

Transport Access Program Kingswood Station Upgrade

Review of Environmental Factors



Artist's impression of the proposed Kingswood Station Upgrade, indicative only, subject to detailed design



Kingswood Station Upgrade Review of Environmental Factors

Transport Access Program Ref – 6166753

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Abbreviations

Term	Meaning
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
APS	Access to Premises (Disability Standards)
ARI	Average Recurrence Interval
ASA	Asset Standards Authority (refer to Definitions)
ASS	Acid Sulfate Soils
BCA	Building Code of Australia
BC Act	Biodiversity Conservation Act 2016 (NSW)
CBD	Central Business District
ССТУ	Closed Circuit TV
СЕМР	Construction Environmental Management Plan
CLM Act	Contaminated Land Management Act 1997 (NSW)
CNVMP	Construction Noise and Vibration Management Plan
CPTED	Crime Prevention Through Environmental Design
СТМР	Construction Traffic Management Plan
DBH	Diameter Breast Height
DBYD	Dial Before You Dig
D&C	Design & Construct
DDA	Disability Discrimination Act 1992 (Cwlth)
DoE	Commonwealth Department of the Environment
DP&E	NSW Department of Planning and Environment
DSAPT	Disability Standards for Accessible Public Transport (2002)
DSI	Detailed Site Investigation (Phase II Contamination Investigation)
ECM	Environmental Controls Map
EMS	Environmental Management System
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)

Term	Meaning
EP&A Regulation	Environmental Planning and Assessment Regulation 2000 (NSW)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development (refer to Definitions)
ETS	Electronic Ticketing System
FM Act	Fisheries Management Act 1994 (NSW)
Heritage Act	Heritage Act 1977 (NSW)
HV	High Voltage
ICNG	Interim Construction Noise Guideline (Department of Environment and Climate Change, 2000).
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007 (NSW)
LEP	Local Environmental Plan
LGA	Local Government Area
LoS	Level of Service
LV	Low Voltage
NES	National Environmental Significance
Noxious Weeds Act	Noxious Weeds Act 1993 (NSW)
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NSW	New South Wales
OEH	NSW Office of the Environment and Heritage
OHWS	Overhead Wire Structure
оонw	Out of hours works
PA system	Public Address system
PDP	Public Domain Plan
POEO Act	Protection of the Environment Operations Act 1997 (NSW)
RailCorp	(former) Rail Corporation of NSW
RAP	Remediation Action Plan
RBL	Rating Background Level

Term	Meaning
REF	Review of Environmental Factors (this document)
Roads Act	Roads Act 1993 (NSW)
Roads and Maritime	NSW Roads and Maritime Services (formerly Roads and Traffic Authority)
SEPP	State Environmental Planning Policy
SHR	State Heritage Register
SoHI	Statement of Heritage Impact
ТСР	Traffic Control Plan
TfNSW	Transport for NSW
TGSI	Tactile Ground Surface Indicators ("tactiles")
ТМР	Traffic Management Plan
TPZ	Tree Protection Zone
TT&IA	Traffic, Transport and Access Impact Assessment
ТVМ	Ticket Vending Machine
UDP	Urban Design Plan
WARR Act	Waste Avoidance and Resource Recovery Act 2001 (NSW)

Definitions

Term	Meaning
Average Recurrence Interval	The likelihood of occurrence, expressed in terms of the long-term average number of years, between flood events as large as or larger than the design flood event. For example, floods with a discharge as large as or larger than the 100-year ARI flood will occur on average once every 100-years.
Asset Standards Authority	The ASA is an independent body within TfNSW, responsible for engineering governance, assurance of design safety, and ensuring the integrity of transport and infrastructure assets. Design Authority functions formerly performed by RailCorp are now exercised by ASA.
Concept design	The concept design is the preliminary design presented in this REF, which would be refined by the Contractor (should the Proposal proceed) to a design suitable for construction (subject to TfNSW acceptance).
Design and Construct Contract	A method to deliver a project in which the design and construction services are contracted by a single entity known as the Construction Contractor. The Construction Contractor completes the project by refining the concept design presented in the REF and completing the detailed design so that it is suitable for construction (subject to TfNSW acceptance). The Construction Contractor is therefore responsible for all work on the project, both design and construction.
Detailed design	Detailed design broadly refers to the process that the Construction Contractor undertakes (should the Proposal proceed) to refine the concept design to a design suitable for construction (subject to TfNSW acceptance).
Disability Standards for Accessible Public Transport	The Commonwealth <i>Disability Standards for Accessible Public Transport 2002</i> ("Transport Standards") (as amended) are a set of legally enforceable standards, authorised under the Commonwealth <i>Disability Discrimination Act 1992</i> (DDA) for the purpose of removing discrimination 'as far as possible' against people with disabilities. The Transport Standards cover premises, infrastructure and conveyances, and apply to public transport operators and premises providers.
Ecologically Sustainable Development	As defined by clause 7(4) Schedule 2 of the EP&A Regulation. Development that 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.
Feasible	A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.
Interchange	Transport interchange refers to the area/s where passengers transit between vehicles or between transport modes. It includes the pedestrian pathways and cycle facilities in and around an interchange.
Noise sensitive receiver	In addition to residential dwellings, noise sensitive receivers include, but are not limited to, hotels, entertainment venues, pre-schools and day care facilities, educational institutions (e.g. schools, TAFE colleges), health care facilities (e.g. nursing homes, hospitals), recording studios and places of worship/religious facilities (e.g. churches).
NSW TrainLink	From 1 July 2013, NSW Trains (NSW TrainLink) became the new rail provider of services for regional rail customers.

Term	Meaning
Opal card	The integrated ticketing smartcard introduced by TfNSW.
Out of hours works	Defined as works <i>outside</i> standard construction hours (i.e. outside of 7am to 6pm Monday to Friday, 8am to 1pm Saturday and no work on Sundays/public holidays).
Proponent	A person or body proposing to carry out an activity under Division 5.1 of the EP&A Act - in this instance, TfNSW.
Rail possession	Possession is the term used by railway building/maintenance personnel to indicate that they have taken possession of the track (usually a section of track) for a specified period, so that no trains operate for a specified time. This is necessary to ensure the safety of workers and rail users.
Reasonable	Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.
Sensitive receivers	Land uses which are sensitive to potential noise, air and visual impacts, such as residential dwellings, schools and hospitals.
Sydney Trains	From 1 July 2013, Sydney Trains replaced CityRail as the provider of metropolitan train services for Sydney.
Tactiles	Tactile tiles or Tactile Ground Surface Indicators (TGSIs) are textured ground surface indicators to assist pedestrians who are blind or visually impaired. They are found on many footpaths, stairs and train station platforms.
The Proposal	The construction and operation of the Kingswood Station Upgrade.
Vegetation Offset Guide	The TfNSW guide that applies where there is vegetation clearing proposed, and where the impact of the proposed clearing is not deemed 'significant' for the purposes of section 5.5 of the EP&A Act. The Guide provides for planting of a minimum of eight trees for each large tree with a diameter at breast height (DBH) of more than 60 cm, four trees where the DBH is 15-60 cm, or two trees where DBH is less than 15 cm.

Executive summary

Overview

The NSW Government is improving accessibility at Kingswood Station. This project is being delivered as part of the Transport Access Program, a NSW Government Initiative to provide a better experience for public transport customers by delivering accessible, modern secure and integrated transport infrastructure.

As part of this program, the Kingswood Station Upgrade (the Proposal) would aim to provide a station precinct that is accessible to those with a disability, limited mobility, parents/carers with prams, and customers with luggage.

The Proposal would aim to provide:

- two new lifts and stairs to provide access to each station platform
- new accessible pathways throughout the station precinct
- new station entrances on the Great Western Highway and the corner of Park Avenue and Richmond Road
- improved amenities such as a new ambulant toilet and family accessible toilet.

Transport for NSW (TfNSW) is the government agency responsible for the delivery of major transport infrastructure projects in NSW and is the proponent for the Proposal.

This Review of Environmental Factors (REF) has been prepared to assess the environmental impacts associated with the construction and operation of the Proposal under the provisions of Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Subject to approval, construction is expected to commence in early 2019 and take around 18 months to complete. A detailed description of the Proposal is provided in Chapter 3 of this REF. An overview of the Proposal is shown in Figure 1 below.



Figure 1 Proposed Kingswood Station Upgrade (subject to change during detailed design)

Need for the Proposal

The Proposal would ensure that Kingswood Station would meet legislative requirements under the *Disability Discrimination Act 1992* (DDA) and the *Disability Standards for Accessible Public Transport 2002* (DSAPT).

The Proposal is designed to drive a stronger customer experience outcome, to deliver improved travel to and between modes, encourage greater public transport use and better integrate interchanges with the role and function of town centres. The Proposal would also assist in responding to forecasted growth in the region and as such would support growth in commercial and residential development.

Chapter 2 of this REF further describes the need for the proposal and outlines the options considered in developing the design.

Community and stakeholder consultation

Community consultation activities for the Proposal would be undertaken during the public display period of this REF and the public invited to submit feedback to help TfNSW understand what is important to customers and the community. The REF would be displayed for a period of two weeks. Further information about these specific activities is included in Section 4.5 of this REF.

During this period a Project Infoline (1800 684 490) and email address (projects@transport.nsw.gov.au) would be also available for members of the public to make enquiries.

TfNSW would review and assess all feedback received during the public display period, prior to determining whether or not to proceed with the Proposal.

Should the Proposal proceed to construction, the community would be kept informed throughout the duration of the construction period. Figure 2 shows the planning approval and consultation process for the Proposal.

Feedback can be sent to:

- projects@transport.nsw.gov.au
- Transport Access Program Kingswood
 - Associate Director Environmental Impact Assessment

Transport for NSW

Locked Bag 6501

St Leonards NSW 2065

Or submitted:

- in person at a project community information session
- via yoursay.transport.nsw.gov.au/Kingswood



Figure 2 Planning approval and consultation process for the Proposal

Environmental impact assessment

This REF identifies the potential environmental benefits and impacts of the Proposal and outlines the mitigation measures to reduce the identified impacts.

The following key impacts have been identified should the Proposal proceed:

- temporary noise and vibration impacts during construction
- temporary traffic impacts during construction
- removal of vegetation and subsequent planting offsets.

The longer term benefits of the Proposal include improved accessibility to the station and improved station facilities.

Further information regarding these impacts is provided in Chapter 6 of the REF.

Conclusion

This REF has been prepared having regard to sections 5.5 and 5.7 of the EP&A Act, and clause 228 of the EP&A Regulation, to ensure that TfNSW takes into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the Proposal.

Should the Proposal proceed, any potential associated adverse impacts would be appropriately managed in accordance with the mitigation measures outlined in this REF, and the Conditions of Approval imposed in the Determination Report. This would ensure the Proposal is delivered to maximise benefit to the community and minimise any adverse impacts on the environment.

In considering the overall potential impacts and proposed mitigation measures outlined in this REF, the Proposal is unlikely to significantly affect the environment including critical habitat or threatened species, populations, ecological communities or their habitats.



Figure 3 Photomontage of the Proposal (subject to detailed design)

1 Introduction

Transport for NSW (TfNSW) was established in 2011 as the lead agency for integrated delivery of public transport services across all modes of transport in NSW. TfNSW is the proponent for the Kingswood Station Upgrade (the Proposal), to be delivered by the Infrastructure and Services Division.

1.1 Overview of the Proposal

1.1.1 The need for the Proposal

The NSW Government is committed to facilitating and encouraging the use of public transport, such as trains, by upgrading stations to make them more accessible, and improving interchanges around stations with other modes of transport such as bicycles, buses and cars.

The Transport Access Program is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

Kingswood Station does not currently meet key requirements of the *Disability Standards for Accessible Public Transport* (DSAPT) or the Commonwealth *Disability Discrimination Act* 1992 (DDA).

The non-compliant access points, ramps and stairs to the Kingswood Station concourse and platforms do not facilitate access for people with reduced mobility, parents/carers with prams or customers with luggage. There are no lift facilities and inadequate tactile surfacing to stairs, platforms and interchange facilities.

The Proposal would provide safe and equitable access to the platforms and to the pedestrian network surrounding the station. Customer facilities and amenity would also be improved. The improvements would provide an improved customer experience for existing and future users of the station.

The expected increase in patronage has been taken into consideration during the design development. The Bureau of Transport Statistics (BTS) 2017 opal card tap on/off counts indicated a daily patronage of 4,637 trips, which is expected to increase to 7,576 by 2036. The Proposal has been designed to cater for a daily patronage of 7,206 (which is the daily patronage plus an increase of 15 per cent).

1.1.2 Key features of the Proposal

The key features of the Proposal are summarised as follows:

- new station entries at the eastern end of each station platform at the corner of Park Avenue and Richmond Road and the Great Western Highway
- installation of a new lift, canopy and concrete suspended landing on each station platform to the east of the concourse
- installation of new access stairs and new landing at the eastern end of each station platform
- installation of new roof and guttering at the eastern end of the station concourse to allow for the new access stairs and pedestrian access to and from the new lifts
- installation of about 35 solar panels on the new roof of the concourse
- regrade existing platform/concourse surfaces to provide DDA compliant pedestrian routes between new lifts and station entry/exit

- modification of pedestrian access to provide a DDA compliant accessible path of travel from the station concourse to the interchange facilities
- installation of a new 75 kVA high voltage transformer, underground cabling of existing 33 kVA power supply and installation of a new power pole to the north east of the station; upgrade of low voltage systems to account for new infrastructure including aboveground and underground cable containment
- removal of existing landscaping, kerb edge and fencing near Park Avenue and Richmond Road and the Great Western Highway
- internal reconfiguration of existing station building layout (within concourse) to allow for a new communications room, family accessible toilet, ambulant toilet, staff toilet, storage room and cleaner's storeroom. Works would also increase space within the concourse for movement of customers
- ancillary works including adjustments to lighting and ticketing machines, new antithrow screens, handrails and fencing, minor drainage works on both side of the rail corridor, landscaping, improvements to the station communications systems including closed circuit TV (CCTV) cameras, hearing loops, public announcement (PA) system, wayfinding signage, emergency help points, and installation of tactile ground surface indicators (TGSIs).

Subject to planning approval, construction is expected to commence in early 2019 and take around 18 months to complete.

A detailed description of the Proposal is provided in Chapter 3 of this Review of Environmental Factors (REF).

1.2 Location of the Proposal

The Proposal is located in the suburb of Kingswood in the Penrith Local Government Area (LGA) about 52 kilometres west of Sydney's Central Business District (CBD). The location of the Proposal in the regional context is shown in Figure 4.

Kingswood Station is located on the northern side of the Great Western Highway. Nepean Hospital is located about 400 metres west of the station on the southern side of the rail corridor. Access from the northern side of the rail corridor is available via Park Avenue (Richmond Road).

Kingswood Station is serviced by the T1 Northern and Western Line providing connections to the metropolitan train network. Platform 1 provides train services east to the CBD and Platform 2 provides train services west to Penrith. The station has a daily patronage of 4,637, based on May 2017 Opal card tap on/off.

The Proposal includes upgrades to Kingswood Station on land owned by RailCorp and managed by Sydney Trains.



Figure 4: Regional Context - Kingswood

1.3 Existing infrastructure and land uses

Platforms

Kingswood Station consists of two platforms located on either side of the existing rail tracks. Platform 1 is located on the northern side of the rail corridor and services trains travelling towards Central. Platform 2 is located on the southern side of the rail corridor and services trains travelling towards Penrith.

Platforms 1 and 2 are accessed at ground level from the land adjacent to the station. An elevated concourse is also present which provides access across the rail corridor (further discussion of the existing concourse is located below).

Both platforms contain canopies over the centre of the platforms to provide weather protection (refer to Figure 5). No station buildings are located on the platforms.



Figure 5 Kingswood Station looking west from the elevated concourse, showing Platforms 1 and 2

Station entrances

Station entrances are located on either side of the station. The northern entrance is located within the commuter car park located on the northern side of the station off Park Avenue (as described below). The southern entrance is located at the eastern end of the commuter car park located on the southern side of the station accessed off the Great Western Highway (as described below).

Concourse

The existing station concourse is located at the eastern end of the platforms (Figure 6). The concourse is currently accessed via existing ramps which provide access to both platforms (Figure 7). Stairs are also provided at the western end of the ramp to provide more direct access to the platforms. The existing concourse structure is not entirely used with some areas currently closed off to the public. The existing concourse contains the following:

- ticketing office and ticketing machines
- communications rooms
- staff area including office, toilet and store room
- family accessible toilet and unisex toilet.

All public areas of the concourse are covered.



Figure 6 Kingswood Station looking east from Platform 1, showing the elevated concourse

Intermodal facilities

The following intermodal facilities are located at Kingswood Station:

- kiss and ride facilities (including shelter) at Park Avenue
- bus stops (including shelters) are located on both sides of the rail corridor on Park Avenue and on the Great Western Highway
- bike shelters and lockers are located on both sides of the station east of each station entrance.



Figure 7 Kingswood Station showing elevated concourse and pedestrian ramp access from the Great Western Highway

Car parking

Commuter car parks are located on both sides of the rail corridor. The car park on the southern side of the corridor is located between the station and the Great Western Highway. This car park contains 65 spaces including two accessible spaces located adjacent to the station entrance (Figure 8).

The car park on the northern side of the rail corridor has two distinct sections with an internal driveway providing access between the sections. One section is located between the station and the adjacent industrial properties. The other section extends north towards Cox Avenue, This car park contains approximately 200 spaces including two accessible spaces located adjacent to the station entrance.



Figure 8 Kingswood Station northern pedestrian access point from the commuter carpark

1.3.1 Existing land uses

Land directly to the north-west of the station is occupied by a row of industrial properties which back onto the rail corridor. North of these industrial properties (northern side of Cox Avenue) is the Penrith Cemetery. Land east of Richmond Road north of the corridor consists of residential apartment blocks. St Joseph's Primary School is located at the corner of Richmond Road and Joseph Street about 150 metres north of the station.

A number of commercial properties including the Kingswood Hotel are located on the southern side of the Great Western Highway opposite the station. A mixture of residential apartment blocks and low density dwellings are located south of these commercial properties. Residential apartment blocks lie to the south of the Great Western Highway, east of Bringelly Road. Nepean Hospital is located west of the station (west of Somerset Street) on the southern side of the Great Western Highway. The key features of the study area are shown in Figure 9.



1.4 Purpose of this Review of Environmental Factors

This REF has been prepared by TfNSW to assess the potential impacts of the Kingswood Station Upgrade. For the purposes of these works, TfNSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this REF is to describe the Proposal, to assess the likely impacts of the Proposal having regard to the provisions of section 5.5 of the EP&A Act, and to identify mitigation measures to reduce the likely impacts of the Proposal. This REF has been prepared in accordance with clause 228 of the *Environment Planning and Assessment Regulation 2000* (the EP&A Regulation).

This assessment has also considered the relevant provisions of other relevant environmental legislation, including the *Biodiversity Conservation Act 2016* (BC Act), *Fisheries Management Act 1994* (FM Act) and the *Roads Act 1993* (Roads Act).

Having regard to the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), this REF considers the potential for the Proposal to have a significant impact on matters of National Environmental Significance (NES) or Commonwealth land, and the need to make a referral to the Commonwealth Department of Environment for any necessary approvals under the EPBC Act. Refer to Chapter 4 for more information on statutory considerations.

2 Need for the Proposal

Chapter 2 discusses the need and objectives of the Proposal, having regard to the objectives of the Transport Access Program and the specific objectives of the Proposal. This chapter also provides a summary of the options that have been considered during development of the Proposal and why the preferred option has been chosen.

2.1 Strategic justification

2.1.1 Overview

Improving transport customer experience is the focus of the NSW Government's transport initiatives. Transport interchanges and train stations are the important gateways to the transport system and as such play a critical role in shaping the customer's experience and perception of public transport.

The Kingswood Station Upgrade, the subject of this REF, forms part of the Transport Access Program. This program is designed to drive a stronger customer experience outcome to deliver seamless travel to and between modes, encourage greater public transport use and better integrate station interchanges with the role and function of town centres within the metropolitan area and developing urban centres in regional areas of NSW.

In September 2015, the NSW Government announced a series of State Priorities as part of *NSW: Making It Happen* (NSW Government, 2015). The State Priorities are intended to guide the ongoing actions of the NSW Government across the State, and guide resource allocation and investment in conjunction with the NSW Budget. *NSW: Making it Happen* focuses on 12 key 'priorities' to achieve the NSW Government's commitments. These priorities range across a number of issues including infrastructure, the environment, education, health, wellbeing and safety in addition to Government services.

One of the 12 priorities identified as part of *NSW: Making It Happen* relates to investment in building infrastructure. The ongoing development and investment in transport infrastructure is identified as part of the wider building infrastructure priority.

