles and objectives identified in this</p>	Transport for NSW	Detailed design	Standard measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<p>REF. The Plan will confirm 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 • Details of the staging of landscape works 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"> • Beyond the Pavement urban design policy, process and principles (Roads and Maritime, 2014) • Landscape Guideline (Roads and Maritime Services, 2019). 			
Visual impacts	Following the completion of construction works, plant/equipment will be removed, and disturbed areas will be revegetated, turfed or otherwise restored as appropriate.	Contractor	Construction	Additional measure
Visual and landscape impacts	Opportunities to support the Five Million Trees for Greater Sydney initiative and the greening our city Premier's priority will be explored during detailed design and as part of the development of the landscape design for the proposal. This would include consultation with Blacktown City Council.	Transport for NSW	Detailed design	Additional measure
Impact from lighting	Temporary site lighting will be installed and operated in accordance with AS4282:1997 Control of the Obtrusive Effect of Outdoor Lighting, and an approved Traffic Management Plan.	Contractor	Construction	Additional measure
Impacts from lighting	The design of new street lighting will consider potential light spill impacts on adjacent properties.	Transport for NSW	Detailed design	Additional measure

6.7 Air quality

6.7.1 Methodology

A qualitative assessment of potential changes in local air quality during the construction of the proposal is provided in this section. Potential impacts on local air quality and nearby sensitive receivers were identified and assessed through a desktop review of the construction impact area, potential pollutants generated by construction, available background monitoring data and local meteorological data.

To assess potential operational air quality impacts, dispersion modelling was undertaken using the Transport for NSW Tool for Roadside Air Quality (TRAQ) model. The model has been specifically developed for roadside air quality impact assessments and uses a conservative approach to estimate the concentrations of air pollutants near to roadways. It should also be noted that like any other screening model, the TRAQ model will inherently overestimate the likely emissions, but more accurately shows the relative change that can occur when changes are made to a road.

For the TRAQ assessment two way traffic of 1,400 vehicles per day was assumed, with a speed of 50 kilometres per hour, a flat grade and a link length of two kilometres.

6.7.2 Existing environment

Sensitive receivers for air quality include known or likely future locations where people are likely to work or reside. This includes but is not limited to dwellings, schools, hospitals, offices or public recreational areas. The following sensitive receivers have been identified:

- Residences along Denmark Road, Carlton Street, Trevithick Street, West Parade and Bridge Street
- Users of Riverstone Park.

Daily Air Quality Index Values for north-west Sydney (including Riverstone) are typically rated between fair and very good. At the local level the key influence on air quality is traffic on Garfield Road West.

The nearest EPA air quality monitoring site is located within a Sydney Water property (Rouse Hill Reservoir) at 130 Cudgegong Road, Rouse Hill (about 3.5 kilometres to the east of the proposal). Background monitoring data collected from the Rouse Hill station includes data for ozone (O₃) oxides of nitrogen (NO_x), sulphur dioxide (SO₂), carbon monoxide (CO) and fine particulate matter with aerodynamic diameters of 10 micrometres (µm) or less (PM₁₀) and 2.5 µm or less (PM_{2.5}). A review of 2019 data identified 24 exceedances of EPA assessment criteria for PM_{2.5} and no exceedances for the other measured air pollutants.

6.7.3 Criteria

Relevant EPA air quality assessment criteria in the publication Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2016) is summarised in Table 6-31.

Table 6-31: Air quality impact assessment criteria

Pollutant	Averaging period	Concentration	
Sulfur dioxide (SO ₂)	10 minutes	25 pphm	712 µ/m ³
	1 hour	20 pphm	570 µ/m ³
	24 hours	8 pphm	228 µ/m ³
	Annual	2 pphm	60 µ/m ³

Pollutant	Averaging period	Concentration	
Nitrogen dioxide (NO ₂)	1 hour	12 ppm	246 µ/m ³
	Annual	3 ppm	62 µ/m ³
Photochemical oxidants (as ozone)	1 hour	10 ppm	214 µ/m ³
	4 hours	8 ppm	171 µ/m ³
PM _{2.5}	24 hours	-	25 µ/m ³
	Annual	-	8 µ/m ³
PM ₁₀	24 hours	-	50 µ/m ³
	Annual	-	25 µ/m ³
Carbon monoxide (CO)	15 minutes	87 ppm	100 mg/m ³
	1 hour	25 ppm	30 mg/m ³
	8 hours	9 ppm	10 mg/m ³
Deposited dust	Annual	2 gm ² /month	4 gm ² /month
		Max increase	Max total

6.7.4 Potential impacts

Construction

Potential impacts associated with the proposal include minor emissions from machinery (e.g. delivery vehicles, construction plant) and dust. Emissions from construction vehicles/equipment would be minor and short term.

Dust could be generated from a variety of activities including:

- Clearing vegetation
- Earthworks
- Stripping, stockpiling and managing topsoil
- Road sub-grade preparation
- Transportation and handling of soils and materials
- Line marking.

The total amount of dust would depend on the silt and moisture content in the soil, prevailing weather conditions and the types of activities being carried out. Depending on wind speed and direction, short-term impacts could be experienced at all nearby sensitive receivers.

Nuisance dust can be expected to impact on residential and commercial areas (Riverstone town centre) when annual average dust deposition levels exceed 4g/m²/month. The mobilisation of dust associated with the proposal is expected to be below nuisance levels through the implementation of appropriate mitigation measures.

During the application of asphalt and line marking, odours may be generated that impact adjacent residential areas or users open space areas. These impacts would be limited to the duration of certain activities during construction and no long-term odour impacts would result from the proposal.

Operation

The proposal would assist in reducing congestion on Garfield Road West. While general traffic growth is expected to impact on local air quality through vehicle emissions, the proposal could reduce emissions associated with idling of vehicles and stop start movements, which typically characterise congested conditions. This is likely to represent an air quality benefit during peak periods.

The model predictions for carbon monoxide, nitrogen dioxide and particulate matter concentrations during operation of the proposal at opening were all compliant with the relevant EPA criteria, including concentrations at the kerb. Compliance would also be achieved should traffic on the link grow to its capacity of 2,000 vehicles per day.

This suggests that air quality impacts are at an acceptable level and further, more detailed assessment is not required.

6.7.5 Safeguards and management measures

Table 6-32: Air quality environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: <ul style="list-style-type: none">• Potential sources of air pollution (including site compound operation)• Air quality management objectives consistent with any relevant published EPA guidelines• Mitigation and suppression measures to be implemented• Methods to manage work during strong winds or other adverse weather conditions.	Contactors	Construction	Section 4.4 of QA G36 Environment Protection

6.8 Soils, contamination and water quality

6.8.1 Methodology

Soils information was sourced from available reference material including soil landscape maps, salinity mapping and acid sulfate soil risk mapping. Emphasis was placed on identifying relevant limitations that would affect the construction or operation of the proposal.

Water quality was considered by reference to existing Blacktown City Council data and potential water quality risks associated with the construction and operation of the proposal.

The assessment of contamination was informed by the Phase 1 Preliminary Site Investigation conducted by Hazmat Services and included in Appendix J.

6.8.2 Existing environment

Soils

Soil landscape mapping shows that the proposal site traverses two soil landscapes. The western part of the proposal site is within the South Creek soil landscape while the eastern

part of the site is within the Blacktown soil landscape as identified in Soil landscapes of the Penrith 1:100 000 Sheet (Bannerman & Hazelton, 1990). Relevant characteristics of these soil landscapes are provided in Table 6-33.

Table 6-33: Soil landscapes

Soil landscape	Limitations	Soil erodibility
Blacktown	Localised seasonal waterlogging, localised water erosion hazard, moderately reactive highly plastic subsoil, localised surface movement potential.	Blacktown soil materials have moderate erodibility. The topsoils are often hardsetting and they have high fine sand and silt content, but they also have high to moderate organic matter content. The subsoils are very low in organic matter. Where they are also highly dispersible and occasionally sodic the erodibility is high.
South Creek	Flood hazard, seasonal waterlogging, localised permanently high watertables, localised water erosion hazard, localised surface movement potential.	The erodibility of these soil materials is high. The topsoil is moderately dispersible and has more than 50% fine sand, but it contains moderate amounts of organic matter. The subsoils have high fine sand and silt fractions with a very low percentage of organic matter.

Salinity

Salinity is the accumulation of salts in soil and water to levels that impact on people and the environment. Salinity occurs where salt in the landscape is mobilised and redistributed closer to the soil surface and/or into waterways by rising groundwater. Rising groundwater is commonly caused by removal of deep-rooted vegetation such as trees and perennial pasture. It is also caused by changes in soil permeability and structure which restrict groundwater movement. Compaction and cut / fill works can be contributors.

Parts of the proposal footprint where it crosses tributaries of Eastern Creek is mapped as high salinity potential (Department of Infrastructure, Planning and Natural Resources, 2003). This means these areas predisposed to salinity due to soil, geology, topography and groundwater conditions. The remainder of the proposal footprint has a moderate salinity potential, which means that scattered areas of scalding and indicator vegetation have been noted but concentrations have not been mapped.

