



# Pendle Hill Station Easy Access Upgrade Traffic, Transport and Access Impact Assessment

**Client //** Transport for NSW  
**Office //** NSW  
**Reference //** 15S1212000  
**Date //** 08/12/14

# Pendle Hill Station

## Easy Access Upgrade

### Traffic, Transport and Access Impact Assessment

Issue: A 08/12/14

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GTA Consultants Office: NSW

#### Quality Record

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# Executive Summary

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## Background and Upgrade Works

Transport for New South Wales, through the Transport Projects Division is proposing to upgrade Pendle Hill Railway Station as part of the Transport Access Program (TAP) which is a NSW Government initiative involving many transport facility upgrades throughout NSW.

The main objective of the program is to provide better access to, within and around public transport interchanges, railway stations and surrounding station precincts, along with improvements in station amenities and general customer facilities.

Pendle Hill Railway Station, located in the western suburbs of Sydney, has been earmarked for inclusion in the Easy Access Upgrade Projects to improve the customer experience, accessibility for those with a disability, modal interchange facilities and general station precinct.

The proposed Pendle Hill Station Easy Access Upgrade is designed to improve pedestrian access to and from the station, increase Pendle Hill Station's ability to cope with the predicted future patronage demands and improve pedestrian flow, passenger information services and wayfinding between transport modes.

The Proposal provides:

- four new lifts:
  - one at each station entrance
  - one to Platform 1-2
  - one to Platform 3-4
- a new station concourse featuring
  - a booking office
  - a family accessible toilet
  - amenities for staff
- new platform stairs and canopies
- new street entry stairs and canopies
- demolition of the existing ramps and partial demolition of the existing footbridge.

Supporting these major features of the preferred concept design are a number of interchange and accessibility upgrade works that would improve access, convenience, and interchange between modes

Construction is anticipated to commence in mid-2015 and would take up to 2 years to complete.

## Existing Conditions

Pendle Hill Railway Station is currently the 72<sup>nd</sup> busiest station within the Sydney Trains network, with approximately 3,360 passengers recorded entering and exiting the station during an average weekday in 2011. Existing station facilities include a bicycle rank with capacity for 5 bicycles, 4 bicycle lockers, a pedestrian crossing on Wentworth Avenue, footpath network linking to the surrounding network, 90° angle parking on both Wentworth Avenue and Joyce Street, a taxi rank and bus zone on Joyce Street, and a formal kiss and ride facility on Wentworth Avenue. Four car parks in the vicinity of the station are used by commuters, in addition to the on-street parking supply

The station is accessed by more than 1,000 rail users during the weekday AM peak hour. Significant traffic volumes were recorded on Wentworth Avenue and Joyce Street, with nearly 1200 and 550 vehicles in the AM peak respectively. Site observations indicate that the demand for unrestricted parking was high, with moderate demand for other short-term parking. Informal kiss and ride activity was noted on the southern side of the station.

The station is serviced by T1 Western Line and T5 Cumberland Line. There are also several bus stops within walking distance of the site, serviced by 3 local bus routes linking to Blacktown, Parramatta and Constitution Hill.

### Operational and Construction Impacts

TfNSW predicts that daily rail patronage at Pendle Hill Railway Station is expected to increase by 42% between 2011-2016 and 2031-2036. The pedestrian improvements (including wider pedestrian footbridge with stair and lift access) would provide adequate capacity to accommodate this expected growth, while also enabling direct and safe travel routes with an overall improved user experience and connectivity.

Pedestrian capacity assessment using Fruin Theory concludes that peak pedestrian activity would continue to operate at a good level of service (LOS A) on account of existing and forecast patronage and improved footpath capacity within the precinct.

The proposed indented kiss and ride facilities (capacity for approximately 11 vehicles) on both sides of the station, as well as a new taxi rank in Pendle Way would improve passenger interchange with these modes and improve local traffic operations in the station precinct.

An extended bus stop with new shelters and seating would encourage the use of local bus feeder services.

Improved bicycle facilities in station forecourt areas would improve visibility and quality of these facilities as well as passive surveillance, encouraging cycling as a viable mode choice for local residents accessing the station. Appropriate weather protection should be provided for the proposed bicycle parking.

A series of changes to the location, orientation and/or restrictions of existing on-street car parking are proposed, with negligible impacts anticipated. Accessible parking has generally been relocated to be in close proximity to the new lifts.

Further consideration during detailed design of road setbacks for new infrastructure (for safety and pedestrian activity), heavy vehicle swept paths, footpath extents as well as car parking layout and compliance, would be required.

Construction vehicles would use designated approach and departure routes with mitigation measures to ensure safety at all times, especially at the site accesses, within the site and through school zones. Construction traffic generation is expected to be minimal and have a negligible impact on existing traffic conditions. It is anticipated that the primary site compound would be located at Wentworthville Railway Station (east of Pendle Hill) due to the site constraints, with appropriate vehicle routes available between the two stations.

Notwithstanding the likely limited impacts of construction on traffic operation of the surrounding network, a Construction Traffic Management Plan and Traffic Control Plans (TCP) would likely need to be prepared and submitted to the RMS (TMC) Council's Traffic Committee to appropriately manage the use of the designated construction routes and site interfaces. On-street parking impacts as a result of construction workers or localised construction activities would

need to be appropriately managed given the high demand for existing parking by commuters accessing Pendle Hill Railway Station.

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# 1. Introduction

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## 1.1 Background

Transport for New South Wales, through the Transport Projects Division is proposing to upgrade Pendle Hill Railway Station as part of the Transport Access Program (TAP) which is a NSW Government initiative involving many transport facility upgrades throughout NSW.

The main objective of the program is to provide better access to, within and around public transport interchanges, railway stations and surrounding station precincts, along with improvements in station amenities and general customer facilities. This will ensure an enhanced experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure.

The planning and delivery of transport infrastructure as part of TAP will focus on the following:

- Upgrading existing railway stations to improve access, particularly for those with a disability, the elderly and parents with prams.
- Providing modern buildings and facilities for all modes that meet the needs of a growing population.
- Providing transport interchanges that support an integrated network and allow seamless transfers between all modes for all customers.
- Improving safety and security measures, such as extra lighting, help points, fences and other security features.
- Improving signage and wayfinding.

The TAP has funding to deliver a series of projects ranging from small works such as ramp and access upgrades, through to larger projects including new stations, whole of station upgrades, transport interchanges and multi-deck commuter car parks.

Transport for NSW engaged GTA Consultants to prepare a Traffic, Transport and Access Impact Assessment (TT&AIA) for the Pendle Hill Station Easy Access Upgrade.

## 1.2 Project Objectives

The overall objectives of the Easy Access Upgrade projects include:

- Improving the customer experience (specifically by provision of canopies, improved interchange facilities and a high standard of urban design).
- Improving accessibility and compliance with the Disability Discrimination Act (DDA) and the Disability Standards for Accessible Public Transport (DSAPT).
- Improving modal access facilities and integration with surrounding precinct.
- Where possible, increasing station capacity to address identified congestion issues (if any) and to accommodate patronage growth to 2036.
- Upgrading transport modal interchange facilities and equipment to current standards.
- Improving amenity for customers, including general access to the station and precinct facilities.
- Facilitating future unmanned station operation through rationalisation of all station systems including security, ticketing and passenger information display.



- Reviewing precinct facilities for life expired elements and recommending appropriate action.
- Balancing the cost of ownership and maintenance with capital cost.
- Providing documentation and data inputs into the TfNSW Review of Environmental Factors (REF) to secure planning approval.
- Minimising construction stage impacts on passengers and station operations.

Specific design objectives include:

- Verifying compliance with functional and operational requirements.
- Promoting efficient and effective wayfinding.
- Minimising pedestrian conflict, congestion and crowding points.
- Minimising queuing at station and interchange facilities.
- Increasing accessibility for commuters with mobility impairment.
- Accommodating growth of patronage and changing travel and working patterns.
- Improving station functionality, covering improved access to ticketing, platform clearance rates and station control (including congestion and pinch points).

### 1.3 Pendle Hill Station Easy Access Upgrade

The proposed Pendle Hill Station Easy Access Upgrade is designed to improve pedestrian access to and from the station, increase Pendle Hill Station's ability to cope with the predicted future patronage demands and improve pedestrian flow, passenger information services and wayfinding between transport modes.

The Proposal provides:

- four new lifts:
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Construction is anticipated to commence in mid-2015 and would take up to 2 years to complete.

