Transport for New South Wales
30-Mar-2016

Narwee Station Upgrade

Traffic, Transport and Access Impact Assessment

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Client: Transport for New South Wales

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Quality Information

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1.0 Introduction

1.1 Background

Transport for NSW (TfNSW) has proposed the Narwee Station Upgrade (the 'Proposal'). The Proposal forms part of the Transport Access Program (TAP), a NSW Government initiative to provide accessible, modern, secure and integrated transport infrastructure. The aim is to provide accessible station precincts for the mobility impaired, the elderly and parents/carers with prams and to meet the needs of a growing population. Interchange facilities must allow for seamless transfer between all modes, and for all customers, and safety must be given priority to all design options.

In 2015, Jacobs (commissioned by TfNSW) produced accessibility upgrade concept plans and undertook options development and assessment for the Narwee Station Precinct. The report developed alternative concept plans to address station precinct deficiencies and a preferred concept was identified using a Multi-Criteria Assessment methodology.

The preferred concept has since been refined and is being progressed towards construction and implementation. As part of the Review of Environmental Factors (REF), AECOM has been commissioned by TfNSW to undertake a Traffic, Transport and Access Impact Assessment of the construction and operation of the Proposal.

1.2 Proposal context

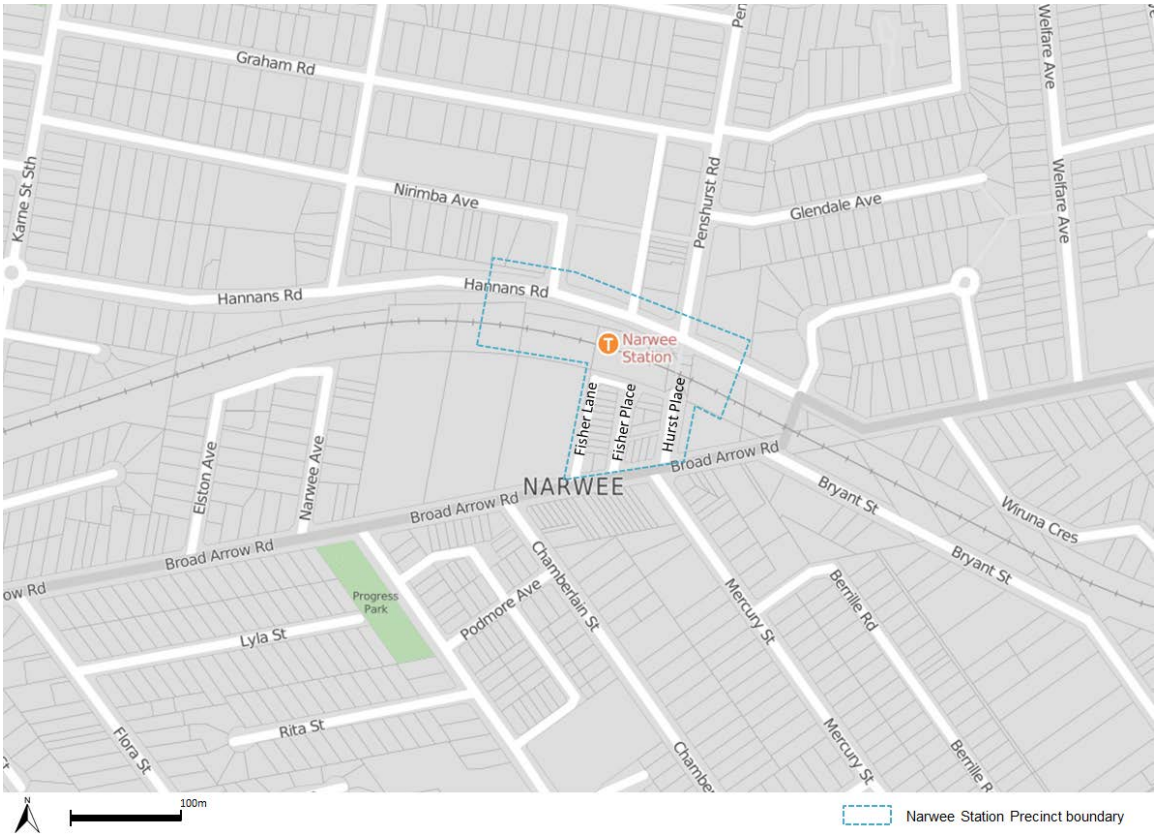
The objective of TfNSW's Transport Access Program is to "provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure". The program aims to provide station upgrades which would deliver components of this objective, as summarised below:

- stations that are accessible to those with a disability, the elderly and parents/carers with prams
- 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, help points, 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.

1.3 Study area

Narwee Station is located between Broad Arrow Road and Hannans Road in the suburb of Narwee. The Narwee Station Precinct includes the rail station, associated interchange structures and buildings, gates, pedestrian and cycle access paths, pedestrian access, pedestrian linkages to the adjacent streets and commuter car parking, bus stops, kiss and ride and bicycle facilities. The indicative boundary definition of Narwee Station Precinct is shown in Figure 1. The broader Narwee area has also been considered in terms of the road network and potential traffic impacts on the northern and southern side of the station.

Figure 1 Location map



Source: AECOM, 2016

1.4 Proposed works

The Proposal involves an upgrade of Narwee Station as part of the Transport Access Program which would improve accessibility and amenities for customers. The Proposal would provide a number of improved features to provide an accessible station and improved interchange facilities, including:

- extension of the island platform at the eastern end to provide new stairs, a lift and waiting area
- installation of new canopies for weather protection above the new lift, stairs and waiting area providing cover up to the existing Platform Building
- refurbishment of the Platform Building with a new family accessible toilet, a Customer Information Window and staff facilities to replace existing facilities in the Ticket Office (to be demolished)
- improvements to bicycle facilities including new shelters and additional bicycle racks
- provision of a new kiss and ride area, new kerb ramps and bus zone works (including new shelter) on Hannans Road
- upgrade of the two existing accessible parking spaces in the commuter car park off Hannans Road to ensure compliance with relevant standards
- provision of an accessible parking space, upgrade of the taxi rank and kiss and ride area, and installation of Tactile Ground Surface Indicators (TGSI's) at the raised pedestrian crossing on Hurst Place and Fisher Place
- ancillary works including localised platform regrading (as necessary), improvements to lighting and seating, improvement of station communication systems (including CCTV cameras), wayfinding signage, services diversion and/or relocation, station power supply upgrade, minor road/drainage works, fencing and landscaping.

A detailed description of the Proposal and its associated works are provided in Chapter 3 of the *Narwee Station Upgrade Review of Environmental Factors* (AECOM) April 2016.

Construction is anticipated to commence in 2016 and would take approximately 18 months to complete. It is likely that around six weekend rail possessions would be required (requiring temporary station closure).

An alternative construction option is being considered which may use an extended (six week) temporary station closure to allow for an accelerated construction completion which would reduce the overall program by up to six months.

If the temporary station closure option is adopted, replacement shuttle buses would be provided between Narwee and its adjacent stations (Beverly Hills and Riverwood) at suitable intervals for the duration of the shutdown. The benefits of this alternative construction option include:

- reduced construction period (by up to six months) which would allow the upgraded station to be opened to the community sooner
- reduced temporary visual and amenity impacts due to a reduced construction period
- remove the need for a temporary pedestrian access bridge
- reduce the safety risk to the customers from the construction/pedestrian interface
- improve construction staging efficiency with potential cost benefits.

The construction methodology would be further developed during the detailed design of the Proposal by the nominated contractor in consultation with TfNSW. Both the option to provide a temporary pedestrian access bridge and the option to use a temporary station closure have been assessed in this report.

1.5 Scope of the study

This Traffic, Transport and Access Impact Assessment provides a high level assessment of the potential impacts of the Proposal on transport, traffic, access and road safety. The purpose of this report is to:

- assess the existing traffic and transport conditions in and around the Station Precinct
- evaluate the operational impacts associated with the Proposal
- assess the construction impacts associated with the Proposal
- recommend mitigation measures to manage impacts, if required.

A site visit was undertaken on Thursday 18 February 2016 to observe the existing conditions at the site. In addition, a number of technical documents were reviewed to inform the assessment of Narwee Station, including:

- Concept Plans Final Report (Jacobs, March 2015)
- Traffic, Transport and Access Impact Assessment (Jacobs, January 2015)
- Narwee Pedestrian Modelling Technical Note (Jacobs, February 2015).