The Proposal assists in meeting the priority by improving accessibility to public transport and encouraging greater use of public transport.

The NSW Government has developed *Future Transport Strategy 2056* (Transport for NSW 2018a). This plan provides a comprehensive strategy for all modes of transport across NSW over the next 40 years, while also delivering on current commitments.

Data forecasts indicate that there would be significant growth in population and employment from 2006 up to 2036 in the area within the station catchment. The Proposal accommodates the forecast Sydney Trains patronage growth (an increase of 15 per cent to 2036) and changing travel patterns.

The *Disability Inclusion Action Plan 2018-2022* (TfNSW, 2017b) was developed by TfNSW in parallel with the development of Future Transport 2056. The plan builds on the objectives of Future Transport 2056 in relation to accessibility to transport. The Transport Access Program has been identified in this plan as a key action of ensuring transport networks in Sydney are accessible for all potential users.

Public transport is viewed as critical to urban productivity, expanding employment opportunities by connecting people to jobs, reducing congestion, and supporting delivery of urban renewal. Further details of the application of NSW Government policies and strategies are discussed in Section 4.5 of this REF.

2.1.2 Objectives of the Transport Access Program

The Transport Access Program is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most. The program aims to provide:

- stations that are accessible to those with disabilities, are less mobile and parents/carers with prams and customers with luggage
- modern buildings and facilities for all modes that meet the needs of a growing population
- modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers
- safety improvements including extra lighting, lift alarm, fences and security measures for car parks and interchanges, including stations, bus stops and wharves
- signage improvements so customers can more easily use public transport and transfer between modes at interchanges
- other improvements and maintenance such as painting, new fencing and roof replacements.

2.1.3 Objectives of the Proposal

The specific objectives of the Kingswood Station Upgrade are to:

- provide a station that is accessible to those with a disability, are less mobile and parents/carers with prams and customers with luggage
- improve customer experience (weather protection, better interchange facilities and visual appearance)
- minimise pedestrian conflict and crowding points
- improve integration with surrounding precinct
- improve customer safety
- improve wayfinding in and around the station
- improve customer amenity
- maintain and enhance cross corridor access/pedestrian links.

2.2 Design development

The need for an upgrade was identified due to the following constraints and issues at the station:

- existing station entrance off Richmond Road is accessed via a path which is not DDA compliant
- existing concourse at the eastern end is considered suitable for the positioning of lifts to ensure compliance
- existing station entrances are in the centre of the platform whereas the concourse is located towards the eastern end of the platforms
- existing stairs and ramps to the concourse limited the areas where lifts can be positioned
- existing platforms (at eastern end near concourse) are narrow which limits the positioning of any new lifts

- platform heights do not match train heights
- station amenities are available but are not DDA compliant.

To address the above issues Sinclair Knight Merz (now Jacobs) were engaged to develop and assess a number of options for the proposed station upgrade in 2013 as part of a feasibility stage. The options considered during this assessment are outlined in Table 1 and Section 2.3 (i.e. Options 1 to 3). Further development of a preferred option was then undertaken in 2017 by Jacobs with these options also outlined in Table 1 and Section 2.3.

Following the options development phase, further investigations were undertaken which identified a different preferred option with a more equitable travel distance to the lift location as well as solving some potential safety issues of other options considered. The preferred option was altered to include a new main entrance which provides both lift and stair access to the elevated concourse. This preferred option was carried forward in the concept design phase.

The concept design (which is subject to this REF) would continue to be developed to ensure all the above mentioned constraints and issues are addressed through the detailed design phase of the Proposal.

2.3 Alternative options considered

2.3.1 The 'do-nothing' option

Under a 'do-nothing' option, existing access to the platform would remain the same and there would be no changes to the way the station and associated interchange currently operates.

The NSW Government has identified the need for improving the accessibility of transport interchanges, train stations and commuter car parks across NSW as a priority under the Transport Access Program.

The 'do nothing' option was not considered a feasible alternative as it is inconsistent with NSW Government objectives and would not help encourage the use of public transport and would not meet the needs of the Kingswood community.

2.3.2 Identified options

Table 1 outlines the options considered during both the initial preliminary options and the design development options phases.

Option	Description	
Initial preliminary options (2013)		
Option 1	 Provide two lifts at eastern end of station, adjacent to the existing overhead concourse 	
	Upgrade existing ramps	
	Upgrade staff amenities, ticket office and toilet facilities	
	 Upgrade security, electrical, communication, mechanical, fire and hydraulic systems 	
	 Upgrade ticketing services, passenger wayfinding and communication services. 	

Table 1 Options considered during design development

Option	Description	
Option 2	 Provide two lifts at eastern end of station, adjacent to existing overhead concourse 	
	Replace existing ramps and stairs with a new set of stairs only	
	Upgrade staff amenities, ticket office and toilet facilities	
	 Upgrade security, electrical, communication, mechanical, fire and hydraulic systems 	
	 Upgrade ticketing services, passenger wayfinding and communication services. 	
Option 3	Retain existing stairs	
	Provide an accessible ramp	
	Upgrade staff amenities, ticket office and toilet facilities	
	 Upgrade security, electrical, communication, mechanical, fire and hydraulic systems 	
	 Upgrade ticketing services, passenger wayfinding and communication services. 	
Design development options (2017)		
Option 1a	New lifts and stairs connecting existing concourse to platforms	
	Upgrade existing ramp hand rails and tactiles	
	 Upgraded pedestrian path between new DDA compliant car parking spaces and lift to concourse 	
	 Upgrade accessible spaces to DDA compliant car parking spaces within the commuter carpark on northern side of station 	
	 Provision of accessible seating and waiting spaces as required to meet DSAPT requirements 	
	 Upgraded accessible toilet with accessible entries as required to comply with current standards to AS1428.1-2009 	
	 Upgraded ambulant toilet in existing toilets as required to comply with current standards to AS1428.1 	
	• Provision/upgrade of other accessible facilities including signage, directional and hazard tactile, lighting, hearing augmentation, emergency warning, telephones, water fountains and handrails to be compliant as required.	

Option	Description
Option 1b	New lifts connecting existing concourse to platforms
	 Remove existing ramps and stairs and construct new compliant stairs from concourse to platforms
	Upgrade accessible spaces to DDA compliant car parking spaces within the commuter carpark on northern side of station
	 Provision of accessible seating and waiting spaces as required to meet DSAPT requirements
	Upgraded accessible toilet with accessible entries as required to comply with current standards to AS1428.1-2009
	 Upgraded ambulant toilet in existing toilets as required to comply with current standards
	 Provision/upgrade of other accessible facilities including signage, directional and hazard tactiles, lighting, hearing augmentation, emergency warning, telephones, water fountains and handrails to be compliant as required.

2.3.3 Assessment of identified options

Initial preliminary options (2013)

All options were considered equal from the provision of upgrade facilities such as staff amenities, passenger services and other systems (eg electrical, communication). The differences between all options were the way in which an accessible path of travel would be provided to the existing station in particular to the elevated concourse.

Option 1 was considered to be the preferred option as it would provide two accessible paths of travel to access the station (ramps and lifts). This would mean in the event of any issues with the lifts, access to the station would still be maintained by the upgraded ramps.

Option 2 would provide an accessible path of travel to the station via the new proposed lifts, however the removal of the existing ramps would remove alternate access to the station. Should the new lifts be unavailable due to breakdown or maintenance, this option would mean that access across the corridor via the elevated concourse would not be available, with stairs being the only alternate access.

Option 3 was not considered to meet the objectives of the Proposal as well as Options 1 and 2. While an accessible path of travel was to be provided through the upgrade of the existing ramps, these ramps were not considered to be preferred over the option of providing lifts at the station.

Design development options (2017)

The design development options further considered the preferred option (Option 1) from the initial preliminary options phase. To select a preferred option, design options (Option 1a and Option 1b) were assessed in a multi-criteria analysis that included consideration of factors such as customer experience, accessibility, engineering constraints, modal integration and cost. A summary of the multi-criteria analysis is outlined in Table 2.





Option 1a (Option 1 in Table 1) was similar to Option 1 considered as part of the initial preliminary design options (2013), however it included the replacement of the existing stairs located at the western end of the existing ramps in their current position. This option as with Option 1 allows station access via the lifts, ramps and stairs. Overall this option was considered to meet all the criteria (as shown in Table 2), with the exception of one where it only partially met the criteria. The impacts resulting from the operational and maintenance aspect of this option were however considered minor.

Option 1b (Option 2 in Table 1) was similar to Option 2 considered as part of the initial preliminary options. This option was not considered to be preferred as it did not meet the engineering and constructability criteria (as shown in Table 2). The constructability of this option resulted in negative impacts associated with station access due to the need to remove the existing ramps to construct the new ramps. This would result in the need for temporary access ramps to access the station which further increase the impacts to the station precinct. This option would also potentially require a temporary concourse in the event that temporary ramps to the existing concourse are not a viable option. As with Option 2 (considered during the 2013 design development), this option would reduce the number of access options available should lifts not be operational for various reasons.

2.4 Justification for the preferred option

As outlined in Section 2.3.3, the preferred option from the initial preliminary options was for the upgrade of the station to include the provision of new lifts at the eastern end of the station and the upgrade of the existing ramps to be DDA compliant.

The design development options largely selected a similar preferred option to the first stage of the development process. This preferred option did however include the upgrade of the existing stairs at the station to ensure DDA compliance.

As discussed in Section 2.2, following the selection of the preferred option, TfNSW modified the preferred option to include a new set of stairs at the eastern end of the station (east of concourse) to ensure that a new station entrance can be provided to improve safety and ensure equity for travel distances to station entrances. Option 1a was considered to have inequitable access as the location of the proposed lifts would result in access being in a different location and an increased distance to be travelled to the access location.

For access to be equitable it is considered that accessible access locations should be in close proximity to non-accessible access. The positioning of the proposed accessible access (ie lifts) in Option 1a would also result in safety issues as this proposed access was located away from the main station entrance. The modifications to Option 1a by TfNSW ensured that a non-accessible access is located in close proximity to the lifts and therefore activating this area to be a secondary station entrance improving safety.

3 Description of the Proposal

Chapter 3 describes the Proposal and summarises key design parameters, construction methodology, and associated infrastructure and activities. The description of the Proposal is based on the concept design and is subject to detailed design.

3.1 The Proposal

As described in Section 1.1, the Proposal involves an access upgrade of Kingswood Station as part of the Transport Access Program which would improve accessibility and amenities for customers.

The Proposal would include the following key elements:

- new station entries at the eastern end of each station platform at the corner of Park Avenue and Richmond Road and the Great Western Highway
- installation of a new lift, canopy and concrete suspended landing on each station platform to the east of the concourse
- installation of new access stairs and new landing at the eastern end of each station platform
- installation of new roof and guttering at the eastern end of the station concourse to allow for the new access stairs and pedestrian access to and from the new lifts
- installation of about 35 solar panels on the new roof of the concourse
- regrade existing platform/concourse surfaces to provide DDA compliant pedestrian routes between new lifts and station entry/exit
- modification of pedestrian access to provide a DDA compliant accessible path of travel from the station concourse to the interchange facilities
- installation of a new 75 kVA high voltage transformer, underground cabling of existing 33 kVA power supply and installation of a new power pole to the north east of the station; upgrade of low voltage systems to account for new infrastructure including aboveground and underground cable containment
- removal of existing landscaping, kerb edge and fencing near Park Avenue and Richmond Road and the Great Western Highway
- internal reconfiguration of existing station building layout (within concourse) to allow for a new communications room, family accessible toilet, ambulant toilet, staff toilet, storage room and cleaner's storeroom. Works would also increase space within the concourse for movement of customers
- ancillary works including adjustments to lighting and ticketing machines, new antithrow screens, handrails and fencing, minor drainage works on both sides of the rail corridor, landscaping, improvements to the station communications systems including CCTV cameras, hearing loops, PA system, wayfinding signage, emergency help points, and installation of TGSIs.

Subject to planning approval, construction is expected to commence in early 2019 and take around 18 months to complete.

Figure 10 shows the general layout of key elements for the Proposal. The layout of the new station concourse for the Proposal is shown in Figure 11.



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Figure 10: General layout of key elements of proposal

3.1.1 Scope of works

Station upgrade

The Proposal would improve accessibility to the station through the installation of two new lifts on either side of the station. The lifts would provide access to the existing elevated concourse which would largely be retained with some minor adjustments. New stairs from either side of the rail corridor would also be installed from street level to the existing elevated concourse. The proposed lifts and stairs would be installed on the eastern side of the existing concourse as shown in Figure 11.

New station entrances would be constructed on either side of the corridor at the new lifts and stairs. These entrances would be in addition to the existing entrances to the west which would remain in operation.

The existing concourse area would be modified to accommodate the new lifts and stairs at the station. This would include the removal of a number of existing walls and would make use of the existing concourse structure on the eastern side of the concourse which is currently not accessible to the public. These works would also result in modification to existing station facilities to include a new communications room, family accessible toilet, ambulant toilet, staff toilet, storage room and cleaners storeroom. The proposed layout of the elevated concourse is shown in Figure 11. The proposed internal layout of the reconfigured concourse is shown in.

To facilitate the above upgrades, the following works would also be required:

- a new roof over existing concourse area (to provide cover to new lift and stairs)
- installation of solar panels on new roof of concourse, this would include about 35 panels
- regrading of existing platform/concourse surfaces to provide DDA compliant pedestrian routes between new lifts, station entry/exit and amenities
- electrical upgrades including installation of new 75 kVA high voltage transformer to the north east of the station, installation of a new electricity pole and associated 33 kVA cabling
- upgrade of low voltage systems to account for new infrastructure such as lifts; and aboveground and underground cable containment works
- minor drainage works on both sides of the rail corridor
- adjustment to station ticketing facilities, including new Opal card readers
- improvements to station systems including CCTV cameras, hearing loops, PA system, wayfinding signage, emergency help points, and installation of TGSIs
- upgrades to fencing (including boundary fencing) and handrails
- new/upgraded wayfinding signage and provision of statutory/regulatory signage
- temporary site compounds for storage of materials and equipment
- temporary works (where required) during construction in order to maintain existing pedestrian "level of service".



Figure 11 Upgraded elevated station concourse



Figure 12 Internal layout of concourse

Interchange facilities

To complement the upgrades to the station, a number of adjustments to the interchange areas around the station are proposed to improve accessibility and the customer experience:

- construction of a new accessible path to the new station entrance adjacent to the Great Western Highway on the southern side of the station
- adjustments to pedestrian infrastructure adjacent to Park Avenue on the northern side of the station to provide accessible path to station entry and interchange facilities in the vicinity of the station
- removal of a landscaped area to allow for new pedestrian path upgrades (mentioned above) with new landscaped areas to be provided
- adjustment to line marking for existing accessible parking located on northern side of the station adjacent to the existing northern entrance to ensure DDA compliance.

Materials and finishes

Materials and finishes for the Proposal have been selected based on the criteria of durability, low maintenance and cost effectiveness to minimise visual impacts, and to be aesthetically pleasing.

Availability and constructability are also important criteria to ensure that materials are readily available and the structure can be built with ease and efficiently. Materials are also selected for their application based on their suitability for meeting design requirements.

Each of the upgraded or new facilities would be constructed from a range of different materials, with a different palette for each architectural element. Subject to detailed design, the Proposal would include the following:

- lift shafts precast concrete, steel and glass
- concourse- concrete base with mesh anti-throw screens, and roof to match existing
- platform stairs concrete with mesh anti-throw screens

The design would be submitted to TfNSW's Urban Design Review Panel at various stages for comment before being accepted by TfNSW. An Urban Design Plan (UDP) and/or Public Domain Plan (PDP) would also be prepared by the Contractor, prior to finalisation of detailed design for endorsement by TfNSW.

Photomontages showing the proposal are shown in Figure 13 and Figure 14.


Figure 13 Proposed view southwest from Park Avenue (Viewpoint 2) (indicative, subject to detailed design)



Figure 14 Proposed view north from Great Western Highway (Viewpoint 7) (indicative, subject to detailed design)

3.1.2 Engineering constraints

There are a number of constraints which have influenced the design development of the Proposal.

Existing structures: the placement and integrity of existing structures needed to be considered during the development of the design – these structures included the platforms, station buildings, and elevated concourse.

Continued operation of existing concourse: modification of the existing concourse is required to be undertaken in a way that allows existing facilities to continue to operate during construction.

Sydney Trains' requirements: modifications for existing structures and new structures within the rail corridor must be designed and constructed with consideration of train impact loads, structural clearances to the track, and safe working provisions (including need for works during possession periods).

Kingswood Quadruplication: the proposed upgrade would be designed to not preclude a potential rail expansion to cater for future growth.

Utilities: A Dial Before You Dig (DBYD) search has identified a number of utilities in the vicinity of the proposed works including:

- Sydney Water recorded sewer and water assets located within the Proposal area
- a Jemena distribution gas man is located along the Great Western Highway
- RMS assets occur within the Great Western Highway alignment and intersection with Bringelly Road
- Telstra infrastructure (location unknown)
- NBN cabling within Park Avenue and the Great Western Highway
- Optus underground cable travelling along the Great Western Highway
- Endeavour Energy assets below ground.

Constructability: availability of land for the use of cranes for the construction and installation of new lifts.

Electricity infrastructure: existing transformer on nearby pole cannot be utilised and nearest available pole is too far away to meet relevant electrical standards.

3.1.3 Design standards

The Proposal would be designed having regard to the following:

- Disability Standards for Accessible Public Transport 2002 (issued under the Commonwealth Disability Discrimination Act 1992)
- Building Code of Australia
- relevant Australian Standards
- Asset Standards Authority standards
- Sydney Trains standards
- NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017a)
- *Guidelines for the Development of Public Transport Interchange Facilities* (Ministry of Transport, 2008).

- Crime Prevention Through Environmental Design (CPTED) principles
- other TfNSW policies and guidelines
- council standards where relevant.

3.1.4 Sustainability in design

The development of the concept design for the Proposal has been undertaken in accordance with the project targets identified in TfNSW's Environmental Management System (EMS) and the *NSW Sustainable Design Guidelines - Version 4.0* (TfNSW, 2017a) which groups sustainability into seven themes:

- energy and greenhouse gases
- climate resilience
- materials and waste
- biodiversity and heritage
- water
- pollution control
- community benefit.

There are 14 compulsory requirements and 2 sub requirements that project teams are required to implement when there is confirmation that these individual initiatives are applicable to the project. Each compulsory requirement has an associated list of supporting initiatives.

These compulsory requirements have been reviewed and incorporated into the concept design (unless otherwise justified) and documented in a Sustainable Design Guidelines checklist that was approved by TfNSW (a summary is provided in Appendix C). The checklist and the requirements contained within would be reviewed again at the detailed design and construction phases, and submitted for approval by TfNSW.

3.2 Construction activities

3.2.1 Work methodology

Subject to approval, construction is expected to commence in early 2019 and take around 18 months to complete. The construction methodology would be further developed during the detailed design of the Proposal by the nominated Contractor in consultation with TfNSW.

The proposed construction activities for the Proposal are identified in Table 3. This staging is indicative and is based on the current concept design and may change once the detailed design methodology is finalised. The staging is also dependent on the Contractor's preferred methodology, program and sequencing of work.

Table 3 Indicative construction staging for key activities

Stage	Activities
Site establishment and enabling works	 establishment of construction site area including compound and associated utilities (i.e. erect fencing, tree protection zones, site offices, amenities and plant/material storage area) establishment of temporary access points from both the Great Western Highway and Park Avenue (Richmond Road) and temporary facilities as required erect site hoarding as required remove vegetation to allow for new infrastructure relocate station services which are to be impacted by the works installation of power where required
Station entrance	 new station entry paving and fencing to the new station entry points
Lift and stair installation	 excavate lift pit piling works for new stairs and lifts install lift structure including top landing, roof and louvres install new stairs including landing install anti-throw screens install lift equipment and lift fit-out
Concourse works	 install structural steel and roofing for concourse install services below concourse adjust room layout within concourse fit out of new station rooms within concourse install solar panels to new roof canopy over portion of existing concourse
Platform works	 install combined services routes for station power and station systems resurface localised sections of the platform
Interchange works	 modification of footpath on both sides of the rail corridor relocation of high voltage transmission line to underground on northern side of station install seating for bus stop at the Richmond Road new station entry install new kerb ramps in carpark and to kiss and ride
Finalisation	 install wayfinding signage electrical and power supply upgrade works replanting/landscaping, fencing adjustments and installation of bollards
Testing and commissioning	 various activities to test and commission power supply, lifts, lighting, new/modifications to station services, ticketing systems, communication and security systems

3.2.2 Plant and equipment

The plant and equipment likely to be used during construction includes:

- trucks
- jack hammer
- chainsaw
- piling rig
- franna/mobile cranes
- bobcat
- excavator
- demolition saw
- concrete pump
- concrete truck

- lighting tower
- coring machine
- water cart
- suction trucks
- rail mounted elevated work platform
- forklift
- hi-rail plant (EWP/flatbed/hiab,etc)
- vibrating roller/compaction plate

- road rail excavator
- hand tools
- skip trucks
- hammer drills
- torque wrenches and impact wrenches
- grinders and bar benders
- elevated work platform
- crane

3.2.3 Working hours

The majority of works required for the Proposal would be undertaken during standard (NSW) Environment Protection Authority (EPA) construction hours, which are as follows:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm Saturdays
- no work on Sundays or public holidays.