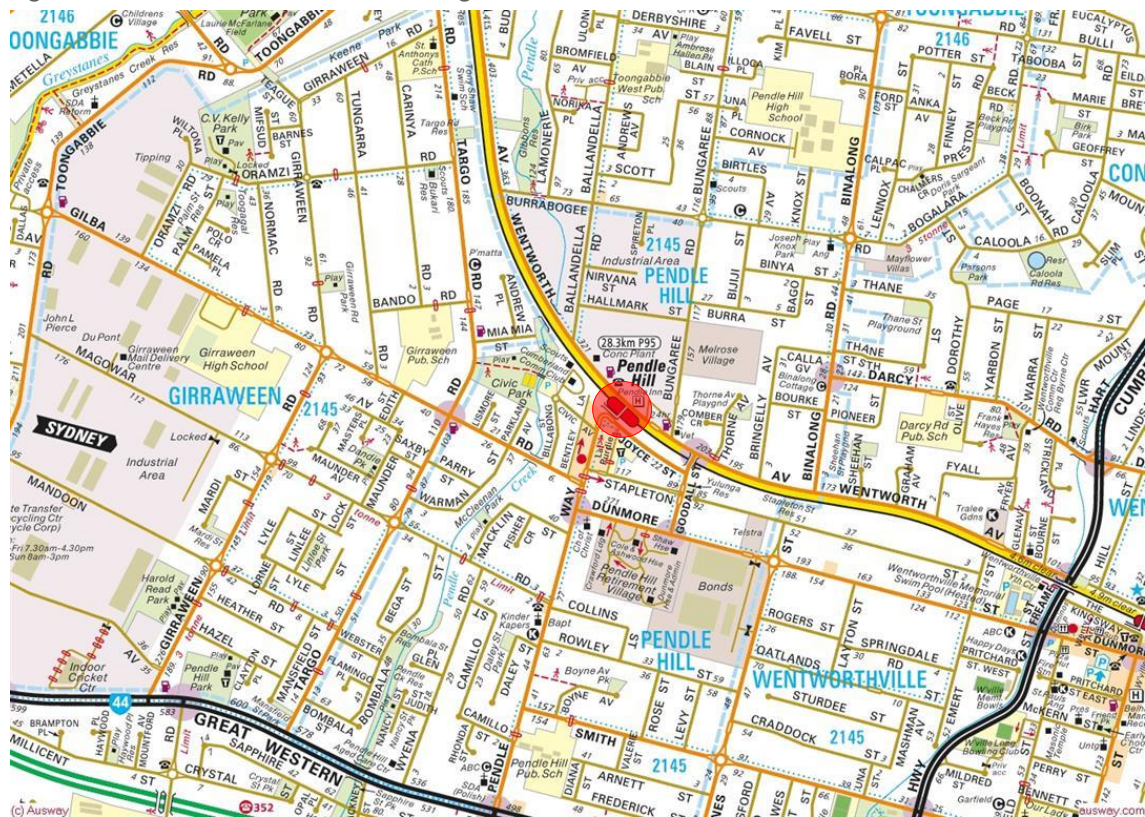
### 1.4 Study Area

Pendle Hill Railway Station is located in the western suburbs of Sydney and adjacent to Wentworth Avenue. The station precinct is located on the border of the City of Holroyd Local

Government Area (LGA) and Parramatta LGA, and is surrounded by Blacktown LGA in the north-west, in the north-east and Fairfield LGA in the south.

The local and regional context is shown in Figure 1.1.

**Figure 1.1: Pendle Hill and its Surrounding Environs**



Basemap source: Sydney

## 1.5 Study Scope

This TT&AIA report sets out an assessment of the anticipated traffic, transport and access impacts of the proposed Pendle Hill Station Easy Access Upgrade for inclusion in the REF, including consideration of the following:

- o existing traffic and transport conditions and facilities in the vicinity
- o operational traffic impacts associated with the proposed facilities
- o construction impacts associated with the upgrade works
- o potential mitigation measures required as a result of the impacts.

This assessment has been prepared noting the following:

- o stakeholder consultation was not conducted as part of this study
- o assumptions were made in regard to the proposed construction activities
- o pedestrian, traffic and parking surveys were conducted during the weekday AM and PM peak periods with the primary aim of capturing commuter behaviour
- o no modelling was completed as part of this project, noting that the Proposal is not expected to generate additional traffic.

## 1.6 References

In preparing this report, reference has been made to the following:

- o an inspection of the site and its surrounds
- o Australian Standard, Parking Facilities, Part 1: Off-Street Car Parking AS 2890.1:2004
- o Australian Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS 2890.6:2009
- o traffic and car parking surveys as referenced in the context of this report
- o plans for the proposed development prepared by DesignInc, Drawing Package Number TAP-1856-WBD-0001 - 0005, Revision B, 24 October 2014
- o other documents and data as referenced in this report.

## 2. Existing Conditions

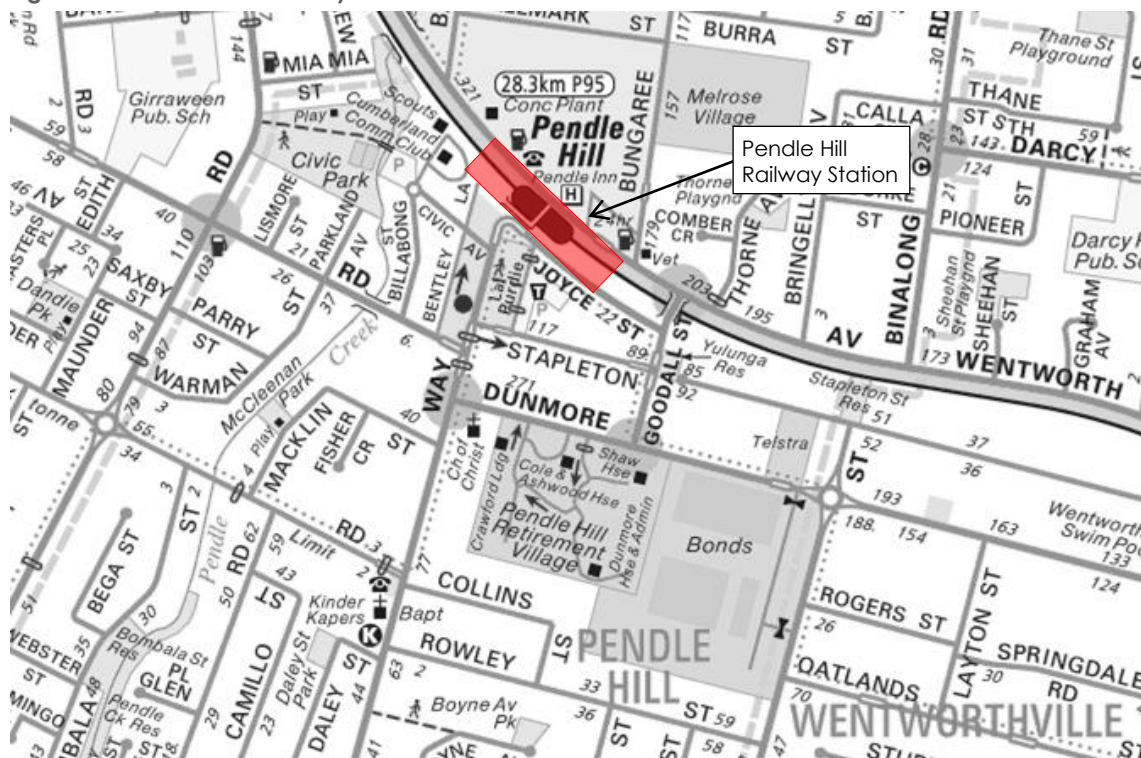
### 2.1 Site Context

Pendle Hill Railway Station is located approximately 28km west of the Sydney CBD between Toongabbie and Wentworthville Stations on the Sydney Trains T1 Western Line and T5 Cumberland Line. It is currently the 72<sup>nd</sup> busiest station within the Sydney Trains network, with 3,360 passengers recorded entering and exiting the station during an average weekday in 2011.

Pendle Hill Railway Station is bounded by Wentworth Avenue to the north and Joyce Street/ Pendle Way to the south. Pendle Hill town centre is located on the southern side of the station where the land is zoned as a mix of Local Centre, Public Recreation and commercial space. The remainder of the area is dominated by low, medium and high density residential areas.

The location of Pendle Hill Railway Station and the local area context is shown in Figure 2.1.

Figure 2.1: Pendle Hill Railway Station Precinct



Basemap source: Sydney

### 2.2 Existing Station Facilities

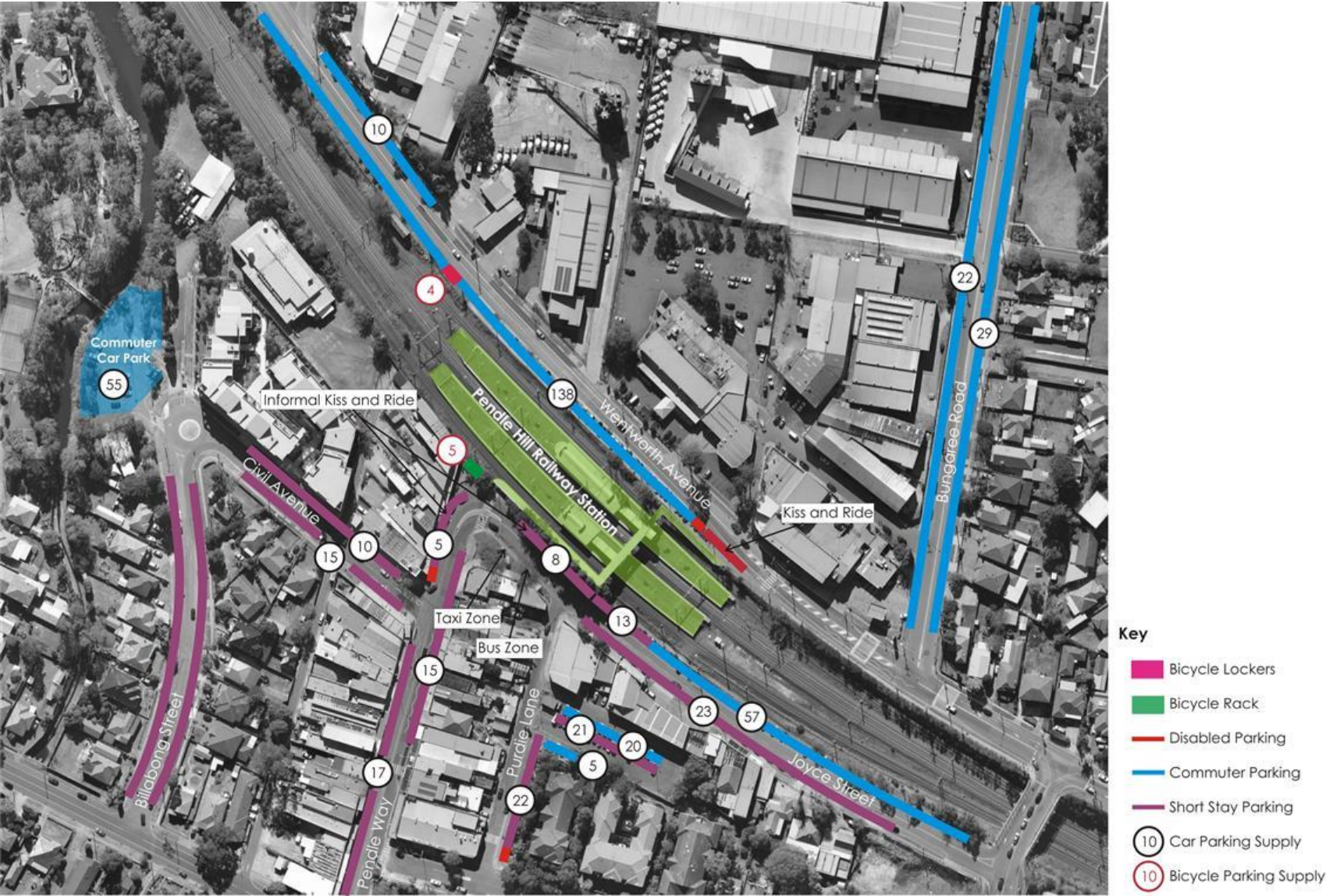
Pendle Hill Railway Station and surrounding precinct provides a range of integrated transport facilities including commuter car parks, bicycle storage, accessible parking and kiss and ride. The existing layout of the southern station precinct is shown in Figure 2.2 with all existing facilities indicatively shown in Figure 2.3.