2.0 Existing conditions

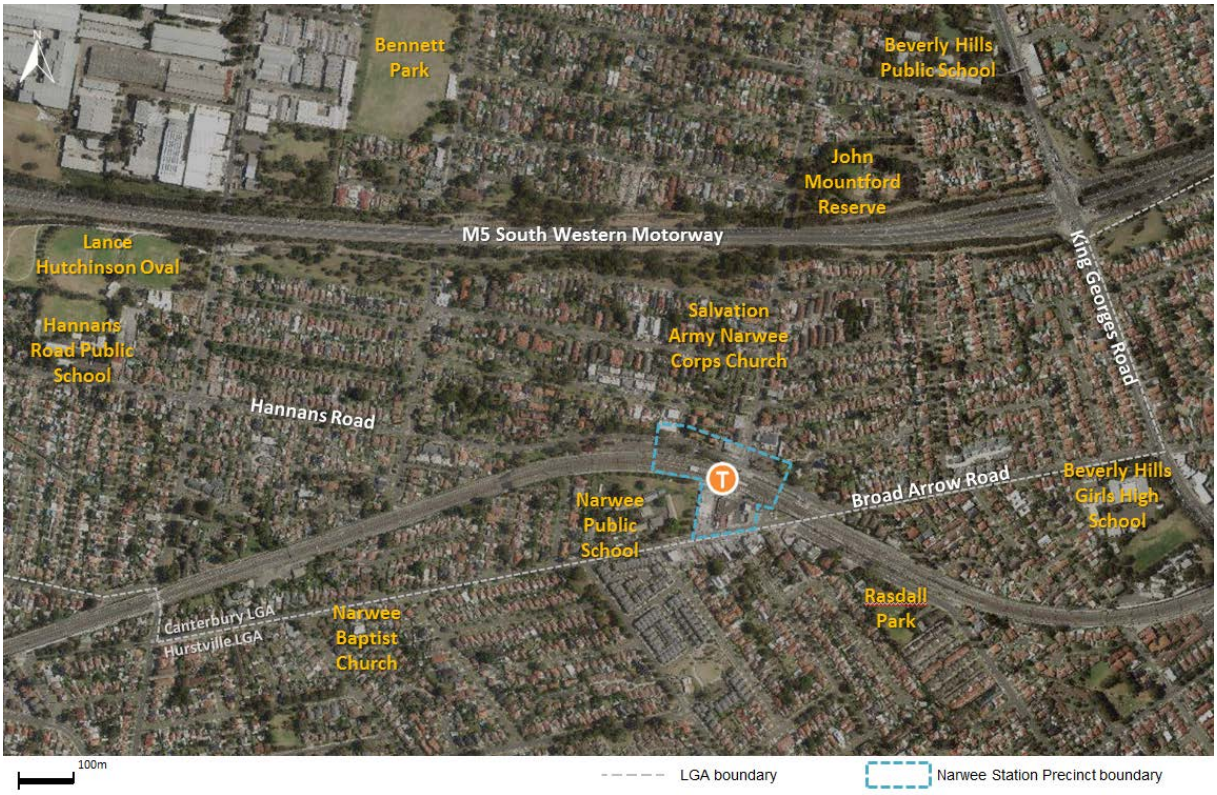
2.1 Narwee context

The suburb of Narwee is located around 16 kilometres south-west of Sydney Central Business District (CBD). The area north of Broad Arrow Road is located within the Canterbury Local Government Area (LGA) and the area to the south is located within the Hurstville LGA.

Narwee is bordered by Riverwood to the west, Beverly Hills to the east, Mortdale to the south and Roselands to the north. The suburb is served by the T2 Airport, Inner West and South Line providing connections to the suburban Sydney Trains Network. The adjacent stations to Narwee are Beverly Hills (east) and Riverwood (west).

Land use surrounding Narwee Station comprises primarily low and medium density residential areas and mixed use local centres. Figure 2 illustrates the LGA boundary, some of the key roads and land use features in Narwee including community facilities, schools, parks and reserves.

Figure 2 Narwee context

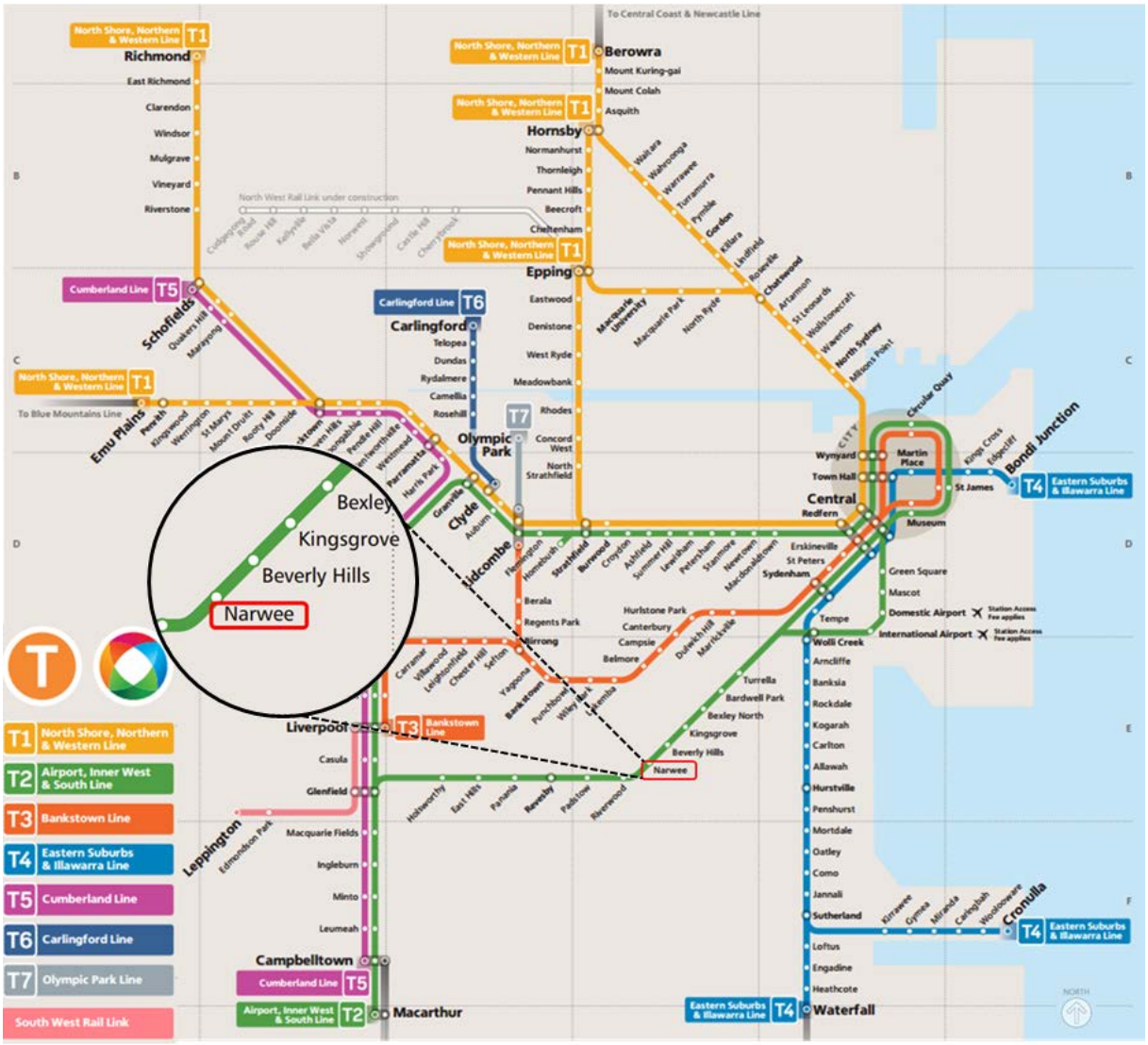


Source: AECOM, 2016

2.2 Narwee Station

Narwee Station is served by the T2 Airport, Inner West and South Line providing train services between Revesby and the City via Airport. Figure 3 shows Narwee Station on the Sydney Trains network.

Figure 3 Location of Narwee Station on the Sydney Trains network



Source: Sydney Trains, 2016 (modified by AECOM 2016).

The station platform is accessible via stairs from a pedestrian underpass beneath the railway line, which also provides a link from Hannans Road on the northern side to Hurst Place on the southern side. The station consists of two platforms on a single island with two tracks either side. Platform 1 provides services in the up direction, providing services to the City via Sydney Airport. Platform 2 provides services in the down direction, providing services to the Revesby and Macarthur.