Certain works may need to occur outside standard hours and would include night works and works during routine rail possessions which are scheduled closures that would occur regardless of the Proposal when part of the rail network is temporarily closed and trains are not operating.

Out of hours works are required in some cases to minimise disruptions to customers, pedestrians, motorists and nearby sensitive receivers; and to ensure the safety of railway workers and operational assets. It is estimated that approximately six rail possessions would be required to facilitate activities and may include the following:

- installation of lift structures
- installation of new stair structures
- installation of anti-throw screens
- installation of concourse roofing
- delivery of lift equipment
- resurfacing of platform.

Out of hours works may also be scheduled outside rail possession periods. Approval from TfNSW would be required for any out of hours work and the affected community would be notified as outlined in TfNSW's *Construction Noise Strategy* (TfNSW, 2012c) (refer to Section 6.3 for further details).

3.2.4 Earthworks

Excavations and earthworks would generally be required for the following:

- services relocation including construction of new combined services route
- construction of lift shaft, stairs and fencing
- drainage upgrade works

Excavated material would be reused onsite where possible or disposed of in accordance with relevant legislative requirements. Overall about 100 cubic metres of excavated material would be excavated.

3.2.5 Source and quantity of materials

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* (TfNSW, 2017a). Materials would be sourced from local suppliers where practicable. Reuse of existing and recycled materials would be undertaken where practicable.

3.2.6 Traffic access and vehicle movements

Traffic and transport impacts associated with the Proposal are assessed in Section 6.1 of this REF. The potential traffic and access impacts expected during the construction of the Proposal include:

- impacts to pedestrian, rail customers and cyclists
 - impact to pedestrian and bicycle rider movements on both sides of the station due to the movement of construction material, traffic diversions and the location of crane/s during construction
 - o temporary pedestrian access
 - o increased vehicle movements may reduce safety
- impacts to bus services
 - o difficulty in accessing the bus stops along Park Avenue
- impacts to off-street parking at the commuter car parks located to both the northern and southern sides of Kingswood Station
- impacts to on-street car parking locations
- impact to the kiss and ride facilities at both the northern and southern sides of Kingswood Station.

3.2.7 Ancillary facilities

A temporary construction compound would be required to accommodate a site office, amenities, laydown and storage area for materials. An area for a construction compound has been proposed to the south and to the west of the station as shown in Figure 10. The area nominated for the compound is on land owned by RailCorp. Impacts associated with utilising this area have been considered in the environmental impact assessment including requirements for rehabilitation.

3.2.8 Public utility adjustments

The Proposal has been designed to avoid relocation of services where feasible, however further investigation may be required. It is likely some services may require relocation, but such relocation is unlikely to occur outside of the footprint of the works assessed in this REF. In the event that works would be required outside of this footprint, further assessment would be undertaken. The appropriate utility providers would be consulted during the detailed design phase.

3.3 **Property acquisition**

TfNSW does not propose to acquire any property as part of the Proposal.

3.4 Operation management and maintenance

The future operation and maintenance of the new station/interchange is subject to further discussions with Sydney Trains, TfNSW and Penrith Council. Structures constructed under this Proposal would be maintained by Sydney Trains. However it is expected that adjacent garden/landscape areas would continue to be maintained by Penrith Council.

4 Statutory considerations

Chapter 4 provides a summary of the statutory considerations relating to the Proposal including a consideration of NSW Government polices/strategies, NSW legislation (particularly the EP&A Act), environmental planning instruments, and Commonwealth legislation.

4.1 Commonwealth legislation

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The (Commonwealth) EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places - defined in the EPBC Act as 'matters of National Environmental Significance (NES)'. The EPBC Act requires the assessment of whether the Proposal is likely to significantly impact on matters of NES or Commonwealth land. These matters are considered in full in Appendix A.

The Proposal would not impact on any matters of NES or on Commonwealth land. Therefore a referral to the Commonwealth Minister for the Environment is not required.

4.2 NSW legislation and regulations

4.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act establishes the system of environmental planning and assessment in NSW. This Proposal is subject to the environmental impact assessment and planning approval requirements of Division 5.1 of the EP&A Act. Division 5.1 of the EP&A Act specifies the environmental impact assessment requirements for activities undertaken by public authorities, such as TfNSW, which do not require development consent under Part 4 of the Act.

In accordance with section 5.5 of the EP&A Act, TfNSW, as the proponent and determining authority, must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the Proposal.

Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) defines the factors which must be considered when determining if an activity assessed under Division 5.1 of the EP&A Act has a significant impact on the environment. Chapter 6 of the REF provides an environmental impact assessment of the Proposal in accordance with clause 228 and Appendix B specifically responds to the factors for consideration under clause 228.

4.2.2 Other NSW legislation and regulations

Table 4 provides a list of other relevant legislation applicable to the Proposal.

Table 4 Other legislation applicable to the Proposal

Applicable legislation	Considerations
Contaminated Land Management Act 1997 (CLM Act) (NSW)	Section 60 of the CLM Act imposes a duty on landowners to notify the Office of Environment and Heritage (OEH), and potentially investigate and remediate land if contamination is above EPA guideline levels.
	The site has not been declared under the CLM Act as being significantly contaminated (refer Section 6.8).
Crown Lands Act 1987 (NSW)	The Proposal does not involve works on any Crown land.
<i>Disability Discrimination Act 1992</i> (DDA Act) (Cwlth)	The Proposal would be designed having regard to the requirements of this Act.
<i>Heritage Act 1977</i> (Heritage Act) (NSW)	 Sections 57 and 60 (approval) where items listed on the State Heritage Register are to be impacted
	 Sections 139 and 140 (permit) where relics are likely to be exposed
	 Section 170 where items listed on a government agency Heritage and Conservation Register are to be impacted.
	As outlined in Section 6.5 the Proposal is not located within or adjacent to any heritage listed properties and therefore no approvals or notifications are required for the Proposal.
National Parks and Wildlife Act 1974 (NPW Act) (NSW)	Sections 86, 87 and 90 of the NPW Act require consent from OEH for the destruction or damage of Indigenous objects. The Proposal is unlikely to disturb any Indigenous objects (refer Section 6.4).
	However, if unexpected archaeological items or items of Indigenous heritage significance are discovered during the construction of the Proposal, all works would cease and appropriate advice sought.
Biosecurity Act 2015 (NSW)	Appropriate management methods would be implemented during construction if weeds declared noxious in the Penrith City Council are encountered (refer Section 6.7).
Protection of the Environment Operations Act 1997 (PoEO Act) (NSW)	The Proposal does not involve a 'scheduled activity' under Schedule 1 of the PoEO Act. Accordingly, an Environment Protection Licence (EPL) is not required for the Proposal. However, in accordance with Part 5.7 of the PoEO Act, TfNSW would notify the EPA of any pollution incidents that occur onsite. This would be managed in the CEMP to be prepared and implemented by the Contractor.

Applicable legislation	Considerations
<i>Roads Act 1993</i> (Roads Act) (NSW)	Section 138 of the Roads Act requires consent from the relevant road authority for the carrying out of work in, on or over a public road. However, clause 5(1) in Schedule 2 of the Roads Act states that public authorities do not require consent for works on unclassified roads.
	The proposal would not result in any impacts on any classified roads and therefore consent is not required under Section 138 of the Roads Act.
Sydney Water Act 1994 (NSW)	The Proposal would not involve discharge of wastewater to the sewer.
Biodiversity Conservation Act 2016(BC Act) (NSW)	The site does not contain suitable habitat for any listed threatened species or community and is unlikely to have a significant impact on any threatened species or community (refer Section 6.7).
Waste Avoidance and Resource Recovery Act 2001 (WARR Act) (NSW)	TfNSW would carry out the Proposal having regard to the requirements of the WARR Act. A site-specific Waste Management Plan would be prepared.
Water Management Act 2000 (NSW)	The Proposal would not involve any water use (from a natural source e.g. aquifer, river – only from the network), water management works, drainage or flood works, controlled activities or aquifer interference.

4.3 State Environmental Planning Policies

4.3.1 State Environmental Planning Policy (Infrastructure) 2007

The Infrastructure SEPP is the key environmental planning instrument which determines the permissibility of the Proposal and which part of the EP&A Act an activity or development may be assessed.

Clause 79 of the Infrastructure SEPP allows for the development of 'rail infrastructure facilities' by or on behalf of a public authority without consent on any land (i.e. assessable under Division 5.1 of the EP&A Act). Clause 78 defines 'rail infrastructure facilities' as including elements such as 'railway stations, station platforms and areas in a station complex that commuters use to get access to the platforms', public amenities for commuters' and 'associated public transport facilities for railway stations'.

Additionally clause 36(3) of the Infrastructure SEPP allows development for the purposes of solar energy systems to be carried out by a public authority where it is ancillary to an existing infrastructure facility and where the system has the capacity to generate no more than 100kW.

Consequently, development consent is not required for the Proposal which is classified as a rail infrastructure facility and for the proposed solar panels as they are associated with the existing infrastructure facility and will generate under 100kW. The environmental impacts of the Proposal have been assessed under the provisions of Division 5.1 of the EP&A Act.

Part 2 of the Infrastructure SEPP contains provisions for public authorities to consult with local councils and other agencies prior to the commencement of certain types of development. Section 5.2 of this REF discusses the consultation undertaken under the requirements of the Infrastructure SEPP.

It is noted that the Infrastructure SEPP prevails over all other environmental planning instruments except where *State Environmental Planning Policy (Major Development) 2005* and *State Environmental Planning Policy (Coastal Management) 2018* applies. The Proposal does not require consideration under these SEPPs and therefore do not require further consideration as part this REF.

4.3.2 State Environmental Planning Policy 55 – Remediation of Land

SEPP 55 provides a State-wide approach to the remediation of contaminated land for the purpose of minimising the risk of harm to the health of humans and the environment. While consent for the Proposal is not required, the provisions of SEPP 55 have still been considered in the preparation of this REF.

Section 6.8 of this REF contains an assessment of the potential contamination impacts of the Proposal. It is unlikely that any large-scale remediation (Category 1) work would be required as part of the Proposal. The proposed land use does not differ to the existing use and is, therefore, unlikely to be affected by any potential contaminants that exist within the rail corridor.

4.4 Local environmental planning instrument and development controls

The Proposal is located within the Penrith LGA. The provisions of the Infrastructure SEPP mean that Local Environmental Plans (LEPs), prepared by councils for an LGA, do not apply. However, during the preparation of this REF, the provisions of the *Penrith Local Environmental Plan 2010* were considered.

4.4.1 Penrith Local Environmental Plan 2010

The Penrith *Local Environmental Plan 2010* (Penrith LEP) is the governing plan for the Penrith LGA, including Kingswood. Table 5 summarises the relevant aspects of the Penrith LEP applicable to the Proposal. Figure 15 shows the relevant section of the zoning map from the Penrith LEP, with the indicative location of the Proposal.

Table 5 Relevant provisions of the Penrith LEP

Provision description	Relevance to the Proposal
SP2 Infrastructure (Railway), SP2 Infrastructure (Classified	The Proposal is located in land zoned SP2 Infrastructure (Railway), SP2 Infrastructure (Classified Road) and R4 High Density Residential.
Road), R4 High Density Residential	The land use objectives within the SP2 zone include:
	 to provide for infrastructure and related uses
	 to prevent development that is not compatible with or that may detract from the provision of infrastructure.
	The land use objectives within the R4 zone include:
	 to provide for the housing needs of the community within a high density residential environment
	 to provide a variety of housing types within a high density residential environment
	 to enable other land uses that provide facilities or services to meet the day to day needs of residents
	 to ensure that a high level of residential amenity is achieved and maintained
	 to encourage the provision of affordable housing
	 to ensure that development reflects the desired future character and dwelling densities of the area.
	The Proposal is consistent with the objectives of both zones as it would provide required infrastructure for the community in the form of works to improve access. All works are also located on rail land or land occupied by existing roads.
Clause 5.12 – Infrastructure development and use of existing buildings of the Crown	The LEP does not restrict or prohibit the carrying out of development by, or on behalf of a public authority, that is permitted with or without consent, or is exempt development under the Infrastructure SEPP.



afoddy Created By: zoning_LEP.mxd. G:\21\27503\GIS\Maps\Deliverables\21_27503_Kingswood_Land_

Figure 15: Penrith LEP zoning

4.5 **NSW Government policies and strategies**

Table 6 provides an overview of other NSW Government policies and strategies relevant to the Proposal.

Table 6 NSW Government policies and strategies applicable to the Proposal

Policy/Strategy	Commitment	Comment
Future Transport Strategy 2056 (Transport for NSW 2018a)	 Future Transport 2056 (Transport for NSW 2018a) is an overarching strategy that ensures transport in NSW is prepared for rapid changes in technology and innovation to create and maintain a world class, safe, efficient and reliable transport system over the next 40 years. Future Transport 2056 ensures that we are prepared for rapid changes in technology and innovation to create and maintain a world class, safe, efficient and reliable transport system. The strategy is supported by a range of sub plans which are outlined in the below sections. The strategy has been developed to ensure land use and transport strategies are in line with one another through the strategy being development in consultation with the Greater Sydney Commission, Infrastructure NSW, Department of Premier and Cabinet and Department of Planning and Environment. 	 The Proposal would assist in meeting the following State wide outcomes detailed in Future Transport 2056: Encouraging active travel (walking and cycling) and using public transport A fully accessible network that enables barrier-free travel for all.
Greater Sydney: Services and Infrastructure Plan (TfNSW, 2018b)	The Greater Sydney Services and Infrastructure Plan builds on the strategic initiatives outlined in Future Transport 2056 (discussed above). This plan provides a detailed look at the initiatives with the Greater Sydney area including identifying specific projects which have been identified as assisting in delivering Future Transport 2056.	The Transport Access Program, to which the Proposal forms part of is identified in the services and infrastructure plan as a key initiative with a commitment for the works to occur in the next 10 years.

Policy/Strategy	Commitment	Comment
Disability Inclusion Action Plan 2018-2022 (TfNSW, 2017b)	The Disability Inclusion Action Plan was developed as part of Future Transport 2056. The plan builds on the objectives regarding accessibility to transport as outlined in Future Transport 2056.	The Proposal has been developed with consideration of the objectives outlined in this Plan and seeks to improve and provide equitable access to public transport facilities. The Transport Access Program, of which the Proposal forms part is identified in the plan as a key action of ensuring the transport networks in Sydney are accessible for all potential users.
Sydney's Walking Future - Connecting people and places (TfNSW, 2013a)	 Sydney's Walking Future outlines the NSW government's efforts to: promote walking for transport connect people to places through safe walking networks around activity centres and public transport interchanges. 	The Proposal would facilitate walking by removing physical barriers to accessible public transport and by providing accessible cross-corridor access, hence contributing a relative reduction in local trips via private cars.
Sydney's Cycling Future - Cycling for everyday transport (TfNSW, 2013b)	Sydney's Cycling Future outlines the NSW government's commitment to a safe and connected network of bicycle paths as an important part of Sydney's integrated transport system. The government wants to make bike riding a convenient and enjoyable option by improving access to towns and centres, and investing in bicycle facilities at transport hubs.	The Proposal supports the government's Bike and Ride initiative that better integrates bicycle riding with other modes of transport, making it convenient to ride to transport hubs, park bicycles securely and transfer to public transport as part of longer transport journeys.
Building Momentum: State Infrastructure Strategy 2018- 2038 (Infrastructure NSW, 2018)	The NSW government has devised a 20-year strategy to improve the current state of NSW's infrastructure. The <i>State</i> <i>Infrastructure Strategy</i> (Infrastructure NSW 2018) identifies policies and strategies for infrastructure needed to meet the demands of a growing population and economy.	The Proposal supports investment in rail infrastructure as identified in the strategy.

Policy/Strategy	Commitment	Comment
Greater Sydney Region Plan: A Metropolis of Three Cities Our Greater Sydney 2056: Western City District Plan – connection communities (Greater Sydney Commission, 2018)	 A Metropolis of Three Cities guides the future growth of Greater Sydney. The plan includes a number of objectives related to transport networks including: provision of transport infrastructure to support future growth optimising existing infrastructure where possible. The Proposal is located within the Western City District as outlined in the plan. Further discussion of the Proposal in relation to the Western City is outlined below. 	The Proposal would assist in meeting these objectives as it would provide a more accessible rail network which would include the availability of the network to a wider range of commuters. It would also involve the upgrade of existing infrastructure (ie stations) to enable them to better serve growth without the need for new investment.

4.6 Ecologically sustainable development

TfNSW is committed to ensuring that its projects are implemented in a manner that is consistent with the principles of ecologically sustainable development (ESD). The principles of ESD are generally defined under the provisions of clause 7(4) of Schedule 2 to the EP&A Regulation as:

- the precautionary principle If there are threats of serious or irreversible damage, a lack of full scientific uncertainty should not be used as a reason for postponing measures to prevent environmental degradation
- intergenerational equity the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations
- conservation of biological diversity and ecological integrity the diversity of genes, species, populations and their communities, as well as the ecosystems and habitats they belong to, should be maintained or improved to ensure their survival
- improved valuation, pricing and incentive mechanisms environmental factors should be included in the valuation of assets and services.

The principles of ESD have been adopted by TfNSW throughout the development and assessment of the Kingswood Station Upgrade. Section 3.1.4 summarises how ESD would be incorporated in the design development of the Proposal. Section 6.13 includes an assessment of the Proposal on climate change and sustainability, and Section 7.2 lists mitigation measures to ensure ESD principles are incorporated during the construction phase of the Proposal.

5 Community and stakeholder consultation

Chapter 5 discusses the consultation undertaken to date for the Proposal and the consultation proposed for the future. This chapter discusses the consultation strategy adopted for the Proposal and the results of consultation with the community, relevant government agencies and stakeholders.

5.1 Stakeholder consultation during concept design

Key stakeholders for Kingswood Station, comprising TfNSW, Sydney Trains and Penrith Council, were engaged in the development of the Concept Design Plan to provide insights into the station's deficiencies and future development and growth plans, and to also participate in the development and assessment of the station improvement options.

Workshops and meetings undertaken during development of the concept design included:

- options assessment workshops with relevant TfNSW and Sydney Trains representatives
- TfNSW design and sustainability panel presentation
- safety meetings.

The following meetings were undertaken as part of the design development:

- Stakeholder workshop 1 Options Assessment. Attendees included representatives from a range of TfNSW divisions and Sydney Trains
- design and sustainability presentation to TfNSW Design and Sustainability Panel
- safety meeting
- Stakeholder workshop 2 Preferred option development. Attendees were as workshop 1.

5.2 Consultation requirements under the Infrastructure SEPP

Part 2, Division 1 of the Infrastructure SEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Clauses 13, 14, 15 and 16 of the Infrastructure SEPP require that public authorities undertake consultation with councils and other agencies, when proposing to carry out development without consent.

Table 7 provides details of consultation requirements under the Infrastructure SEPP for the Proposal.

Table 7 Infrastructure SEPP consultation requirements

Clause	Clause particulars	Relevance to the Proposal
Clause 13 Consultation with Councils – development with impacts on council related infrastructure and services	 Consultation is required where the Proposal would result in: substantial impact on stormwater management services generating traffic that would place a local road system under strain involve connection to or impact on a council owned sewerage system involve connection to and substantial use of council owned water supply significantly disrupt pedestrian or vehicle movement involve significant excavation to a road surface or footpath for which Council has responsibility. 	 The Proposal does not include works that would: require connections or impacts the stormwater system disrupt pedestrian and vehicle movements impact on Council operated footpaths. Consultation with Penrith City Council has been undertaken and would continue throughout the detailed design and construction phases.
Clause 14 Consultation with Councils – development with impacts on local heritage	 Where railway station works: substantially impact on local heritage item (if not also a State heritage item) substantially impact on a heritage conservation area. 	There is no proposed impact to local heritage/heritage conservation area. Accordingly, consultation with Council is not required. Refer to Section 6.5.
Clause 15 Consultation with Councils – development with impacts on flood liable land	 Where railway station works: impact on land that is susceptible to flooding – reference would be made to <i>Floodplain Development</i> <i>Manual: the management of</i> <i>flood liable land.</i> 	The Proposal is not located on land that is susceptible to flooding. Accordingly, consultation with Council is not required in regard to this aspect. Refer to Section 6.9.