Figure 2.2: Pendle Hill Railway Station (Southern Precinct)



Figure 2.3: Existing Transport Facilities



## 2.3 Public Transport

### 2.3.1 Passenger Rail Services

Pendle Hill Railway Station is serviced by the T1 Western Line and T5 Cumberland Line. The journey between Pendle Hill Railway Station and Central Station takes 37-42 minutes during peak periods.

Train frequencies during the weekday AM, PM and Saturday peak hours are shown in Table 2.1.

**Table 2.1: Train Service Frequencies**

Direction	AM Peak (8:00am-9:00am)	PM Peak (5:00pm-6:00pm)	Saturday Peak (12:00pm-1:00pm)
Eastbound (Central)	15 minutes	15 minutes	30 minutes
Westbound (Richmond/Emu Plains)	15 minutes	15 minutes	30 minutes

A summary of facilities provided at Pendle Hill Railway Station is detailed in Figure 2.4.

**Figure 2.4: Pendle Hill Railway Station Facilities**

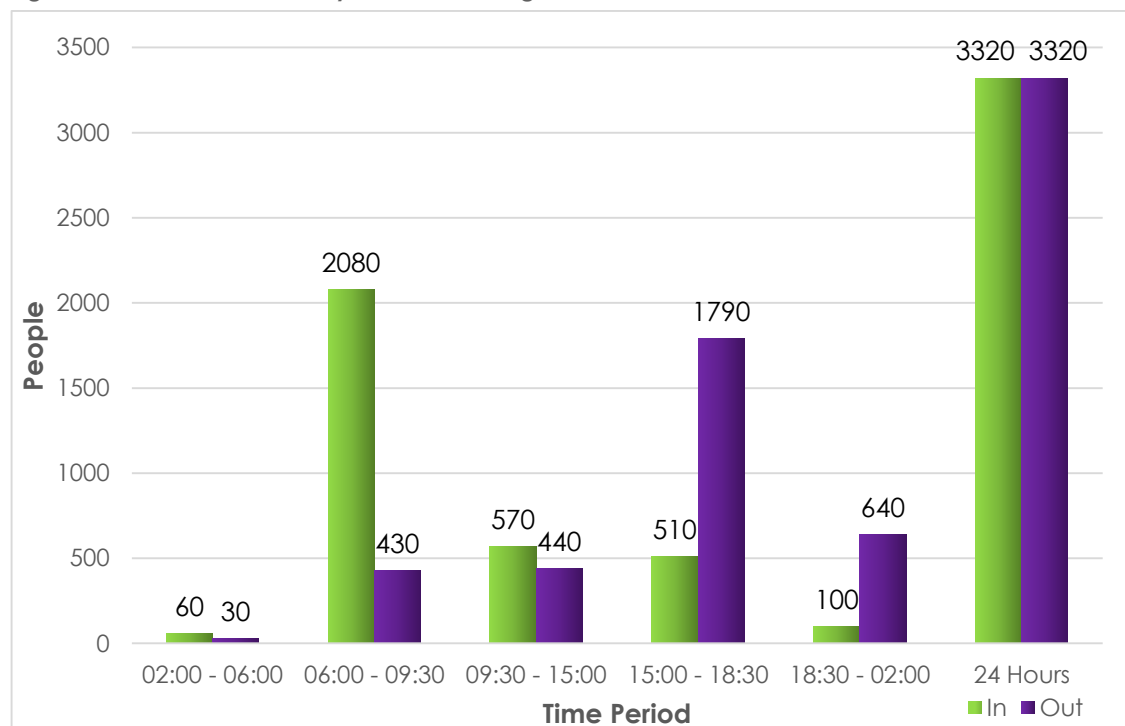
Getting around the station	Accessibility
 Stairs 	 Hearing loop 
 Escalator 	 Platform tactile tiles 
 Lift 	 Portable boarding ramp 
 Ramp (1:7 gradient) 	 Wheelchair accessible toilet 
 Level crossing 	 Wheelchair accessible payphone 
	 Wheelchair accessible carspace/s 
General facilities	Transport interchanges
 Ticket vending machine 	 Bus stop close by 
 Eftpos 	 Ferry wharf close by 
 Toilet 	 Taxi rank close by 
 Payphone 	 Bike racks or bike lockers 
 Passenger display screens 	 Kiss and ride 
 Help point 	 Car park close by 

Source: Sydney Trains website [http://www.sydneytrains.info/stations/station\\_details.htm](http://www.sydneytrains.info/stations/station_details.htm)

### 2.3.2 Rail Patronage

Rail patronage data for Pendle Hill Railway Station is detailed in Figure 2.5. Across the 24 hour period, the station has an even split between station entries and exits<sup>1</sup>.

**Figure 2.5: Pendle Hill Railway Station Patronage**



Source: *Compendium of Sydney Rail Travel Statistics* (8th Edition v1.1, Bureau of Transport Statistics, November 2012).

From Figure 2.5, it is evident that Pendle Hill Railway Station is busiest during the morning and afternoon commuter peak periods, which reflects its primary use as a commuter station to/ from Sydney CBD/ Parramatta and key employment zones.

Historical barrier count data for Pendle Hill Railway Station has also been gathered from information published by the Bureau of Transport Statistics<sup>2</sup>, covering the years 2004 to 2012, and given in terms of key time periods during the day. The barrier counts for 3.5-hour morning peak between 6:00am and 9:30am, as well as the totals for the day (24 hours), are shown in Table 2.2.

<sup>1</sup> Source: 2012 *Compendium of Sydney Rail Travel Statistics* (8th Edition v1.1, Bureau of Transport Statistics, November 2012).

<sup>2</sup> From the Bureau of Transport Statistics website: <http://visual.bts.nsw.gov.au/barrier/>



**Table 2.2: Pendle Hill Railway Station Barrier Counts 2004-2012**

Year	Time Period					
	6:00am – 9:30am			24 hours		
	In	Out	In + Out	In	Out	In + Out
2004	1,200	360	1,560	2,360	2,360	4,720
2005	1,200	360	1,560	2,360	2,360	4,720
2006	1,200	360	1,560	2,360	2,360	4,720
2007	1,610	460	2,070	3,030	3,030	6,060
2008	1,720	480	2,200	3,250	3,250	6,500
2009	1,750	480	2,230	3,300	3,300	6,600
2010	1,750	490	2,240	3,300	3,300	6,600
2011	2,100	430	2,530	3,360	3,360	6,720
2012	2,080	430	2,510	3,320	3,320	6,640

Source: Bureau of Transport Statistics

The data indicates that rail patronage has increased significantly in the 8 year period to 2012 and equates to an approximate 40% increase.

### 2.3.3 Bus Services

Bus stops are provided within a typical walking distance from Pendle Hill Railway Station, including on Joyce Street (south of the station) and Bungaree Road to the north. The buses are operated by Hillsbus and provide services linking Blacktown with Parramatta (route 705), and Constitution Hill with Parramatta (route 708). Route 711 also makes use of Bungaree Road and comes within approximately 700m north of the station.

The bus stop locations and the routes in the vicinity of Pendle Hill Railway Station are presented in Figure 2.6, with bus frequencies detailed in Table 2.3.

**Table 2.3: Bus Service Frequencies**

Route	Number of Services
705	20
708	2
711	35
<b>Total</b>	<b>57</b>

In addition, school set-down/ pick-up occurs at the Joyce Street bus stop, with the majority of activity observed between 8.15am and 8.30am.

Figure 2.6: Bus Stop Locations and Bus Routes



## 2.4 Kiss and Ride Facilities

A formal kiss and ride facility has been provided on the northern side of the station along Wentworth Avenue with capacity for three vehicles. No formal kiss and ride facilities are provided on the southern side of the station. However such activity does occur, particularly during the AM peak period in the no parking and 1P areas located on either side of the marked pedestrian crossing.

A formal taxi rank with capacity for approximately two vehicles is also located adjacent to the bus zone.

The formal and informal kiss and ride locations are shown in Figure 2.7.

