

Pennant Hills Road and North Rocks Road, Carlingford – Intersection Upgrade

Addendum review of environmental factors

Transport for NSW

May | 2021

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Prepared by Transport for NSW

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Executive summary

The proposed modification

Transport for NSW proposes to modify the Pennant Hills Road and North Rocks Road, Carlingford Intersection Upgrade by including additional widening, through and right turn lanes, a signalised pedestrian crossing and raised medians along the corridor (referred to in this Addendum REF as the “proposed modification”).

An REF was prepared for the project ‘Pennant Hills Road and North Rocks Road, Carlingford Intersection Upgrade’ and determined in April 2018 (referred to in this addendum REF as the “project REF” and “determined project”).

Background

In April 2018, Transport for NSW (previously Roads and Maritime Services (Roads and Maritime)) approved a proposal to upgrade the intersection at Pennant Hills Road and North Rocks Road in Carlingford. The determined project involved the provision of an additional through lane and new intersection configurations on Pennant Hills Road and North Rocks Road, which would ease congestion and improve traffic flow along the corridor. The main features of the determined project are widening Pennant Hills Road to three lanes from the intersection of the North Rocks Road to the BP service station using an existing kerbside merge lane and minor road widening, alterations to lanes and an additional left-turn slip lane at the Pennant Hills Road and North Rocks Road intersection.

Due to insufficient funding, the determined project was placed on hold. In 2020, with additional funding secured, the scope was updated to also include widening of Pennant Hills Road southbound from Woodstock Road to Murray Farm Road and intersection upgrade work at Pennant Hills Road and North Rocks Road west (the proposed modification).

Need for the proposed modification

The project REF identified that the proposal was initiated by the need to increase the storage capacity and reduce significant congestion of the Pennant Hills Road and North Rocks Road intersection. With the opening of the NorthConnex Project in 2020, it is expected that the intersection performance would be impacted further.

Proposal objectives

The objectives as identified in the project REF are:

- Improve the operational efficiency of the Pennant Hills Road corridor, specifically at the North Rocks Road intersection
- Improve traffic flow and maximise use of road space
- Improve road safety and minimise non-recurrent congestion events
- Ease traffic congestion and improve the consistency of travel times for motorists, particularly during peak hours.

The development criteria as identified in the project REF are:

- Minimise environmental impacts
- Minimise community issues and land acquisition impacts
- Minimise constructability issues
- Minimise impact on utility services.

Additional objectives for the purpose of this modification are:

- Improve performance of North Rocks Road approaches and the intersection
 - Provide additional capacity on Pennant Hills Road to accommodate the anticipated change of traffic demands resulting from background growth and opening of NorthConnex
-

- Improve connectivity and safety for pedestrians.

Options considered

Three options were considered, a base case 'do nothing' option, the proposed modification option and the determined project option:

Option 1 – do nothing

This option retains the existing road arrangement and assumes ongoing maintenance of the road.

Option 2 – proposed modification

Upgrade and widen Pennant Hills Road to three through lanes north and south bound, including widening on the north east and south east corners of the intersection.

This option would allow three through lanes on both the north and south bound lanes on Pennant Hills Road, an added right turn lane from North Rocks Road onto Pennant Hills northbound, a high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road and extension of the dual right turn lanes northbound lane on Pennant Hills Road onto North Rocks Road. This option would involve the installation of a median along Pennant Hills Road.

Option 3 – determined project

Widen Pennant Hills Road to three through lanes (northbound only) from the intersection of North Rocks Road to Murray Farm Road (ties back into the existing three lane arrangement), and retaining the existing southbound lanes of Pennant Hills Road as two through lanes. This option also includes a dedicated high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road.

This option would provide an additional lane on Pennant Hills Road, northbound only (currently two lanes with a merge lane). The existing merge lane (kerbside) would be utilised and would involve minor widening in front of four residences including property fence and driveway adjustment (within the road reserve, no property acquisition required). A dedicated right turn bay from North Rocks Road (eastern leg) onto Pennant Hills Road (travelling north), lengthened existing left turn only bay from North Rocks Road (eastern leg) onto Pennant Hills Road (southbound). This option also includes a high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (east leg).

Statutory and planning framework

This addendum REF is to be read in conjunction with the project REF. The purpose of this addendum REF is to describe the proposed modification, to document and assess the likely impacts of the proposed modification on the environment, and to detail mitigation and management measures to be implemented. For all proposed modifications that are not consistent with the project REF assessment, further environmental assessment is required.

This addendum 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.

Community and stakeholder consultation

Transport for NSW proposed the following activities as part of their consultation strategy:

- Media release distributed on 9 November 2020
- Distribution of a Have Your Say letter to local residents and businesses on 18 November 2020. Feedback was invited over a four week period and closed on 18 December 2020.
- An online community information session via Facebook Live
- Display of the addendum REF on the Transport for NSW project website
- Consultation with the City of Parramatta Council in accordance with ISEPP requirements.

Transport received 32 submissions from local residents via email and phone calls.

Key issues raised included:

- justification of the proposal
- property impacts
- pedestrian and residents safety along the Pennant Hills Road
- environmental impacts.

Environmental impacts

The main environmental impacts for the proposed modification are:

Biodiversity – The proposed modification would require the removal of additional areas of vegetation with a combined total (both determined project and proposed modification) of vegetation clearance of 0.9 ha. The additional vegetation clearance as part of the proposed modification is predominantly along the southbound verge of Pennant Hills Road south of the North Rocks Road intersection. The trees to be removed comprise native and introduced species and recent plantings, and do not comprise threatened species or form part of threatened ecological communities. Due to the mostly scattered layout of the trees along the verge and their location along a busy and noisy urban road, it is unlikely that any threatened fauna species would be dependent on these trees.

Traffic and transport - During construction, potential impacts would be similar to those assessed under the project REF. Traffic disruptions would be minimised as the majority of construction activities would occur outside of standard construction hours. The proposed modification would impact on right turn access to properties were a raised concrete median is proposed along Pennant Hills Road south of the intersection and on North Rocks Road at the westbound and eastbound approaches to the Pennant Hills Road intersection.

Approximately five parking spaces in front of residential properties on North Rocks Road would be lost due to road widening on the northern verge east of the Pennant Hills Road intersection.

Noise and vibration - Receivers within close proximity of Pennant Hills Road already experience traffic background noise from existing traffic flows. During the construction phase of the proposal, work outside normal hours may be required to reduce disruptions to daily traffic and surrounding receivers. Additional residential sensitive receivers near the proposal would potentially be impacted by construction activities due to the increase in proposal area. Noise modelling results indicate that noise levels would exceed noise management levels (NMLs) for all construction scenarios. Safeguard measures have been proposed to mitigate noise impacts during construction. During operation, considering both the determined project and proposed modification, no receivers would experience noise increases above 2dB.

Landscape character and visual impacts – The proposed modification would not change the overall landscape character of the area. However, the removal of vegetation and the widening of the road closer to properties would have visual impacts which are considered high adjacent to Pennant Hills Road south of the intersection with North Rocks Road.

Planting on the verge of the public road would assist in mitigating the identified visual impacts.

Socio economic – The proposed modification would require property acquisition of one property, partial acquisition of four properties and property boundary adjustments at six properties. The installation of raised concrete medians would result in the ban of right turn movements into 22 residential properties, with alternative routes increasing travel distance by 2 – 2.4 km and an additional time of 4 to 6 minutes. Overall, the broad benefits to a large number of road users on these roads and pedestrians would result in a moderate positive magnitude of impact, despite some adverse impacts to access to properties and businesses along Pennant Hills Road and North Rocks Road. As such, the significance of socio-economic impact is high-moderate positive.

Justification and conclusion

The proposal is subject to assessment under Part 5 of the EP&A Act. This REF has examined and considered all matters affecting or likely to affect the environment by reason of the proposed modification of the determined project.

The proposal is considered to be consistent with Government strategic planning at Commonwealth, State and regional levels as it would lead to improved efficiency and safety of the road network. While there would be some environmental impacts as a consequence of the proposal, these impacts have been avoided or minimised wherever possible through design and site-specific safeguards (Chapter 6 and Section 7.2).

The assessment of the impact of the proposed modification has concluded:

- The adverse impacts and risks of the proposal would be outweighed by the longer-term benefits of improvements to traffic flow, reduced congestion and improved safety for all road users. On balance, the proposal is therefore considered justified.
 - 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 of Planning under Division 5.2 of the EP&A Act. A Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Consent from Council is not required.
 - 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* (EPBC Act). A referral to the Australian Department of the Environment is not required.
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1 Introduction

This addendum review of environmental factors (addendum REF) has been prepared for the proposed modification of the project to upgrade the Pennant Hills Road and North Rocks Road, Carlingford intersection. This addendum REF assesses the potential environmental impacts and any additional mitigation measures that should be implemented for the proposed modification.

1.1 Proposed modification overview

Transport for NSW proposes to modify the Pennant Hills Road and North Rocks Road, Carlingford Intersection Upgrade by including additional widening, through and right turn lanes, a signalised pedestrian crossing and raised medians along the corridor (referred to in this Addendum REF as the “proposed modification”).

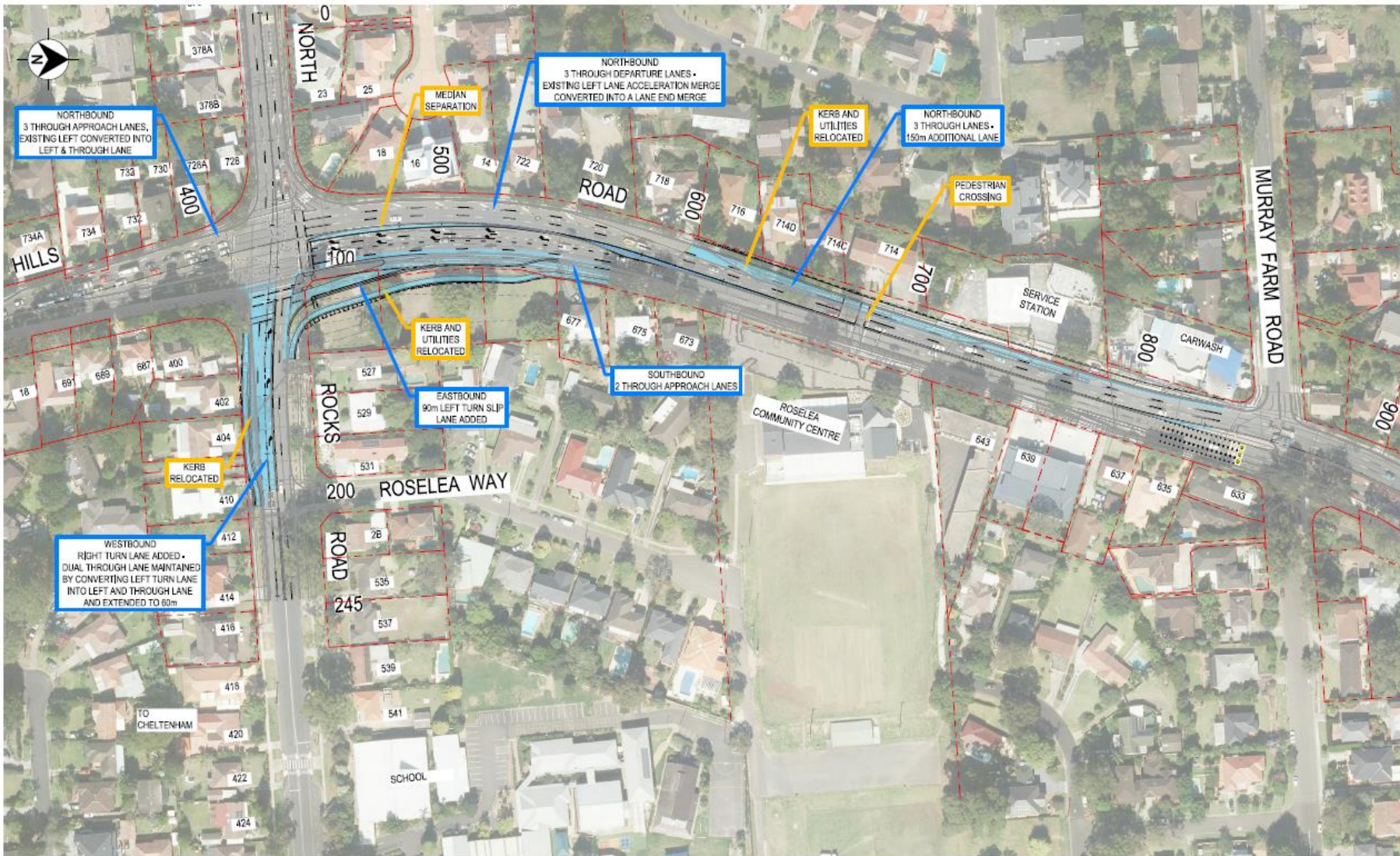
An REF was prepared for the project ‘Pennant Hills Road and North Rocks Road, Carlingford Intersection Upgrade’ and determined in April 2018 (referred to in this addendum REF as the “project REF”). The project REF is provided in Appendix C.

Determined project

In April 2018, Transport for NSW (previously Roads and Maritime Services (Roads and Maritime)) approved a proposal to upgrade the intersection at Pennant Hills Road and North Rocks Road in Carlingford. The determined project involved the provision of an additional through lane and new intersection configurations on Pennant Hills Road and North Rocks Road, which would ease congestion and improve traffic flow along the corridor. Key features of the determined project are shown in Figure 1-1 and also summarised below:

- Widen Pennant Hills Road to three through lanes (northbound only, currently two lanes with a merge lane), from the intersection of North Rocks Road to the BP service station (ties back into the existing three lane arrangement). Utilising the existing merge lane (kerbside) and minor widening (within the road reserve)
- Modification of the bus lane to a through lane in front of the BP service station including road regrade to remove the small drain
- Install a concrete median along Pennant Hills Road from North Rocks Road intersection up to Murray Farm Road (connects to existing concrete median)
- Dedicated right turn bay from North Rocks Road (eastern leg) onto Pennant Hills Road (travelling north)
- Lengthen existing left turn only bay from North Rocks Road (eastern leg) onto Pennant Hills Road (travelling south) to make this a shared left and through lane
- Dedicated high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (eastern leg).

Though the project REF was not placed on public display, the community engagement strategy for the proposal included approximately 2417 project letters, targeted doorknocking, a project website, and media release.



OVERVIEW PLAN

Figure 1-1 Key features of the determined project

Proposed modifications

Key features of the proposed modification assessed in this Addendum REF would include:

- Widen Pennant Hills Road on both sides between Woodstock Road and Murray Farm Road to accommodate an additional through lane in each carriageway, providing three through lanes in each direction
- Widen North Rocks Road west into the southern verge to install a second right turn lane from North Rocks Road onto Pennant Hills Road heading south
- Widen North Rocks Road east into the northern verge to accommodate a dedicated right turn bay from North Rocks Road onto Pennant Hills Road heading north
- Install left turn slip lane with new traffic island on Pennant Hills Road southbound to North Rocks Road eastbound
- Install a raised median in the centre of Pennant Hills Road between Woodstock Road and Murray Farm Road and on North Rocks Road on the approaches to the intersection
- Implement a new signalised pedestrian crossing on the southern leg of Pennant Hills Road/North Rocks Road intersection

The location of the proposed modification is shown in Figure 1-2 and the proposed modification is shown in Figure 1-3, with boxes outlined in red identifying the proposed modification and boxes not outlined identifying the features of the determined project REF. The proposal area includes North Rocks Road between 374 and 418 North Rocks Road, and Pennant Hills Road between 698 and 746 Pennant Hills Road, Carlingford. Chapter 3 describes the proposed modification in more detail.

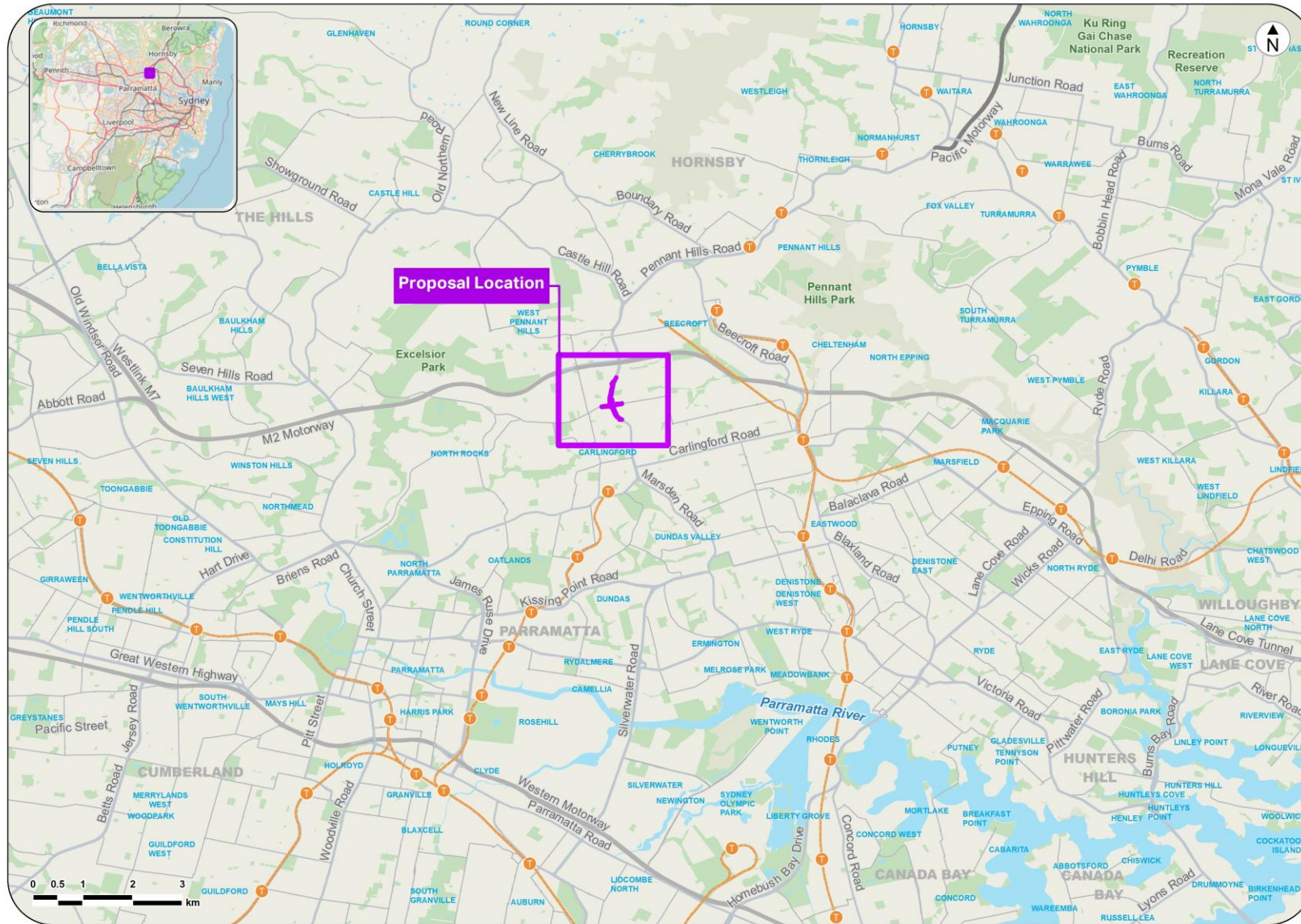


Figure 1-2: Location of the proposed modification

Pennant Hills Road and North Rocks Road, Carlingford
 Intersection Upgrade Addendum REF – May 2021

Intersection improvements on Pennant Hills Road and North Rocks Road, Carlingford



Figure 1-3: The proposed modification (subject to detailed design). Proposed modifications are outlined in red.

The key differences of the determined project and the proposed modification are identified in Table 1-1.

Table 1-1 Key differences between the determined project and the proposed modification

Determined project	Proposed modification
Pennant Hills Road north	
<ul style="list-style-type: none"> Widen into the western verge of Pennant Hills Road for about 250 m to facilitate three northbound through lanes Widen into the eastern verge of Pennant Hills Road for about 130 m to facilitate a dedicated high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (eastern leg) using the vacant TfNSW-owned land at the corner of the intersection Installation of a concrete median along Pennant Hills Road from the intersection to Murray Farms Road to restrict right turning movements to and from properties and Pennant Hills Road. 	<p>All of the determined project and:</p> <ul style="list-style-type: none"> Widen into the eastern verge of Pennant Hills Road for about 450 m to facilitate three southbound through lanes and tie in to existing three southbound lanes on Pennant Hills Road north of Murray Farm Road.
Pennant Hills Road south	
<ul style="list-style-type: none"> Convert existing left turn lane from Pennant Hills Road (northbound) onto North Rocks Road (westbound) into a through and left turn lane. 	<p>All of the determined project and:</p> <ul style="list-style-type: none"> Widening into the eastern verge of Pennant Hills Road for about 300 m to facilitate an additional through lane in both directions Widening into the western verge of Pennant Hills Road for about 90 m to facilitate an additional through lane in both directions Installation of a concrete median along Pennant Hills Road from Woodstock Road to the intersection to restrict right turning movements to and from properties and Pennant Hills Road Installation of a signalised pedestrian crossing on the southern leg of the intersection across Pennant Hills Road.
North Rocks Road west	
<ul style="list-style-type: none"> No work. 	<ul style="list-style-type: none"> Installation of a second right turn lane by widening into the southern verge of North Rocks Road for about 120 m Installation of a new raised median between 376A North Rocks Road and the intersection.

Determined project	Proposed modification
North Rocks Road east	
<ul style="list-style-type: none"> • Installation of a dedicated right turn bay from North Rocks Road onto Pennant Hills Road (travelling north) • Widen into the southern verge of North Rocks Road to lengthen existing left turn only bay from North Rocks Road onto Pennant Hills Road (travelling south) and make this a shared left and through lane. 	<ul style="list-style-type: none"> • Installation of a new raised median between Roselea Way and the intersection • Widening into the northern verge of North Rocks Road to facilitate the approved lane configuration changes for westbound traffic • No widening into the southern verge of North Rocks Road.
Property adjustments, driveway and pedestrian footpath adjustments	
<ul style="list-style-type: none"> • Driveway modification and property front fence modification on Pennant Hills Road north for widening in the western verge. Properties impacted are four residential properties (716, 714D, 714C and 714 Pennant Hills Road) and one commercial property (BP Service Station – 712-714 Pennant Hills Road) • No private property acquisition. 	<p>Updated adjustments:</p> <ul style="list-style-type: none"> • Driveway modification and fence/retaining wall/boundary adjustment at properties: 400 North Rocks Road, 378B, 378A, 376B and 376A North Rocks Road; and 679-683, 685, 687, 689, 691, 714D, 714C, 712-714 Pennant Hills Road • Fence/boundary adjustment at 18, 20, 22, 24, 26, 28, 30 and 46 Tripoli Avenue • Driveway adjustments at 639, 637 and 635 Pennant Hills Road • Full property acquisition of 728 Pennant Hills Road and partial acquisition of 378B, 378A, 376B and 376A North Rocks Road • Partial property acquisition of commercial property 712-714 Pennant Hills Road (BP service station). • Where possible, wider footpaths installed on the northern side of North Rocks Road between Roselea Way and Pennant Hills Road, the eastern side of Pennant Hills Road north between North Rocks Road and the mid-block crossing near Murray Farm Road, and the southern side of North Rocks Road along a quarter of the block between Pennant Hills Road and Jenkins Road.

Determined project	Proposed modification
Properties impacted by right turn ban as a result of new raised concrete median	
<ul style="list-style-type: none"> 712-714 Pennant Hills Road – BP service station 710, 714, 714C, 714D, 716, 718, 720, 722 Pennant Hills Road (residential northbound side north of North Rocks Road intersection) 637, 673, 675, 677 Pennant Hills Road (residential southbound side north of North Rocks Road intersection) 639, 643, 647 Pennant Hills Road (commercial, accommodation provider and community centre southbound side north of North Rocks Road intersection) 	<p>All of the determined project and:</p> <ul style="list-style-type: none"> 687, 689, 691 Pennant Hills Road (southbound side south of North Rocks intersection) 728A, 730, 732, 734, 734A, 736, 736A, 738, 740, 742, 744 Pennant Hills Road (northbound side south of North Rocks intersection) 527 and 529 North Rocks Road (eastbound side east of Pennant Hills Road intersection) 376A, 376B, 378A, 378B, 400, 402, 404, 406 and 408 North Rocks Road (westbound, both west and east of Pennant Hills Road intersection)
Bus lanes and stops	
<ul style="list-style-type: none"> Modification of the bus lane to a through lane in front of the BP service station including road regrade to remove the small drain 	<p>All of the determined project and:</p> <ul style="list-style-type: none"> Conversion of two existing bus bays on Pennant Hills Road to trafficable through lanes – bus stops relocated to proposed footpath Relocation of bus stop on Pennant Hills Road southbound: north of the intersection, relocation 150m south of exiting bus stop ID 2118174 and south of the intersection, relocation 18m south of the existing bus stop ID 211831. A retaining wall would be installed at the back of the bus shelter at the new bus stop ID 2118174.
Vegetation and tree removal	
<ul style="list-style-type: none"> Removal of large shrubs located adjacent to retaining wall to be rebuilt as part of installation of left turn slip lane in the north eastern corner of the intersection – also enables use of land for site compound during construction Tree removal kerbside of Pennant Hills Road northbound north of the intersection 	<p>All of the determined project and:</p> <ul style="list-style-type: none"> Vegetation removal kerbside of Pennant Hills Road northbound and southbound south of the intersection, and southbound north of the intersection Vegetation removal southern verge of North Rocks Road, and within properties, west of the intersection Vegetation removal northern verge of North Rocks Road east of the intersection
Parking	
<ul style="list-style-type: none"> No changes to on-street parking 	<ul style="list-style-type: none"> Loss of about five street parking spaces along the northern kerb of North Rocks Road east.

Determined project	Proposed modification
Ausgrid substation on Pennant Hills Road (south of the intersection)	
<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Retaining wall installed in front of the substation (raised footpath).

1.2 Purpose of the report

This addendum review of environmental factors (addendum REF) has been prepared by Transport for NSW Pinch Points Program. 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).

This addendum REF is to be read in conjunction with the project REF. The purpose of this addendum REF is to describe the proposed modification, to document and assess the likely impacts of the proposed modification 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 context of clause 228 of the Environmental Planning and Assessment Regulation 2000, *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 Road Related Facilities EIS Guideline (DUAP, 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the addendum 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 addendum REF would be considered when assessing:

- Whether the proposed modification is likely to result in 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 proposed modification to significantly impact any other matters of national environmental significance or Commonwealth land and therefore the need to make a referral to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Australian Government 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 proposed modification

Chapter 2 of the project REF addresses the strategic need for the project, the project objectives and the options that were considered. The proposed modification described and assessed in this addendum REF is consistent with the strategic need for the project.

The project REF identified that the proposal was initiated by the need to increase the storage capacity and reduce significant congestion of the Pennant Hills Road and North Rocks Road intersection. With the opening of the NorthConnex Project in 2020, it is expected that the intersection performance would be impacted further.

The project was previously determined in 2018 with a reduced scope which included the widening of Pennant Hills Road northbound from North Rocks Road to Murray Farm Road, with intersection upgrade work at Pennant Hills Road and North Rocks Road east. However, due to insufficient funding, the determined project was placed on hold. In 2020, with additional funding secured, the scope was updated to also include widening of Pennant Hills Road southbound from Woodstock Road to Murray Farm Road and intersection upgrade work at Pennant Hills Road and North Rocks Road west (the proposed modification).

2.2 Proposal objectives and development criteria

Section 2.3 of the project REF identifies the proposal objectives and development criteria that apply to the proposed modification.

The objectives as identified in the project REF are:

- Improve the operational efficiency of the Pennant Hills Road corridor, specifically at the North Rocks Road intersection
- Improve traffic flow and maximise use of road space
- Improve road safety and minimise non-recurrent congestion events
- Ease traffic congestion and improve the consistency of travel times for motorists, particularly during peak hours.

The development criteria as identified in the project REF are:

- Minimise environmental impacts
- Minimise community issues and land acquisition impacts
- Minimise constructability issues
- Minimise impact on utility services.

Additional objectives for the purpose of this modification are:

- Improve performance of North Rocks Road approaches and the intersection
- Provide additional capacity on Pennant Hills Road to accommodate the anticipated change of traffic demands resulting from background growth and opening of NorthConnex
- Improve connectivity and safety for pedestrians.

2.3 Alternatives and options considered

2.3.1 Methodology for selection of preferred option

A strategic investigation was undertaken to provide an overview of the physical constraints of the intersection, including utilities, property boundaries and bus zones.

In response to the physical constraints of the intersection a traffic analysis was conducted to determine the optimal configuration for the Pennant Hills and North Rocks Road intersection. During the traffic analysis, preliminary design elements were investigated by Transport for NSW for the proposal area, which identified two main options, as identified in section 2.3.2, along with the 'Do nothing' option.

The determined project REF (refer Appendix C) describes that the original preferred option was Option 2 as it provided the greatest traffic benefit to the Pennant Hills Road corridor and improvement to the level of service at the intersection, however, funding allocated to the Pennant Hills Road corridor would not have provided for development and construction of this option. As such, Option 2 was discarded to be investigated at a later stage. Option 3 (the determined project) was selected as it achieved the proposal objectives, performed well against the development criteria assessed in the project REF, with a lower cost to implement and indicated the intersection would operate adequately based on peak period traffic demands. However as discussed in Section 2.1, additional funding was secured in 2020 and Option 2 (the proposed modification) could be reconsidered.

The identified options were assessed against their ability to meet the project objectives and development criteria in the Project REF and against the additional improvement objectives in Section 2.2.

2.3.2 Identified options

The identified options for considerations are the proposed modification features and the 'Do Nothing' option as described in Table 2-1 below.

Table 2-1: The identified options for the proposal










Option	Description
Option 1 – Do nothing	This option retains the existing road arrangement and assumes ongoing maintenance of the road.
Option 2 – Proposed modification.	<p>The proposed modifications are as described below and as described in section 1.1:</p> <ul style="list-style-type: none"> • Widening of Pennant Hills Road between Woodstock Road and Murray Farm Road to accommodate an additional through lane in each carriageway • Widening of North Rocks Road west to install a second right turn lane from North Rocks Road • Installing a raised median in the centre of Pennant Hills Road between Woodstock Road and Murray Farm Road • Installing a new pedestrian crossing on the southern leg of Pennant Hills Road/North Rocks Road intersection.

Option	Description
Option 3 – Determined project	This option would allow three through lanes on both the north and south bound lanes on Pennant Hills Road, an added right turn lane from North Rocks Road onto Pennant Hills northbound, a high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road and extension of the dual right turn lanes northbound lane on Pennant Hills Road onto North Rocks Road. This option would involve the installation of a median along Pennant Hills Road as described in section 1.1.

2.3.3 Analysis of options

As identified within Table 2-1, three options were identified for the proposal. An analysis of these options is provided below against the additional improvement objectives of this assessment which are identified in Section 2.2 above. Refer to the project REF for the options analysis for the original proposal against the project objectives and development criteria.

Table 2-2: Analysis of options for the proposal

Legend		Additional objectives		
		Improve performance of North Rocks Road approaches and the intersection	Provide additional capacity on Pennant Hills Road to accommodate the anticipated change of traffic demands resulting from background growth and opening of NorthConnex	Improve connectivity and safety for pedestrians
Options	Option 1 – Do nothing	 The performance of North Rocks Road approaches and the intersection would not be improved.	 Capacity on Pennant Hills Road would not be changed.	 Conditions for pedestrians would not be improved.
	Option 2 – Proposed modification	 The performance of North Rocks Road east and west approaches and the intersection would be improved on, specifically through widening of North Rocks Road and the provision of an additional right turn lane to Pennant Hills Road south and dedicated right turn lane to Pennant Hills Road north.	 Widening on both sides of Pennant Hills Road to allow for three through lanes in each direction would provide additional capacity to accommodate change of traffic demands.	 Conditions for pedestrians would be improved with the provision of the missing crossing on the southern approach.
	Option 3 – Determined project	 The performance of North Rocks Road west approach and the intersection would be improved, specifically through the provision of a dedicated right turn lane to Pennant Hills Road north. No improvement for traffic turning right from North Rocks Road to Pennant Hills Road south.	 Widening Pennant Hills Road to provide three northbound lanes between North Rocks Road and Murray Farm Road would provide additional capacity to accommodate change of traffic demands for traffic travelling north on Pennant Hills Road only.	 Conditions for pedestrians would not be improved.

2.4 Preferred option

Option 2 is the recommended preferred option. Option 2 is preferred as it would:

- improve the operational efficiency of the Pennant Hills Road corridor, specifically at the North Rocks Road intersection;
- improve traffic flow and maximise use of road space;
- improve road safety;
- minimise non-recurrent congestion events;
- ease traffic congestion; and
- improve the consistency of travel times for motorists, particularly during peak hours.

The original preferred option in the Project REF was Option 2 as it provided the greatest traffic benefit to the Pennant Hills Road corridor and improvement to the level of service at the intersection, however due to insufficient funding allocated to the Pennant Hills Road corridor at the time, this option was discarded.

The proposed modification would provide additional capacity on Pennant Hills Road to accommodate the anticipated change of traffic demand resulting from background growth and opening of NorthConnex by providing three through lanes in each direction, and improve the conditions for pedestrians by adding a new crossing on the southern approach of Pennant Hills Road. The proposed modifications would improve performance of both North Rocks Road approaches and the overall intersection by providing an additional right turn lane from North Rocks Road west to Pennant Hills Road south and a dedicated right turn lane from North Rocks Road east to Pennant Hills Road north.

3 Description of the proposed modification

3.1 The proposed modification

Transport for NSW proposes to modify the Pennant Hills Road and North Rocks Road, Carlingford Intersection Upgrade to include additional widening, right and left turn lanes, pedestrian crossings and a raised median.

The determined project including the proposed modification is detailed below and shown in the design drawings provided in Appendix D. Refer to Table 1-1 to distinguish between features which form part of the determined project and features which form part of the proposed modification.

Pennant Hills Road

- Widen Pennant Hills Road on the eastern and western verges to three through lanes (northbound and southbound), between Woodstock Road and Murray Farm Road, where it ties back into the existing road alignment
 - In the northern leg, the widening of Pennant Hills Road northbound lane will utilise the existing merge lane (kerbside) from the left slip lane from North Rocks Road (western side) in addition to changes in kerb alignment, by removing the existing merging line marking
 - As the existing merge lane on Pennant Hills Road terminates after approximately 170m, the widening on Pennant Hills Road northbound lane will require minor widening works within the road reserve
 - In the southern leg, the widening of Pennant Hills Road northbound lane will utilise the existing left turn bay (kerbside) in addition to changes in kerb alignment, by removing the existing left turn line marking
- Properties along the proposed widening will require driveway modifications. Fence/retaining wall adjustment will be required adjacent to a number of properties along Pennant Hills Road and North Rocks Road
- Conversion of the three existing bus bays (ID 211825, 2118174 and 211831) on Pennant Hills Road between Woodstock Road and Murray Farm Road to trafficable through lanes. The three bus stops will be relocated as detailed in Section 0
- Install a narrow concrete median along Pennant Hills Road between Woodstock Road and North Rocks Road and between North Rocks Road and Murray Farm Road (connects to existing concrete median) to avoid traffic turning right into private properties
- Install a new dedicated high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (eastern leg) with a 90 metre storage utilising the vacant land owned by Transport for NSW at the corner of the intersection. The traffic island on this left slip lane will be paved and a zebra crossing will be installed for pedestrians. There is an existing retaining wall at this corner which will require adjustments and some planted vegetation removal of large shrubs located adjacent to this existing retaining wall
- Where the widening works are occurring on Pennant Hills Road (northbound lane and southbound lane), realign the pedestrian footpath to the edge of the new kerb
- Due to the widening works on Pennant Hills Road (northbound lane and southbound lane) along the private property frontages, vegetation removal is required including shrubs and planted mature trees
- Utility relocation due to the widening works on Pennant Hills Road will be required, underground and above ground assets will require relocation and is detailed in Section 3.5
- Install formalised kerbs, pram ramps, new line marking and road furniture signage.

North Rocks Road

- Widen into the southern verge of the western leg of North Rocks Road to accommodate for a 80 metre long right turn bay in the eastbound direction in addition to the existing right turn lane
- Widen North Rocks Road eastern leg to accommodate an 80 metre long right turn bay in the westbound direction. The existing left turn only bay will be converted into a shared left and through lane. Widening will occur into the existing wide grass verge within the road corridor on the northern side of North Rocks Road, no property acquisition is required. Properties along the proposed widening will require driveway modification and fence/retaining wall adjustment will be required at 400 North Rocks Road
- The widening of North Rocks Road on the western leg lane will require widening works within the road reserve and at times within properties. As a result, properties along the proposed widening will require driveway modification and property acquisition will be required at 728 Pennant Hills Road (full acquisition), 378B, 378A, 376B and 376A North Rocks Road (partial acquisition)
- Where the widening works are occurring on North Rocks Road (eastbound lane and westbound lane), realign the pedestrian footpath to the edge of the new kerb
- Install a narrow concrete median along North Rocks Road on both approaches to the intersection to avoid right turning traffic into private properties
- Due to the widening works on North Rocks Road (eastern and western legs) on the grass verge, some vegetation removal is required including shrubs and planted mature trees
- Utility relocation due to the widening works on North Rocks Road will be required, underground and above ground assets will require relocation and is detailed in Section 3.5
- Install formalised kerbs, pram ramps, new line marking and road furniture signage.

3.2 Design

Since determination, the following issues have been resolved:

- Partial acquisition of land from BP Carlingford that extends into the road corridor is assumed to be undertaken by Transport for NSW, thus allowing the previous road cross section to be increased to incorporate a 1.2 metre wide median and wider lanes
- Agreement with relevant bus authorities and Transport for NSW has been reached for the removal of bus bays to be replaced by bus shelters only
- Any works proposed for North Rocks Road west can be documented and constructed independently from the remainder of the scope if required to suit timing of land acquisition associated with this leg.

3.2.1 Design criteria

The design criteria is defined in Table 3-1.

Table 3-1: Defined design criteria

Design element	Design criteria	Remarks
Speed		
Design speed	Pennant Hills Road – 70 km/h North Rocks Road West – 60 km/h North Rocks Road East – 60 km/h	
Posted speed	Pennant Hills Road – 60 km/h North Rocks Road West – 50 km/h North Rocks Road East – 50 km/h	
Turn paths		
Design vehicle	Pennant Hills Road – 26 m B-Double North Rocks Road West – 12.5 m single unit truck/bus North Rocks Road East – 12.5 m single unit truck/bus	Pennant Hills Road is a designated B-double route. North Rocks Road East design vehicle adopted due to 3 Tonne load limit signposted, however is to consider a 12.5 m single unit truck/bus due to school buses running through North Rocks Road East.
Check vehicle	Pennant Hills Road – 26 m B-Double North Rocks Road West – 19 m semi-trailer North Rocks Road East – 12.5 m single unit truck/bus	Pennant Hills Road is a designated B-double route. North Rocks Road East check vehicle adopted due to 3 Tonne load limit signposted.

