

Jannali Station Precinct Accessibility Upgrade

Traffic, Transport and Access Impact Assessment



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1 Introduction

Multi-modal transport interchanges are critical pieces of urban infrastructure within the transport network. Efficient interchanges enable people to move conveniently between different parts of the transport network and provide a viable alternative to the private car. These facilities should be integrated with the surrounding land use and enhance the user experience when navigating the transport network by providing access to desired destinations via a range of mode choices.

The NSW Government places a strong focus on the transport customer, aiming “...to create interchanges that are places for people rather than just facilities for vehicles¹”. Recognising that interchanges should accommodate the needs of all people, Jannali Station was identified for inclusion in the Transport Access Program through an evidenced-based selection process. The Interchange will continue to experience patronage growth and various improvements are required to improve the experience for these customers. Of particular importance is the need to better accommodate mobility-impaired customers.

Upgrades to provide accessible infrastructure at the interchange should be accompanied by increased capacity for future patronage demands, as well as convenient and legible interchange and wayfinding between transport modes.

Jannali Interchange provides local residents with an entry point to the train network of Sydney and NSW to access employment, shopping and education in nearby Sutherland as well as destinations further afield across the state including the Sydney CBD. Improvements to the interchange access and functionality have the potential to impact positively on the public transport experience for all customers.

1.1 Background

The Transport Access Program (TAP) is an initiative by Transport for New South Wales (TfNSW) to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most. The aim of the program is to provide:

- Station Precincts that are accessible to the mobility impaired, aging and parents 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 zones 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.

The TAP will deliver customer-focused and high quality public transport interchanges through upgrades and improvements, providing customers with easier travel connections and access to the different transport services. The program, with its customer focus, will transform interchanges from a vehicle focus to a people focus and in doing so improve the comfort and ease for all interchange users.

The scope of this project encompasses the rail station, associated interchange facilities and passenger access between those facilities and the station proper. It includes station platforms, buildings, gates, pedestrian and cycle access paths, pedestrian access footbridge, pedestrian linkages to the adjacent streets and the commuter car park, bus zones, accessible parking and shelters, taxi stands, Kiss & Ride locations and bicycle facilities.

¹ Making interchange places, Product Strategy, 6 May 2012 (Transport for NSW)

1.2 Study Objectives

The objective of this Traffic, Transport and Access Impact Assessment is to assess the impact of the new station infrastructure and detail how the new station configuration can be best integrated into the area with minimal disruption to the local transport network.

1.3 Scope of Works

The scope of works undertaken as a part of this study include:

- Overview of the current transport environment in close proximity to the station, including road, public transport, cycle and pedestrian networks;
- Assessment of the construction issues that may arise as a result of the station infrastructure upgrade and the impacts on the transport network;
- Analyse station patronage, including current and forecasted patronage between 2014 and 2036;
- Review of current and proposed pedestrian crossing facilities with recommendations of crossing facilities where pedestrian desire lines are not covered;
- Assess the impact on the local road network including disruptions and any loss of service (where applicable) during construction and post-construction; and
- Review of all station access points with reference to relevant guidelines to ensure appropriate standards are met.

1.4 Reference Documents

The following documents were used as reference as a part of this assessment:

- Australian Standards AS890 – Part 6: Off-street car parking for people with disabilities;
- RMS – Technical Direction – Stopping and Parking Restrictions at Intersections and Crossings TDT02002/12c;
- Proposed scope of works as provided within the report;
- An inspection of the site and its surroundings; and
- Any documents as referenced within the context of this assessment.

2 Existing Station Environment

2.1 Study Area

Jannali Interchange is a railway station together with adjacent bus zones and taxi zone, in Sydney's south-eastern outer suburbs that provides access to the Sydney Trains network via the Eastern Suburbs and Illawarra line (T4). Jannali Interchange is located approximately 30 kilometres from Central Station.

Jannali Interchange sits within the local government area of the Shire of Sutherland. Adjacent to the station, the rail corridor is bounded by Jannali Avenue/Mitchell Avenue to the west of the station, and Railway Crescent to the east.

Jannali Interchange is nestled within a B2 Local Centre land use zone though this is surrounded by R4 Residential High-Density to the immediate north of the interchange and R2 Residential Low-Density elsewhere.

2.2 Vehicle Network

2.2.1 Parking Provisions

Jannali Station currently has two commuter car parks on the western side of the station, and two Council owned parking areas/on-street parking on the eastern side. The main commuter parking areas are the north-west car park and the Jannali Avenue south-west car park which have 109 and 69 spaces respectively. Both of these car parks are owned by TfNSW and operated and maintained by Sydney Trains.

Parking areas on Railway Crescent close to the station entry are time-restricted and therefore not suitable as commuter parking. However, the areas on Railway Crescent north of taxi zone and south of existing raised flat top near White Street have unrestricted parking which can be used for commuter parking.

2.2.2 North-West Car Park

Jannali Interchange has a commuter car park to its north, on the western side of the railway line which is accessed from Oxley Avenue. This has 109 parking spaces including 3 accessible spaces at the southernmost end. The southernmost parking spaces are approximately 125 metres from the station's western entrance, while the northernmost spaces are approximately 300 metres from the station entrance. Access to the station's eastern entrance is an additional distance of approximately 180 metres; there is currently no link between the platforms in the station and access has to be gained by crossing the Railway Crescent road bridge.

Access to the station is via a footpath of approximately 1.2 metres width and a gradient of approximately 2-3% (uphill from the car park).

The car park is well lit, while the footpath has some lighting but this is limited and can be obscured by trees. There is also a deficiency of CCTV and passive surveillance in the car park and the footpath.