ID	AEC	Potential contaminating activity	Contaminants of concern*	Risk of contamination
2	Carlton Street, Trevithick Street and surrounds	Importation of fill of unknown origin	Heavy metals, TRH, BTEX, PAH, OCP, PCB, asbestos	Low
2	Bushland areas	Dumping of potentially contaminated household waste	Asbestos	Low
2	Lots 10 & 14 Section W DP 712	Historical farming practices	Heavy metals, PAH, OCP, OPP, herbicides	Low
2	Lots 10 & 14 Section W DP 712	Potentially contaminated surface water in dam	Heavy metals, PAH, OCP, OPP, herbicides, nutrients, cations, anions	Low
3	West Parade and surrounds	Importation of fill of unknown origin	Heavy metals, TRH, BTEX, PAH, OCP, PCB, asbestos	Low
3	Bushland areas	Dumping of potentially contaminated household waste	Asbestos	Medium to High
3	Drainage channels	Potentially contaminated surface water in drainage channels	Heavy metals, TRH, BTEX, PAH, OCP, PCB, nutrients, cations, anions	Low
4	Bridge Street and surrounds	Importation of fill of unknown origin	Heavy metals, TRH, BTEX, PAH, OCP, PCB, asbestos	Low
4	Bushland areas	Dumping of potentially contaminated household waste	Asbestos	Low
4	Lot 1 DP 527115	Historical farming practices	Heavy metals, PAH, OCP, OPP, herbicides	Low

* Heavy metals = arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc; TRH = Total Recoverable Hydrocarbons; BTEX = Benzene, Toluene, Ethylbenzene and Xylenes; PAH = Polycyclic Aromatic Hydrocarbons; OCP = Organochlorine Pesticides; PCB = Polychlorinated Biphenyls; OPP = Organophosphorus Pesticides

EI Australia Pty Ltd conducted a Preliminary Site Investigation covering the proposal footprint for Transport for NSW in 2017. The investigation included a soil sampling program (nine boreholes and the excavation of nine test pits) and laboratory analysis of selected samples for potential contaminants of concern, including heavy metals, hydrocarbons, pesticides and asbestos. The results indicated that concentrations of contaminants of concern were below the adopted assessment criteria in each of the samples analysed. It was concluded that the site was unlikely to be subject to widespread contamination and therefore was likely to be suitable for the proposed use as a roadway.

Water quality

Tributaries of Eastern Creek cross the proposal footprint near the Trevithick Street / West Parade intersection and in the area between the southern end of West Parade and the northern end of Bridge Street. There is an existing farm dam located on Lot 10 DP712,

immediately to the south of the section of the proposed link road between Denmark Road and Carlton Street.

The quality of the water entering local waterways near the proposal footprint would be largely a function of the contaminants on roads and activities on adjacent areas discharged via the stormwater system. Common road runoff pollutants include gross pollutants and litter, sediment and suspended solids, toxic organics, nutrients, heavy metals and hydrocarbons.

The Waterway Health Report Card 2018-2019 (Blacktown City Council, 2020) gives Eastern Creek (north) an overall 'C' grade (with a C grade for water quality and a D grade for riparian health). A 'C' grade is 'Fair' and means that water quality indicators are within guideline limits 70 per cent of the time.

6.8.3 Potential impacts

Construction

Water quality

Potential water quality impacts would mainly relate to soil loss from erosion of exposed soils and stockpiles, and potential sedimentation of surrounding land and waterways, including the tributaries of Eastern Creek which cross the proposal footprint. Work activities with the potential to expose soils include:

- Earthworks within the construction impact area
- Drainage works
- Vehicle movements
- Removal and installation of general fill material
- Stockpiling
- Vegetation removal
- Grubbing processes
- Landscaping.

These activities would potentially cause:

- Erosion and sedimentation of exposed soils
- Erosion, leaching and dust generation from stockpiled materials
- Loss of soil quality and condition from material stockpiling
- Associated soil quality impact as a result of accidental spills and leaks caused by:
 - Use of fuels and oils outside of bunded and/or contained areas
 - Leaks from poorly maintained vehicles, machinery and equipment
- Temporary storage and management of spoil and waste.

Unmitigated potential impacts associated with the sedimentation of eroded material include:

- Increased sedimentation and elevated turbidity levels of nearby drainage channels from exposed soil during site disturbance and movement of construction vehicles, particularly following rainfall events
- Increased sedimentation in receiving watercourses, which reduces light penetration, smothers aquatic life, alters fluvial geomorphology and affects the ecosystems of downstream sensitive waterways

- Increased levels of nutrients, metals and other pollutants, transported via sediment receiving watercourses.

Saline soils could impact on sub-surface structures constructed for the proposal, impact on vegetation growth and make reuse of soil excavated for the proposal unsuitable.

Contamination

The risk of contamination for most of AECs was considered to be low. There is potential for complete exposure pathways to human and ecological receptors should soil and surface water contamination exist. There is also a higher risk of contaminated waste items being illegally dumped in the bushland between West Parade and Bridge Street. Potential sources, pathways and receptors of contamination are summarised in Table 6-35.

Table 6-35: Potential sources, pathways and receptors of contamination

Source	Pathway	Receptor	Comment
Potentially contaminated fill	Ingestion and dermal contact	Current and future site users	There is potential for site users to come into contact with contaminated fill, therefore a complete pathway potentially exists.
	Inhalation of dust and vapours	Current and future site users and surrounding site users	There is potential for site users and surrounding land users to be exposed to dust and vapours from the site, therefore a complete pathway potentially exists.
	Leaching of contaminants into shallow soils	Soil biota, native plants and transitory wildlife across the Site	There is potential for surface and shallow soils to be present which may be impacted by contaminating activities, therefore a complete pathway potentially exists to ecological receptors.
	Leaching of contaminants into groundwater	Groundwater beneath the Site and Eastern Creek	Given that contaminated soils, if present, are likely to be in surface or shallow soils, and the groundwater beneath the site is anticipated to at depths greater than five metres below ground surface, a potentially complete pathway is not considered to exist.
	Surface water runoff	Drainage channels and Eastern Creek	Given that a number of drainage channels intersect the site, and Eastern Creek is approximately 200m to 300m away, there is potential for contaminated surface water runoff to enter these waterbodies. Therefore, a potentially complete pathway is considered to exist.
Potentially Contaminated Household Waste	Ingestion and dermal contact	Current and future site users	There is potential for site users to come into contact with contaminated waste, therefore a complete pathway potentially exists.
	Inhalation of dust and vapours	Current and future site users and surrounding site users	There is potential for site users and surrounding land users to be exposed to dust and vapours due to the presence of dumped waste on the site, therefore a complete pathway potentially exists.

Source	Pathway	Receptor	Comment
Historical Farming Practices	Ingestion and dermal contact	Current and future site users	There is potential for site users to come into contact with soils contaminated from historical farming practices, therefore a complete pathway potentially exists.
	Inhalation of dust and vapours	Current and future site users and surrounding site users	There is potential for site users and surrounding land users to be exposed to dust and vapours from historical farms, therefore a complete pathway potentially exists.
	Leaching of contaminants into ground surface	Soil biota, native plants and transitory wildlife across the site	There is potential for surface and shallow soils to be present which may be impacted by historical farming activities, therefore a complete pathway potentially exists to ecological receptors.
	Leaching of contaminants into groundwater	Groundwater beneath the site and Eastern Creek	Given that contaminated soils, if present, are likely to be in surface or shallow soils, and the groundwater beneath the Site is anticipated to at depths greater than five metres below ground surface, a potentially complete pathway is not considered to exist.
	Surface water runoff	Dams	Given that one dam is present on a possible historical farm within the Site boundaries, there is potential for the water in this dam to be impacted. Therefore, a potentially complete pathway is considered to exist.

Operation

There is expected to be minimal impact on soils and water quality following completion of construction, once disturbed areas have been stabilised and scour protection has been installed at the proposed new culvert location. The additional road space proposed is relatively small in the context of the broader road network and the receiving catchment and therefore changes in water quality due to road runoff are expected to be minor.

It is not expected that the proposal would have any ongoing contaminated land impacts after the completion of construction because any identified contaminated material would be removed off site to be legally disposed of or managed safely onsite.