3.2.2 Engineering constraints

The design constraints identified include:

- Telstra pit at the corner of Pennant Hills Road and North Rocks Road West is a large conduit bank that would trigger significant utility relocation costs if impacted
- Partial acquisition of car wash café on corner of Murray Farm Road and Pennant Hills Road is to be avoided
- Property accesses along Pennant Hills Road and North Rocks Road are to be maintained if the project is not considering partial acquisition of these properties.

3.3 Construction activities

The construction activities for the additional road widening are consistent with the methodology as per the project REF as outlined below. Where more details have been provided based on the modification, these details have been added into the following sections.

3.3.1 Work methodology

Construction activities would be guided by a construction environmental management plan (CEMP) to ensure work is carried out to Transport for NSW specifications within the specified work area. Detailed work methodologies would be determined as part of the construction planning and documented within the CEMP.

The anticipated work methodology for the main contract works is described below.

Early Works

- Compound establishment at Transport for NSW vacant block at the north east corner of the intersection of Pennant Hills Road and North Rocks Road
- Utility investigations
- Early utility adjustments as required
- Early ground clearing / grubbing

Stage 1 Widening of Pennant Hills Road western verge

- Property adjustments and tree clearing
- Ground clearing / grubbing
- Utility adjustments into new service corridor
- Removal of existing footpath, driveways and kerb
- Excavate to foundation level (behind barriers)
- Install new stormwater pit and pipes
- Place and compact foundation and placement of asphalt or concrete pavement materials to finished levels (for either temporary or permanent pavements)
- Place new kerb, driveway, footpath and landscaping (turf)
- Seal and asphalt new lane (night works)
- Line marking (night works)
- Removal and replacement of signage and road furniture
- Installation of road lighting and ITS infrastructure

Stage 2 Widening into eastern verge of Pennant Hills Road north and into the northern verge of North Rocks Road east

- Property adjustments and tree clearing
- Excavate to base of retaining wall and ground levelling
- Construct retaining wall
- Backfill to required levels
- Utility adjustments into new service corridor
- Install drainage pipes and pits
- Excavate to foundation level for new road area
- Place and compact foundation and base materials to finished levels for new lane and footpath
- Relocate traffic control signals
- Place asphalt and concrete pavement works
- Build new footpath and kerb
- Place new kerb, driveway, footpath and landscaping (turf)
- Seal and asphalt new lane (night works)
- Line marking (night works)
- Removal and replacement of signage and road furniture
- Installation of road lighting and ITS infrastructure

Stage 3 Widening into western verge of Pennant Hills Road south and median drainage works

- Earthworks and levelling
- Excavate to foundation level for new road area
- Place and compact foundation and base materials to finished levels for new lane and footpath
- Relocate traffic control signals
- Concrete pavement works
- Build new footpath and kerb
- Place new kerb, driveway, footpath and landscaping (turf)
- Seal and asphalt new lane (night works)
- Line marking (night works)

- Removal and replacement of signage and road furniture
- Installation of road lighting and ITS infrastructure

Stage 4 Final works

- Construct raised median kerbs and median infill
- Correction course placement
- Place asphalt wearing course
- Landscaping and finishing works
- Installation of signage and road furniture
- Installation of road lighting and ITS infrastructure

Construction activities associated with trenching include:

- Site preparation
- Trench excavation, stockpiling of spoil material on the upslope side of trenches and/or carting material to stockpile
- Shoring and dewatering of trenches if required (depending upon trench depth and groundwater levels)
- Spreading of granular material such as sand or gravel along the bottom of the trench prior to laying
- Installing drainage pipes, gas mains, water mains, electrical conduits and telecommunications conduits
- Backfilling the trench with bedding material and excavated soil
- Compacting trench fill material
- Testing and commissioning pipelines
- Implementing traffic management measures
- Providing temporary access to properties where trench routes impact driveways
- Site reinstatement.

The construction boundary (proposal area) for the determined project and the proposed modification is shown below in Figure 3-1.

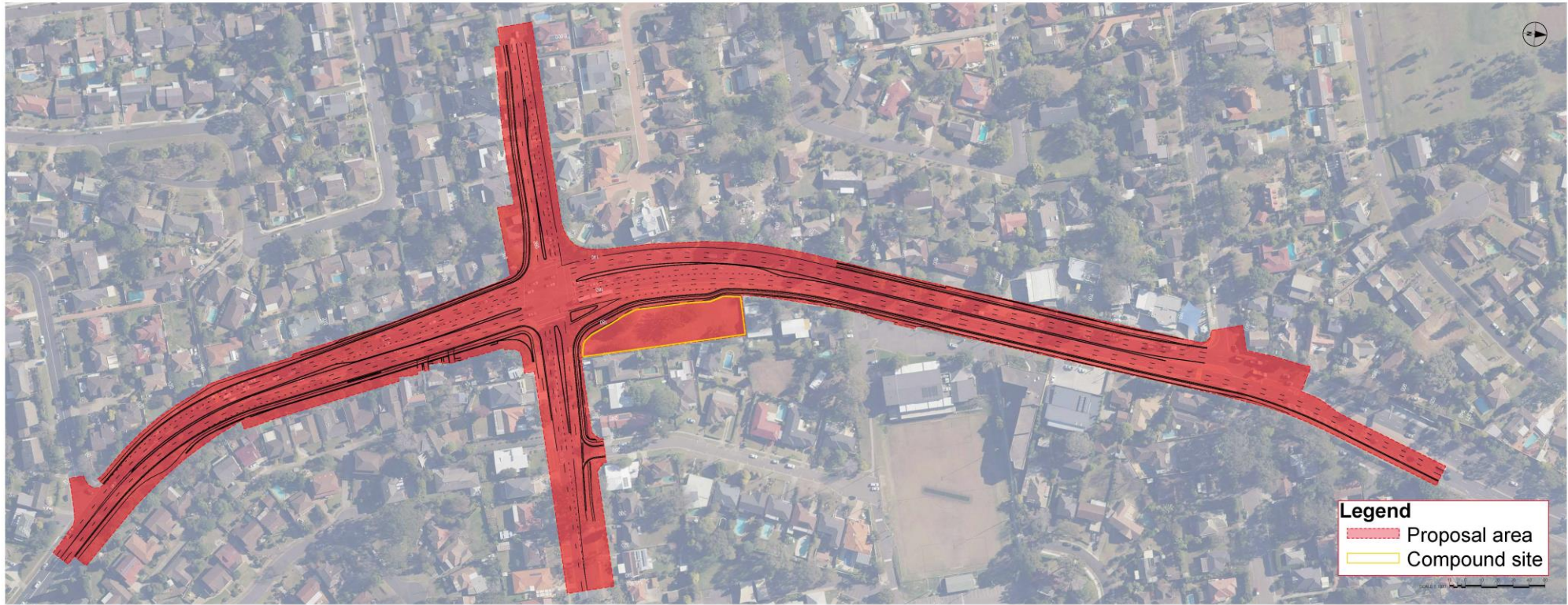


Figure 3-1 Proposal area which includes the construction works extent

3.3.2 Construction hours and duration

Construction hours and duration would be consistent with the project REF. The works would start in either late 2021 or early 2022 and will take up to two years to complete.

Due to the requirement of lane closures and utility relocations on Pennant Hills Road and North Rocks Road, the majority of works would be undertaken under a Road Occupancy Licence (ROL) outside of standard working hours:

- Monday to Friday: 7am and 6pm
- Saturday: 8am and 1pm
- No work on Sundays or public holidays.

However, to minimise disruption to daily traffic and access to surrounding land owners and businesses, and to ensure the safety of workers, it would be necessary to carry out work outside of standard working hours. Noisier activities such as jackhammering and concrete cutting will be completed by midnight. These hours would be in accordance with the Road Occupancy Licence (ROL) issued by the Transport Management Centre and up to five nights a week as follows:

- Evening / night work hours – Sunday to Thursday
- No work on public holidays.

Approval from Transport for NSW would be required for out of hours works and the affected community would be engagement of the proposed construction hours at least five working days prior to works commencing in accordance with the *Construction Noise and Vibration Guideline* (Roads and Maritime, August 2016) and EPA *Interim Construction Noise Guideline* (ICNG) (DECC, 2009). They would be provided with works details and contact information if there are any issues.

Potential noise impacts from construction activities are discussed further in Section 6.1.

3.3.3 Plant and equipment

A range of plant and equipment would be used during construction. The final equipment and plant requirements would be determined by the construction contractor. An indicative list of plant and equipment is provided below in Table 3-2.

Table 3-2: Indicative plant and equipment

Equipment (as per project REF)	Additional equipment (for proposed modification)
<ul style="list-style-type: none"> • Rigid and articulated trucks • Semi-trailers to deliver materials • Bobcat • Forklift • Up to 20 tonne excavators with hammer for demolition of concrete pavements • Vibrating and smooth drum rollers • Asphalt paver • Multi tyred roller • 30 tonne trucks for delivering asphalt and concrete • Road profiler • Lighting towers • Generators • Light vehicles • Electric and fuel powered hand tools • Water cart • Line marking machine • Concrete saw / Road cutting saw • Bitumen sprayer • Tree pruning truck and mulcher • Trucks with boom lift and hiab • Jack hammers. 	<ul style="list-style-type: none"> • Vacuum excavator (Sucker Truck) • Concrete pumps (Pumpcrete) • Concrete mixer/truck • Vibration Plate • Wacker Packer • Franna Crane • Horizontal Directional Drilling machine • Water pump • Concrete vibrators • 12t or 15t excavator with piling auger attachment • Circular saw (water pipe cutting) • Air compressor and pneumatic tools • Elevated working platforms • Shuttle buggy • Kerb and barrier slipform machine.

3.3.4 Earthworks

The proposed modification would require earthworks for road widening, intersection upgrade works and utility trenching.

Approximate quantities of material are as follows:

- 11,000m³ of excavated material (cut)

3.3.5 Source and quantity of materials

Fill would be required at various locations. Consistent with the project REF, aggregate pavement materials would be imported from a local quarry using truck and dog. Concrete for kerbs, pavement and structures would be sourced from local suppliers.

As outlined in section 3.3.4 above, about 11,000 m³ of earthworks would be cut from the removal of the footpath, verge and road and disposed of offsite.

The source and quantity of materials would be determined during the detailed design phase of the proposal, and would consider the requirements of the *NSW Sustainable Design Guidelines – Version 4.0*. Materials would be sourced from local suppliers where practicable. Surplus material that is not able to be used on-site as part of the proposal would be reused or disposed of in the following order of priority:

- Transfer to a Transport for NSW approved site for reuse (with appropriate approvals as required)
- Disposal at an approved materials recycling or waste disposal facility
- As otherwise provided for by the relevant waste legislation.

The process for management of excess material would be detailed in a Waste and Resource Recovery Management Plan (WMRRP) that would form part of the CEMP. Water for construction would be sourced from available hydrants in the area. The required quantities of water are not yet known, however the use of material such as ready mix concrete (required for pavement and kerbs) would reduce the amount of onsite water required during construction. Water would also be required for compaction of pavement layers, such as select layers to adjust the moisture content, and for dust suppression.

3.3.6 Traffic management and access

Traffic management

Consistent with the project REF, a Traffic Management Plan (TMP) would be prepared in accordance with *Roads and Maritime Services Traffic Control at Work Sites Manual* (RTA, 2010), Transport for NSW Specification G10 – Traffic Management (RMS, 2015). The TMP will be implemented during the construction period to manage and reduce the impacts of the proposal along all affected roads throughout construction.

The TMP will also detail specific routes that construction traffic would follow during the construction phase and address impacts to other traffic such as pedestrian and cyclist traffic. All works will be undertaken in accordance with the TMP.

Road and lane closures

Traffic controls such as detour and contraflow arrangements may be utilised to ensure access is maintained during construction. Any changes to the route requiring detours would be communicated to road users in advance via Variable Message Signs (VMS) and community notifications. Traffic delays would be managed with the TMP.

Vehicle movements

Maintaining traffic flow during construction is a key consideration for construction traffic planning for the proposal. It is expected that about 10 construction plant and/or heavy vehicles per day during the peak construction period would be required.

Construction traffic would generally use Pennant Hills Road and North Rocks Road to travel to and from the proposal site construction compound which will be located at the corner of Pennant Hills Road and North Rocks Road within the proposal area (refer Section 3.4). Due to the location of the site compound being so close to the work site, no dedicated haulage routes are required.

Parking

'No Stopping' and 'No Parking' zones are in place along both directions of Pennant Hills Road and North Rocks Road near the intersection. In addition, clearways are in operation along Pennant Hills Road during the hours of 6:00am to 7:00pm on weekdays and 8:00am to 8:00pm on weekends and public holidays. No additional construction parking spaces would be required for the proposed modification.

Access

Properties which have direct driveway access to the proposal area may require temporary access adjustments during the construction phase. All residents and businesses whose access would be impacted would be notified prior to commencement of works and consulted regarding alternative arrangements (e.g. use of parking on adjacent side streets).

Public transport

There are seven bus stops in the proposal area (bus ID 211855, 211864, 211865, 211825, 211824, 211831 and 2118174) as shown in Figure 3-2. All bus stops would remain operational during construction, with temporary bus stops in place while new bus shelters are constructed.

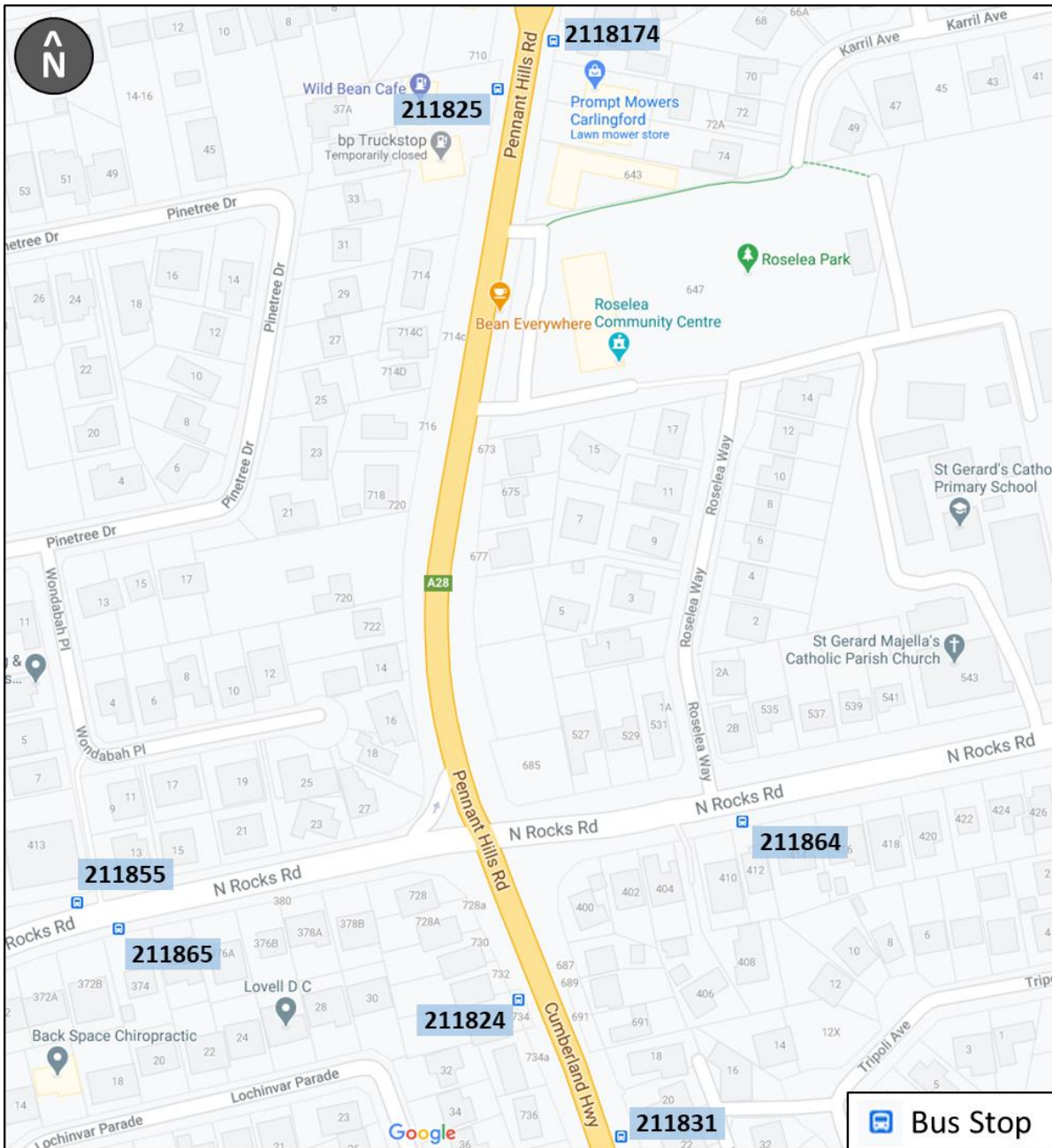


Figure 3-2 Location of the seven bus stops within the proposal area

Pedestrian access

As part of preliminary construction staging plans, it is likely the existing pedestrian footpaths adjacent to the work areas (along North Rocks Road and Pennant Hills Road where the widening is occurring) will be temporarily occupied. Wayfinding signage will be used to direct pedestrians to the other side of the footpath using the existing at grade pedestrian crossing near the Roselea Community Centre. Similarly, on North Rocks Road west where widening is occurring, wayfinding signage will be used to direct pedestrians around the works.

3.4 Ancillary facilities

The ancillary facility required for the proposal would be consistent with that described in the project REF. The site is located on the north eastern corner of Pennant Hills Road and North Rocks Road (refer Figure 3-3). Refer to section 3.4 of the project REF for further details and section 6 of the project REF for the environmental assessment undertaken for the site.

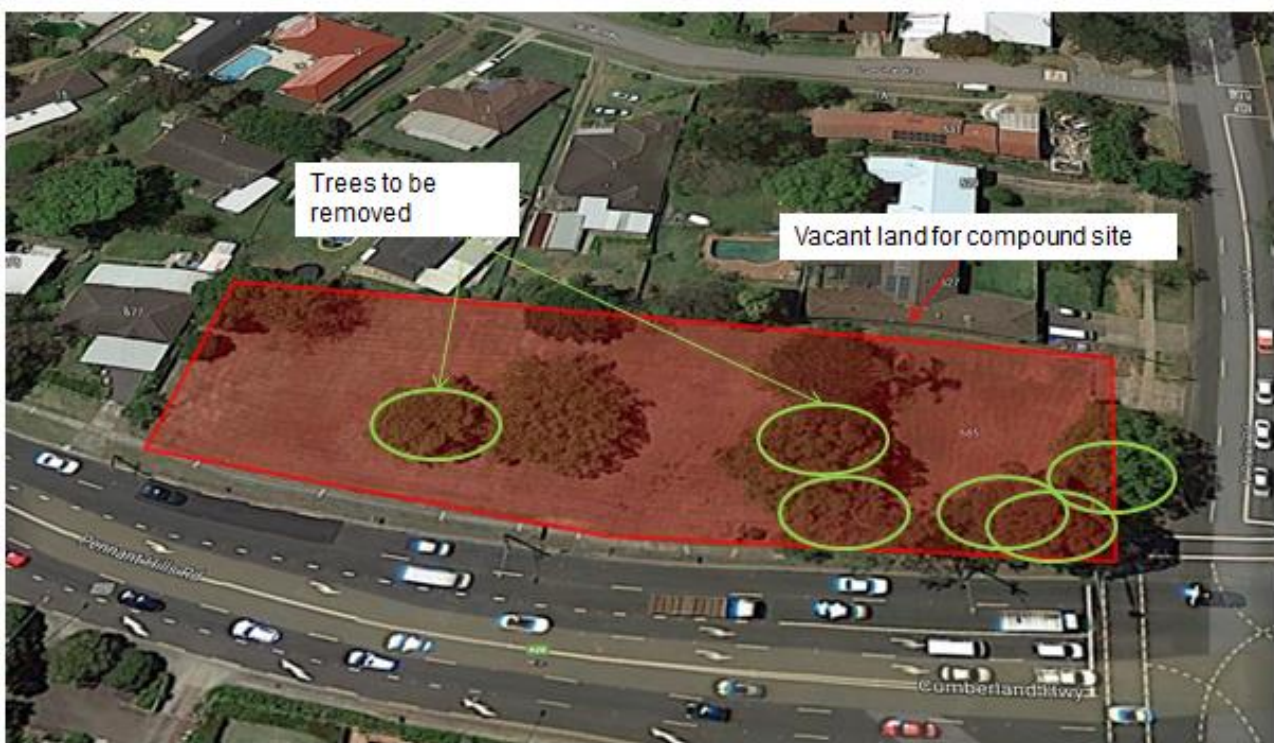


Figure 3-3 Compound site for the project (Source: Project REF, 2018)

3.5 Public utility adjustment

There are several existing utilities within the proposal including water mains, electrical poles with street lighting luminaires and overhead lines, electrical underground cables, communications, and gas main. Existing utilities identified as likely to be impacted due to widening are listed in Table 3-3 and shown in Appendix D. These utilities would require further investigation to confirm the location and length of the assets. Consultation with public utility authorities has not been undertaken as part of the development of the design and would be required prior to relocations and/or adjustments.

Table 3-3 Public utilities in proposal area likely requiring adjustment

Utility	Utility treatment and location
Ausgrid – Electrical - Underground	Relocate: <ul style="list-style-type: none"> • Pennant Hill Rd southbound verge between design CH230 (20 Tripoli Ave) and CH520 (675 Pennant Hills Rd) - Approximate length 290m • North Rocks Rd east - in front of 402 N Rocks Rd and Roselea Way - Approximate length 30m
Ausgrid – Electrical - Overhead	Relocate: <ul style="list-style-type: none"> • Pennant Hill Rd northbound verge between design CH200 (738 Pennant Hills Rd) and CH280 (734a Cumberland Hwy) - Approximate length 80m • Pennant Hill Rd southbound verge between design CH100 (48 Tripoli Ave) and CH840 (629 Pennant Hills Rd) - Approximate length 740m • North Rocks Rd westbound verge between design CH180 (400 N Rocks Rd) and CH280 (412 N Rocks Rd) - Approximate length 100m
Endeavour Energy – Electrical Overhead	Relocate: <ul style="list-style-type: none"> • North Rocks Rd westbound verge between design CH00 (374 N Rocks Rd) and CH140 (728 Pennant Hills Rd) - Approximate length 140m
Sydney Water	Relocate: <ul style="list-style-type: none"> • Pennant Hill Rd southbound verge between design CH60 (50 Tripoli Ave) and CH210 (22 Tripoli Ave) - Approximate length 150m • Pennant Hill Rd southbound verge between design CH210 (22 Tripoli Ave) and CH490 (677 Pennant Hills Rd) - Approximate length 280m • Pennant Hill Rd southbound verge between design CH620 (Bean Everywhere) and CH840 (629 Pennant Hills Rd) - Approximate length 220m • Pennant Hill Rd northbound verge between design CH200 (738 Pennant Hills Rd) and CH260 (736 Pennant Hills Rd) - Approximate length 60m • Pennant Hill Rd northbound verge between design CH540 (716 Pennant Hills Rd) and CH720 (710 A28 Pennant Hills Rd) - Approximate length 180m • North Rocks Rd westbound verge between design CH20 (376A N Rocks Rd) and CH140 (728 Pennant Hills Rd) - Approximate length 120m • North Rocks Rd east - near Roselea Way - Approximate length 30m

Utility	Utility treatment and location
Telecommunications – Optus / Telstra – Overhead	Relocate: <ul style="list-style-type: none"> • Pennant Hill Rd northbound verge between design CH200 (738 Pennant Hills Rd) and CH280 (734a Cumberland Hwy) - Approximate length 80m • Pennant Hill Rd southbound verge between design CH100 (48 Tripoli Ave) and CH840 (629 Pennant Hills Rd) - Approximate length 740m • North Rocks Rd westbound verge between design CH00 (374 N Rocks Rd) and CH280 (412 N Rocks Rd) - Approximate length 280m
Telecommunications – NBN / Telstra / Other Carriers – Underground	Relocate: <ul style="list-style-type: none"> • Pennant Hill Rd southbound verge between design CH210 (22 Tripoli Ave) and CH500 (677 Pennant Hills Rd) - Approximate length 290m • Pennant Hill Rd southbound verge between design CH540 (673 Pennant Hills Rd) and CH840 (629 Pennant Hills Rd) - Approximate length 220m • Pennant Hill Rd northbound verge between design CH170 (738 Pennant Hills Rd) and CH260 (736 Pennant Hills Rd) - Approximate length 60m • Pennant Hill Rd northbound verge between design CH540 (716 Pennant Hills Rd) and CH620 (714 Pennant Hills Rd) - Approximate length 80m • North Rocks Rd westbound verge between design CH20 (376A N Rocks Rd) and CH180 (400 N Rocks Rd) - Approximate length 160m • North Rocks Rd eastbound verge between design CH110 (27 Wondabah PI) and CH200 (527 N Rocks Rd) - Approximate length 900m • Pennant Hill Rd road crossing in front of 22 Tripoli Ave (CH220 and CH230) - Approximate length 25m • Pennant Hill Rd road crossing at the intersection of Pennant Hill Rd and Murray Farm Rd (CH790) - Approximate length 25m • North Rocks Rd road crossing in front of 27 Wondabah PI (CH110) - Approximate length 25m

Utility	Utility treatment and location
Jemena - Gas	Relocate: <ul style="list-style-type: none"> • Pennant Hill Rd southbound verge between design CH210 (22 Tripoli Ave) and CH490 (677 Pennant Hills Rd) - Approximate length 280m • Pennant Hill Rd northbound verge between design CH200 (738 Pennant Hills Rd) and CH280 (734 Pennant Hills Rd) - Approximate length 80m • North Rocks Rd westbound verge between design CH20 (376A N Rocks Rd) and CH140 (728 Pennant Hills Rd) - Approximate length 120m • Pennant Hill Rd road crossing in front of 635 Pennant Hills Rd (CH750) - Approximate length 25m

3.5.1 Traffic Control Signals

At the Pennant Hills Road/North Rocks Road intersection the potential changes to Traffic Control Signals (TCS) infrastructure will include the following:

- Four new type 2 posts are provided across the intersection. At North Rocks Road West, a type 2 post is proposed in the central median which has been locally widened to a minimum 1.5m
- One new type 9 mast arm is proposed on North Rocks Road in the westbound approach
- Two new type 6 posts are proposed on Pennant Hills Road northbound and on the new southbound traffic island which facilitates the high-entry angle left turn movement. This will also provide mounding for directional signage
- One type 13 post (short push button post) is proposed within the central median of North Rocks Road (western leg)
- TCS controller and CCTV housing on the north-eastern corner to be relocated
- Two new type 11 mast arm posts are proposed on the south-western and north-eastern corners of the intersection to accommodate traffic signals for increased carriageway widths.

The midblock pedestrian crossing at Pennant Hills Road is proposed to be reinstated at the same location with the following changes to TCS:

- Two type 2 posts are to be provided at the kerb ramps
- Two type 5XL mast arms either side of the midblock crossing.

3.6 Bus stop adjustment

Three of the existing bus bays on Pennant Hills Road between Woodstock Road and Murray Farm Road would be converted to trafficable through lanes. The three bus shelters would be relocated to the proposed footpath as detailed below and described in Figure 3-4:

- Bus Shelter B (ID 211831) would be relocated to the back of the verge and 18 metres south from the original location
- Bus Shelter C (ID 211825) would be relocated to the back of the verge with the shared path diverted around it
- Bus Shelter D (ID 2118174) would be relocated to the front of the Roselea Community Centre, 150 metres south of its original location.

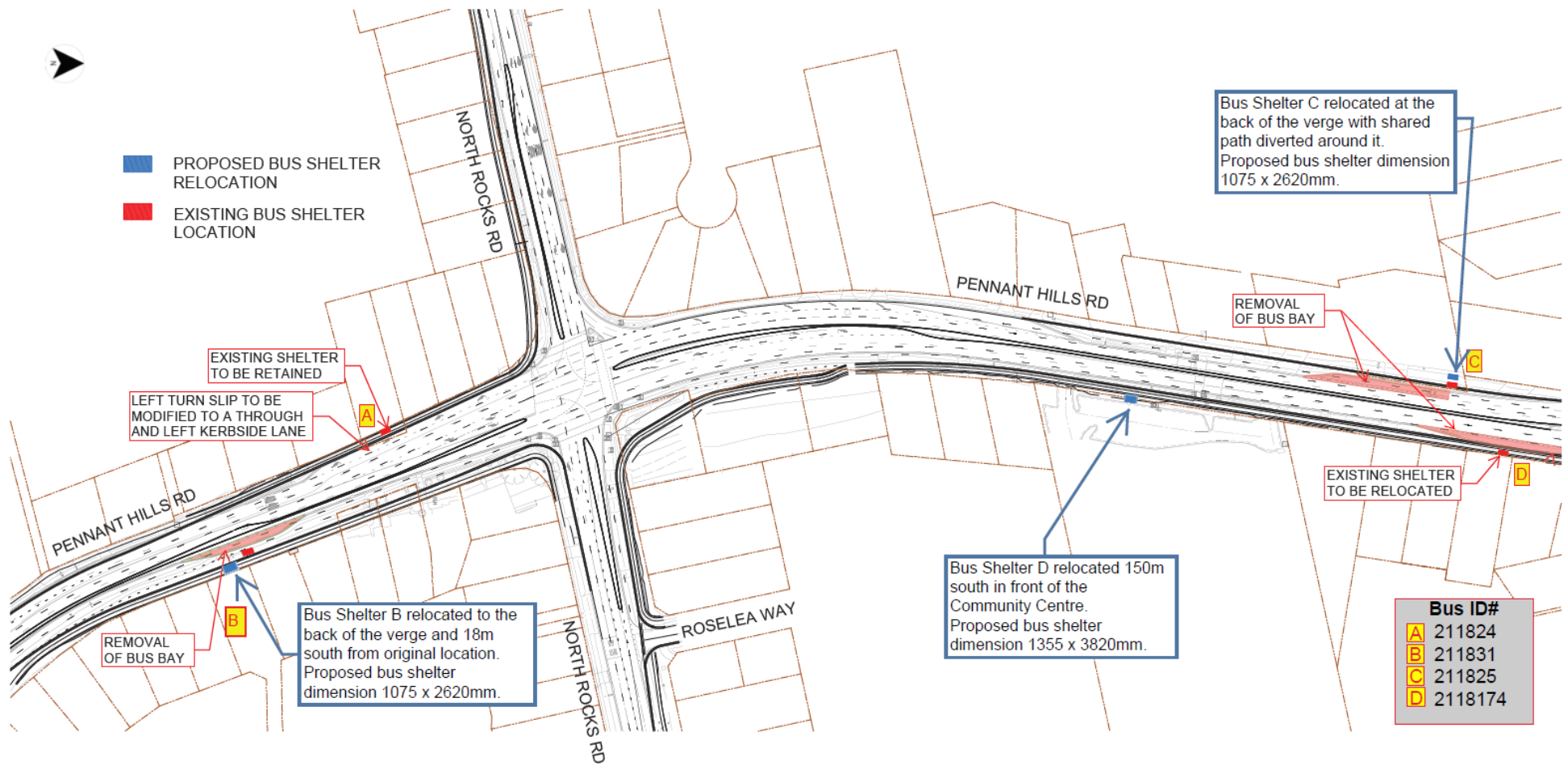


Figure 3-4 Proposed impacts to bus shelters on Pennant Hills Road between Woodstock Avenue and Murray Farm Road

3.7 Parking adjustment

There would be loss of about five unrestricted parking spots due to the proposed taper on the north side of North Rocks Road east of Roselea Way (refer to Figure 1-3). The five parking spots are located in front of residential properties, all of which have driveway access off either North Rocks Road or Roselea Way. In the vicinity of the five parking spots there are unrestricted parking spaces along Roselea Way and further east on both sides of North Rocks Road.

3.8 Pedestrian footpath adjustment

Wider footpaths would be installed, where possible, that can be upgraded to shared paths in the future by the City of Parramatta Council on:

- the northern side of North Rocks Road between Roselea Way and Pennant Hills Road
- the eastern side of Pennant Hills Road north between North Rocks Road and the mid-block crossing near Murray Farm Road
- the southern side of North Rocks Road along a quarter of the block between Pennant Hills Road and Jenkins Road – the wider footpath will run for approximately 130 metres from the intersection.

Refer to Figure 1-3 for the location of the wider footpaths.

3.9 Property acquisition and adjustment

The project REF did not require private property acquisition, although some property boundary and driveway modifications along Pennant Hills Road due to the widening works were identified. Since determination, partial acquisition of land from the BP Carlingford petrol station that extends into the road corridor has been identified, thus allowing the previous road cross section to be increased to incorporate a 1.2m wide median and wider lanes. The properties requiring acquisition are detailed in Table 3-4 and the properties only requiring boundary modifications are detailed in

Table 3-5. The boundary modifications are to remove fences to correct property boundaries and reclaim the Transport for NSW-owned road reserve. Properties requiring boundary adjustments due to determined project with proposed modification are shown in

Figure 3-5.

Table 3-4: Proposed property acquisition

ID	Description	Total area (m²)	Acquisition type	Current owner	Lot and DP	Land use zone (LEP)	Comment
1	376A North Rocks Road	19	Required partial acquisition	Private property	Lot 1 DP502151	R2 – Low density residential	Existing boundary to be pushed south
2	376B North Rocks Road	48	Required partial acquisition	Private property	Lot 5 DP502151	R2 – Low density residential	Existing boundary to be pushed south
3	378A North Rocks Road	59	Required partial acquisition	Private property	Lot 3 DP509854	R2 – Low density residential	Existing boundary to be pushed south
4	378B North Rocks Road	57	Required partial acquisition	Private property	Lot 1 DP509854	R2 – Low density residential	Existing boundary to be pushed south
5	728 Pennant Hills Road	649	Required full acquisition	Private property	Lot 1 DP726718	R2 – Low density residential	Structure to be demolished
6	712 – 714 Pennant Hills Road	265	Required partial acquisition	BP Carlingford	Lot 31 DP1060821	R2 – Low density residential / SP2 – Infrastructure (Amendment No. 60)	Existing boundary to be pushed west

Table 3-5: Proposed property boundary adjustments

ID	Description	Indicative area of to be adjusted (m²)	Current owner	Lot and DP	Land use zone (LEP)	Comment
1	679-683 Pennant Hills Road (685 Pennant Hills Road)	300	Transport for New South Wales	Lot 2/3 DP205746	R2 – Low density residential / SP2 – Infrastructure	Existing boundary pushed east (TfNSW land)
2	685 Pennant Hills Road	370	Transport for New South Wales	Lot 1 DP205746	R2 – Low density residential / SP2 – Infrastructure	Existing boundary pushed east (TfNSW land)
3	687 Pennant Hills Road	100	Private property	Lot 1 DP865243	R2 – Low density residential	Existing boundary pushed east to the official property boundary
4	689 Pennant Hills Road	120	Private property	Lot 1 DP864232	R2 – Low density residential	Existing boundary pushed east to the official property boundary
5	691 Pennant Hills Road	120	Private property	Lot 10 DP1017453	R2 – Low density residential	Existing boundary pushed east to the official property boundary
6	400 North Rocks Road	320	Private property	Lot 1 DP135227	R2 – Low density residential	Existing boundary pushed east to the official property boundary
7	714C Pennant Hills Road	110	Private property	Lot 412 DP874457	R2 – Low density residential	Existing boundary to be pushed west to official property boundary

ID	Description	Indicative area of to be adjusted (m²)	Current owner	Lot and DP	Land use zone (LEP)	Comment
8	714D Pennant Hills Road	120	Private property	Lot 1 DP874458	R2 – Low density residential	Existing boundary to be pushed west to official property boundary
9	18 Tripoli Avenue	25	Private property	Lot 24 DP263807	R2 – Low density residential	Existing boundary to be pushed east to official property boundary
10	20 Tripoli Avenue	25	Private property	Lot 23 DP263807	R2 – Low density residential	Existing boundary to be pushed east to official property boundary
11	22 Tripoli Avenue	25	Private property	Lot 22 DP263807	R2 – Low density residential	Existing boundary to be pushed east to official property boundary
12	24 Tripoli Avenue	25	Private property	Lot 21 DP263807	R2 – Low density residential	Existing boundary to be pushed east to official property boundary
13	26 Tripoli Avenue	25	Private property	Lot 20 DP263807	R2 – Low density residential	Existing boundary to be pushed east to official property boundary
14	28 Tripoli Avenue	25	Private property	Lot 19 DP263807	R2 – Low density residential	Existing boundary to be pushed east to official property boundary

ID	Description	Indicative area of to be adjusted (m²)	Current owner	Lot and DP	Land use zone (LEP)	Comment
15	30 Tripoli Avenue	25	Private property	Lot 18 DP263807	R2 – Low density residential	Existing boundary to be pushed east to official property boundary
16	46 Tripoli Avenue	25	Private property	Lot 17 DP263807	R2 – Low density residential	Existing boundary to be pushed east to official property boundary

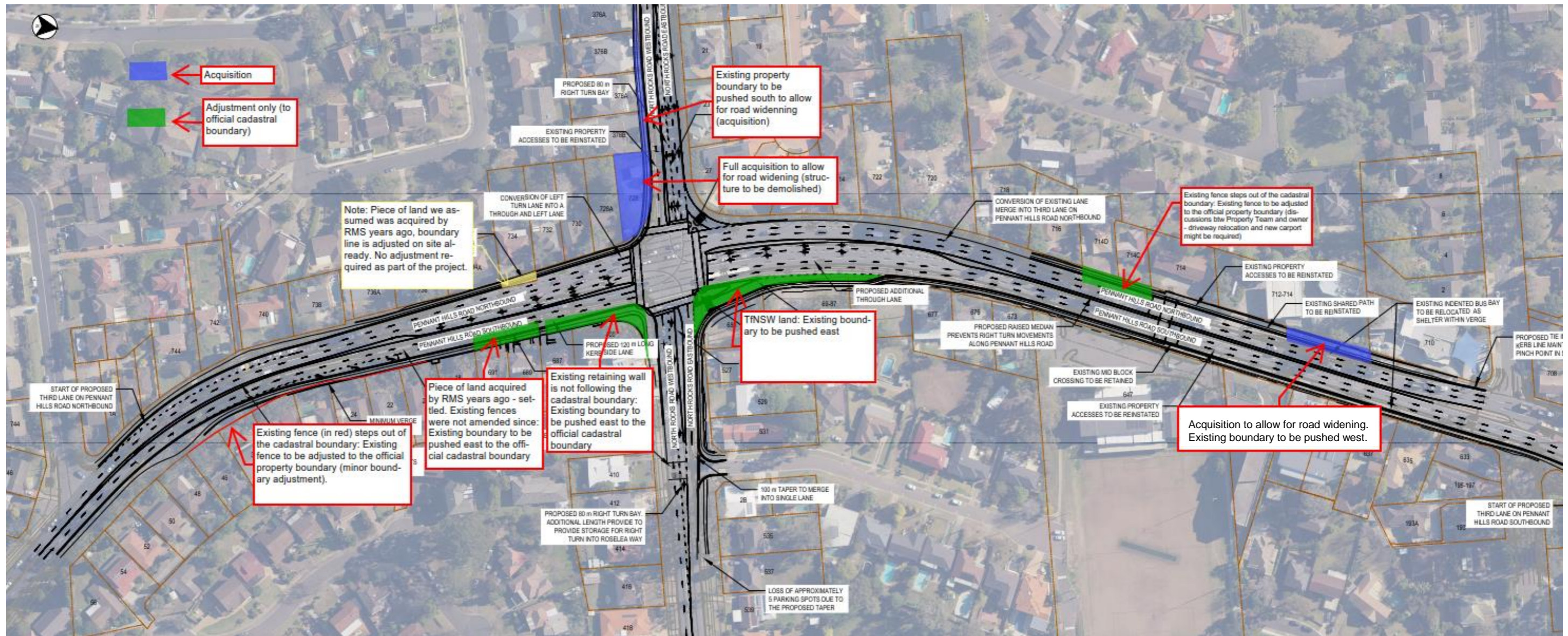


Figure 3-5: Proposed property acquisition

4 Statutory and planning framework

The proposal is consistent with the statutory and planning framework as per the project REF. No additional statutory or planning requirements were identified for the additional property acquisition and alterations and additional vegetation impacts.