The car park surface is worn, creating trip hazards. The footpath is concrete and of generally good condition although there are occasional trip hazards where the surface is worn.

Figure 2.1: North-west Car Park



Figure 2.2: Accessible Spaces in North-West Car Park



Figure 2.3: Footpath from North-West Car Park to the Western Entrance



2.2.3 Jannali Avenue Car Park

There is a commuter car park immediately parallel to Jannali Avenue, south of the Railway Crescent bridge (western side of the railway line), separated from Jannali Avenue only by a raised median with some vegetation. This includes 2 accessible parking spaces at the northern end, approximately 100 metres from Jannali Station's western entrance and approximately 130 metres from the eastern station entrance. The southern limit of this car park is approximately 220 metres further south. Additionally, this stretch of Jannali Avenue has mostly unrestricted on-street parking, as well as some verge parking. These parking areas were observed to be well used.

There are security issues with these parking areas as there is limited surveillance. It is also rather remote from the interchange, as the southernmost spaces in the commuter car park are approximately 320 metres from the station's western entrance or approximately 350 metres from the station's eastern entrance (there is currently no link between the platforms in the station).

The grade of Jannali Avenue slopes down towards the station's western entrance at 6-7% grade. The grade of Railway Crescent, leading northwards to the station's eastern entrance from the bridge over the station, is steeper at approximately 7-10% downhill.

Many areas of the footpaths surfaces are worn and there are potential trip hazards; however, the footpath on Railway Crescent at the station's eastern entrance up to approximately 50 metres south, appears to have been upgraded and improved recently.

Figure 2.4: Jannali Avenue Car Park



Figure 2.5: Jannali Avenue Footpath from Car Park Towards Station



2.2.4 Railway Crescent North Parking

The Railway Crescent north parking area owned by Council consists of approximately 37 unmarked 90-degree parking. This area of parking is currently unrestricted, and most likely used by station commuters. From the northern most extremity of this car park, commuters may have to walk between 200m and 380m to arrive at the station platform. No footpaths have been provided over the length of the car park, on the western side, thus pedestrians will most likely be walking behind cars which may be a safety hazard.

Figure 2.6: Railway Crescent North Parking



2.2.5 Railway Crescent South Parking

The Railway Crescent south parking consists of 79 parking spaces at 90-degrees. 15 of these parking spaces are 1P, for the retail centre customers. The remaining 64 spaces are unrestricted, most likely used by station commuters. From the southern extremity of the car park, commuters may have to walk between 340m and 400m, depending on the platform they wish to take. No footpaths have been provided over the length of the car park, on the western side, thus pedestrians will most likely be walking behind cars which may be a safety hazard.

Figure 2.7: Railway Crescent South Parking



2.2.6 On-Street Parking

Unrestricted on-street parking has been provided on the south side of Mitchell Avenue, both sides of Oxley Avenue, eastern side of Jannali Avenue, and most of Railway Crescent (except close to the town centre). Areas close to the retail centre of Jannali such as Box Road and the western side of Jannali Avenue have time restricted parking.

2.2.6.1 Kiss-and-ride Facilities

There is no formal, designated Kiss & Ride area, i.e. spaces for people to drop off car passengers at the interchange, although there are some locations used as informal Kiss & Ride.

Discussions with station staff have revealed that, just outside the western station entrance on Jannali Avenue/ Mitchell Avenue, car drivers have often been observed to drop off passengers on the bend in the road. This has safety implications, as cars that have stopped on the bend can encourage following vehicles to overtake on the bend, where visibility of on-coming traffic is limited. Station staff suggested a solution by creating a formal drop-off area on the vacant land south of the station entrance on the eastern side of Jannali Avenue. This is discussed in more detail in Section 6 “Opportunities and Constraints”

It is likely that the taxi zone (described above) would be used as informal Kiss & Ride, given its convenient proximity to the eastern entrance to the Station.

Figure 2.8: Corner of Jannali Avenue and Mitchell Avenue where kiss-and-ride has been observed



2.2.7 Local Road Network

Jannali Station is flanked by Jannali Avenue to its west and Railway Crescent to its east. These roads are distributors, linking to various local access roads. In the vicinity of the interchange, these are single-carriageway undivided 2-lane roads.

To the north-east of the interchange, Railway Crescent runs parallel to the railway line, until the road is curtailed by the Georges River and leads into several local access roads. To the immediate north-west of the interchange, Jannali Avenue becomes Mitchell Avenue which follows a westbound alignment and terminates as a cul-de-sac approximately 350 metres west of the interchange.

To the south of the interchange, both Jannali Avenue and Railway Crescent ultimately intersect with Princes Highway, a major arterial road that serves Wollongong and the M1 motorway to the south, and the M4 and M5 motorways to the north.

Box Road is a distributor, which intersects with Railway Crescent opposite the eastern entrance to Jannali Station. From this intersection, it extends eastwards for approximately 950 metres and intersects with several local access roads. It is a single-carriageway undivided 2-lane road.

Table 2.1 below summarises the characteristics of the roads surrounding Jannali Interchange. These are all “Local Roads” and “unclassified” in the NSW Roads & Maritime Services’ (RMS’s) administrative framework of State, Regional, and Local Road categories. They are deemed “Local Roads” by their exclusion from the RMS’s “*Schedule of Classified Roads and Unclassified Regional Roads*”².