Clause	Clause particulars	Relevance to the Proposal
Clause 16 Consultation with public authorities other than Councils	For specified development which includes consultation with the OEH for development that is undertaken adjacent to land reserved under the National Parks and Wildlife Act 1974, and other agencies specified by the Infrastructure SEPP where relevant.	The Proposal is not located adjacent to land reserved under the <i>National Parks and Wildlife Act</i> <i>1974</i> . Accordingly, consultation with the OEH on this matter is not required.
	 Although not a specific Infrastructure SEPP requirement, other agencies TfNSW may consult with could include: Roads and Maritime Sydney Trains OEH. 	

5.3 Consultation strategy

The consultation strategy for the Proposal was developed to encourage stakeholder and community involvement and foster interaction between stakeholders, the community and the project team. The consultation strategy that was developed, having regard to the requirements of the planning process ensures that stakeholders, customers and the community are informed of the Proposal and have the opportunity to provide input.

The objectives of the consultation strategy are to:

- provide accurate and timely information about the Proposal and REF process to relevant stakeholders
- raise awareness of the various components of the Proposal and the specialist environmental investigations
- ensure that the directly impacted community are aware of the REF and consulted where appropriate
- provide opportunities for stakeholders and the community to express their view about the Proposal
- understand and access valuable local knowledge from the community and stakeholders
- record the details and input from community engagement activities
- build positive relations with identified community stakeholders
- ensure a comprehensive and transparent approach.

5.4 Public display

The REF display strategy adopts a range of consultation mechanisms, including:

- public display of the REF at various locations
- distribution of a project newsletter at the station, and to local community and rail customers, outlining the Proposal and inviting feedback on the REF
- advertisement of the REF public display in local newspapers with a link to the TfNSW website that includes a summary of the Proposal and information on how to provide feedback

- consultation with council/s, Sydney Trains, NSW Trains and other non-community stakeholders
- 'pop-up' community information sessions near the station.

Community consultation activities for the Proposal would be undertaken during the public display of this REF. The display period of the REF would be advertised in the week that the public display commences. The REF would be displayed for a period of approximately two weeks.

The REF would be placed on public display at the following locations:

Penrith City Council Chambers / Penrith City Library

601 High Street, Penrith NSW 2750

(02) 4732 7891

(02) 4732 7777

TfNSW Office at Level 5, Tower A, Zenith Centre, 821 Pacific Highway, Chatswood

The REF would also be available on the <u>TfNSW website</u>¹. Information on the Proposal would be available through the Project Infoline (1800 684 490) or by <u>email</u>². During this time feedback is invited. Following consideration of feedback received during the public display period, TfNSW would determine whether to proceed with the Proposal and what conditions would be imposed on the project should it be determined to proceed.

5.5 Aboriginal community involvement

An Aboriginal Heritage Information Management System (AHIMS) search was undertaken for the area covered by the Proposal (the area around Kingswood Station) plus a 200 metre radius, on 28 July 2018. No Aboriginal Heritage items or sites were recorded within the search area.

The extensive landscape modification that has occurred across the Proposal area suggests that intact evidence of Aboriginal land use is unlikely to occur within the boundaries of the Proposal area. Similarly, the high level of disturbance would suggest that the archaeological potential of the area is low. Therefore it was not considered necessary to undertake specific Aboriginal consultation.

5.6 Ongoing consultation

At the conclusion of the public display period for this REF, TfNSW would acknowledge receipt of feedback from each respondent. The issues raised by the respondents would be considered by TfNSW before determining whether to proceed with the Proposal (refer, page 13).

Should TfNSW determine to proceed with the Proposal, the Determination Report would be made available on the TfNSW website and would summarise the key impacts identified in this REF, demonstrate how TfNSW considered issues raised during the public display period, and include a summary of mitigation measures proposed to minimise the impacts of the Proposal.

¹ <u>http://www.transport.nsw.gov.au/projects-tap</u>

² projects@transport.nsw.gov.au

Should TfNSW determine to proceed with the Proposal, the project team would keep the community, councils and other key stakeholders informed of the process, identify any further issues as they arise, and develop additional mitigation measures to minimise the impacts of the Proposal. The interaction with the community would be undertaken in accordance with a Community Liaison Plan to be developed prior to the commencement of construction.

6 Environmental impact assessment

Chapter 6 of the REF provides a detailed description of the likely environmental impacts associated with the construction and operation of the Proposal. For each likely impact, the existing environment is characterised and then an assessment is undertaken as to how the Proposal would impact on the existing environment.

This environmental impact assessment has been undertaken in accordance with clause 228 of the EP&A Regulation. A checklist of clause 228 factors and how they have been specifically addressed in this REF is included at Appendix B.

6.1 Traffic and transport

A Traffic, Transport and Access Impact Assessment (TT&IA) was prepared for the Proposal in September, 2018 (GHD, 2018a). The scope included an assessment of the proposed upgrade arrangements on pedestrian flows at pinch points in the pedestrian network and was prepared with reference to the static Fruin Level of Services (LoS) criteria. On site observations of existing pedestrian demands at the station were identified through undertaking weekday morning and afternoon peak pedestrian surveys on Thursday 6 August 2018. The weekday morning peak period survey occurred between 6.00 – 9.00 AM and the afternoon peak period survey occurred between 3.00-6.00 PM.

No traffic modelling, intersection or mid-block assessment of traffic impacts were undertaken as part of the assessment as there are no additional car parking proposed. The proposed upgrade of Kingswood Station is expected to result in negligible traffic impacts on the surrounding road network.

The findings of the assessment are summarised in this section.

6.1.1 Existing environment

Kingswood Station

Kingswood station is located 52 kilometres west of the Sydney Central Business District (CBD) in the suburb of Kingswood and is serviced by the T1 Western Line. Platform 1 provides train services east towards the CBD and Platform 2 provides train services west towards Penrith. This Western line provides connections between Emu Plains and Hornsby via Central Station.

Road network and traffic

Great Western Highway (A44)

The Great Western Highway (A44) is an arterial road, located directly south of Kingswood Station (Figure 16). It has three traffic lanes in each direction, separated by a raised centre median strip. The Great Western Highway has a sign-posted speed limit of 60 km/h within the vicinity of the station.

To the southeast of Kingswood Station, the Great Western Highway forms a signal controlled intersection with Bringelly Road, where a right turn bay is provided on the Great Western Highway (western) approach. Signal controlled pedestrian crossings are provided at each approach at this intersection.

An indented bus stop bay is provided approximately 75 metres to the southeast of Kingswood Station (eastbound direction). A bus stop is also provided on the westbound carriageway, east of the Bringelly Road intersection.

Access to the off-street commuter car park located to the south of Kingswood Station, is provided from the Great Western Highway via separate left-in only and left-out only priority controlled intersections.

Based on traffic count data (2017) provided from the Roads and Maritime Traffic Volume Website (count station 86008 located near South Creek, Werrington – approximately 4 km east of Kingwood Station), the Great Western Highway carries around 32,750 vehicles per day. This data indicates that during the weekday AM peak hour (8-9am) there were around 2,840 two way vehicle movements, with around 3200 two way vehicle movements during the weekday PM peak hour (5-6pm).

Richmond Road

Richmond Road functions as a local collector road and provides access to a commuter car park located to the north of Kingswood Station and St Joseph's Catholic Church and Primary School. To the north, Richmond Road also provides a connection to Parker Street / The Northern Road (A9) via a signal controlled intersection with Coreen Avenue. Richmond Road has one traffic lane in each direction, separated by a solid double centre line (BB line).

Unrestricted parallel parking is provided on either side of the Richmond Road in the vicinity of Kingswood Station. A southbound bus zone is located adjacent to the St Joseph's Primary School.

Richmond Road has a sign posted speed limit of 50 km/h outside of school zone hours. During school zone hours, the sign posted limit within the vicinity of Kingswood Station and St Joseph's Catholic Church and Primary School is 40 km/h.

Cox Avenue

Cox Avenue functions as a local road, located to the north of Kingswood Station and forms the minor approach of a priority controlled 'give way' intersection with Richmond Road. Cox Avenue has one travel lane in each direction separated by a broken single line.

Access to the commuter car park located to the north of Kingswood Station is provided from Cox Avenue. Unrestricted parallel parking is provided on either side of the road.

Cox Avenue has a speed limit of 50 km/h outside of school zone hours. During school zone hours, the sign posted limit within the vicinity of Kingswood Station is 40 km/h.

Park Avenue

Park Avenue functions as a local collector road, and connects with the southern end of Richmond Road. Park Avenue has one travel lane in each direction separated by a broken single line.

Unrestricted parallel parking is provided on the northern side of the road. Eastbound and westbound bus stops are located to the east of Richmond Road and the entrance to Kingswood Station.

Park Avenue has a sign posted speed limit of 50 km/h outside of school zone hours. During school zone hours, the sign posted limit within vicinity of Kingswood Station is 40 km/h.

Parker Street (The Northern Road, A9)

Parker Street (and to the north becomes Richmond Road) forms part of the Northern Road (A9). It is an arterial road, located approximately 750 metres to the west of Kingswood Railway Station. It has three travel lanes in both directions separated by a raised centre median strip.

Parker Street has a sign posted speed limit of 70 km/h in each direction within the vicinity of Kingswood Station, with a 40 km/h school zone in operation during school pick-up and drop-off periods to the north of the intersection with the Great Western Highway.



Figure 16 The road network surrounding Kingswood Train Station State roads are marked in red with the remainder of the road network classified as local roads. Source: Roads and Maritime Regional Road network - Modified by GHD

Public Transport

Buses

Bus stops servicing Kingswood Station are located on either side of the Great Western Highway. The following bus services operate from these bus stops:

- Bus route N70 (northern side of Great Western Highway) Penrith and City Town Hall
- Bus route N70 (southern side of Great Western Highway) City Town Hall and Penrith.

To the northeast of Kingswood Station, a bus stop is located along Park Avenue with the following bus services operating from this bus stop:

• Route 785 – Penrith and Werrington Station via Cambridge Park.

Walking network

Walking access to Kingswood Station is provided from the Great Western Highway to the southern station entrance and from Richmond Road to the northern station entrance.

Footpaths are provided along both sides of each road in the vicinity of Kingswood Station, with the exception of Park Avenue where a footpath is provided along the northern side of the road only. Other pedestrian facilities in the vicinity of the station include signal controlled pedestrian crossing which are provided on each approach at the Great Western Highway / Bringelly Road intersection.

Bicycle network

Sheltered bicycle parking is provided to the north and south of Kingswood Station. A shared path of low difficulty is provided along the northern side of the Great Western Highway.

Outside of the dedicated shared path, bicycle riders can use the on-road path on the Great Western Highway which provides a link to the Northern Road. This on-road route is of high difficulty.

Low difficulty on-road bicycle routes are also located along Richmond Road and Bringelly Road, with no dedicated bicycle paths provided.

Car Parking

Off-street commuter car parks are provided on both sides of Kingswood Station. The car park located on the northern side accessed from Richmond Avenue and Cox Avenue, provides approximately 200 spaces. The time restrictions are as follows:

- Monday to Friday: 8:30 am to 6:00 pm
- Saturday: 8:30 am to 4:30 pm

The car park located on the southern side accessed from the Great Western Highway, provides approximately 65 spaces, which are unrestricted. Unrestricted on-street car parking is also provided along Richmond Road, Cox Avenue and Park Avenue.

Taxi / kiss and ride facilities

No formal taxi zones are provided within the vicinity of Kingswood Station. A kiss and ride facility is located at Kingswood Station, adjacent to the southern station entrance and within the commuter car park, accessed from the Great Western Highway. There is no designated kiss and ride facility on the northern side of the station with a "No Stopping" zone located at the corner of Richmond Road and Park Avenue.

6.1.2 Potential impacts

a) Construction phase

Traffic generated by construction activities for the Proposal would include heavy vehicles associated with construction plant, deliveries and removal of materials along with light vehicles from construction workers.

The duration of the construction activities for Kingswood Station is around 18 months.

Heavy vehicles

The types of heavy vehicles to be used are expected to include medium and large rigid vehicles. Oversized vehicles may also be required for transporting lifts and pre-cast structures.

For the purposes of this assessment, the number of heavy vehicles accessing the site has been assumed to be up to 10 heavy vehicles per day. Heavy vehicles are expected to access the site outside of the AM and PM peak hours. However, as a conservative approach it has been assumed that 20 percent of construction heavy vehicle traffic would access the site during the weekday AM and PM peak hours (i.e. 2 vehicles).

It is proposed that all construction storage containment will be within the proposed construction compounds. However, this will be confirmed in the detailed construction planning stage.

This small increase in heavy vehicle traffic is expected to result in minimal impacts to the operation of the surrounding road network and fall within typical daily traffic fluctuations. Should additional peak construction movements vary, the potential impacts will need to be reviewed as part of the detailed construction planning stage.

Light vehicles

For the purpose of this assessment, it has been assumed that there would be up to 30 construction workers at the site during peak periods, with around 20 workers at the site on a typical day. It has been assumed for a worst case scenario that there would be a typical car driver rate of 100 per cent (i.e. each individual worker driving a car), however it is expected that a significant proportion of workers would arrive by train or car pool. Application of this car driver rate to the assumed workforce yields a traffic generation in the order of up to 30 light vehicles per day.

In conjunction with the proposed standard hours of construction (i.e.7:30 am to 5:00 pm), it is expected that all workers would arrive at the site during the observed road network AM peak hour (7- 8am) while an assumed 50 per cent of workers would depart during the PM peak hour (5- 6pm). These peak hours were observed based on traffic data provided from the Roads and Maritime Traffic Volume Viewer Website. This small increase in light vehicle traffic is expected to result in minimal impacts to the operation of the surrounding road network and fall within typical daily traffic fluctuations. Should the anticipated number of construction workers vary, the potential impacts will need to be assessed as part of the detailed design phase.

Construction light vehicles are expected to park on-street if required, with limited off site parking available. This would need to be addressed in greater detail in a Construction Traffic Management Plan (CTMP) for the proposed works. Construction light vehicles are expected to utilise the road network surrounding both sides of the station during construction activities. Construction workers would not use the designated commuter spaces. It is recommended that workers be encouraged to use alternate transport options such as public transport to access the site.

Construction vehicle access routes

To reduce the potential impacts on the performance of intersections in the vicinity of the site, it is recommended that heavy and light construction vehicles arrive to the site from the west of Kingswood Station, from either The Northern Road or Parker Street.

Construction vehicle access to the northern side of Kingswood Station should be via Copeland Street and Richmond Road. Subject to the location of the construction site / compound, which could potentially incorporate a section of the north car parking, the return route to The Northern Road or Parker Street would be via Cox Avenue, Phillip Street and Copeland Avenue.

Construction vehicle access to the southern side of the Kingswood Station would be via The Great Western Highway (Figure 17). No loading or unloading would occur from The Great Western Highway. A designated loading area (if required), would be positioned off the road carriageway and outside road network peak periods. Temporary road closures could occur on Richmond Road / Park Avenue at various times during the construction period. Vehicles may need to take alternate road routes during this time.



Figure 17: Construction vehicle access routes

Pedestrian and bicycle rider impacts

Access to the station would be maintained at all times during rail operation. However, pedestrians and bicycle riders on both sides of the station are anticipated to be affected by the proposed construction activities.

Potential interactions between construction traffic and pedestrians and cyclists include:

- periodic restrictions on accessibility for pedestrian and bicycle rider movements on both sides of the station due to the movement of construction material, traffic diversions and the location of crane/s during construction
- pedestrian access is likely to be impacted due to the construction of temporary pedestrian access paths
- increased vehicle movements may reduce safety.

Mitigation measures for ensuring that pedestrian and cyclist access and safety are not compromised would include traffic control at the pedestrian and bicycle access points on the northern and southern side of the station.

Public transport impacts

Bus services would continue to operate along the Great Western Highway and Park Avenue / Richmond Road in the vicinity of the station during construction. Potential interactions between construction traffic and bus services include:

- potential difficulty in accessing the bus stops along Park Avenue (subject to the construction staging/sequencing adopted by the Contractor)
- some impacts on access to buses for passengers during the demolition of the existing westbound bus stop along Park Avenue and construction of a new bus shelter.

Should the existing westbound bus stop on Park Avenue require relocation during construction, it could be relocated at Richmond Road, to the north of Park Avenue, where there are around six unrestricted car parking spaces on the western side of the road.

Car parking impacts

Construction of the Proposal is likely to impact off-street parking at the commuter car parks located to both the northern and southern sides of Kingswood Station. The number of parking spaces that will be accommodated by these compounds and construction worker parking is currently unknown. This will need to be identified and addressed as part of the detailed CTMP and further analysis of the Proposal impacts as part of the detailed design stage.

It is expected that some workers would also park at on-street (and commuter) parking locations in the vicinity of the construction compound. This would reduce the available on-street parking, currently used by commuters and visitors in the vicinity of Kingswood Station.

On-street parking in the vicinity of the works is anticipated to be sufficient to cater for temporary parking losses during construction.

Taxi / kiss and ride impacts

A kiss and ride facility is located within the southern commuter car park area. Preliminary construction compound areas have been identified adjacent to the parking (and subsequent) kiss and ride facility. While it is not anticipated that the current proposed compound area will impact on the facility, the CTMP should identify traffic control measures to avoid and minimise impact on its accessibility.

There is currently no formal taxi zone at Kingswood Station. As such, the impacts to taxis would be negligible.

b) Operational phase

Traffic impacts

As no additional car parking is proposed, the proposed upgrade of Kingswood Station is expected to result in negligible traffic impacts in the vicinity of the station.

Parking

The proposed works do not identify any changes to the current parking provisions on the northern or southern sides of Kingswood Station.

Pedestrian and bicycle rider impacts

Pedestrian access to Kingswood Station would be improved by providing new entries to the station at both the northern and southern sides of the station. The new entries would be located closer to the bus stops on the Great Western Highway and Park Avenue, allowing for improved access to the bus stops.

New lifts, in conjunction with existing accessible ramps, would improve accessibility to the station. In addition, the proposed stairs at both the northern and southern sides of the station would improve access to the surrounding footpath network at Park Avenue / Richmond Road and the Great Western Highway / Bringelly Road.

No changes to the bicycle network or bicycle parking are proposed.

The proposed improvements would provide better accessibility to the station, improve interchange between different modes of transport and encourage public transport use.

Bus impacts

No changes are proposed to the existing bus stop facilities or bus services at Kingswood Station. The proposed pedestrian access improvements will provide better accessibility to the station, improve interchange between different modes of transport and encourage public transport use.

Taxi / kiss and ride impact

The informal kiss and ride facility at Richmond Road is currently non-compliant due to the grade of the footpath servicing the area. As part of the Proposal, access paths will be upgraded to be DDA compliant, thereby improving accessibility.

No taxi zones are proposed. However, the proposed pedestrian access improvements will provide better accessibility to the station, including between the kiss and ride zone and new station entries.

6.1.3 Mitigation measures

A detailed CTMP would be prepared prior to the commencement of works with site induction for construction personnel being undertaken to outline the requirements of the CTMP. The aim of the CTMP is to maintain the safety of all workers and road users within the vicinity of the site and outline mitigation measures for construction traffic impacts. The CTMP will be prepared by the Contractor in consultation with TfNSW and provided to Penrith City Council and Roads and Maritime Services. Table 25 and Section 4.6 of the TT&IA describes the requirements of the CTMP. This include (but not limited to):

- designated construction vehicle access routes and time restrictions to avoid key road network periods (i.e. morning and astern road network and school peak periods)
- traffic control requirements near the bus stop when large vehicles need to access the site during construction and operation
- management of pedestrians and bicycle riders past the work site

• encourage workers to use alternate transport options such as public transport to access the site to reduce impacts on the parking demand and prohibit parking in commuter parking spaces.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures and Section 4.6 of the TT&IA. All mitigation measures are to be incorporated into the CEMP.

6.2 Urban design, landscape and visual amenity

A Landscape and Visual Impact Assessment (LVIA) was prepared for the Proposal in September 2018 (GHD, 2018b). The LVIA assessed the landscape character and visual impact of the Proposal. This includes landscape and visual effects of both construction and operational stages of the Proposal. The findings of the assessment are summarised in this section.

6.2.1 Existing environment

The study area for the LVIA has been defined as land within 600 metres of the Proposal site. A total of seven landscape character types were identified within the study area, including residential-detached, residential-apartment, mixed use, open space and cemetery, industrial, community infrastructure, and transport infrastructure.

Key views and viewshed

Key views in the study area include distant views to the west towards the Blue Mountains from elevated locations including Kingswood Station. Other views of note include views across the rail corridor from Richmond Road to Bringelly Road.