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

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP), 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 addendum REF.

4.1.2 Local Environmental Plans

The Proposal is located within the Parramatta Local Government Area (LGA) (former Hills Shire Council and Shire of Hornsby Council). The land on which the Proposal is located on is still governed by the Hills Local Environmental Plan (LEP) 2012 and the Hornsby LEP 2013.

The relevant local government provisions for the proposal modifications are outlined in Table 4-1 and Table 4-2 below. Section 5.12 of both LEP's states the following:

“This Plan does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent, or that is exempt development, under State Environmental Planning Policy (Infrastructure) 2007 (ISEPP)”. As the Proposal is permitted without consent under ISEPP, the consent requirements of the LEP do not apply.

Land use zoning in the vicinity of the proposal area is shown in Figure 4-1.

The Hills Local Environmental Plan 2012

Table 4-1 Applicable land use zoning and objectives of the proposal modifications under the Hills LEP 2012

Zoning	Objective
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 maintain the existing low density residential character of the area.
SP2 – Infrastructure: Road and Traffic Facility	<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.
RE1 – Public Recreation	<ul style="list-style-type: none"> To enable land to be used for public open space or recreational purposes. To provide a range of recreational settings and activities and compatible land uses. To protect and enhance the natural environment for recreational purposes.

Hornsby Local Environmental Plan 2013

Table 4-2 Applicable land use zoning and objectives of the proposal modifications under the Hornsby LEP 2013

Zoning	Objective
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
SP2 – Infrastructure: Road and Traffic Facility	<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.
RE1 – Public Recreation	<ul style="list-style-type: none"> To enable land to be used for public open space or recreational purposes. To provide a range of recreational settings and activities and compatible land uses. To protect and enhance the natural environment for recreational purposes. To protect and maintain areas of bushland that have ecological value.

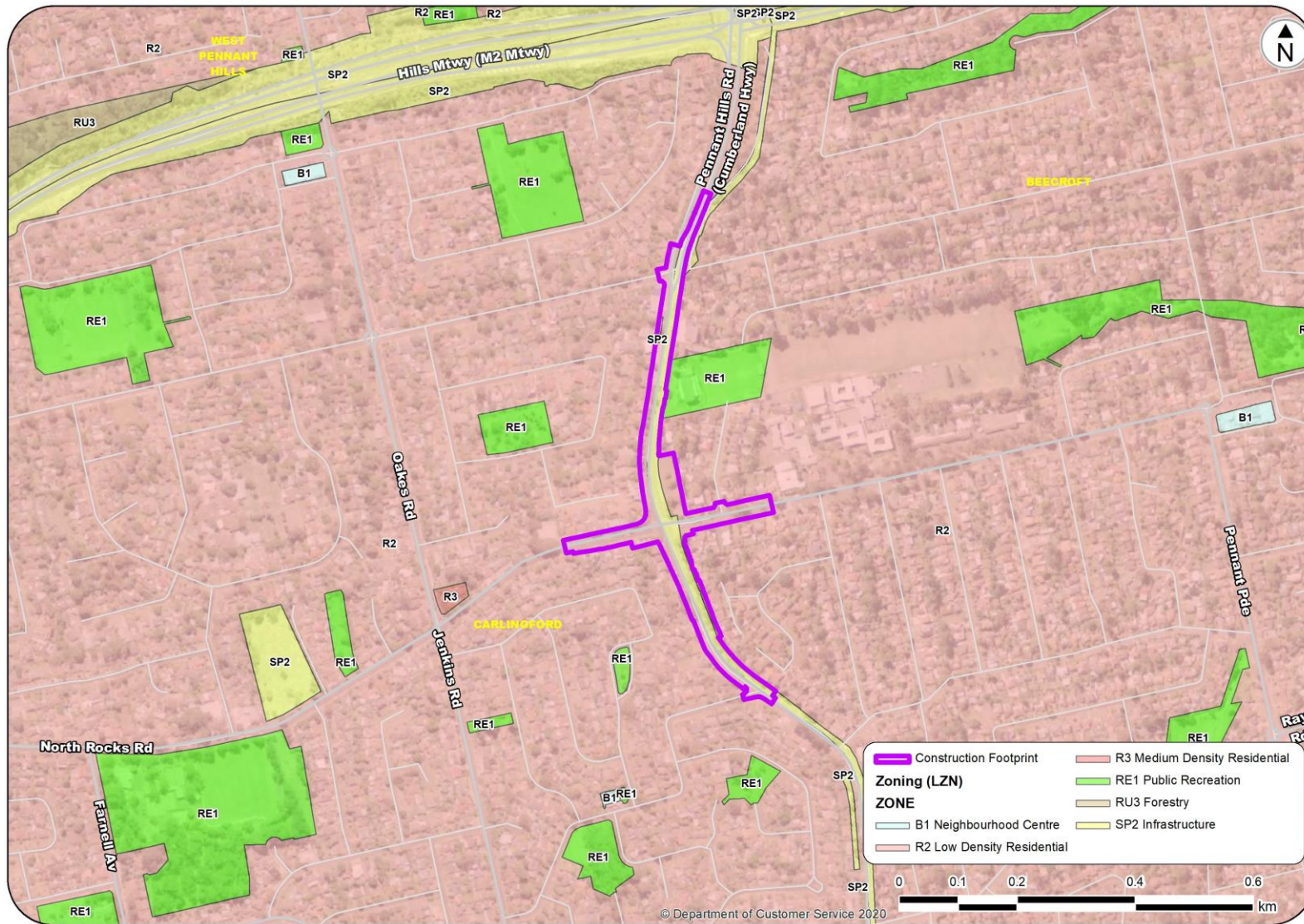


Figure 4-1: Land use zoning for the project modification

Pennant Hills Road and North Rocks Road, Carlingford
 Intersection Upgrade Addendum REF – May 2021

4.2 Other relevant NSW legislation

4.2.1 Biodiversity Conservation Act 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act) aims to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BC Act replaces the *Threatened Species Conservation Act 1995* (TSC Act) as the key piece of legislation that identifies and protects threatened species, populations and ecological communities in NSW.

The BC Act lists a number of threatened species, populations or ecological communities to be considered in deciding whether there is likely to be a significant impact on threatened biota, or their habitats. If any of these could be impacted by the Proposal, an assessment of significance that addresses the requirements of section 1.7 of the EP&A Act must be completed to determine the significance of the impact.

The proposal corridor does not contain suitable habitat for any listed threatened species, population or community listed under the BC Act and as such, the proposal is unlikely to result in a significant impact upon any threatened species or community listed under the BC Act. Refer to Section 6.2 for the assessment on impacts to biodiversity.

4.2.2 Biosecurity Act 2015

The *Biosecurity Act 2015* and its subordinate legislation commenced on 1 July 2017. The *Biosecurity Act 2015* replaces wholly or in part 14 separate pieces of biosecurity related legislation including the Noxious Weeds Act 1993. Under the *Biosecurity Act 2015*, all plants, including weeds 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.

The *Biosecurity Act 2015* and Regulations provide specific legal requirements for high risk activities and State level priority weeds. The State level priority weeds and associated legal requirements relevant to the region are outlined in the Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022 (Greater Sydney Local Land Services, 2017) together with the high risk priority weeds from the regional prioritisation process. As such if present, priority weeds on the site should be assessed and controlled to fulfil the General Biosecurity Duty and minimise biosecurity risks.

4.2.3 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) aims to conserve nature, habitat, ecosystems, ecosystem processes and biological diversity at the community, species and genetic levels. It also legislates Aboriginal heritage in NSW. This Act is administered by the Office of Environment and Heritage (OEH). The proposal is not located on land reserved under this Act.

Part 6 of this Act refers to Aboriginal objects and places and prevents persons from impacting on an Aboriginal place or relic, without consent or a permit. The Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation was followed. Potential impacts on Aboriginal heritage are considered unlikely and are discussed further in Section 6.6.

4.2.4 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to protect and preserve items of non-Aboriginal heritage significance. The Heritage Act provides for the protection of items of local, regional and State heritage significance. It establishes a list of State Heritage Items and outlines process for approval of development which may impact items of non-Aboriginal heritage significance. Database searches showed there are a number of heritage items in the vicinity of the proposal. As they are located outside of the proposal area, the assessment concluded that the project is unlikely to impact on any items of local, regional and State heritage significance as discussed in Section 6.7.

4.2.5 The Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) establishes the procedures for issuing licences for environmental protection in relation to aspects such as waste, air, water and noise pollution control. The owner or occupier of premises engaged in scheduled activities is required to hold an environment protection licence and comply with the conditions of that licence.

Under Part 3.2 of the POEO Act, the carrying out of scheduled development work as defined in Schedule 1 requires an environmental protection licence. Schedule 1, Clause 35 (road construction) is potentially relevant to the Proposal. Road construction is defined by Clause 35(1) as ‘...the construction, widening or re-routing of roads, but does not apply to the maintenance or operation of any such road’.

Clause 35(2) specifies that road construction is declared to be a scheduled activity if it results in four or more traffic lanes (not including bicycle lanes or lanes used for entry or exit), where the road is classified or proposed to be classified as a main road (but not a freeway or tollway) under the Roads Act 1993, for at least three kilometres of its length in the metropolitan area, or five kilometres of its length in any other area.

The proposal involves the upgrade of an intersection in the Sydney metropolitan area and is therefore not a ‘scheduled activity’ under Schedule 1 of the POEO Act and would not require an EPL.

The Proposal involves the upgrade of a four-lane road (two in each direction), with an additional lane being added, however the proposal length is less than three kilometres. It is not expected that any other scheduled activities would be triggered and therefore an environmental protection licence is not anticipated to be required however the contractor and Transport for NSW are obliged to notify the Environment Protection Authority (EPA) when a ‘pollution incident’ occurs that causes or threatens ‘material harm’ to the environment.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

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

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

Potential impacts to these biodiversity matters are also considered as part of chapter 6 of the addendum REF and Appendix G.

Findings – matters of national environmental significance (other than biodiversity matters)

The assessment of the proposed modification's impact on matters of national environmental significance and the environment of Commonwealth land found that there would be no change to the findings of the determined activity and would be unlikely to cause a significant impact on matters of national environmental significance or the environment of Commonwealth land. A referral to the Australian Government Department of Agriculture, Water and the Environment is not required.

4.4 Confirmation of statutory position

The proposed modification 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 proposed modification is permissible without consent. The proposed modification is not State significant infrastructure or State significant development. The proposed modification can be assessed under Division 5.1 of the EP&A Act. Consent from Council is not required.

Transport for NSW is the determining authority for the Proposal. This addendum REF fulfils Transport for NSW's obligation under clause 111 of the EP&A Act to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5 Consultation

The project REF described the consultation on the determined project undertaken in December 2017 and how the project responded to feedback. For the proposed modification, Transport of NSW invited community feedback on the proposal in November 2020.

5.1 Consultation strategy

Consultation activities conducted for the proposed modification (including the scope of the determined project) and the outcomes of these are documented in the Community Consultation Report included in Appendix E. The Community Consultation report outlines the consultation approach carried out, a summary of matters raised by the community, Transport for NSW response to the matters raised, and the next steps to be carried out by Transport for NSW, such as further engagement and engagement outcomes.

The objectives of consultation were to:

- seek comment, feedback, ideas and suggestions on the proposed modification, to inform the decisions on the proposed modification
- advise directly affected stakeholders of the proposed modification
- build a database of interested and concerned community members to continue engagement during the project's development and delivery
- advise the community on how they can obtain further information and provide feedback.

Community consultation was carried out from 18 November to 18 December 2020. A summary of the communications tools and methodology used as part of the consultation strategy is provided in Table 5-1.

Table 5-1 Communication tools and methodology

Consultation methods	
Channel	Message
Print community update via letterbox	Have your say - a community update was distributed to 1,574 residences and businesses in the local area on 18 November 2020 (see Figure 5-1 for distribution zone)
Emails to stakeholders	Emails including updates on the project including the proposed modification were sent to the council and the community who have subscribed to email updates.
Project website	Project page on the Transport for NSW (Roads and Maritime) website: https://www.rms.nsw.gov.au/projects/pennant-hills-road-north-rocks-road-carlingford/index.html
Media releases	Media release was distributed on 9 November.
Social media	Geo-targeted Facebook post 1 ran from 17 December to 30 November 2020 and post 2 ran from 12 December to 18 December 2020. These posts reached 116,383 people and 94,458 people respectively.

Consultation methods	
Channel	Message
Facebook Live information session	Geo-targeted Facebook live event on 4 December 2020 reached 28,128 people.

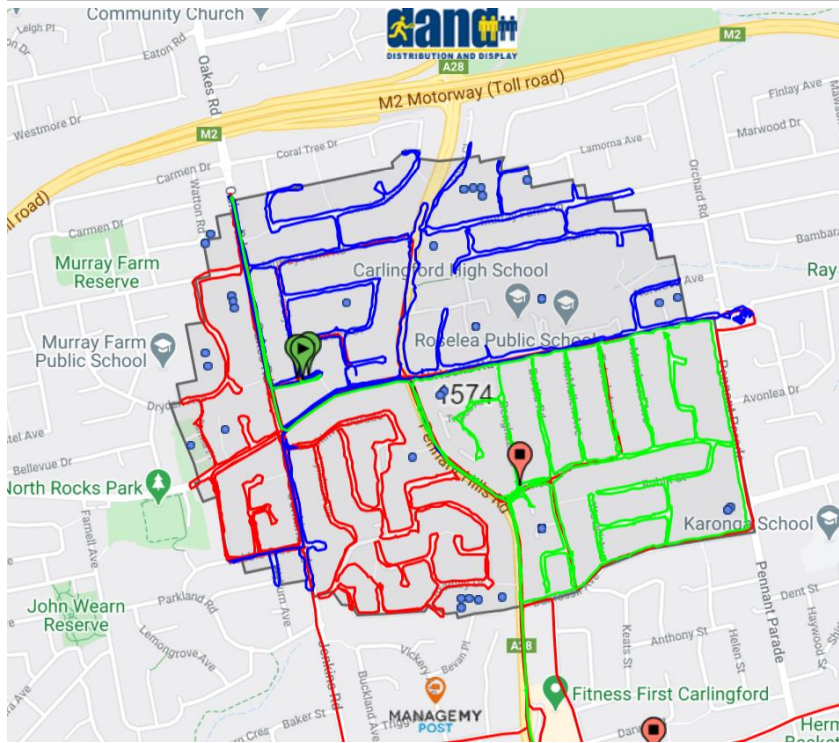


Figure 5-1 Community update distribution map during 'Have Your Say'

5.2 Consultation outcomes

A Have Your Say period was opened from 18 November to 18 December 2020, where community members and stakeholders were invited to provide feedback on the proposed design.

Transport received 32 submissions from local residents via email and phone calls. Key issues raised included:

- justification of the proposal
- property impacts
- pedestrian and residents safety along the Pennant Hills Road
- environmental impacts.

A summary of the key issues raised in relation to the proposed modification and Transport's response is provided in Table 5-2. Further details including a full list of issues raised and responses are provided in the Community Consultation Report provided in Appendix E.

Table 5-2 Summary of key issues raised by the community during ‘Have Your Say’

Key issues raised	Transport’s response
Proposal justification	
<p>Why does the median strip stop in front of the Roselea Community Centre and not in front of the nearby businesses on Pennant Hills Road?</p>	<p>As part of the project we are installing a raised central median along Pennant Hills Road. This will create a physical barrier between the two directions of traffic. This is a common practice on roads with multiple lanes in each direction.</p> <p>There is an existing pedestrian crossing on Pennant Hills Road in front of the Community Centre. This crossing won’t be changed by the project. It will help maintain cycling and pedestrian connections in the local area. To provide pedestrians and cyclists a level crossing, we have put a break in the median.</p> <p>Road users wanting to access the businesses on the eastern side of Pennant Hills Road, will no longer be able to turn right across Pennant Hills Road because of the road median. The project will make Pennant Hills Road three lanes in each direction. Road users will be prevented from turning right across three lanes of traffic, as it is unsafe.</p> <p>Road users will still be able to access these businesses by a detour. The proposed detour for road users heading north on Pennant Hills Road is to continue on Pennant Hills Road, travel through the intersection with the M2 Motorway, turn right onto Copeland Road and use the round-about at Cardinal Avenue to turn around and then come back along Copeland Road and Pennant Hills Road.</p> <p><i>Refer also Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>A slip lane from Pennant Hills Road southbound onto North Rocks Road is not needed and will increase traffic on North Rocks Road.</p> <p>Add a slip lane near Carlingford High School.</p> <p>Turning left from Pennant Hills Road going east on North Rocks Road will result in three lanes converging into one lane on North Rocks Road and that will lead to congestion on North Rocks Road.</p>	<p>The project includes widening Pennant Hills Road to add a third through lane in each direction and a slip lane from Pennant Hills Road onto North Rocks Road heading east. This change will allow motorists to turn left from Pennant Hills Road onto North Rocks Road at any time, as long as it is safe.</p> <p>Currently, road users travelling south on Pennant Hills Road wanting to turn left onto North Rocks Road have to wait for the traffic light to turn green and give way to pedestrians crossing the road. As road users give way to pedestrians, this can cause traffic to queue which causes congestion on Pennant Hills Road and travel delays.</p> <p>The project creates a slip lane for road users wanting to turn left onto North Rocks Road from Pennant Hills Road when travelling southbound. The slip lane will also provide a dedicated space for turning vehicles to wait till they can turn safely. This will mean vehicles wanting to turn left won't be waiting in the through traffic lanes, stopping other motorist from moving through the intersection.</p> <p>While the project will make it easier to access North Rocks Road from Pennant Hills Road, it is not expected that traffic volumes will increase on North Rocks Road because of this change, outside of normal growth.</p> <p>The traffic modelling for this project shows that the slip lane will reduce queuing on Pennant Hills Road, which will help ease congestion and keep traffic flowing through the intersection.</p> <p>To ensure pedestrian safety, the project will install a zebra crossing across the slip lane.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>
<p>Why is Transport widening Pennant Hills Road to three lanes when the bus has to stop and block the new lane?</p>	<p>While buses will stop in the kerb-side lane at set down and pick up passengers, two other traffic lanes will remain available for through traffic.</p> <p>The project, even with buses stopping for short times in the kerb-side lane to pick up and set down passengers, will improve traffic flow along Pennant Hills Road, ease congestion and reduce travel times.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>Removing the left turn slip lane from Pennant Hills Road onto North Rocks Road heading west would worsen the congestion.</p>	<p>The project removes the left turn slip lane from Pennant Hills Road onto North Rocks Road heading west. Road users will still be able to turn left from Pennant Hills Road onto North Rocks Road from the kerb-side lane, however, they will need to wait for the green light to do so.</p> <p>This change is necessary to accommodate the proposed three northbound lanes through the intersection. If the slip lane remained and the project allowed for three northbound lanes through the intersection, the project would impact a larger area and more properties.</p> <p>Moreover, the impact of this change was investigated using existing traffic data and modelling. The data and modelling shows that the volume of road users turning left from Pennant Hills Road onto North Rocks Road heading west is small and that overall benefits gained from having three northbound lanes through the intersection outweigh the negative impact of removing the slip lane.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>Creating a right turn lane from North Rocks Road onto Pennant Hills Road north will increase congestion and increase the volume of road users wanting to turn right.</p>	<p>As part of the planning process a number of investigations were undertaken, including analysis of the traffic data including traffic counts, vehicle type, traffic movements etc. These investigations show that there is a need for a permanent right turn lane from North Rocks Road onto Pennant Hills Road northbound.</p> <p>Currently at this intersection road users can turn right from North Rocks Road onto Pennant Hills Road heading north from the right traffic lane which can be used by motorists turning right and travelling straight through the intersection. This can cause delays and congestions.</p>
<p>Add an additional lane on North Rocks Road to turn right toward M2.</p>	<p>The proposed intersection improvements include widening North Rocks Road to add a dedicated right turn lane from North Rocks Road onto Pennant Hills Road northbound. This will give road users a place to wait before turning right, without queuing in general traffic lanes and blocking other traffic.</p>
<p>The right turn lane from North Rocks Road onto Pennant Hills Road northbound is not needed 24 hours a day.</p>	<p>The project will have two other traffic lanes at the intersection. Road users travelling through the intersection will be able to use the middle lane and kerbside lane and motorists turning left can use the kerbside lane. This design will mean more motorists can travel through the intersection on a green light.</p> <p>The project will also change the phasing of the traffic lights, which will allow more road users to turn right.</p> <p>These changes will help improve traffic flow through the intersection, ease congestion and reduce travel times.</p> <p>Moreover, giving right turning traffic a dedicated place to queue to wait for the green light will reduce the risk of rear-end crashes at the intersection. Reducing the risk of crashes improves safety.</p> <p>The project is not expected to increase traffic volumes or demand at this intersection, outside of normal growth.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>Traffic jams on Pennant Hills Road are due to lights near the M2 and further north.</p>	<p>The Pennant Hills Road and North Rocks Road intersection has been identified as experiencing significant traffic congestion due to high traffic volumes travelling through the intersection and the intersection no longer having the best configuration for the traffic.</p> <p>The proposed intersection upgrade will ease congestion and improve travel times for all road users, traffic flow through the intersection and safety at the intersection.</p> <p>Traffic lights in NSW are controlled by the Sydney Coordinated Adaptive Traffic System (SCATS), which allocates the length of green time based on real time traffic flow. Sensors beneath the road measure the flow and density of traffic approaching the lights in each direction and the green time is allocated accordingly. They are also coordinated with other traffic lights in the area. The length of time the light stays green varies in response to changing traffic conditions. This ensures that the traffic light phasing is operating at maximum efficiency.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>
<p>Why Transport is widening the Pennant Hills Road?</p>	<p>Pinch Points are traffic congestion points, intersections or short lengths of road at which a traffic bottleneck exists, slowing down the broader network. They cause a build-up of traffic and travel delays at these spots and on the wider road network.</p> <p>The intersection of Pennant Hills Road and North Rocks Road has been identified as a major pinch point causing significant traffic congestion due to high traffic volumes travelling through the intersection.</p> <p>Each day nearly 60,000 vehicles travel through this intersection. These road users experience heavy congestion, long delays and slow travel times.</p> <p>The project will widen the Pennant Hills Road between Woodstock Road and Murray Farm Road will increase the capacity of the road reducing queue length, improving travel times and safety for all road users.</p> <p><i>Refer also Chapter 2 Need and options considered, Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>The right turn lanes from North Rocks Road onto Pennant Hills Road will encourage more traffic on North Rocks Road.</p>	<p>Traffic data shows that there is already a high demand for vehicles turning right from North Rocks Road onto Pennant Hills Road in both directions. This high demand is causing congestion at this intersection resulting in slow travel times and delays.</p> <p>At this intersection road users can currently turn right from North Rocks Road onto Pennant Hills Road heading north from the right traffic lane which can be used by motorists turning right and travelling straight through the intersection. This can cause delays and congestions.</p> <p>The project will create a dedicated right turn lane from North Rocks Road onto Pennant Hills Road northbound. This will give road users a place to wait before turning right, without queuing in general traffic lanes and blocking other traffic.</p> <p>For road users wanting to turn right from North Rocks Road onto Pennant Hills Road southbound, the project will create a second dedicated right turn bay. Vehicles wanting to turn right can wait here to make the right turn. Currently some motorists wanting to turn right, wait in the existing dedicated right turn lane, while others queue in the general traffic lane. The second dedicate right turn bay will provide additional space for vehicles to turn right without impacting vehicles wanting to travel through the intersection or turn left.</p> <p>The additional right turn bays on North Rocks Road will reduce queue length and improve travel times by allowing a higher number of right turn movements from North Rocks Road onto Pennant Hills Road during the green right turn arrow time.</p> <p>The project will also change the phasing of the traffic lights, which will allow more road users to turn right.</p> <p>These changes will help improve traffic flow through the intersection, ease congestion and reduce travel times and are not expected to increase the traffic volumes or demand at this intersection outside of normal growth.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>The proposal will only improve traffic flow on Pennant Hills Road but not on North Rocks Road.</p>	<p>The project will improve traffic flow on both Pennant Hills Road and North Rocks Road.</p> <p>One of the contributing factors to congestions at the Pennant Hills Road and North Rocks Road is traffic flow through the intersection. It can take many changes of the traffic lights to move through the intersection.</p> <p>The traffic data, which includes information on volumes, travel times and how vehicles are traveling through the intersection, shows that road users wanting to turn right from North Rocks Road onto Pennant Hills Road are causing congestion on North Rocks Road and creating long queues of vehicles wanting to travel through the intersection and travel delays.</p> <p>The project will help road users turn right from North Rocks Road onto Pennant Hills Road, by:</p> <ul style="list-style-type: none"> • installing a dedicated right turn bay from North Rocks Road onto Pennant Hills Road heading north towards the M2 • adding a second dedicated right turn bay from North Rocks Road onto Pennant Hills Road heading south • changing the phasing of the traffic lights to allow more road users to turn right at the intersection. <p>These changes will help ease congestion on North Rocks Road, reduce queues and improve travel times.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>Adding an extra lane southbound on Pennant Hills Road will only shift the congestion from where it is now to where the road goes from three lanes to two lanes.</p>	<p>The Pennant Hills Road and North Rocks Road intersection is a pinch point. The key focus of the project is to improve traffic flow and safety at this intersection, which will ease congestion on both Pennant Hills Road and North Rocks Road.</p> <p>The project will add an additional lane on Pennant Hills Road in each direction between Woodstock Avenue and Murray Farm Road. This will mean there are three through lanes in each direction along Pennant Hills Road between Murray Farm Road and Woodstock Avenue.</p> <p>It is likely that there will be some small congestion and delays where traffic merges from three lanes into two lanes heading south on Pennant Hills Road near Woodstock Avenue. However, by improving traffic flow through the intersection and easing congestion, these delays will be offset and road users will, overall, still be saving travel time.</p> <p>As part of the work, improvements to the road network to ease congestion, reduce travel times and improve safety will continue to be investigated. There are early stage investigations along other parts of Pennant Hills Road considering other changes to the road network that will have a positive impact for customers.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>
<p>Pedestrians and cyclists</p>	
<p>Can there be a provision of a shared pedestrian/cycling path?</p>	<p>Shared path will be reinstated where the existing path is impacted by the project, on both sides of Pennant Hills Road between the existing mid-block crossing and Murray Farm Road.</p> <p>As part of the project, wide footpaths will be built, where possible, that can be upgraded to shared paths in the future by the City of Parramatta Council on:</p> <ul style="list-style-type: none"> • the northern side of North Rocks Road between Roselea Way and Pennant Hills Road • the eastern side of Pennant Hills Road north between North Rocks Road and the mid-block crossing near Murray Farm Road • the southern side of North Rocks Road along a quarter of the block between Pennant Hills Road and Jenkins Road – the widen footpath will run for approximately 130 metres from the intersection. <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>Is the proposal narrowing the footpaths?</p> <p>Will pedestrians move closer to my property?</p>	<p>The project will widen Pennant Hills Road between Woodstock Avenue and Murray Farms Road from two lanes to three lanes in both directions. To allow for road widening, the verge width will be reduced in some areas.</p> <p>As part of this process, footpaths will need to be relocated. The footpath will be designed and built as per NSW specifications. The footpaths will be located between the road and property boundaries.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>
Bus stops	
<p>Is the proposal moving bus stop closer to the houses along Pennant Hills Road?</p> <p>If you widen Pennant Hills Road the bus stop located on south side of the intersection on Pennant Hills Road, needs to be moved.</p>	<p>The proposal will impact the location of a number of bus stops along Pennant Hills Road. The widening work means that many of the current locations of bus stops along Pennant Hills Road will be in the middle of the third northbound lane. The bus stops will generally be positioned at the same location but further back, so that they are at a safe distance from the kerb.</p> <p>However, there are two exceptions to this. Two bus stops on Pennant Hills Road will be relocated. Bus stop ID 211831 will be moved 18 metres south of where it is currently located and bus stop ID 2118174 will be moved 150 metres south to be nearer to the Roselea Community Centre.</p> <p>No bus stops will be permanently removed as part of this proposal.</p> <p>During construction, the bus stops will be temporarily relocated to ensure bus customers can safely access bus services, with as minimal disruption as possible. The community will be notified well in advance of any changes.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>
<p>Can the bus stop be relocated closer to the new pedestrian crossing or at empty space near the eastbound left turn slip lane on Pennant Hills Road?</p>	<p>As part of this project, bus stop ID 2118174 will be moved 150 metres south to be nearer to the Roselea Community Centre and the mid-cross pedestrian crossing on Pennant Hills Road.</p> <p>The bus stop cannot be moved closer to the Pennant Hills Road and North Rocks Road intersection as buses stopping this close to the intersection would negatively impact traffic flow, resulting in congestion and delays.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
Property	
<p>How do we access properties of the right hand side of Pennant Hills Road when heading north from Carlingford?</p>	<p>The project will install a raised central median along Pennant Hills Road. This will prevent road users turning right across Pennant Hills Road.</p> <p>The project will widen Pennant Hills Road to three lanes in each direction between Woodstock Avenue and Murray Farms Road. It is unsafe to turn right across three lanes of traffic without the assistance of a right turn arrow.</p> <p>This will mean road users need to travel further to be able to access properties. The proposed detour for road users heading north on Pennant Hills Road is to continue on Pennant Hills Road, travel through the intersection with the M2 Motorway, turn right onto Copeland Road and use the round-about at Cardinal Avenue to turn around and then come back along Copeland Road and Pennant Hills Road.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>
<p>How do we access properties on the northern side of North Rocks Road just before the Pennant Hills Road intersection?</p>	<p>The project will install a raised central median for 70 metres along North Rocks Road between Roselea Way and Pennant Hills Road. This will prevent road users turning right across North Rocks Road.</p> <p>It is unsafe to have vehicles turning across two lanes of traffic in such close proximity to the intersection, especially given the high volume of road users traveling eastbound on North Rocks Road. Banning right turns across this section of North Rocks Road will improve safety.</p> <p>This will mean road users need to travel further to be able to access properties. The proposed detour for road users heading west on North Rocks Road is to continue through the intersection with Pennant Hills Road, turn left onto Jenkins Road, use the roundabout on Jenkins Road and come back on Jenkins Road and North Rocks Road.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>Will retaining walls be built to protect properties along Pennant Hills Road and North Rocks Road?</p> <p>Given the different ground levels between North Rocks Road, Pennant Hills Road and nearby properties, how will you prevent land slipping?</p>	<p>As part of the project a number of retaining walls will be built along Pennant Hills Road, where there is a difference between the ground level and the road level. The retaining walls will help retain the soil and prevent land sliding. These retaining walls will be built in the verge and along the property boundary line.</p> <p>Property owners will be contacted individually if a retaining wall will be built on the property boundary.</p> <p><i>Refer also Chapter 3 Description of the proposed modification of the Addendum REF.</i></p>
<p>If you widen the North Rocks Road to install a second right turn lane, we will lose our car parking spot.</p>	<p>When designing the project we traffic data including volumes, travel times and where vehicles were heading was reviewed. This analysis showed that road users wanting to turn right from North Rocks Road onto Pennant Hills Road heading south was a significant cause of congestion.</p> <p>To address this, second dedicated right turn lane will be built. This will provide road users wanting to turn right a place to queue without blocking other traffic. By having a second right turn lane, more road users will able to turn right when there is a green right turn arrow. This will improve traffic flow and ease congestion.</p> <p>To create this additional right turn lane North Rocks Road will need to be widened. The southern side of North Rocks Road will be widened for about a quarter of the block between Pennant Hills Road and Jenkins Road – approximately 130 metres from the intersection.</p> <p>The project will not change the current on-street parking conditions on North Rocks Road west of the intersection, the verge will be reduced which may impact unofficial parking opportunities.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>How will you ensure nearby properties are not damaged by your project?</p>	<p>Prior to starting construction on this project, Transport will undertake building condition inspections on potentially affected properties. Impacted property owners will be contacted to make arrangements to undertake this inspection.</p> <p>This inspection will be undertaken by an independent third party and copies of these reports can be shared with property owners.</p> <p>During construction mitigation measures will be implemented, as per the EPA – NSW Road Noise Policy – 2011 and RMS Environment Noise Management Manual.</p> <p>At the end of construction, if the property owner has any concerns, Transport will consider undertaking a second building condition inspection to see if any damage was sustained. If there is any damage, the cause will be investigated and property owners will be contacted to discuss this and next steps.</p> <p><i>Refer also Section 6.1 of the Addendum REF.</i></p>
<p>The proposed lane widening will impact our backyard.</p>	<p>The project will widen Pennant Hills Road and North Rocks Road to create additional turning bays, slip lanes and three general traffic lanes along Pennant Hills Road from Woodstock Avenue to Murray Farms Road.</p> <p>The project will impact some private properties. This will be discussed with property owners individually. Where possible, the project will use Transport for NSW land to undertake the widening work. This will minimise the impact on private property.</p> <p>Along Pennant Hills Road, some properties have put their back yard and front yard fences on Transport for NSW land. As the project progresses, these property owners will be contacted to discuss moving the fences off Transport land and back onto the property boundary.</p> <p>Transport for NSW will cover the cost of relocating these fences to the property boundaries and this work will be done in discussion with property owners.</p> <p><i>Refer also Chapter 3 Description of the proposed modification of the Addendum REF.</i></p>

Key issues raised	Transport's response
Environmental impacts – noise and air	
<p>What sound barrier will be introduced to offset the additional traffic noise?</p> <p>Previous noise mitigation measures have only partially reduced the noise levels.</p> <p>Will properties on Pennant Hills Road and North Rocks Road be eligible for noise treatments?</p> <p>Are you planning to build a noise wall as part of this project?</p>	<p>Transport for NSW undertakes noise modelling for projects to predict future noise levels after a project opens to traffic. Noise modelling has been carried out to understand what the future noise levels would be following the road improvements compared to the existing noise levels. The modelling takes into consideration growth in traffic volumes.</p> <p>Noise treatments are determined based on noise modelling. Where there is an increase in noise levels because of the project or increased traffic that meets a pre-determined threshold under the EPA – NSW Road Noise Policy – 2011 and RMS Environment Noise Management Manual, properties are eligible for noise treatments. What treatments they received depends on the noise impact and this can mean that different sides of properties receive different treatments.</p> <p>When road projects impact noise levels above a threshold, it is the project's responsibility to mitigate the noise impacts for residents. Noise modelling has been undertaken for this project. The noise modelling results predicts a slight increase in noise levels (less than 2dB) received by adjoining properties near Pennant Hills Road and North Rocks Road. According to the EPA this increase is very small and would have minor impacts on the community.</p> <p>A 2dB noise increase is not at a level that would require noise mitigation treatment under the EPA – NSW Road Noise Policy – 2011 and RMS Environment Noise Management Manual. Therefore the project does not include noise mitigation including noise walls.</p> <p>Transport for NSW has a noise abatement program, where you can apply for noise treatment of your property due to increase traffic noise.</p> <p><i>Refer also Section 6.1 of the Addendum REF.</i></p>
<p>Road widening will move the road closer to properties and could lead more dust and pollution entering people's homes.</p>	<p>The project will widen Pennant Hills Road and North Rock Road and it will bring the road closer to nearby properties.</p> <p>By easing congestion and improving traffic flow through the intersection there will be less road users waiting at the intersection and motorists won't need to brake and accelerate as often. These changes are expected to improve the air quality.</p> <p><i>Refer also Section 6.10 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>More traffic lanes mean additional noise from vehicles especially big trucks and buses.</p>	<p>The project aims to ease congestion, reduce travel times and improve traffic flow through the intersection.</p> <p>By easing congestion and improving traffic flow through the intersection there will be less road users waiting at the intersection and motorists won't need to brake and accelerate as often. This will mean less noise from traffic.</p> <p>As part of our work, a noise assessment and noise modelling have been undertaken. The noise modelling predicts future noise levels after a project opens to traffic, compared to the existing noise levels. It also takes into consideration growth in traffic volumes.</p> <p>The noise modelling results showed there will be a slight increase in noise levels received by adjoining properties near Pennant Hills Road and North Rocks Road, but that this increase is not at a level that would require noise mitigation treatment under the EPA – NSW Road Noise Policy – 2011 and RMS Environment Noise Management Manual.</p> <p><i>Refer also Section 6.1 of the Addendum REF.</i></p>
Environmental impacts – loss of vegetation	
<p>What will be the impact of this project on the trees?</p>	<p>To widen Pennant Hills Road and North Rocks Road a number of trees will need to be removed along these roads.</p> <p>Trees that are near or next to the proposal area will be assessed by an arborist to see what impact the project will have on the trees. Transport for NSW will investigate ways to minimise the number of trees that need to be removed, including following the arborist's advice and implementing mitigation measures.</p> <p>If there is a tree on a private property that will be impacted, the property owners will be contacted prior to the start of construction to discuss this matter individually.</p> <p>Any removed trees will be replaced at a ratio of one-for-one in the local area. However, it is unlikely that we will be able to replace them in the same location. Transport for NSW will work with City of Parramatta Council to identify appropriate areas to plant these trees.</p> <p><i>Refer also Section 6.2 of the Addendum REF.</i></p>