² <http://www.rms.nsw.gov.au/business-industry/partners-suppliers/lgr/downloads/documents/classifiedroadschedule.pdf>

Table 2.1: Characteristics of Streets Surrounding Jannali Interchange

	Railway Crescent	Jannali Avenue	Mitchell Avenue	Box Road
Road class	Local road	Local road	Local road	Local road
Cross section (in vicinity of Jannali Interchange)	Two lane, two way	Two lane, two way	Two lane, two way	Two lane, two way
Median	None	None	None	None
Restrictions	No B-doubles, road trains or 4.6-metre high vehicles	No B-doubles, road trains or 4.6-metre high vehicles	No B-doubles, road trains or 4.6-metre high vehicles	No B-doubles, road trains or 4.6-metre high vehicles
Posted speed	50km/h (advisory 25km/h at speed humps/pedestrian crossings)	50km/h	50km/h	50km/h (advisory 25km/h at speed humps/pedestrian crossings)
Pedestrian paths	Provided along eastern side of the road; Intermittent on western side, i.e. between bridge and taxi zone, and a short stretch south of bridge. On remainder of western side, mostly displaced by right-angled parking	Provided on both sides of the road, north of Railway Crescent bridge, i.e. close to Jannali Station; western side only to the south of bridge	Provided on both sides of the road	Provided on both sides of the road
Cycleways	Approx. 300-metre stretch of on-road cycle path on the western side of Railway Crescent, running from close to Buller Street, to just south of the Railway Crescent bridge over Jannali Interchange.	None	None	None
Parking	South of Beatrice Road, on-street parking is generally time-restricted, or banned for short stretches such as loading zones; north of Beatrice Road, on-street parking on both sides including right-angled for part of western side	Time restricted on-street parking permitted on western side, north of Railway Crescent bridge, i.e. close to Jannali Station; parking ban on eastern side. South of Railway Crescent bridge, intermittent on-street parking permitted, both sides	On-street parking permitted on southern side; "No-stopping" signs on northern side	Time restricted on-street parking permitted on both sides; some other restrictions also, e.g. loading zones
Bus/taxi facilities	Taxi zone for 5 taxis outside Jannali Station eastern entrance; bus zone approx. 110m south of Rail Station eastern entrance	Bus zone approx. 40m south of Rail Station western entrance	None	Bus zones near Flemmings supermarket (eastbound) and near Roberts Street (westbound)

2.3 Public Transport Network

2.3.1 Train Network

Jannali Station is on the T4 Eastern Suburbs & Illawarra Line, and is located between Como (city direction) and Sutherland (country direction). Key stations along this route include Sutherland, Hurstville, Rockdale, Wolli Creek, Sydenham, Redfern, Bondi Junction, Central, Town Hall and Martin Place. Commuters are able to interchange at Wolli Creek for the Airport Line services, at Sydenham for Bankstown Line Services and at Redfern, Central or Town Hall for all other lines entering the city.

Platform 1 trains run all stations and limited stops services to Hurstville, Central and Bondi Junction via Central. Platform 2 trains run all stations and limited stops services to Sutherland, Cronulla and Waterfall

Figure 2.9: SydneyTrains Map



Source: Sydney Train Website (2015)

2.3.1.2 Services

The train frequency across the day at Jannali Station is shown in **Table 2.2**. Throughout the day, there is a minimum of four trains departing Jannali Station in each direction every hour. In peak periods, this number of train's increases to five to six trains every hour. Services run throughout the days, from approximately 4:00am to 2:00am.

Table 2.2: Train frequency at Jannali Station

Direction	Monday – Friday Peak Services		Off-Peak	Service Span	Daily Services
	7:00am – 9:00am	4:00pm – 6:00pm			
Jannali – City	10 mins	12 mins	15 mins	4:21am – 2:01am	84
City - Jannali	15 mins	10 mins	15 mins	4:34am – 1:37am	87