6.8.4 Safeguards and management measures

Table 6-36: Soils, contamination and water environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil and water	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will	Contractor	Detailed design Pre-construction	Section 2.1 of QA G38 Soil and Water Management

Impact	Environmental safeguards	Responsibility	Timing	Reference
	be addressed during construction.			
Soil and water	A site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the Soil and Water Management Plan	Contractor	Detailed design Pre-construction	Section 2.1 of QA G38 Soil and Water Management
Contamination	<p>A Detailed Site Investigation ("DSI") will be undertaken prior to construction works commencing, targeting the AECs where exposure pathways are potentially complete. The DSI should include, but not be limited to:</p> <ul style="list-style-type: none"> Investigation of the extent and nature of the illegally dumped waste in bushland at the southern end of the Denmark Road section of the Site, and between West Parade and Bridge Street. This will likely require clearing of vegetation Collection of a surface water sample from the dam on Lot 10 Section W DP 712 to assess for water quality Soil sampling across Lots 10 and 14 Section W DP 712, to assess possible contamination from potential historical farming practices Sampling of the fill along Denmark Road, Carlton Street, Trevithick Street, West Parade and Bridge Street. 	Transport for NSW	Detailed design	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
Contamination	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 Transport for NSW Environment Manager and/or EPA.	Contractor	Detailed design Pre-construction	Section 4.2 of QA G36 Environment Protection
Accidental spills	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Transport for NSW Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and EPA officers).	Contractor	Detailed design Pre-construction	Section 4.3 of QA G36 Environment Protection
Salinity	Soil salinity testing will be carried out prior to construction to further assess these risks and implement appropriate controls.	Contractor	Detailed design Pre-construction	Additional measure

6.9 Hydrology, flooding and groundwater

6.9.1 Methodology

The assessment of potential hydrology and flooding impacts was carried out with reference to the following:

- Flow paths passing through the proposal footprint
- Changes to impervious surfaces due to the proposal
- Flood impact assessment conducted for Transport for NSW by Lyall and Associates
- Review of available groundwater levels.

6.9.2 Existing environment

Catchments and watercourses

The proposal footprint is within the Eastern Creek catchment, which is part of the broader Hawkesbury Nepean system. Tributaries of Eastern Creek cross the proposal footprint near the Trevithick Street / West Parade intersection and in the area between the southern end of West Parade and the northern end of Bridge Street.

Flooding

The proposal footprint is subject to the following three primary mechanisms of flooding:

- Hawkesbury-Nepean River Flooding, which occurs when floodwater backs up the main arms of South Creek and Eastern Creek from the Hawkesbury-Nepean River
- Major Tributary Flooding, which occurs when heavy rain falls over the Eastern Creek catchment, causing floodwater to surcharge the banks of the watercourse
- Minor Tributary Flooding, which occurs when runoff is experienced in the minor drainage lines and unnamed watercourses which cross the project corridor.

Backwater flooding from the Hawkesbury-Nepean River starts to inundate Garfield Road West near its intersection with Denmark Road during a 20 per cent (1 in 5) Annual Exceedance Probability (AEP) flood event (i.e. a 20 percent or one in five chance of occurring in any one year), with floodwater extending to the Blacktown-Richmond Railway corridor near the intersection of West Parade and Trevithick Street during a one per cent AEP flood on the Hawkesbury River.

In addition to being impacted by backwater flooding from the Hawkesbury-Nepean River, sections of the proposal footprint are also impacted by both minor and major tributary flooding. For example, floodwater which surcharges the northern (right) bank of Eastern Creek during a 20 per cent (1 in 5) AEP flood inundates the proposal footprint midway along Denmark Road, while the full length of Denmark Road is inundated during a 1 per cent AEP flood on Eastern Creek.

Groundwater

Groundwater beneath the proposal footprint is anticipated to be present in an unconfined aquifer within alluvial or residual sands and clays at depths greater than five metres below ground surface. Groundwater is expected to flow generally to the west and south-west and discharge to Eastern Creek, located about 200 metres to 300 metres west / south-west.

6.9.3 Potential impacts

Construction

There is potential for a broader flood event to affect the proposal footprint during construction. The impact of a large flood would depend on the stage of construction at the time of the event, and the intensity of the rainfall event.

Flooding during construction could potentially impact areas within and near the construction area (including the construction compound) and/or cause damage to construction plant and equipment. Construction sites could also increase potential runoff to the catchments during heavy rainfall due to an increase of impermeable surface; however this increase would be relatively small in terms of the overall catchment area, and unlikely to significantly increase the severity of any flood events.

Construction compounds and materials stockpiles may also increase potential runoff to the catchments. The potential impact would be localised and most likely to occur as a result of poorly located stockpiles or compound sites, for example, locating compounds or stockpiles in drainage paths.

During construction, there is also the potential for existing drainage infrastructure to be partially blocked or temporarily diverted due to earthwork and other construction activities. Blocking or diverting local drainage lines may result in local flooding upstream of the construction areas. Diverting drainage lines may also create local areas of flooding and scour.

Any interception of groundwater during construction would be minor and unlikely to affect groundwater levels in the locality.

The temporary potential impacts referred to above expected to be minor if they occur and would be managed through the implementation of the proposed safeguards.

Operation

Hydrology and drainage

The proposal would result in a modest increase in impermeable surfaces (and therefore some additional runoff) due the construction of widened and additional road surfaces. The new and widened road formations would cross minor watercourses and drainage lines. The drainage design (longitudinal and cross drainage) is adequate to address these issues.

The proposed new link between West Parade and Bridge Street would result in a minor increase in the rate of flow discharging to the receiving drainage lines downstream of new/upgraded transverse drainage structures XING03 and EXD06 at the southern end of the proposal footprint near the Bridge Street connection (refer to Section 3.2.3). Appropriate scour protection and energy dissipation at these outlets to address the risk of scour affecting the downstream watercourse.

Flooding

Flood modelling carried out for the proposal considered potential impacts in terms of minor and major tributary flooding, and Hawkesbury Nepean River flooding.

The key findings in relation to minor tributary flooding were:

- Proposal would not result in adverse flood behaviour being experienced on the eastern (upstream) side of the Blacktown-Riverstone Railway corridor for all storms up to one per cent AEP in intensity
- Minor increases in the depth of ponding would be experienced on the southern (upstream) side of Garfield Road West in Riverstone Park for storms as frequent as 50 per cent AEP. The impacts would be the result of the lifting of existing road levels at the intersection of Garfield Road West and Creek Street. No existing residential development would be impacted by the increase in the depth of ponding at this location
- Minor increases in the depth of ponding would be experienced on the eastern (upstream) side of Denmark Road adjacent to upgraded transverse drainage structure EXD03 for storms that are more intense than about 50 per cent AEP. The impacts are a result of the raising of natural surface levels associated with the extension of Denmark Road toward the south. Impacts are confined to presently undeveloped land.

The key finding in relation to major tributary flooding was that the proposal would increase peak one per cent AEP flood levels by up to 100 millimetre near the existing dwellings on the northern side of Garfield Road West near the intersection with Denmark Road. This impact would be investigated further during detailed design.

The key findings in relation to Hawkesbury Nepean River flooding were:

- As finished road levels have been set at or very near existing ground levels, the proposal would have a negligible impact on peak flood levels resulting from backwater flooding from the Hawkesbury-Nepean River

- Denmark Road would be partially inundated in the vicinity of new transverse drainage structure EXD03 during a 10 per cent AEP flood event
- The Denmark Road / Garfield Road West intersection would be inundated during a 10 per cent AEP flood event
- All of Denmark Road and a large portion of the road linking it and Carlton Street would be inundated during a five per cent AEP flood event
- All but the upgraded section of West Parade would be inundated in a two per cent AEP flood event
- The upgraded section of West Parade would be inundated during a one per cent AEP flood event near its intersection with Trevithick Street and near new transverse drainage structure XING03.

6.9.4 Safeguards and management measures

Table 6-37: Hydrology, flooding and groundwater environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Flooding and hydrology	Staging for the construction of the proposal will consider adequate stormwater flow paths (including diversions and temporary connections as required) to be implemented and maintained during construction to minimise the potential on-site or upstream flooding.	Contractor	Construction	Additional measure
Flooding and hydrology	A flood management procedure will be prepared to detail procedures to be implemented where extreme weather is predicted and where there is a risk of flooding affecting the work site and compound, including removal and storage of plant and equipment and securing of site.	Contractor	Construction	Additional measure
Flooding and hydrology	Further investigation into flooding impacts on the existing dwellings on the northern side of Garfield Road West near the intersection with Denmark Road will occur with the purpose of minimising impacts.	Transport for NSW	Detailed design	Additional measure

6.10 Socio-economic

A Socio-economic Assessment for the proposal was carried out by Element Environmental. The main findings of that assessment are summarised below while the full report is included in Appendix K.

6.10.1 Methodology

The socio-economic assessment was prepared in accordance with the Environmental Impact Assessment Practice Note: Socio-economic assessment (Transport for NSW, 2020). A 'moderate' level of socio-economic assessment was carried out.

The socio-economic assessment involved:

- Literature review – Review of socio-economic literature to enable the development of knowledge about the proposal and its local and regional context, and supports the development of a socio-economic profile
- Socio-economic profile development and desktop research – An archive of socio-economic indicators relevant to the profile was collected and analysed. Consistent with the moderate level of assessment secondary data was also obtained, predominantly via desktop research
- Semi-structured interview with key informant – A semi-structured interview was conducted with a key informant from Blacktown City Council to explore potential socio-economic impacts (both positive and negative)
- Analyse data and conduct assessment – Descriptive qualitative and quantitative analyses were applied to analyse the data archive compiled for the project. The analysis results informed an evaluation of impacts and the recommendation of measures to address impacts.

Consistent with the practice note, the socio economic assessment has evaluated the significance of impacts by reference to sensitivity (vulnerability to change and capacity to adapt) and magnitude (scale, duration, intensity and scope of the proposed works).