Key issues raised	Transport's response
Safety	
<p>Will there be a fence running along the new raised median strips?</p>	<p>Installing pedestrian fencing in the raised median along Pennant Hills Road has been considered.</p> <p>Pedestrian fencing is used in areas where there are large numbers of pedestrians to direct pedestrians to safe locations to cross the road, such as zebra crossings and signalised pedestrian crossings.</p> <p>Pedestrian volumes have been reviewed in the area however results showed volumes are low when compared to locations where pedestrian fencing has been installed.</p> <p>As there are low pedestrian volumes in the area, when compared to locations where pedestrian fencing is used, and there are a number of safe crossing points for pedestrians, pedestrian fencing will not be installed along the raised median as part of this project.</p> <p>The project includes a number of pedestrian protection measures such as:</p> <ul style="list-style-type: none"> • installing pedestrian signals at all sides of the Pennant Hills Road and North Rocks Road intersection – currently there are only signalised pedestrian crossings on three sides of the intersection • installing a zebra crossing across the slip lane from Pennant Hills Road onto North Rocks Road heading east. This will help pedestrians, including school children, safely cross the slip lane to use the pedestrian crossing at the intersection. <p>There is also a mid-block signalised pedestrian crossing on Pennant Hills Road near Roselea Community Centre to help pedestrians cross the road safely.</p> <p>Transport for NSW strongly encourages pedestrians to cross Pennant Hills Road and North Rocks Road at signalised crossings and follow NSW Road Rules.</p> <p><i>Refer also Chapter 3 Description of the proposed modification of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>The proposal to widen the Pennant Hills Road will bring traffic closer to the properties on Pennant Hills Road and increase the risk of accidents.</p>	<p>When upgrading the road network, the priority is to improve safety for road users, including pedestrians and the local community.</p> <p>When designing the project, the relevant guidelines will be followed such as the Austroads Geometric Road Design Standards. The project will go through a rigorous safety review at various stages to ensure it is safe. Some of these reviews are internal and some are done by external experts.</p> <p>The project will widen Pennant Hills Road from two lanes to three lanes in both directions between Woodstock Avenue and Murray Farms Road and will bring the road closer to properties. The project also includes road widening on North Rocks Road.</p> <p>Currently there is a very large verge between the road and nearby properties. The project will reduce the size of the verge, however, the new verge will still meet the width requirements for a verge under the NSW Streets Opening Coordination Council Guide to Codes and Practices for Streets Opening and will maintain a safe distance between the road and nearby properties.</p> <p><i>Refer also Chapter 3 Description of the proposed modification of the Addendum REF.</i></p>
<p>What safety measures are being introduced to protect children crossing the road at the Pennant Hills Road and North Rocks Road intersection?</p>	<p>Transport is very concerned about the safety of all road users, including pedestrians, and is working towards zero deaths and serious injuries on our roads.</p> <p>The project includes an additional signalised pedestrians crossing at the Pennant Hills Road and North Rocks Road intersection. This means all sides of the intersections will have signalised pedestrian crossings, which will make it easier and safer for pedestrians to cross the road at this intersection.</p> <p>The project will also install a zebra crossing across the slip lane from Pennant Hills Road onto North Rocks Road heading east. This will help pedestrians, including school children, safely cross the slip lane to use the pedestrian crossing at the intersection.</p> <p>There is also a mid-block signalised pedestrian crossing on Pennant Hills Road near Roselea Community Centre to help pedestrians cross the road safely.</p> <p><i>Refer also Chapter 3 Description of the proposed modification of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>Creating a left turn slip lane onto North Rocks Road heading east from Pennant Hills Road will result in road users speeding when entering the school zone, increasing the risk to pedestrian safety and congestion.</p>	<p>When turning left from Pennant Hills Road, vehicles enter the slip lane at reduced speed to prepare to make the turn. As a result, the slip lane is not expected to increase the speed of vehicles travelling eastbound on North Rocks Road.</p> <p>When designing the project, traffic data such as traffic counts, vehicle types, traffic movements etc. has been studied which showed the traffic volumes, travel times and the directions motorists were heading.</p> <p>The proposed slip lane will improve traffic flow for vehicles turning left and ease congestions and improve journey times as road users turning left don't have to stop at the lights. It is not expected to increase the demand for the left turn from Pennant Hills Road or traffic volume on North Rocks Road, outside of normal growth.</p> <p>Road users need to comply with speed limits include school zones during the nominated hours. The project will not change the speed limit on Pennant Hills Road or North Rocks Road or make any changes to the nearby school zone.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>
<p>Safety at the intersection should be the priority.</p>	<p>Transport is committed to improving safety for all road users and is working towards zero deaths and serious injuries on our roads.</p> <p>When undertaking any road improvements, our plans undergo rigorous safety reviews. Some of these reviews are carried out by external experts.</p> <p>The proposed intersection improvements will improve safety by:</p> <ul style="list-style-type: none"> • installing a raised median along Pennant Hills Road – this will create a barrier between the different directions of traffic and prevent vehicles from making unsafe turns across three lanes of traffic • adding an extra signalised pedestrian crossings at the Pennant Hills Road and North Rocks Road intersection so all sides of the intersection will have pedestrian protection – currently there are only three signalised pedestrian crossings • adding a zebra crossing across the slip lane from Pennant Hills Road onto North Rocks road • providing additional right turn bays at the intersection for motorists which will provide dedicated space for road users to wait to turn right, while still allowing through traffic to travel through the intersection. This will reduce the likelihood of rear-end crashes at the intersection. <p><i>Refer also Chapter 3 Description of the proposed modification of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>How will utilities be relocated so that our services are not disrupted and this is done safely?</p>	<p>The project will require the relocation of a number of utilities such as electrical, water, telecommunication and gas services. This work will be coordinated with the relevant service providers.</p> <p>The project will aim to minimise disruption to services when relocating these utilities. However to undertake this work safely services may need to be temporarily suspended. If this is necessary, the community will be notified in advance.</p> <p>Transport will also work with the relevant service providers to ensure all safety rules and regulations are followed.</p> <p><i>Refer also Chapter 3 Description of the proposed modification of the Addendum REF.</i></p>
<p>Increasing travel speed will result in a greater risk to safety of pedestrians and school children on North Rocks Road</p>	<p>Transport is committed to improving safety for all road users and is working towards zero deaths and serious injuries on our roads.</p> <p>The project will not increase travel speeds on either Pennant Hills Road or North Rocks Road. Motorists will need to follow the existing speed limits, including the school zone during nominated hours.</p> <p>The project includes a number of pedestrian protection measures such as:</p> <ul style="list-style-type: none"> • installing pedestrian signals all sides of the Pennant Hills Road and North Rocks Road intersection – currently there are only signalised pedestrian crossings on three sides of the intersection • installing a zebra crossing across the slip lane from Pennant Hills Road onto North Rocks Road heading east. This will help pedestrians, including school children, safely cross the slip lane to use the pedestrian crossing at the intersection. <p>There is also a mid-block signalised pedestrian crossing on Pennant Hills Road near Roselea Community Centre to help pedestrians cross the road safely.</p> <p><i>Refer also Chapter 3 Description of the proposed modification of the Addendum REF.</i></p>
<p>Can we have brighter lights or more lights be installed near the bus stops or interaction areas to deter crime?</p>	<p>When considering what lights to use along roads, what lighting is needed for motorists, pedestrians and the impact of this lighting on nearby residents is considered.</p> <p>The project will improve the street lighting along Pennant Hills Road and North Rocks Road by using new LED lights which produce a crisper, whiter light, which appear brighter. This lighting will be positioned along the road way, foot and shared paths and near bus stops.</p>

Key issues raised	Transport's response
<p>Are you planning to build a safety wall along Pennant Hills Road?</p>	<p>The road layout has been designed to comply with requirements of Austroads Geometric Road Design standards. This document is used Australia wide to design roads.</p> <p>Moreover, the proposed road designs are reviewed by Transport and independent Road Safety Auditors. Where risks are identified they are assessed and addressed.</p> <p>Although the roads will be closer to properties, the project will maintain the required width between the road and the property boundary as per NSW Streets Opening Coordination Council Guide to Codes and Practices for Streets Opening.</p> <p>At this stage, a barrier along Pennant Hills Road will not be installed as part of this project. However, Transport will continue to assess the safety implications of this project and if a barrier, such as a safety wall, is required it will be incorporated it into the design.</p>
<p>Are there any plans for another pedestrian crossing along Pennant Hills Road between the lights at Carlingford Road and then North Rocks Road?</p>	<p>As part of this proposal, a new signalised pedestrian crossing at the intersection of Pennant Hills Road and North Rocks Road will be installed, which will mean all sides of the intersection will have signalised crossing for pedestrians.</p> <p>There is currently no plans to install another pedestrian crossing along Pennant Hills Road between Carlingford Road and North Rocks Road. However, Transport is continually undertaking investigations of key corridors, including Pennant Hills Road, as part of the network planning process. This process aims to establish the transport vision and objectives for the corridor, in line with the NSW Government's strategies including Future Transport 2056.</p> <p>Additional pedestrian crossing along Pennant Hills Road will be considered as part of this investigation process.</p>
<p>Can you add traffic lights at the Murray Farm Road and Pennant Hills Road intersection?</p>	<p>Murray Farm Road is in close proximity to three sets of traffic lights:</p> <ol style="list-style-type: none"> 1. the M2 signalised interchange 2. the intersection of Pennant Hills Road and North Rocks Road 3. the signalised mid-block pedestrian crossing on Pennant Hills Road between North Rocks Road and Murray Farm Road. <p>Signalising the Murray Farm Road and Pennant Hills Road intersection will add a fourth set of traffic lights in a relatively small area. If the Murray Farm Road and Pennant Hills Road intersection was signalised, it would be within 184 metres of the signalised mid-block crossing across Pennant Hills Road near the Roselea Community Centre. This would negatively impact traffic flow, resulting in delays and congestion.</p> <p>As this change would have the opposite impact of the proposed intersection upgrades, it has not been included in the scope of the project.</p>

Key issues raised	Transport's response
<p>Can the middle lane from North Rocks Road be made into a right turn and through lane rather than just a right turn lane onto Pennant Hills Road heading south?</p>	<p>When designing this project all configuration options for the intersections were considered. As part of this process the traffic data such as traffic counts, vehicle type, traffic movements etc. was reviewed which showed traffic volumes, travel times and which direction motorists were heading.</p> <p>The traffic data shows that most road users on North Rocks Road heading east who pass through this intersection are turning right onto Pennant Hills Road heading south. The number of motorists travelling straight through the intersection and turning left onto Pennant Hills Road is significantly lower than those turning right.</p> <p>The data also shows that there are long queues of motorists on North Rocks Road wanting to turn right onto Pennant Hills Road. Some of these motorists wait in the existing dedicated right turn lane, but others queue in the general traffic lane.</p> <p>As part of this process the traffic data was modelled to predict how traffic would behave in the future. This modelling takes into consideration predicted growth for the area. The modelling showed that the proposed configuration, of two dedicated right turn lanes, one through traffic lane and a left turn slip lane, is the best configuration to improve traffic flow and reduce queueing.</p> <p>If the middle lane was both a right turn lane and a through traffic lane it would impact the efficiency of the intersection. Intersections are more efficient when each traffic lane has only one possible traffic movement, e.g. turning left, traveling straight or turning right. Combining two possible movements, e.g. turning right and traveling straight, will make the intersection less efficient.</p> <p>Given the demand for right turns from North Rocks Road onto Pennant Hills Road south and the need to ease congestion, the proposed lane configuration at the intersection will not be changed.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>The lane configuration from North Rocks Road through the intersection heading west should be:</p> <ul style="list-style-type: none"> • right turn only • right turn or through travel • left turn or through travel. 	<p>When designing the project all configuration options for the intersection was considered. As part of this process the traffic data such as traffic counts, vehicle type, traffic movements etc. was reviewed which shows traffic volumes, travel times and which direction motorists are heading.</p> <p>The traffic data shows that there is a large number of road users on North Rocks Road turning right onto Pennant Hills Road towards the M2.</p> <p>As part of this process traffic data was modelled to predict how traffic would behave in the future. This modelling takes into consideration predicted growth for the area. The modelling showed that the proposed configuration, of installing a dedicated right turn lane and two through traffic lane where road users can turn left from the kerbside lane, is the best configuration to improve traffic flow and reduce queueing.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>
<p>The left turn slip lane from North Rocks Road onto Pennant Hills Road needs to be longer.</p>	<p>A left turn slip lane from Pennant Hills Road onto North Rocks Road heading east will be constructed as part of the project. While planning this project, the possibility of extending the left turn slip lane from Pennant Hills Road onto North Rocks Road was investigated.</p> <p>If the proposed left turn slip lane was extended, more property would need to be acquired for the project and additional service utilities would need to be relocated. This would add additional time to the length of the project and cost. While the extended slip lane would add a small benefit, given the constraints mentioned above, the benefits achieved would not outweigh the cost.</p>
<p>The green light for travelling east to west through the intersection needs to be longer.</p> <p>Can you change the phasing of the traffic lights to allow more green time for road users to travel through this intersection?</p>	<p>Traffic lights in NSW are controlled by the Sydney Coordinated Adaptive Traffic System (SCATS), which allocates the length of green time bases on real time traffic flow. Sensors beneath the road measure the flow and density of traffic approaching the lights in each direction and the green time is allocated accordingly. The length of time the light stays green varies in response to changing traffic conditions. This ensures that the traffic light phasing is operating at maximum efficiency.</p>

Key issues raised	Transport's response
A footbridge at the intersection.	<p>Installing a footbridge at the Pennant Hills Road and North Rocks Road was considered however, there is not enough pedestrians to warrant building a footbridge at the Pennant Hills Road and North Rocks Road intersections.</p> <p>The project ensures pedestrians can safely cross Pennant Hills Road and North Rocks Road using signalised pedestrian crossings. Under the proposed intersection upgrades all sides of the intersection of Pennant Hills Road and North Rocks Road will have signalised pedestrian crossings.</p> <p>A zebra crossing across the slip lane from Pennant Hills Road onto North Rocks Road heading east will also be installed. This will help pedestrians, including school children, safely cross the slip lane to use the pedestrian crossing at the intersection.</p> <p>There is also a mid-block signalised pedestrian crossing on Pennant Hills Road near Roselea Community Centre to help pedestrians cross the road safely.</p>
Install a zebra crossing on the new proposed slip lane between the corner of Pennant Hills Road and North Rocks Road	<p>As part of the project design a zebra crossing is proposed at the new left turn slip lane on the north east corner of the intersection. The zebra crossing will be installed to make it safer for the pedestrian to cross the slip lane.</p> <p><i>Refer also Chapter 3 Description of the proposed modification of the Addendum REF.</i></p>
How much time will commuters save from this intersection improvement?	<p>Traffic modelling has shown that the project will improve travel times and save commuters on an average 44 seconds each day at the intersection, 83 seconds on North Rocks Road and 74 seconds on Pennant Hills Road. While this may not seem like a lot, when you consider that 60,000 motorists travel through this intersection each day the total savings are significant. This means less time stuck in traffic and more time with family and friends and doing the things you love.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.3 of the Addendum REF.</i></p>

Key issues raised	Transport's response
<p>Will construction works be carried out at night to minimise impacts on the local road network?</p>	<p>The work schedule will be planned so the upgrades can be completed as quickly as possible, limiting the impact on road users and the local community.</p> <p>Works will be done during the day when possible. Day work hours will be between 7am and 6pm from Monday to Friday and between 8am to 1pm on Saturday.</p> <p>However, most of the work will need to be carried out at night to minimise traffic disruption and reduce safety risks to the workers. When necessary, works will be undertaken up to five nights a week, weather permitting and excluding public holidays. The night time work will be from Sunday night to Thursday night between 8pm and 5am the next day</p> <p>The community will be informed of upcoming night work before starting. Mitigation measures to reduce the impact of noisier tasks will be implemented including using noisier plant such as saw cutters and jack hammers before midnight.</p> <p><i>Refer also Chapter 3 Description of the proposed modification and Section 6.1 of the Addendum REF.</i></p>

5.3 ISEPP consultation

City of Parramatta were consulted about the proposed modification in January 2020 as per the requirements of clause 13 of ISEPP. Appendix B contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been identified. No response was received from the City of Parramatta.

5.4 Ongoing or future consultation

Should Transport for NSW proceed with the project, consultation activities would continue up to and during construction. These consultation activities would include:

- Consultation with directly impacted community stakeholders to assist in managing impacts during construction
- Ongoing updates to the immediately affected community during the detailed design phase and the construction period
- Ongoing consultation with City of Parramatta Council and other relevant government agencies
- Consultation with affected bus operators and utility providers.

6 Environmental assessment

This section of the addendum REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposed modification of the Pennant Hills Road and North Rocks Road, Carlingford Intersection Upgrade. All aspects of the environment potentially impacted upon by the proposed modification are considered. This includes consideration of the factors specified in the guidelines *Roads and Related Facilities EIS Guideline* (DUAP, 1996) and *Is an EIS required?* (DUAP, 1999) as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000. 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 ameliorate the identified potential impacts.

6.1 Noise and vibration

A noise and vibration impact assessment (RWDI, 2021) was prepared to quantify the potential noise and vibration impacts on sensitive receivers associated with the construction and operation of the proposal. The assessment is included in Appendix F.

6.1.1 Methodology

The noise assessment was undertaken in accordance with the Roads and Maritime Procedure – *Preparing an Operational Traffic and Construction Noise and Vibration Assessment Report*, NSW *Interim Construction Noise Guideline (ICNG)*, the Roads and Maritime’s Noise Criteria Guideline (NCG), EPA’s “Application Notes – NSW Industrial Noise Policy” and EPA’s Environmental Criteria for Road Traffic Noise (ECRTN).

Noise monitoring was undertaken within the proposal corridor to evaluate the existing traffic noise and background noise environment. Unattended monitoring was undertaken outside the property boundary at 716 Pennant Hills Road between Monday 22 January and Wednesday 31 January 2018 concurrently with a traffic counting event undertaken by Austraffic, to broadly characterise the noise environment and to verify the traffic noise model. The location of the noise monitor is shown in Figure 6-1.



Figure 6-1 Noise monitoring location outside 716 Pennant Hills Road, Carlingford

Noise monitoring recorded LA1, LA10, LA90 and LAeq levels of the existing noise environment. The LA1, LA10 and LA90 levels are the levels exceeded for 1 per cent, 10 per cent and 90 per cent of the sample time, respectively. The LA1 is indicative of maximum noise levels due to individual noise events such as the occasional passby of a heavy vehicle. The LA90 level is normally taken as the background noise level. The LAeq level is the equivalent continuous sound level and has the same sound energy over the sampling period as the actual noise environment with its fluctuating sound levels. While the LA10 has in the past been used as a descriptor for traffic noise, the LAeq is now the standard descriptor for traffic noise in NSW.

Construction noise modelling

Construction noise emissions from the works have been modelled using the Cadna-A (Version 2021 MR1) acoustic noise prediction software. Factors that are addressed in the noise modelling are:

- Equipment noise level emissions and location
- Screening from structures
- Receiver locations
- Ground topography
- Noise attenuation due to geometric spreading
- Ground absorption
- Atmospheric absorption.

Operational noise modelling

To determine existing traffic noise levels and noise levels with the project at the closest potentially-affected receivers to the road, a model was implemented using the Cadna-A noise prediction software (Version 2021 MR1). The traffic counts obtained by Austraffic during the noise monitoring have been applied to the model for validation purposes. Noise levels from the proposed road designs were calculated using procedures based on the

CoRTN prediction algorithms (Calculation of Road Traffic Noise, UK Department of Transport, 1988).

6.1.2 Existing environment

The acoustic environment within and around the proposal area is considered to be urban and is dominated by road traffic noise as traffic data indicates traffic volumes on Pennant Hills Road near the proposal area are more than 17,000 vehicles per day eastbound and more than 26,000 vehicles per day westbound (Transport for NSW, 2021).

An aerial view of the site and Noise Catchment Areas (NCAs) considered by this assessment is shown in Figure 6-2. Receivers within NCAs 1A to 1O front onto the road and typically have direct lines of sight to the various works areas. Receivers set back further from the road are grouped into NCAs 2 to 7. These are typically shielded from the works areas by buildings.

The predominant sensitive receivers are residential. Other receivers include:

- Commercial
 - R16 and R17: BP service station and Wild Bean Cafe
 - R18: Concierge Car Wash Café and Genuine Car Service
 - R22: Plus Fitness and Prompt Mowers Carlingford
- Accommodation
 - R23: Sydney Temple Accommodation
- Recreational
 - R24: Roselea Community Centre
- School
 - R38: St Gerard's Catholic Primary School

The location of each of these receivers is shown in Figure 6-2.



Figure 6-2 Site plan identifying Noise Catchment Areas and sensitive receivers considered
Measured noise levels

Observations made during the site survey confirmed that Pennant Hills Road traffic was the principal source of influence on the measured L_{Aeq} noise levels, whilst background LA_{90} noise levels may be influenced by other noise sources such as distant urban 'hum' and fauna (i.e. insects).

A summary of the measured noise level is provided in Table 6-1.

Table 6-1: Measured noise levels (22-31 January 2018)

Site	Approx. setback distance to nearside carriageway	Day Time L _{Aeq, 15hr} (dBA)	Night Time L _{Aeq, 9hr} (dBA)	Rating Background Level (RBL) (dBA)		
				Day	Evening	Night
L1	6	74	72	58	53	40

6.1.3 Criteria

6.1.3.1 Construction noise

The noise criteria set out in the ICNG have been used to assess the potential impacts from construction noise. This document guides the EPA in setting statutory conditions in licences or other regulatory instruments for construction noise.

Table 6-2 summarises the construction noise management levels (NMLs) relevant to residences, as specified in the ICNG.

Table 6-2 Construction NMLs - Residences

Time of day	Management Level $L_{Aeq, 15min}$	How to Apply
<p>Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays</p>	<p>Noise affected RBL + 10dBA</p>	<p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <ul style="list-style-type: none"> Where the predicted or measured $L_{Aeq, 15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	<p>Highly noise affected 75dBA</p>	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <ul style="list-style-type: none"> Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: <ol style="list-style-type: none"> times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
<p>Outside recommended standard hours</p>	<p>Noise affected RBL + 5dB</p>	<ul style="list-style-type: none"> A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the Guideline.

For the purpose of assessment, the daytime, evening and night time Rating Background Levels (RBLs) determined by the monitoring have been used to establish construction Noise Management Levels (NMLs) for all residential receivers potentially impacted by the works. In accordance with the above guideline, the construction NMLs set out in **Error! Reference source not found.** would be applicable during the works.

Table 6-3: Project-specific construction Noise Management Levels for standard hours and outside standard construction hours

Receivers	Standard construction hours		Out of hours		
	Noise Affected Level $L_{Aeq, 15min}$ (dBA)	Highly Noise Affected Level $L_{Aeq, 15min}$ (dBA)	Noise Affected Level – Day $L_{Aeq, 15min}$ (dBA)	Noise Affected Level – Evening $L_{Aeq, 15min}$ (dBA)	Noise Affected Level - Night $L_{Aeq, 15min}$ (dBA)
Residential	68	75	63	58	45

Note: The determined residential criteria apply at the most affected point on or within the receiver property boundary.

On the basis that the night time RBL in the area is in the range of 40 dBA, a $L_{A1,1min}$ sleep disturbance screening criterion of $L_{A1,1min}$ 55 dBA has been considered for this assessment.

6.1.3.2 Construction vibration criteria

Construction work is generally an intermittent and not continuous source of vibration. Vibration from construction activities may have two potential impacts:

- Human exposure to vibration
- The potential for building damage from vibration.

Standards or guidelines used to assess construction vibration are as follows:

- Structural damage: British Standard BS 7385 Part 2 – ‘Evaluation and measurement for vibration in buildings’
- Human comfort (tactile vibration): Assessing vibration -A Technical Guideline (DEC, 2006) (This document is based upon the guidelines contained in British Standard 6472:1992, ‘Evaluation of human exposure to vibration in buildings (1-80 Hz)’)
- Safe Working Distances: NSW Transport Construction Authority’s Construction Noise Strategy (CNS).
- The safe working distances for both cosmetic damage to buildings and human comfort set out in

Table 6-4.

Table 6-4 Recommended safe working distances for vibration intensive plant

Plant item	Rating / description	Safe working distance	
		Cosmetic damage (BS 7385)	Human response (DECCW Vibration Guideline)
Vibrator Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25	100 m
Small hydraulic hammer	(300 kg – 5 to 12t excavator)	2 m	7 m
Medium hydraulic hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large hydraulic hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory pile driver	Sheet piles	2 to 20 m	20 m
Pile boring	800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

6.1.3.3 Road Traffic noise

Construction traffic

The CNVG requires an initial screening test to evaluate whether noise levels would increase by more than 2dB(A) due to construction traffic or a temporary reroute to a road closure. Where increases are 2dB(A) or less then no further assessment is required. The EPA's 'Road Noise Policy' (RNP) states that in assessing feasible and reasonable mitigation measures, an increase of up to 2dB(A) represents a minor impact. Where noise levels increase by more than 2dB(A) then further assessment is required using the Transport for NSW 'Noise Criteria Guideline' (NCG).

Operational traffic

Where a proposal has the potential to generate a new source of noise for residential receivers, either through changes in road alignment or a change to the volume or mix of vehicles, an operational traffic noise assessment is required in accordance with the RNP. The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessment noise impacts and determining mitigation

measures for developments that are potentially affected by road traffic noise. However, page 5 of the RNP states the following:

“Some works that are either minor or required to improve safety are not covered by this RNP”

The proposed modification to Pennant Hills Road, North Rocks Road and the intersection of the two roads involves widening the existing roads northbound and southbound on Pennant Hills Road and to the immediate west and east of Pennant Hills Road on North Rocks Road. The objectives of the proposed works are to:

- Ease congestion and improve travel times for all road users during peak periods.
- Improve the flow of traffic through the intersection.
- Improve safety at the intersection of Pennant Hills Road and North Rocks Road.

With respect to the above, the NCG states the following:

“Some works may be primarily to improve safety. This may include minor straightening of curves, installing traffic control devices, intersection widening and turning bay extensions or making minor road alignments.

These works are not considered redeveloped or new as they are not intended to increase the traffic carrying capacity of the overall road or accommodate a significant increase in heavy vehicle traffic.”

Therefore, the proposed modification not specifically assessed against the RNP.

Based on the above, the proposed modification is considered to be minor works. For minor works the NCG states the following regarding noise level targets:

“Roads and Maritime applies the existing road criteria (RNP Table 8) where the minor works increase noise levels by more than 2.0 dBA relative to the existing noise levels at the worst affected receiver.”

Table 8 of the RNP (Section 4.4) has the following target noise abatement levels for existing roads not subject to redevelopment:

- L_{Aeq} , 15 hour 60 dB(A) Day
- L_{Aeq} , 9 hour 55 dB(A) Night

Additionally, the NMG states:

“For minor works, Roads and Maritime applies the criteria from the NCG if noise levels increase by more than 2.0 dBA at the worst affected receiver.

When this is demonstrated, all sensitive receivers must be assessed where noise levels exceed the controlling criterion within the minor works study area (NCG). Where the total noise level for the ‘build’ year exceeds the criterion and there is an increase of more than 2.0 dBA (ie. 2.1 dBA), relative to the ‘no-build’ year, then the receiver qualifies for consideration of noise mitigation. This includes the situation where the ‘no-build’ noise level is below the criterion values(s).”

Therefore based on the NMG, affected receivers qualify for noise mitigation treatment where reasonable and feasible, only if traffic noise levels predicted for the ‘build’ year (ie. when upgrade is completed) exceed the existing road noise criteria and the increase in traffic noise between the ‘build’ and ‘no-build’ years is greater than 2.0 dB(A).

Where the changes of an existing road alignment are only minor, a less detailed assessment of traffic noise impacts is required. The primary operational noise criteria considered for this assessment is whether the proposal would result in a traffic noise increase of more than 2 dB(A) at any nearby receiver.

6.1.4 Potential impacts

6.1.4.1 Construction Noise

Standard construction hours in accordance with the ICNG are as follows:

- Monday to Friday 7.00am to 6.00pm
- Saturday 8.00am to 1.00pm
- Sunday and public holidays No work.

Activities would generally be undertaken at night. Any out-of-hours works would be undertaken in accordance with the ICNG and Practice Note vii of Roads and Maritime's Environmental Noise Management Manual (RTA 2001). The night works would be required in order to minimise disruption to road users and to ensure the safety of the public and construction crews. Night works to accommodate traffic closures would be conducted in accordance with approved Road Occupancy Licences (ROLs).

Table 6-5 lists the major plant and equipment likely to be used by the contractor during construction and their corresponding sound power levels.

Table 6-5 Typical activities and sound power levels (SWL)

Equipment Used	Equipment SWL dB(A)
Rigid and articulated trucks	109
Semi-trailers to deliver materials	109
Bobcat	95
Forklift	90
Up to 20 tonne excavators with hammer for demolition of concrete pavements	122
Vibrating and smooth drum rollers	107
Asphalt paver	114
Multi-tyred roller	109
30 tonne trucks for delivering asphalt and concrete	109
Road profiler	114
Lighting towers	85
Generators	90
Light vehicles	80
Electric and fuel powered hand tools	100
Water cart	107
Line marking machine	108
Concrete saw / road cutting saw	118
Bitumen sprayer	106
Tree pruning truck and mulcher	116
Trucks with boom lift and hiab	98
Jackhammers	113

Noise emissions would impact different receivers to various degrees as construction progresses. The worst case predicted construction noise levels determined through the modelling undertaken are set out in Appendix F, and the predicted potential exceedances of the relevant NMLs are set out in Table 6-6 for works within standard work hours and in

Table 6-7 for works out of hours (night works).

Table 6-6 Predicted construction noise NML exceedances (dBA) during standard hours

NCA	Compound Setup	Clear & Grub		
		Work Stage 1	Work Stage 2	Work Stage 3
NCA1-A	Nil	Nil	Nil	13
NCA1-B	2	4	5	11
NCA1-C	Nil	11	5	Nil
NCA1-D	Nil	11	Nil	Nil
NCA1-E	Nil	Nil	Nil	Nil
NCA1-F	Nil	3	Nil	Nil
NCA1-G	11	5	9	Nil
NCA1-H	Nil	Nil	2	Nil
NCA1-I	Nil	Nil	Nil	Nil
NCA1-J	Nil	Nil	Nil	Nil
NCA1-K	Nil	Nil	8	Nil
NCA1-L	Nil	Nil	12	Nil
NCA1-M	Nil	Nil	6	Nil
NCA1-N	Nil	Nil	6	7
NCA1-O	Nil	Nil	Nil	13
NCA2	Nil	Nil	Nil	Nil
NCA3	Nil	Nil	Nil	Nil
NCA4	Nil	Nil	Nil	Nil
NCA5	Nil	Nil	Nil	Nil
NCA6	Nil	Nil	Nil	Nil
NCA7	Nil	Nil	Nil	Nil

Table 6-7 Predicted construction noise NML exceedances (dBA) during night works

NCA	Excavate			New Kerb			Seal & Asphalt			Line Mark		
	Work Stage			Work Stage			Work Stage			Work Stage		
	1	2	3	1	2	3	1	2	3	1	2	3
NCA1-A	9	21	36	9	20	36	3	13	28	Nil	9	21
NCA1-B	27	29	35	26	29	34	20	22	27	15	16	20
NCA1-C	35	28	5	34	28	5	28	22	Nil	22	16	Nil
NCA1-D	32	9	Nil	33	9	Nil	27	3	Nil	20	Nil	Nil
NCA1-E	23	13	2	23	14	1	18	7	Nil	11	1	Nil
NCA1-F	25	17	5	25	19	4	20	13	Nil	13	7	Nil
NCA1-G	28	32	16	28	33	16	22	26	9	16	21	2
NCA1-H	10	23	9	11	19	9	5	14	2	Nil	9	Nil
NCA1-I	8	6	Nil	8	6	Nil	1	Nil	Nil	Nil	Nil	Nil
NCA1-J	6	19	6	6	18	6	Nil	12	Nil	Nil	5	Nil
NCA1-K	9	32	21	9	31	22	3	25	15	Nil	19	8
NCA1-L	5	35	21	5	35	21	Nil	28	14	Nil	23	7
NCA1-M	7	29	24	7	29	24	Nil	23	14	Nil	17	7
NCA1-N	10	29	31	10	29	31	4	22	24	Nil	17	17
NCA1-O	4	20	37	4	20	37	Nil	14	30	Nil	8	24
NCA2	22	10	3	21	15	3	15	9	Nil	9	3	Nil
NCA3	13	6	Nil	13	6	Nil	7	Nil	Nil	Nil	Nil	Nil
NCA4	11	8	2	11	8	2	5	2	Nil	Nil	Nil	Nil
NCA5	16	14	4	16	15	3	10	8	Nil	4	2	Nil
NCA6	2	18	8	1	18	7	Nil	12	Nil	Nil	6	Nil
NCA7	Nil	11	16	Nil	10	16	Nil	4	10	Nil	Nil	3

The predictions indicate that clear and grub construction activities during standard hours would result in exceedances of up to approximately 13 dB at the most affected receivers.

Out-of-hours nightworks have the greatest potential to generate noise impacts. Exceedances of the night time 45 dBA NML are expected for works undertaken out-of-hours. Potential exceedances of up to approximately 37 dB are predicted during the out-of-hours works at the the most exposed residential receivers. In particular, excavation and new kerb installation activities would have the greatest potential to impact residents in NCA1-O as identified in

Table 6-7.

The worst-case construction scenario (night works with all works stages occurring concurrently) was modelled to identify receivers impacted by different levels of construction noise. Figure 6-3 identifies the noise contours for the worst-case scenario and Figure 6-4 identifies the receivers where NMLs are exceeded.

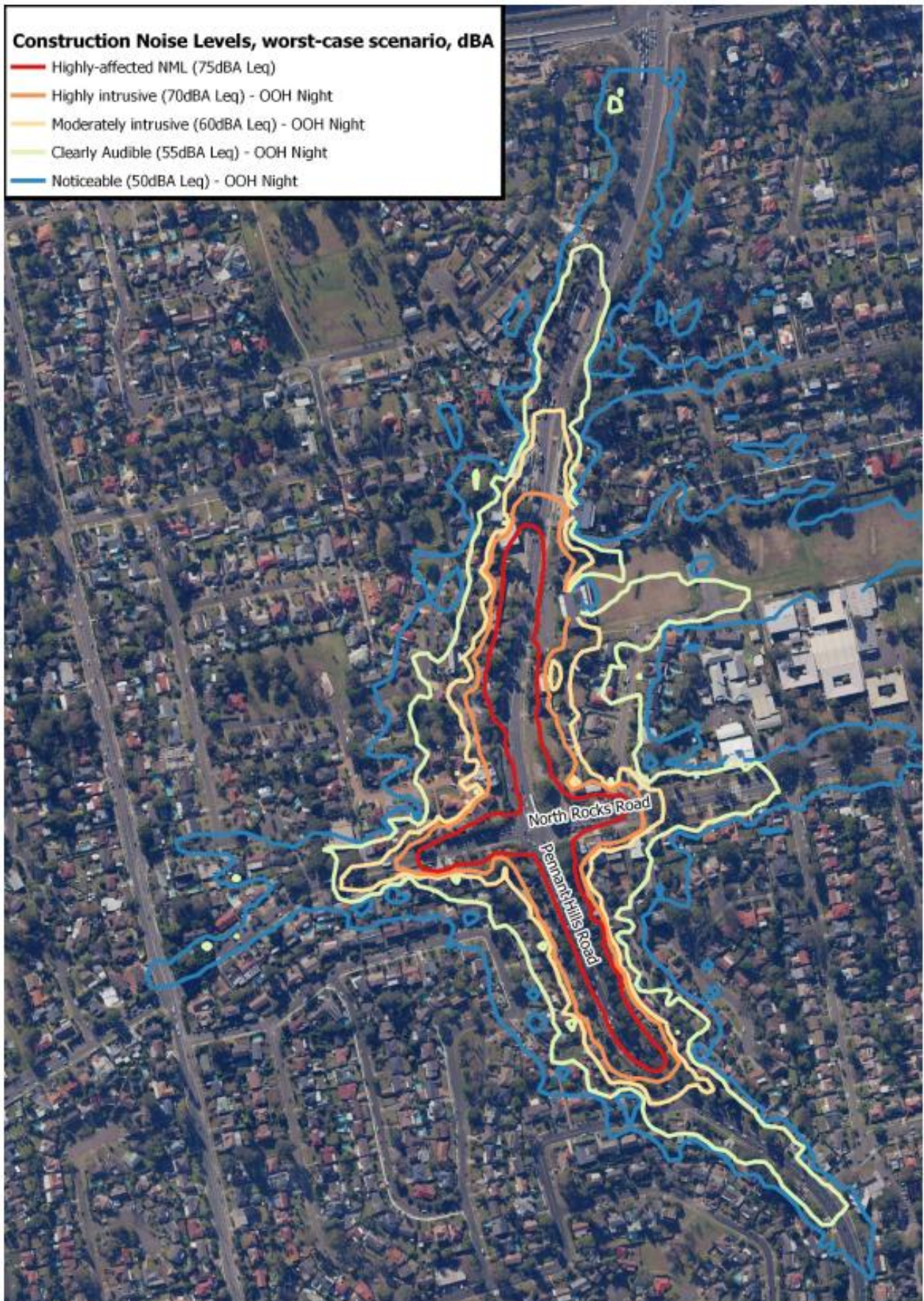


Figure 6-3 Construction noise levels, worst case scenario - night works



Maximum Construction Noise Levels, dBA

- > 45 dBA, < 75dBA - Exceed Night time OOH NMLs, complies with Highly Affected NMLs
- > 75dBA - Exceed Highly Affected NMLs
- NCA1
- NCAs 2-7

Figure 6-4 Maximum construction noise levels compared to night-time NMLs

Nightworks including pavement and asphaltting would be expected to generate extensive exceedance of the $L_{A1,1min}$ 60 dBA sleep disturbance criterion adopted by this assessment. Table 6-8 identifies the NCAs where sleep disturbance criteria would be exceeded and in bold as the levels exceeding $L_{A1, 1 min}$ 75 dBA. The noise assessment notes that the impacts are based on the conservative assumption that bedroom windows may be partially open for ventilation purposes however given the proximity of receivers to a busy road, it is assumed that many will normally keep their windows closed.