**Figure 2.7: Kiss and Ride Locations**



Formal kiss and ride facility on the southern side of Wentworth Avenue



Informal kiss and ride activity adjacent to 1P parking along the western side of Pendle Way



Informal kiss and ride activity on Pendle Way and Joyce Street outside the station entrance



Informal kiss and ride activity near the 1P parking along the northern side of Joyce Street

## 2.5 Walking and Cycling

### 2.5.1 Pedestrian Infrastructure

Direct access to inbound and outbound platforms is available via ramps on both Joyce Street and Wentworth Avenue. The ramps are connected to an elevated footbridge located at the eastern end of the station that facilitates access to the platforms via stairs.



The key pedestrian desire lines for the station are presented in Figure 2.10 with the majority being via established footpaths. These include along both sides of Wentworth Avenue, Joyce Street and Pendle Way and throughout the town centre to the south.

The pedestrian crossing on Wentworth Avenue accommodates the majority of the pedestrian movements to/ from the north, with a 2-3m wide footpath connecting the crossing with the northern station access. Similarly, a marked pedestrian crossing on the bend of Joyce Street and Pendle Way connects the southern station access with footpaths provided on both sides of Joyce Street and Pendle Way. Pedestrian movements along the western side of Pendle Way were observed to be the heaviest, mostly associated with the commuter car park further to the west.

As discussed, access to the station platforms is via a combination of ramps and stairs thereby not complying with the DDA.

Examples of the pedestrian facilities for Pendle Hill Railway Station are provided in Figure 2.8.

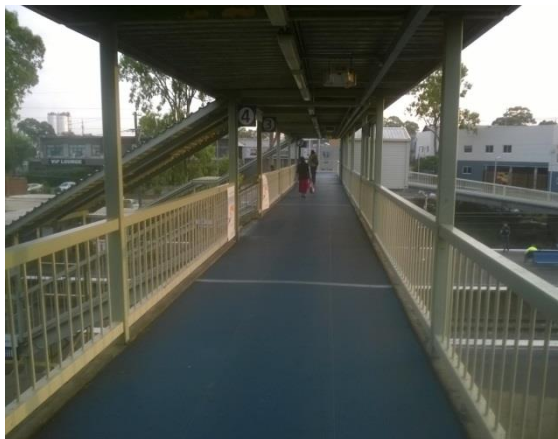
**Figure 2.8: Pedestrian Facilities and Station Access**



Ramp along Wentworth Avenue on the northern side



Ramp along Joyce Street on the southern side



Footbridge with stairs connecting to the station platforms



Pedestrian crossing on Wentworth Avenue east of the station entrance



Pedestrian crossing on Joyce Street, south of the station



Pedestrian plaza on the southern side of Joyce Street

## 2.5.2 Pedestrian Activity

GTA Consultants completed pedestrian demand surveys in early November 2014 during the weekday AM (6:30am-8:30am) and PM (4:00pm-7:00pm) peak periods. AM peak activity is summarised in Table 2.4, indicating that up to 1,045 pedestrians access Pendle Hill Railway Station during the peak hour with a 90:10 split between in and out.

The PM peak pedestrian activity was approximately 20% less than the AM, with a similar directional split albeit in the opposing direction. Of those exiting Pendle Hill Railway Station on the northern side, approximately 55% of pedestrians were headed along the western side of Pendle Hill.

**Table 2.4: Weekday AM Peak Hour Pedestrian Generation (7:00am-8:00am)**

Location	In	Out	Total
Northern side	359	58	417
Southern side	559	69	628
<b>Total</b>	<b>918</b>	<b>127</b>	<b>1,045</b>

The following observations were made with respect to the pedestrian arrival and departure profiles during the peak periods:

- 50-60% of pedestrian activity at the southern station access travelled along the western side of Pendle Way, which is seemingly associated with activity to/from the Town Centre and the commuter car park.
- 40-50% of pedestrians at the northern station access crossed at the existing Wentworth Avenue pedestrian crossing during both peak periods.

## 2.5.3 Cycling Infrastructure

Bicycle facilities at the station include bicycle racks at the southern station access with capacity for 5 bicycles. At the time of the site visit, bicycle parking was underutilised with 1-2 bicycle racks occupied. 4 bicycle lockers are located on Wentworth Avenue, approximately 170m west of the station access. These lockers are not conveniently located and do not have high usage rates. Of the 4 available, only 1 is currently in use.

**Figure 2.9: Bicycle Facilities**



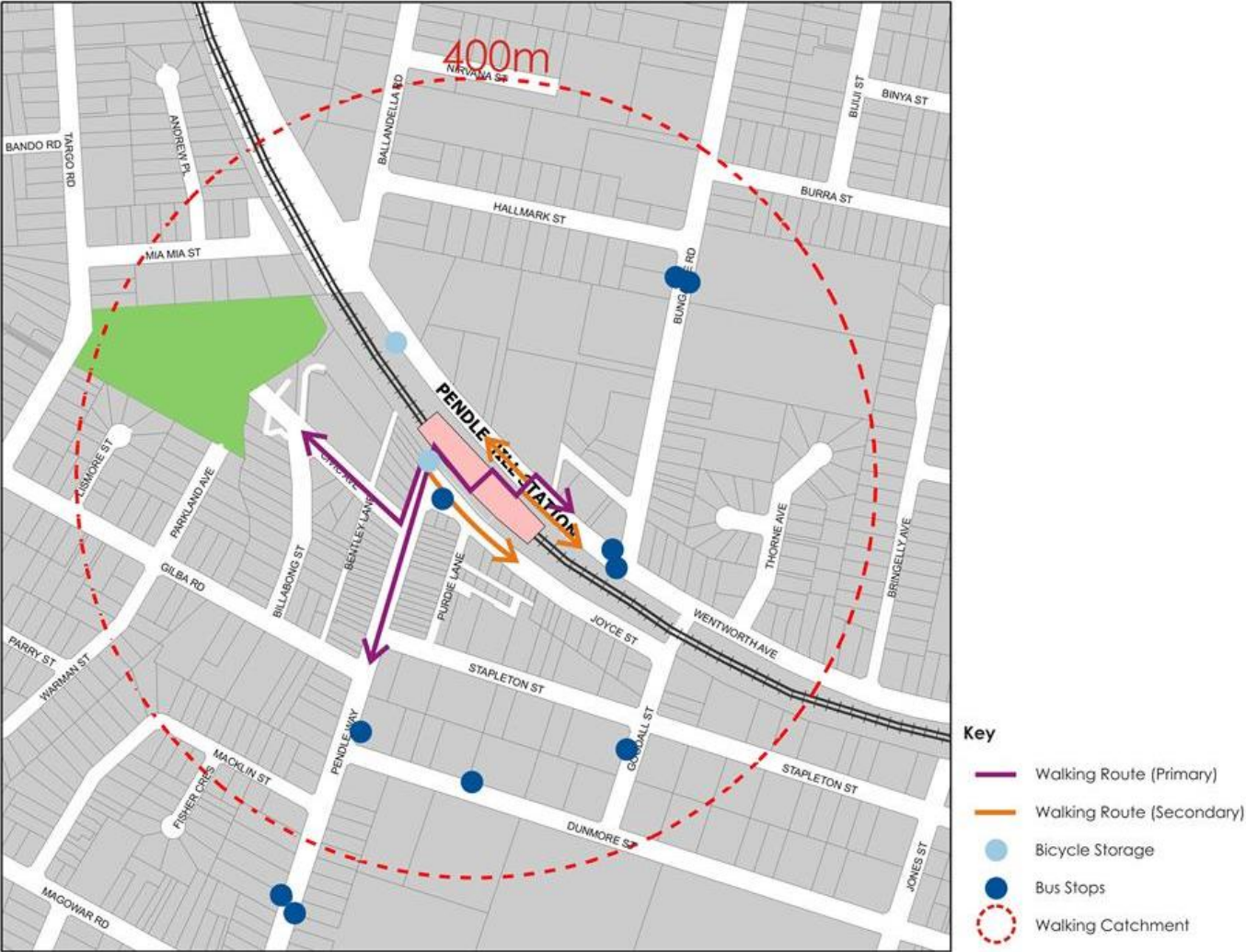
Bicycle racks located at the southern station access



Informal bicycle parking at the northern station access



Figure 2.10: Pedestrian Desire Lines and Cycling Facilities



## 2.6 Road Network

### Joyce Street

Joyce Street is a two lane single carriageway with approximately 3.5m lane widths and is generally aligned in an east-west direction. It is located on the southern side of Pendle Hill Railway Station and serves as a local street continuing as Pendle Way to the west and forming a priority controlled T-intersection with Goodall Street to the east. The Joyce Street/ Goodall Street intersection permits left-only movements from Joyce Street into Goodall Street.

A marked pedestrian crossing is located at the southern station access, with a taxi rank and bus zone located on the southern side. 1P parallel parking is provided along southern side, with a mixture of 1P and unrestricted 90° parking along the northern side.

Joyce Street is shown in Figure 2.11.

**Figure 2.11: Joyce Street (looking west)**



### Pendle Way

Pendle Way is a two-way road configured with 3.5m wide lanes (approximately) and is generally aligned in a north-south direction. It is located on the southern side of Pendle Hill Railway Station and serves as a local street forming priority controlled T-intersections with Civic Avenue and Gilba Road.

1P parking is provided throughout the town centre including an accessible parking space on the western side near the Civic Avenue intersection.

Pendle Way is shown in Figure 2.12.



Figure 2.12: Pendle Way (looking south)



### Wentworth Avenue

Wentworth Avenue is a two-way road, configured with 4m wide lanes (approximately) and is generally aligned in an east-west direction along the northern side of the station. It forms a signalised intersection with Goodall Street to the east.