The number of services at Narwee Station during the AM and PM two hour peak periods are shown in Table 1.

Table 1 Rail services at Narwee Station (part of the T2 Airport, Inner West and South Line)

Key Destination	AM Weekday Peak (07:00-09:00)	PM Weekday Peak (16:00-18:00)
Revesby to City via Airport	8 services	8 services
City to Revesby via Airport	8 services	8 services

Source: Sydney Trains, 2016

2.2.1 Current train passenger travel demand

Station barrier counts obtained from the Bureau Transport Statistics show Narwee Station is the 124th busiest station on the Sydney Trains network with approximately 4,040 trips per average weekday recorded in 2014. A breakdown of the 2014 station entries and exits over a 24 hour period are provided in Table 2.

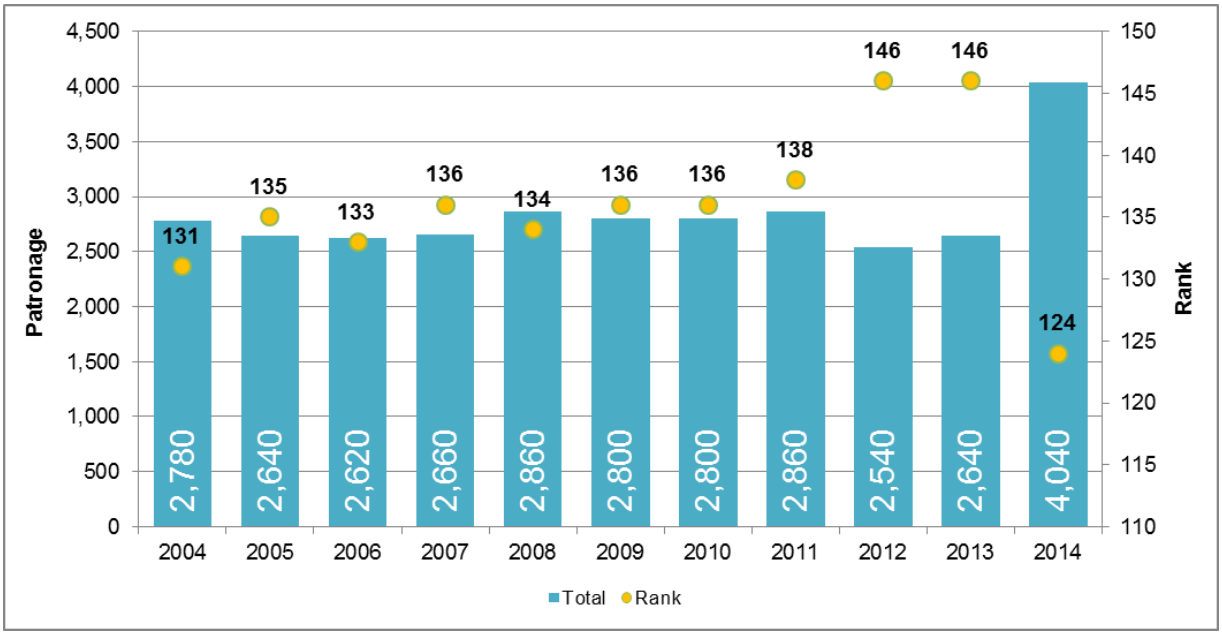
Table 2 Narwee Station 2014 barrier counts

Time period (within a single day)	In (numbers of customers)	Out (numbers of customers)
0200 – 0600	20	20
0600 – 0930	1,350	110
0930 – 1500	410	360
1500 – 1830	210	1,090
1830 – 0200	30	440
Total (24 hours)	**2,020**	**2,020**

Source: Bureau of Transport Statistics, 2016

Historical patronage figures for Narwee Station are provided in Figure 4. The general trend in the data suggests that patronage has remained relatively steady over the past decade at around 2,700 trips per day**.** However, in 2014, Narwee Station recorded a significant increase in patronage of 53 per cent, substantially higher than the patronage recorded for the previous ten years. This increase may be attributed to the updated rail timetable rolled out in late 2013, which included altered stopping patterns and increased T2 Airport, Inner West and South Line services.

Figure 4 Historical patronage data at Narwee Station



Source: Station Barrier Counts – 2004 to 2013, Bureau of Transport Statistics, 2016

2.2.2 Access mode split

A survey was undertaken by Jacobs as part of the development of concept design options on Tuesday 11 November 2014, which identified the modes of access during the AM peak period. Results of the survey indicate that 54 per cent of station entries arrived by walking and 42 per cent accessed the station by car (either as a driver or passenger). Table 3 presents the mode of access survey results.

Table 3 Access mode to Narwee Station in the AM Peak period

Mode	Percentage
Walk	54%
Bike	<1%
Bus	4%
Car lift (passenger / kiss and ride)	17%
Car park (park and ride)	25%

Source: Jacobs, 2015.

2.2.3 Station accessibility

The station is located between Hurst Place and Hannans Road, with a pedestrian underpass joining the two access points under the railway line. Narwee Station is currently not accessible with stairs providing the only form of access to the station platform, located at the centre of the pedestrian underpass.

The majority of the station facilities are located on the platform level and there are currently a number of interchange facilities provided at Narwee Station, as shown in Table 4

Table 4 Narwee Station facilities

Accessibility	General facilities	Transport interchange
- Stairs - Hearing loop - Portable boarding ramp	- Ticket vending machine - EFTPOS - Toilet - Payphone - Real-time information display screens - Help point	- Bus stop - Taxi rank - Bicycle racks - Kiss and ride - Car park

Source: Sydney Trains, 2016

2.2.4 Pedestrian facilities

Pedestrian access to Narwee Station is provided from Hurst Road and Hannans Road, via a pedestrian underpass beneath the railway line. A ramp link to the underpass is provided at the southern side of the station, but is not DSAPT compliant. Footpaths are present along both sides of Hurst Place, Broad Arrow Road and Hannans Road as well as other roads surrounding the station. The pedestrian facilities at the Narwee Station Precinct are presented in Figure 5**.**

Figure 5 Overview of pedestrian facilities and access routes

Source: Narwee Station Precinct Accessibility Upgrade Concept Plan, Jacobs, 2015

Figure 6 and Figure 7 highlight some of the key pedestrian crossing facilities near Narwee Station. Pedestrian crossing facilities are provided on all approaches at the signalised intersection of Hannans Road and Penshurst Road, and on the southern and western approaches of the Broad Arrow Road and Hannans Road signalised intersection. Raised unsignalised zebra crossings are provided along Hurst Place, Fisher Place and Mercury Street. These facilities provide pedestrians a safe crossing point to and from the station. The crossing facility along Hurst Place was identified as poor due to lack of tactile ground surface indicators (TGSI).

Figure 6 Signalised pedestrian crossings at Hannans Road and Penshurst Road

Source: AECOM, 2016.