Table 6-8 Predicted $L_{A1, 1 min}$ Construction Levels - Night (dB)

NCA	Excavate			New Kerb			Seal & Asphalt			Line Mark		
	Work Stage			Work Stage			Work Stage			Work Stage		
	1	2	3	1	2	3	1	2	3	1	2	3
NCA1-A	57	69	84	57	68	84	51	61	76	45	57	69
NCA1-B	75	77	83	74	77	82	68	70	75	63	64	68
NCA1-C	83	76	53	82	76	53	76	70	47	70	64	41
NCA1-D	80	57	47	81	57	46	75	51	40	68	46	34
NCA1-E	71	61	50	71	62	49	66	55	43	59	49	37
NCA1-F	73	65	53	73	67	52	68	61	46	61	55	39
NCA1-G	76	80	64	76	81	64	70	74	57	64	69	50
NCA1-H	58	71	57	59	67	57	53	62	50	47	57	43
NCA1-I	56	54	45	56	54	45	49	48	37	44	42	31
NCA1-J	54	67	54	54	66	54	48	60	47	42	53	40
NCA1-K	57	80	69	57	79	70	51	73	63	45	67	56
NCA1-L	53	83	69	53	83	69	47	76	62	41	71	55
NCA1-M	55	77	72	55	77	72	49	71	62	43	65	55
NCA1-N	58	77	79	58	77	79	52	70	72	46	65	65
NCA1-O	52	68	85	52	68	85	46	62	78	40	56	72
NCA2	70	58	51	69	63	51	63	57	45	57	51	38
NCA3	61	54	47	61	54	47	55	47	40	49	41	33
NCA4	59	56	50	59	56	50	53	50	43	47	44	36
NCA5	64	62	52	64	63	51	58	56	44	52	50	37
NCA6	50	66	56	49	66	55	43	60	48	38	54	42
NCA7	45	59	64	45	58	64	39	52	58	34	47	51

Note: Levels exceeding the sleep disturbance criterion of $L_{A1,1min}$ 60 dBA (RBL Night + 15dB) are shown in red

With consideration to the ECRTN and the typical noise reduction of 10dB that is achieved through a bedroom facade with partially open windows, it is considered that an external noise level of $L_{A1,1min}$ 60-65dBA would be unlikely to cause sleep disturbance. Where windows remain closed, external noise level of up to $L_{A1,1min}$ 75-80 may not necessarily result in sleep disturbances.

The majority of construction truck movements would be expected during standard works hours, with no more than two or three movements per hour expected during the night at either site at peak times. Construction traffic would not be expected to increase traffic noise levels by more than 2 dB. An increase of no more than 2 dB is not considered significant and therefore specific construction traffic noise impacts are not anticipated.

Works during approved standard works hours are expected to be able to be managed effectively with standard mitigation measures. During out of hours work compliance with NML is often unachievable and the CNVG provides guidance and outlines a number of additional mitigation measures based on the level of noise above the NML. Table 6-9 sets out the noise mitigation measures listed in the CNVG and Table 6-10 sets out when each of

the mitigation measures are to be applied. Figure 6-3 identifies the noise contours applicable to the trigger levels stated in Table 6-10 for the worst case construction scenario.

Table 6-9 CNVG noise mitigation measures

Measure	Abbreviation
Notification (letterbox drop or equivalent)	N
Specific Notifications	SN
Phone Calls	PC
Individual Briefings	IB
Respite Offers	RO
Respite Period 1	R1
Respite Period 2	R2
Duration Respite	DR
Alternative Accommodation	AA
Verification	V

Table 6-10 Triggers for additional mitigation measures

Time Period		Airborne Noise			
		L _{Aeq,15min} Mitigation Levels above			
		NML	NML + 5	NML + 15	NML + 25
		Noticeable	Clearly Audible	Moderately Intrusive	Highly Intrusive
OOHW Period 1	Mon-Sat (6pm-10pm)	-	N, R1*, DR	V, N, R1*, DR	V, IB, PC*, SN, N, R1*, DR
	Sat (7am-8am & 1pm-10pm)				
	Sun / Pub Hol (8am-6pm)				
OOHW Period 2	Mon-Fri (10pm-7am)	N	V, N, R1*, DR	V, IB, PC*, SN, N, R2*, DR	AA*, V, IB, PC*, SN, N, R2*, DR
	Sat (10pm-8am)				
	Sun / Pub Hol (6pm-7am)				

Table 6-10 lists additional mitigation measures that are reasonable and feasible to apply. **Notification (N)** in a form of letterbox drop will be sent to the community no later than seven calendar days ahead of construction activities. Notification will have information detailing work activities, dates and hours of proposed works, impacts and mitigation measures, indication of work schedule over the night time period, as well as any operational noise benefits from the works and contact information. **Specific notifications (SN)** and **Phone calls (PC)** are not recommended in order to minimise the confusion for the residences. **Respite condition 2 (R2)** is a measure to minimise the impacts of construction noise in out of hours period. The works shall be limited to two consecutive nights except for where there is a **Duration Respite (DR)**. For night work these periods of work should be separated by not less than one week and 6 nights per month. High noise generating works such as jackhammering and sawcutting will be completed before midnight. **DR** proposes to condense the overall work duration by increasing number of evenings and nights worked through so that the project can be completed more quickly. It is anticipated that the proposal will not be able to comply with **R2** mitigation measure. Therefore **DR** is proposed and work would proceed up to five nights per week. Advanced information notification will be sent out to the

community regarding construction schedule detailing the mitigation measures proposed to be implemented to minimise the potential impacts. **Verification monitoring (V)** would be conducted during construction to confirm verify noise assessment results. It is not considered feasible for this project with proposed modification to offer **Alternate accommodation (AA)**. Due to the high number of noise sensitive receivers within the noise catchments areas it would be impractical and difficult to consistently deliver alternative accommodation arrangements across the entire proposal area. This would be reviewed pre-construction and following a complaint.

Given the staging of construction activities is to be determined by the contractor and is unlikely to reflect the worst-case scenario where all stages are completed concurrently the mitigation measures for each NCA may change. Once the final works scheduling has been confirmed, the successful contractor should confirm construction noise predictions and based on these determine the additional mitigation requirements for each NCA in accordance with Table 6-10. A Construction Noise and Vibration Management Plan (CNVMP) should be prepared and updated as necessary. These safeguards are set out below.

6.1.4.2 Construction vibration impacts

The closest receivers are located at approximately 12-20 m from the works areas. Based on the use of a representative vibration intensive plant (an 18 tonne vibratory roller), Figure 6-5 shows receivers where the vibration criteria for cosmetic damage or human comfort (refer

Table 6-4) may be exceeded if mitigation measures are not implemented. The piece of equipment was chosen as it represents the worst case scenario for construction vibration.

At these setback distances there is some risk of exceeding the human comfort criteria. In practice, it is usually found that vibration impacts can be largely controlled by virtue of the progressing works, that is, the vibratory rollers and hammers would not remain in static locations for prolonged periods of time, but would typically move around the works areas, thereby limiting the vibration dose experienced by individual receivers.

Safe working distances (as provided by the CVNG and outlined in

Table 6-4) are recommended to reduce the potential of vibration impacts occurring during the construction period in terms of cosmetic damage and human comfort.

In relation to cosmetic damage risk, a specific ground vibration risk assessment would be undertaken prior to construction to determine site specific safe working distances at each works location. All properties identified as being at risk to ground vibration under the vibration risk assessment would be subject to building condition surveys to be carried out by the Contractor prior to construction. The pre-condition surveys would be undertaken to understand the current condition of buildings identified as being potential at risk to ground vibration impacts before construction occurs. The surveys would be undertaken as part of the Noise and Vibration Management Plan prepared for construction.

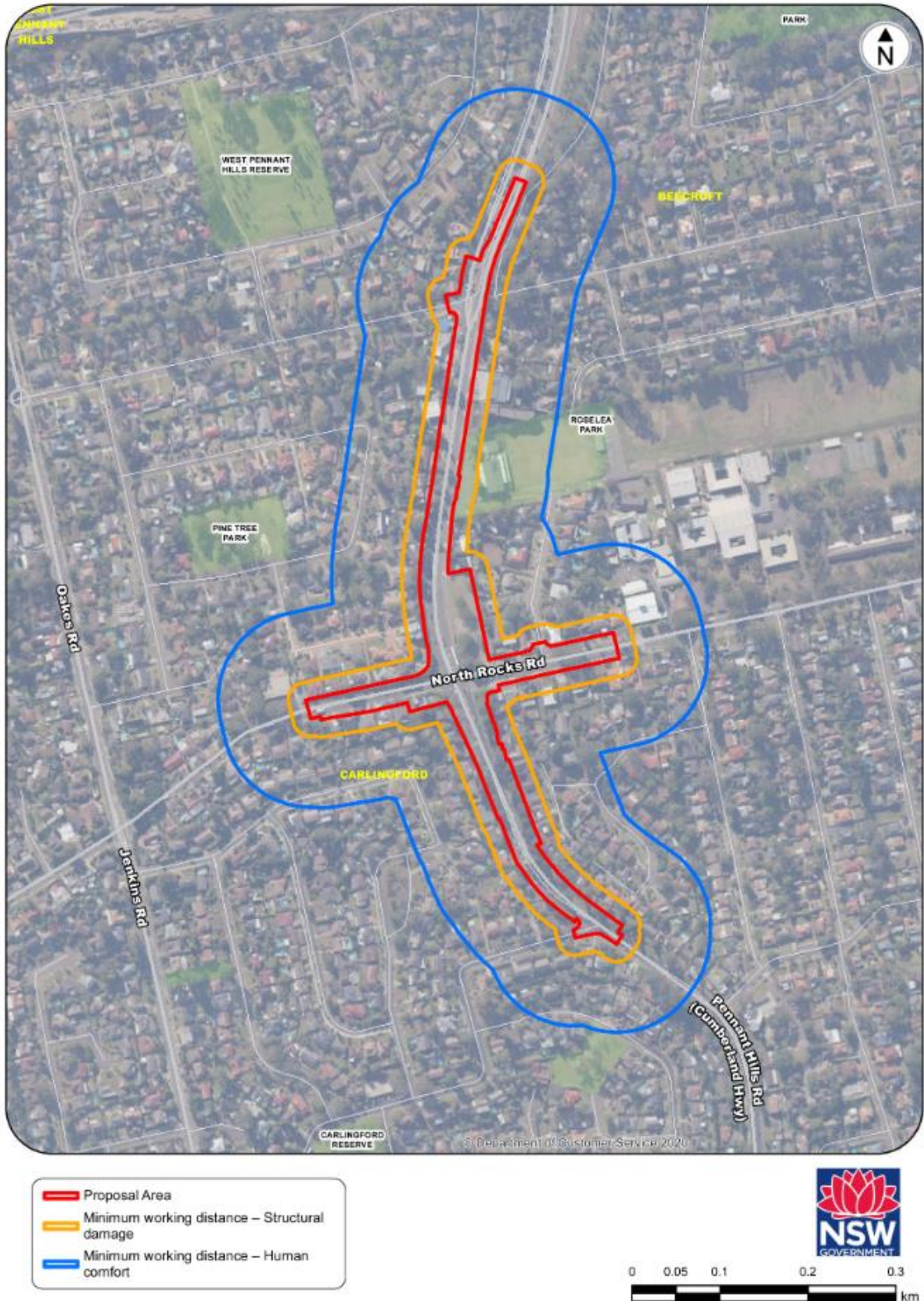


Figure 6-5 Minimum safe working distances when using the 18 tonne vibratory roller (worst case scenario) during construction

6.1.4.3 Operation

Predicted traffic noise levels for the No Build and Build scenarios within the identified NCAs are set out in Table 6-11. The NCA predictions and relative traffic noise increases shown in the table are based on predictions at the individual receivers. For each NCA, the maximum predicted $L_{Aeq,Period}$ noise levels and relative changes are shown.

Table 6-11: Predicted traffic noise levels – ‘Build’ compared to ‘No Build’

Receiver ID	$L_{Aeq,Period}$ (dBA) ‘No build’		$L_{Aeq,Period}$ (dBA) ‘Build’		Change in noise levels – Build / No Build	
	Day	Night	Day	Night	Day	Night
NCA1-A	70	65	70	65	0	0.1
NCA1-B	73	70	73	70	0	0.1
NCA1-C	72	69	72	69	0.3	0.3
NCA1-D	73	70	74	71	0.4	0.4
NCA1-E	72	69	72	69	0	0
NCA1-F	72	69	72	69	0	0
NCA1-G	72	70	72	70	0.3	0.2
NCA1-H	62	57	63	57	0.1	0.1
NCA1-I	54	50	54	50	0	0
NCA1-J	62	57	62	57	0.1	0.1
NCA1-K	72	69	72	69	0.4	0.2
NCA1-L	73	70	74	71	0.5	0.6
NCA1-M	73	70	73	70	-0.1	-0.1
NCA1-N	72	69	72	69	-0.1	0
NCA1-O	68	63	68	64	0.5	0.8
NCA2	60	58	60	58	0	0
NCA3	55	53	55	53	0	0
NCA4	58	55	58	55	0	0
NCA5	61	59	61	59	0	0
NCA6	59	56	59	56	0	0
NCA7	54	51	55	52	0	0

As shown in Table 6-11, whilst the existing traffic noise levels already exceed the NCG criteria, the project is only expected to result in marginal traffic noise increases at the closest (most affected) receivers and subsequently for all receivers as well. At the most affected receivers, the L_{Aeq} daytime and night-time levels are predicted to increase by less than 1.0 dB, which would not be perceptible to most people and well within the 2 dB permissible increase range.

6.1.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Construction noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> • all potential noise and vibration generating activities associated with the activity • a monitoring program to assess performance against relevant noise and vibration criteria • arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 	Contractor	Detailed design / pre-construction
Construction noise	<p>Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise levels should be scheduled during less sensitive time periods.</p> <p>The most noise-intensive construction processes (such as pavement sawing and jack hammering) is to be completed prior to midnight.</p>	Contractor	Construction
Construction noise	<p>All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least seven 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 project • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting 	Contractor	Pre-construction /Construction

	<ul style="list-style-type: none"> • How to obtain further information. 		
Construction noise	Noise curtains are to be placed between sources of construction noise and sensitive receivers during night works where noise sources are stationary.	Contractor	Construction
Construction vibration	<p>Pre-construction vibration trials to be undertaken on site to if vibration producing plant are expected to work within safe working distances to verify acceptable limits.</p> <p>Select plant to ensure that the recommended safe working distances for cosmetic damage are maintained.</p>	Contractor	Pre-construction
Construction vibration	A vibration risk assessment will be carried out before construction to identify if there are any buildings located within the minimum working distances for construction activities proposed to be undertaken. Where vibration is found to be excessive on any receiving properties, management measures will be implemented to ensure vibration compliance is achieved. Management measures may include modification of construction methods such as using smaller equipment, establishment of safe buffer zones and if necessary, time restrictions for the most excessive vibration activities.	Contractor	Pre-construction
Construction vibration	Dilapidation/building condition surveys will be conducted at receivers determined by the contractor through a vibration risk assessment, to be sensitive to ground vibration impacts.	Contractor	Pre-construction

6.2 Biodiversity

6.2.1 Methodology

Database Searches and Literature Review

A desktop review was undertaken to identify current records of threatened flora, fauna and ecological communities, migratory species, critical habitats and Key Threatening Processes (KTP) within five kilometres of the proposal. This included searches of online databases and a review of available spatial data and literature:

- The NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife database, which contains records of threatened species, populations and ecological communities, critical habitat and KTPs listed under the BC Act (Reviewed: 5 November 2020);

- The Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST) was used to identify MNES listed under the Commonwealth EPBC Act (Reviewed: 4 November 2020);
- Local vegetation mapping – The Native Vegetation of the Sydney Metropolitan Area (OEH 2016); and
- Habitat profiles for all threatened, populations and ecological communities, and migratory species that are known to or have potential to occur within the locality. Marine species were not considered in this assessment as the proposal area does not contain any marine habitat.

Field Survey

A field survey was undertaken on 11 January 2018 by an ecologist to assess the vegetation and habitat in the original study area. An additional field survey was completed on 12 March 2021 to incorporate the proposed modification area. It is assumed based on the urban nature of the area that the vegetation in the modified proposal would be consistent with that already surveyed.

The database searches are included in the ecological report which is in Appendix F.

6.2.2 Existing environment

Flora

The vegetation within the proposal area occurs in highly disturbed and modified land that has predominantly been cleared to accommodate the existing road, driveways, housing and footpaths. The remaining vegetation occurs as mowed lawns and planted exotic and native street trees. Common introduced tree species observed within the proposal area include *Cupressus macrocarpa* (Monterey Cypress), *Cinnamomum camphora* (Camphor Laurel), *Jacaranda mimosifolia* (Jacaranda) and *Erythrina x sykesii* (Coral tree). Commonly observed native trees, many of which appeared planted, included *Angophora floribunda* (Rough-barked Apple), *Eucalyptus punctata* (Grey Gum), *Eucalyptus saligna* (Sydney Blue Gum) and *Lophostemon confertus* (Brush Box).

The field surveys of the subject site did not detect any threatened species listed under the BC Act or EPBC Act.

Much of the understorey has been cleared and consists of mowed lawns and patches of weed including *Lantana camara* (Lantana), *Asparagus aethiopicus* (Asparagus Fern) however, there was clear evidence of recent weed removal.

Weeds

Most of the understorey/groundcover of within the proposed site is comprised of weeds. Four species identified are Priority Weeds under the NSW Biosecurity Act 2015, these are:

- *Olea europaea* subsp. *cuspidata** (African Olive) - Regional Recommended Measure: The plant or parts of the plant are not traded, carried, grown or released into the environment;
- *Lantana camara* (Lantana) - Mandatory Measure: Must not be imported into the State or sold. This species is also a Weed of National Significance (WoNS); and
- *Asparagus aethiopicus* (Asparagus Fern) – Mandatory Measure: Must not be imported into the State or sold. This species is also a WoNS.
- *Eragrostis curvula* (African lovegrass) – General Biosecurity Duty: 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. Must not be imported into the State or sold. This species is also a WoNS.

Fauna

No threatened fauna species listed under the BC Act and / or EPBC Act were observed within the proposal site during the field survey. The most commonly observed fauna were birds. Bird species observed were those known to be common within the urban Sydney region and included the native Noisy Miner (*Manorina melanocephala*), Australian Raven (*Corvus coronoides*) and Rainbow Lorikeet (*Trichoglossus moluccanus*).

The Bionet Atlas desktop searches identified 48 threatened species (including three frog species, 13 bird, 13 mammal, 18 flora species and one gastropod) that are known or are predicted to occur within 5km of the proposal area. The results of the EPBC Protected Matters database search indicated 50 threatened species are known, or have potential, to occur within five kilometres of the proposal area. Given the highly disturbed and significantly modified nature of the area, it is expected that all would be highly tolerant urban animals.

Fauna habitat features

The habitat features for threatened fauna within the proposal area are predominantly restricted to the planted native/exotic trees. Whilst no hollow-bearing trees were detected within the proposal site, the trees provide potential foraging and nesting habitat for fauna species. However, the value of these habitat features is low due to their limited extent and highly disturbed condition. Eucalyptus species, other flowering plants, and fruiting trees have the potential to provide a seasonal foraging resource for nectar feeding birds and bats species. In addition, there were a number of *Cupressus macrocarpa* (Monterey Cypress) that are often used as drey sites by the non-threatened native Ring-tailed Possum (*Pseudocheirus peregrinu*).

Threatened ecological communities

The Bionet Atlas desktop searches identified eight threatened ecological communities (TECs) that are known or are predicted to occur within five kilometres of the proposal area. The results of the EPBC Protected Matters database search indicated nine TECs are known, or have potential, to occur within five kilometres of the proposal area. Given the highly disturbed and significantly modified nature of the area, it is expected that all would be highly tolerant urban animals.

The field survey concluded that whilst a small number native trees occur within the proposal area, these were not considered to form part of any potentially occurring listed Endangered Ecological Communities (EECs).

6.2.3 Potential impacts

Construction

The proposed modification, in combination with the determined project, would result in the removal of about 0.9 ha of vegetation, as identified in Figure 6-6 and determined based on the dripline of native and exotic trees or shrubs within the proposal area. Vegetation would be removed to enable construction of the proposal at the following locations:

- kerbside areas of Pennant Hills Road both northbound and southbound
- within the site compound and the north east corner of the Pennant Hills Road and North Rocks Road intersection
- the south west corner of the Pennant Hills Road and North Rocks Road intersection
- kerbside areas of North Rocks Road east and west bound on the eastern leg of the Pennant Hills Road and North Rocks Road intersection.

This vegetation consists of a mix of planted native and ornamental trees that exist in highly urban and modified environments. The trees to be removed comprise native and introduced species and recent plantings, and do not comprise threatened species or form part of threatened ecological communities.

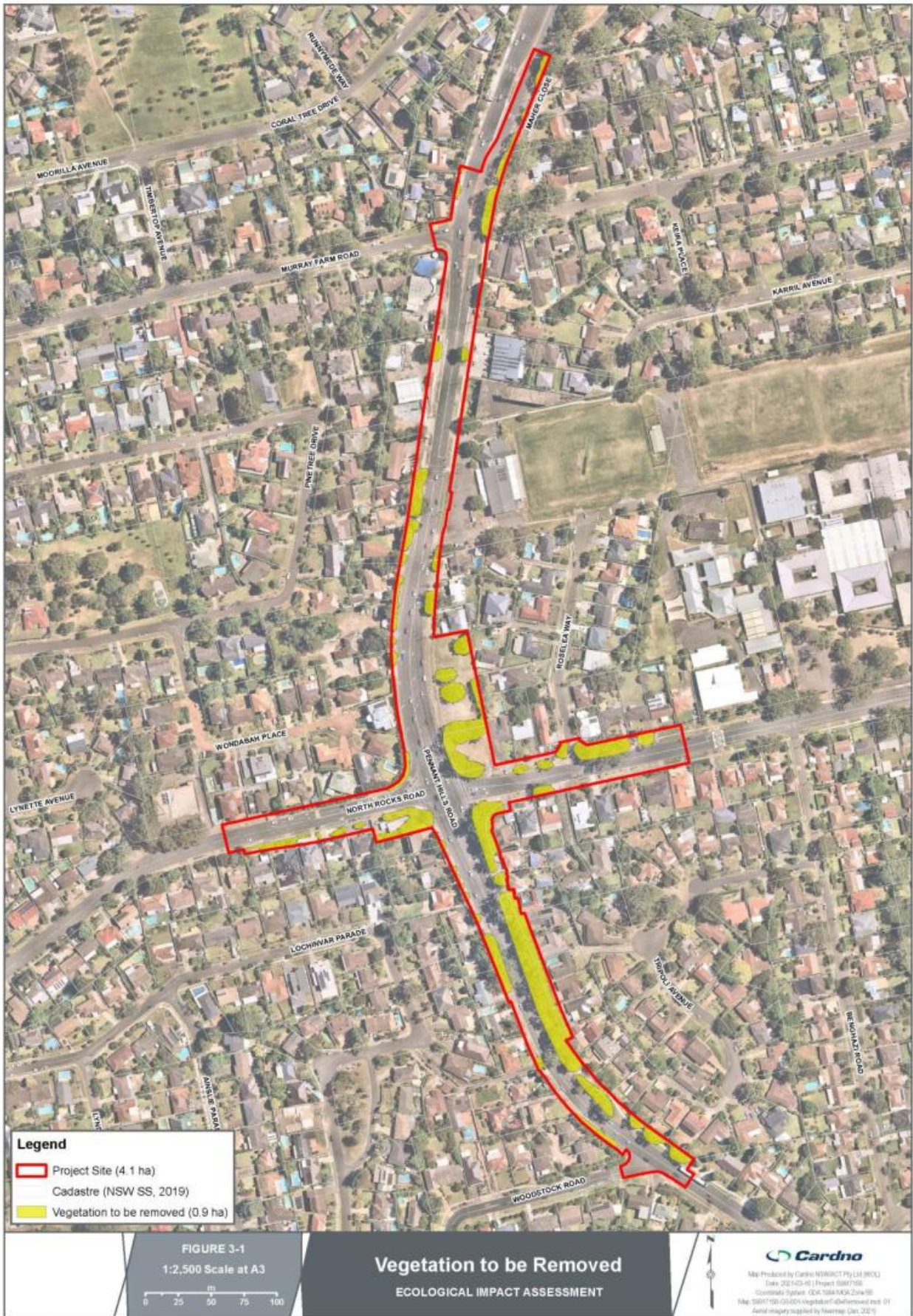


Figure 6-6 Vegetation to be removed

Operation

There would be no operational impacts to biodiversity due to the proposal, provided the recommendations and safeguards are implemented below. The proposal is unlikely to remove, modify, fragment or isolate any area of habitat important to the long-term survival of the addressed threatened flora and fauna species, population or ecological communities in the locality.

Conclusion on significance of impacts

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

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

6.2.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) pre-clearing survey requirements procedures for unexpected threatened species finds and fauna handling protocols to manage weeds and pathogens. 	Contractor	Detailed design / pre-construction
Biodiversity	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Contractor	Detailed design / pre-construction
Biodiversity	A landscaping plan will be developed for the proposal.	Transport for NSW	Detailed design / pre-construction
Biodiversity	Exclusion zones will be set up at the limit of clearing in accordance with <i>Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting</i>	Contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<i>and managing biodiversity on RMS projects (RTA 2011).</i>		
Biodiversity	If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the Transport for NSW's Unexpected Threatened Species Find Procedure in the Roads and Maritime Services Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process).	Contractor	Construction
Biodiversity	All pathogens (e.g. Chyid, Myrtle Rust and <i>Phytophthora</i>) are to be managed in accordance with the Roads and Maritime Services Biodiversity Guidelines - Guide 7 (Pathogen Management) and DECC Statement of Intent 1: Infection of native plants by <i>Phytophthora cinnamomi</i> (for <i>Phytophthora</i>).	Contractor	Construction
Biodiversity	Priority weeds are to be managed according to requirements of the <i>Biosecurity Act 2015</i> and Guide 6 (Weed Management) of the Roads and Maritime Services Biodiversity Guidelines 2011.	Contractor	Construction
Biodiversity	All pruning and trimming of trees are to be in accordance with the Australian Standard 4373-2007 <i>Pruning of amenity trees</i> . Pruning of mature trees is to be undertaken by a qualified arborist.	Contractor	Construction

6.3 Traffic, transport and Access

6.3.1 Methodology

A traffic and transport report was prepared in November 2020 to assess the modelled operational traffic predictions for the proposal. Intersection turn count and queue length surveys were commissioned in November 2019 to inform the assessment. Refer to Appendix H for the traffic report.

The traffic report assessed traffic performance of proposed options. Base modelling was developed based on the previously developed SIDRA model in accordance with TfNSW Traffic Modelling Guidelines. Modelling considered 2016 as the base year. Modelling considered AM and PM weekday peak hours as informed by the traffic counts and SCATS traffic signal data. The report also considered crash reports in order to identify any crash trends.

Overall intersection performance is reported as an estimate of the average delay that all vehicles encounter at a particular intersection; the detailed measure is commonly expressed

qualitatively as Level of Service which categorises the average delay into bands A to F, with LoS A representing the best operation and LoS F representing the worst operation. The banded categories are defined in Table 6-2. Intersection performance is also reported as Degree of Saturation (DoS), which represents the flow-to-capacity ratio for the most critical movement on each leg of the intersection.

Table 6-12: Level of Service

Level of Service (LoS)	Average delay per vehicle in seconds
	Signalised Movements
A	< 14.5
B	14.5 to 28.5
C	28.5 to 42.5
D	42.5 to 56.5
E	56.5 to 70.5
F	> 70.5

6.3.2 Existing environment

Pennant Hills Road (part of the A28 road route), is an arterial road classified as a State Road. It is a designated B-double freight route, with a posted speed of 60km/h. Within the project extents, the typical existing lane configuration is two lanes north and two lanes south, with no raised median between carriageways. North of Murray Farm Road, Pennant Hills Road becomes three lanes in both directions.

The intersection of Pennant Hills Road / North Rocks Road is one of the key intersections along Pennant Hills Road that connects Wahroonga in the north of Sydney metropolitan area to Parramatta in the west. The intersection also is located within proximity of the key M2 Motorway.

The eastern leg of North Rocks Road is a local road servicing the residential areas of Epping and Carlingford and a number of schools. The eastern leg of North Rocks Road has a load restriction for vehicles over three tonnes, which is reflective of the predominantly residential catchment of this road.

The western leg of North Rocks Road is also a collector road and has no load restriction. This is reflective of a larger catchment for this road, consisting of a significant residential component, as well as the North Rocks Shopping Centre and a large light industrial/commercial precinct.

The most recent average daily traffic (ADT) data for Pennant Hills Road was collected in 2020. The data was obtained from one permanent mid-block counting station (74090) located along Pennant Hills Road (Cumberland Highway) approximately 2.4km north of M2 Motorway and provides ADT data in both directions. **Error! Reference source not found.** shows the historical growth experienced at the counting station.

Table 6-13: Pennant Hill Road historical daily traffic count

Station	Location	Direction	Traffic volumes			
			2018	2019	2020	% Growth 2018-2019
74090	Pennant Hill Road, 2.4km north of M2 Motorway	Eastbound	30,237	29,543	17,433	-2%
		Westbound	32,685	33,022	26,088	1%

Source: Transport for NSW 2021

Traffic congestion

The following key observations were made with regards to existing performance at the intersection:

- Queuing and delays for southbound traffic on Pennant Hills Road in the AM peak largely due to the high through traffic demand which has two through lanes with the kerbside lane shared with the left turn. Total approach volumes in AM peak are approximately 2,000 vehicles per hour (82 per cent as through movement), making it the busiest approach in the AM.
- Southbound delays are also observed in the PM peak, though less significant than in the AM. The delays in the PM are largely caused by the right turn into North Rocks Road. Total PM peak demand per hour is lower than in the AM peak (close URCP Options Assessment - November 2020 8 to 1,700 vehicles) whilst the demand for the right turn remains similar to the AM peak (close to 300 vehicles).
- Congested conditions for northbound traffic on Pennant Hills Road were mainly observed in the PM peak with a total demand of about 1,930 vehicles at approach (compared to 1,700 in the AM peak) underlining the tidal characteristics of the intersection.
- The through lanes on the southern approach are at times impacted by vehicles queuing out of the short turn lanes to either side. This particularly affects the AM peak, which has a higher demand of right turners than the PM peak (215 vs 49).
- Access to service stations, community facilities and schools located along Pennant Hills Road to the north of North Rocks Road likely further contribute to the congested conditions along the corridor north of the intersection.
- Congestion on the western approach of North Rocks Road primarily due to high demand for the right turn to Pennant Hills Road south with average queues of approximately 120 metres in the peak hours. The right turn has one short dedicated lane and one shared left, through and right lane leading to inefficiencies at the approach.
- Queuing and delays on eastern arm of North Rocks Road in both peaks; this approach has the lowest traffic demand in both peaks. With the intersection currently operating split phasing for North Rocks Road, relatively less green time is allocated to reduce overall intersection congestion and delay.

The SIDRA intersection performance under base year (2016) conditions is summarised in Table 6-14.

Table 6-14: Existing intersection performance

Approach	Existing AM			Existing PM		
	DoS	Delays (s)	LoS	DoS	Delays (s)	LoS
Pennant Hills Road (S)	0.98	46	D	1.02	82	F
North Rocks Road (E)	1.00	127	F	1.02	152	F
Pennant Hills Road (N)	1.01	114	F	0.97	49	D
North Rocks Road (W)	1.01	124	F	1.00	126	F
Intersection	1.01	92	F	1.02	82	F

The SIDRA analysis shows that the intersection currently operates at LoS F in both peaks, with an average delay of about 82-92 seconds and is operating at capacity on most approaches. The highest delays are on North Rocks Road approaches, which runs a split approach.

Modelling of the future intersection performance (10-year horizon forecast) which accounted for the opening of NorthConnex in late 2020 shows that the intersection is expected to experience significant delays without intersection modifications. An average delay of 254 seconds in the AM peak and 298 seconds in the PM peak would be expected.

Intersection safety

Crash data between July 2014 and June 2019 shows 36 crashes were reported within 550 metres north and 300 metres south of the intersection, and 100 metres east and west along North Rocks Road. A summary illustration of crashes at the intersection during this period is provided in Figure 6-7. Of the 36 reported crashes, 16 (44 per cent) were rear-end collisions of vehicles travelling in the same lane, indicating that queueing conditions along the corridor due to congestion comprise a significant portion of the safety risk at this intersection.

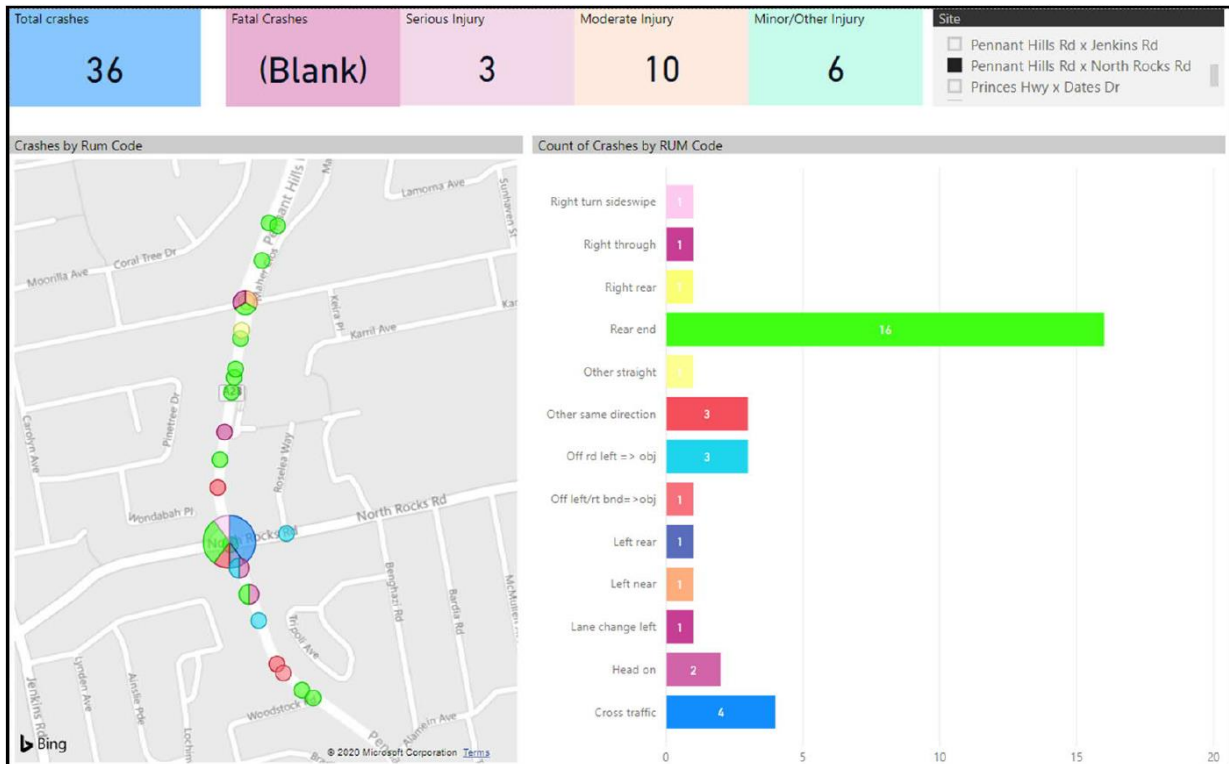


Figure 6-7 Intersection five-year crash summary

Pedestrian connectivity

The following key observations were made about pedestrian connectivity and volumes at the intersection:

- No pedestrian crossing on the southern approach of Pennant Hills Road means some pedestrians need to navigate through multiple crossings to reach the other side of Pennant Hills Road.
- Whilst overall pedestrian volumes at the intersection tend to be low it is noted that three schools are located within 500 metres east of the intersection, leading to higher concentrations of pedestrians in the AM peak. This is particularly the case when students travel by bus, walking from the stops located on Pennant Hills Road south of the intersection (both northbound bus ID 211824 and southbound bus ID 211831) towards the schools in the eastern verge.
- Pedestrian island on north western corner of intersection is very small and presents a potential safety hazard due to crowding. This is particularly relevant for aforementioned pedestrian peaks prior to school starting in the morning.

Public transport

There are seven bus stops in the proposal area (bus ID 211855, 211864, 211865, 211825, 211824, 211831 and 2118174) as noted in section 3.3.6. These bus stops service bus routes 549, 553, 625 and 630. There are designated bus bays which allow buses to turn out from the through traffic for stop 211825 servicing routes 553 and 625, located on Pennant Hills Road northbound opposite Roselea Community Centre; stop 211831 servicing routes 625 and 630, located on the south side of the intersection on Pennant Hills Road southbound; and stop 2118174 servicing route 625, located on Pennant Hills Road southbound to the north of Roselea Community Centre.

Access to properties

Excluding the properties at the southern extent of the proposal area which are accessed via either Tripoli Avenue or Woodstock Road, the properties along the corridor within the

proposal area are accessed via Pennant Hills Road and North Rocks Road. Since there is no raised median on Pennant Hills Road or North Rocks Road within the proposal area, vehicles are able to turn right into these properties.

6.3.3 Potential impacts

Construction

Impacts during construction would include road and lane closures, impacts on property access, footpaths and public transport stops. These impacts and the safeguards to manage traffic impacts are described in Section 3.3.6.

Properties which have direct driveway access to the proposal area may require temporary access adjustments during the construction phase. All residents and businesses whose access would be impacted would be notified prior to commencement of works and consulted regarding alternative arrangements (e.g. use of parking on adjacent side streets).

Construction traffic would generally use Pennant Hills Road and North Rocks Road to travel to and from the proposal site construction compound which will be located at the corner of Pennant Hills Road and North Rocks Road within the proposal area. Pennant Hills Road is a main road which carries high traffic volumes, any additional construction vehicle traffic would have a negligible traffic impact, as light and heavy construction vehicle traffic are expected to be within the range of daily variation in traffic on these routes.

Lane closures as a result of construction may mean detour and contraflow arrangements are utilised to ensure access to properties and that roads are maintained for vehicles, pedestrians and cyclists during construction. Wayfinding signage will be used to direct pedestrians to the other side of the footpath using the existing at grade pedestrian crossing near the Roselea Community Centre. Similarly, on North Rocks Road west where widening is occurring, wayfinding signage would be used to direct pedestrians around the works.

No additional construction parking spaces would be required for the proposed modification.

Bus bays for stops 211825, 211831 and 2118174 would be removed. Bus shelters for stops 211825 and 211831 would be relocated to the back of the verge, while bus shelter for stop 2118174 would be retained. During construction, all bus stops would remain operational, with temporary bus stops in place while new bus shelters are constructed.

Operation

The SIDRA intersection performance with the proposal is summarised in Table 6-14 for the base and future year scenario.

Table 6-15: Base (2016) and future (10-year horizon forecast) intersection performance with proposal

	Approach		Pennant Hills Road (S)	North Rocks Road (E)	Pennant Hills Road (N)	North Rocks Road (W)	Intersection
Base year AM	Without the proposal	Delays (s)	46	127	114	124	92
		LoS	D	F	F	F	F
	With the proposal	Delays (s)	43	71	40	79	48
		LoS	D	F	C	F	D
	Difference ¹	Delays (s)	3	56	74	45	44
Base year PM	Without the proposal	Delays (s)	82	152	49	126	82
		LoS	F	F	D	F	F
	With the proposal	Delays (s)	39	69	36	66	44
		LoS	C	E	C	E	D
	Difference ¹	Delays (s)	43	83	13	60	38
Future Year AM	Without the proposal	Delays (s)	150	543	206	569	255
		LoS	F	F	F	F	F
	With the proposal	Delays (s)	45	76	56	100	59
		LoS	D	F	D	F	E
	Difference ¹	Delays (s)	105	467	150	469	196
Future year PM	Without the proposal	Delays (s)	307	747	83	469	298
		LoS	F	F	F	F	F
	With the proposal	Delays (s)	59	70	44	72	57
		LoS	E	E	D	F	E
	Difference ¹	Delays (s)	248	677	39	397	241

¹ Green represents a positive change

Average delays would be reduced with the proposal as follows:

- Pennant Hill Road by up to 74 seconds in the base year scenarios and up to 248 seconds in the future scenarios
- North Rocks Road by up to 83 seconds in the base year scenarios and by up to 11 minutes in the future scenarios
- At the intersection by up to 44 seconds in the base year scenarios and by up to 241 seconds in the future scenarios.