6.10.2 Existing environment

Regional socio-economic overview

Regional population

The Western Sydney region has one of the fastest growing economies in Australia and a population that is expected to rise to 2.9 million in 2031 (NSW DPIE, 2014). With recent and ongoing delivery of essential infrastructure, urban development is underway in parts of Marsden Park, Riverstone, The Ponds, Schofields, Rouse Hill, Box Hill and Kellyville. (NSW DPIE, 2017). The scale of the forecast growth is significant considering the region is already home to a large population. For example, commentary by the Centre for Western Sydney (.id community, 2020) indicates the region contains about 9 per cent of Australia's population and 44 per cent of Sydney's population.

Regional economy

The Western Sydney region is Australia's third largest economy. It covers 85 per cent of Sydney, contains 47 per cent of its population (2.12 million) and produces 31 per cent of its Gross Regional Product (\$104 billion) (NSW Parliamentary Research Service, 2015).

According to Western Sydney University (2020), the region:

- Has higher than average unemployment and lower than average salary levels
- Has high levels of mortgage stress as well as rental stress
- Is heavily car dependent with resulting impacts on air quality, health, quality of life and household budgets
- Has 75 per cent of its working population also living in the region.

Local community profile and socio-economic characteristics

Population, demography and land use

Key population and demographic information is as follows:

- Estimated resident population for Riverstone – Vineyard as of end June 2019 was 10,082. Since the previous year, the population grew by 7.06 per cent. The comparative figure for Greater Sydney was 1.67 per cent
- Overall, 21.1 per cent of the population was aged between 0 and 15, and 11.4 per cent were aged 65 years and over, compared with 18.5 per cent and 16.3 per cent respectively for NSW (2016 Census)
- The population of Aboriginal and Torres Strait Islander (ATSI) people was measured at 313 (or 4.2 per cent) on 2016 census night, an increase of 47 from the 2011 census. These figures represented 4.2 per cent of the total population in the catchment on both occasions
- Overall, 78.4 per cent of the population spoke English only, and 14.8 per cent spoke a non-English language, compared with 68.5 per cent and 25.1 per cent respectively for NSW (2016 Census)
- In 2016, a total of 92 per cent of the dwellings in Riverstone – Vineyard were occupied on census night, compared to 90.5 per cent in NSW. The proportion of unoccupied dwellings was eight per cent, which is smaller compared to that found in NSW (9.3 per cent)
- Overall, 11.3 per cent of households were in dwellings with two bedrooms or less, and 36.1 per cent of four or more bedroom dwellings, compared with 27.7 per cent and 29.6 per cent for NSW respectively (2016 Census).

The proposal footprint is situated with a semi-rural context with residential dwellings mixed with rural uses, transport businesses and stabling associated with the nearby Riverstone Paceway. The active recreation facilities at Riverstone Park (oval, netball courts, tennis courts and cricket nets) are also a key land use type in the locality.

Need for assistance

In the Riverstone – Vineyard population, there was a lower proportion (4.7 per cent) of people who reported needing assistance (due to a severe or profound disability) with core activities compared to the NSW population (5.4 per cent) (2016 Census).

Travel behaviour

In 2016, there were 390 people who caught public transport to work (train, bus, tram or ferry) in Riverstone – Vineyard, compared with 2,543 who drove in private vehicles (car – as driver, car – as passenger, motorbike, or truck).

Analysis of the method of travel to work of the residents in Riverstone – Vineyard in 2016, compared to NSW, shows that 11.4 per cent used public transport, while 74.2 per cent used a private vehicle, compared with 15.9 per cent and 63.7 per cent respectively in NSW.

Labour force, income and employment

Comparing household income levels in Riverstone – Vineyard to NSW in 2016 shows that there was a similar proportion of high income households (those earning \$2,500 per week or more) and a lower proportion of low income households (those earning less than \$650 per week). Overall, 23.5 per cent of the households earned a high income and 13 per cent were low income households, compared with 23.1 per cent and 17.8 per cent respectively for NSW.

Analysis of the employment status (as a percentage of the labour force) in Riverstone – Vineyard in 2016 compared to NSW shows that there was a similar proportion in employment, as well as a similar proportion unemployed. Overall, 93.9 per cent of the labour force was

employed and 6.1 per cent unemployed, compared with 93.7 per cent and 6.3 per cent respectively for NSW.

In Riverstone – Vineyard in 2016 the three most popular industry sectors were:

- Construction (505 people or 14.9 per cent)
- Retail trade (362 people or 10.7 per cent)
- Health care and social assistance (300 people or 8.8 per cent).

In combination, these three industries employed 1,167 people in total or 34.4 per cent of the total employed resident population. An important source of employment and economic activity is the Riverstone town centre which includes a variety of retail and service-based businesses.

Community values

Community values identified include transport and connectivity, amenity (e.g. acoustic conditions), semi-rural character, and access to nearby businesses. One aspect of the character of the area with the presence of the Riverstone Paceway and the nearby stables (and the periodic walking of horses between the stables and the paceway).

Social infrastructure

Social infrastructure identified in the locality is listed in Table 6-38.

Table 6-38: Social infrastructure in the locality

Category	Social infrastructure
Community facilities	Sam Lane Community Complex Schofields community centre Riverstone Schofields Memorial Club
Education	Riverstone High School Richard Johnson Anglican School Marsden Park Campus St John's Primary School Riverstone Public School Schofields Public School Casuarina School Norwest Christian College
Places of worship	St. Clare's Convent Uniting Church Presbyterian Church
Emergency services	Riverstone Fire Station Schofields Rural Fire Brigade Riverstone Police Station
Parkes and reserves	Ridgeview Park Grange Avenue Reserve Knudsen Reserve Mill Street Reserve Schofields Park Riverstone Park
Culture and recreation	Blacktown City Museum Riverstone Swimming Centre Riverstone Paceway (horse riding)

Category	Social infrastructure
Other	Riverstone Cemetery Riverstone Post Office Riverstone Village Shopping Centre

Social infrastructure closest to the proposal footprint includes Riverstone Paceway (west of Denmark Road) and Riverstone Park (on the Southern side of Garfield Road between Creek Street and Carlton Street) which includes an oval, netball courts, tennis courts and cricket nets.

6.10.3 Potential impacts

Construction

Property impacts

The proposal is one part of a broader strategy to reduce congestion and improve local access. It is consistent with the West Schofields Draft Indicative Layout Plan and its implementation represents a step towards improving planning certainty for property owners in the locality.

There may be some negative impacts associated with the partial acquisition of four properties (refer to Section 3.6). While dwellings would not be affected (and people would therefore not need to find alternative accommodation), the partial acquisitions may affect the current use of these properties.

There would also be more general amenity impacts on property occupiers during construction. Noise and vibration, visual and air quality impacts are discussed in Section 6.2, Section 6.6 and Section 6.7 respectively.

Economy, business and industry

The proposal would contribute positively to the local economy by creating a demand for local contractors (e.g. truck and dog operators, waste removal companies) and goods and services. Groceries and other incidentals would also likely be purchased by the workforce from retailers in the Riverstone business precinct.

No commercial property acquisitions are required by the proposal and construction noise levels are predicted to be meet the applicable noise management levels for all commercial receivers.

Social infrastructure

The nearest social infrastructure is the Riverstone Paceway and active recreation facilities at Riverstone Park. Access to these facilities would remain available during construction, although there could be some short-term delays on the local road network due to construction activities.

Community values

Community values were identified as including transport and connectivity, amenity, the semi-rural character of the area, and access to nearby businesses.

During construction, the proposal would result in some short-term impacts on transport and connectivity due to road works (see Section 6.1) and changes to the semi rural character of the area as discussed in Section 6.6. Construction noise would affect local amenity with expected exceedances of noise management levels as discussed in Section 6.2.

There would also be some impacts on Aboriginal and non-Aboriginal heritage values as discussed in Section 6.4 and Section 6.3 respectively.

Local amenity

During construction of the proposal residents may experience minor delays on the local road network and minor changes to property access which could affect local amenity. Short-term delays may be experienced at the intersection of Garfield Road and Denmark Road, and between Carlton Street, West Parade and Bridge Street. The proposal would also introduce construction vehicles to the area south of West Parade, which would detract from the current rural / bushland value and character of this area.

Construction noise would also affect local amenity with predicted exceedances of construction noise management levels. These impacts are discussed in Section 6.2.

Access and connectivity

During construction, the proposal would result in some short-term impacts on access (minor driveway adjustments) and connectivity due to road works (see Section 6.1). Safeguards and management measures have been proposed to address those impacts. The bus stop on the northern side of Garfield Road West, between Denmark Road and Creek Street, would need to be relocated outside of the work area but this would not appreciably affect the convenience of this bus stop for bus customers.

Operation

Property impacts

There is potential for positive property impacts for those properties with a frontage to the upgraded road network. Minor property access adjustments and the reforming of driveway accesses may represent an improvement for property owners / occupiers.

As noted in Section 6.2, there would be an increase in road traffic noise at some residences and a total of 24 residences have been identified for consideration of acoustic treatments.