A marked pedestrian crossing is located approximately 20m east of the station access ramp and connects footpaths on both sides of Wentworth Avenue. Unrestricted 90° parking is provided along the southern side west of the station access ramp, including two accessible spaces.

Wentworth Avenue is shown in Figure 2.13.

Figure 2.13: Wentworth Avenue (looking west)



#### Other Local Roads

Purdie Lane provides for two-way traffic within a 6m wide carriageway and forming a priority controlled T-intersection with Joyce Street and Stapleton Street. It generally serves as a back-of-house laneway for the commercial premises fronting Pendle Way, with signposted loading zones and general parking permitted. Pendle Way also provides access to an off-street parking area, comprising 48 2P spaces and 20 unrestricted spaces.

Civic Avenue provides for two-way traffic within a 10m wide carriageway. It is aligned in an east-west direction, forming a priority controlled intersection with Pendle Way. 1P parallel parking is provided along both sides, while also providing access to the Civic Park car park. The Civic Park car park provides 55 unrestricted parking spaces, including two accessible parking spaces.

Goodall Street provides grade separated access between the northern and southern sides, effectively linking Wentworth Avenue and Joyce Street with Dunmore Street further south. It provides a signalised intersection at Wentworth Avenue and a priority controlled intersection with Joyce Street. Bungaree Road travels north from Wentworth Avenue and is a key north-south traffic route north of the station. It connects with Wentworth Avenue at a priority controlled intersection, east of the station access.

## 2.7 Traffic Volumes

GTA Consultants completed traffic movement counts in the immediate vicinity of the station on Tuesday 4 November 2014 and Thursday 6 November 2014 during the AM and PM peak periods.

Two-way traffic volumes along Joyce Street/ Pendle Way totalled approximately 555 vehicles, with 1,190 two-way vehicles along Wentworth Avenue. These traffic volumes reflect Wentworth

Avenue primarily serving as a through traffic route, while traffic in the southern precinct is generally associated with the station and town centre activity. It is also worth noting that much of the traffic activity involved commuter set-down/ pick-up activity during both peaks.

## 2.8 Parking Demand

There are several designated and on-street commuter car parking areas in the vicinity of Pendle Hill Railway Station. This includes the Civic Park commuter car park and parking spaces adjacent to Purdie Lane. Joyce Street and Wentworth Avenue also provide 90° on-street commuter parking, with time restricted parking generally within the town centre.

In combination, there is approximately 500 marked car parking spaces in the vicinity of the station, with up to 60% of these within the southern precinct and roughly being for use by commuters. The majority of parking in the northern precinct is for use by commuters.

In line with expectations the demand for commuter parking is high, while restricted parking demand remains moderate during the AM and PM peaks. Given the town centre environment restricted parking demand is generally higher during the middle of the day.

Table 2.5 and Table 2.6 show peak hour parking demand within each precinct, with Figure 2.14 illustrating demand in the southern precinct only.

**Table 2.5: Peak Hour Parking Demand (Southern Precinct)**

Street	From	To	Side	Type	Supply (No.)	AM Peak Demand (09:00)		PM Peak Demand (16:00)	
						No.	%	No.	%
Joyce Street	Purdie Lane	Goodall Street	North	All Day	57	57	100%	55	96%
			North	1P	13	3	23%	4	31%
			South		23	3	13%	13	57%
		Pendle Way	North		8	1	13%	5	63%
			South		2	1	50%	0	0%
Pendle Way	Joyce Street	Civic Avenue	West		5	5	100%	3	60%
			East		5	3	60%	5	100%
	Civic Avenue	Gilba Road	West		17	9	53%	17	100%
		Stapleton Road	East		10	9	90%	10	100%
	Civic Avenue	Pendle Way	Billabong Street		North	10	8	80%	9
South					15	5	33%	8	53%
Civic Park Car Park	-	-	-		All Day	55	53	96%	55
Purdie Lane Car Park	-	-	-	25		20	80%	20	80%
	-	-	-	2P	43	18	42%	22	51%
TOTAL					286	195	68%	226	79%

Figure 2.14: Peak Hour Parking Demand (Southern Precinct)



Table 2.6: Peak Hour Parking Demand (Northern Precinct)

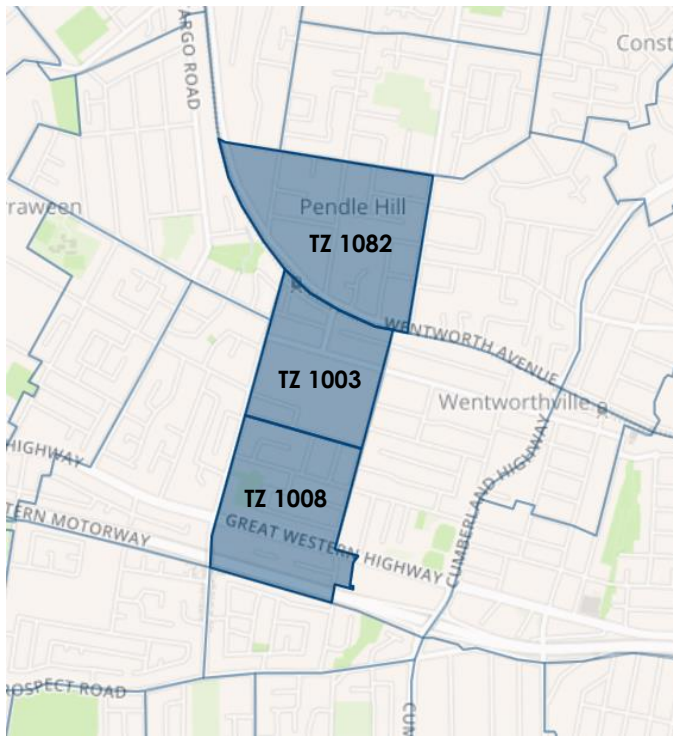
Street	From	To	Side	Type	Supply (No.)	AM Peak Demand (08:30)		PM Peak Demand (16:00)	
						No.	%	No.	%
Wentworth Avenue	Station Access	Ballandella Road	South	All Day	138	138	100%	120	87%
			North		10	10	34%	9	90%
Bungaree Road	Wentworth Avenue	Hallmark Street	West		22	20	91%	19	86%
			East		29	26	90%	22	76%
TOTAL					199	194	97%	170	85%

## 2.9 Travel Mode Choice

The Census *Journey to Work* (JTW) data 2011 is regarded as the most robust picture of existing travel patterns to/ from Pendle Hill. The smallest geographical area for which JTW data is available is a Travel Zone (TZ). JTW data was analysed for the broader Pendle Hill Railway Station catchment, to better understand the current travel patterns for people who live in the area.

The Pendle Hill Railway Station catchment, which was analysed is shown in Figure 2.15.

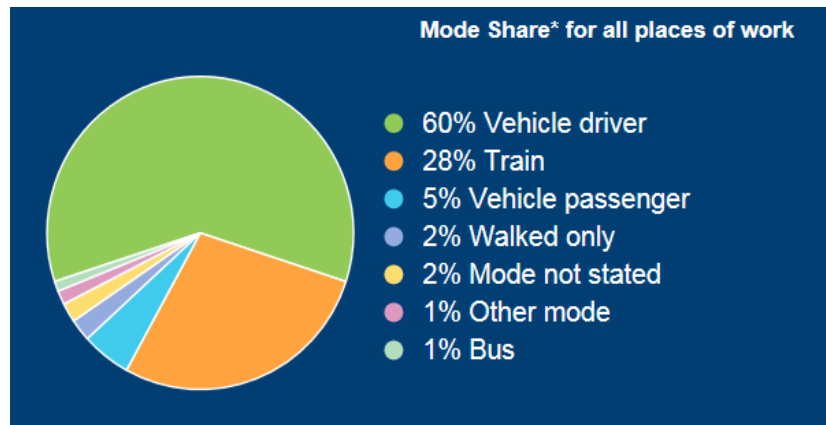
**Figure 2.15: 2011 Census Data Journey to Work Data (TZ 1082, TZ 1003 and TZ 1008)**



Basemap source: Bureau of Transport Statistics

The JTW data indicates that 60% (1,100) drive to work, with additional 5% (92) travelling as passengers. Further, it is noted that 29% (532) commute via public transport, comprising of 28% (513) who use train and 1% (9) who use bus. These statistics are summarised in Figure 2.16.

**Figure 2.16: 2011 JTW – Employed Residents Commuting from TZ 1082, TZ 1003 and TZ 1008**



Basemap source: Bureau of Transport Statistics

The JTW data also indicates that Parramatta, Sydney Inner City and Auburn areas are the primary trip generators, with 46% (835) people commuting to these areas. Other common work places include:

- Blacktown (5%)
- Ryde – Hunters Hill (5%)
- Baulkham Hills (4%)
- Merrylands – Guildford (4%).



## 2.10 Road Safety

Recorded crash history (sourced from RMS) in the vicinity of Pendle Hill Railway Station is presented in Table 2.7. The data includes the most recent 5-year period from January 2009 to December 2013 and indicates that a total of 35 crashes have occurred in the study area. The breakdown of these crashes is as follows:

- 15 crashes occurred on Wentworth Avenue between Ballandella Road and Thorne Avenue
- 8 crashes occurred on Joyce Street between Pendle Way and Goodall Street
- 4 crashes occurred on Pendle Way between Gilda Road and Joyce Street
- 3 crashes occurred on Bungaree Road between Wentworth Avenue and Eastern Access Driveway
- 5 crashes occurred on Civic Avenue between Billabong Street and Pendle Way.

These crash results are consistent with the role and function of Wentworth Avenue and Joyce Street, given they carry a reasonable volume of traffic and pedestrian activity, as well as experiencing peak period congestion.

The crash statistics are summarised in Table 2.7.