The average queue distance would be reduced by up to 1,020 metres on the southern approach, up to 440 metres on the northern approach, up to 340 metres on the eastern approach and by up to 360 metres on the western approach compared to the existing layout in the future scenarios.

Accommodating two dedicated right turn lanes on the western approach and enabling a diamond phasing for North Rocks Road delivers further improvements to intersection efficiencies. The additional capacity also provides opportunities for reallocating of the green time to approaches with higher delays. Conditions for pedestrian would also be improved by providing the missing crossing on the southern approach.

Right turn property access

Right turn access to properties on Pennant Hills Road and North Rocks Road will be restricted due to the installation of the raised medians. Right turn bans as a result of the installation of raised medians will occur at the locations below and identified in Figure 6-8:

- Pennant Hills Road vehicles travelling northbound turning right into properties:
 - 687 to 691 (3 residential properties) – **new banned movements as part of the proposed modification**
 - 637 to 677 Pennant Hills Road (4 residential properties, 1 commercial, a community centre and accommodation provider) – included in determined project
- Pennant Hills Road vehicles travelling southbound turning right into properties:
 - 728A to 744 (11 residential properties) – **new banned movements as part of the proposed modification**
 - 710 to 722 Pennant Hills Road (7 residential properties and 2 commercial) – included in determined project
- North Rocks Road vehicles travelling westbound turning right into properties 527 and 529 North Rocks Road (both residential properties) – **new banned movements as part of the proposed modification**
- North Rocks Road vehicles travelling eastbound turning right into 376A to 378B and 400 to 408 North Rocks Road (9 residential properties) - **new banned movements as part of the proposed modification**



Figure 6-8 Location of new raised medians which would prevent right turns into property accesses

The new raised medians would restrict the access to the properties from the opposing side of the road which would require the use of alternative routes to access those properties. A summary of the alternative routes required for properties affected by new banned movements described in this proposed modification is set out in Table 6-16 and shown in Figure 6-9 to Figure 6-12.

Table 6-16 Alternative routes required due to new banned right turn movements

Banned movement	Impacted properties	Alternative route	Additional time / distance¹
Pennant Hills Road vehicles travelling northbound turning right	687, 689, 691 Pennant Hills Road	When travelling northbound on Pennant Hills Road, vehicles can turn left on Murray Farm Road, turn right on Jenkins Road, turn right on North Rocks Road then turn right on Pennant Hills Road southbound. Refer Figure 6-9.	4 minutes / 2 km
Pennant Hills Road vehicles travelling southbound turning right	728A, 730, 732, 734, 734A, 736, 736A, 738, 740, 742, 744 Pennant Hills Road	When travelling southbound on Pennant Hills Road, vehicles can turn right on North Rocks Road, then left on Jenkins Road, then left on Woodstock Road, then left on Pennant Hills Road northbound. Refer Figure 6-10.	4 minutes / 2.1 km
North Rocks Road vehicles travelling westbound turning right	527 and 529 North Rocks Road	When travelling westbound on North Rocks Road, vehicles can turn left on Jenkins Road, turn around using the roundabout on Jenkins Road at Parkland Road then turn right on North Rocks Road eastbound. Refer Figure 6-11.	6 minutes / 2.4 km
North Rocks Road vehicles travelling eastbound turning right	376A, 376B, 378A, 378B, 400, 402, 404, 406, 408 North Rocks Road	When travelling eastbound on North Rocks Road, vehicles can turn around using the roundabout on North Rocks Road at Pennant Parade. Refer Figure 6-12.	4 minutes / 2 km

¹Based on Google Maps estimation

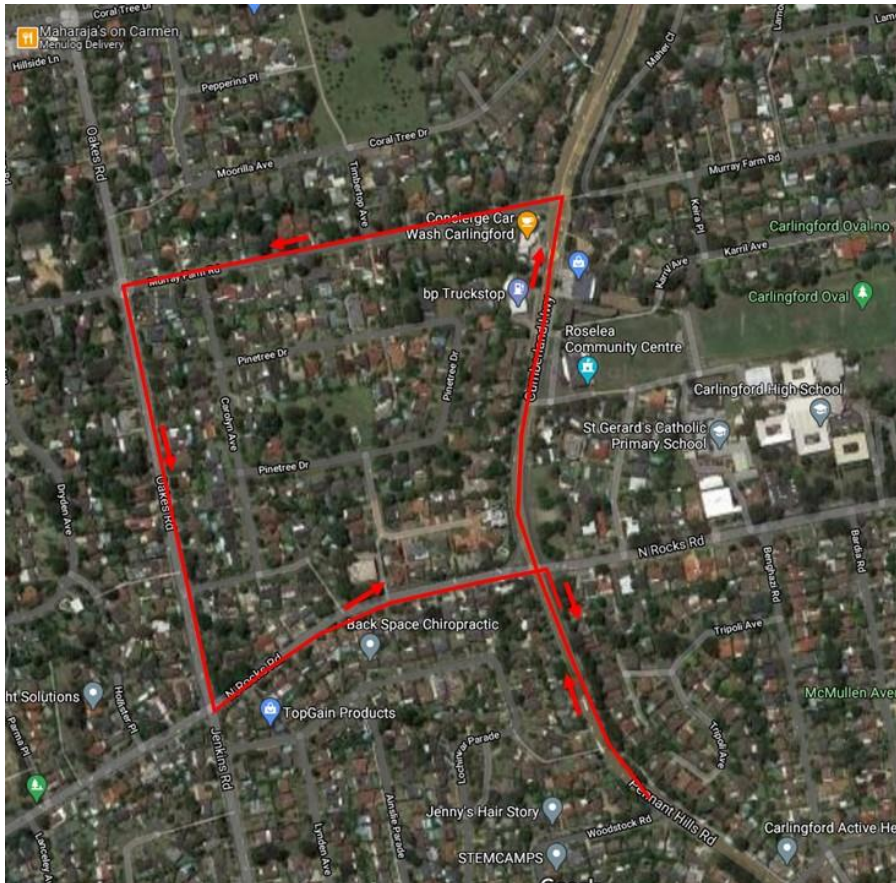


Figure 6-9 Alternate access route – vehicles travelling northbound on Pennant Hills Road to access east of Pennant Hills Road south of North Rocks Road intersection

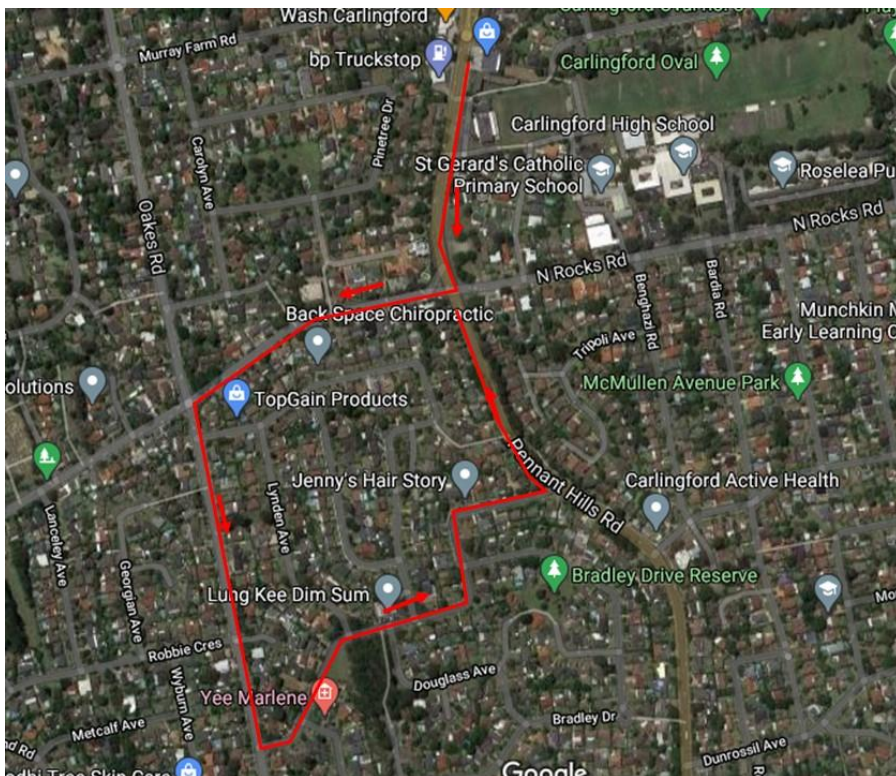


Figure 6-10 Alternate access route – vehicles travelling southbound on Pennant Hills Road to access west of Pennant Hills Road south of North Rocks intersection

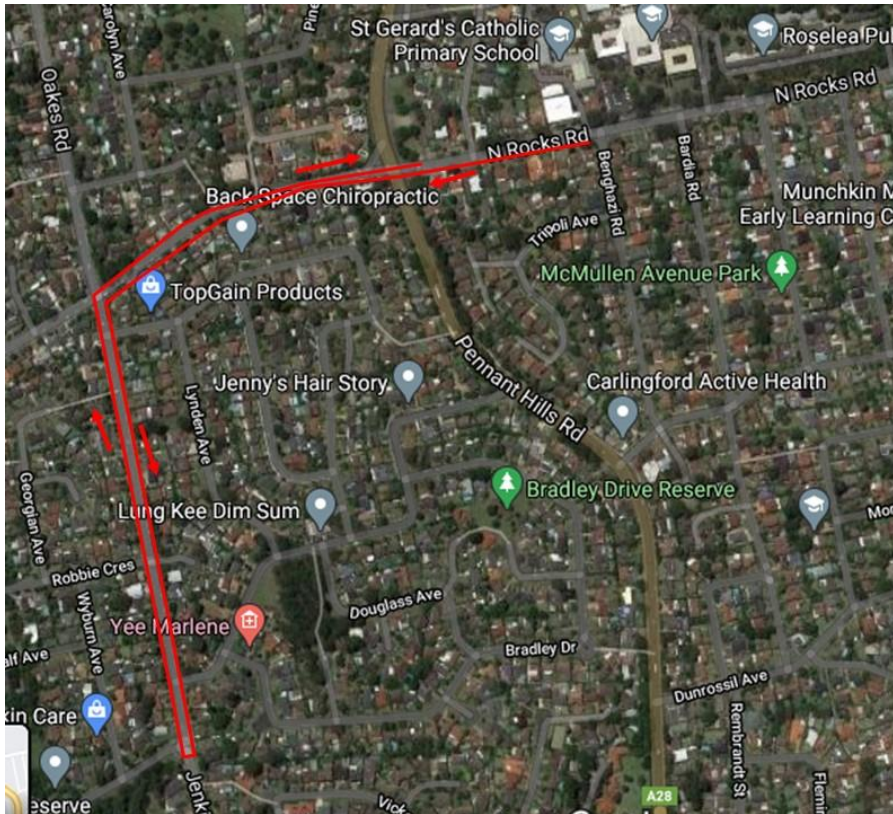


Figure 6-11 Alternate access route vehicles travelling westbound on North Rocks Road to access north side of North Rocks Road east of intersection with Pennant Hills Road

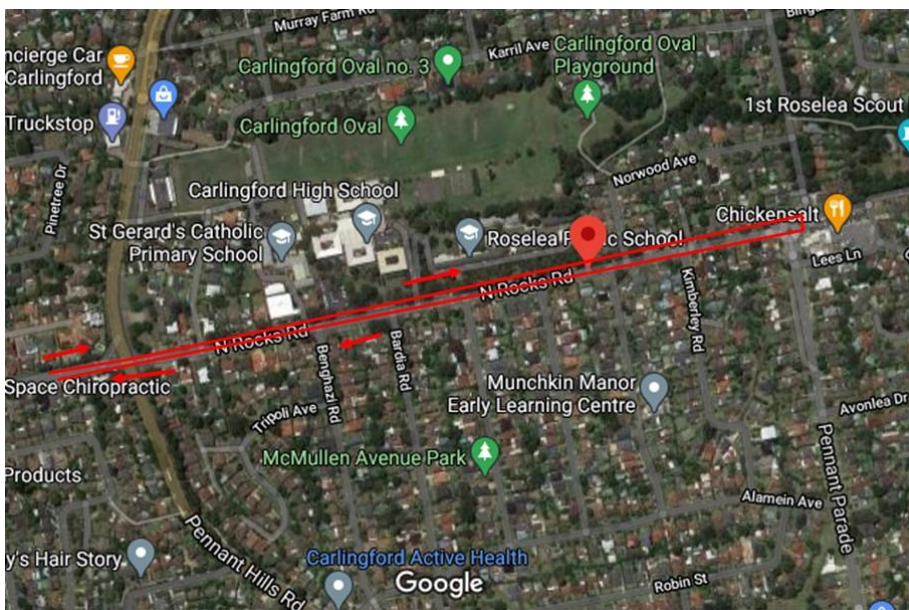


Figure 6-12 Alternate access route – vehicles travelling eastbound on North Rocks Road to access south side of North Rocks Road on both sides of the intersection with Pennant Hills Road

Consultation activities would continue up to and at completion of construction. In particular, consultation activities would be undertaken with directly impacted community stakeholders to assist in managing impacts to property access.

Parking

There would be loss of about five parking spots due to the proposed taper on the north side of North Rocks Road east of Roselea Way. The five parking spots are located in front of residential properties, all of which have driveway access off either North Rocks Road or Roselea Way. There are currently no parking restrictions in place for the five parking spots. In the vicinity of the five parking spots there are unrestricted parking spaces along Roselea Way and further east on both sides of North Rocks Road, as identified in Figure 6-13. It is considered there is sufficient offset parking available given the unrestricted parking spaces nearby and the driveway access all the residential properties have.



Figure 6-13 Location of parking spaces proposed to be removed are shown in red. Available unrestricted offset parking is shown in green.

Public transport

Bus bays for stops 211825, 211831 and 2118174 would be removed (refer Section 3.6). Relocations would involve:

- Bus Stop ID 211831 relocated to the back of the verge and 18 metres south from the original location
- Bus Stop ID 211825 relocated to the back of the verge with the shared path diverted around it
- Bus Stop ID 2118174 relocated to the front of the Community Centre, 150 metres south of its original location.

The relocation of bus stops 211825 and 211831 would result in negligible and minor impacts to bus transit customers respectively. The new location of this bus stop, 150m south of the original location in the eastern verge of Pennant Hills Road north may result in minor additional walking distance for pedestrians accessing the stop, however this is mitigated by the preceding bus stop located near the intersection of Pennant Hills Road and the M2

Motorway about 320 m north of the existing bus stop. Relocation of this bus stop would result in a beneficial impact as the new stop would be in front of the Community Centre, closer to the intersection and closer to schools that are located on North Rocks Road. The removal of the bus bays also provides a positive outcome for bus drivers as by facilitating easier re-entry into traffic.

Bus stops Relocations of the three bus stops would require bus services to amend their bus routes and scheduling information but these impacts are expected to be negligible.

6.3.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Traffic and transport	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime Traffic Control at Work Sites Manual (RTA, 2010) 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 	Contractor	Detailed design / Pre-construction

	<p>including entry and exit locations and measures to prevent construction vehicles queuing on public roads.</p> <ul style="list-style-type: none"> • 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. 		
Traffic congestion and safety	Traffic control will be provided in accordance with the approved construction TMP to manage traffic movements (vehicular, cycle and pedestrian) during construction.	Contractor	Construction
Traffic and transport	Road users including motorists, cyclists and pedestrians will be provided with timely, accurate, relevant and accessible information about changed traffic conditions and delays owing to construction activities.	Contractor	Pre-construction / construction
Public transport	Access to bus stop locations would be maintained as much as possible during construction. Any temporary changes or relocation of bus stops or access will be undertaken in	Contractor	Pre-construction / construction

	consultation with the bus service provider.		
Pedestrian and cyclist access	When access cannot be maintained for pedestrians or cyclists, signage outlining pedestrian and cyclist diversion routes would be displayed during construction.	Contractor	Construction
Property access	During construction, pedestrian access to residential properties would be maintained at all times and driveway access would be maintained. If there is temporary closure of property access, the property owner will be engaged. The management of property access would be considered by the construction contractor and detailed in the traffic management plan.	Contractor	Pre- Construction and Construction
Property access	Transport for NSW will continue to engage with all properties that will have altered access following construction of the Proposal.	Contractor	Pre- Construction and Construction
Property access	Residents and businesses will be notified at least five working days prior to construction works of any specific impacts to property access and arrangements required during construction.	Contractor	Construction

6.4 Landscape and visual impacts

6.4.1 Methodology

Assessment criteria based on landscape character zones (LCZ) has been developed in response to the uses and function of the upgraded intersection. Visual impacts have been assessed by identifying a key viewpoint and determining the overall impact of key features of the proposal.

The assessment was carried out accordance with the Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment (Roads and Maritime, 2013).

The method to measure landscape character and visual impact is based on the combination of the sensitivity of the existing area or view to change and the magnitude (scale, character, distance) of the proposal on that area or view.

Sensitivity refers to the qualities of an area, the number and type of receivers and how sensitive the existing character of the setting is to the proposed change. Magnitude refers to the physical scale of the proposal.

The combination of sensitivity and magnitude will provide the visual impact for viewpoints (refer to Table 6-17 for grading values).

Table 6-17: Impact grading matrix (Roads and Maritime 2013)

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Landscape Character Zones

For the purpose of the landscape character assessment, the proposal area was divided into two key landscape character zones (LCZ's). The LCZ are identified in Figure 6-14 are:

- LCZ 1: Mixed residential
- LCZ 2: Commercial



Figure 6-14 Landscape Character Zones adjacent to the proposal area

Viewpoints

For the purpose of the visual impact assessment, four observer location (OL) viewpoints were identified. They are the residents on Pennant Hills Road and North Rocks Road and road users travelling south on Pennant Hills Road south of the intersection as identified in Figure 6-15.

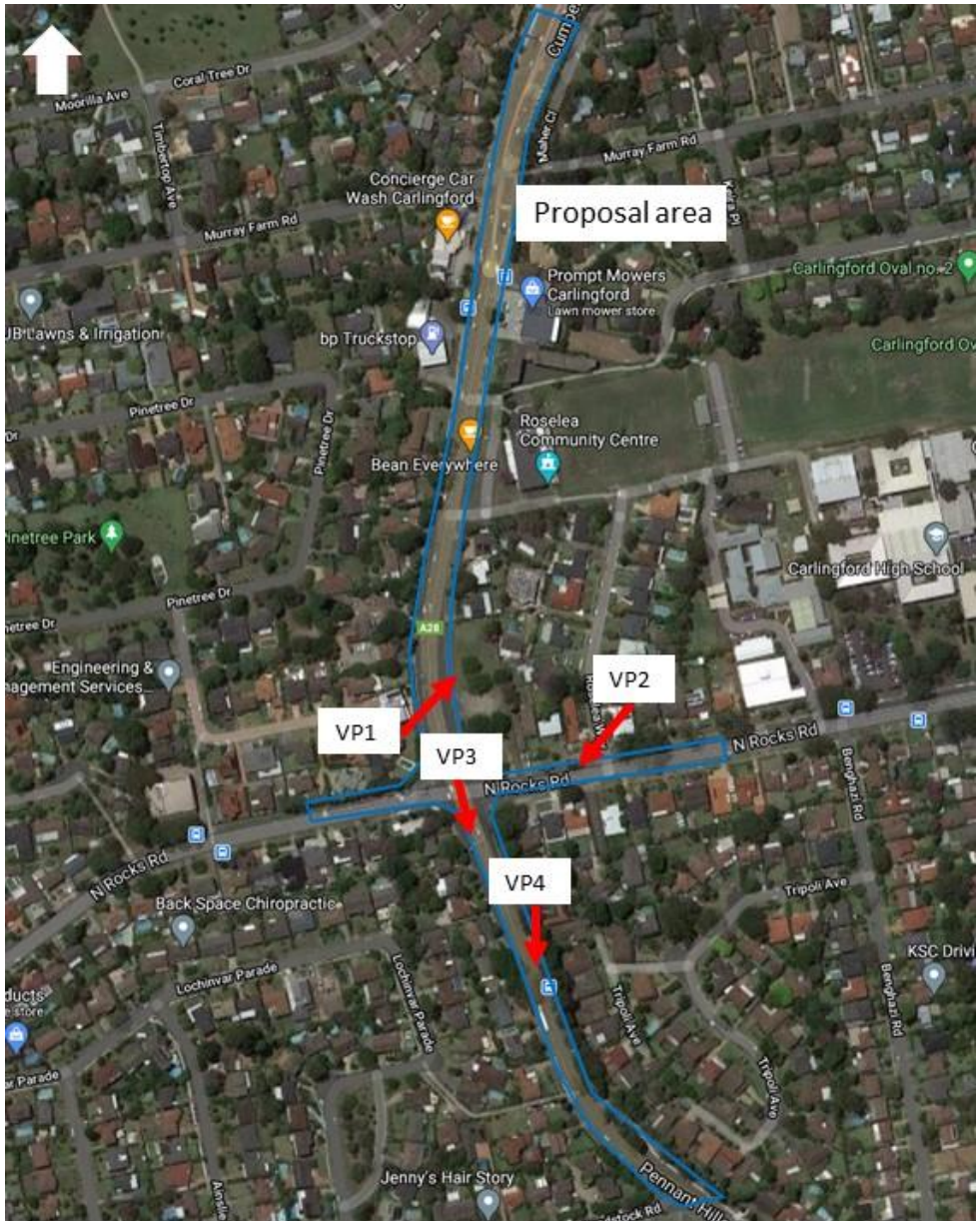


Figure 6-15 Aerial figure identifying key viewpoints (Source: Google Maps)

6.4.2 Existing environment

The proposal is located in an urban area in the suburb of Carlingford. The surrounding land uses include infrastructure (arterial and local roads), low density residential, a community centre and commercial properties on Pennant Hills Road (mowing service, gym and BP service station).

Vehicles travel in a north/south direction along Pennant Hills Road and east/ west along North Rocks Road. There are a number of bus routes that service this corridor (refer to Section 6.3). Cycle access is not specifically catered for in the proposal area and pedestrian access along Pennant Hills Road is limited to footpaths on the kerbside lane of both sides of the road with a number of at grade pedestrian crossings (across Pennant Hills Road at the community centre, and at all four legs of the intersection with North Rocks Road).

Pennant Hills Road has a pedestrian footpath along the kerbside lane on both sides of the road, with a signalised crossing on the northern leg across Pennant Hills Road (at the intersection of North Rocks Road) and another signalised crossing at the Roselea

Community Centre. North Rocks Road has a pedestrian footpath along the kerbside lane on both sides of the road, with a signalised pedestrian crossing on the eastern and western legs of the intersection at Pennant Hills Road. There is also a zebra crossing on the left turn slip lane from North Rocks Road to Pennant Hills Road (northbound).

Landscape character zones

LCZ 1: Mixed residential

The Mixed residential LCZ comprises of low to medium density residential properties on Pennant Hills Road and North Rocks Road (Figure 6-16). There is a pedestrian footpath on both sides of Pennant Hills Road. A tall hedge is planted on the northbound verge of Pennant Hills Road. There are a number of street trees along the both sides of Pennant Hills Road. While the street trees are not ecologically significant, the mass of vegetation provides a visually important edge to the street.



Figure 6-16 Landscape Character Zone 1 – mixed residential

LCZ 2: Commercial

There are a number of small businesses on both sides of Pennant Hills Road, north of the intersection (Figure 6-17) including:

- BP Service Station
- Concierge car wash cafe
- Plus Fitness gym
- Prompt Movers Carlingford
- Sydney Temple Accommodation.

The businesses are located in single storey buildings with hedges and trees along both sides of the road which provide a visual feature within the area.



Figure 6-17 Landscape Character Zone 2 – commercial

Existing viewpoint

Viewpoint 1 looks east onto Pennant Hills road from the residents on the western side of Pennant Hills Road (Figure 6-18 and Figure 6-19). The primary feature of the viewpoint is Pennant Hills Road and associated road infrastructure such as light posts and street signs as well as vegetation (trees and hedges) on the road verge.



Figure 6-18 Identified residents which make up viewpoint 1



Figure 6-19 Views from VP1 – from kerb of Pennant Hills Road northbound immediately after intersection with North Rocks Road looking north east

Viewpoint 2 looks south onto North Rocks Road from the residents on the northern side of North Rocks Road (near Roselea Way) (Figure 6-20 and Figure 6-21). The primary feature of the viewpoint is North Rocks Road, the houses on the opposite side of the road and some mature trees and bushes on the road verge.

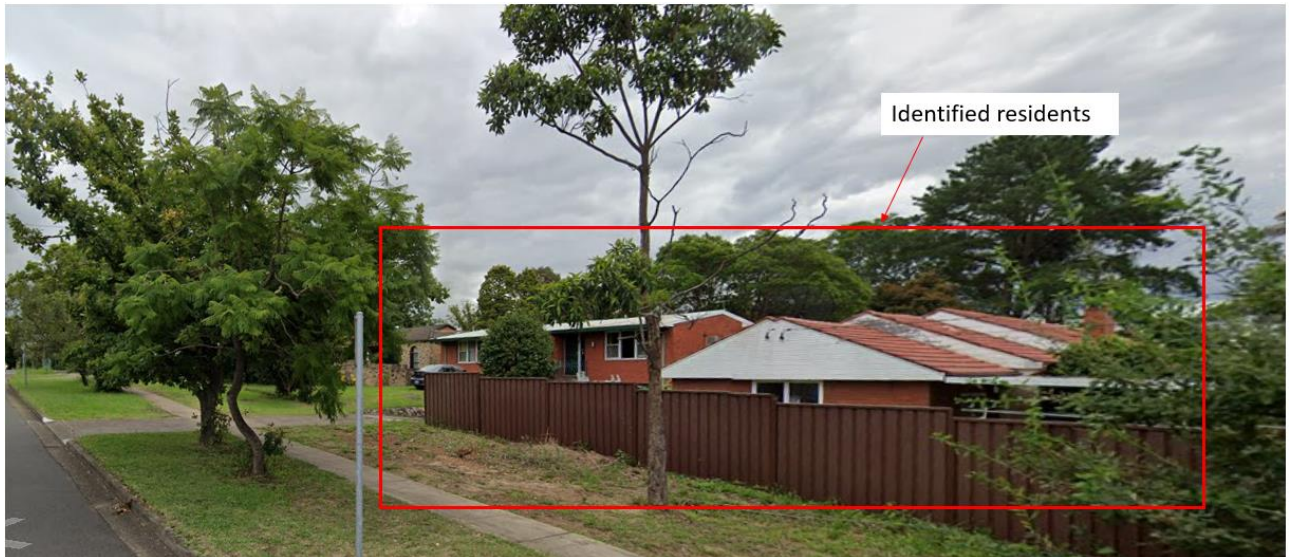


Figure 6-20 Identified residents which make up viewpoint 2



Figure 6-21 Views from VP2 – from North Rocks Road eastbound lane east of intersection with Pennant Hills Road looking west

Viewpoint 3 looks south down Pennant Hills Road as road users travel on the southern side of Pennant Hills Road (near Woodstock Road) (Figure 6-22). The primary feature of the viewpoint is Pennant Hills Road and some mature trees and bushes, interspersed with street poles on the road verge on both sides.



Figure 6-22 Views from VP3 – from intersection of Pennant Hills Road and North Rocks Road looking south along Pennant Hills Road

Viewpoint 4 includes views of Pennant Hills Road from residential properties on either side of Pennant Hills Road south of the intersection with North Rocks Road and in particular those properties on the eastern side where road widening is proposed. On the eastern side of Pennant Hills Road, south of North Rocks Road, properties are front facing Pennant Hills Road for the first 85 metres and then are backing onto Pennant Hills Road (front access is via Tripoli Avenue). Properties on the western side of Pennant Hills Road, south of North Rocks Road, are front facing Pennant Hills Road. The vegetation on both sides of Pennant Hills Road provides screening for the residential properties on either side of the road (Figure 6-23). Properties have driveway access onto Pennant Hills Road providing sections of direct views onto the existing four lane road, however most of the properties have high fences at the boundary which screen views in addition to established vegetation.



Figure 6-23 Views from VP4 - from kerbside of Pennant Hills Road southbound looking south along and across Pennant Hills Road

6.4.3 Potential impacts

Construction

Visual impacts during construction would be caused by the equipment associated with the road widening and compound site, including temporary fencing, signage and construction machinery. The presence of hoardings and temporary signage would result in a more cluttered streetscape and there may be a visible increase in traffic congestion due to the presence of construction vehicles.

Construction phase impacts such as fencing and set up of the construction works area would be temporary with construction activity and most of the road widening expected to generally only occur at night or during the day behind barriers. There may be visual impacts from the use of construction lighting during night works, however lighting would be directed away from properties.

Vegetation removal to accommodate the road widening work would also occur during construction which would reduce the visual amenity in the area and have a lasting impact beyond the construction phase. Tree protection controls would remain in place for the duration of construction for those trees to be retained in the vicinity of the proposed intersection works area.

Due to the type and temporary nature of construction activities, the magnitude of impact is not expected to be significant and therefore these impacts are not expected to be significant overall. Safeguards and management measures have been proposed to address potential impacts during construction. The worksite would be decommissioned and fully restored in accordance with the proposal design following completion of construction.

Operation

The potential operation impacts to the landscape character zone and viewpoints are discussed below in Table 6-18 and Table 6-19 respectively.

Table 6-18 Landscape character zone assessment

Landscape character zone	Proposal effects	Sensitivity	Magnitude	Overall assessment
<p>Mixed residential</p>	<p>The proposal would span over this LCZ. The road widening of up to about seven metres on Pennant Hills Road and North Rocks Road would take place within the existing road reserve between the existing road and residential properties. The majority of the residential properties face Pennant Hills Road or North Rocks Road with the exception of properties on the southbound side of Pennant Hills Road, starting about 85 metres south of North Rocks Road.</p> <p>Changes to the landscape would include removal of vegetation along North Rocks Road and Pennant Hills Road and the widening of Pennant Hills Road northbound.</p>	<p>The sensitivity of this LCZ is Moderate due to the residential neighbourhood character with street trees however the area is already located on a busy road and exposed to live traffic.</p> <p>Residential properties facing Pennant Hills Road or North Rocks Road would be more sensitive to the road moving closer to their properties than those backing Pennant Hills Road (southbound side of Pennant Hills Road, about 85 metres south of North Rocks Road).</p>	<p>The effect of the proposal varies along the corridor depending on the extent of widening in that area however overall would be Low. The residential area is already located on a busy road and exposed to live traffic. The road is being widened within road reserve. It is utilising already used space (footpath) for the new lane.</p>	<p>The landscape impact rating is Low.</p> <p>Due to the small size of the development (relative to the area covered by this LCZ), the proposal would not change the overall character of the LCZ, and would only affect a small area directly surrounding the proposal.</p>

Landscape character zone	Proposal effects	Sensitivity	Magnitude	Overall assessment
Commercial	The proposal would span over this LCZ. The installation of a concrete median on Pennant Hills Road would prevent access to the businesses from Pennant Hills Road northbound.	The sensitivity of this LCZ is Low due to the small number of businesses.	The magnitude of this LCZ is Moderate as there would be a direct change in the road frontage for businesses on Pennant Hills Road.	The landscape impact rating is Moderate- Low . Due to the small size of the development, it would not change the overall character of the LCZ, and would only affect a small area directly surrounding the proposal.

Table 6-19 Visual Impact assessment viewpoints

Viewpoint	Proposal impacts	Sensitivity	Magnitude	Overall assessment
<p>1 (no change from determined project)</p>	<p>Road widening would occur at property frontages and the road would move towards their property. Road widening would be up to about five metres in front of residential properties on the southbound side of Pennant Hills Road and up to 13 metres in front of the vacant lot on the north eastern corner of Pennant Hills Road and North Rocks Road. Properties at this viewpoint are front facing Pennant Hills Road. The greatest visual impact would be due to some vegetation removal, widening of the road and relocation of the footpath closer to the properties.</p>	<p>The sensitivity of this viewpoint is Low due to the residential neighbourhood character with street trees however the area is already located on a busy road and exposed to live traffic.</p>	<p>The proposal is expected to have a Moderate impact to residents along Pennant Hills Road due to the removal of trees, the widening of the road and the alteration of the property fences. The road however is being widened within road reserve.</p> <p>The property boundary fences that require adjustments would be replaced with a matching fence to minimise the visual impact to properties. With the fence modification, vegetation removal will also be triggered. Vegetation replanting is proposed in consultation with the property owner however it will take some time for this new vegetation to establish and provide screening again.</p>	<p>The visual impact would be Moderate. Properties would have the road move towards their properties and screening vegetation removed however they are already exposed to live traffic on Pennant Hills Road.</p>
<p>2 (no change from determined project)</p>	<p>Road widening up to seven metres would occur at property frontages and the road moved towards their property. The greatest visual impact would be due to vegetation removal, widening of the road and relocation of the footpath closer to the properties.</p> <p>Residences on the southern verge of North Rocks Road west of Pennant Hills Road would experience similar impacts due to road widening.</p>	<p>The sensitivity of this viewpoint is Moderate due to the residential neighbourhood character with street trees however the area is already located on a busy road and exposed to live traffic.</p>	<p>The proposal is expected to have a Moderate impact to residents along North Rocks Road due to the removal of trees, the widening of the road and the alteration of the property fences. The road however is being widened within road reserve.</p> <p>The property boundary fences that require adjustments would be replaced with a matching fence (like for like) to minimise the visual impact to properties. With the fence modification, vegetation removal will also be triggered. Vegetation replanting is proposed in consultation with the property owner however it will take some time for this</p>	<p>The visual impact would be Moderate. Properties would have the road move towards their properties and vegetation removed however they are already exposed to live traffic on North Rocks Road.</p>

Viewpoint	Proposal impacts	Sensitivity	Magnitude	Overall assessment
			new vegetation to establish and provide screening again.	
3	The visual impact for road users at this viewpoint would include the removal of vegetation in the road verge.	The sensitivity of this viewpoint is Moderate due to the residential neighbourhood character with street trees however the area is already located on a busy road and exposed to live traffic. Road users would not generally spend a long period of time along the road, as traffic flow would be improved with the project.	The proposal is expected to have a Moderate impact to road users along Pennant Hills Road due to the removal of trees, the widening of the road and the alteration of the property fences. Planting would occur on the public road verge, however planting within private property would be subject to property owner consultation. Views down Pennant Hills Road would become more open and reveal more built structures, fences and street poles, however, this would be consistent with other views along the road.	The visual impact would be Moderate . Vegetation removal would have a moderate change on the views. However, given road users are moving along Pennant Hills Road, they are already exposed to a range of similar views.
4	Road widening of up to seven metres on the southbound side of Pennant Hills Road would occur at property frontages (from North Rocks Road up to 85 metres south) and at properties backing onto Pennant Hills Road (from 85 metres south of North Rocks Road up to Woodstock Avenue) and the road would move towards their property. The greatest visual impact would be due to substantial removal of mature vegetation, widening of the road and relocation of the footpath closer to the properties.	The sensitivity of this viewpoint is Moderate due to the residential neighbourhood character with street trees. Properties generally back on to Pennant Hills Road on the southbound verge. However, properties on the northbound verge have property access directly to the proposed modification area with direct or screened views a busy road with a backdrop of vegetation.	The proposal is expected to have a High impact to residents along Pennant Hills Road due to the removal of trees, the widening of the road and the alteration of the property fences. The road however is being widened within road reserve. Views from residential properties would have less vegetation buffer to screen their backyards from the busy road or from the front yards of properties on the northbound side of Pennant Hills Road.	The visual impact would be High . Vegetation removal would have a high change on views due to the width of vegetation removed, particularly on the southbound verge of Pennant Hills Road.

6.4.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Removal of street trees	<p>Detailed design will consider the following:</p> <ul style="list-style-type: none"> • Utility adjustment options to minimise impact to tree roots and minimise tree removal • Vegetation clearing would be kept to the minimum to accommodate the proposal • A landscape plan to offset tree removal and mitigate the loss of screening for certain residences. 	Transport for NSW	Detailed design / pre-construction
Visual impacts of construction lighting	Construction lights will be directed away from residential receivers.	Contractor	Construction
Visual impacts of construction activities	<ul style="list-style-type: none"> • The work site will be left in a tidy manner at the end of each work day. • Fencing with material attached (e.g. shade cloth) would be provided around the construction compounds to screen views of the construction compounds from adjoining properties • Landscaping will be managed in accordance with the Roads and Maritime Services <i>Landscape guideline, 2018</i>. 	Contractor	Construction
Tree removal and replanting	A landscaping plan will be developed in consultation with City of Parramatta Council and property owners for replanting within private properties prior to construction and will include detail on the planting species mix.	Transport for NSW / Contractor	Pre-construction

6.5 Soil and water

This section assesses the potential erosion, sedimentation and contamination impacts of the proposal.

6.5.1 Methodology

An in-situ waste classification assessment was undertaken to classify the soil at the site for off-site disposal at an appropriately licensed landfill facility in accordance with the NSW EPA Waste Classification Guidelines (2014). This included fieldwork to collect and analyse soil samples within the proposal area. The Waste Classification Assessment is included in Appendix I.

A review of the following publicly available registers was conducted on the 5 November 2020:

- Acid Sulfate Soil Risk from Australian Soil Resource Information System (ASRIS)
- LEP layers and land use maps from the Hills LEP 2012 and Hornsby LEP 2013 and NSW Government Planning and Environment Planning Viewer
- Soil Landscapes of the Sydney 1:100 000 Sheet
- Contaminated land Register (Environmental Protection Authority).

The searches are included in Appendix I.

6.5.2 Existing environment

Geology, soils and surface water

The proposal is located with the West Pennant Hills colluvial landscape which is characterised by steep, narrow, generally south west facing, hill slopes on the Hornsby Plateau. The geological profile consists of the Wianamatta Group shale, Ashfield shale formation-laminite and dark grey shale. Bringelly shale- shale, calcareous claystone, laminate, fine to medium grained lithic quartz sandstone.

The soils are characterised as:

- Deep red and brown podzolic soils on upper mid slopes
- Yellow and brown podzolic soils on colluvial benches
- Yellow podzolic soils and greyed podzolic soils in drainage lines and poorly drained areas.

The topography of the proposal is located on a gentle undulating hill slope. There are no waterways near the proposal. The closest waterway to the proposal is a tributary of Devlin Creek, located approximately 590 metres east of the proposal. Devlin Creek drains into the Lane Cover River about 5 kilometres north east of the proposal site. Pennant Hills Road grades longitudinally towards the north. The road currently has a one way cross fall towards the east for the first 100m from North Rocks Road and Pennant Hills Road intersection. The cross fall then transitions to two way cross fall crowned between the northbound and southbound lanes.