Source: Sydney Trains Timetable 2015

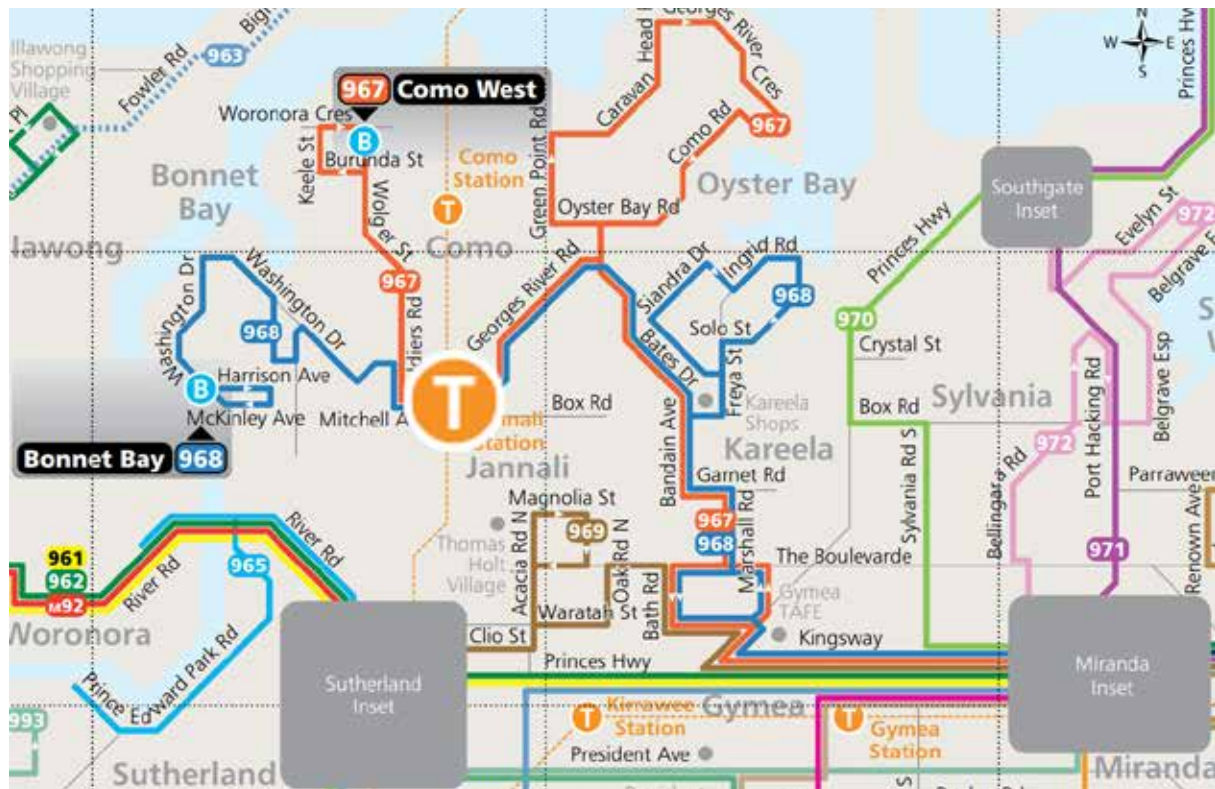
2.3.1.3 Patronage

Jannali Station is the 91st busiest railway station on the NSW rail network; according to the NSW Bureau of Transport Statistics (BTS), rail station barrier counts, there were around 5,560 trips on a typical weekday in 2013.

2.3.2 Bus Network

The bus services that service Jannali Interchange are route 967 and 968, which are both operated by Transdev. An extract from the Transdev Bankstown, Hurstville and Miranda area network map is provided in Figure 2.10.

Figure 2.10: Transdev Bus Network Map



Source: Transdev Bankstown, Hurstville and Miranda area network map

Within a 250m radius of Jannali Interchange, the bus routes follow the same path, where they service both sides of Jannali Station. There are multiple bus zones that service this station, located on both sides of the station. The bus zones along with the route alignment are shown on Figure 2.11, while descriptions of the bus services for each bus zone are provided in Table 2.3.

Figure 2.11: Jannali interchange bus routes and zones



The bus zones and services near Jannali Station are summarised below Table 2.3.

Table 2.3: Bus Services

Bus Zone	Services
Jannali Avenue, approx. 40m south of Rail Station western entrance	967 (Transdev)
	968 (Transdev)
Railway Crescent, approx. 110m south of Rail Station eastern entrance	967 (Transdev)
	968 (Transdev)
Jannali Post Office, White Street	967 (Transdev)
	968 (Transdev)
Flemmings Supermarket, Box Road	967 (Transdev)
	968 (Transdev)
Box Road, near Roberts Street	967 (Transdev)
	968 (Transdev)

These bus routes operate on low to moderate service frequencies. The daily service spans of each route are generally between 11 – 13 hours with the exception of the 967 – Miranda to Como West which operates for approximately 15 hours on weekdays. The services provide local services connecting residential areas to activity areas within Sutherland Shire. A summary of bus services at Jannali Station is provided in **Table 2.3**.

Table 2.3 Jannali Station Bus Service Summary

Route Description	Monday – Friday Peak Services (typical)		Daily Operation	
	7:00am – 9:00am	4:00pm – 6:00pm	Service Span	Daily Services
Route 967 - Como West & Jannali to Oyster Bay & Miranda	35 mins	50 mins	7:32am – 6:09pm	13
Route 967 - Miranda & Oyster Bay to Jannali & Como West	14 mins	32 mins	5:49am – 9:06pm	30
Route 968 - Bonnet Bay & Jannali to Kareela & Miranda	40 mins	28 mins	6:40am – 7:20pm	18
Route 968 - Miranda & Kareela to Jannali & Bonnet Bay	25 mins	30 mins	6:16am – 6:58pm	22

2.3.3 Taxi Network

A signposted taxi zone is provided on the eastern side of the station, on a service road adjoining Railway Crescent. This service road is shown in the photo below. It is in the form of an indented lay-by, separated from the main carriageway by an island and is approximately 25 metres long, excluding entry and exit bends.

The service road entry from the main carriageway is immediately adjacent to the eastern entrance to the Rail Station. There is a shelter with seating, of the same type as a bus shelter. At 25 metres in length, the service road could reasonably accommodate 5 taxis.

It should be noted that the taxi zone is not an accessible path from other transport modes.

Figure 2.12: Taxi Rank



2.4 Pedestrian and Cycle Network

The walking catchment of the station includes the Jannali town centre which generally comprises retail and commercial land uses, particularly to the east of the station. The station and railway line bi-sect the town centre and a bridge across the southern end of the station facilitates a connection between the east and west of the town centre along the southern boundary of the station. Low and medium density residential land uses surround the town centre and straddle the railway corridor to the north and south of Jannali Station. Educational land uses are located to the south-west of the railway station and their approximate walking distance from Jannali station are listed as follows:

- Jannali Public School located approximately 450m
- St George and Sutherland Community College, 600m
- The Jannali High School, 850m

Zebra crossing facilities are provided to the south-west of the station to cross Jannali Avenue and the Railway Crescent bridge; signalised crossing facilities are provided at the intersection of Railway Crescent/ Box Road adjacent to the east access point to the station.