The viewshed, which forms the study area for the visual impact assessment, is defined as the area of land surrounding and beyond the Proposal site, which could be potentially affected by the Proposal.

Visually prominent features within the study area include two new mixed use buildings along the Great Western Highway about 26 metres in height. These can be seen from elevated locations on the northern side of the rail corridor, such as within the Penrith Cemetery.

The relative abundance of mature eucalyptus tree species with broad canopies provides screening or filtering of views within the study area, as well as a green backdrop to the built form. In the vicinity of Kingswood Station, a combination of existing vegetation currently mitigates the scale and elevation of built form elements.

Landscape character types

Based on the assessment of natural and cultural influences shaping the study area the following Landscape Character Types (LCT's) have been defined:

The following LCT's have been identified for the study area:

- LCT1 Residential detached
- LCT2 Residential apartments
- LCT3 Mixed use
- LCT4 Open space and cemetery
- LCT5 Industrial
- LCT6 Community infrastructure
- LCT7 Transport infrastructure

Refer Figure 18 for landscape character types plan.



Figure 18: Landscape character types plan

Sensitive visual receivers

Sensitive visual receivers within the Proposal viewshed include the following:

- residents on Park Avenue, Richmond Road, the Great Western Highway, and Bringelly Road
- businesses on the Great Western Highway and the eastern side of Bringelly Road
- pedestrians and shared path users on the Great Western Highway
- pedestrians on Richmond Road, the eastern side of Bringelly Road, Park Avenue, Richmond Road, and Cox Avenue
- road users on Richmond Road, Bringelly Road, the Great Western Highway and Cox Avenue
- commuters using Kingswood Station
- school children at St Joseph's Primary School
- visitors to the Penrith Cemetery
- workers of industrial businesses.

Viewpoint locations

Viewpoints which represent views from the most sensitive visual receivers are provided in Figure 19 and Table 8.

Table 8 Viewpoint locations

Viewpoint	Location	Description
VP1	Richmond Road (north)	This view represents road users and pedestrians on Richmond Road, as well as St Joseph's Primary School users.
VP2	Richmond Road (central)	This view represents residents, pedestrians and road users on Richmond Road near the station.
VP3	Park Avenue	This view represents residents, pedestrians and road users on Park Avenue.
VP4	Great Western Highway (east)	This view represents residents, shared path users and road users on the Great Western Highway.
VP5	Bringelly Road	This view represents pedestrians on Bringelly Road close to businesses.
VP6	Great Western Highway (west)	This view represents businesses, residents and pedestrians on the Great Western Highway.
VP7	Great Western Highway (central)	This view represents pedestrians and road users at the intersection of the Great Western Highway and Bringelly Road.



Figure 19: Viewpoint location plan

6.2.2 Potential impacts

a) Construction phase

Construction works would result in temporary landscape and visual impacts which may extend beyond the Proposal site. Landscape and visual impacts associated with construction activities are generally of greater magnitude than those associated with operation, however are temporary in nature.

Landscape and visual impacts during construction resulting from those activities outlined in Section 3.2 may include:

- the presence of one small crane required for lift construction, and one large crane required to position the small crane
- the presence of an excavator, boom truck, concrete truck, concrete pump, piling rig, and water truck
- temporary safety screens between the work being undertaken and the public domain, platform and concourse
- presence of construction traffic and workers
- temporary parking areas
- importation and storage of construction equipment and plant
- · materials stockpiling and the presence of incomplete structures
- vegetation removal or trimming
- construction activities associated with the existing concourse structure, lift and stair, which may be visible above safety screens from ground level.

b) Operational phase

Potential visual impacts relate to the introduction of new elements in the landscape. The key features of the Proposal are described in Section 3.1. Once constructed, the potential visual impacts of the Proposal would be mainly associated with:

- the upgraded station facilities, including the new lifts, landings and canopies
- new stairs
- new roofing and installation of solar panels on the concourse
- new lighting
- associated landscaping.

Photomontages providing an indication of the appearance of the Proposal are included in Section 3.1.1 as Figure 13 and Figure 14.

Landscape character impacts

Operational landscape impacts were assessed to be either negligible or no impact and the Proposal would result in a built form generally consistent with the existing landscape character of the study area.

Table 9 provides a summary of landscape character impacts for the Proposal at each LCT.

LCT	Description	Sensitivity to change	Magnitude of change	Overall Rating
LCT1	Residential – detached	N/A	N/A	No Impact
LCT2	Residential - apartment	Low	Negligible	Negligible
LCT3	Mixed use	Negligible	Negligible	Negligible
LCT4	Open space and cemetery	N/A	N/A	No Impact
LCT5	Industrial	N/A	N/A	No Impact
LCT6	Community infrastructure	N/A	N/A	No Impact
LCT7	Transport infrastructure	Low	Negligible	Negligible

Table 9 Summary of landscape impacts

Visual impacts

The significance of the potential visual impacts was determined by assessing the magnitude of potential impacts for each receiver in combination with the sensitivity of the receiver. Significant impacts are considered to be those with a rating of high-moderate or above. A summary of the results of the visual impact assessment for those receivers with the potential to be impacted by the Proposal is provided in Table 10.

In summary, the Proposal would introduce constructed elements which, in general, complement the scale and form of some existing commercial buildings to the north of the station. The Proposal is not expected to create a noticeable deterioration in the amenity of the existing view and surrounding built environment. The assessed significance of impacts for the receivers with the potential to be impacted by the Proposal ranged from negligible to moderate.

The most significant impact was found to be moderate from viewpoint locations two, three and four associated with nearby residential apartments. This is primarily due to the residential receiver type, the scale of change to the view, and the location in close proximity to the proposal.

LCT	Description	Sensitivity to change	Magnitude of change	Overall Rating
VP1	Richmond Road (north)	Low	Low	Low
VP2	Richmond Road (central)	High	Low	Moderate
VP3	Park Avenue	High	Low	Moderate
VP4	Great Western Highway (east)	High	Low	Moderate

Table 10 Summary of visual impacts

LCT	Description	Sensitivity to change	Magnitude of change	Overall Rating
VP5	Bringelly Road	Low	Low	Low
VP6	Great Western Highway (west)	Moderate	Negligible	Negligible
VP7	Great Western Highway (central)	Low	Moderate	Moderate-Low

6.2.3 Mitigation measures

General recommendations

General considerations for the detailed design phase include:

- incorporate new landscape planting to replace that which is to be removed, including trees, shrubs and groundcovers, to provide visual screening to new vertical built form elements from sensitive receivers, and to soften the visual impact of additional paving and retaining walls. Ensure new landscape planting enhances the public realm
- ensure the design, location and materiality of Proposal components contributes positively to the achievement of a high quality public realm
- ensure the lift, stair and new canopy components of the Proposal integrate well with, and complement, the existing station building through the use of colour and materiality
- ensure the Proposal urban design solution is sympathetic to achieving a positive viewing experience from Richmond Road, Park Avenue and the Bringelly Road intersection, through well considered design for the location of vegetation, signage, shelters and furniture elements
- ensure the Proposal contributes positively to the existing landscape character
- ensure the Proposal responds to principles and objectives outlined in the TfNSW Sustainable Design Guidelines Version 4.0, Around the Tracks: urban design for heavy and light rail, the Kingswood Public Domain Manual, and the City of Penrith Landscape Character Strategy, as identified in the LVIA prepared by GHD (2018b).

Construction activity and storage

General considerations for the construction phase include:

- taking all practical measures to ensure construction equipment, stockpiles, and other visible elements are located away from key views to or from the sensitive visual receivers identified in this assessment
- Where such equipment or stockpiles are to be located in a visually prominent location for any reasonable period of time, incorporate screening measures and practices to ensure sites are kept tidy.

Retention of visually important vegetation

Visually important vegetation as shown on Figure 7 of the landscape and visual report includes the existing mature eucalyptus tree species within the station precinct, and all vegetation currently providing visual mitigation to built form elements, including buffer vegetation along the rail corridor boundary and vegetation mitigating views from sensitive receiver locations.
General considerations for vegetation retention include:

- as the Proposal design progresses, the extent of disturbance on visually important vegetation within the station precinct and along the rail corridor boundary must be considered, and practical measures should be given to enable retention of visually important vegetation wherever possible
- seek opportunities to retain visually important vegetation, and investigate urban and landscape design solutions to achieve this, such as permeable paving and relocation of belowground services where possible.

Signage and poles

General consideration for signage and poles include:

avoid locating permanent signage which may impede views. Minimise the amount
of services poles in the public realm by utilising built form mounting and combining
services on shared poles.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.

6.3 Noise and vibration

The TAP 3 – Kingswood Station Noise and Vibration Impact Assessment (NVIA) was prepared by GHD in October 2018 for Transport for NSW (GHD, 2018c). The findings of the assessment are summarised in this section.

Nearby noise and vibration sensitive receivers were identified and unattended noise measurements were completed to characterise the existing noise environment. The measured noise levels were used to establish construction and operational noise management levels. Construction and operational noise impact assessments were then completed to assess the impacts of the proposed works associated with the Proposal.

6.3.1 Existing environment

The existing noise environment in the vicinity of Kingswood Station is dominated by existing road traffic primarily from the Great Western Highway. Rail noise from the Western Line also contributes to the background noise level. Intermittent PA system announcements at Kingswood Station also contribute to the background noise levels.

Noise sensitive receivers

The following sensitive receivers and land uses have been identified in close proximity to the Proposal:

- residential properties located in the area surrounding the station including Park Avenue and Richmond Road properties which are located about 50 metres to the north of the station
- industrial properties located to the north of the Proposal
- commercial properties located to the south of the Proposal along the Great Western Highway and between the highway and the rail corridor
- Nepean Hospital located 570 metres west of the Proposal on the southern side of the Great Western Highway
- St Joseph's Primary School and Catholic parish are located on Joseph Street about 100 metres north of the station (buildings are about 240 metres from the station).

All modelled sensitive receivers are shown in Figure 20.

Background noise levels

Background noise monitoring was undertaken at two locations considered to be representative of the nearby sensitive receivers. Long term monitoring was undertaken for a minimum period of seven days between 27 July and 3 August 2018 at the following locations:

- Location 1 10 Rodgers Street, Kingswood: about 180 metres south of the Proposal
- Location 2 70 Joseph Street, Kingswood: about 430 metres north-east of the Proposal.

These locations are shown on Figure 20.

A detailed monitoring methodology and daily noise level charts are located in the NVIA prepared by GHD (GHD, 2018c).

The measured noise monitoring data were used to determine the Rating Background Levels (RBL) for the assessment during the day, evening and night-time periods in accordance with the Noise Policy for Industry (NPI) (EPA, 2017). A summary of the measured RBL and ambient noise levels is provided in Table 11.

The monitoring data from Location 2 is the more conservative of the two locations and has been used for this assessment. This is likely due to the greater set-back distance from the main transportation corridor.

At Location 1 the evening background noise levels are greater than the day-time background noise levels. This is likely to be attributed to transportation noise during the evening period, noting that the evening period is four hours in duration and therefore has fewer sample points, which inherently makes it more susceptible to variance using the NPI 90th percentile method.

Location	Rating background level, L _{A90}			Ambient level, L _{Aeq}		
	Day 7am to 6pm	Evening 6pm to 10pm	Night 10pm to 7am	Day 7am to 6pm	Evening 6pm to 10pm	Night 10pm to 7am
Location 1	37	40	32	50	50	45
Location 2	33	33	28	55	41	39

Table 11 Summary of measured noise levels, dBA



Figure 20: Sensitive noise receivers & noise monitoring locations

6.3.2 Criteria

Construction noise

Construction noise management levels

The construction noise management levels for the Proposal are based on the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) and the *Construction Noise and Vibration Strategy* (CNVS) (TfNSW, 2018c). The ICNG specifies the method used to determine the noise management levels for residential receivers during standard construction hours and out of hours works. A fixed noise management level is set by the ICNG for receiver types classed as commercial, schools and places of worship.

Guidelines to determine the noise management levels for residential receivers, during and outside of standard recommended hours provided in the ICNG, are summarised in Table 12.

Table 12 Construction noise management level guidelines for residences

Time of day	Noise management level L _{Aeq(15min)}
Recommended standard hours	Noise affected: Rating background level + 10 dBA
	Highly noise affected: 75 dBA
Outside recommended standard hours	Noise affected: Rating background level + 5 dBA

Noise management levels for other sensitive land uses are provided in Table 13. These levels only apply when the relevant land use is in use.

Table 13 Noise management levels for other sensitive land uses

Land use	Noise management level, L _{Aeq(15min)}
Commercial premises	70 dBA (external)
Industrial premises	75 dBA (external)
Educational institutes	45 dBA (internal)
Hospital wards and operating theatres	45 dBA (internal)
Places of worship	45 dBA (internal)
Active recreation areas	65 dBA (external)
Passive recreation areas	60 dBA (external)

The specific construction noise management levels are outlined in Table 14.

Sleep disturbance

The ICNG recommends that maximum noise level events and the frequency of maximum noise level events exceeding the RBL should be assessed where construction works are planned to extend over two or more consecutive nights.

The *Noise Policy for Industry* (NPI) (EPA, 2017) provides the most updated guidance for the assessment of sleep disturbance. The NPI recommends a maximum noise level assessment to assess the potential for sleep disturbance impacts which include awakenings and disturbance to sleep stages. An initial screening test for the maximum noise levels events should be assessed to the following levels.

- L_{Aeq(15 min)} 40 dBA or the prevailing RBL plus 5 dB, whichever is greater, and/or
- L_{AFmax} 52 dBA or the prevailing RBL plus 15 dB, whichever is greater.

If the screening test indicates there is a potential for sleep disturbance then a detailed maximum noise level assessment should be undertaken. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Specific construction noise management levels

A summary of the construction noise management levels for residential receivers is provided in Table 14.Noise management levels at non-residential receivers are provided in Table 13.

Receiver type	Time of day	Management level (dBA)
Residential	Recommended standard hours	Noise affected: 45 ²
		Highly affected: 75
	Outside recommended standard hours ¹	Day: 40 ²
		Evening: 38
		Night: 35 ³

Table 14 Construction noise management levels

Note 1: The Noise Policy for Industry (EPA, 2018) defines day, evening and night time periods as:

- Day: the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays.
- Evening: the period from 6 pm to 10 pm.
- Night: the remaining periods.
- Note 2: Measured background levels during the day were below the minimum background noise level from the Noise Policy for Industry (EPA, 2017). The minimum background level of 35 dBA has been used to calculate the noise management levels during the day-time period
- Note 3: Measured background levels during the night were below the minimum background noise level from the Noise Policy for Industry (EPA, 2017). The minimum background level of 30 dBA has been used to calculate the noise management levels during the night-time period

Construction vibration

Human comfort

Acceptable vibration levels for human comfort have been set with consideration to Assessing Vibration: a technical guideline (DEC, 2006) which is based on the guidelines contained in British Standard *BS 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*.

Typically, construction activities generate ground vibration of an intermittent nature. Intermittent vibration is assessed using the vibration dose value. Acceptable values of vibration are presented in Table 15 for sensitive receivers.

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

Table 15 Human comfort intermittent vibration limits (BS 6472-1992)

Structural damage to buildings

The effects of transient vibration on structures is considered in *BS 7385 Part 2 – 1993 Evaluation and measurement for vibration in buildings*. The criteria provided in BS 7385 are presented in Table 16.

Table 16 Transient vibration guide values – minimal risk of cosmetic damage (BS 7385-2)

Type of building	Peak component particle velocity in frequency range of predominant pulse		
	4 Hz to 15 Hz	15 Hz and above	
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above.	

Heritage buildings and structures would be assessed using the guide values in Table 16. A heritage building or structure should not be assumed to be more sensitive to vibration unless they are found to be structurally unsound. If a heritage building or structure is found to be structurally unsound (following inspection) a more conservative cosmetic damage criterion of 2.5 mm/s peak component particle velocity (from DIN 4150) should be considered.

Construction traffic

The *Road Noise Policy* (RNP) (DECCW, 2011) provides road traffic noise criteria for residential land uses affected by construction traffic on the public road network.

The *Road Noise Policy application notes* state that any increase in the total noise level at existing residences and other sensitive land uses affected by traffic generation on existing roads should be limited to 2 dBA above current levels. This limit only applies when the noise level without the development is within 2 dBA or exceeds the road traffic noise criterion provided in the RNP.

Where construction traffic increases the existing road traffic noise levels by more than 2 dBA then further assessment against the road traffic noise criteria in Table 17 is required.

Type of development	Day 7 am to 10 pm	Night 10 pm to 7 am
Existing residence affected by additional traffic on arterial roads generated by land use developments	60 LAeq(15 hour)	55 L _{Aeq(9 hour)}
Existing residence affected by additional traffic on local roads generated by land use developments	55 L _{Aeq(1 hour)}	50 L _{Aeq(1 hour)}

Table 17 Roads traffic noise criteria

Operational noise

Operational noise is assessed in accordance with the *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013). The RING refers to the *NSW Industrial Noise Policy* (INP) (EPA, 2000) for the assessment of fixed facilities including railway stations. The INP has since been superseded by the *Noise Policy for Industry* (NPI) (EPA, 2017).

Operational noise is assessed in accordance with the *Noise Policy for Industry* (NPI) (EPA, 2017). The NPI addresses noise emanating from fixed facilities through assessing its intrusiveness based on the rating background noise level, and is presented below in Table 18.

Table 18 NPI Noise intrusiveness criteria

Time of day	RBL (L _{A90,15min}), dBA	Intrusiveness trigger level
7am - 6pm (daytime)	35	40 (BG + 5 dB)
6pm - 10pm (evening)	33	38 (BG + 5 dB)
10pm - 7am (night time)	30	35 (BG + 5 dB)

Table 19 outlines the recommended amenity noise levels for different land uses for operational noise.

Table 1	9 O	perational	noise -	amenity	noise	levels

Receiver	Noise amenity area	Time of day	L _{Aeq} , dBA
Residential	Suburban	Day	55
		Evening	45
		Night	40
Commercial	All	When in use	65
Industrial	All	When in use	70
Educational	All	Noisiest 1 hour	35 (internal)
Hospital/Medical	All	When in use	35 (internal) 50 (external)
Place of Worship	All	When in use	40 (internal)
Passive recreation	All	When in use	50
Active recreation	All	When in use	55

6.3.3 Potential impacts

a) Construction phase

Construction noise

A number of construction noise scenarios were considered as part of the construction noise and vibration assessment. A summary of these scenarios is provided in Table 20

Table 20 Construction scenarios

Construction scenario	Construction phase	Time frame
CS01	Site establishment and relocation of services	Standard hours OOHW Period 1 OOHW Period 2
CS02	Vegetation	Standard hours
CS03	Piling works	Standard hours
CS04	Stairs and lift upgrades	Standard hours OOHW Period 1 OOHW Period 2
CS05	Station fit out and systems	Standard hours OOHW Period 1 OOHW Period 2

Construction scenario	Construction phase	Time frame
CS06	Platform level works	Standard hours OOHW Period 1 OOHW Period 2
CS07	Compound operations	Standard hours OOHW Period 1 OOHW Period 2
CS01	Site establishment and relocation of services	Standard hours OOHW Period 1 OOHW Period 2
CS02	Vegetation	Standard hours
CS03	Piling works	Standard hours

A summary of the number of exceedances of the noise management levels for sensitive receivers is presented in Table 21 for residential receivers.

Table 22 outlines the only exceedance for non-residential receivers in the vicinity of the proposal, with all other sensitive receiver types not considered to have any exceedances.

Exceedances of the construction noise management levels are typical for construction projects of this scale. The noise impacts would be limited to the construction period only and would not have lasting effects on the community. The maximum noise impacts would be expected during works at the platform level involving the use of a concrete saw.

Construction noise contours for all modelled scenarios are provided in the NVIA prepared by GHD (GHD, 2018c).

Impacts during standard hours

Residences located within 400 metres of the Proposal site are expected to be noise impacted at some point during construction. The noise management level is predicted to be exceeded by up to 21 dBA due to the low background noise levels and the receiver's proximity to the proposed construction. The CNVS considers this level of exceedance as 'highly intrusive' and the additional mitigation measures discussed in Section 6.3.4 should be implemented at the affected receivers.

Impacts outside standard hours

Works outside standard construction hours are expected during rail possessions to complete installation works for the lift, stairs, roofing and anti-throw screens. Works during the rail possession have been assessed for all modelled scenarios during the day, evening and night-time assessment periods.

Residences located within 900 metres of the Proposal site are expected to be noise impacted at some stage during construction outside of standard construction hours. The noise impacts would be experienced over a short term period limited to the proposed rail possession periods (weekend closures). Approximately six rail possessions are anticipated in order to complete the proposed construction. The predicted exceedance of the OOHW noise management levels are:

- 26 dBA during OOHW Period 1 (day)
- 28 dBA during OOHW Period 1 (evening)
- 31 dBA during OOHW Period 2 (night).