Acid Sulfate Soils

Acid sulfate soil occurs predominantly on low lying coastal estuary and embayment. Due to their estuarine origin, acid sulfate soils are found close to sea level, generally less than 1 metre Australian Height Datum (AHD) and are therefore not expected within the proposal area. A search of the ASRIS database, Hills LEP 2012 and Hornsby LEP 2013 indicated acid sulfate soils were not present within the proposal area. A search of the NSW

Government Planning and Environment Planning Viewer identified Class 5 acid sulfate soils 1.5km south of the proposal area and are likely associated with the low lying banks of the Parramatta River 6.5km further south of the proposal area.

Contamination

A search of the NSW Environmental Protection Agency (EPA) database conducted on 5 November 2020 identified two sites of potential contamination concern in proximity to the proposal. Table 6-1 displays contaminated site notified to EPA which has been assessed in accordance with the Contaminated Land Management Act 1997 (CLM Act).

There is a BP service station located at the northern end of the proposal area. There is a potential for hydrocarbon contamination to be present at the BP site at 712-714 Pennant Hills Road, Carlingford, typically at depths within the saturated zone (approximately 3.3 to 4.4 metres below ground level).

Table 6-20 Proximity of contamination causing activity

Contamination causing activity	Site description and address	EPA site management class	Distance from the proposal
Service station	Pennant Hills- Caltex Service Station 797 Pennant Hills Road, (-33.7757819, 151.0516532)	Under assessment	1.2km
Service station	7-Eleven Service Station 340 North Rocks Road	Under assessment	1.6km

The sites would not be impacted by excavation activities undertaken for the proposal.

6.5.3 Potential impacts

Construction

Primary potential impacts would be associated with sediment migration from runoff as a result of excavation associated with the road widening, underboring and utility trenching, the erosion of exposed soils and stockpiles and tree clearing. The mechanisms through which sediment could move offsite could be a result of rainfall events and vehicle tracking. Implementing appropriate management measures would effectively mitigate such impacts.

During construction, work elements have the potential to expose soils which can lead to erosion and sedimentation including:

- Earthworks within the construction impact area
- Drainage works
- Vehicle movements
- Removal and installation of general fill material
- Stockpiling
- Vegetation removal
- Grubbing processes
- Underboring (entry and exit points)

The identified risk areas of erosion and sedimentation resulting from earthworks are as follows:

- Road widening
 - Road widening is required along Pennant Hills Road northbound lane between Woodstock Road and Murray Farm Road, at the north east corner of the North Rocks Road intersection, on the eastern leg of North Rocks Road kerbside lane and the western leg of North Rocks Road to allow for a dual right turn bay
 - Construction of the new lanes would require excavation into the existing road verge, and placement of new pavement material using earth moving equipment
 - Excavated areas may remain open for a relatively long period of time if work occurs behind barriers
- Trenching for utilities
 - Construction would include trenching along Pennant Hills Road and North Rocks Road mostly due to the widening and for the underbore establishment entry and exit points
 - Excavation for trenching is required to accommodate the relocation of existing utilities and installation of new services and would involve the removal and placement of fill material using earthmoving equipment, which are generally opened and closed within one or a few shifts.

Potential contaminated land may be uncovered during the construction phase. Although it is considered unlikely, the prospect of encountering contaminated land should not be discounted.

Impacts to the BP service station would involve an adjustment to the driveway (entrance) of the service station to accommodate the widening of Pennant Hills Road. Construction activities are unlikely to impact the BP site and it would remain in operation throughout construction, however there is a risk that excavation near the BP service station may encounter contaminated soils. A report undertaken by EMM considered that construction works would represent a low risk of contamination to human and/or ecological receptors and remediation and management measures could be implemented to manage and mitigate potential risks during construction.

Operation

It is not expected that the proposal would have any ongoing contaminated land or soil erosion sedimentation impacts after the completion of construction because any identified contaminated material would be removed off site to be legally disposed of at a licensed waste facility or managed safely onsite. Disturbed areas would be stabilised and suitable pavement and cross drainage would be in place.

6.5.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Contaminated land	A Contaminated Land Management Plan will be prepared and implemented as part of the CEMP. The Contaminated Land Management Plan will comply with the <i>Contaminated Land Management Act</i>	Contractor	Construction

	<p>1997 (NSW), TfNSW publication “Guideline for the Management of Contamination”, TfNSW “Environmental Incident Classification and Reporting Procedure”, and EPA guidelines on contaminated land management.</p> <p>The plan will provide for dealing with:</p> <ul style="list-style-type: none"> • areas of known contamination; • unexpected contamination finds; • any land contamination caused by the project. <p>The plan will include methods for identifying and investigating potential contamination, storage or stockpile management processes and measures and disposal processes.</p>		
<p>Contaminated land</p>	<p>If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. Works in the 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</p>	<p>Contractor</p>	<p>Construction</p>

	consultation with the Transport for NSW Environment Manager and/or EPA.		
Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime <i>Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and EPA officers).	Contractor	Construction
Fuel spills	Vehicles and machinery should be properly maintained to minimise the risk of fuel/oil leaks. Routine inspections of all construction vehicles and equipment should be undertaken for evidence of fuel/oil leaks.	Contractor	Construction
Erosion and sedimentation	Erosion and sediment control measures are to be implemented and maintained to:	Contractor	Construction

	<ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets. • Reduce water velocity and capture sediment on site. • Minimise the amount of material transported from site to surrounding pavement surfaces. • Divert clean water around the site. <p>(in accordance with the Landcom/Department of Housing <i>Managing Urban Stormwater, Soils and Construction Guidelines</i> (the Blue Book)).</p>		
Erosion and sedimentation	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Contractor	Construction
Erosion and sedimentation	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Contractor	Construction

Erosion and sedimentation	Work areas are to be stabilised progressively during the works.	Contractor	Construction
Erosion and sedimentation	The maintenance of established stockpile sites during is to be in accordance with the Roads and Maritime Services <i>Stockpile Site Management Guideline (EMS-TG-10)</i> .	Contractor	Construction
Water quality	Water quality control measures are to be used to minimise any materials (e.g. concrete, grout, sediment etc.) entering drain inlets or waterways.	Contractor	Construction

6.6 Aboriginal heritage

6.6.1 Methodology

A database search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken on 5 November 2020, with a search buffer of 50 metres around the proposal area and site compound.

The Transport for NSW Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI) is a four stage process used to assess the potential impact on Aboriginal cultural heritage and ensure effective consultation with the Aboriginal community is completed for all Transport for NSW developments.

The AHIMS search and PACHCI letter are included in Appendix J.

6.6.2 Existing environment

The AHIMS search showed no Aboriginal heritage sites or Aboriginal objects were found within the proposal area and site compound area within the 50m buffer.

The proposal area is located on disturbed land, however, it is also located on a ridgeline, which is a landscape feature that elevates the risk of unexpected encounters of Aboriginal heritage items.

6.6.3 Potential impacts

Construction

The proposed modification is unlikely to have construction impacts on Aboriginal cultural heritage in the proposal area due to the lack of recorded items or places in the vicinity as

well as the urbanised environment and previous ground disturbance from construction of the original road and residential properties. The potential for unexpected Aboriginal cultural objects to be discovered is considered low.

A Stage 1 assessment was undertaken for this proposal. This found that the proposal is unlikely to affect Aboriginal cultural heritage and therefore was not required to progress to Stage 2. The assessment was based on the following diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate any known Aboriginal objects or places in the immediate proposal area.
- The area does contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW's procedure, however, the cultural heritage potential of the study area appears to be reduced due to past disturbance in the form of construction of Pennant Hills Road, North Rocks Road, and surrounding residential development.
- The cultural heritage potential of the proposal area appears to be reduced due to past disturbance in the form of construction of Pennant Hills Road, North Rocks Road and surrounding residential development.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

Operation

No impacts on Aboriginal heritage items are expected following construction.

6.6.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where 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. <p>Procedures for unexpected finds will be addressed in the CEMP.</p>	Contractor	Construction

6.7 Non-Aboriginal heritage

6.7.1 Methodology

The following database searches were conducted on 5 November 2020 and 12 April 2021:

- Australian Heritage Database with the search area defined for Carlingford, NSW
- NSW State Heritage Register search was conducted with the search area defined for Hornsby LGA and the Hills LGA
- Hills Shire Local Environmental Plan 2019 and Hornsby Local Environmental Plan 2013 (prior to the council amalgamation, the proposal area was in both the Hills LGA and Hornsby LGA).

The heritage searches are included as Appendix K.

6.7.2 Existing environment

There are a number of heritage items listed in the registers that are in the vicinity of the proposal. See Table 6-21 for a list of the heritage items and Figure 6-24 for their location in relation to the proposal site.

Table 6-21 Identified Non-Aboriginal heritage

Place Name	Location	Register/List	Distance to site (approximately)
Havilah House	29 Bevan Place (backs on to Pennant Hills Road)	The Hills LEP 2019 I42	450 m south
Havilah Stables	29 Bevan Place	The Hills LEP 2019 I41	450 m south

Carlingford Public School Building & Cottage	Marsden Road, corner of Rickard Street, Carlingford, 2118. NSW	Register of National Estate	2 km south
St Pauls Anglican Church (former)	346 Marsden Rd, Carlingford, 2118. NSW	State Heritage Register (SHR 00056)	1.8 km south

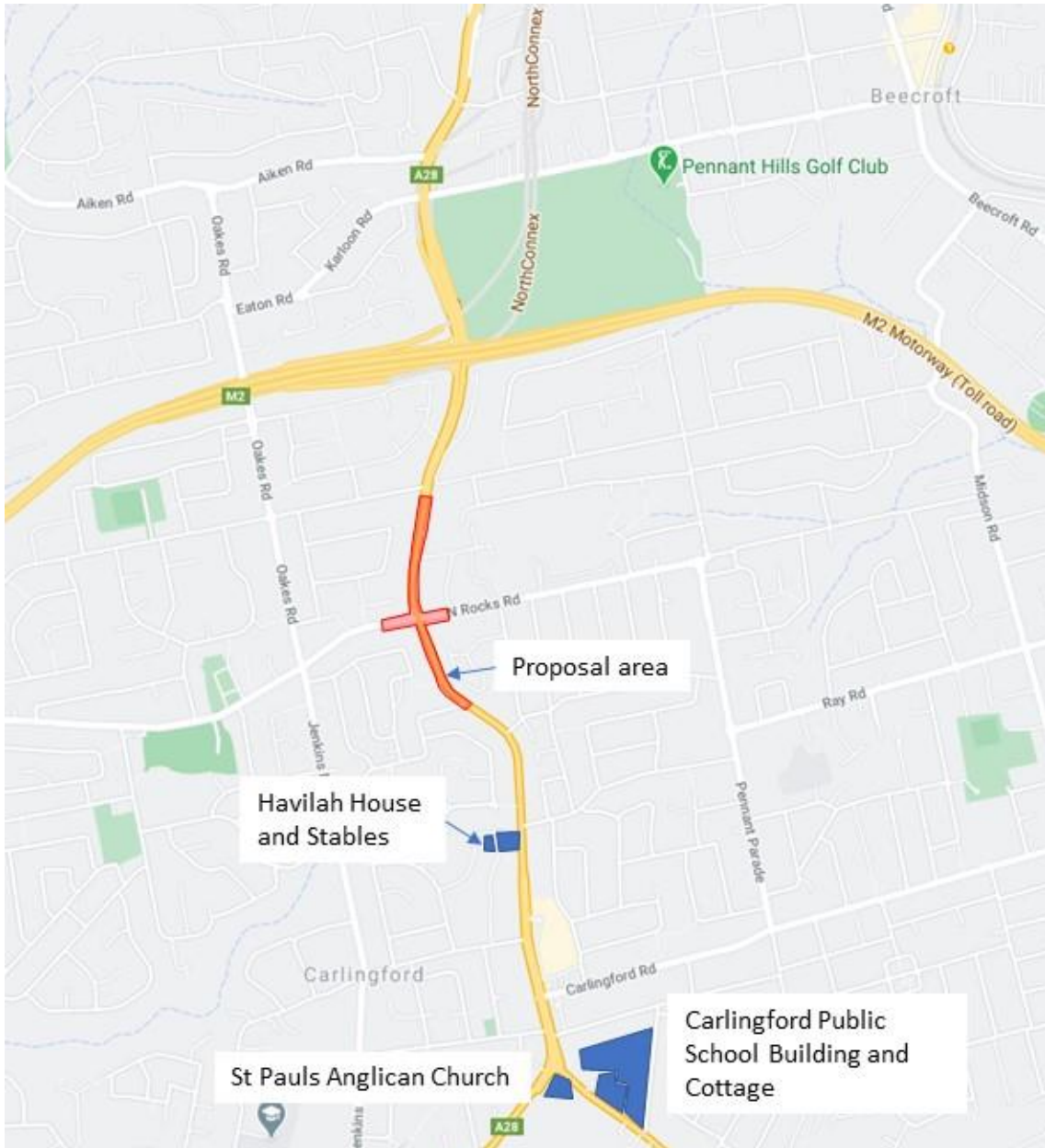


Figure 6-24 Location of heritage items in the vicinity of the proposal

6.7.3 Potential impacts

Construction

The closest heritage items are the Havilah House and Havilah Stables located approximately 450 metres south of the proposal. No construction impact to the places listed on Australian Heritage Database or State Heritage Register is expected due to their distance from the proposal.

Operation

No impacts on non-Aboriginal heritage items are expected following construction.

6.7.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Non-Aboriginal heritage	<ul style="list-style-type: none">The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered.Work will only re-commence once the requirements of that Procedure have been satisfied. <p>Procedures for unexpected finds will be addressed in the CEMP</p>	Contractor	Construction

6.8 Socio economic

6.8.1 Methodology

The socio-economic assessment addresses the requirements of the Roads and Maritime *Environment Impact Assessment Practice Note: Socio-economic Assessment (EIA – N05)* with a ‘Basic Level’ of assessment. The assessment involved completing a desktop assessment, including collating qualitative and quantitative data to determine the socio-economic environment within and surrounding the proposal area. The level of significance of potential impacts was assessed by considering the sensitivity of the existing socio-economic environment and the magnitude of proposed works, as determined by Table 6-22.

Table 6-22 Assessing socio-economic impact level of significance

		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

6.8.2 Existing environment

The proposal is located across the suburbs of Carlingford and Beecroft within the Parramatta Local Government Area, with the location of the proposal area in each of these suburbs identified in Figure 6-25. The proposal area is characterised by single and multistorey dwellings and businesses fronting Pennant Hills Road and North Rocks Road.

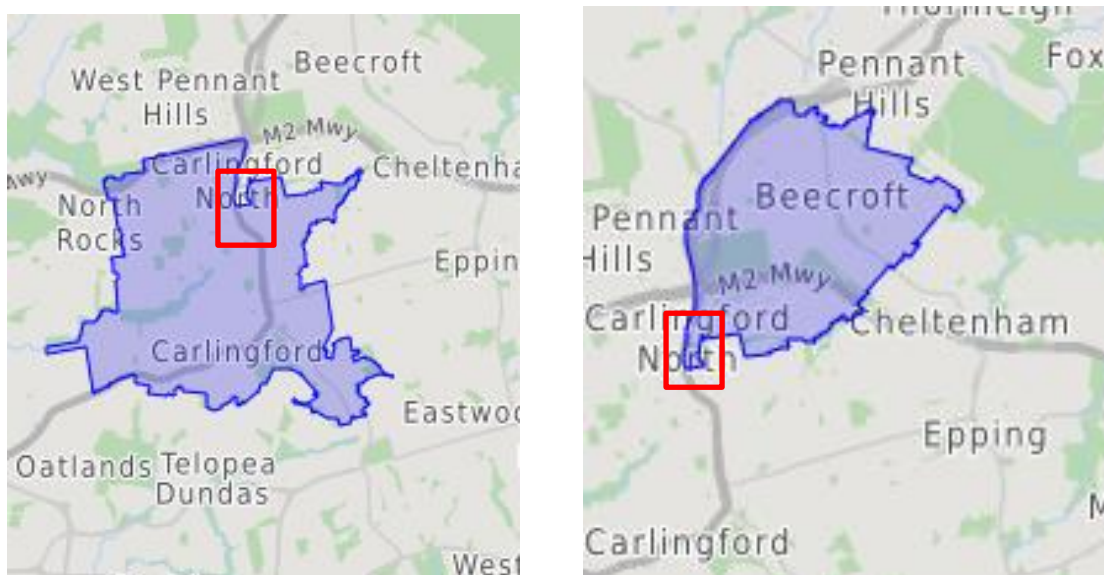


Figure 6-25 Suburb boundaries of Carlingford and Beecroft (Source: Australian Bureau of Statistics, 2020)

Demographics

According to the latest census from the Australian Bureau of Statistics (ABS) in 2016, the population of the Parramatta LGA was 226,149 people. A summary of demographic data for the suburbs of Carlingford and Beecroft is provided in Table 6-23.

Table 6-23 Census data for Carlingford and Beecroft (Source: 2016 Quick Stats, ASB)

	Carlingford	Beecroft
Population	24,394	9,396
Gender	Male 49.7% Female 50.3%	Male 47.4% Female 52.6%
Median age	39	43
Travel to work	By public transport – 22.1% By car as driver or passenger – 67%	By public transport – 26.2% By car as driver or passenger – 57.9%
Dwelling structure	Separate house – 75% Semi-detached – 11.8% Flats, units or apartments – 12.9%	Separate house – 90% Semi-detached – 3.7% Flats, units or apartments – 6%

In Carlingford and Beecroft the most common occupations were professionals, clerical and administrative workers, managers, sales workers and technicians/trade workers.

Social infrastructure and local businesses

The social infrastructure and local business within and near the proposal area are identified in Figure 6-26. The Roselea Community Centre is located at 645-671 Pennant Hills Road, within the proposal area. The Centre is used as an event space and has a foyer to display artwork. Access to the centre is via Pennant Hills Road.

To the east of the proposal area along North Rocks Road are:

- St Gerard Majella’s Catholic Church
- St Gerard’s Catholic Primary School
- Carlingford High School

There are a number of businesses within the proposal area including:

- BP Service Station and Wild Bean cafe (24 hours 7 days)
- Concierge Car wash cafe (8am to 5:30pm 7 days)
- Plus Fitness gym (24 hours 7 days)
- Prompt Mowers Carlingford (8am to 5pm weekdays, 8am to 12pm Saturdays)
- Sydney Temple Accommodation (24 hours 7 days).

However, it is noted that there are no local businesses or social infrastructure land uses within the proposed modification of the proposal area.

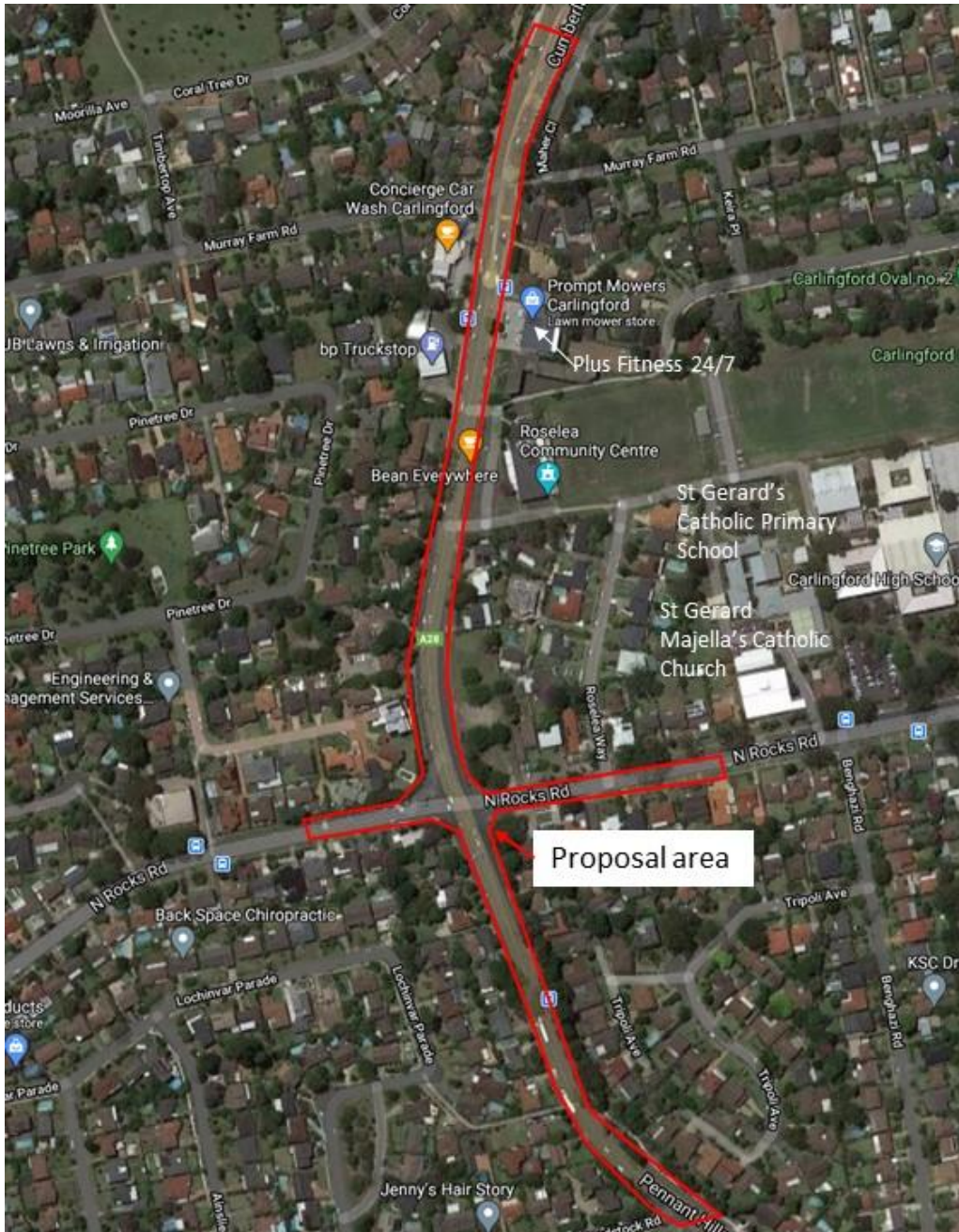


Figure 6-26 Social infrastructure and local businesses located near the proposal area (Source: Google Maps)

Access and connectivity

There are a number of properties that have driveways onto Pennant Hills Road and North Rocks Road and fences which encroach into the Transport for NSW owned road reserve (Figure 6-30).

Pedestrian footpaths are located on both sides of Pennant Hills Road and North Rocks Road for the extent of the proposal area. Footpaths exist on one side of other intersecting roads within the proposal area, being Murray Farms Road, Woodstock Road and Roselea Way. There are formalised pedestrian crossings at the Pennant Hills Road and North Rocks Road intersection except along the southern leg, and an additional signalised pedestrian crossing near the Roselea Community Centre on Pennant Hills Road north. The intersection pedestrian crossings are utilised by a number of schools in the area, including Carlingford High School and Roselea Public School on North Rocks Road east.

Other than a shared use path on Pennant Hills Road north there are no formal provisions for cyclists in the proposal area. As noted in Section 3.3.6, there are a number of bus stops in the proposal area which service bus routes 549, 553, 625 and 630.

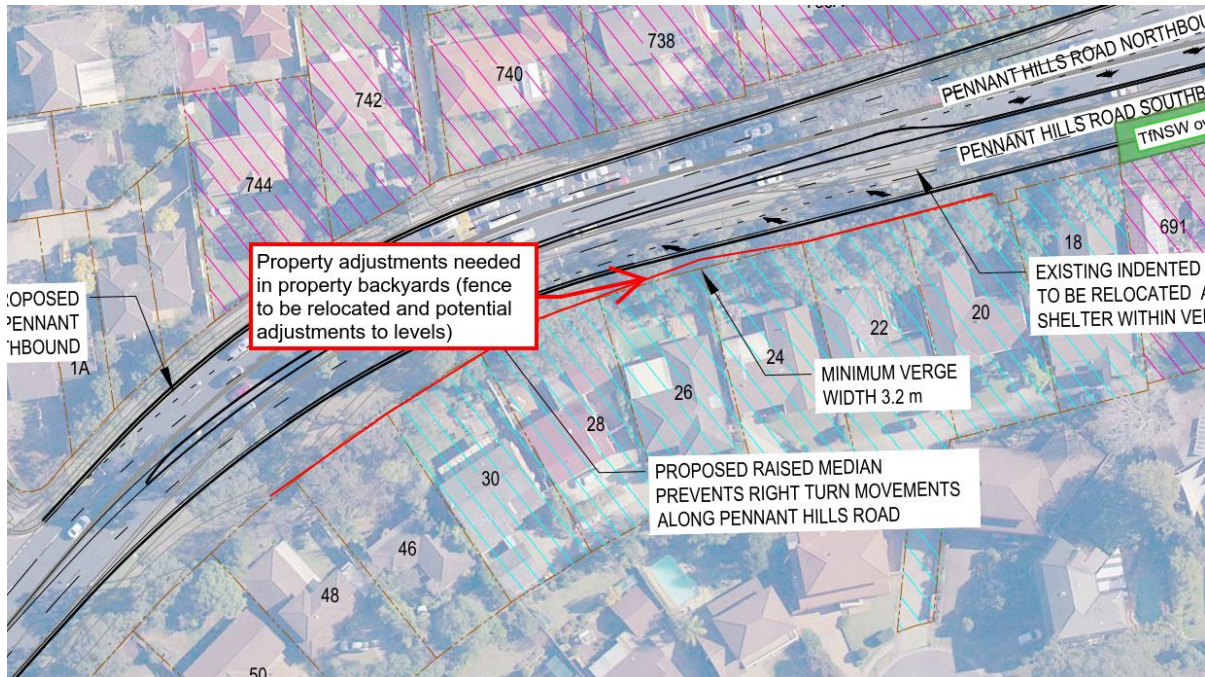


Figure 6-27 Property driveways and fences to be impacted by the proposal that are within the Transport for NSW road reserve

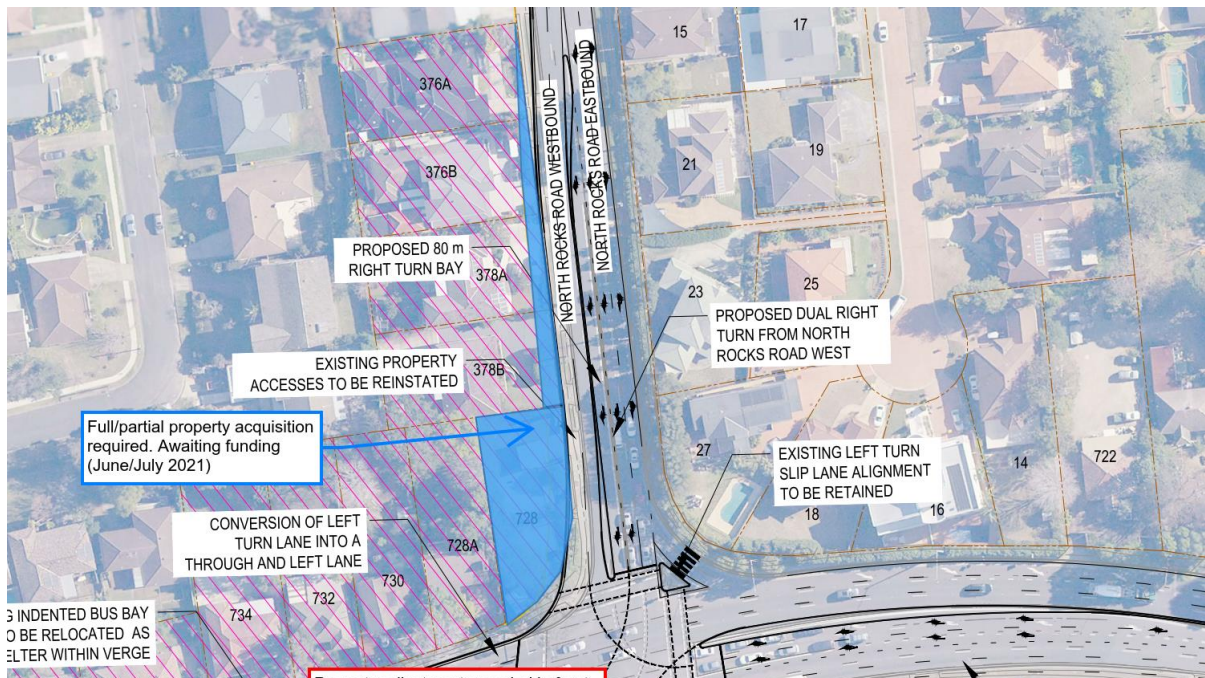


Figure 6-28 Property driveways and fences to be impacted by the proposal that are within the Transport for NSW road reserve

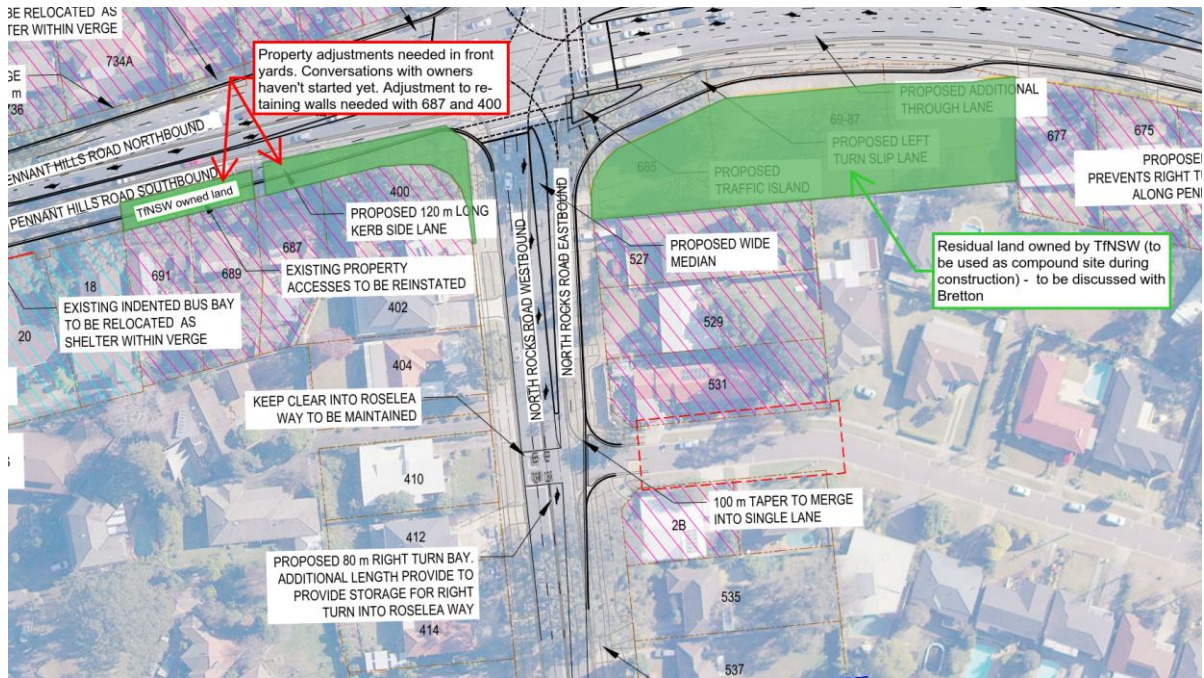


Figure 6-29 Property driveways and fences to be impacted by the proposal that are within the Transport for NSW road reserve

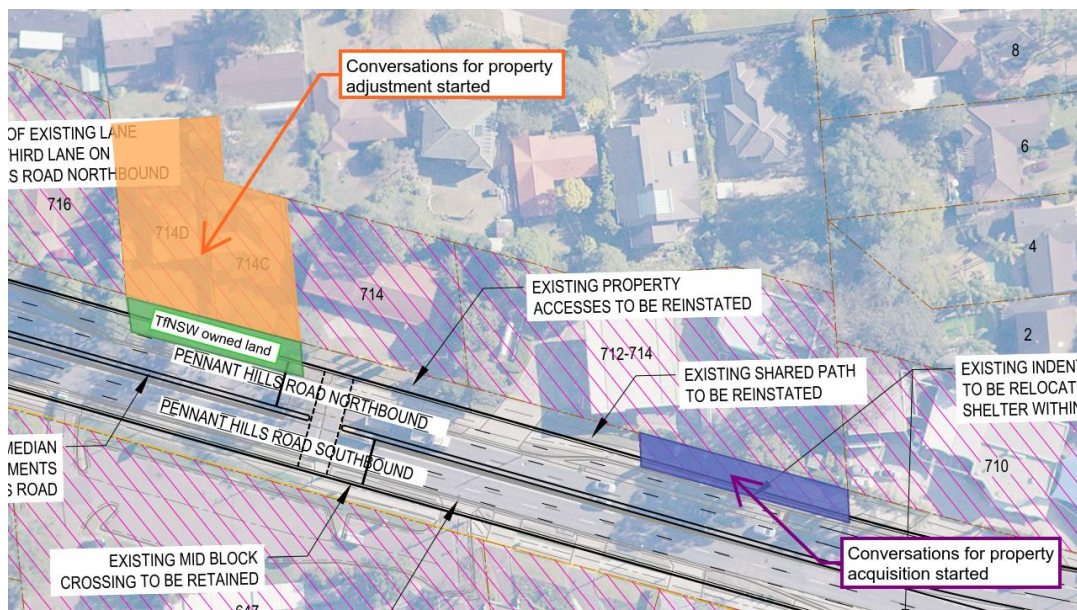


Figure 6-30 Property driveways and fences to be impacted by the proposal that are within the Transport for NSW road reserve

6.8.3 Potential impacts

6.8.3.1 Construction

There is potential for socio-economic impacts to occur as a result of proposed construction works. The potential impacts would be from changes to traffic and access, noise and vibration, visual amenity and air quality.

Construction impacts on residents would be disruptive but temporary. The sensitivity of residents within the proposal area is considered moderate, given the existing nature of the busy arterial roads. The level of significance for residents during the construction works

would be highly negative, given the likelihood of night works, causing potential disruption for between 18 to 24 months.

Social infrastructure

The community centre would be exposed to increased noise and traffic due to reduced speed limits and construction activities during construction.

The community centre would have a moderate sensitivity given its occasional use for a variety of activities. There is opportunity for scheduling of construction in discussion with the centre to minimise construction impacts where possible. The level of significance of impacts on social infrastructure would be moderate to low negative and no further impacts are expected due to the proposed modification.

Local businesses

The potential impacts on local businesses within the proposal area was assessed in the Project REF. There are no businesses within the area of the proposed modification, therefore potential impacts due to the proposed modification would be limited to minor increases in construction traffic and construction timeframe due to the proposed increase in scope of construction.

There would-be short-term construction noise and traffic disruptions up to 18 to 24 months. Noise would be intermittent and is expected to move along the corridor as the works progress. In general, the magnitude of impacts is considered low, due to the scheduling of works predominantly outside of standard construction hours and the temporary nature of impacts. Therefore, for impacts on business the level of significance would be moderate-low negative.

Access and connectivity

As part of preliminary construction staging plans, it is likely the existing pedestrian footpaths adjacent to the work areas (including Pennant Hills Road where the widening is occurring in front of residential properties and for the new high entry slip lane) will be temporarily occupied. Wayfinding signage will be used to direct pedestrians to the other side of the footpath using the pedestrian crossing at the Pennant Hills Road and North Rocks Road intersection. Similarly, on North Rocks Road west where widening is occurring, wayfinding signage will be used to direct pedestrians around the works, as described in Section 3.3.6.

Properties within the proposal area on Pennant Hills Road and North Rocks Road would have temporary access restrictions to their driveways as construction at their frontage occurs.

There could be minor delays to public transport routes through the proposal area due to traffic delays, which would be managed through the scheduling of works to avoid peak hours in the Traffic Management Plan.

The overall sensitivity of road users, including public transport users, and pedestrians to impacts on access and connectivity is considered to be high. In general, the magnitude of impacts are considered to be low, due to the scheduling of works predominantly outside of standard construction hours, limited impact on public transport and access and the temporary nature of impacts. Therefore, for impacts on access and connectivity the level of significance would be moderate negative.

6.8.3.2 Operation

During operation, the primary impact will be improved traffic flow and pedestrian connectivity. However, there would also be visual amenity impacts from the removal of vegetation due to road widening.

For residents, their experience of the changed visual environment would be particularly extensive given the removal of mature trees along Pennant Hills Road. These changes are considered to have a moderate magnitude of change and would have an overall moderate negative level of significance. However, visual impacts would remain consistent with other areas of the road corridor, which are more open and views of the built environment are more prevalent.

Social infrastructure

The potential impacts on social infrastructure within the proposal area were assessed in the Project REF, there are no social infrastructure land uses within the area of the proposed modification

Local businesses

The potential impacts on local businesses within the proposal area was assessed in the Project REF, there are no businesses within the area of the proposed modification.

Access and connectivity

As part of the proposed modification, a concrete median along Pennant Hills Road would be constructed from Woodstock Road up to the existing concrete median at Murray Farm Road. The determined project considered the impacts of the new concrete median on Pennant Hills Road north of the intersection with North Rocks Road, the impacts of the proposed modification are limited to the additional length of raised concrete median south of the North Rocks Road intersection and on both North Rocks Road approaches to the Pennant Hills Road intersection. The proposed raised concrete medians will improve the through flow of vehicles on Pennant Hills Road and North Rocks Road by removing vehicles potentially stopping on the median side lane to make a right turn into residential properties, causing queuing.

As set out in Section 6.3.3, residences at 22 residential properties would no longer be able to make right turns into their properties and alternative routes would be required. The alternative routes would increase travel distance by 2 to 2.4 km and an additional time of four to six minutes.

Property acquisition and adjustments

Property acquisition and adjustments required for the determined project with proposed modification are described in Section 3.7.

Properties whose fences are removed to accommodate road widening would have their driveways and fences reinstated to match the existing ones.

The existing environment's sensitivity to change is high due to the importance of Pennant Hills Road – Its connectivity to the M2 and high traffic volumes. Overall, the broad benefits to a large number of road users on these roads and pedestrians would result in a moderate positive magnitude of impact, despite some adverse impacts to access to properties along Pennant Hills Road and North Rocks Road. As such, the significance of impact is high-moderate positive.

Public Transport

Two bus stops in the eastern verge of Pennant Hills Road would be relocated further south of their existing locations (refer Section 3.6). They would each have a minor adverse and positive impact on bus users (refer Section 6.3.3).

6.8.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Socio-economic	<p>A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):</p> <ul style="list-style-type: none"> mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions contact name and number for complaints. <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>	Contractor	Construction
Community consultation	Community consultation is to be undertaken in accordance with the <i>Community Involvement Practice Notes and Resource Manual</i> .	Contractor	Construction
Community consultation	Complaints received are to be recorded and attended to promptly in accordance with the <i>Community Involvement Practice Notes and Resource Manual</i> .	Contractor	Construction
Community consultation	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	Contractor	Construction
Community consultation	All residences likely to be affected by the proposed works must be notified at least five working days prior to the commencement of the proposed activities.	Contractor	Construction

Other safeguards and management measures that would address socio economic impacts are identified in Sections 6.3.4 and 6.4.4.