Crossing of the railway corridor in the vicinity of Jannali Station is limited to the Railway Crescent bridge which crosses over the southern area of the station. The next closest pedestrian crossings are:

- Leonary Street/Waratah Street pedestrian bridge approximately 1,150m south
- Railway Road bridge adjacent to Como Railway Station approximately 1,350m north

The limited crossing facilities create pedestrian permeability constraints along the rail corridor. Passengers that live and/or park in the north-east area relative to the station have a circuitous walk to Platform 1 (western side, City-bound).

A single bicycle rack with parking for four bicycles is located adjacent to Platform 1 entrance which was observed to be used by three bikes.

The bicycle parking facilities do not comply with contemporary standards and the attractiveness of riding could be improved with improved cycle parking facilities.

Additionally, there is a lockable shed on Railway Crescent approximately 60 metres south of the eastern entrance to the station; lockers inside this shed need to be hired. There are 4 lockers in this shed and they can be hired for periods of 3, 6, 9 or 12 calendar months, at a rate of \$50 per 3 months, or the discounted rate of \$180 for 12 months.

2.4.1 End-of-Trip Cycle Facilities

Jannali Interchange provides secure cycle storage for bicycle riders, as follows:

- Cycle parking at the top of steps by western entrance on Jannali Avenue: n-shaped steel rack with 3 circular steel loops for affixing to locks;
- A lockable shed on Railway Crescent approximately 60 metres south of the eastern entrance to the station; lockers inside this shed need to be hired. There are 4 lockers in this shed and they can be hired for periods of 3, 6, 9 or 12 calendar months, at a rate of \$50 per 3 months, or the discounted rate of \$180 for 12 months.
- Bicycles have been observed to be chained to the boundary fencing alongside the station, although this is not formally designated as cycle parking.

Figure 2.13: Cycle Rack by Western Station Entrance



Figure 2.14: Bicycle Lockers on Railway Crescent



2.4.2 Cycle Paths and Crossings

There are currently no formally designated cycle paths or cycle crossings in the close vicinity of Jannali Interchange, with the exception of a short stretch of on-road cycle paths on the western side of Railway Crescent, running from close to Buller Street, to just south of the Railway Crescent bridge over Jannali Interchange (approx. 300 metres of cycle lane). This runs past a right-angled parking area, between the parking spaces and the carriageway, which could be a hazard.

There are no current plans for such infrastructure either, according to the <http://www.sydneycycleways.net/> website.

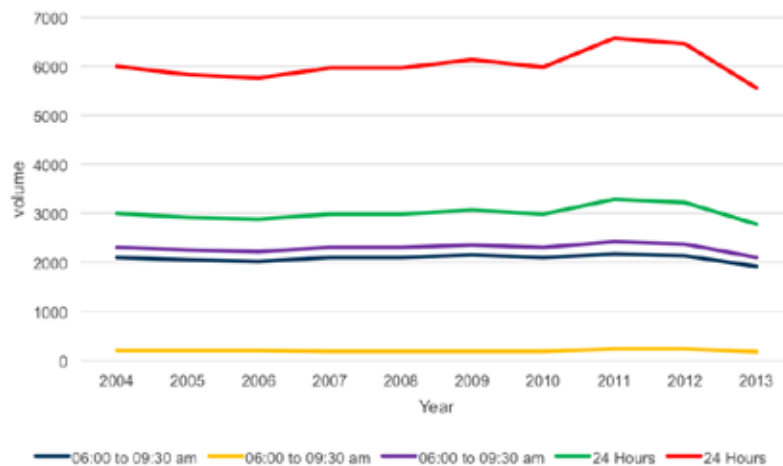
3 Station Patronage

3.1 Existing Station Patronage

The BTS maintain a database of rail station barrier count data across the Sydney Trains network. The data is based on one typical busy weekday each year. This would occur outside of school holiday periods, a day not adjacent to a public holiday or weekend day. The data is based on actual counts combined with electronic ticket data where possible. This allows the data to capture all passenger movements including non-fare paying passengers. Major stations are manually counted annually and other stations are counted every 3 – 4 years with data interpolated using ticket sale and barrier count data between manual count years. Further details can be found in the “*Rail Station Barrier Counts August 2014 Release Database Documentation*” from TfNSW/Bureau of Transport Statistics – available at: <http://www.bts.nsw.gov.au/Statistics/Train/default.aspx>

The pedestrians entering and exiting the station over the 24 hour period, and in the AM peak period (6:00am - 9:30am) from 2004 - 2013 are reported in **Figure 3-1**.

Figure 3.1: Passengers in and out volumes at Jannali Station



Source: BTS – Station Barrier Counts – 2004 to 2013 (<http://www.bts.nsw.gov.au/Statistics/Train/default.aspx>)

It is noted that the 2013 patronage volumes were the lowest in the 10 year historic data. This is said to have been caused by a timetable change that reduced the frequency of services.

3.2 Current Station Patronage

Pedestrian volume surveys were conducted at Jannali Station on Thursday 13 November 2014 in the AM Period 6:00am – 9:30am, to compare passenger patronage, directional and temporal distribution. The results of the on-site pedestrian volume surveys indicate movements at the station are not evenly distributed throughout the 3.5 hour peak period. These surveys established the following pedestrian peaks:

- The peak *one-hour* period occurred at 7:05am – 8:05am where there were 1,059 people accessing station, which was 48% of the AM period total.
- The peak 15 minute period occurred at 7:40am – 7:55am where there were 324 people accessing the station which was 15% of the AM period total.
- The peak 5 minute period occurred at 7:45am – 7:50am where there were 136 people accessing the station which was 6.2% of the AM period total.