**Table 2.7: Crash Statistics Summary**

Location	Type of Crash	Number of Crashes
Wentworth Avenue	Intersection, adjacent approaches	1
	Head-on (not overtaking)	1
	Opposing vehicles; turning	2
	Rear-end	3
	Hit pedestrian	4
	Off road on straight, hit object	1
	Off road on curve, hit object	1
	Other crash type	2
Joyce Street	Intersection, adjacent approaches	1
	Opposing vehicles; turning	3
	Hit pedestrian	1
	Off road on straight, hit object	1
	Other crash type	2
Pendle Way	Hit pedestrian	1
	Off road on straight, hit object	1
	Other crash type	2
Bungaree Road	Opposing vehicles; turning	1
	U-turn	1
	Off road on straight, hit object	1
Civic Avenue	Intersection, adjacent approaches	1
	Hit pedestrian	1
	Off road on straight, hit object	2
	Other crash type	1

Figure 2.17: Existing Crash History



## 3. Proposed Station Precinct Improvements

### 3.1 Overview

An Accessibility Upgrade design for the Pendle Hill Station Easy Access Upgrade has been prepared by DesignInc and is shown in Figure 3.1. As outlined in Section 1.3, the Proposal includes the following:

- four new lifts:
  - one at each station entrance
  - one to Platform 1-2
  - one to Platform 3-4
- a new station concourse featuring
  - a booking office
  - a family accessible toilet
  - amenities for staff
- new platform stairs and canopies
- new street entry stairs and canopies
- demolition of the existing ramps and partial demolition of the existing footbridge.

**Figure 3.1: Pendle Hill Railway Station Proposed Layout**

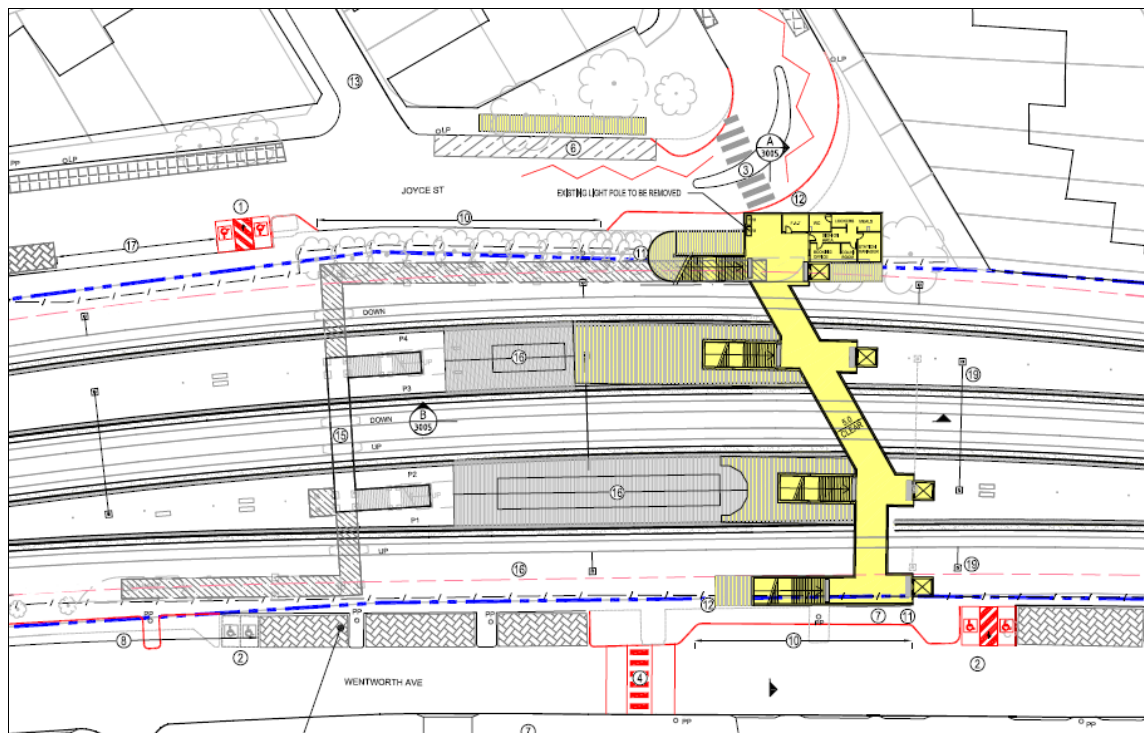


Image source: DesignInc design plans

#### 3.1.1 Station Access

The Proposal includes a new pedestrian footbridge, which would link the two platforms with Wentworth Avenue and Joyce Street. The proposed station access points and footbridge would



align with the existing pedestrian crossing on Joyce Street, with a new pedestrian crossing proposed in Wentworth Avenue to align with the northern station access.

Lifts and stairs would be provided on the northern and southern side of the station and on both platforms.

The existing station footbridge would be demolished as part of the Proposal, as well as the existing raised pedestrian crossing and associated facilities located in Wentworth Avenue, east of the station.

### 3.1.2 Integrated Transport Facilities

#### Taxi and Kiss and Ride

Indented kiss and ride facilities would be provided on both sides of the station, with a combined capacity for approximately 11 vehicles.

The existing 'No Parking -Taxis Excepted' currently operates as a Taxi rank in Joyce Street. This would be removed and a formalised taxi rank is proposed in Pendle Way, replacing the existing accessible parking space, located on the western side of Joyce Street adjacent to the bus stop, south of the station.

#### Bus Stop

The existing bus stop located in Joyce Street would be extended to accommodate additional capacity. New bus shelters and seating is also proposed at the bus stop.

#### Bicycle Parking

The existing bicycle lockers (with capacity for three bicycles) would be relocated to the northern station forecourt, with additional bicycle storage/ racks also provided at the southern station forecourt.

### 3.1.3 Car Parking

Additional commuter car parking would be provided on the northern and southern sides of Pendle Hill Railway Station.

Removal of 1P restrictions east of the station in Joyce Street would allow the provision of 2 accessible spaces and approximately 10 commuter parking spaces in this area. As discussed above, the existing single accessible space in Joyce Street would be replaced with a Taxi rank.

The two existing accessible spaces in Wentworth Avenue would be relocated to the western side of the station, near the northern station forecourt and lifts.

Up to 10 new 90 degree commuter parking spaces are proposed at the eastern end of the station along the southern side of Wentworth Avenue. In addition, 45 degree angled commuter parking spaces is proposed at the western end of the station along the southern side of Wentworth Avenue.

## 4. Operational Traffic Impacts

### 4.1 Future Demand

Forecast station patronage data provided by Transport for NSW is provided in Table 4.1. This data indicates that rail patronage at Pendle Hill Railway Station is expected to increase to 9,840 persons per day and 3,633 in an average AM peak period. This equates to a 42% overall increase in persons per day.

**Table 4.1: Forecast Station Patronage [1]**

	Period in Years				
	2011-2016	2016-2021	2021-2026	2026-2031	2031-2036
Growth	3%	13%	11%	9%	4%
Daily Patronage (at the end of period)	6,920	7,820	8,680	9,463	9,840
AM peak	2,719	2,816	3,317	3,511	3,633

[1] Transport for NSW, Easy Access / Station Upgrade Projects 2014 (Project 1) Portion 3 (Pendle Hill), Deed Exhibit B, Works Brief Appendix A (31/10/14)

### 4.2 Public Transport

The Proposal would not have any significant impacts on bus or rail operations. It would likely bring about positive impacts in terms of contributing towards making public transport more accessible to the community.

The extension of the existing bus stop on the southern side of Joyce Street ensures adequate capacity for bus services. In addition, the proposed bus shelter new seats would improve amenity and the overall user experience, encouraging the use of local bus feeder services to access the station.

### 4.3 Pedestrians

The proposed pedestrian facilities, including the new footbridge and a raised pedestrian crossing in Wentworth Avenue would offer obvious pedestrian benefits, particularly in improving the user experience by providing new and improved facilities with greater capacity.

Relocation of the pedestrian footbridge to the western end of Pendle Hill Railway Station would provide a more direct route for the majority of pedestrians, particularly for those approaching from the south. In addition, the proposed access arrangements would cater for an increase in parking demand west of the station, noting that car parking supply is expected to be increased in this area.

The relocation of the accessible spaces would improve accessible accessibility, particularly on the northern side where accessible spaces would be located in close proximity to the lift, stairs and entry forecourt area. The accessible spaces on the southern side would be located approximately 70-80m from the station access. Although this is not a desirable distance, there is a suitable pedestrian path which could adequately accommodate an accessible path of travel. In addition, this location could allow for an increased accessible parking provision.

Based on the above, the proposed pedestrian improvements would result in coherent, direct and safe connections and the overall user efficiency and connectivity for the station would be enhanced.

Maintaining the existing pedestrian link between platforms would enable efficient and safe pedestrian activity, particularly for passengers who would be required to transfer between trains on opposing platforms.

### Capacity Assessment

To understand whether there is adequate capacity in the station surrounds to cater for future pedestrian demands while ensuring the safety and convenience for pedestrians, GTA Consultants has used Fruin Theory<sup>3</sup> as reproduced in the *'Transit Capacity and Quality of Service Manual – 2<sup>nd</sup> Edition – Part 7'*<sup>4</sup> which involves evaluating the pedestrian capacity and level of service (LOS) of an area.

To assess pedestrian LOS, GTA Consultants chose to use the criteria of 'Pedestrian Flow Rate'. Pedestrian flow rate, measured in pedestrians per metre per minute, is the number of pedestrians that pass a point during a specific period of time.

Table 4.2 presents the LOS criteria based on 'Pedestrian Flow Rate' and Figure 4.1 presents a graphical representation of the walkway LOS.