Figure 7 Zebra crossings at Hurst Place and Mercury Street off Broad Arrow Road

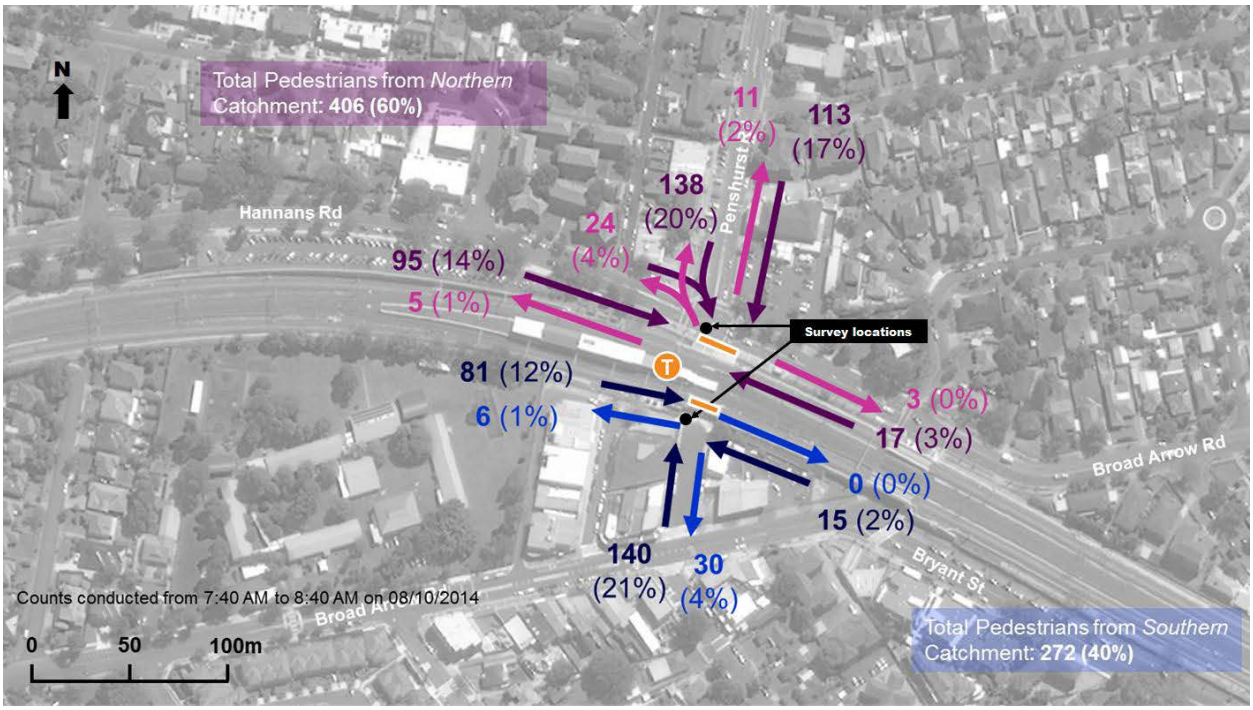
Source: AECOM, 2016.

A pedestrian count was undertaken by Jacobs as part of the development of concept design options to survey station platform movements during the AM peak period on 8 October 2014. Analysis of the AM peak hour pedestrian movements at the station showed the following travel patterns:

- Approximately 60 per cent of the station access / egress movements originated from the northern side (Hannans Road)
- Approximately 40 per cent of the station access / egress movements originated from the southern side (Hurst Place).

Figure 8 presents the results of the pedestrian analysis, indicating the directional splits for pedestrians accessing and egressing the station.

Figure 8 Pedestrian access analysis

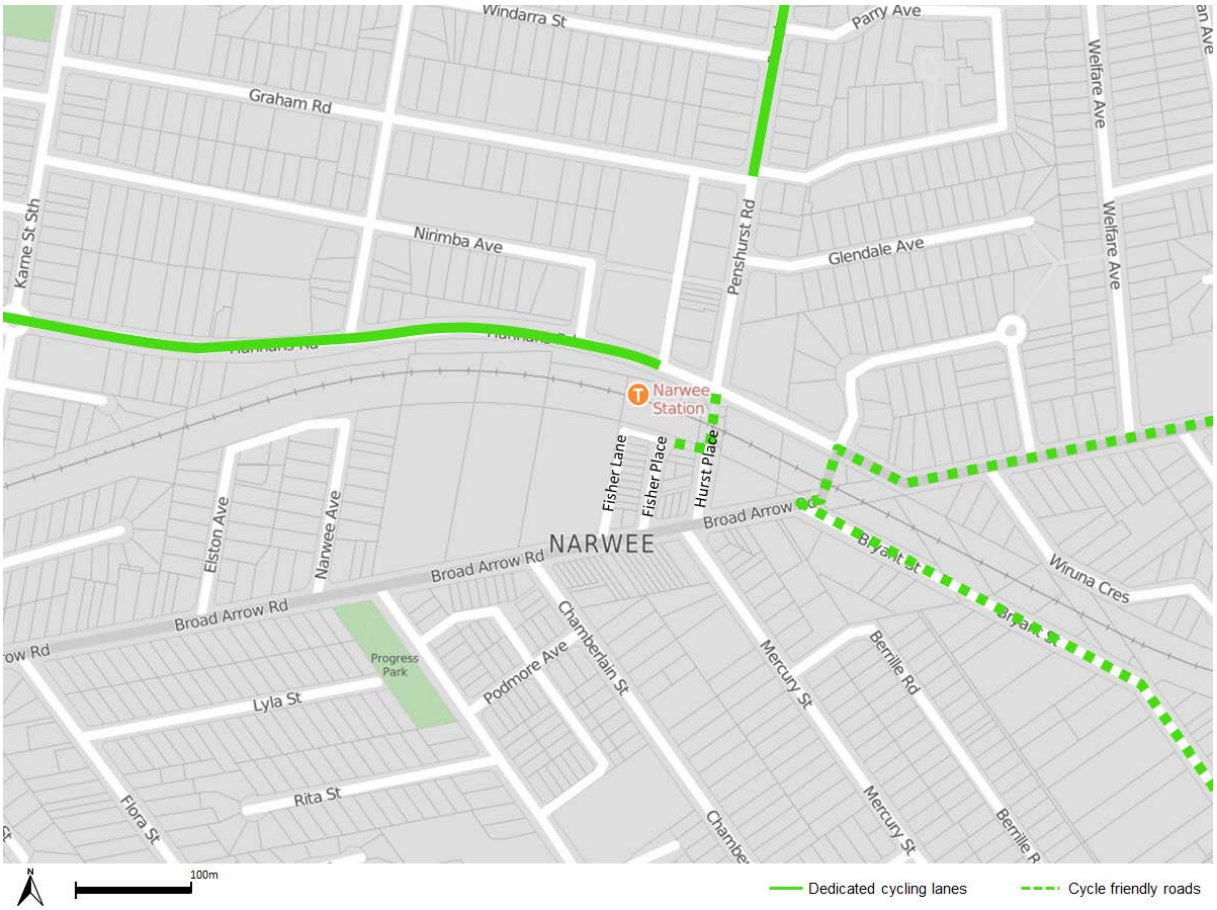


Source: Narwee Station Precinct Accessibility Upgrade Concept Plan, Jacobs, 2015

2.2.5 Cycling facilities

Existing cycle routes in the vicinity of Narwee Station are shown in Figure 9. Dedicated on-road cycle connections are provided along Penshurst Road (north) and Hannans Road (west). However, these lanes terminate prior to the station entrance, forming a gap in connectivity to the station. There are currently no formal cycle routes to the southern (Hurst Road) entrance.

Figure 9 Cycle routes around Narwee Station



Source: Sydney Cycleways, 2016.

There are currently six unsheltered bicycle rails (12 spaces) provided near the Hannans Road entrance, on the northern side of the station, as shown in Figure 10. No bicycle storage facilities are present along Hurst Place at the southern side of the station.

Figure 10 Bicycle storage rails near the Hannans Road entrance

Source: AECOM, 2016.

2.2.6 Bus services and facilities

Figure 11 presents the bus routes that currently stop within walking distance of Narwee Station. These bus routes connect residential areas to local transport interchanges, as well as employment and retail areas. The bus stops shown on Hannans Road, Penshurst Road and Broad Arrow Road are the main bus stops for interchange between rail and bus at Narwee Station.

Figure 11 Bus routes servicing Narwee Station

Source: Narwee Station Precinct Accessibility Upgrade Final Report, Jacobs, 2015

The following bus routes service Narwee Station in the AM and PM peak periods:

- Route 940 operates from Hurstville to Bankstown via Narwee, Roselands and Punchbowl
- Route 941 operates from Hurstville to Bankstown via Penshurst, Narwee, Roselands, Punchbowl and Greenacre
- Route 944 operates from Hurstville to Bankstown via Peakhurst, Mortdale, Peakhurst Heights, Riverwood and Punchbowl.

In addition, Route N20 operates from Riverwood to Rockdale, providing NightRide services (late night bus departures).

Table 5 provides a summary of bus services operating in peak periods near Narwee Station.

Table 5 Bus Services at Narwee Station

Route	Direction	Peak period frequency (mins)	
		AM peak (07:00 – 09:00)	PM peak (16:00 –18:00)
940	Hurstville to Bankstown	30	30
	Bankstown to Hurstville	30	30
941	Hurstville to Bankstown	30	30
	Bankstown to Hurstville	30	30
944	Hurstville to Bankstown	30	30
	Bankstown to Hurstville	30	30
N20	Rockdale to Riverwood	60 (NightRide) services, available from 12:00am to 5am	
	Riverwood to Rockdale		

Approximate frequencies over the two hour peak, rounded to the nearest 5 minutes.