Business and industry

The proposal would help reduce congestion in the Riverstone business precinct and this may help make the area more convenient to access and more appealing to customers.

The potential for the proposal to cause a loss of trade due to traffic bypassing businesses in Riverstone is considered low with many of the businesses unlikely to be reliant on passing trade, and with the Riverstone business precinct remaining a convenient option.

Social infrastructure

A lower traffic volume of traffic on Garfield Road West, adjacent Riverstone Park represents a positive effect in terms of safety and access for pedestrians.

Access to both Riverstone Park and the Riverstone Paceway would remain available during operation.

Community values

Transport, connectivity and access to businesses were identified as important community values. The proposal would provide improved local connectivity and would help ease congestion near the intersection of Railway Terrace and Garfield Road, and this would help improve pedestrian safety and access to the Riverstone shopping precinct.

There would be some changes to the semi-rural character of the area (another identified community value) associated with new road connection and the introduction of through traffic. This is discussed further in Section 6.6.

Local amenity

As noted above the proposal would help improve amenity by reducing congestion near the intersection of Railway Terrace and Garfield Road, but would have amenity impacts associated with the introduction of through traffic on the new link road.

Operational road traffic noise would also affect local amenity. These impacts are discussed in Section 6.2.

Access and connectivity

The proposal would provide a new local connection between Garfield Road West and Schofields and would help ease congestion near the intersection of Railway Terrace and Garfield Road, improving access to the Riverstone business precinct.

For properties along the new link the standard of access may be improved with the reforming of driveway accesses (where required), although there may be small delays in access associated with the through traffic on the new link. There may also be delays in egress from properties should traffic be queuing at the southern end of the link while waiting to cross the Westminster Street bridge.

Access to and from the Riverstone Paceway would remain available, although there may be some minor delays in crossing Denmark Road due to the presence of through traffic.

The bus stop on the northern side of Garfield Road West, between Denmark Road and Creek Street, would need to be relocated a short distance but this would not appreciably affect the convenience of this bus stop for bus customers.

Access and connectivity are discussed further in Section 6.1.

Summary of key impacts and impact ratings

The key potential negative socio-economic impacts (construction and operation) that could occur due to the proposal are assessed in Table 6-39.

Table 6-39: Potential socio-economic impacts

Issue	Comment	Sensitivity	Magnitude	Significance
Property impacts (Impacts of property acquisition)	Four private properties would be partially acquired to accommodate the construction of the proposal. This change would be permanent for the impacted property owner. The socio-economic impact could be positive depending on the circumstances of the property owner.	Low	Low	Low
Property impacts (Impacts on property amenity)	During construction, the noise intensive type of work required and close proximity of surrounding residential properties means that the proposal would result in high noise levels. Due to additional traffic during operation, residential receivers along the new link road would experience an increase in operational road traffic noise. A total of 24 residential receivers	High	Moderate	High-moderate

Issue	Comment	Sensitivity	Magnitude	Significance
	have been identified for consideration of feasible and reasonable noise mitigation measures due to predicted exceedances of road traffic noise criteria.			
Local amenity	The proposal would introduce a larger volume of vehicles to the area west of West Parade and may detract from the current rural value and character of this area, albeit for a small number of people.	Low	Low	Low
Community values (Local character and identity, community cohesion, community safety, environmental values, sense of place, heritage)	<p>Potential impacts on community values include:</p> <ul style="list-style-type: none"> • Potential impact on the semi-rural character of the area west of Carlton Street during operation, and its effect of interfering with access to and horse movements to/from Riverstone Paceway • Impacts to non-Aboriginal heritage at Hebe Farm during construction • Impact to one Aboriginal archaeological site partially located within the proposed impact area during construction 	Moderate	Low	Moderate

6.10.4 Safeguards and management measures

Table 6-40: Socio-economic environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Anxiety and uncertainty	<p>A Community and Stakeholder Engagement Plan (CSEP) will be prepared and will include:</p> <ul style="list-style-type: none"> • Procedures and mechanisms that would be implemented in response to the key social impacts identified for the proposal • Procedures and mechanisms that would be used to engage with affected landowners, business owners, and the wider community to identify potential access, parking, business visibility, and other impacts and develop appropriate management measures 	Transport for NSW	Pre-construction	Standard measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<ul style="list-style-type: none"> Procedures to keep the community informed about construction and any associated changes to conditions (e.g. detours or lane closures) such as through advertisements in local media and advisory notices or variable message signs Procedure for the management of complaints and enquiries, including a contact name and number for complaints. 			
Anxiety and uncertainty	Horse owners will be engaged to identify suitable management measures for horse riders near the construction areas. Management measures would be adopted in the traffic management plan and noise management plan to mitigate against livestock disturbance.	Transport for NSW	Pre-construction	Additional measure

Other safeguards and management measures that would address socio-economic impacts are identified in Section 6.1.4 (transport and traffic), Section 6.2.5 (noise and vibration), Section 6.3.5 (non-Aboriginal heritage), Section 6.4.4 (Aboriginal heritage), Section 6.6.4 (landscape and visual) and Section 6.7.5 (air quality).

6.11 Other impacts

6.11.1 Existing environment and potential impacts

Table 6-41: Existing environment and potential impacts – other issues

Environmental factor	Existing environment	Potential impacts
Climate change	The Australian climate is likely to experience a greater frequency and severity of extreme weather events due to climate change. Increased average temperatures and reduced annual rainfall are also expected (Intergovernmental Panel on Climate Change, 2013).	<p>The following construction activities would result in the release of greenhouse gas emissions:</p> <ul style="list-style-type: none"> • Fossil fuel combustion relations to use of plant, equipment and vehicles • Electricity use • Embedded emissions from manufacture and delivery of materials <p>Given the scope and duration of the proposal, the impact of the emissions would be minor in nature.</p> <p>No climate change adaption requirements have been identified for the proposal.</p>
Waste and resource use	<p>Transport for NSW is committed to ensuring the responsible management of unavoidable waste and promotes the reuse of such waste in accordance with the resource management hierarchy principles outlined in the <i>Waste Avoidance and Resource Recovery Act 2001</i>. These resource management hierarchy principles, in order of priority are:</p> <ul style="list-style-type: none"> • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Disposal is undertaken as a last resort (in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>). <p>By adopting the above principles, Transport for NSW aims to efficiently reduce resource use, reduce costs, and reduce</p>	<p>The proposal is not expected to generate large quantities of waste materials. The following waste streams have been identified:</p> <ul style="list-style-type: none"> • Spoil • Removed vegetation • Waste concrete / asphalt • General garbage and refuse.

Environmental factor	Existing environment	Potential impacts
	environmental harm in accordance with the principles of ecologically sustainable development.	

6.11.2 Safeguards and management measures

Table 6-42: Safeguards and management measures – other issues

Environmental factor	Environmental safeguards	Responsibility	Timing	Reference
Waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> • Measures to avoid and minimise waste associated with the project • Classification of wastes and management options (re-use, recycle, stockpile, disposal) • Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • Procedures for storage, transport and disposal • Monitoring, record keeping and reporting. 	Contactors	Detailed design / pre-construction	Section 4.2 of QA G36 Environment Protection

6.12 Cumulative impacts

6.12.1 Study area

A cumulative impact occurs when two or more projects are carried out concurrently and near to one another. The impacts may be caused by both construction and operational activities and can result in a greater impact to the surrounding area than would be expected if each project was carried out in isolation.

A search of the Department of Planning, Industry and Environment's Major Projects Register was carried out in September 2020 for Blacktown local government area. Consideration was also given to infrastructure proposals in the North West Growth Area. The results are discussed in Section 6.12.2.

Other developments likely to occur within the locality would be small-scale projects and would be unlikely to result in a cumulative impact with the proposal.

6.12.2 Other projects and developments

Table 6-43 identifies those projects with the potential to have consecutive or cumulative impacts in association with the proposal.

Table 6-43: Past, present and future projects

Project / development	Construction impacts	Operational impacts
Development of the Riverstone West precinct (including business park and industrial lands on the northern side of Garfield Road West) (could occur at the same time as the proposal)	<ul style="list-style-type: none"> Construction noise and vibration Moderate volumes of construction traffic with some potential network impact. 	<ul style="list-style-type: none"> Connection of a spine road to the Denmark Road / Garfield Road West intersection (an installation of traffic lights)
Garfield Road West, Central and Garfield Road East upgrades (would occur after opening of the proposal to traffic)	<ul style="list-style-type: none"> Water quality risks associated with construction disturbance Impacts on local heritage items Construction noise and vibration Moderate volumes of construction traffic with some potential network impact Temporary traffic delays and congestion, as well as restricted access to street parking and loading zones Temporary changes to established cycling, pedestrian and vehicle routes Temporary disruption / changes in access for businesses Property acquisition. 	<ul style="list-style-type: none"> Reduced congestion Changes to road traffic noise Promotion of active transport through shared path infrastructure

6.12.3 Potential impacts

Table 6-44 reviews the potential cumulative impacts for both the construction and operation stages of the proposal.