- During the AM peak period, the 2014 surveys showed 82% of pedestrian movements enter the station, while 18% exited. The majority of these entering movements (95%) were observed to access Platform 1 for citybound services.
- In the AM peak period, platform 1 is accessible from two access points. The northernmost access point is opened between 6:30am – 9:30am, Monday to Friday. The gate has two Opal “tap on, tap off” poles. This access creates a short cut for passengers accessing the station from the north including the north-west commuter car park. This access point is used by 11 % of people accessing platform 1.
- The main entrance to Platform 1 serves 89% of passengers and is generally utilised by passengers arriving from the east side of the railway line and from the south and west catchments.

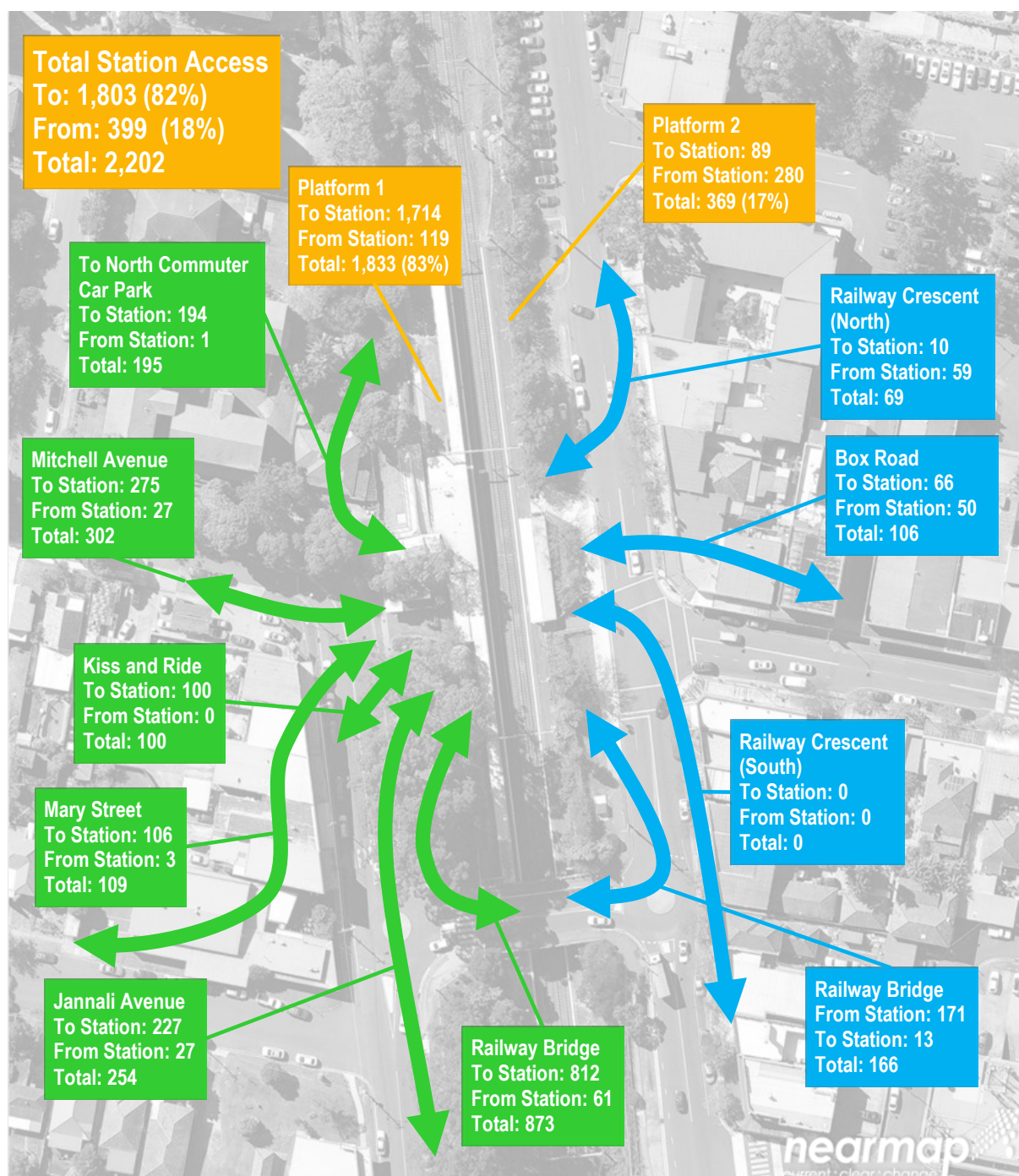
The results of the survey are provided below in Table 3-1.

The AM peak period volumes and directional split are presented in **Figure 3.2**. Note that platform 1 (west side of the station) serves City-bound trains, while platform 2 serves outbound trains.

Table 3.1: Pedestrian Survey - Jannali Station – 2014 AM

Direction	Count (peds)
Entering	1,803 (82 %)
Exiting	399 (18%)
Total	2,202

Figure 3.2: Pedestrian volumes and distribution survey summary, 6am to 9:30am, Thursday 13 November 2014



3.3 Projected Station Patronage

Passenger numbers at Jannali Station are forecast to increase from 5,560 in 2013 to 6,938 per day in 2036 (TfNSW, Rail Station Forecast Model). This represents a 1.1% increase annually. The Transport for NSW Transport Access Program specifies a design patronage contingency to reduce the risk of station improvements not being sufficient for passenger volumes in the intended design life. This adds another 15% to the 2036 estimates for a design volume of 7,979 passengers at Jannali Station per weekday.