Source: Punchbowl Bus Company and Sydney Buses, 2016

2.2.7 Parking facilities

A number of car parking facilities are located around Narwee Station. A commuter car park located on Hannans Road, provides 72 unrestricted car parking spaces including two accessible parking spaces (but which are not wholly -DDA compliant). Unrestricted on-street parking is also provided along a majority of the surrounding local road network, north of the station, including Hannans Road.

A limited number of short term (1P) on-street parking spaces are also provided to the south, along Broad Arrow Road, Hurst Place and Fisher Place. However, these spaces are located within a mixed use / commercial zone and are consequently not available exclusively to commuters.

During the site inspection it was observed that the majority of the spaces available within the Hannans Road commuter car park were occupied. However, at the time of inspection there were a number of untimed on-street parking spaces available on surrounding streets.

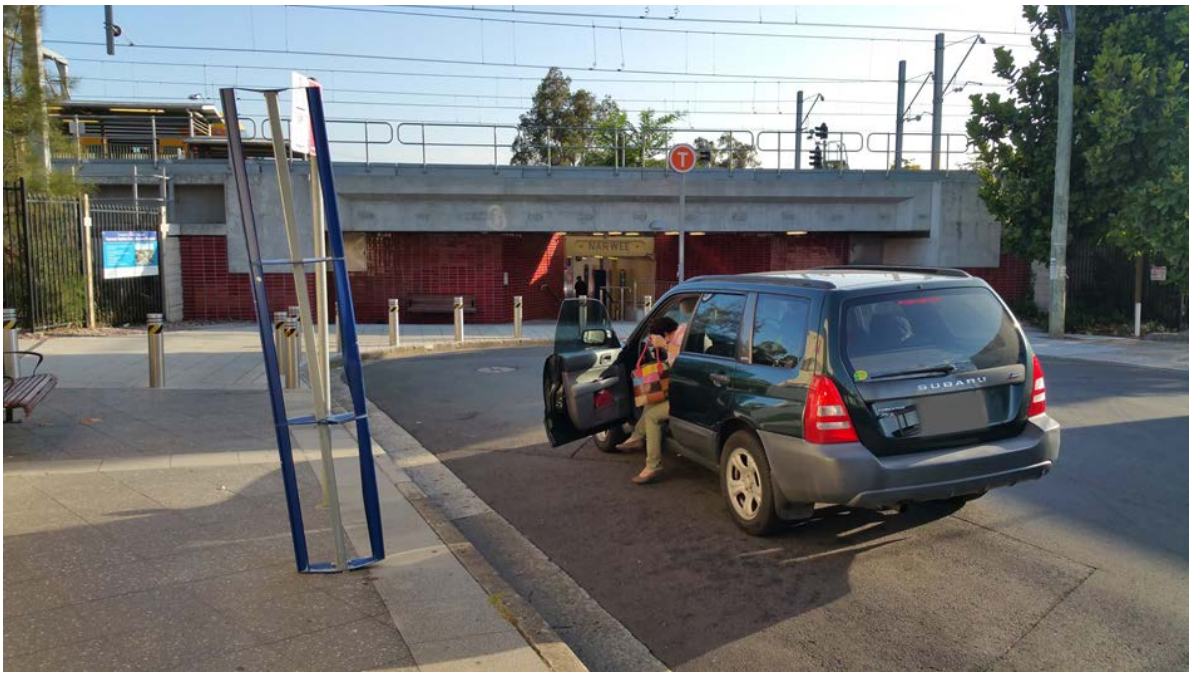
Figure 12 Hannans Road commuter car park

Source: AECOM, 2016.

2.2.8 Kiss and ride facilities

Narwee Station currently provides a formal signposted kiss and ride zone near the Hurst Place entrance, as shown in Figure 13, with approximately three spaces. It was noted during AECOM's field inspections that the existing kiss and ride sign is damaged. Short-term parking zones on Fisher Place are also used as informal kiss and ride areas. During the AM peak, it was observed that 'no stopping' zones on Hannans Road near the northern entrance are used as informal kiss and ride areas.

Figure 13 Kiss and ride zone at Hurst Place



Source: AECOM, 2016.

2.2.9 Taxi facilities

A taxi zone is located along Hurst Place near the intersection with Broad Arrow Road and provides a single car space. The zone is approximately 50 metres from the station entrance and provides a sheltered seating area, as shown in Figure 14.

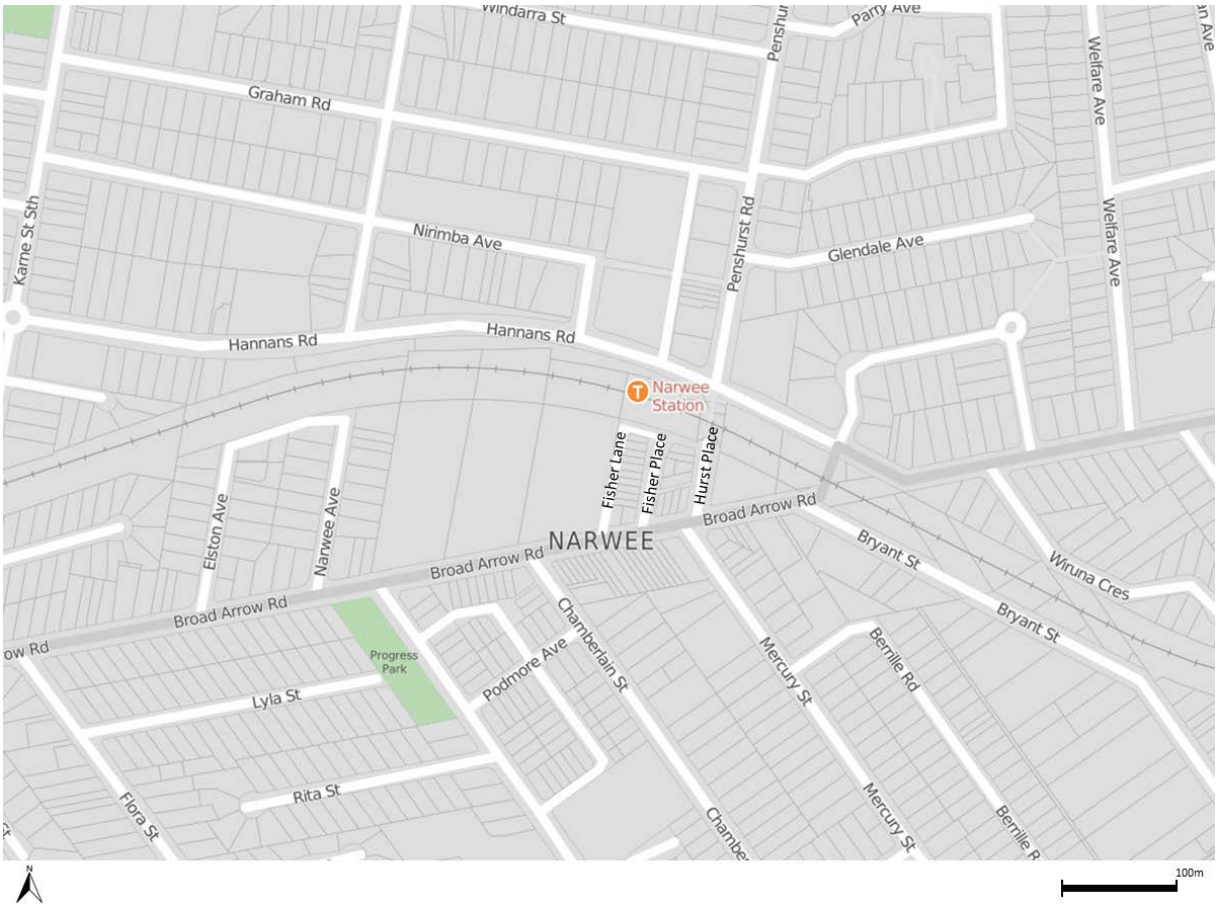
Figure 14 Taxi zone along Hurst Place

Source: AECOM, 2016.

2.3 Road network

The existing roads in the vicinity of the rail reserve include Broad Arrow Road, Hurst Place, Hannans Road, Fisher Place and Penshurst Road, as shown in Figure 15. This section outlines the network with respect to the Narwee Station, providing a description of each key road.