Table 6-44: Potential cumulative impacts

Environmental factor	Construction	Operation
Noise	<p>There is the potential for the proposal to occur concurrently with and near construction works associated with other projects (such as the development of the Riverstone West precinct). The Garfield Road upgrades would occur after the completion of the Denmark Link Road.</p> <p>There is the potential for cumulative noise impacts (i.e. a higher noise level than for any individual project) where works are carried out at the same time, and both are predicted to exceed noise management levels at the same receivers.</p> <p>Cumulative noise impacts, if they occur, would only be experienced for short periods at a time, with the implementation of appropriate management measures and respite.</p> <p>There is also the potential for consecutive impacts, where a receiver is affected by one project and then by another project shortly after. This can be minimised through coordination between projects.</p>	<p>No cumulative operation stage noise impacts are expected as a result of the proposal.</p> <p>The Denmark Link road would be existing infrastructure at the time the Garfield Road upgrades become operational.</p>
Traffic and transport	<p>Multiple projects which generate construction traffic, and / or which involve traffic lane closures or pedestrian / cyclist diversions can combine to result cumulative delays and affect people's ability to access places of employment, services, family and friends.</p> <p>Construction traffic generated by the proposal is small and would occur primarily outside of peak periods. There are not expected to be broader network impacts even with construction traffic generated by adjacent projects.</p> <p>Where lane closures and pedestrian diversions are needed, coordination with other projects would reduce the potential for cumulative impacts (i.e. the</p>	<p>In the short-term the proposal would assist in reducing congestion on Garfield Road West and would reduce travel times for people traveling to and from the southern part of Riverstone. Over the longer term, and following the completion of Garfield Road upgrades, the proposal would represent an important improvement to local connectivity.</p> <p>The proposal would not increase operational traffic volumes, composition or distribution and is therefore not expected to have operational traffic impacts.</p>

Environmental factor	Construction	Operation
	number of closure/diversion periods).	
Non-Aboriginal heritage	While other nearby projects have identified impacts on local and State heritage, impacts levels associated with the proposal are low and would not generate additional impacts of a cumulative nature.	No additional cumulative heritage impacts beyond those identified for the construction stage are expected.
Visual	Multiple projects which introduce new visual elements to the environment could result in an overall cumulative increase in visual impacts. In this case visual impacts would be highly localised. In this context cumulative impacts are not expected.	The proposal would deliver improved public domain areas. No additional cumulative visual impacts beyond those identified for the construction stage are expected.
Biodiversity	The biodiversity assessment did not identify any construction stage cumulative impacts associated with the proposal. The loss of native vegetation would be offset.	The biodiversity assessment did not identify any operational stage cumulative impacts associated with the proposal.

Minimising impacts attributable to the proposal is the best way to address any potential cumulative effects and various measures have been proposed throughout this chapter. These measures are summarised in section 7.1.

A coordinated approach to the management and construction of the proposal and nearby concurrent projects would ensure that cumulative and consecutive impacts are minimised.

6.12.4 Safeguards and management measures

Table 6-45: Cumulative impacts environmental management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative impacts	Current and upcoming projects with the potential to interact with the proposal will be monitored. Where potential cumulative impacts are identified, the scheduling of works will be coordinated with interacting projects to minimise potential impacts. This will include: <ul style="list-style-type: none"> • Scheduling works to allow suitable respite periods for construction noise • Scheduling of works to minimise consecutive construction noise impacts, where feasible • Coordinating lane closures and pedestrian/cyclist diversions to minimise the 	Transport for NSW Project Manager	Construction	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
	overall number of occasions where disruption occurs.			

7 Environmental management

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 Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Transport for NSW Environment Officer, Western Sydney Project Office, prior to the commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G40 – Clearing and Grubbing, QA Specification G10 – Traffic Management.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed 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.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
GEN1	General – minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> • Any requirements associated with statutory approvals • Details of how the project will implement the identified safeguards outlined in the REF • Issue-specific environmental management plans • Roles and responsibilities • 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 Transport for NSW project manager	Pre-construction Detailed design	
GEN2	General – notification	All businesses, residential properties and other key stakeholders (e.g. schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor Transport for NSW project manager	Pre-construction	

No.	Impacts	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.</p>	Contractor Transport for NSW project manager	Pre-construction	
TT1	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 Traffic Control at Work Sites Manual (Roads and Maritime, 2018) and QA Specification G10 Control of Traffic (Roads and Maritime, 2008). 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 traffic incident. <p>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.</p>	Contractor	Pre-construction	Section 4.8 of QA G36 Environment Protection
TT2	Traffic and transport	The operation of the Bridge Street / Railway Terrace / Westminster Street intersection will be reviewed following the opening of the new Denmark Link Road.	Transport for NSW	Operation	Additional measure
NV1	Construction noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP.	Contractor	Pre-construction	Section 4.6 of QA G36

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
		<p>The NVMP will generally follow the approach in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) and the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016) and identify:</p> <ul style="list-style-type: none"> • Key potential noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented • A monitoring program to assess performance against relevant noise and vibration criteria • A review process scheduling and assessing out-of-hours activities including consideration of alternatives to out-of-hours work, plant selection, work locations and screening to minimise impacts • A working schedule which records respite periods for extended out-of-hours works • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures <p>Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.</p>			Environment Protection
NV2	Construction vibration	<p>Where vibration intensive plant such as vibratory rollers are used, vibration must be managed to minimise disturbance to building occupants and to avoid damage to buildings and other structures (including heritage fabric). This includes adhering to the recommended minimum working distances for vibration intensive plant identified in Section 7.1 of the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016).</p> <p>If recommended minimum working distances cannot be met by selecting smaller plant, vibration monitoring will occur to quantify and help manage vibration. If necessary, trial vibration measurements will be conducted to further assess any possible impacts and buffer distances that may be required.</p>	Contractor	Construction	Additional measure

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
NV3	Construction noise and vibration	<p>All sensitive receivers likely to be affected will be notified at least five working days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of:</p> <ul style="list-style-type: none"> • The proposal • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting <p>How to obtain further information.</p>	Contractor	Pre-construction	Standard measure
NAH1	Non-Aboriginal heritage	<p>A Non-Aboriginal Heritage Management Plan will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to non-Aboriginal heritage and will include:</p> <ul style="list-style-type: none"> • Site inductions which cover significant heritage fabric and protection requirements • Specific protection measures including fencing and maintenance of buffer areas • Tailored construction methods for works near significant heritage fabric (such as use of hand tools only). 	Contractor	Detailed design Pre-construction	QA G36 Environment Protection
NAH2	Non-Aboriginal heritage	The later 19th century brick culvert and the open cut drainage channel under the railway line on the eastern boundary of the proposal footprint at Hebe Farm will be protected during construction.	Contractor	Construction	Additional measure
NAH3	Non-Aboriginal heritage	An archaeological testing program will be submitted as an Exception 1B under section 139(4) of the <i>Heritage Act 1977</i> . Test trenches will target zones of archaeological potential within the development footprint at Hebe Farm, notably the area bordering the brick culvert and drainage channel, which runs into the property. Archival recording of any 'works' uncovered will also be undertaken as part of the testing program.	Transport for NSW	Detailed design	Additional measure

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
NAH4	Non-Aboriginal heritage	A Photographic Archival Recording will be prepared for the portion of Hebe Farm within the project footprint prior to impact.	Transport for NSW	Detailed design	Additional measure
NAH5	Non-Aboriginal heritage	<p>The Standard Management Procedure - Unexpected Heritage Items (Roads and Maritime Services, 2015) will be followed in the event 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>	Contactora	Construction	Section 4.10 of QA G36 Environment Protection
AH1	Aboriginal cultural heritage	An application for an Aboriginal Heritage Impact Permit (AHIP) will be made under section 90A of the <i>National Parks and Wildlife Act 1974</i> for the land and associated objects within the boundaries of the study area.	Transport for NSW	Detailed design	Additional measure
AH2	Aboriginal cultural heritage	The non-impacted portion of site Denmark Road AFT 1 (outside of construction and AHIP boundary) will be identified in the Construction Environmental Management Plan (CEMP) prior to construction activities to ensure this part of the site is avoided and not impacted by the proposal. The site area should be marked as an environmentally sensitive “no-go zone”.	Contractor	Construction	Additional measure
AH3	Aboriginal cultural heritage	Workers will be inducted as to appropriate Aboriginal heritage protection measures.	Contractor	Construction	Additional measure
AH4	Aboriginal cultural heritage	<p>The Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime Services, 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 Transport for NSW 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.</p> <p>Work will only re-commence once the requirements of that Procedure have been satisfied.</p>	Contractor	Construction	Section 4.9 of QA G36 Environment Protection
AH5	Aboriginal cultural heritage	Archaeological salvage excavation will be required for the impacted portion of site Denmark Road AFT 1 (partial impact	Transport for NSW	Pre-construction	Additional measure