6.9 Cumulative impacts

There is a requirement under Clause 228(2) of the EP&A Regulations to take into account any cumulative environmental impacts of the proposed works with other existing or planned future activities. Cumulative impacts have the potential to arise from the interaction of individual components within the proposed site and the effects of the proposal with other projects in the local area.

6.9.1 Methodology

A review of the Department of Planning and Environment (DP&E) Major Projects Register on 6 November 2020 returned the following results for the Parramatta LGA within five kilometres of the proposal area:

- NorthConnex M1 – M2 – (Former F3 – M2)
- Modification to NorthConnex M1 – M2.
- Epping West Public School Alterations and Additions
- New Epping South Primary School (Concept and Stage 1)
- Application for a residential flat building development at 242-244 Beecroft Road, Epping (Stage1 Concept)

A review of the City of Parramatta's website completed 12 April 2021 showed the following Development Approval's advertised in the vicinity of the proposal:

- 752 Pennant Hills Road – Alterations and modification to a building used for health consulting rooms including a first-floor addition
- 559 North Rocks Road - alterations and additions to a dwelling house including first floor addition.
- 712-714 Pennant Hills Road – Alterations and additions to the existing BP Service Station, including internal alterations, facade treatment, removal of signage and construction of new signage.
- 735-739 Pennant Hills Road – Alterations and additions to the existing place of public worship including internal changes, relocation of crèche, provision of ambulant facilities and tree removal.

A review of the Transport for NSW Projects page on 12 April 2021 returned the following results for the Carlingford area:

- Parramatta Light Rail
- New and extended clearways on Carlingford Road – have been installed
- Changes to bus stops along the Parramatta to Macquarie Park via Epping (route M54) – has been completed

6.9.2 Existing environment

The proposal area is located in an area of residential and commercial properties and is based within the suburb of Carlingford. As a part of the City of Parramatta LGA, the proposal area is bordered by West Pennant Hills and Beecroft to the north, Epping to the east, North Rocks and North Parramatta to the west and Telopea and Dundas Valley to the south. These suburbs are linked by Pennant Hills Road and North Rocks Road.

6.9.3 Potential impacts

Potential cumulative impacts during construction and operation phases of current and proposed projects within five kilometres of the proposal area are summarised in Table 6-24 Projects within five kilometres of proposal area.

Table 6-24 Projects within five kilometres of proposal area

Project	Construction impacts	Operational impacts
<p>NorthConnex</p> <p>NorthConnex is a nine kilometre tunnel linking the M1 Pacific Motorway at Wahroonga to the Hills M2 Motorway at West Pennant Hills that opened in October 2020.</p> <p>The southern interchange provides connections between the tunnel, Hills M2 Motorway and Pennant Hills Road. The northbound on-ramp and southbound off-ramp joining Pennant Hills Road is located about one kilometre north of the Pennant Hills Road and North Rocks Road intersection.</p>	<p>Construction of NorthConnex is complete and cumulative construction impacts would not be generated.</p>	<p>The operational impacts of the NorthConnex project would include the removal of around 5,000 trucks off Pennant Hills Road each day.</p>
<p>Epping West Public School Alterations and Additions</p> <p>Epping West Public School is approximately 3km from the proposal area. The project involves the demolition of Building G, alterations and refurbishment of existing buildings, construction of two new buildings, removal of demountable classrooms and landscaping.</p> <p>The project is undergoing planning and is in the Environmental Impact Statement preparation phase.</p>	<p>Construction of the school infrastructure would have dust, noise and vibration and traffic impacts. However, it is unlikely that the construction phases of the projects would overlap.</p>	<p>The operation of the school would not impact the proposal.</p>
<p>New Epping South Primary School</p> <p>The site is approximately 3.5km from the proposal area. The school is proposed to be a K-6 public educational establishment and will be for a Staged Concept Development Application comprising demolition works and the construction of new buildings to cater for an enrolment capacity for up to 1,000 students.</p> <p>The project is undergoing planning and is in the Environmental Impact Statement preparation phase.</p>	<p>Construction of the school infrastructure would have dust, noise and vibration and traffic impacts. However, it is unlikely that the construction phases of the projects would overlap.</p>	<p>The operation of the school would not impact the proposal.</p>
<p>Residential flat building development at 242-244 Becroft Road, Epping</p> <p>The site is approximately 4km from the proposal site and would provide a new mixed-use development. The application for this development was determined in July 2020. Delivery timing is subject to detailed design approvals.</p>	<p>Construction of the development would have dust, noise and vibration and traffic impacts, however, would be unlikely have substantial cumulative impacts given the distance from the proposal area.</p>	<p>Future stages of the development are expected to have a negligible impact on existing road network conditions.</p>

Project	Construction impacts	Operational impacts
<p>Parramatta Light Rail</p> <p>The Parramatta Light Rail will connect Westmead to Carlingford over 12km via the Parramatta CBD and Camellia. The Carlingford station is located approximately 2.5km from the proposal site. The light rail network is currently under construction and the new light rail network is expected to open in 2023.</p>	<p>The T6 Carlingford Line has permanently closed for the construction and operation of the Parramatta Light Rail. Traffic impacts on the intersection of Grand Avenue North and James Ruse Drive are expected, however, this is approximately 7.5 km away from the proposal area and would unlikely have cumulative impacts.</p>	<p>When in operation, the project will provide a 'Kiss and Ride' facility at Carlingford, encouraging public transport use, The level crossing at Parramatta Road, Granville, has been removed, which will also improve traffic flow in the area.</p>

Cumulative impacts such as increased traffic and noise and local impacts to air quality may occur as a result of the combined impacts of projects in the vicinity, however due to the minor nature of the works this impact is expected to be negligible, however are discussed in Table 6-25.

Table 6-25: Potential cumulative impacts

Environmental factor	Construction	Operation
<p>Cumulative traffic, noise, visual and biodiversity impacts</p>	<p>This proposal forms part of the wider Pinch Point program along Pennant Hills Road. Construction at the North Rocks Road intersection is anticipated to commence late 2021 or early 2022.</p> <p>Due to both the scale and spatial location of the proposal, it is unlikely there would be any cumulative impact with the projects identified in Table 6-24. However, potential cumulative impacts may include:</p> <ul style="list-style-type: none"> • Additional traffic impacts as a result of multiple construction projects, in particular Parramatta Light Rail. This may increase traffic and travel times, however, due to proposal staging and individual traffic management at the project level, impacts are anticipated to be minimal • Noise, vibration and air quality impacts associated with each of the proposals are expected to be managed at project level through appropriate noise, vibration and air quality mitigation measures. Due to the distance between the proposals and proposal staging, impacts are anticipated to be minimal 	<p>As part of The Pennant Hills and North Rocks Road intersection upgrade program, this proposal would contribute to the overall safety of the road network across Sydney. The operation of the proposal and other projects on the Transport for NSW road network would improve congestion and travel time for road users.</p>

	<ul style="list-style-type: none"> • Visual impacts from construction equipment, materials, stockpile sites and vehicles in the area. 	
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6.9.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Cumulative construction impacts	<p>If there is a project overlap with Parramatta Light Rail, schools, residential developments, or other Pinch Point program works, consultation will occur with the objective to:</p> <ul style="list-style-type: none"> • Increase awareness of construction timeframes and impacts • Coordinate impact mitigation and management (e.g.: respite periods). 	Contractor	Construction

6.10 Other impacts

6.10.1 Existing environment and potential impacts

Environmental factor	Existing environment	Potential impacts
<p>Waste</p>	<p>The existing waste producing activities in the immediate vicinity of the proposal are the council bins from residential properties and small businesses along Pennant Hills Road and litter from passing vehicles. A small amount of general litter was observed along the roadside at the location of the proposed works on a site inspection undertaken in January 2018. Section 143 of the POEO Act requires waste to be transported to a place that can lawfully accept it and that the owner of the waste and the transporter are responsible for ensuring that waste is transported to a suitable waste facility. Principles of waste management and the Resource Management Hierarchy (e.g. avoid, reduce, reuse, dispose) are embodied in the Waste Avoidance & Resource Recovery Act 2001 and through the NSW Waste Avoidance and Resource Recovery Strategy 2007.</p>	<p>Waste volumes would be low to moderate and the following waste streams are expected to be produced during the construction phase of the works:</p> <ul style="list-style-type: none"> • Excess construction materials • Excess spoil unsuitable for reuse • Packaging or protective products for materials • Roadside materials (signage, fencing etc) • General waste from staff • Wastewater from wash down or bunded areas • Redundant erosion and sediment controls • Demolition waste • Vegetation waste • Potential asbestos and other hazardous waste from existing utilities. <p>Waste oils and other materials from the maintenance of construction machinery may also be produced and would be disposed of at licensed facilities.</p> <p>Waste would be managed in accordance with POEO Act and the NSW Waste Classification Guidelines (EPA, 2014).</p>

Environmental factor	Existing environment	Potential impacts
<p>Air quality</p>	<p>No air quality monitoring or modelling has been undertaken for the proposal. The existing air quality in the area surrounding the North Rocks Road and Pennant Hills Road intersection would be heavily influenced by emissions from motor vehicles from the surrounding road network. Other local sources of air emission would include residential and commercial land uses particularly the BP petrol station.</p> <p>Data from the Macquarie Park (Willandra Village) weather station (site number 066156) indicated the average wind speed at 9am is between 6.5km/h to 9km/hr with a maximum of 10.2km/h in October. The average wind speed at 3pm is between 10km/h and 15km/h with a maximum of 18.5km/h in December.</p>	<p>Air quality impacts during construction would largely result from dust generated during earthworks and other engineering activities associated with road construction including:</p> <ul style="list-style-type: none"> • Clearing of vegetation • Demolition and excavation works to construct a new lane • Transport and handling of soils and materials • Road pavement works <p>Areas of exposed land would be susceptible to dust generation from wind erosion and mechanical disturbance, depending on the size of exposed areas, the frequency of water spraying and the speed of machinery.</p> <p>Potential impacts would be temporary, localised and readily manageable.</p> <p>Improved traffic flow and reduced congestion may have a positive effect on operational air quality in the area due to less stop/start traffic.</p>

6.10.2 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Air quality	<p>Air quality management measures are to be included within the CEMP would include but may not be limited to the following:</p> <ul style="list-style-type: none"> • disturbed areas would be minimised in extent and rehabilitated progressively • speed limits would be imposed on unsealed surfaces • stockpiles would be located as far away from residences and other sensitive receivers • works (including the spraying of paint and other materials) would not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely • no burning of any timbers or other combustible materials would occur on site • visual monitoring of air quality would be undertaken to verify the effectiveness of controls and enable early intervention • work activities would be reprogrammed if the management measures are not adequately restricting dust generation 	Contractor	Construction
Vehicles emissions	<ul style="list-style-type: none"> • Plant and machinery must be maintained in accordance with manufacturer's specification • Vehicles must not be left running when idle. 	Contractor	Construction
Dust generation	<ul style="list-style-type: none"> • Any material transported in trucks must be appropriately covered to reduce dust generation • Measures including watering or covering exposed areas must be used to minimise or prevent dust generation. 	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Waste management	<p>Resource management hierarchy principles are to be followed:</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 <p>(in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>).</p>	Contractor	Construction
Waste management	<p>A Waste Management and Resource Recovery Plan (WMRRP) will be prepared and implemented as part of the CEMP. The WMRRP 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. <p>The WMRRP will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Contractor	Detailed design / pre-construction
Waste management	<p>Bulk project waste (e.g. fill) sent to a site not owned by the Roads and Maritime Services (excluding Office and Environment and Heritage licensed landfills) for land disposal is to have prior formal written approval from the landowner, in accordance with <i>Environmental Direction No. 20 – Legal Off-site disposal of Bulk RTA Project Wastes</i>.</p>	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Waste management	There is to be no disposal or re-use of construction waste on to other land.	Contractor	Construction
Waste management	Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed.	Contractor	Construction
Waste management	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction

7 Environmental management

7.1 Environmental management plans

A number of safeguards and management measures have been identified to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposed modification. Should the proposed modification proceed, these management measures would be addressed if required during detailed design and incorporated into the Contractors Environmental Management Plan (CEMP) and applied during the construction and operation of the proposed modification.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures for the Project REF are summarised in Table 7-1. Additional safeguards and management measures identified in this addendum REF are included in bold and italicised font. The safeguards and management measures will be incorporated into the detailed design phase of the proposed modification, the CEMP and implemented during construction and operation of the proposed modification, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
NV1	Construction noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> • all potential noise and vibration generating activities associated with the activity • a monitoring program to assess performance against relevant noise and vibration criteria • arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 	Contractor	Detailed design / pre-construction
NV2	Construction noise	<p>Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise levels should be scheduled during less sensitive time periods.</p> <p>The most noise-intensive construction processes (such as pavement sawing and jack hammering) is to be completed prior to midnight.</p>	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NV3	Construction noise	<p>All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least seven 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 project • 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/Construction
NV4	Construction noise	Noise curtains are to be placed between sources of construction noise and sensitive receivers during night works where noise sources are stationary.	Contractor	Construction
NV5	Construction vibration	<p>Pre-construction vibration trials to be undertaken on site to if vibration producing plant are expected to work within safe working distances to verify acceptable limits.</p> <p>Select plant to ensure that the recommended safe working distances for cosmetic damage are maintained.</p>	Contractor	Pre-construction
NV6	Construction vibration	A vibration risk assessment will be carried out before construction to identify if there are any buildings located within the minimum working distances for construction activities proposed to be undertaken. Where vibration is found to be excessive on any receiving properties, management measures will be implemented to ensure vibration compliance is achieved. Management measures may include modification of construction methods such as using smaller equipment, establishment of safe buffer zones and if necessary, time restrictions for the most excessive vibration activities.	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NV7	Construction vibration	Dilapidation/building condition surveys will be conducted at receivers determined by the contractor through a vibration risk assessment, to be sensitive to ground vibration impacts.	Contractor	Pre-construction
B1	Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) • pre-clearing survey requirements • procedures for unexpected threatened species finds and fauna handling • protocols to manage weeds and pathogens. 	Contractor	Detailed design / pre-construction
B2	Biodiversity	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Contractor	Detailed design / pre-construction
B3	Biodiversity	A landscaping plan will be developed for the proposal.	Transport for NSW	Detailed design / pre-construction
B4	Biodiversity	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: <i>Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RMS projects</i> (RTA 2011).	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B5	Biodiversity	If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the Transport for NSW's Unexpected Threatened Species Find Procedure in the Roads and Maritime Services Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process).	Contractor	Construction
B6	Biodiversity	All pathogens (e.g. Chytid, Myrtle Rust and <i>Phytophthora</i>) are to be managed in accordance with the Roads and Maritime Services Biodiversity Guidelines - Guide 7 (Pathogen Management) and DECC Statement of Intent 1: Infection of native plants by <i>Phytophthora cinnamomi</i> (for Phytophthora).	Contractor	Construction
B7	Biodiversity	Priority weeds are to be managed according to requirements of the <i>Biosecurity Act 2015</i> and Guide 6 (Weed Management) of the Roads and Maritime Services Biodiversity Guidelines 2011.	Contractor	Construction
B8	Biodiversity	All pruning and trimming of trees are to be in accordance with the Australian Standard 4373-2007 <i>Pruning of amenity trees</i> . Pruning of mature trees is to be undertaken by a qualified arborist.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
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 Roads and Maritime Traffic Control at Work Sites Manual (RTA, 2010) 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	Detailed design / Pre-construction
TT2	Traffic congestion and safety	Traffic control will be provided in accordance with the approved construction TMP to manage traffic movements (vehicular, cycle and pedestrian) during construction.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
TT3	Traffic and transport	Road users including motorists, cyclists and pedestrians will be provided with timely, accurate, relevant and accessible information about changed traffic conditions and delays owing to construction activities.	Contractor	Pre-construction / construction
TT4	Public transport	Access to bus stop locations would be maintained as much as possible during construction. Any temporary changes or relocation of bus stops or access will be undertaken in consultation with the bus service provider.	Contractor	Pre-construction / construction
TT5	Pedestrian and cyclist access	When access cannot be maintained for pedestrians or cyclists, signage outlining pedestrian and cyclist diversion routes would be displayed during construction.	Contractor	Construction
TT6	Property access	During construction, pedestrian access to residential properties would be maintained at all times and driveway access would be maintained. If there is temporary closure of property access, the property owner will be engaged. The management of property access would be considered by the construction contractor and detailed in the traffic management plan.	Contractor	Pre- Construction and Construction
TT7	Property access	Transport for NSW will continue to engage with all properties that will have altered access following construction of the Proposal.	Contractor	Pre- Construction and Construction
TT8	Property access	Residents and businesses will be notified at least five working days prior to construction works of any specific impacts to property access and arrangements required during construction.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
LV1	Removal of street trees	<p>Detailed design will consider the following:</p> <ul style="list-style-type: none"> • Utility adjustment options to minimise impact to tree roots and minimise tree removal • Vegetation clearing would be kept to the minimum to accommodate the proposal • A landscape plan to offset tree removal and mitigate the loss of screening for certain residences. 	Transport for NSW	Detailed design / pre-construction
LV2	Visual impacts of construction lighting	Construction lights will be directed away from residential receivers.	Contractor	Construction
LV3	Visual impacts of construction activities	<ul style="list-style-type: none"> • The work site will be left in a tidy manner at the end of each work day. • Fencing with material attached (e.g. shade cloth) would be provided around the construction compounds to screen views of the construction compounds from adjoining properties • Landscaping will be managed in accordance with the Roads and Maritime Services <i>Landscape guideline, 2018</i>. 	Contractor	Construction
LV4	Tree removal and replanting	A landscaping plan will be developed in consultation with City of Parramatta Council and property owners for replanting within private properties prior to construction and will include detail on the planting species mix.	Transport for NSW / Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SW1	Contaminated land	<p>A Contaminated Land Management Plan will be prepared and implemented as part of the CEMP. The Contaminated Land Management Plan will comply with the <i>Contaminated Land Management Act 1997</i> (NSW), TfNSW publication “Guideline for the Management of Contamination”, TfNSW “Environmental Incident Classification and Reporting Procedure”, and EPA guidelines on contaminated land management.</p> <p>The plan will provide for dealing with:</p> <ul style="list-style-type: none"> • areas of known contamination; • unexpected contamination finds; • any land contamination caused by the project. <p>The plan will include methods for identifying and investigating potential contamination, storage or stockpile management processes and measures and disposal processes.</p>	Contractor	Construction
SW2	Contaminated land	<p>If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. Works in the 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.</p>	Contractor	Construction
SW3	Accidental spill	<p>A site specific emergency spill plan will be developed, and include spill management measures in accordance with the <i>Roads and Maritime Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and EPA officers).</p>	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SW4	Fuel spills	Vehicles and machinery should be properly maintained to minimise the risk of fuel/oil leaks. Routine inspections of all construction vehicles and equipment should be undertaken for evidence of fuel/oil leaks.	Contractor	Construction
SW5	Erosion and sedimentation	<p>Erosion and sediment control measures are to be implemented and maintained to:</p> <ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets. • Reduce water velocity and capture sediment on site. • Minimise the amount of material transported from site to surrounding pavement surfaces. • Divert clean water around the site. <p>(in accordance with the Landcom/Department of Housing <i>Managing Urban Stormwater, Soils and Construction Guidelines</i> (the Blue Book)).</p>	Contractor	Construction
SW6	Erosion and sedimentation	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Contractor	Construction
SW7	Erosion and sedimentation	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Contractor	Construction
SW8	Erosion and sedimentation	Work areas are to be stabilised progressively during the works.	Contractor	Construction
SW9	Erosion and sedimentation	The maintenance of established stockpile sites during is to be in accordance with the Roads and Maritime Services <i>Stockpile Site Management Guideline (EMS-TG-10)</i> .	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SW10	Water quality	Water quality control measures are to be used to minimise any materials (e.g. concrete, grout, sediment etc.) entering drain inlets or waterways.	Contractor	Construction
AH1	Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where 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. <p>Procedures for unexpected finds will be addressed in the CEMP.</p>	Contractor	Construction
NAH1	Non-Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied. <p>Procedures for unexpected finds will be addressed in the CEMP.</p>	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SC1	Socio-economic	<p>A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):</p> <ul style="list-style-type: none"> mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions contact name and number for complaints. <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>	Contractor	Construction
SC2	Community consultation	Community consultation is to be undertaken in accordance with the <i>Community Involvement Practice Notes and Resource Manual</i> .	Contractor	Construction
SC3	Community consultation	Complaints received are to be recorded and attended to promptly in accordance with the <i>Community Involvement Practice Notes and Resource Manual</i> .	Contractor	Construction
SC4	Community consultation	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	Contractor	Construction
SC5	Community consultation	All residences likely to be affected by the proposed works must be notified at least five working days prior to the commencement of the proposed activities.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
CU1	Cumulative construction impacts	<p>If there is a project overlap with Parramatta Light Rail, schools, residential developments, or other Pinch Point program works, consultation will occur with the objective to:</p> <ul style="list-style-type: none"> • Increase awareness of construction timeframes and impacts • Coordinate impact mitigation and management (e.g.: respite periods). 	Contractor	Construction
AQ1	Air quality	<p>Air quality management measures are to be included within the CEMP would include but may not be limited to the following:</p> <ul style="list-style-type: none"> • disturbed areas would be minimised in extent and rehabilitated progressively • speed limits would be imposed on unsealed surfaces • stockpiles would be located as far away from residences and other sensitive receivers • works (including the spraying of paint and other materials) would not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely • no burning of any timbers or other combustible materials would occur on site • visual monitoring of air quality would be undertaken to verify the effectiveness of controls and enable early intervention • work activities would be reprogrammed if the management measures are not adequately restricting dust generation. 	Contractor	Construction
AQ2	Vehicles emissions	<ul style="list-style-type: none"> • Plant and machinery must be maintained in accordance with manufacturer's specification • Vehicles must not be left running when idle. 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
AQ3	Dust generation	<ul style="list-style-type: none"> Any material transported in trucks must be appropriately covered to reduce dust generation Measures including watering or covering exposed areas must be used to minimise or prevent dust generation. 	Contractor	Construction
WM1	Waste management	<p>Resource management hierarchy principles are to be followed:</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 <p>(in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>).</p>	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
WM2	Waste management	<p>A Waste Management and Resource Recovery Plan (WMRRP) will be prepared and implemented as part of the CEMP. The WMRRP 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. <p>The WMRRP will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Contractor	Detailed design / pre-construction
WM3	Waste management	<p>Bulk project waste (e.g. fill) sent to a site not owned by the Roads and Maritime Services (excluding Office and Environment and Heritage licensed landfills) for land disposal is to have prior formal written approval from the landowner, in accordance with <i>Environmental Direction No. 20 – Legal Off-site disposal of Bulk RTA Project Wastes</i>.</p>	Contractor	Construction
WM4	Waste management	<p>There is to be no disposal or re-use of construction waste on to other land.</p>	Contractor	Construction
WM5	Waste management	<p>Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed.</p>	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
WM6	Waste management	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction

7.3 Licensing and approvals

All relevant licenses, permits, notifications and approvals needed for the Project REF and when they need to be obtained are listed in Table 7-2. Additional or changed licenses and approval requirements identified in this addendum REF are indicated by underlined and/or struck out font.

Table 7-2: Summary of licensing and approval required

Instrument	Requirement	Timing
<i>Roads Act 1993</i>	Approved Road Occupancy Licence (ROL) under Section 138 from the appropriate road authority prior to works on roads.	Prior to start of the activity.
<i>REF Approval</i>	Determination of this REF by Transport for NSW	Prior to the start of the activity

8 Conclusion

8.1 Justification

The REF has assessed the potential, biophysical, social and economic impacts of the preferred option. The proposed road widening of Pennant Hills Road and upgrade of the Pennant Hills Road/ North Rocks Road intersection would result in a number of environmental impacts including:

- Construction and operation noise levels
- Traffic impacts for the duration of construction
- Visual impact through the removal of road side trees and hedges, the adjusting of property fences and the widening of the road
- Full and partial property acquisition and changes to property access
- Biodiversity through the removal of a number of trees and road side vegetation.

The proposal involves the provision of additional lanes and new intersection configurations on Pennant Hills Road and North Rocks Road, which would ease congestion and improve traffic flow along the corridor. The proposal would deliver a rapid improvement to the recognised pinch point through improved intersection performance.

This REF has concluded that the impacts of the proposal would be outweighed by the long term beneficial impacts of providing improved traffic flow, reduced congestion and improved safety for road users. Therefore the proposal is considered justified.

8.1.1 Socio and economic factors

An assessment of the Proposal's social and economic impacts is documented in section 6 of this addendum REF and section 6.8 of the project REF (April 2018). Adverse social impacts associated with the original proposal identified in the project REF included the use of alternative routes required for access to properties and some property boundaries being pushed to official properties boundaries. Since determination, the design has progressed, and six additional properties have been identified as requiring partial or full property acquisition and another two requiring property adjustment works up to the boundary. However, the majority of works will take place within the existing road corridor and access to properties will be maintained. Given that the surrounding area is residential and recreational with a few businesses in the area, socio-economic impacts are expected to be minimal.

Long term the Proposal is expected to have a positive effect on the local community and nearby businesses as it will create a slight improvement to traffic flow and improve road safety. The Proposal will achieve this by road widening to create an additional lane on Pennant Hills Road (northbound and southbound), between Woodstock Road and Murray Farm Road.

8.1.2 Biophysical factors

An assessment of the Proposals environmental impact is documented in Section 6 of this REF and Section 6 of the project REF (April 2018). The Proposal would have a minor biophysical impact due to the proposed vegetation removal and temporary impacts to amenity including local air quality, noise and vibration and visual impacts. These impacts would not be significant and are manageable through the application of the safeguards and management measures documented in Section 7.2 and the Project REF.

8.1.3 Public interest

During construction the public would experience amenity impacts such as noise, traffic disruption, visual impacts and air quality (refer section 6). These impacts would be temporary (excluding visual impact from vegetation removal) and limited to the construction period only.

Once in operation the Proposal is expected to provide public benefit and would be in the public interest as it contributes to improving congestion and road safety on Pennant Hills Road and North Rocks Road.

8.1.4 Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	<p>The proposal design, impact mitigation and management measures detailed in this REF allow for the proper management, development and conservation of natural and artificial resources. The main objective of the proposal is to provide additional through lanes along Pennant Hills Road to reduce congestion and improve the safety at the intersection.</p> <p>Where possible throughout the design of the proposal, management and conservation of natural resources has been incorporated. This has included optimising the balance between cut and fill, minimising the need to import additional natural resources. Additionally, vegetation removal has been minimised as far as possible to reduce the potential impact on the potential sensitive receivers.</p>
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically sustainable development is considered in Section 8.1.1 to Section 8.1.4 below.
1.3(c) To promote the orderly and economic use and development of land.	The Proposal is largely contained within the road corridor. Private and Council owned land will be acquired however would not impact on the economic use of the land.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the project.

<p>1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.</p>	<p>The Proposal will not impact on any threatened species or communities. Vegetation removal will consist of planted exotic and native trees within the road corridor.</p>
<p>1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).</p>	<p>Heritage impacts are assessed in section 6.6 and 6.7. The assessment includes management measures to avoid and/or minimise impacts.</p>
<p>1.3(g) To promote good design and amenity of the built environment.</p>	<p>The design criteria includes: minimising environmental impacts of the Proposal; minimising project impacts on the community, including minimising property acquisition and; providing a value for money solution</p>
<p>1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.</p>	<p>Not relevant to the project.</p>
<p>1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.</p>	<p>Not relevant to the project.</p>
<p>1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.</p>	<p>Not relevant to the project.</p>

8.2 Ecologically sustainable development

8.2.1 The precautionary principle

The assessment of the potential impacts of the proposal is considered to be consistent with the precautionary principle. The detailed environmental investigations carried out for this REF have been consistent with accepted scientific and assessment methodologies. The investigations have identified a range of potential impacts associated with the construction and operation of the proposal.

The evaluation and assessment of alternative options within the proposal have also aimed to reduce the risk of serious and irreversible impacts on the environment as a result of the proposal.

The proposal has sought to take a precautionary approach to minimising environmental impacts. This has been applied through the development of a range of environmental safeguards, as summarised in Section 7.2. These safeguards would be implemented during construction and operation of the proposal.

No safeguards have been postponed as a result of lack of scientific certainty. The selected construction contractor would be required to prepare CEMP before starting construction. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

8.2.2 Intergenerational equity

The proposal would benefit future generations by improving congestion and travel times. Implementation of the safeguards contained in this REF (Chapter 7) would ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

8.2.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity has been considered during all stages of the proposal's development. Potential impacts have been avoided where possible, and safeguarded against or offset where necessary.

The biodiversity assessment (refer to Section 6.2) concludes that the proposal would not have an impact on the existing ecological environment. Impacts would be minimised through the safeguards summarised in Section 7.2.

8.2.4 Improved valuation, pricing and incentive mechanisms

Environmental and social issues were considered in the strategic planning and establishment of the need for the proposal, and in consideration of various proposal options. The value placed on environmental resources is evident in the extent of the planning and environmental investigations, and in the design of the proposed mitigation measures and safeguards. Implementation of these mitigation measures and safeguards would result in an economic cost to Transport for NSW, which would be included in the capital cost of the proposal.

8.3 Conclusion

This addendum 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, populations 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 proposed modification have been avoided or reduced during the design development and options assessment. The proposed modification as described in the addendum REF best meets the project objectives, but would still result in some impacts on traffic and access, visual amenity, noise and biodiversity. Safeguards and management measures as detailed in this addendum REF would ameliorate or minimise these expected impacts. The proposed modification would also improve the intersection performance, ease congestion and improve traffic flow along the corridor. On balance the proposed modification is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposed modification would not result in a change to the findings of the project REF and 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 proposed modification is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposed modification would not likely cause a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Australian Government Department of Agriculture, Water and the Environment is not required.

This addendum REF has been prepared to meet the requirements of the EPBC Act strategic assessment approval for Transport for NSW Division 5.1 road activities. A referral to the Australian Government Department of Agriculture, Water and the Environment is not required.

10 References

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Terms and acronyms used in this addendum REF

Term / Acronym	Description
AusLink	Mechanism to facilitate cooperative transport planning and funding by Commonwealth and state and territory jurisdictions
BC Act	<i>Biodiversity Conservation Act 2016</i> (NSW).
CEMP	Construction / Contractor's environmental management plan
EIA	Environmental impact assessment
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
Heritage Act	<i>Heritage Act 1977</i> (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
NES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
Roads and Maritime	NSW Roads and Maritime was dissolved by the Transport Administration Amendment Bill in August 2019, all function are now managed by Transport for NSW
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SEPP 14	State Environmental Planning Policy No.14 – Coastal Wetlands
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW)

Transport for New South Wales	Transport for NSW
QA Specifications	Specifications developed by Transport for NSW for use with road work and bridge work contracts let by Transport for NSW.

Appendix A

Consideration of clause 228(2) factors and matters of National Environmental Significance and Commonwealth land



Clause 228(2) Checklist

In addition to the requirements of the Is an EIS required? (1995/1996) guideline and the Roads and Related Facilities EIS Guideline (DUAP, 1996) as detailed in the addendum 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 proposed modification on the natural and built environment.

Factor	Impact
<p>Any environmental impact on a community?</p> <p>Construction of the proposal would result in impacts on the local community as discussed in Section 6. Potential construction impacts include traffic and transport delays and changes, noise and vibration, changes to visual and air quality amenity. These impacts are temporary during construction and would be managed through implementation of the recommended safeguards and management measures.</p> <p>The proposal would have a positive effect on the local community and road users long term by improving travel times, congestion and road safety on Pennant Hills Road and North Rocks Road.</p>	<p>Short-term negative</p> <p>Long-term positive</p>
<p>Any transformation of a locality?</p> <p>During construction the proposal would have a negative impact on the locality through presence of construction activities, equipment and traffic controls.</p> <p>Long-term the proposal would result in the upgrade of an existing road corridor. The upgrade to the corridor, while resulting in the removal of some vegetation, would retain the character of the existing corridor. The Landscaping Plan and recommended safeguards and management measures would also reduce the impact on the locality.</p>	<p>Short-term negative</p> <p>Long-term positive</p>
<p>Any environmental impact on the ecosystems of the locality?</p> <p>The proposal would involve the removal of trees within the proposal area. This vegetation is fully comprised of exotic and native landscape plantings within both private properties and public land. There would be no long-term impacts to biodiversity due to the proposal, provided the recommendations and safeguards are implemented. The proposal is unlikely to remove, modify, fragment or isolate any area of habitat important to the long-term survival of the addressed threatened flora and fauna species, population or ecological communities in the locality.</p>	<p>Negligible</p>
<p>Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p>	<p>Nil</p>

Factor	Impact
<p>The proposal would not reduce the aesthetic, recreational, scientific or other environmental quality or value of the community.</p>	
<p>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 Stage 1 PACHCI assessment concluded that the proposal is unlikely to have any impact on Aboriginal cultural heritage.</p> <p>There are no non-Aboriginal heritage items within the proximity to the proposal area and so there is unlikely to be an impact on non-Aboriginal heritage.</p> <p>The risk of indirect damage or unforeseen heritage items may be found during the construction works would be managed through implementation of the safeguards.</p>	Negligible
<p>Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>The proposal would include the loss of vegetation within the existing road reserve and private properties within the proposal area. This includes flowering trees and shrubs that may provide a small degree of habitat value to certain urban-adapted native fauna such as possums and bats. The loss of the habitat value provided by this vegetation is however expected to be of negligible biodiversity impact.</p>	Negligible
<p>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 any species of animal, plant or other form of life, whether living on land, in water or in the air, due to the limited biodiversity value and limited scope of works.</p>	Negligible
<p>Any long-term effects on the environment?</p> <p>The proposal would have a positive effect on the environment long-term by reducing traffic congestion and improving safety.</p>	Long-term positive
<p>Any degradation of the quality of the environment?</p> <p>The proposal would result in traffic, noise and vibration and minor visual and air quality amenity impacts during construction. These impacts would be temporary and managed through the proposed safeguards and management measures. The proposal is in line with the existing use of the site.</p>	Short-term negative
<p>Any risk to the safety of the environment?</p> <p>During construction, traffic management measures would be implemented to minimise any potential road safety risks. Water, soil and air quality risks are expected to be effectively managed by the proposed safeguards and management measures.</p>	Short-term negative

Factor	Impact
<p>During operation, safety of the environment would be improved by the addition of travel lanes, pedestrian crossing and raised medians.</p>	<p>Long-term positive</p>
<p>Any reduction in the range of beneficial uses of the environment?</p> <p>There would be no long-term reduction in the range of beneficial uses of the environment as a result of the proposed work as all works would be within the existing road reserve. The proposal would improve the beneficial use of the road reserve by providing additional travel lanes and wider pedestrian footpaths.</p>	<p>Long-term positive</p>
<p>Any pollution of the environment?</p> <p>The proposed works would likely result in minor, temporary pollution of the local environment (e.g. noise and exhaust/dust) however the potential impacts would be minimised with the implementation of the safeguards given in Chapter 7 of this REF.</p>	<p>Short-term negative</p>
<p>Any environmental problems associated with the disposal of waste?</p> <p>The potential to reuse materials would be investigated during detailed design. Waste that cannot be reused on site would be classified in accordance with the Waste Classification Guidelines (DECCW, 2009) and disposed of at an approved materials recycling or waste disposal facility. No environmental problems are anticipated with the disposal of waste.</p>	<p>Nil</p>
<p>Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>The proposal does not require resources that are or likely to become in short supply.</p>	<p>Nil</p>
<p>Any cumulative environmental effect with other existing or likely future activities?</p> <p>If the proposal is carried out concurrently with the projects identified in Section 6.9 of this REF then cumulative impacts are likely to occur, particularly in relation to traffic, noise and visual amenity. However, with the proposed management measures identified in Chapter 7 of this REF, including the communication with other project teams, cumulative impacts are expected to be effectively managed.</p>	<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 would not impact coastal processes and coastal hazards.</p>	<p>Nil</p>

Matters of National Environmental Significance and Commonwealth land

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

Under the EPBC Act strategic assessment approval a referral is not required for proposed road actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. Impacts on these matters are assessed in detail as part of this addendum REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
Any impact on a World Heritage property?	Nil
Any impact on a National Heritage place?	Nil
Any impact on a wetland of international importance?	Nil
Any impact on a listed threatened species or communities?	Nil
Any impacts on listed migratory species?	Nil
Any impact on a Commonwealth marine area?	Nil
Does the proposed modification involve a nuclear action (including uranium mining)	Nil
Additionally, any impact (direct or indirect) on Commonwealth land?	Nil

Appendix B

Statutory consultation checklists



Infrastructure SEPP

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	City of Parramatta	ISEPP cl. 95A
Bus Depots	Does the project propose a bus depot?	No	City of Parramatta	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	City of Parramatta	ISEPP cl. 95A

Development within the Coastal Zone

Issue	Description	Yes / No / NA	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	City of Parramatta	ISEPP cl. 15A

Note: See interactive map here: <https://www.planning.nsw.gov.au/policy-and-legislation/coastal-management>. Note the coastal vulnerability area has not yet been mapped.

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

Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	ISEPP clause
Stormwater	Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	Yes	City of Parramatta	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	City of Parramatta	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	City of Parramatta	ISEPP cl.13(1)(c)
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	City of Parramatta	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?	No	City of Parramatta	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	City of Parramatta	ISEPP cl.13(1)(f)

Local heritage items

Issue	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s)	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?	No	City of Parramatta	ISEPP cl.14

Flood liable land

Issue	Potential impact	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?	No	City of Parramatta	ISEPP cl.15
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance	No	State Emergency Services Email: erm@ses.nsw.gov.au	ISEPP cl.15AA

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

Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	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	DPIE	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	DPIE	ISEPP cl. 16(2)(b)
Aquatic reserves and marine parks	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)
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</i>	No	Mine Subsidence Board	ISEPP cl. 16(2)(i)

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
	<i>Subsidence Compensation Act 1961?</i>			

Growth Centres SEPP

Issue	Potential impact	Yes / No	If 'yes' consult with	SEPP clause
Clearing native vegetation	Do the works involve clearing native vegetation (as defined in the Local Land Services Act 2013) on land that is not subject land (as defined in cl 17 of schedule 7 of the <i>Threatened Species Conservation Act 1995</i>)?	No	Department of Planning, Industry and Environment	SEPP 18A

Appendix C

**Pennant Hills Road and North Rocks Road, Carlingford Intersection Upgrade Project
REF, April 2018**

Appendix D

Design drawings (subject to detailed design)

Appendix E

Community consultation report and ISEPP consultation letter

Appendix F

Noise and Vibration Assessment

Appendix G

Biodiversity Assessment

Appendix H

Traffic Report

Appendix I

Waste Classification and Soil Searches

Appendix J

AHIMS search and PACHCI letter

Appendix K

Non-Aboriginal Heritage searches