Figure 15 Road network surrounding Narwee Station



Source: AECOM, 2016

2.3.1 Hannans Road

Hannans Road is a local collector road consisting of one traffic lane and one on-street parking lane in each direction, with an east-west alignment. The road provides connections to local streets between Belmore Road (west) and Broad Arrow Road (east). North of Narwee Station a signalised intersection is present at Hannans Road and Penshurst Road which provides signalised pedestrian crossings at all approaches. The sign-posted speed limit is 50 kilometres per hour, with the exception of a school zone (40 kilometres per hour) near Hannans Road Public School. Hannans Road is shown in Figure 16.

Figure 16 View of Hannans Road (looking west towards intersection of Penshurst Road)

Source: AECOM, 2016.

2.3.2 Penshurst Road

Penshurst Road is a local road with one traffic lane in each direction with a north-south alignment. The road provides a connection from Broad Arrow Road to Forest Road. Kerbside 90-degree angle parking is present at the western side of the road near the intersection with Hannans Road, providing 16 parking spaces (including one accessible parking space). The remainder of the road provides a lane for kerbside parking in each direction. The sign-posted speed limit is 50 kilometres per hour. Penshurst Road is shown in Figure 17.

Figure 17 View of Penshurst Road (looking north towards Graham Road)

Source: AECOM, 2016.

2.3.3 Broad Arrow Road

Broad Arrow Road is a regional collector road consisting of one traffic lane and one parking lane, aligned parallel to the rail corridor to the south. The road provides an east-west connection between King Georges Road, Bonds Road and Romilly Street. The road intersects with Hurst Place and Fisher Place, both allowing pedestrian access to Narwee Station. The sign-posted speed limit is 50 kilometres per hour, with the exception of a school zone (40 kilometres per hour) near Beverly Hills Girls High School and Narwee Public School. A view of Broad Arrow Road is presented in Figure 18.

Figure 18 View of Broad Arrow Road (looking east towards Mercury Street)

Source: AECOM, 2016.

2.3.4 Hurst Place

Hurst Place is a local cul-de-sac with one traffic lane in each direction, providing access to Narwee Station, a service station, convenience store and other small retail stores. The road is accessible from Broad Arrow Road (east of Fisher Place) and provides short term parking, accessible parking, kiss and ride facilities and a taxi zone. The sign-posted speed limit is 50 kilometres per hour. Hurst Place is shown in Figure 19.

Figure 19 View of Hurst Place (looking north towards the station entrance)

Source: AECOM, 2016.

2.3.5 Fisher Place / Fisher Lane

Fisher Place / Fisher Lane is a one-way local road which forms a circuit accessible from Broad Arrow Road. A footpath allows convenient access to the Hurst Place station entrance to the east. Fisher Place provides short term (1P) parking on both sides of the road, adjacent to retail / mixed-use developments. The sign-posted speed limit is 50 kilometres per hour. Fisher Place is shown in Figure 20.

Figure 20 Fisher Place (looking north towards the rail reserve)

Source: AECOM, 2016.

2.4 Travel mode choice

Travel data obtained from the Bureau Transport Statistics provides an insight into the Journey to Work characteristics of residents in Narwee. The Bureau Transport Statistics uses the Australian Bureau of Statistics data collected during the 2011 Census which includes method of travel to work at a travel zone level. Travel zone 2621, 2624 and 2623 represents the immediate catchment area (within about 800 metres of Narwee Station). The data from these travel zones are summarised in Table 6.

Table 6 Journey to work data

Mode of travel	Narwee*		Greater Sydney
	Number	%	%
Train	1,009	29%	16%
Bus	50	1%	7%
Car – as driver	2,075	60%	61%
Car – as passenger	162	5%	5%
Walked only	64	2%	5%
Mode not stated	71	2%	2%
Other	15	0%	4%

**Excludes those who did not go to work*

Source: Bureau of Transport Statistics, 2011

The 2011 Journey to Work data shows that the majority of trips from Narwee are made by car, with approximately 65 per cent of trips attributable to this mode (including car drivers and passengers). Approximately 29 per cent of journeys to work trips were made by train, which is higher than the Greater Sydney average at 16 per cent.

The main destinations of the Journey to Work trips from Narwee are shown in Table 7.

Table 7 Destination of journey to work travel

Destination of travel	Percentage
Sydney Inner City	25%
Hurstville	12%
Botany	9%
Canterbury	7%
Kogarah – Rockdale	5%

Source: Bureau of Transport Statistics, 2013

3.0 Operational impacts

3.1 Future demand

The Bureau Transport Statistics has provided patronage forecasts for Narwee Station based on its Strategic Travel Model where it is expected patronage will increase to approximately 4,200 by 2036. For design assessment purposes, an additional 15 per cent has been used to account for the trips expected to be generated by the Narwee Station due to improvements in facilities as part of the proposed upgrades. The patronage forecasts are provided in Table 8.

Table 8 Patronage forecasts

Year	AM Peak Hour Entries[2]	AM Peak Hour Exits[2]	24 hour (entries and exits)
2014	707	101	4,040
2036	735	105	4,200
2036 (+15%)[1]	845	121	4,830

[1] an additional 15% has been added to the forecast years for design assessment purposes.

[2] peak 1 hour conversion factors were applied to hourly volumes based on 2014 station barrier counts for the 3.5 hour AM peak period.

Source: Jacobs and TfNSW, 2015.

3.2 Public transport

The upgrade would not impact on the operation of public transport in the vicinity of Narwee Station. The scope of the Proposal does not include changes to public transport (rail and bus) service operation or timetabling.

The Proposal includes the following improved facilities and benefits to public transport users, including:

- improved pedestrian access to Narwee Station (see Section 3.3 for details)
- the existing bus stop shelter on the northern side of Hannans Road would be upgraded to provide a wheelchair space improving the customer experience for all users
- tactile ground surface indicators (TGSI) would be provided at the bus shelter on the southern side of the Hannans Road
- remarking the lines of the existing bus bay on the southern side of Broad Arrow Road.

It is anticipated that the additional rail patronage will mainly generate walking trips. However, with improved accessibility to Narwee Station and interchange facilities (on Hannans Road and Hurst Place), it is anticipated that the bus, kiss and ride, taxi and commuter car park transport facilities would be better used by the community in and around the precinct.

3.3 Pedestrians

The Proposal would improve facilities and offer significant benefits to pedestrians. These upgrades include:

- the proposed new platform access lift and stairs, which would provide an accessible path of travel for those with a disability, the elderly and parents/carers with prams where previously they were not able to accessthe station platform
- extension of the eastern end of the platform to provide an accessible path to the lift
- demolition of the existing Ticket Office to improve visibility, circulation and general waiting areas on the platform
- regrading of the platform and provision of Tactile Ground Surface Indicators (TGSIs) where required
- improved lighting and CCTV coverage to Hurst Place and the adjacent lane near the southern station entrance
- provision of kerb ramps for kiss and ride and accessible space on Hurst Place
- improved wayfinding signage.

The Proposal would improve the user experience in the vicinity of the site and has the potential to encourage more commuters to walk to the station. The pedestrian modelling of the station undertaken by Jacobs indicated that with the Proposal would achieve a level of service 'C' for all elements (excluding stairs) for 2036 + 15 per cent under normal peak hour conditions. This is considered acceptable under the Building Code of Australia as the Proposal provides access via stairs with a width no less than the existing stairs.

3.4 Cyclists

Narwee Station is classified as a Level B interchange which requires a minimum of 20 undercover bicycle rack spaces. The Proposal includes the provision of four new sheltered racks (with a capacity for eight bicycles) near the southern entrance and the installation of shelter above the existing six bicycle racks (with a capacity for 12 bicycles) near the northern entrance. Once complete, there would be a total of 10 racks, which would provide 20 undercover spaces, and therefore meet the bicycle storage requirements for Narwee Station.

The introduction of additional storage facilities in the vicinity of the station is likely to encourage active transport as a mode of access to the station precinct. Additionally, it is likely to minimise the likelihood of informal cycle parking along fences and railings, in the absence of convenient formal storage facilities.

3.5 Kiss and ride / taxi

The Proposal includes the provision of four kiss and ride spaces at Hannans Road (north of the station) and maintaining the three existing kiss and ride spaces at Hurst Place (south of the station), with compliant access to the station entrance. The single space taxi zone at Hurst Place would be relocated to the north to allow for an accessible car parking space, resulting in no net loss of on-street parking. These upgrades would address the informal kiss and ride activity, currently observed on roads near Narwee Station. The kiss and ride facilities would be located close to the station entrances, with appropriate pedestrian facility provisions, to ensure direct and equitable access is provided.