The CNVS considers the level of exceedances as 'highly intrusive' and the additional mitigation measures discussed in Section 6.3.4 should be implemented at the affected receivers, the receivers which are to receive the additional mitigation are outlined the NVIA (GHD 2018c).

|--|

	Construction scenario						
	CS01	CS02	CS03	CS04	CS05	CS06	CS07
Summary during	g standard	construct	ion hours				
Number of exceedances	37	36	61	45	118	235	19
Highest noise level	59	61	63	61	63	66	53
Highest exceedance	14	16	18	16	18	21	8
Worst affected receiver	R332, R384	R332, R393	R332	R332	R332	R278, R332	R332
Summary during OOHW Period 1 (Day)							
Number of exceedances	95	88	178	137	320	409	45
Highest noise level	59	61	63	61	63	66	53
Highest exceedance	19	21	23	21	23	26	13
Worst affected receiver	R332, R384	R332, R393	R332	R332	R332	R278, R332	R332
Summary during OOHW Period 1 (Evening)							
Number of exceedances	129	129	280	213	388	443	68
Highest noise level	59	61	63	61	63	66	53

	Construction scenario						
	CS01	CS02	CS03	CS04	CS05	CS06	CS07
Highest exceedance	21	23	25	23	25	28	15
Worst affected receiver	R332, R384	R332, R393	R332	R332	R332	R278, R332	R332
Summary during OOHW Period 2 (Night)							
Number of exceedances	258	251	383	353	443	486	125
Highest noise level	59	61	63	61	63	66	53
Highest exceedance	24	26	28	26	28	31	18
Worst affected receiver	R332, R384	R332, R393	R332	R332	R332	R278, R332	R332

Table 22 Non-residential receiver exceedances - education institute

	Construction scenario						
	CS01	CS02	CS03	CS04	CS05	CS06	CS07
Number of exceedances	0	0	0	0	2	5	0
Highest noise level	50	50	54	53	55	58	42
Highest exceedance	-	-	-	-	0	3	-
Worst affected receiver	R259	R259	R259	R259	R246	R246	R246

Sleep disturbance impacts

Construction activities are expected outside standard construction hours to minimise the impacts on rail traffic during construction. The sleep disturbance screening criteria of 52 dBA is exceeded at 46 residential receivers. Therefore a detailed maximum noise level assessment has been undertaken. The RNP states that maximum internal noise levels between 50 to 55 dBA are unlikely to awaken people from sleep. Typically a window will provide a 10 dBA reduction when partially open and a 20 dBA reduction when closed. For a conservative assessment, the windows have been assumed to be partially open to assess sleep disturbance impacts.

Based on this assessment, 11 receivers would potentially experience sleep disturbance impacts. Eight of these receivers are located north-east of the Proposal near the corner of Park Avenue and Richmond Road, while three are located south-east of the Proposal near the corner of the Great Western Highway and Bringelly Road. The details of these receivers where exceedances are found are outlined in Table 4-6 of the noise and vibration report.

Construction traffic

Construction traffic movements would be limited to along the Great Western Highway and Richmond Road which have significant existing traffic flows. A significant increase in traffic volumes would be needed in order to increase road traffic noise by 2 dBA (a doubling in traffic corresponds to about a 3 dBA increase). The construction traffic increase is not considered likely to result in a doubling of traffic and therefore noise increase would be less than 2 dBA and further assessment of construction traffic noise is not required.

Construction vibration

The CNVS specifies a safe working buffer distance of 25 metres for standard structures. The following standard structures have been identified within 25 metres of the construction area:

• 8 – 16 Cox Avenue.

The following residential structures have been identified within 100 metres of the construction activities and could potentially experience human comfort impacts:

- 78 80 Park Avenue
- 8 10 Richmond Road
- 174 176 Great Western Highway.

Impacts on these properties would be minimised through the implementation of mitigation measures outlined in Table 25.

b) Operational phase

The proposed station upgrades will not increase the operation of the rail line and there will be no increase from the rail noise of Kingswood station due to the operation of the station upgrades. All other operational noise impacts from the station (lift, plant, PA systems) are not expected to increase noise levels past the operational noise criteria.

6.3.4 Mitigation measures

As part of the detailed design process, further background noise monitoring and analysis would be undertaken to minimise the potential for sleep disturbance during construction. Any residual exceedances as a result of further analysis will be managed in accordance with the CVNS.

Prior to commencement of works, a Construction Noise and Vibration Management Plan (CNVMP) would be prepared and implemented in accordance with the requirements of the *Construction Noise Strategy* (TfNSW, 2012).

The CNVMP would be the key management document that would prescribe specific mitigation measures to help reduce the impacts of construction noise and vibration. The measures would focus on Contractor inductions, the efficient operation of plant and equipment, along with prescribing safe working distances for vibration intensive equipment and detailing procedures for noise and vibration monitoring, and for obtaining TfNSW approval for out of hours works.

Noise management zones have been calculated for each construction stage showing the recommended additional mitigation measure for each time period. Noise management zones are shown in the noise and vibration report and are shown for levels that are moderately intrusive and highly intrusive for distances up to one kilometre from the site as it is assumed distances greater than this would not be feasible or reasonable to implement in practice.

The CNVMP would also be supported by the Community Liaison Plan to be prepared for the Proposal, which would detail community notification requirements.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP or CNVMP.

Additional noise mitigation measures

The CNVS provides the following information regarding further mitigation measures for certain receivers exceeding noise management levels, these are outlined in Table 6-2 of the NVIA prepared by GHD (GHD, 2018c).

The CNVS outlines the various trigger levels to warrant these mitigation measures, and such is presented below in Table 23.

The predicted noise levels for each receiver, and hence any additional noise mitigation measures, are presented in Appendix B of the NVIA prepared by GHD (GHD, 2018c).

Table 23 Triggers for	Additional Mitigation	Measures -	Airborne Noise

Construction hours	Receiver perception	dBA above RBL	dBA above NML	Additional management measures
Standard	Noticeable	5 to 10	0	-
Monday – Friday (7 am – 6 pm) Saturday	Clearly audible	> 10 to 20	< 10	-
(8 am – 1 pm)	Moderately intrusive	> 20 to 30	> 10 to 20	PN, V
	Highly intrusive	> 30	> 30	PN, V
	75 dBA or greater	N/A	N/A	PN, V, SN
OOHW Period 1 Monday – Friday (6 pm – 10 pm) Saturday (7 am – 8 am, 1 pm – 10 pm) Sunday/PH (8 am – 6 pm)	Noticeable	0 to 10	< 5	-
	Clearly audible	> 10 to 20	5 to 15	PN
	Moderately intrusive	> 20 to 30	> 15 to 25	PN, V, SN, RO
	Highly intrusive	> 30	> 25	PN, V, SN, RO, RP ¹ , DR ¹
OOHW Period 2 Monday – Saturday (12 am – 7 am, 10 pm – 12 am) Sunday/PH (12 am – 8 am, 6 pm – 12 am)	Noticeable	0 to 10	< 5	PN
	Clearly audible	> 10 to 20	5 to 15	PN, V
	Moderately intrusive	> 20 to 30	> 15 to 25	PN, V, SN, RP, DR
	Highly intrusive	> 30	> 25	PN, V, SN, AA, RP, DR

Note 1: Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only. Note 2: PN = Periodic Notification, V = verification monitoring, SN = specific notification, RO = respite offer, AA = alternative accommodation, AC = alternative construction methodology, RP = respite period, DR = duration reduction. A more detailed description of the additional management measures mentioned above are located in Table 6-2 of the noise and vibration report.

6.4 Indigenous heritage

6.4.1 Existing environment

An Aboriginal Heritage Information Management System (AHIMS) search was undertaken for the area covered by the Proposal with a 200 metre radial buffer on 23 July 2018. No AHIMS sites were identified in the search. The extensive landscape modification and high level of disturbance that has occurred across the Proposal area suggests the presence of culturally sensitive buried items is unlikely within the boundaries of the Proposal.

6.4.2 Potential impacts

a) Construction phase

Construction of the Proposal would involve some minor excavation and other ground disturbing activities for:

- the foundations and pits for the two new lift shafts and lifts at each platform
- construction of stairs
- services relocation including construction of new combined services route.

Ground disturbing activities have the potential to impact Indigenous sites, if present.

As no known Indigenous heritage items are located in the vicinity of the Proposal area and no high risk landscape features are located at or near the Proposal area, the potential for unknown items to be present is considered to be low. As such, the Proposal is unlikely to affect Indigenous heritage during construction.

b) Operational phase

There would be no risks to Indigenous heritage from the operation of the Proposal.

6.4.3 Mitigation measures

Mitigation of Indigenous heritage impacts is not expected to be required as no known Indigenous heritage items or high risk landscape features have been identified near the Proposal area. Mitigation would therefore be limited to the management of any unknown impacts to non-Indigenous heritage through worker inductions and protocols for unexpected finds.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.

6.5 Non-Indigenous heritage

6.5.1 Existing environment

A desktop search of the following historic heritage registers was undertaken for the study area:

- National Heritage List
- Commonwealth Heritage List
- Register of the National Estate (non-statutory archive)
- NSW State Heritage Register
- Penrith LEP.

The search identified no items listed on the Commonwealth, National or State Heritage Register within the Proposal area or immediate surrounds. Two locally listed heritage items were identified within 200 metres of the Proposal:

- Penrith General Cemetery (item 97 under Penrith LEP) located about 200 metres north of the Proposal
- Milestone along the Great Western Highway (item 861 under Penrith LEP) located about 200 metres east of the Proposal.

These items are shown in Figure 21.

6.5.2 Potential impacts

a) Construction phase

The Proposal would be confined to the boundary shown in Figure 21 Non-Indigenous heritage items. As no heritage items are located within the Proposal site or in close proximity (closest is about 200 metres away), the Proposal would not result in any direct or indirect (ie vibration) impacts on any heritage items.

b) Operational phase

There would be no risks to non-Indigenous heritage from the operation of the Proposal.

6.5.3 Mitigation measures

Mitigation of non-Indigenous heritage impacts is not expected to be required due to the lack of any potential impacts. Mitigation would therefore be limited to the management of any unknown impacts to non-Indigenous heritage through worker inductions and protocols for unexpected finds.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.



Figure 21: Non-Indigenous heritage items

6.6 Socio-economic impacts

6.6.1 Existing environment

Kingswood is a suburb located in western Sydney at the foot of the Blue Mountains and just east of Penrith which is the primary focus of the community in far western Sydney, mainly due to the presence of shopping areas and a number of other large employment areas. While not a key centre within far western Sydney, Kingswood does contain Nepean Hospital which services far western Sydney. Nepean Hospital is located about 400 metres from Kingswood Station.

A review of the 2016 Australian Bureau of Statistics (ABS) Census data was undertaken for Kingswood. The suburb of Kingswood had a population of 9,301 people with a relatively even age distribution.

7.5 per cent of residents within Kingswood reported the need for assistance as a result of a disability which is high compared to the wider Penrith local government area of which 5.2 per cent of the population require assistance.

The population of Kingswood is heavily dependent on private vehicles for the primary mode of travel to work with 67.2 per cent of the population being the driver or passenger. 17.2 per cent of the population utilised public transport to travel to work, with 11.1 per cent (of the total population) utilising trains. While car usage is considered high, use of cars for travel to work for Kingswood is similar to the NSW and Australian averages and below the Penrith local government area percentage of 75.1 per cent. The use of vehicles is reflected in that 82.7 per cent of the population own at least one vehicle which is slightly lower than the NSW average and well below the Penrith local government area average of 90.4 per cent.

6.6.2 Potential impacts

a) Construction phase

The Proposal has the potential to temporarily impact customers, pedestrians and the surrounding community as a result of:

- temporary changes to bicycle and pedestrian access to, through and movements around the station (i.e. including along platforms)
- temporary impacts to local traffic movements
- increased truck movements delivering materials and equipment and transporting waste
- construction amenity impacts such as noise, vibration, dust and visual impacts.

The above impacts on the community are expected to be relatively short term in nature. These impacts would be further reduced as many of the proposed impacts would likely occur during possession periods when movements in the vicinity of the station would be lower as a result of the trains not operating.

The majority of the works are also to occur in areas located at the eastern end of the platform which is away from the existing station entrance. A number of the proposed works would also occur in areas not currently accessible to the public (including the eastern part of the concourse which is currently not accessible to the public).

The proposal would not result in any acquisition and would not result in any impacts to any adjacent land uses as works would be located on RailCorp land.

b) Operational phase

The Proposal would provide positive, long term socio-economic benefits to the broader Kingswood community, including:

- improved accessibility for station customers and pedestrians, particularly people with a disability, elderly people and those with prams or luggage
- improved customer amenity and facilities, including accessible toilets, increase area within the concourse to improve flow
- improved access to transport interchange facilities through improved paths to meet DDA requirements
- improved safety for customers on the station platform, including upgrade of station systems including CCTV and emergency help points

The Proposal would improve the overall accessibility of the station. The Proposal would also ensure that the station will be able to handle the predicted increase in patronage in 2036.

No adverse impacts are considered to result from the Proposal.

6.6.3 Mitigation measures

Potential impacts on the community would be managed through ensuring that access to, from and around the station would be maintained at all times, albeit with potential changes to access. The community would be provided with information of any changes in advance and would also be provided with contact details to make any complaints regarding the construction of the Proposal.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures (including traffic, transport and access measures). All mitigation measures are to be incorporated into the CEMP.

6.7 Biodiversity

A biodiversity impact assessment was prepared by GHD in September 2018 for the Proposal (GHD, 2018d). A desktop review of existing information was undertaken prior to the site inspection to identify biodiversity values that may be of relevance to the proposal. A site inspection was completed by a GHD ecologist on 7 August 2018 to identify vegetation, conservation significance, and habitat. The findings of the assessment are summarised in this section.

6.7.1 Existing environment

The proposal site is located within a highly urbanised and modified landscape. No stands of intact naturally occurring native vegetation are present within the proposed area of works.

The following planted vegetation occurs within the proposal site:

- exotic shrubs within planter boxes alongside the platforms
- a mix of native and exotic ornamental species, including Eucalyptus spp. saplings, Prickly Paperbark trees (*Melaleuca styphelioides*), bottlebrushes (*Callistemon* spp.),exotic Crepe Myrtle (*Lagerstroemia*) and Canary Island Date Palm (*Phoenix canariensis*) are located within landscaped areas at the eastern end of each station platform at the corner of Park Avenue and Richmond Road and the Great Western Highway.

All native trees have been planted. No threatened flora species are likely to occur in this planted vegetation given the highly modified and maintained nature of the landscaped areas.

The small, isolated stands of planted trees in landscaped areas do not provide suitable or important habitat for the threatened fauna that have been previously recorded in the locality. Records of threatened fauna from the wider locality are associated with more extensive areas of intact native vegetation associated with regional reserves and riparian corridors.

6.7.2 Potential impacts

a) Construction phase

Every effort would be made to trim trees instead of removing them. However, where no alternative exists, the proposal would result in the removal of two small patches of planted native and ornamental exotic species located within landscaped areas at the eastern end of each station platform at the corner of Park Avenue and Richmond Road and the Great Western Highway for the upgrade of facilities at the station (refer to Figure 22).

The proposed works would not remove or modify any stands of complete or representative sections of native vegetation or important habitat for common native fauna that may occur at the site on occasion. The small patches of planted trees do not comprise suitable habitat for threatened flora or fauna species and no threatened fauna species would be reliant on these areas for their survival in the locality. Consequently, the proposed works would not have a significant impact on any threatened biota listed under the BC Act or the EPBC Act.

b) Operational phase

The proposed works are located within a highly modified urban landscape and will have very limited impacts on biodiversity values. Impacts during the operational phase on biodiversity would be negligible.

6.7.3 Mitigation measures

Temporary fencing should be installed around trees proposed for retention in the vicinity of the proposed works in accordance with Standards Australia (2009) - *protection of trees on development sites, AS 4970 – 2009* to protect trees during construction.

The removal of individual trees for the proposal would be offset in accordance with the TfNSW *Vegetation Offset Guide* (2016a) and outlined in Table 24. Offsets would be implemented once the exact extent of the clearing required and the number of trees to be removed has been confirmed with TfNSW. Under the TfNSW *Vegetation Offset Guide* (2016a), trees are defined as a 'woody plant greater than two metres tall with a single stem or branches above the base'.

Table 24 Offsetting for individual tree removal

Size of tree (Diameter at Breast Height)	Offset required
Large tree (DBH>60cm)	Plant minimum of 8 trees
Medium tree (DBH 15-60cm)	Plant minimum of 4 trees
Small young tree (DBH<5cm)	Plant minimum of 2 trees

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.



Figure 22: Vegetation at Kingswood Station

6.8 Contamination, landform, geology and soils

A geotechnical desktop assessment and contamination assessment was undertaken as part of the REF. The findings are summarised in this section.

6.8.1 Existing environment

Landform

The landform in the vicinity of Kingswood Station is relatively flat with the station positioned at the same level as the surrounding areas.

Soils and geology

Geological Series Sheet 9030 (Clark and Jones, 1991) shows that Kingswood Station is underlain with Bringelly shale overlying the Hawkesbury Sandstone formation. The Bringelly Shale consists of shale, carbonaceous claystone, laminite, fine to medium-grained lithic sandstone, rare coal and tuff. Localised quaternary alluvium deposits have been mapped approximately 800 metres east of the station.

A search of the Mitchell Soil Landscapes (Mitchell, 2002) identifies that the site is located within the Cumberland Plain soil landscape. This landscape consists of red and brown texture-contrast soils on crests grading to yellow harsh texture-contrast soils in valleys.

A search of the NSW Planning portal tool and the Sharing and Enabling Environmental Data (SEED) showed no occurrences of Acid Sulfate Soils. The Australian Soil Resource Information System (ASRIS) showed extremely low probability of Occurrence of Acid Sulphate Soils.

Contamination

The AS 4482. 1-2005 – *Guide to the investigation and sampling of sites with potentially contaminated soils* – *Non-volatile and semi-volatile compounds* lists the chemicals used by specific industries. The standard lists the following chemicals that are commonly associated with railway yards and may be present at Kingswood Station:

- hydrocarbons
- arsenic
- phenolics
- heavy metals
- nitrates and ammonia.

The EPA contaminated lands register was searched on 4 September 2018. No identified contaminated lands are located within the suburb of Kingswood. A search of the List of NSW Contaminated Sites Notified to the EPA was also undertaken (list current at 2 August 2018), no sites within Kingswood are listed.

The station may contain contaminated materials with the fabric of the existing buildings including:

- asbestos
- lead paint
- polychlorinated biphenyls in light fittings
- synthetic mineral fibres.

There may be contaminated fill present onsite, in particular beneath the hardstand of the platform and within the footprint of the railway corridor. Soils underlying the railway corridor may have also been impacted from previous spills or leaks.

6.8.2 Potential impacts

a) Construction phase

Erosion and sedimentation

The Proposal would require some excavation work for the installation of the lift shaft pits, new footpaths, new ramp and stairs, and associated sign posts. Other trenching or excavation may be required for the relocation of services or vegetation removal.

Excavation and other earthworks such as trenching can result in erosion and sedimentation if not undertaken with appropriate controls. Such impacts can also lead to an adverse effect on water quality and biodiversity through the introduction of sediments into waterways. Erosion and sedimentation risks for the Proposal are considered to be low, as it is expected that erosion could be adequately managed through the implementation of mitigation measures outlined in Table 25 in Section 7.2.

Contamination

Excavation also has the potential to expose contaminants, which if not appropriately managed, can present a health risk to construction workers and the community. Contaminants would also pose an environmental risk if they were to enter nearby waterways through the stormwater infrastructure. As there are no confirmed contaminated sites within close proximity of the Proposal site, contamination is not expected to be encountered.

During construction works, there is also the potential for soil to become contaminated through accidental chemical or fuel spills and leaks from construction plant and equipment. Such impacts would be managed with the implementation of mitigation measures outlined in Table 25 in Section 7.2.

Prior to works commencing on any existing buildings or structures, a hazardous materials survey for lead paint, asbestos and other potentially hazardous materials would be required.

b) Operational phase

There would be no operational risks to geology and soils as a result of the Proposal.

6.8.3 Mitigation measures

As part of the CEMP, a site-specific erosion and sediment controls plan would be prepared and implemented in accordance with the 'Blue Book' - Managing Urban Stormwater: Soils and Construction Guidelines (Landcom, 2004). The plan would be established prior to the commencement of construction and be updated and managed throughout as relevant to the activities during the construction phase.