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
		on site of moderate significance). Salvage excavation must be completed prior to any activities which may harm Aboriginal objects at this site location, including all construction and pre-construction works. Salvage excavation activities would be undertaken in accordance with the methodology provided in the Cultural Heritage Assessment Report.			
BIO1	Biodiversity impacts	<p>A Flora and Fauna Management Plan will be prepared in accordance with Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (RTA, 2011) and will be implemented as part of the CEMP.</p> <p>The Flora and Fauna Management Plan 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 Pre-clearing survey requirements Procedures for unexpected threatened species finds and fauna handling Procedures in the event of injury to native fauna <p>Protocols to manage weeds and pathogens.</p>	Contractor	Pre-construction	Section 4.8 of QA G36 Environment Protection
BIO2	Biodiversity impacts	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal (including hollow bearing trees) will be investigated during detailed design and implemented where practicable and feasible.	Transport for NSW	Detailed design	Additional measure
BIO3	Biodiversity impacts	<p>Pre-clearing survey will be conducted and will:</p> <ul style="list-style-type: none"> Confirm clearing boundaries, exclusion zones, protected habitat features and revegetation areas prior to starting work <p>Identify, in toolbox talks, where biodiversity controls are located on the site.</p>	Contractor	Pre-construction	Additional measure
BIO4	Spread of weeds	Weed management will occur in accordance with Biodiversity Guidelines, Guide 6 (Roads and Maritime, 2016) and include:	Contractor	Pre-construction	Additional measure

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> The Identification of weeds on site (confirmed during pre-clearing survey) Weed management priorities and objectives Exclusion zones, protected habitat features and revegetation areas prior to starting work within or directly next to the site The location of weed infested areas Weed control methods Measures to prevent the spread of weeds, including machinery hygiene procedures and disposal requirements A monitoring program to measure the success of weed management <p>Communication with local Council noxious weed representative.</p>			
BIO5	Spread of diseases affecting plants	Management measures will be implemented to control and/or prevent the introduction and/or spread of disease-causing agents such as bacteria and fungi in accordance with the Biodiversity Guidelines, Guide 7 (Roads and Maritime, 2016).	Contractor	Construction	Additional measure
BIO6	Unexpected threatened species finds	If unexpected flora or fauna are discovered on site stop work immediately and implement the Roads and Maritime Unexpected Threatened Species Find Procedure in the Biodiversity Guidelines, Guide 1 (Roads and Maritime, 2016).	Contractor	Construction	Additional measure
LCV1	Landscape character and visual impact	<p>An Urban Design Plan (including detailed urban design drawings and landscape plans) will be prepared to support the final detailed project design.</p> <p>The Urban Design Plan will present an integrated urban design for the project, providing further practical detail on the application of design principles and objectives identified in this REF. The Plan will confirm 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 	Transport for NSW	Detailed design	Standard measure

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> Details of the staging of landscape works 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"> Beyond the Pavement urban design policy, process and principles (Roads and Maritime, 2014) <p>Landscape Guideline (Roads and Maritime Services, 2019).</p>			
LCV2	Visual impacts	Following the completion of construction works, plant/equipment will be removed, and disturbed areas will be revegetated, turfed or otherwise restored as appropriate.	Contractor	Construction	Additional measure
LCV3	Visual and landscape impacts	Opportunities to support the Five Million Trees for Greater Sydney initiative and the greening our city Premier's priority will be explored during detailed design and as part of the development of the landscape design for the proposal. This would include consultation with Blacktown City Council.	Transport for NSW	Detailed design	Additional measure
LCV4	Impact from lighting	Temporary site lighting will be installed and operated in accordance with AS4282:1997 Control of the Obtrusive Effect of Outdoor Lighting, and an approved Traffic Management Plan.	Contractor	Construction	Additional measure
LCV5	Impacts from lighting	The design of new street lighting will consider potential light spill impacts on adjacent properties.	Transport for NSW	Detailed design	Additional measure
AQ1	Air quality	<p>An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to:</p> <ul style="list-style-type: none"> Potential sources of air pollution (including site compound operation) Air quality management objectives consistent with any relevant published EPA guidelines 	Contactar	Construction	Section 4.4 of QA G36 Environment Protection

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> Mitigation and suppression measures to be implemented <p>Methods to manage work during strong winds or other adverse weather conditions.</p>			
SWQ1	Soil and water	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Contractor	Detailed design Pre-construction	Section 2.1 of QA G38 Soil and Water Management
SWQ2	Soil and water	A site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the Soil and Water Management Plan.	Contractor	Detailed design Pre-construction	Section 2.1 of QA G38 Soil and Water Management
SWQ3	Contamination	<p>A Detailed Site Investigation ("DSI") will be undertaken prior to construction works commencing, targeting the AECs where exposure pathways are potentially complete. The DSI should include, but not be limited to:</p> <ul style="list-style-type: none"> Investigation of the extent and nature of the illegally dumped waste in bushland at the southern end of the Denmark Road section of the Site, and between West Parade and Bridge Street. This will likely require clearing of vegetation Collection of a surface water sample from the dam on Lot 10 Section W DP 712 to assess for water quality Soil sampling across Lots 10 and 14 Section W DP 712, to assess possible contamination from potential historical farming practices Sampling of the fill along Denmark Road, Carlton Street, Trevithick Street, West Parade and Bridge Street. 	Transport for NSW	Detailed design	Additional measure
SWQ4	Contamination	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	Contractor	Detailed design Pre-construction	Section 4.2 of QA G36 Environment Protection

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
		consultation with the Transport for NSW Environment Manager and/or EPA.			
SWQ5	Accidental spills	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Transport for NSW Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and EPA officers).	Contractor	Detailed design Pre-construction	Section 4.3 of QA G36 Environment Protection
SWQ6	Salinity	Soil salinity testing will be carried out prior to construction to further assess these risks and implement appropriate controls.	Contractor	Detailed design Pre-construction	Additional measure
HF1	Flooding and hydrology	Staging for the construction of the proposal will consider adequate stormwater flow paths (including diversions and temporary connections as required) to be implemented and maintained during construction to minimise the potential on-site or upstream flooding.	Contractor	Construction	Additional measure
HF2	Flooding and hydrology	A flood management procedure will be prepared to detail procedures to be implemented where extreme weather is predicted and where there is a risk of flooding affecting the work site and compound, including removal and storage of plant and equipment and securing of site.	Contractor	Construction	Additional measure
HF3	Flooding and hydrology	Further investigation into flooding impacts on the existing dwellings on the northern side of Garfield Road West near the intersection with Denmark Road will occur with the purpose of minimising impacts.	Transport for NSW	Detailed design	Additional measure
SEC1	Anxiety and uncertainty	A Community and Stakeholder Engagement Plan (CSEP) will be prepared and will include: <ul style="list-style-type: none"> Procedures and mechanisms that would be implemented in response to the key social impacts identified for the proposal 	Transport for NSW	Pre-construction	Standard measure

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> Procedures and mechanisms that would be used to engage with affected landowners, business owners, and the wider community to identify potential access, parking, business visibility, and other impacts and develop appropriate management measures Procedures to keep the community informed about construction and any associated changes to conditions (e.g. detours or lane closures) such as through advertisements in local media and advisory notices or variable message signs Procedure for the management of complaints and enquiries, including a contact name and number for complaints. 			
SEC2	Anxiety and uncertainty	Horse owners will be engaged to identify suitable management measures for horse riders near the construction areas. Management measures would be adopted in the traffic management plan and noise management plan to mitigate against livestock disturbance.	Transport for NSW	Pre-construction	Additional measure
WM1	Waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> Measures to avoid and minimise waste associated with the project Classification of wastes and management options (re-use, recycle, stockpile, disposal) Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions Procedures for storage, transport and disposal Monitoring, record keeping and reporting. 	Contactor	Detailed design / pre-construction	Section 4.2 of QA G36 Environment Protection
CI1	Cumulative impacts	Current and upcoming projects with the potential to interact with the proposal will be monitored. Where potential cumulative impacts are identified, the scheduling of works will be coordinated with interacting projects to minimise potential impacts. This will include:	Transport for NSW Project Manager	Construction	Additional measure

No.	Impacts	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> • Scheduling works to allow suitable respite periods for construction noise • Scheduling of works to minimise consecutive construction noise impacts, where feasible • Coordinating lane closures and pedestrian/cyclist diversions to minimise the overall number of occasions where disruption occurs. 			

7.3 Licensing and approvals

Table 7-2 provides a summary of the licensing and approval requirements relevant to the proposal.

Table 7-2: Summary of licencing and approvals required

Instrument	Requirement	Timing
<i>Roads Act 1993</i> (section 138)	Road occupancy licence	Prior to start of activity
<i>Heritage Act 1977</i> (section 134)	Notification of the proposal to the Heritage Division, Department of Premier and Cabinet as part of an application for an exception under Section 134 of the <i>Heritage Act 1977</i> .	Prior to decision to proceed.
<i>National Parks and Wildlife Act 1974</i>	Aboriginal Heritage Impact Permit under Section 90 of the <i>National Parks and Wildlife Act 1974</i> for the land and associated Aboriginal objects within the boundaries of the study area.	Prior to start of activity

8 Conclusion

8.1 Justification

The proposal has been developed to address congestion on Garfield Road West and limitations in the connectivity of the local road network. The proposal is consistent with a number of strategic plans and policy documents.