The 2013 data in Figure 3.1 shows the total number of passengers in the morning peak period (2,100) and the daily passenger numbers (5,560). From this data, the proportion of the AM peak of the daily total is calculated to be 37.8%. This proportion is applied to future daily passenger numbers to estimate the future AM peak passenger numbers as shown in Table 3.2.

Table 3.2: Forecast daily and AM Peak Period passenger volumes

Year	Daily passenger numbers (24 hrs)	AM Peak period (6:00-9:30am)	AM Peak Proportion of Daily Total
2013	5,560	2,100	37.8%
2036	6,938	2,623	37.8%
Design Patronage (2036 +15%)	7,979	3,016	37.8%

Source: Transport for NSW, 2014

The distribution of passengers entering and exiting the station in the AM peak is shown in the BTS data in **Figure 3.1** and this proportion has been applied to the design patronage totals from **Table 3.2** to determine the expected number of passengers entering and exiting the station in the AM peak period, and shown in **Table 3.3**.

Table 3.3: Pedestrian directional split in the AM Peak (6:00-9:30am)

	Entering	Exiting	Total
2013	1,920	180	2,100
Proportion of total	91.4%	8.6%	100%
Design Patronage (2036 +15%)	2,757	259	3,016

Source: Transport for NSW, 2014

3.3.1 Patronage Comparison

The pedestrian surveys have been compared against BTS station barrier count data (**Figure 3.1**) for 2013 as an indication to confirm the validity of the results, as outlined in **Table 3.4**.

Table 3.4: AM Peak Period Data Comparison, 6am to 9:30am

	Entering	Exiting	Total
2013 BTS	1,920	180	2,100
2014 Survey	1,803 (-7%)	399 (+121%)	2,202 (+4%)

Table 3.4 indicates a significant proportional difference in station exit movements; the reasons for this are not immediately obvious. However, while the proportional change is very high, the change in absolute terms is not significant as morning peak flows are heavily biased towards passengers entering the station. Entering movements showed a moderate decrease of 7%, and the overall station volumes showed a 4% increase in volumes on the 2014 survey day compared with the previous years station in/out barrier data.

3.3.2 Peak patronage

There AM peak proportions of the AM peak period (as determined from the 2014 surveys) has been applied to the design volume calculations for 2036 +15% for each platform, as shown in **Table 3-5**. For consistency, the split between entering and exiting flows found in the 2014 surveys is used from now on, as also shown in **Table 3-5**. This is particularly necessary because only the 2014 surveys show the split between the two platforms as well, which is applied in some of the subsequent analysis.

Table 3.5: Forecast Peak Hour Patronage, 2036 + 15%

Station						
2036 + 15% volume, station total	3,016					
Platforms	1			2		
AM period platform split	2,511 (83.2%)			505 (16.8%)		
	Entering (%)	Exiting (%)	Total (AM peak period % for platform)	Entering (%)	Exiting (%)	Total (AM peak period % for platform)
Peak hour	1,218 (96.2%)	48 (3.8%)	1,266 (50.4%)	77 (31.3%)	168 (68.7%)	245 (48.5%)
Peak 15 minute	374 (95.5%)	18 (4.5%)	392 (15.6%)	16 (18.2%)	74 (81.8%)	90 (17.9%)
Peak 5 minute	160 (97.5%)	4 (2.5%)	164 (6.5%)	1 (2.9%)	45 (97.1%)	46 (9.2%)

4 Proposed Station Upgrades

The proposed upgrade to the Jannali Station includes upgrades to the station infrastructure as well changes to the external road network and various transport modes surrounding the Jannali Train Station.

The proposed design will see a pedestrian overbridge spanning across the station platform connecting Railway Crescent to Jannali Avenue/Mitchell Avenue with commuter connections to the pedestrian bridge gained via new entry plazas on the aforementioned streets. In addition, the proposed option aims at improving accessible paths as well as refining pedestrian movements and providing greater integration of various transport modes with the train station. The proposed upgrades include:

- Demolition of existing waiting room located on the western side of the station platform;
- Raising of existing platforms on the western and eastern sides of the train station;
- Widening footpath of the southern footpath along the Railway Crescent bridge;
- Accessible entry plazas with canopies on Jannali Avenue/Mitchell Avenue and Railway Crescent;
- Construction of stairs located on the eastern and western side of the platform connecting the entry plazas to the station platforms;
- Construction of a pedestrian overbridge that will connect the northbound train platform to the southbound platform;
- Construction of stairs leading from the entry plaza to the pedestrian overbridge on the western and eastern side of the train station;
- Installation of a lift at the entry plaza on Jannali Avenue/Mitchell Avenue and Railway Crescent providing an accessible path between the entry plazas with the pedestrian overbridge and station platforms;
- Retention of existing ramp and stairs from Jannali Avenue/Mitchell Avenue entry plaza to station platform;
- New widened accessible footpath connecting the western entry plaza to the north-west parking facility;
- New raised pedestrian crossing located on the corner of Jannali Avenue and Mitchell Avenue;
- Modification to footpath along the southern verge of Mitchell Avenue to provide commuters with a level path from the proposed bus stop to the western entry plaza;
- Modification of footpath along the northern verge on Mitchell Avenue to provide commuters with a level entry to the western entry plaza;
- Re-configuration of accessible parking spaces at the north-west parking facility providing five AS2890.6 compliant accessible parking spaces. The two addition accessible parking spaces have been relocated from the Jannali Avenue commuter parking which catered two AS2890.6 non-compliant spaces;
- Kiss-and-ride provision located adjacent to accessible parking bays located at the north-west car park facility;
- Installation of bike racks located on the eastern and western side of the station platform in close proximity to the stairs leading to the station platform;
- Relocation of existing bus zone on Jannali Avenue three metres north;
- New bus shelter to be installed along Jannali Avenue catering for existing bus services;
- New bus stop located along the southern verge of Mitchell Avenue providing a closer and accessible path for commuters previously disembarking the services on Railway Crescent, south of the bridge;
- Retention of existing taxi rank location; and

The plans of the proposed upgrade to the Jannali Interchange is provided in Appendix M of the Jannali Concept Design Report.