**Table 4.2: Pedestrian Level of Service on Walkways**

LOS	Flow per Unit Width (p/ m/ min)
A	0-23
B	23-33
C	33-49
D	49-66
E	66-82
F	Variable

Table 4.3 presents the results of the pedestrian LOS assessment for the study location. The assessment was undertaken for the peak 15 minute intervals during the study hour. The walkway widths used are based on the estimated path widths at the existing and future access station points.

**Table 4.3: Pedestrian LOS Assessment**

Period	Peak Pedestrian Volume (p)		Walkway Width (m)	Flow Rate (p/ m/ min)	LOS
	(p/ 15min)	(p/ min)			
Existing	325	21.7	2.0	10-11	A
Future 2031-2036 [1]	462	30.8	3.0	10-11	A

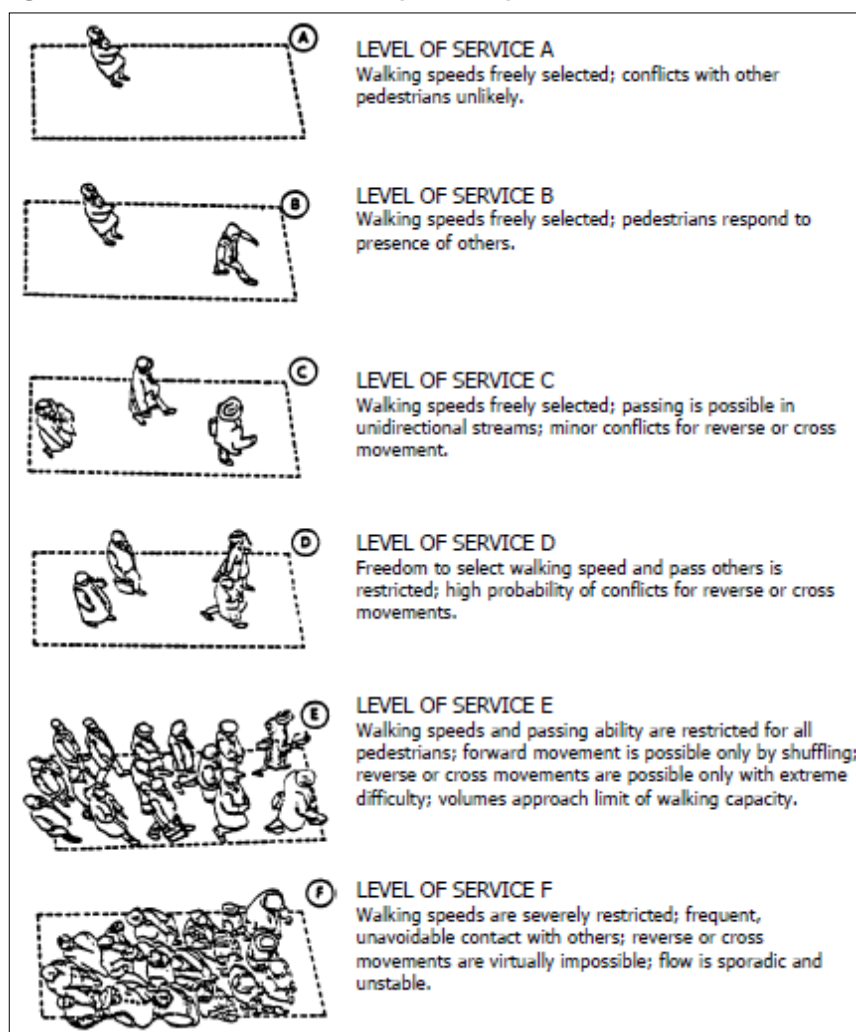
[1] Based on a forecast 42% increase in station patronage between 2011-2016 and 2031-2036 as detailed in Transport for NSW, Easy Access / Station Upgrade Projects 2014, Works Brief Appendix A (31/10/14)

Table 4.3 indicates that based on existing pedestrian volumes, the pedestrian LOS for the study location is 'A' operates well over a 15 or 1 minute peak. In addition, the widened access points for Pendle Hill Railway Station would be adequate to accommodate the expected growth in passenger demand. Overall, the access footpaths would operate well with no queuing or delay at any time or location.

<sup>3</sup> Fruin, John J. 1987 *Pedestrian Planning and Design – Revised Edition*

<sup>4</sup> Transportation Research Board 2003 *Transit Capacity and Quality of Service Manual – 2<sup>nd</sup> Edition – Part 7*

Figure 4.1: Illustration of Fruin Theory Walkway Levels of Service<sup>5</sup>



Source: Transportation Research Board 2003 Transit Capacity and Quality of Service Manual – 2<sup>nd</sup> Edition – Part 7

## 4.4 Cyclists

It is understood that Pendle Hill Railway Station is classified as a Level of Service 3 and therefore requires a minimum of 20 undercover bicycle parking spaces. The Proposal includes a combination of bicycle racks and bicycle lockers, which would be adequate to cater for the current and future demands. It is anticipated that the relocation of the lockers to the northern and southern station access points is likely to increase awareness of such facilities, potentially with an associated increase in the cycling mode share.

## 4.5 Kiss and Ride and Taxi

The Proposal includes provision of formalised kiss and ride facilities, including relocation and expansion of the existing kiss and ride on the northern side, with capacity for up to five vehicles and a new kiss and ride facility on the southern side, with capacity for six vehicles. The kiss and

<sup>5</sup> Fruin, John J. 1987 *Pedestrian Planning and Design* – Revised Edition

ride facilities would be located in close proximity to the realigned station access points, to ensure direct access is provided.

The proposed relocation of taxi facilities from Joyce Street to Pendle Way would not be expected to have any adverse impacts. Its proposed location on a key pedestrian desire line could improve utilisation while also improving pedestrian accessibility to the station.

## 4.6 Proposed Precinct Layout

Significant works are proposed at the station including connections to the existing platform and at each interface with the connecting streets. The proposed design results in some constraints, particularly on the southern side and other select considerations including the following:

### Southern Precinct

- The main station concourse abuts a revised road layout appearing to not provide adequate setback to the road kerb line. Specific height clearances would be required to accommodate the largest vehicle (likely to be minimum 4-4.5m).
- Swept paths would need to be completed to confirm the revised road layout, including 14.5m buses and 12.5m large rigid trucks.
- The central median may require modification or removal to accommodate the swept paths.
- Shifting the southern station forecourt and facilities further west could reduce the amount of redesign at the Joyce Street bend, while also straightening the footbridge, which could improve passive surveillance.

### Northern Precinct

- Adequate setbacks would be required at the kiss and ride facility to ensure capacity for pedestrians, noting the interactions between passing pedestrians and the kiss and ride activity.
- Suitable manoeuvring area would be required adjacent to the proposed 90 degree parking spaces at the eastern end of the station to ensure safe and efficient operation. It appears that this could be achievable within the existing road reserve, with the removal or modification of the median and pedestrian crossing.
- All proposed parking spaces should be designed in accordance with Australian Standard 2890.1:2004 (Parking Facilities, Part 1: Off-Street Parking) and Australian Standard AS 2890.6:2009, (Parking Facilities, Part 6: Off-Street Parking for People with Disabilities).

## 4.7 Traffic Generation and Parking Demand

Given that the Proposal provides a higher level of station accessibility and usability at Pendle Hill Railway Station, the improved commuter experience and upgraded facilities are likely to attract greater commuter use. As a result, traffic activity is anticipated to marginally increase, with a negligible impact on the surrounding road network.

The Proposal includes a range of changes to the on-street parking supply surrounding the station as discussed below.

### Northern Precinct

The proposed parking arrangements along Wentworth Avenue include removal of existing parking spaces at the station entry to accommodate the proposed kiss and ride facility. This

would be offset with the provision of approximately 10, 90 degree angled commuter parking spaces east of the station. It is also proposed to provide up to 28, 45 degree angled parking spaces west of the station, where informal commuter activity is occurring under existing arrangements. This combines to merely formalise parking and would result in a negligible increase in parking supply in the northern precinct.

#### Southern Precinct

The proposed parking arrangements would result in the loss of approximately 20 restricted parking spaces along the northern side of Joyce Street to accommodate the following:

- o kiss and ride for approximately 6 vehicles
- o approximately 10 commuter parking spaces
- o two accessible parking spaces (including one relocated).

The restricted parking appears to be moderately utilised and with its conversion to commuter car park would result in any such demand being redistributed amongst the other restricted parking areas. The parking demand surveys, albeit during the morning and afternoon periods show that there is adequate capacity to accommodate this change.

## 4.8 Property Access

The Proposal is not expected to have any impact on existing access to properties in the vicinity of the site.

## 4.9 Road Safety

The Proposal includes the relocation of the existing pedestrian crossing in Wentworth Avenue to align with the future pedestrian desire line and ensure pedestrian safety at the station. It is anticipated that the proposed kerb realignments in Joyce Street would constrain the road environment, with reduced vehicle speeds in this area. This would improve road user safety.

It is recommended that the footpath located along the southern side of Wentworth Avenue be extended to reach the extent of the new formalised parking provision west of the station.

It is also recommended that a Road Safety Audit be undertaken prior to construction commencing.

## 5. Construction Traffic Impacts

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### 5.1 Construction Activity

Construction works at Pendle Hill Railway Station would be restricted to the standard hours of construction as follows:

- o 7:00am to 6:00pm Monday to Friday
- o 8:00am to 1:00pm Saturdays
- o no work on Sundays or public holidays.

The majority of works are able to be undertaken during non-possession times using appropriate safe working methods to protect the live network. Therefore the majority of works would be conducted during standard working hours, as specified above.