3.6 Parking

As part of the Proposal there would be minimal changes to parking provision with the loss of one car space in the Hannans Road commuter car park to provide two accessible parking spaces (which are currently not DDA compliant). In addition, the accessible parking space on Hurst Place is to be relocated to be nearer the station to improve accessibility.

Approximately two unrestricted on-street parking spaces need to be removed as part of the Proposal. The provision of two kiss and ride spaces on Hannans Road (eastbound) would replace two unrestricted on-street parking spaces. The loss of the two parking spaces is expected to have a minor impact with unrestricted parking available on surrounding streets. The proposed two kiss and ride spaces on Hannans Road (westbound) would have a negligible impact to parking as they are currently in a 'No Parking' zone.

The relocation of an accessible parking space on Hurst Place results in no net loss on-street parking space.

The Proposal would provide designated areas for kiss and ride drop off providing beneficial impacts on parking as customers would be less likely to use spaces designated for parking for drop off.

3.7 Traffic impacts

The Proposal would assist in making public transport infrastructure more accessible to customers and provide a seamless transition between modes. As a result, the implementation of the Proposal may increase the use of Narwee Station.

It is anticipated that the additional rail customer patronage would mainly generate walking trips to access the station. As a result, increase in future traffic is expected to be minimal. It is considered that the proposed upgrades would have a negligible impact on the local road network.

3.8 Property access

No changes to private property access would be required as part of the operation of the Proposal.

4.0 Construction traffic impacts

4.1 Overview

The construction of the Proposal would include the following activities:

- establishment of site compound (erect fencing, tree protection zones, site offices, amenities and plant/material storage areas)
- establishment of temporary facilities as required, e.g. temporary pedestrian access bridge to station (if required), temporary toilets etc
- services relocation
- demolition of existing structures including the Ticket Office
- platform modifications, platform extension, lift shaft including piling and foundations for lift shaft
- installation of fixtures, lighting, signage and CCTV cameras for the station areas (during a possession)
- platform resurfacing, new platform surface drainage and hearing protection loop installation (during a possession)
- reconfiguration of the Platform Building to allow for communications/equipment room, staff facilities and toilets
- refresh of Platform Building including painting works and installation of wayfinding signage
- modifications and making good the existing underpass including re-surfacing, lighting and painting
- taxi zone, kiss and ride, bus stops, bike racks and accessible car spaces in the car park
- installation of a new upgrade Station Main Switchboard for the station supply (during a possession)
- replanting/landscaping, fencing adjustments and bollards.

In facilitating these construction activities, various plant and equipment are likely to be required. These would include a combination of:

- trucks
- generator
- bobcat
- hand tools
- mulcher
- concrete pump
- piling rig
- concrete truck
- hydreama/hirail
- wacker packer
- nail gun
- chainsaw
- excavator
- mini-excavator
- coring machine
- demolition saw
- jack hammer
- grinder
- manitou
- scissor lift
- franna crane
- lighting tower
- mobile crane

Minor volumes of heavy vehicles are likely to be generated during the construction phase when transportation of concrete, equipment, preformed structures etc. is required. It is expected one to five heavy vehicles would be generated per day from Monday to Friday, and up to 10 heavy vehicles during weekend possessions. The size of vehicles used for haulage would be consistent with the access route constraints, safety and any worksite constraints. It is assumed the standard vehicle would be either a tip truck or truck and dog, with a capacity of up to 25 tonnes.

Some construction activities (such as the delivery of precast sections) may require truck and trailer combinations or semi-trailers. Access arrangements for these vehicles would be defined in the Construction Traffic Management Plan produced by the contractor during detailed design.

4.2 Construction activity

Construction is expected to commence in 2016 and take around 18 months to complete. A temporary pedestrian access bridge may be required to maintain access to the station during construction. The temporary pedestrian access bridge would likely span from Hannans Road and connect to Fisher Place (rather than Hurst Place on the southern side of the station). The base of the structure would be required to have a clearance from the overhead wiring of at least 1.5 metres to meet safety and rail operation standards. The details of the temporary pedestrian access bridge, if required, would be subject to further consideration during detailed design and construction planning once the need for and location of the bridge has been confirmed.

The majority of construction work at Narwee Station would be limited to the standard construction hours as recommended by the Environmental Protection Authority (EPA):

- Monday – Friday: 7:00 am – 6:00 pm
- Saturday: 8:00 am – 1:00 pm
- Sunday / Public holidays: No work without prior approval from TfNSW

However, it may be necessary to undertake certain construction activities, such as overnight concrete pours and delivery of oversized materials, outside of the standard construction hours so as to facilitate structural design requirements and minimise traffic disruption. For any out of hours works, prior approval would need to be obtained from TfNSW.

It is likely that around six weekend track possessions would be required to undertake a number of construction activities, which would require approval from TfNSW as well as community notification.

An alternative construction option is being considered which may use an extended (six week) temporary station closure to allow for an accelerated construction completion which would reduce the overall program by up to six months. If the temporary station shutdown option is adopted, replacement shuttle buses would be provided between Narwee and its adjacent stations (Beverly Hills and Riverwood) at suitable intervals for the duration of the shutdown. The benefits of this alternative construction option include:

- reduced construction period (by up to six months) which would allow the upgraded station to be opened to the community sooner
- reduced temporary visual and amenity impacts due to a reduced construction period
- remove the need for a temporary pedestrian access bridge
- reduce the safety risk to the customers from the construction/pedestrian interface
- improve construction staging efficiency with potential cost benefits.

The construction methodology would be further developed during the detailed design of the Proposal by the nominated contractor in consultation with TfNSW. As such, both the temporary pedestrian access bridge and station closure construction options have been assessed in this report

4.2.1 Site hoarding

The design of hoardings for worksite compounds would be carefully considered and installed, given the high pedestrian activity levels during peak periods of the station operation. All construction hoardings would:

- comply with relevant codes and standards
- have smooth surfaces particularly for areas adjacent to footpaths to allow pedestrians to brush past without snagging
- free of trip hazards at the base of the hoardings
- be clean and have a regular inspection of the surfaces
- have adequate lighting.

Worksite hoardings would discourage entry without approval and minimise vandalism. All access points to fenced compounds would have lockable gates and appropriate information signs would be provided at the worksites to identify the project, safety and communication protocols.

4.2.2 Site security, site access and signage

Access to work areas would consider:

- safety of travelling public
- safety of construction workers and equipment
- impact on local communities in terms of safety, noise and road damage
- ease of access for emergency vehicles
- site security, particularly outside work hours.

4.2.3 Worker induction

All workers and sub-contractors engaged during the construction phase would be inducted prior to any commencement of works. The induction would identify the construction haulage routes, local speed zones, worksite protocols, staff parking facilities / public transport availability / carpooling opportunities and emergency / incident management strategies.

4.2.4 Ancillary facilities

Temporary construction compounds are required to accommodate a site office, amenities, laydown and storage area for materials. The following locations are being considered for use as construction compounds:

- a grassed area adjacent to Hannans Road and the existing commuter car park
- up to 20 spaces of the existing commuter car park
- an area adjacent to the rail corridor between Fisher Place and Hurst Place.