A 'do nothing' approach was not considered appropriate as it does not address the identified need and does not meet the proposal's objectives.

While there would be some temporary environmental impacts as a consequence of the proposal including visual impacts, traffic and transport impacts, construction noise, non-Aboriginal heritage impacts, Aboriginal cultural heritage impacts, minor vegetation removal and potential soil and water impacts, they have been avoided or minimised wherever possible through the site specific safeguards summarised in section 7.

The benefits of the proposal are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposal.

8.2 Objectives of the EP&A Act

Table 8-1 reviews the consistency of the proposal with the objects of the EP&A Act.

Table 8-1: Objects of the EP&A Act

Environmental factor	Construction
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal would reduce congestion and improve local connectivity. Environmental impacts have been minimised.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The principles of ecological sustainable development are considered in Section 8.2.1.
1.3(c) To promote the orderly and economic use and development of land.	The proposal is consistent with plans for the future development of the North West Growth Area precincts.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposal.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The proposal would have some potential impacts on threatened and other species of native animals and plants, ecological communities and their habitats. Impacts have been assessed as not significant.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Impacts on Aboriginal and non-Aboriginal heritage have been assessed as part of this REF (Section 6.4 and Section 6.3 respectively). Safeguards and mitigation measures have been proposed to address impacts.

Environmental factor	Construction
1.3(g) To promote good design and amenity of the built environment.	The design of the built elements of the proposal would maintain the existing visual context.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant to the proposal.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	The proposal has been developed with the involvement of Blacktown City Council.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Consultation carried out to date and proposed ongoing consultation is outlined in Chapter 5.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the 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 certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during options development (refer to Chapter 2). The precautionary principle has guided the assessment of environmental impacts for this assessment and the development of mitigation measures. A key focus has been minimising impacts on property and areas of ecological value.

8.2.2 Intergeneration 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 impacts of the proposal have been identified primarily short term and manageable. Benefits to road users in terms of reduced congestion and improved connectivity would be realised over the short and longer term. The proposal has considered the West Schofields Draft Masterplan and associated Indicative Layout Plan and is located so as to not impact future planned social infrastructure such as playing fields.

8.2.3 Conservation of biological diversity and ecological integrity

The twin principles of biodiversity conservation and ecological integrity have been a consideration during the design and assessment process with a view to identifying, avoiding, minimising and mitigating impacts.

The proposal is not expected to have significant biodiversity impacts.

8.2.4 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 a project, including air, water, land and living things.

While it is often difficult to place a reliable monetary value on the residual, environmental and social effects of the proposal, the value placed on environmental resources within and around the corridor is evident in the extent of environmental investigations, planning and design of impact mitigation measures to prevent adverse environmental impacts.

8.3 Conclusion

The proposed Denmark Link Road is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some visual, heritage and construction noise, traffic and socio-economic impacts. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would help reduced congestion and improve local connectivity at the subject location. On balance the proposal is considered justified and the following conclusions are made.

8.3.1 Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

8.3.2 Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of the Agriculture, Water and the Environment 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.

Stuart Hill
Environmental Planner
Hills Environmental
Date: 11 November 2020

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

Yvonne Tsukame
Project Development Manager
Western Sydney Project Office
Date: 11 November 2020

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Terms and acronyms used in this REF

Term / Acronym	Description
BC Act	Biodiversity Conservation Act 2016 (NSW).
AEP	Annual Exceedance Probability
CEMP	Construction environmental management plan
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
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.
Heritage Act	Heritage Act 1977 (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
NCA	Noise Catchment Area
NML	Noise management Level
NPW Act	National Parks and Wildlife Act 1974 (NSW)
POEO Act	Protection of the Environment Operations Act 1997(NSW)
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.

Appendix A

Consideration of clause 228(2) factors and matters of national environmental significance and Commonwealth land

Clause 228(2) Checklist

In addition to the requirements of the Is an EIS required? guideline (DUAP 1995/1996) and the Roads and Related Facilities EIS Guideline (DUAP 1996) as detailed in the REF, the following factors, listed in clause 228(2) of the Environmental Planning and Assessment Regulation 2000, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
<p>a) Any environmental impact on a community?</p> <p>The proposal would have impacts during construction (noise, traffic disruption). The proposal would have some operation phase impacts on the locality associated with traffic using the new link, but it would also improve local connectivity.</p>	<p>Short-term and long-term negative</p> <p>Long-term positive</p>
<p>b) Any transformation of a locality?</p> <p>The proposal would affect the locality to the south of Garfield Road West. This would occur in the context of planned land use changes in the medium to long term.</p>	Short-term negative
<p>c) Any environmental impact on the ecosystems of the locality?</p> <p>The proposal would have some potential impacts on threatened and other species of native animals and plants, ecological communities and their habitats. Impacts have been assessed as not significant.</p>	Negative (not significant)
<p>d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>The proposal would have some visual impacts associated with the new road. These would reduce over time with appropriate landscaping and urban design treatments.</p>	Short-term negative
<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?</p> <p>The proposal has the potential to affect the locally significant Hebe Farm. There are also identified impacts on one Aboriginal site. Safeguards have been proposed to address this impact.</p>	Negative
<p>f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>There would be some impact on habitat for native species. These species would not be solely reliant on the areas of affected habitat.</p>	Minor short-term negative
<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?</p> <p>The proposal would not endanger animals, plants or other forms of life.</p>	Nil
<p>h) Any long-term effects on the environment?</p> <p>The proposal would improve connectivity for road users.</p>	Long-term positive
<p>j) Any risk to the safety of the environment?</p> <p>The proposal does not represent a risk to the safety of the environment.</p>	Nil
<p>k) Any reduction in the range of beneficial uses of the environment?</p> <p>The proposal would not reduce the range of beneficial uses of the environment.</p>	Nil

Factor	Impact
<p>l) Any pollution of the environment?</p> <p>No pollution of the environment is expected to result from the proposal with the implementation of the proposed safeguards and mitigation measures.</p>	Nil
<p>m) Any environmental problems associated with the disposal of waste?</p> <p>Waste generated during construction would be removed from the site and disposed of legally. No environmental problems are anticipated for the disposal of waste.</p>	Nil
<p>n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>The proposal would not increase demand for resources, which are, or are likely to become, in short supply.</p>	Nil
<p>o) Any cumulative environmental effect with other existing or likely future activities?</p> <p>The nature and scale of the proposal limits its potential to have cumulative impacts. Potential cumulative noise and traffic impacts associated development of the Riverstone West Precinct are manageable.</p>	Short-term negative
<p>p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</p> <p>The proposal is not within the coastal zone and would not influence coastal processes and/or coastal hazards.</p>	Nil

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act 1999, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian 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? The proposal would not have any impact on a World Heritage property.	Nil
b) Any impact on a National Heritage place? The proposal would not have any impact on a National Heritage Place.	Nil
c) Any impact on a wetland of international importance? The proposal would not affect a wetland of international importance.	Nil
d) Any impact on a listed threatened species or communities? Some Commonwealth listed threatened species have the potential to occur in the local area. The nature, scale and location of the proposal is such that direct impacts on these species or their habitats are not expected. Indirect impacts are also not expected.	Not significant
e) Any impacts on listed migratory species? Some Commonwealth listed migratory species have the potential to occur in the local area. The nature, scale and location of the proposal is such that impacts on these species or their habitats are not expected. Indirect impacts are also not expected.	Nil
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? The proposal would not impact Commonwealth land.	Nil

Appendix B

Statutory consultation checklists

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No		ISEPP cl. 95A
Bus Depots	Does the project propose a bus depot?	No		ISEPP cl. 95A
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No		ISEPP cl. 95A

Development within the coastal zone

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No		ISEPP cl. 15A

Council related infrastructure or services

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Stormwater	Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	No		ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will strain the capacity of the existing road system in a local government area?	No		ISEPP cl.13(1)(b)
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of any part of the system?	No		ISEPP cl.13(1)(c)

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?	No		ISEPP cl.13(1)(d)
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow?	Yes	Blacktown City Council	ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Blacktown City Council	ISEPP cl.13(1)(f)

Local heritage items

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	Yes	Blacktown City Council	ISEPP cl.14

Flood liable land

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a minor extent?	Yes	Blacktown City Council	ISEPP cl.15

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance.	Yes	State Emergency Service	ISEPP cl.15AA

Public authorities other than councils

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works 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	ISEPP cl.16(2)(a)
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Office of Environment and Heritage	ISEPP cl.16(2)(b)
Aquatic reserves	Are the works adjacent to an aquatic reserve or a marine park declared under the <i>Marine Estate Management Act 2014</i> ?	No	Department of Industry	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the <i>Sydney Harbour Foreshore Authority Act 1998</i> ?	No	Sydney Harbour Foreshore Authority	ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	ISEPP cl.16(2)(f)
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	ISEPP cl.16(2)(g)

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	Secretary of the Commonwealth Department of Defence	ISEPP cl.16(2)(h)
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the <i>Mine Subsidence Compensation Act 1961</i> ?	No	Mine Subsidence Board	ISEPP cl.16(2)(i)



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