An environmental risk assessment is to be undertaken prior to construction and must include a section on contamination as per the Transport for NSW Standard Requirements. Measures to mitigate potential impacts from any contaminated soil/materials during construction would be developed and implemented through an unexpected contamination finds procedure and Waste Management Plan as part of the CEMP. Prior to works commencing on buildings and structures a hazardous materials surveys would be completed. Remediation would be undertaken if identified contamination poses a risk to human health or the environment. All waste would be managed in accordance with relevant legislation.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.

6.9 Hydrology and water quality

6.9.1 Existing environment

Surface water

The Proposal site is located within the Werrington Creek sub catchment of the South Creek Catchment which is located within the Hawkesbury-Nepean Catchment. An unnamed ephemeral tributary of Werrington Creek is located about 220 metres south of the station. This tributary is a drainage line running through Chapman Gardens (open space).

Surface water in the vicinity of the Proposal site is managed by the Council stormwater drainage system consisting mainly of kerb and gutter drainage connected to an underground pipe network.

Surface water quality in the vicinity of the Proposal is considered to be consistent with a highly urbanised environment with many sources of pollution such as oils from adjacent road, rubbish and leaf litter.

Groundwater

A search of WaterNSW's realtime data website identified no existing groundwater bores in the vicinity of the Proposal. The nearest groundwater bore with water level information is located about 1.5 kilometres east of the Proposal. The groundwater levels at this bore and surrounding bores is about 10 metres below the surface.

Flooding

The proposal site is not considered to be flood prone due to the distance to any nearby watercourses which would be subject to flooding. Flood mapping provided in the Penrith LEP indicates that the proposal is not located in a flood planning area. The stormwater drainage system in the vicinity of the Proposal is considered to appropriately manage any surface water to prevent flooding.

6.9.2 Potential impacts

a) Construction phase

Surface water

The Proposal would have limited impacts on surface water during the construction phase. Surface water would be diverted around the proposed works, with existing stormwater infrastructure to remain in operation throughout construction. Where impacts to existing stormwater infrastructure is required, alternative arrangement (diversions) would be put in place.

Without the appropriate management of pollutants (such as fuel, chemicals or wastewater from accidental spills, and sediment from excavations and stockpiles), the Proposal has the potential to result in impacts on water quality in nearby stormwater infrastructure and watercourses. With the implementation of mitigation measures outlined in Section 6.9.3 and Table 25 in Section 7.2, water quality impacts associated with the Proposal are considered to be manageable.

Groundwater

Impacts to groundwater are considered to be unlikely as the majority of works would not require excavation to a depth that would intercept the groundwater. Works such as excavation for the lift shafts or the stair foundations would require deeper excavations, however as the groundwater is expected to be at a depth of 10 metres, these activities are still unlikely to impact on groundwater. Should groundwater be encountered any dewatering activities would be undertaken in line with TfNSW's *Water Discharge and Reuse Guideline* (TfNSW, 2017c).

Areas of excavation such as the lift shafts have the potential to accumulate water due to rainfall or seepage in the excavations. Water from excavation would be required to be removed. Incorrect dewatering methods have the potential to result in impacts on nearby watercourses or stormwater infrastructure. Such impacts would be minimised through undertaking any dewatering activities in accordance with TfNSW's *Water Discharge and Reuse Guideline* (TfNSW 2017c).

Flooding

The Proposal site is not expected to be subject to wide spread flooding, however following larger rainfall events some localised flooding may occur. This flooding has the potential to increase the risk of erosion and sedimentation particularly in areas where vegetation clearing or excavation have been undertaken. These impacts would be minimised through implementing the mitigation measures outlined in Table 25 in Section 7.2.

b) Operational phase

The Proposal is unlikely to substantially change the hydrology of the area surrounding the station. The existing stormwater system would continue to manage surface water around the station. The proposal would result in a minor increase in hardstand areas due to the establishment of the new station entrances (particularly the southern entrance) and an additional canopy over the concourse area. This increase has the potential to increase runoff, however the increase is considered to be negligible on flows around the station.

Further hydrological assessment would be undertaken during detailed design to ensure that the Proposal would not be impacted by flooding and would not worsen local flooding patterns.

6.9.3 Mitigation measures

As part of the CEMP, a site-specific erosion and sediment controls plan/s would be prepared and implemented in accordance with the '*Blue Book' - Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004). The Erosion and Sediment Control Plans would be established prior to the commencement of construction and be updated and managed throughout as relevant to the activities during the construction phase.

Surface water movement around the site would be maintained where possible. Any clean water flows would be diverted around the Proposal site to avoid the polluting of these flows.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.

6.10 Air quality

6.10.1 Existing environment

Air quality in the vicinity of the Proposal site is considered to be typical of an urban environment which is located adjacent to a major road (Great Western Highway) and a rail corridor which is utilised by diesel services. Local air quality is also impacted by vehicles on the surrounding local network. Some local industries are also considered to contribute to the local air quality.

The Office of Environment and Heritage (OEH) operates a number of air quality monitoring sites in Sydney's west. The Regional Air Quality Index (RAQI) for western Sydney was generally considered to be between fair and good for June to August 2018. Some elevated ratings including a hazardous rating, where recorded during this period, however it was limited to one day which can be attributed to an event such as bushfire (or hazard reduction burning).

The Department of Environment's *National Pollutant Inventory* was searched on 6 September 2018 for the Kingswood postcode (2747). One facility was identified as being currently monitored for air quality. This facility and others located in neighbouring suburbs are located over three kilometres from the Proposal.

The Proposal is located in close proximity to some air quality sensitive receptors. These receptors are in the form of residential dwellings (including apartments) located to the northeast and south of the station. The nearest of these receptors is 40 metres from the Proposal on the northern side of Park Avenue. St Joseph's Primary School is also located about 100 metres to the north-east of the station.

6.10.2 Potential impacts

a) Construction phase

The main air quality impacts that have the potential to occur during construction would be temporary and associated with dust generation and emissions from construction vehicles and equipment.

Anticipated sources of dust and dust-generating activities include:

- excavation for the foundations and footings for the lifts and new stairs
- other trenching or excavation may be required for footpath and road works, relocation of services, drainage works and vegetation removal
- stockpiling activities
- dust generated from the loading and transfer of material to and from trucks
- movement of vehicles over disturbed areas.

The Proposal would have minimal impact on air quality as it would not involve extensive excavation or other land disturbance with the potential to generate significant quantities of dust.

The operation of plant, machinery and trucks may also lead to increases in exhaust emissions in the local area however these impacts would be minor and short term.

Sources of a reduction to air quality associated with the Proposal are considered to be able to be appropriately managed with the implementation of mitigation measures outlined in Table 25 in Section 7.2.

b) Operational phase

There are no anticipated impacts to air quality during operation of the Proposal. As the Proposal would increase access to public transport, the use of public transport would be anticipated to increase and lead to a relative reduction in the amount of private vehicle related emissions in the long-term.

6.10.3 Mitigation measures

Mitigation measures area aimed around maintaining and operating plant and equipment efficiently and implementing measures for dust suppression including watering, covered loads and appropriate management of tracked dirt/mud on vehicles.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.

6.11 Other impacts

6.11.1 Waste

The construction of the Proposal would generate the following waste:

- earthworks spoil
- green waste
- asphalt and concrete
- various building material wastes (including metals, timbers, plastics, fencing etc)
- electrical wiring and conduit wastes (from electrical connections)
- hazardous wastes
- general waste, including food and other wastes generated by construction workers.

Waste management would be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act). A Waste Management Plan would be prepared that would identify all potential waste streams associated with the works and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities along with other onsite management practices such as keeping areas tidy and free of rubbish.

Waste management targets would be developed for the Proposal through the application of the TfNSW *Sustainable Design Guidelines – Version 4.*0 (TfNSW, 2017b). These targets would include reuse and recycling.

The Proposal would not result in changes to operational waste management arrangements.

Refer to Table 25 in Section 7.2 for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.

6.12 Cumulative impacts

Cumulative impacts occur when two or more projects are carried out concurrently and in close proximity to one another. The impacts may be caused by both construction and operational activities and can result in a greater impact to the surrounding area than would be expected if each project was undertaken in isolation. Multiple projects undertaken at a similar time/similar location may also lead to construction fatigue, particularly around noise, traffic and air quality impacts, if not appropriately managed.

A search of the Department of Planning and Environment's Major Projects Register, Sydney Western City Planning Panel Development and Planning Register, and Penrith Council Development Application Register on 19 September 2018 identified the following projects as potentially occurring concurrently with the Proposal:

Nepean Hospital and Integrated Ambulatory Services Redevelopment (Stage 1), 35 - 65 Derby Street, Kingswood (application number SSD 17_8766). The Stage 1 redevelopment of the

Nepean Hospital Campus would comprise construction of a new 12 storey main hospital building and associated domain works.

Health Services Facility, 84-88 Parker Street, Kingswood (DA number DA18/0773, panel reference 2018SWT008). The Health Services Facility development includes construction of five storey facility including specialised medical tenancies, three levels of basement car parking and associated site works.

During construction, the works (where applicable) would be coordinated with other major construction activities in the area, including the Nepean Hospital Redevelopment and Health Services Facility listed above. Consultation and liaison would occur with Penrith City Council, Sydney Trains, and any other developers identified, to minimise cumulative construction impacts such as traffic and noise.

Traffic associated with the construction work is not anticipated to have a significant impact on the surrounding road network. Operational traffic and transport impacts would have a minimal impact on the performance of the surrounding road network.

Based on this assessment, it is anticipated that the cumulative impacts would be minor, provided that consultation with relevant stakeholders and mitigation measures in Table 23 in Section 7.2 are implemented.

The potential cumulative impacts associated with the Proposal would be further considered as the design develops and as further information regarding the location and timing of potential developments is released. Environmental management measures would be developed and implemented as appropriate.

6.13 Climate change and sustainability

6.13.1 Greenhouse gas emissions

An increase in greenhouse gas emissions, primarily carbon dioxide, would be expected during construction of the Proposal due to exhaust emissions from construction machinery and vehicles transporting materials and personnel to and from site.

The detailed design process would undertake an AS 14064-2 (Greenhouse Gases - project level) compliant carbon footprinting exercise in accordance with TfNSW's Carbon Estimate and Reporting Tool (TfNSW, 2016b). The carbon footprint would to be used to inform decision making in design and construction.

Due to the small scale of the Proposal and the short term temporary nature of the individual construction works, it is considered that greenhouse gas emissions resulting from the construction of the Proposal would be minimal. Furthermore, greenhouse gas emissions generated during construction would be kept to a minimum through the implementation of the standard mitigation measures detailed in Table 25 in Section 7.2.

It is anticipated that, once operational, the Proposal may result in an increase in use of public transport and a relative decrease in use of private motor vehicles by commuters to travel to and from Kingswood. A modal shift in transport usage may reduce the amount of fuel consumed by private motor vehicles with a corresponding relative reduction in associated greenhouse gas emissions in the local area.

6.13.2 Climate change

The dynamic nature of our climate system indicates a need to focus attention on how to adapt to the changes in climate and understand the limitation of adaptation. The effects of climate on the Sydney region can be assessed in terms of weather changes, storm intensity, flooding and increased risk of fire. Climate change could lead to an increase in the intensity of rainfall events, whereby the rainfall expected to occur in a 100-year average recurrence interval flood event would occur more frequently. Rainfall events and flooding are unlikely to impact on the Proposal (see section 6.9 for an assessment on flood impacts).

Climate change could lead to an increase in frequency and severity in bushfires. The Proposal is not situated on land mapped as bush fire prone, but would be designed with appropriate fire protection measures.

6.13.3 Sustainability

The design of the Proposal would be based on the principles of sustainability, including the incorporation of the *NSW Sustainable Design Guidelines – Version 4.0* (TfNSW, 2017a) and the TfNSW *Environmental Management System* (EMS). These guidelines require a number of mandatory and discretionary initiatives to be applied. Refer to Section 3.1.4 for more information regarding the application of these guidelines.

Further positive impacts in relation to climate change and sustainability associated with the Proposal include encouraging a reduction in private vehicle use and increase the accessibility of public transport services.

7 Environmental management

This chapter of the REF identifies how the environmental impacts of the Proposal would be managed through environmental management plans and mitigation measures. Section 7.2 lists the proposed mitigation measures for the Proposal to minimise the impacts of the Proposal identified in Chapter 6.

7.1 Environmental management plans

A CEMP for the construction phase of the Proposal would be prepared in accordance with the requirements of TfNSW's EMS. The CEMP would provide a centralised mechanism through which all potential environmental impacts relevant to the Proposal would be managed, and outline a framework of procedures and controls for managing environmental impacts during construction.

The CEMP would incorporate as a minimum all environmental mitigation measures identified below in Section 7.2, any conditions from licences or approvals required by legislation, and a process for demonstrating compliance with such mitigation measures and conditions.

7.2 Mitigation measures

Mitigation measures for the Proposal are listed below in Table 25. These proposed measures would minimise the potential adverse impacts of the Proposal identified in Chapter 6 should the Proposal proceed.

Table 25 Proposed mitigation measures

No.	Mitigation measure
	General
1.	A Construction Environmental Management Plan (CEMP) would be prepared by the Contractor in accordance with the relevant requirements of <i>Guideline for Preparation of Environmental Management Plans,</i> Department of Infrastructure, Planning and Natural Resources, 2004) for approval by TfNSW, prior to the commencement of construction and following any revisions made throughout construction.
2.	A project risk assessment including environmental aspects and impacts would be undertaken by the Contractor prior to the commencement of construction and documented as part of the CEMP.
3.	An Environmental Controls Map (ECM) would be developed by the Contractor in accordance with TfNSW's <i>Guide to Environmental Controls Map</i> (TfNSW, 2017d) for approval by TfNSW, prior to the commencement of construction and following any revisions made throughout construction.
4.	Prior to the commencement of construction, all contractors would be inducted on the key project environmental risks, procedures, mitigation measures and conditions of approval.
5.	Site inspections to monitor environmental compliance and performance would be undertaken during construction at appropriate intervals.
6.	Service relocation would be undertaken in consultation with the relevant authority. Contractors would mark existing services on the ECM to avoid direct impacts during construction.

7. Any modifications to the Proposal, if approved, would be subject to further assessment and approval by TfNSW. This assessment would need to demonstrate that any environmental impacts resulting from the modifications have been minimised.

Traffic and site access

- 8. Prior to the commencement of construction, a Construction Traffic Management Plan (CTMP) would be prepared as part of the CEMP and would include at a minimum:
 - ensuring adequate road signage at construction work sites to inform motorists and pedestrians of the work site ahead to ensure that the risk of road accidents and disruption to surrounding land uses is minimised
 - maximising safety and accessibility for pedestrians and cyclists
 - ensuring adequate sight lines to allow for safe entry and exit from the site
 - ensuring access to railway stations, businesses, entertainment premises and residential properties (unless affected property owners have been consulted and appropriate alternative arrangements made)
 - managing impacts and changes to on and off street parking and requirements for any temporary replacement provision
 - parking locations for construction workers away from stations and busy residential areas and details of how this will be monitored for compliance
 - routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and businesses
 - details for relocating kiss and ride, taxi ranks and rail replacement bus stops if required, including appropriate signage to direct patrons, in consultation with the relevant bus/taxi operators. Particular provisions would also be considered for the accessibility impaired
 - measures to manage traffic flows around the area affected by the Proposal, including as required regulatory and direction signposting, line marking and variable message signs and all other traffic control devices necessary for the implementation of the CTMP.

Consultation with the relevant roads authorities would be undertaken during preparation of the CTMP. The performance of all project traffic arrangements must be monitored during construction.

- **9.** Communication would be provided to the community and local residents to inform them of changes to parking, pedestrian access and/or traffic conditions including vehicle movements and anticipated effects on the local road network relating to site works.
- 10. Road Occupancy Licences for temporary road closures would be obtained, where required.
- **11.** Consideration would be given to possible traffic control requirements near the bus stop when large vehicles need to access the site during construction and operation.
- **12.** Workers would be encouraged to use alternate transport options such as public transport to access the site to reduce impacts on the parking demand.
- **13.** Workers would be prohibited to park within the commuter car park.

Urban design, landscape and visual amenity

- 14. An Urban Design Plan (UDP) would be prepared by the Contractor, in consultation with the relevant council, and submitted to TfNSW for endorsement by the Precincts and Urban Design team, prior to finalisation of the detailed design. The UDP, at a minimum, would address the following:
 - the appropriateness of the proposed design with respect to the existing surrounding landscape, built form, behaviours and use-patterns (including consideration of Crime Prevention Through Environmental Design principles). This is to include but not be limited to:
 - connectivity with surrounding local and regional movement networks including street networks, other transport modes and active transport networks. Existing and proposed paths of travel for pedestrians and bicycles should be shown
 - integration with surrounding local and regional open space and or landscape networks. Existing and proposed open space infrastructure/landscape elements should be shown
 - integration with surrounding streetscape including street wall height, active frontages, awnings, street trees, entries, vehicle cross overs etc
 - integration with surrounding built form (existing or desired future) including building height, scale, bulk, massing and land-use
 - design detail that is sensitive to the amenity and character of heritage items located within or adjacent to the Proposal site.
- **15.** A Public Domain Plan (PDP) would be prepared by the Contractor, in consultation with the relevant council, and submitted to TfNSW for endorsement by the Precincts and Urban Design team, prior to finalisation of the detailed design. The PDP, at a minimum, would address the following:
 - materials, finishes, colour schemes and maintenance procedures including graffiti control for new walls, barriers and fences
 - location and design of pedestrian and bicycle pathways, street furniture including relocated bus and taxi facilities, bicycle storage (where relevant), telephones and lighting equipment
 - landscape treatments and street tree planting to integrate with surrounding streetscape
 - opportunities for public art created by local artists to be incorporated, where considered appropriate, into the Proposal
 - total water management principles to be integrated into the design where considered appropriate
 - design measures included to meet TfNSW's NSW Sustainable Design Guidelines -Version 4.0 (TfNSW, 2017a)
 - identification of design and landscaping aspects that will be open for stakeholder input, as required.
- **16.** All permanent lighting would be designed and installed in accordance with the requirements of standards relevant to AS 1158 Road Lighting and AS 4282 Controlling the Obtrusive Effects of Outdoor Lighting.
- **17.** The detailed design of the Proposal would comply with Crime Prevention Through Environmental Design principles.
- **18.** Worksite compounds would be screened with shade cloth (or similar material, where necessary) to minimise visual impacts from key viewing locations.

- **19.** Temporary hoardings, barriers, traffic management and signage would be removed when no longer required.
- **20.** During construction, graffiti would be removed in accordance with TfNSW's Standard Requirements.
- 21. Light spill from the construction area into adjacent visually sensitive properties would be minimised by directing construction lighting into the construction areas and ensuring the site is not over-lit. This includes the sensitive placement and specification of lighting to minimise any potential increase in light pollution.

Noise and vibration

- 22. During detailed design further background noise monitoring and analysis would be undertaken to minimise the potential for sleep disturbance during construction. Where there are any residual exceedances the following reasonable and feasible noise mitigation measures will be applied to address potential sleep disturbance impacts would include:
 - Further assessment of potential sleep disturbance impacts shall be undertaken during detailed design.
 - Background noise monitoring shall be undertaken in accordance with the Noise Policy for Industry at the nearest sensitive receiver (or a representative location if the nearest location is unavailable) to assist in determining receivers eligible for additional mitigation measures.
 - An Out of Hours Work Protocol shall be developed as part of the CEMP for the project for the assessment, management and approval of works outside standard construction hours.
- 23. Prior to commencement of works, a Construction Noise and Vibration Management Plan (CNVMP) would be prepared and implemented in accordance with the requirements of the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009), *Construction Noise Strategy* (TfNSW, 2016a) and the Noise and Vibration Impact Assessment for the Proposal (GHD, 2018c). The CNVMP would take into consideration measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable.