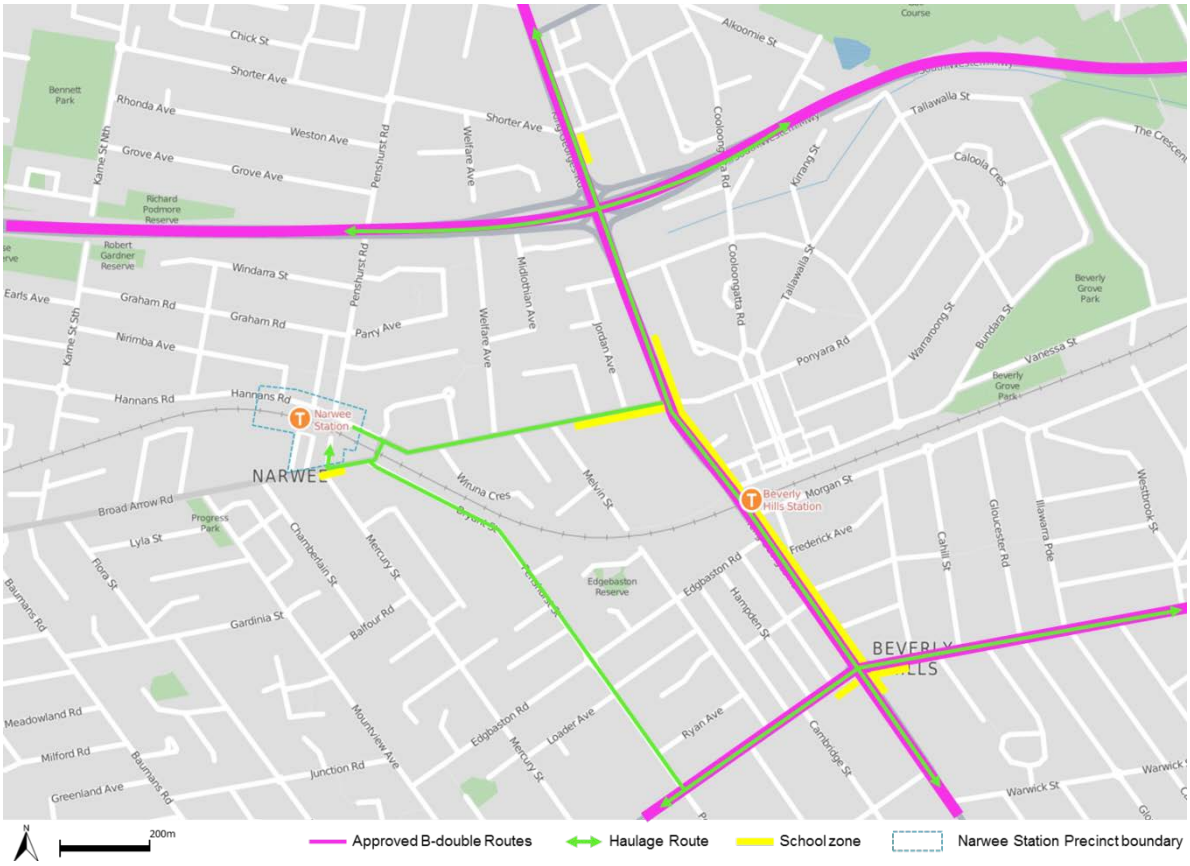
Temporary storage/laydown areas may also be required on the station platform.

The areas nominated for the compounds are on land owned by RailCorp (managed by Sydney Trains) and Canterbury City Council.

4.3 Construction vehicle routes

Figure 21 shows the potential access routes to each side of the station entrance, as well as RMS approved B-double routes adjacent to the sites. The construction site is near the M5 Motorway (east-west) and King Georges Road (north-south), which are B-double routes that are readily accessible. These routes provide high clearances and sufficient road widths to accommodate larger vehicles, making them ideal for the haulage routes.

Figure 21 Proposed haulage routes (indicative only, subject to detailed design)



Source: AECOM 2016, RMS Restricted Vehicle Access Map 2016

The Broad Arrow Road bridge (under the railway line) has a clearance of 3.9 metres, which would potentially restrict heavy vehicle movements. It is considered that Bryant Street and Penshurst Street would provide a more appropriate route for vehicles exceeding 3.9 metres in height.

Traffic generated by construction vehicles, including staff vehicles, is likely to be minimal given the nature of the works proposed and would fluctuate dependant on the construction stage.

4.3.1 Parking impacts

During construction, a work compound may be required along the southern side of Hannans Road commuter car park which may cause up to 20 spaces to be temporarily unavailable. This would increase the demand for on-street parking within the local network in the short term.

Hurst Place may also be partially closed for access during the temporary use of the crane (which would be required for construction activities (e.g. installation of the lift). This would temporarily reduce the availability of parking and increase the demand for on-street parking within the local network in the short term. Parking on Fisher Place is unlikely to be impacted by construction works.

Parking provisions are not proposed for staff vehicles within or adjacent to the construction site, instead construction workers would be encouraged to car-pool or utilise adjacent public transport services. However it is expected a portion of workers would travel via private vehicles which may also marginally increase the demand for on-street parking within the surrounding local streets. A related Construction Traffic Management Plan (CTMP) would be prepared to manage the impacts of construction traffic parking.

Overall, with the current availability of on-street parking surrounding Narwee Station, the impact of increased on-street parking in the short term would be minor. The use of a six week temporary station closure would reduce the overall construction period which would reduce the temporary demands on parking from construction traffic.

4.3.2 Pedestrian provision

During construction, pedestrian movement on the platform would be temporarily impacted due to the reduced amount of space from construction ancillary facilities. The reduced space on the platform may increase pedestrian congestion and reduce the amount of standing area for customers. Appropriate signage would be provided to mitigate any potential impacts to pedestrian movement on the platform.

For the majority of the construction works, the existing longitudinal (along the footpath) and traverse (crossing of roads) pedestrian movements would be maintained. The existing underpass entrance to the station would be accessible until a temporary pedestrian access bridge is installed to maintain pedestrian access during construction. If the alternative construction option is used which would utilise an extended (six week) temporary station closure, access to the station would not be provided and shuttle bus replacements would be used as an alternative. Access would remain across the railway via an alternative route along Broad Arrow Road however pedestrians would have a longer walking distance to cross the railway.

If required, the temporary pedestrian access bridge would span from Hannans Road and connect to Fisher Place (rather than Hurst Place on the southern side of the station), temporarily changing pedestrian desire lines. Safe and suitable detours would be provided. Pedestrians who usually access the station from the southern entrance would be detoured to Fisher Place given that an area adjacent to the rail corridor between Fisher Place and Hurst Place is expected to be used as a construction compound. This could result in a longer walking distance if no space can be provided for pedestrian access between Fisher Place and Hurst Place.

The proposed works may potentially disrupt the existing pedestrian facilities such as the area surrounding the southern compound between Fisher Place and Hurst Place, and at the Hannans Road commuter car park, this has the potential for increased safety risks for pedestrians due to potential interactions with construction vehicles. Appropriate signs or traffic controllers would be positioned to notify pedestrians of the temporary arrangements. Any interaction between construction vehicles and pedestrians would be managed and controlled by traffic controllers. Impacts to pedestrians during construction would be managed through the development of a CTMP.

Mitigation measures would be subject to further consideration during detailed design and construction planning in consultation with the relevant authorities. Notification would be provided to the community on alternative transport arrangements (including details of rail replacement buses, nearby stations and changes to pedestrian access).

4.3.3 Public transport

Minor impacts may occur during off peak times resulting in reduced bus speeds, however it is anticipated that buses would continue to service the station.

If the temporary station shutdown construction option is adopted, replacement shuttle buses would be provided between Narwee and its adjacent stations (Beverly Hills and Riverwood) at suitable intervals for the duration of the shutdown. Appropriate signage to notify customers of the alternate transport arrangements would is to be provided should changes be required.

4.3.4 Kiss and ride/ taxi

During construction, the temporary pedestrian access bridge would relocate the southern station entrance to Fisher Place. There may also be a requirement to temporarily relocate the kiss and ride and taxi facilities on Hurst Place to Fisher Place, given passengers are likely to be dropped off and picked up at this location. This would result in the temporary loss of short-term on-street parking spaces on Fisher Place. Details of these requirements would be confirmed during detailed design and included in the construction Traffic Management Plan.

Appropriate notification and signage would be provided to customers and taxi operators of the alternate transport arrangements should such changes be required.

4.3.5 Bicycle facilities

No impact is anticipated for bicycle facilities provided at Narwee Station, however the existing bicycle rack may be temporarily unavailable while the shelter is being installed.

4.3.6 Property access

Property access would be maintained, where possible, to minimise the impact to local residents and businesses. However, during activities such as unloading of oversized materials, short term impacts to property accesses may be necessary. In such incidences, affected occupants would be notified in advance of the scheduled works.

4.3.7 Emergency vehicle access

Access for emergency vehicles would be maintained at the construction sites in accordance with emergency vehicle requirements. Emergency services would be advised of all planned changes to traffic arrangements prior to applying the changes. Advice would include information about upcoming traffic disruptions, anticipated delays to traffic, extended times of work and locations of road possession.

4.4 Management of construction traffic impacts

Prior to the commencement of construction, a Traffic Management Plan (TMP) would be prepared as part of the Construction Environmental Management Plan 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 would 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 TMP.

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

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.

In addition, Road Occupancy Licences for temporary road closures would be obtained, where required.

The Broad Arrow Road bridge (under the railway line) has a clearance of 3.9 metres, which would potentially restrict heavy vehicle movements. It is considered that Bryant Street and Penshurst Street would provide a more appropriate route for vehicles exceeding 3.9 metres in height.