However, some works outside of standard hours would be required during evenings, night periods and weekends during track possessions, and for key activities to minimise impacts to commuters and pedestrians. It is estimated that a total of eight possession periods would be required for the Proposal.

Where out of hours works are required, approval from TfNSW would be required and the affected community would be advised as outlined in the TfNSW's Construction Noise Strategy (TfNSW, 2012), and as per the Pendle Hill Environmental Noise and Vibration Impact Assessment (SLR, 2014).

#### 5.1.1 Worker Induction

All workers and subcontractors engaged on site would be required to undergo a site induction. The induction would include permitted access routes to and from the construction site for all vehicles, as well as standard environmental, WHS, driver protocols and emergency procedures.

Any workers required to undertake works or traffic control within the public domain shall be suitably trained and would be covered by adequate and appropriate insurances. All traffic control personnel would be required to hold RMS accreditation in accordance with Section 8 of Traffic Control at Worksites.

### 5.2 Construction Stage Impacts

#### 5.2.1 Construction Vehicle Routes

The surrounding road network is well established and would provide direct access to/ from the site. Figure 5.1 and Figure 5.2 have been prepared to illustrate the likely access routes for each side of the railway line.

It is anticipated that the primary site compound would be located at Wentworthville Railway Station (east of Pendle Hill) due to the site constraints. Therefore vehicle routes between the two stations have been specified.

Additional worksites would be required at specific locations on both sides of Pendle Hill Railway Station to cater for temporary works. The layout for the site compound would ensure access by the largest design vehicle, while it is likely that on-street Works Zones would be required to



accommodate vehicle movements to the specific worksites. Prior approval for any Works Zone would be required from Council.

Figure 5.1: Construction Vehicle Routes (Northern Side)

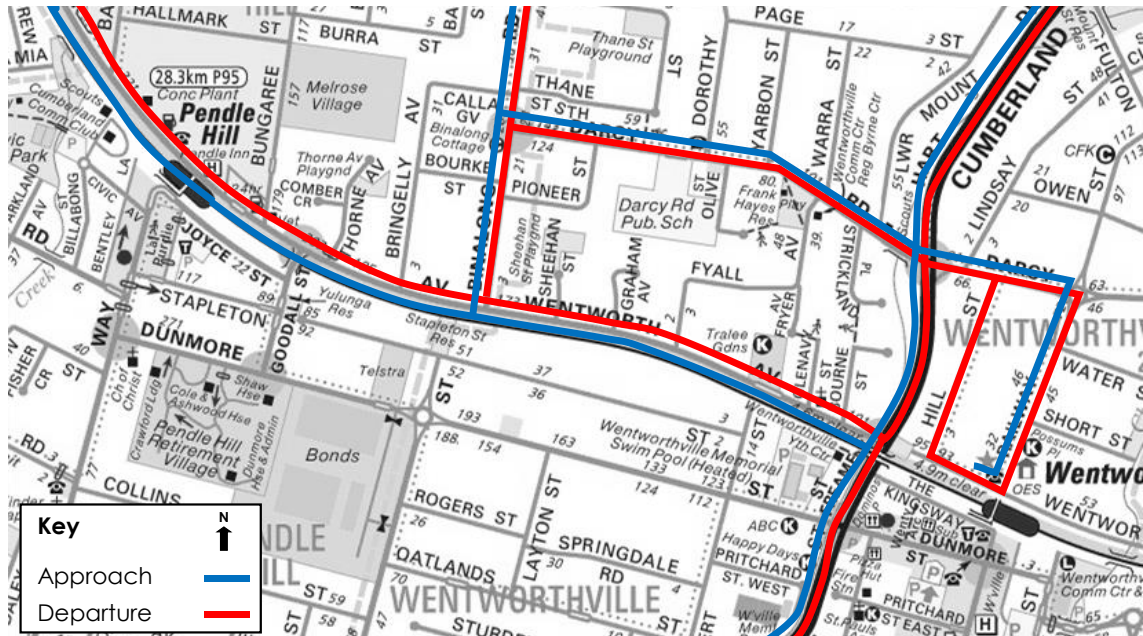


Image source: Sydway

Figure 5.2: Construction Vehicle Routes (Southern Side)

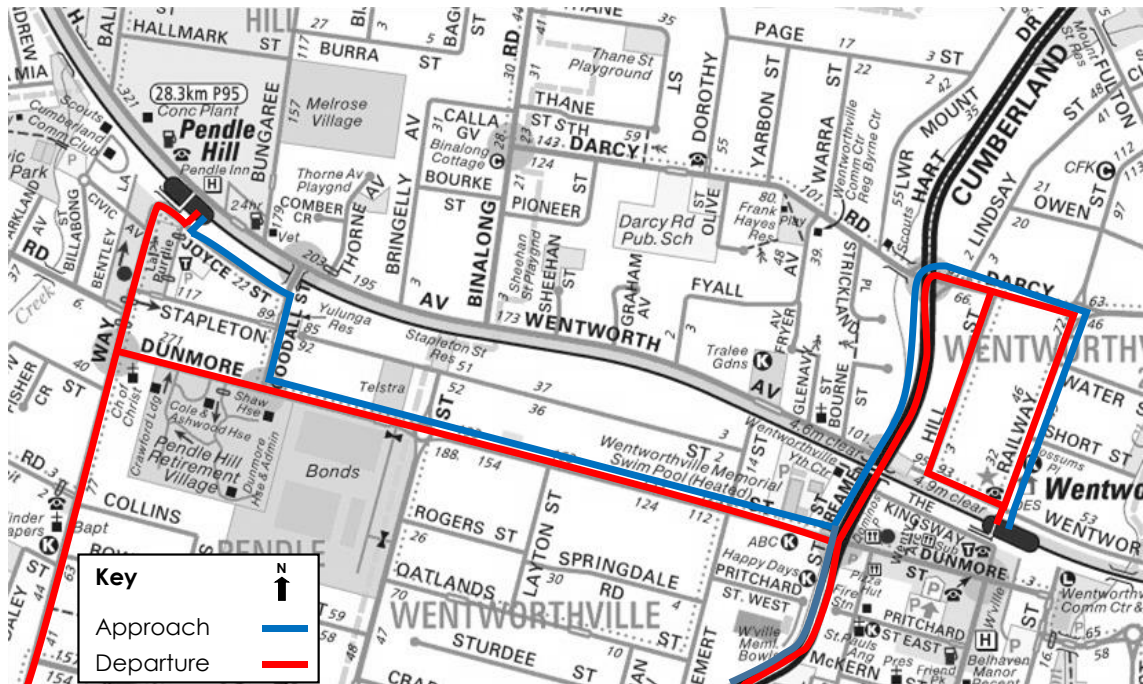


Image source: Sydway



### 5.2.2 Traffic Impacts

Traffic generated by the construction includes construction worker light vehicles (including utility vans), as well as heavy vehicles for periodic delivery and removal of materials, including plant and equipment. Vehicle types and sizes would vary depending on the required use, but include medium and large rigid vehicles and articulated vehicles for import of bulk materials or spoil removal, as well as concrete trucks. The amount of fill material or spoil would be minor as the site is for the most part level and paved.

The traffic generated by construction at the site is unknown at this stage, however given the size of the proposed works, construction traffic generation is expected to be minor and have a negligible impact on existing traffic conditions. The interaction between the work site and street frontages (including traffic and pedestrians) would be managed by qualified personnel to ensure safety for all users at all times.

Any works on weekends would not present significant traffic related impacts, with no known specific restrictions limiting access and/ or the work hours as specified.

### 5.2.3 Parking Impacts

Given that parking is at a premium in the local area, construction workers would be encouraged to use the frequently available public transport for travel to and from the site.

It is anticipated that the localised construction activities, specifically implementation of Works Zone may have a temporary impact on the commuter parking provision, with a degree of parking loss expected along the northern and southern station frontages.

It is desirable that works on either side of the station be staggered to reduce the impact to commuter parking. Should construction activity necessitate a larger impact on parking provision, advance signage informing users of such activity is recommended. This would allow for communication of the works while allowing users to make an informed decision of alternate parking locations, or change mode choice altogether.

### 5.2.4 Other Impacts

Construction activities would not typically present significant impacts on the surrounding area and users. This includes rail operations, bus operations and general traffic. Construction works in the vicinity of any pedestrian and cyclist desire lines would need to be managed and controlled at all times to ensure that there is no impact to public safety.

Negligible impact on access to surrounding properties is expected during construction.

## 5.3 Recommended Mitigation Measures

Notwithstanding the limited impacts of construction on traffic operation of the surrounding network, a Traffic Control Plan (TCP) would likely need to be prepared and submitted to the RMS and/ or Council to appropriately manage the use of the designated construction routes and site interfaces.

As part of implementation of the TCP, standard signage warning approaching vehicles of the construction activity and heavy vehicle movements should be installed. This should include static signage to be in-place in advance of the works. Other possible mitigation measures to minimise traffic impacts during construction of the car park generally include:

- Appropriate traffic management, including static signs, manual traffic control and provision of temporary barriers to control the proposed work areas and minimise delays.
- Establishment of safe access points to work areas from the adjacent road network including safety measures such as barriers and warnings to pedestrians, maintaining sight distance requirements and signage and the provision of traffic management measures such as those identified above.
- Use of traffic controllers to negotiate pedestrian and construction vehicle priority and access, if required.

The TCP should also outline how potential construction vehicle manoeuvres could be accommodated in and out of the construction sites and/ or Works Zones.

## 5.4 Construction Traffic Management

A Construction Traffic Management Plan would also be required to be prepared and submitted to Council's Local Traffic Committee. The plan should include a description of:

- Final construction traffic approach and departure routes.
- Locations of access to and from the local road network.
- Details of construction signage and traffic controllers).

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