- 24. The CNVMP would outline measures to reduce the noise impact from construction activities. Reasonable and feasible noise mitigation measures which would be considered, include:
 - regularly training workers and contractors (such as at the site induction and toolbox talks) on the importance of minimising noise emissions and how to use equipment in ways to minimise noise
 - avoiding any unnecessary noise when carrying out manual operations and when operating plant
 - ensuring spoil is placed and not dropped into awaiting trucks
 - avoiding/limiting simultaneous operation of noisy plant and equipment within discernible range of a sensitive receiver where practicable
 - switching off any equipment not in use for extended periods e.g. heavy vehicles engines would be switched off whilst being unloaded
 - avoiding deliveries at night/evenings wherever practicable
 - no idling of delivery trucks
 - keeping truck drivers informed of designated vehicle routes, parking locations and acceptable delivery hours for the site
 - minimising talking loudly; no swearing or unnecessary shouting, or loud stereos/radios onsite; no dropping of materials from height where practicable, no throwing of metal items and slamming of doors.
- **25.** The CNVMP would include measures to reduce the construction noise and vibration impacts from mechanical activities. Reasonable and feasible noise mitigation options which would be considered, include:
 - maximising the offset distance between noisy plant and adjacent sensitive receivers and determining safe working distances
 - using the most suitable equipment necessary for the construction works at any one time
 - directing noise-emitting plant away from sensitive receivers
 - regularly inspecting and maintaining plant to avoid increased noise levels from rattling hatches, loose fittings etc
 - using non-tonal reversing/movement alarms such as broadband (non-tonal) alarms or ambient noise-sensing alarms for all plant used regularly onsite (greater than one day), and for any out of hours works
 - use of quieter and less vibration emitting construction methods where feasible and reasonable.
- 26. Works would generally be carried out during standard construction hours (i.e. 7.00 am to 6.00 pm Monday to Friday; 8.00 am to 1.00 pm Saturdays). Any works outside these hours may be undertaken if approved by TfNSW and the community is notified prior to these works commencing. An Out of Hours Work application form would need to be prepared by the Contractor and submitted to the TfNSW Environment and Planning Manager for any works outside normal hours.
- 27. Where the L_{Aeq (15minute)} construction noise levels are predicted to exceed 75 dBA and/or 30 dBA above the Rating Background Level at nearby affected sensitive receivers, respite periods would be observed, where practicable, and in accordance with TfNSW's *Construction Noise Strategy* (TfNSW, 2012c). This would include restricting the hours that very noisy activities can occur.
- 28. To avoid structural impacts as a result of vibration or direct contact with structures, the proposed works would be undertaken in accordance with the safe work distances outlined in the Noise and Vibration Assessment (GHD, 2018c) and attended vibration monitoring or vibration trials would be undertaken where these distances are required to be challenged.

- **29.** Vibration resulting from construction and received at any structure outside of the project would be managed in accordance with:
 - for structural damage vibration German Standard DIN 4150: Part 3 1999 Structural Vibration in Buildings: Effects on Structures and British Standard BS 7385-2:1993 Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)
 - for human exposure to vibration the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: A Technical Guideline (Department of Environment and Conservation, 2006) which includes British Standard BS 7385-2:1993 Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz).
- **30.** Work would be conducted behind temporary hoardings/screens wherever practicable. The installation of construction hoarding would take into consideration the location of residential receivers.
- **31.** Property conditions surveys would be completed prior to piling, excavation of bulk fill or any vibratory works including jack hammering and compaction for all buildings/structures/roads with a plan distance of 50 metres from the works and all heritage listed buildings and other sensitive structures within 150 metres of the works (unless otherwise determined following additional assessment they are not likely to be adversely affected).

Indigenous heritage

32. If unforseen Indigenous objects are uncovered during construction, the procedures contained in TfNSW's *Unexpected Heritage Finds Guideline* (TfNSW, 2016b) would be followed, and works within the vicinity of the find would cease immediately. The Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager so they can assist in co-ordinating next steps which are likely to involve consultation with an Aboriginal heritage consultant, the OEH and the Local Aboriginal Land Council. If human remains are found, work would cease, the site secured and the NSW Police and the OEH notified. Where required, further archaeological investigations and an Aboriginal Heritage Impact Permit would be obtained prior to works recommencing at the location.

Non-Indigenous heritage

- **33.** A heritage induction would be provided to workers prior to construction, informing them of the location of known heritage items and guidelines to follow if unanticipated heritage items or deposits are located during construction.
- **34.** In the event that any unanticipated archaeological deposits are identified within the project site during construction, the procedures contained in TfNSW's *Unexpected Heritage Finds Guideline* (TfNSW, 2016b) would be followed, and works within the vicinity of the find would cease immediately. The Contractor would immediately notify the TfNSW Project Manager and the TfNSW Environment and Planning Manager so they can assist in co-ordinating the next steps which are likely to involve consultation with an archaeologist and OEH. Where required, further archaeological work and/or consents would be obtained for any unanticipated archaeological deposits prior to works recommencing at the location.

Socio-economic

35. Sustainability criteria for the Proposal would be established to encourage the Contractor to purchase goods and services locally, helping to ensure the local community benefits from the construction of the Proposal.

- **36.** Feedback through the submissions process would be encouraged to facilitate opportunities for the community and stakeholders to have input into the project, where practicable.
- **37.** A Community Liaison Plan would be prepared prior to construction to identify all potential stakeholders and best practice methods for consultation with these groups during construction. The plan would also encourage feedback and facilitate opportunities for the community and stakeholders to have input into the project, where practicable.
- **38.** Contact details for a 24-hour construction response line, Project Infoline and email address would be provided for ongoing stakeholder contact throughout the construction phase.
- **39.** The community would be kept informed of construction progress, activities and impacts in accordance with the Community Liaison Plan to be developed prior to construction.

Biodiversity

- **40.** Construction of the Proposal must be undertaken in accordance with TfNSW's Vegetation Management (Protection and Removal) Guideline (TfNSW, 2015d) and TfNSW's Fauna Management Guideline (TfNSW, 2017e).
- **41.** All workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity.
- 42. Disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. Trees nominated to be removed in the Ecological Impact Assessment (GHD, 2018d) would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed below and marked on the Environmental Control Map.
- **43.** Tree Protection Zones (TPZs) would be established around trees to be retained, as nominated in the Ecological Impact Assessment (GHD, 2018b). Tree protection would be undertaken in line with *AS* 4970-2009 Protection of Trees on Development Sites and would include exclusion fencing of TPZs.
- 44. In the event of any tree to be retained becoming damaged during construction, the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager to coordinate the response which may include contacting an arborist to inspect and provide advice on remedial action, where possible.
- **45.** Should the detailed design or onsite works determine the need to remove or trim any additional trees, which have not been identified in the REF, the Contractor would be required to complete TfNSW's Tree Removal Application Form and submit it to TfNSW for approval.
- **46.** For new landscaping works, mulching and watering would be undertaken until plants are established.
- **47.** Weed control measures, consistent with TfNSW's *Weed Management and Disposal Guideline* (TfNSW, 2015e), would be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during the construction phase of the project. This would include the management and disposal of weeds in accordance with the *Biosecurity Act 2015*.
No. Mitigation measure

48. Where possible the trimming of trees would be selected over removal. Where this is not possible, the removal of individual trees for the proposal would be offset in accordance with the Vegetation Offset Guide (TfNSW 2016a). Offsets would be implemented once the exact extent of clearing required and number of trees to be removed has been confirmed with TfNSW.

Soils and water

- **49.** Prior to commencement of works, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the 'Blue Book' *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) and updated throughout construction so it remains relevant to the activities. The Erosion and Sediment Control Plan measures would be implemented prior to commencement of works and maintained throughout construction.
- **50.** Erosion and sediment control measures would be established prior to any clearing, grubbing and site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. Erosion and sediment control measures would be maintained and left in place until the works are complete and areas are stabilised.
- **51.** Vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks. Construction plant, vehicles and equipment would also be refuelled offsite, or in a designated refuelling area.
- **52.** All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and TfNSW's *Chemical Storage and Spill Response Guidelines* (TfNSW, 2016c).
- **53.** Adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the TfNSW *Chemical Storage and Spill Response Guidelines* (TfNSW, 2016c) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in how to use the kits in the case of a spill.
- **54.** In the event of a pollution incident, works would cease in the immediate vicinity and the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager. The EPA would be notified by TfNSW if required, in accordance with Part 5.7 of the POEO Act.
- 55. The existing drainage systems would remain operational throughout the construction phase.
- **56.** Should groundwater be encountered during excavation works, groundwater would be managed in accordance with the requirements of the *Waste Classification Guidelines* (EPA, 2014) and TfNSW's *Water Discharge and Reuse Guideline* (TfNSW, 2017c).

Air quality

- **57.** Air quality management for the Proposal would be undertaken in accordance with TfNSW's *Air Quality Management Guideline* (TfNSW, 2017f).
- **58.** Methods for management of emissions would be incorporated into project inductions, training and pre-start/toolbox talks.

No. Mitigation measure

- **59.** Plant and machinery would be regularly checked and maintained in a proper and efficient condition. Plant and machinery would be switched off when not in use, and not left idling.
- **60.** Vehicle and machinery movements during construction would be restricted to designated areas and sealed/compacted surfaces where practicable.
- **61.** To minimise the generation of dust from construction activities, the following measures would be implemented and included in the CEMP:
 - apply water (or alternate measures) to exposed surfaces (e.g. unpaved roads, stockpiles, hardstand areas and other exposed surfaces)
 - cover stockpiles when not in use
 - appropriately cover loads on trucks transporting material to and from the construction site and securely fix tailgates of road transport trucks prior to loading and immediately after unloading
 - prevent mud and dirt being tracked onto sealed road surfaces.

Waste and contamination

- 62. The CEMP (or separate Waste Management Plan, if necessary) must address waste management and would at a minimum:
 - identify all potential waste streams associated with the works and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities
 - detail other onsite management practices such as keeping areas free of rubbish
 - specify controls and containment procedures for hazardous waste and asbestos waste
 - outline the reporting regime for collating construction waste data.
- **63.** An appropriate Unexpected Finds Protocol, considering asbestos containing materials and other potential contaminants, would be included in the CEMP. Procedures for handling asbestos containing materials, including licensed contractor involvement as required, record keeping, site personnel awareness and waste disposal to be undertaken in accordance with WorkCover requirements.
- **64.** All spoil to be removed from site would be tested to confirm the presence of any contamination. Any contaminated spoil would be disposed of at an appropriately licensed facility.
- 65. All spoil and waste must be classified in accordance with the *Waste Classification Guidelines Part 1: Classifying waste (EPA, 2014)* prior to disposal.
- 66. Any concrete washout would be established and maintained in accordance with TfNSW's *Concrete Washout Guideline* – draft (TfNSW, 2015f) with details included in the CEMP and location marked on the ECM.
- 67. Hazardous material surveys are to be undertaken for the station to confirm the presence of any potentially hazardous materials.
- 68. An environmental risk assessment is to be undertaken prior to construction and must include a section on contamination as per the Transport for NSW Standard Requirements.

Climate change and sustainability

69. Detailed design of the Proposal would be undertaken in accordance with the *NSW Sustainable Design Guidelines* – *Version 4.0* (TfNSW, 2017a).

No. Mitigation measure

Cumulative impacts

70. The potential cumulative impacts associated with the Proposal would be further considered as the design develops and as further information regarding the location and timing of potential developments is released. Environmental management measures would be developed in the CEMP, and implemented as appropriate.

8 Conclusion

This REF has been prepared in accordance with the provisions of section 5.5 of the EP&A Act, taking into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the Proposal.

The Proposal would provide the following benefits:

- improved accessibility for station customers and pedestrians, particularly people with a disability, less mobile and those with prams or luggage
- improved customer amenity and facilities, including accessible toilets, increase area within the concourse to improve flow
- improved access to transport interchange facilities through improved paths to meet DDA requirements
- improved safety for customers on the station platform, including upgrade of station system including CCTV, emergency help points.
- The likely key impacts of the Proposal are as follows:
- temporary noise and vibration impacts during construction
- temporary traffic impacts during construction
- temporary disruptions to station facilities and amenities during construction
- removal of trees/vegetation that would require planting offsets
- visual impacts to sensitive receivers during operation including the introduction of new elements, such as canopies and lifts, into the visual environment.

This REF has considered and assessed these impacts in accordance with clause 228 of the EP&A Regulation and the requirements of the EPBC Act (refer to Chapter 6, Appendix A and Appendix B). Based on the assessment contained in this REF, it is considered that the Proposal is not likely to have a significant impact upon the environment or any threatened species, populations or communities. Accordingly an EIS is not required, nor is the approval of the Minister for Planning.

The Proposal would also take into account the principles of ESD (refer to Section 3.1.4 and Section 0). These would be considered during the detailed design, construction and operational phases of the Proposal. This would ensure the Proposal is delivered to maximum benefit to the community, is cost effective and minimises any adverse impacts on the environment.

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Appendix A Consideration of matters of National Environmental Significance

The table below demonstrates TfNSW's consideration of the matters of NES under the EPBC Act to be considered in order to determine whether the Proposal should be referred to Commonwealth Department of the Environment.

Matters of NES	Impacts
Any impact on a World Heritage property? There are no World Heritage Properties in the vicinity of the Proposal.	Nil
Any impact on a National Heritage place? There are no National Heritage places in the vicinity of the Proposal.	Nil
Any impact on a wetland of international importance? There are no wetland of international importance in the vicinity of the Proposal.	Nil
Any impact on a listed threatened species or communities? It is unlikely that the development of the Proposal would significantly affect any listed threatened species or communities.	Nil
Any impacts on listed migratory species? It is unlikely that the development of the Proposal would significantly affect any listed migratory species.	Nil
Does the Proposal involve a nuclear action (including uranium mining)? The Proposal does not involve a nuclear action.	Nil
Any impact on a Commonwealth marine area? There are no Commonwealth marine areas in the vicinity of the Proposal.	Nil
Does the Proposal involve development of coal seam gas and/or large coal mine that has the potential to impact on water resources? The Proposal is for a transport facility and does not relate to coal seam gas or mining.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The Proposal would not be undertaken on or near any Commonwealth land.	Nil

Appendix B Consideration of clause 228

The table below demonstrates TfNSW's consideration of the specific factors of clause 228 of the EP&A Regulation in determining whether the Proposal would have a significant impact on the environment.

Factor	Impacts
(a) Any environmental impact on a community? There would be some temporary impacts to the community during construction, particularly in relation to noise, traffic, access and visual amenity. Mitigation measures outlined in Section 7.2 would be implemented to manage and minimise adverse impacts.	Minor
 (b) Any transformation of a locality? The Proposal would include the introduction of new visible elements in the landscape (including a new roof over the existing concourse area, solar panels, new lift and stairs, new drainage, new fencing and handrails). The appearance of the new elements would be consistent with the existing station elements and are considered to be common features in urban areas. Vegetation removal is limited to removal of two small patches of planted native and ornamental exotic species located within landscaped areas at the eastern end of each station platform at the corner of Park Avenue and Richmond Road and the Great Western Highway. 	Minor
(c) Any environmental impact on the ecosystem of the locality? The Proposal would require the removal of two small patches or planted native and ornamental exotic species, however this vegetation does not form part of any threatened ecological communities, or is likely to provide habitat for threatened species and so would have a negligible impact to the ecosystem. The extent of vegetation trimming and removal has been minimised as far as practicable. Any additional trees that are found to require removal, not assessed in this REF, would be subject to further assessment, offsetting and approval from TfNSW.	Minor
 (d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? There would be some temporary impacts during construction particularly in relation to noise, traffic and access and visual amenity. The removal of vegetation would also result in a visual change however the number of trees to be removed is limited and would be managed via offsetting. Operational landscape impacts on the locality would be either negligible or would not impact on identified sensitive receivers. Operational visual impacts range from moderate to negligible. 	Minor

Factor	Impacts
 (e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The Proposal would have a positive contribution to the locality by creating equitable access to the station and the platform. Non-Aboriginal heritage items are unlikely to be impacted by the Proposal. A desktop archaeological assessment has been undertaken which determined that there is a low risk of encountering archaeological items/deposits and that the Proposal is unlikely to expose historical archaeological relics. 	Nil
(f) Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)? The Proposal is unlikely to have any impact on the habitat of protected fauna.	Nil
(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The Proposal is unlikely to have any impact on endangering any species of animal, plant or other form of like, whether living on land, in water or in the air.	Nil
(h) Any long-term effects on the environment? The Proposal is unlikely to have any long-term effects on the environment.	Nil
(i) Any degradation of the quality of the environment? The Proposal is unlikely to have any degradation of the quality of the environment.	Nil
(j) Any risk to the safety of the environment? Provided the recommended mitigation measures are implemented, the Proposal is unlikely to cause any pollution or safety risks to the environment. Specific management measures would be implemented to manage asbestos and other hazardous materials that may be encountered during construction works.	Minor
(k) Any reduction in the range of beneficial uses of the environment? The Proposal is unlikely to have any reduction in the range of beneficial uses of the environment.	Nil
(I) Any pollution of the environment? The Proposal is unlikely to cause any pollution of the environment provided the recommended mitigation measures are implemented as outlined in section 7.2.	Nil

Factor	Impacts
(m) Any environmental problems associated with the disposal of waste?	Minor
The Proposal is unlikely to cause any environmental problems associated with the disposal of waste.	
Hazardous waste and special waste may be generated from the Proposal. Prior to construction, contamination investigations would be undertaken to confirm the presence of contaminated material, particularly asbestos. All waste would be managed and disposed of with a site-specific Waste Management Plan prepared as part of the Construction Environmental Management Plan. Mitigation measures would be implemented to ensure waste is reduced, reused or recycled where practicable.	
(n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?	Nil
The Proposal is unlikely to increase demands on resources that are, or are likely to become, in short supply.	
(o) Any cumulative environmental effect with other existing or likely future activities?	Nil
Cumulative effects of the Proposal are described in Section 6.12. Where feasible, project activities and environmental management measures would be co-ordinated to reduce any cumulative construction impacts. The Proposal is unlikely to have any significant adverse long-term impacts.	
(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	Nil
The Proposal is unlikely to impact on coastal processes and coastal hazards, including those under projected climate change conditions.	

Appendix C

Sustainable Design Guidelines checklist

Initiative	Theme	Description	Under consideration
1	Energy and greenhouse gases	All projects with a CapEx > \$15 million to reduce construction related GHG emissions by a minimum 5% from the project baseline GHG footprint established using the Carbon Estimate and Reporting Tool (CERT).	No (Project CAPEX value is <\$10M)
2	Energy and greenhouse gases	 Buildings are required to be designed and built to reduce energy consumption: Covered or uncovered areas shall meet prerequisite requirements for services (Appendix F, Section 3). Enclosed building spaces shall meet the performance targets of the energy modelling pathway (P2-P5). Where enclosed building space cost < \$10 million the prescriptive pathway may be followed in lieu of energy modelling (P1). 	No (no new buildings)
2A	Energy and greenhouse gases	All new electrical equipment (for the final asset) to be at least market average star rating. In categories where no star ratings are available, equipment purchased should be recognised as high efficiency either by being ENERGY STAR accredited, in a high efficiency band under Australian Standards or being above-average efficiency of Greenhouse and Energy Minimum Standards (GEMS) registered products.	Yes
3	Climate resilience	All projects with a CapEx >\$15 million to undertake a climate risk assessment that mitigates all extreme and high residual risks. Refer to I&S Climate Risk Assessment Guide for further guidance.	No (Project CAPEX value is <\$10M)
4	Materials and waste	90% of construction waste and demolition waste (by weight) to be diverted from landfill for all projects with a CapEx > \$15 million.	No (Project CAPEX value is <\$10M)
5	Materials and waste	100% of usable spoil (by weight) to be beneficially reused for all projects generating >300m3 of spoil	No

Initiative	Theme	Description	Under consideration
6	Water	Treat all new effective impervious area with a continuous area >1000m ² to the following treatment levels: 90% gross pollutants 85% suspended solids 65% Total phosphorus 45% Total nitrogen Maintain or reduce 1.5 year ARI. 	No (impervious area <1000m²)
7	Water	All projects with a CapEx > \$15 million to monitor and report water consumption during project construction and reduce potable water consumption where practicable.	No (Project CAPEX value is <\$10M)
8	Water	All projects with a CapEx >\$15 million to undertake a water balance study and identify and implement appropriate and proportionate operational water efficiency measures.	No (Project CAPEX value is <\$10M)
8A	Water	All new water-using appliances, shower heads, taps and toilets must be at least the average Water Efficiency Labelling Scheme (WELS) star rating by product type.	Yes
9	Pollution control	All surface coatings to comply with the Australian Paint Approval Scheme (APAS) Volatile Organic Compounds Limits where fit for purpose	Yes
10	Pollution control	All mobile non-road diesel plant and equipment (with an engine greater than 19kW) to report engine conformity with relevant United States Environmental Protection Agency (US EPA), European Union (EU) or equivalent emissions standards and the fitting of any exhaust after treatment devices. Reporting should be in accordance with the Air Emission Data Workbook – 9TP-FT-439.	Yes
11	Biodiversity	All projects with non-significant biodiversity impacts to comply with the Infrastructure and Services Vegetation Offset Guide as applicable.	Yes
12	Community benefit	 All projects must: i. meet steel and timber sustainable procurement requirements; and ii. undertake sustainable procurement training for high impact suppliers. 	Yes

Initiative	Theme	Description	Under consideration
13	Community benefit	All projects to address the urban design principles in the TfNSW Interim Urban Design Best Practice Guidelines within their urban design and landscaping plan (UDLP).	Yes
14	Community benefit	The project is awarded at least 1 point for a single initiative against the ISCA Innovation Credit Inn-1 OR The project makes a contribution to industry and/or the local community in line with the	Yes
		project legacy categories specified (Note: the requirements are determined by CapEx).	