5 Operation during Construction

5.1 Construction Activity

Construction of the proposed upgrade to the Jannali Interchange will occur during general standard working hours, with construction works expected to occur between:

- 7:00am to 6:00pm on Monday to Friday.
- 8:00am to 1:00pm on Saturdays.

Weekend/weeklong rail possessions are 24 hours per day. It is recommended that works that may disrupt that current train line service or on the pedestrian and traffic network be undertaken within the weekend rail possessions with the weekend rail possessions starting from 9:00pm on Friday and continuing till early Monday morning.

The construction works will predominately be undertaken during non-peak commute times, with measures to be implemented to ensure that existing transport modes are not significantly impacted. Heavy vehicles with deliveries that may have an impact on general traffic flow should be restricted to non-peak hour times to avoid impacting fluency of the road network and disruption to public and active transport modes. The limitation of heavy vehicles during peak hour will improve general traffic flow during the peak periods (when Railway Crescent and Jannali Avenue/Mitchell Avenue is the busiest) and improve pedestrian safety.

A construction office is expected to be located within the construction site. Given the current land use, it is recommended that the construction office be located on the north-western side of the station, with the office to be outside of the existing key pedestrian paths.

Some works may be undertaken during non-standard times, including the evening and throughout the weekend to ensure minimum disruption of the transport modes around the station as well as disruptions on the Eastern Suburbs and Illawarra train line. Where works are to be undertaken outside standard work hours, approval is to be sought from TfNSW and the affected community is to be advised as outlined in TfNSW's Rail Infrastructure Noise Guideline 2013.

5.1.1 Worker Induction

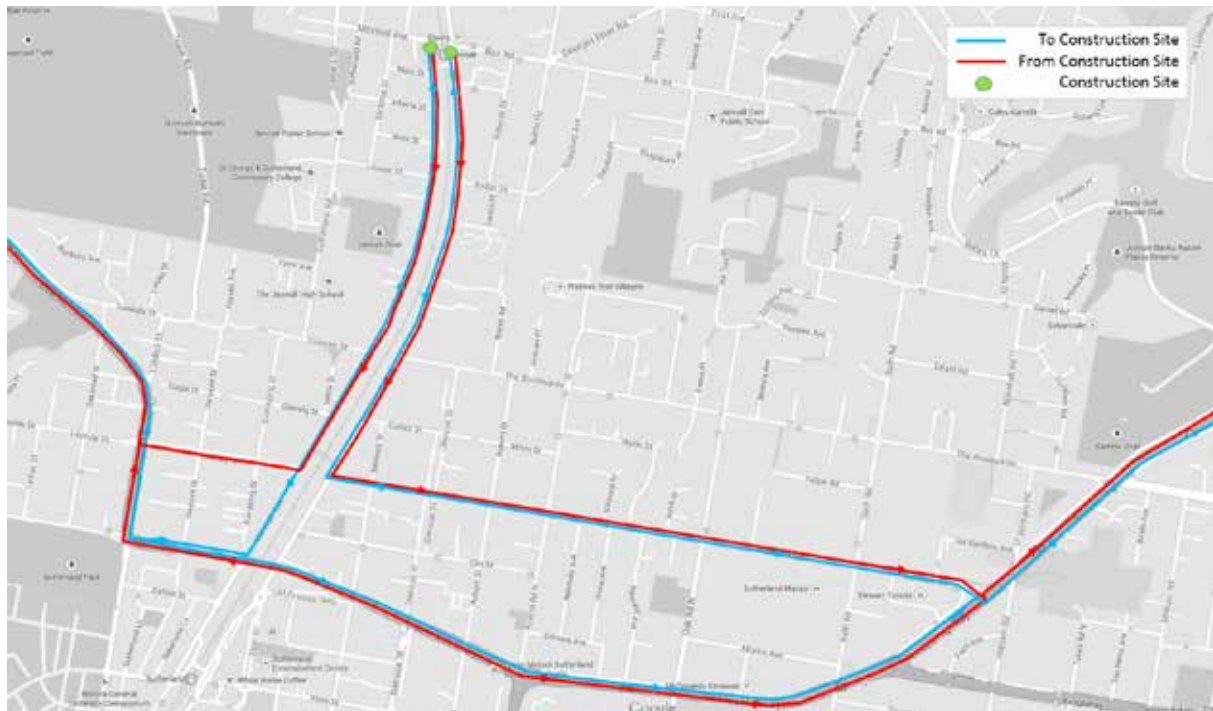
All workers and subcontractors involved in the construction works will be required to undertake a site induction before commencing work. It is recommended that work induction include permitted access routes, driver and worker protocols, emergency procedures, work health and safety requirements and environmental measures. All workers, including construction and traffic controllers, are to hold all appropriate licences.

5.2 Construction Stage Impacts

5.2.1 Haulage Routes

The Jannali Interchange is generally surrounded by local roads that serve property accesses, residential dwellings and local stores with many roads restricting access to vehicles over three tonne. Haulage will generally arrive and depart the construction site via the south with The Grand Parade/Old Princes Highway being an RMS approved 25/26 metre B-double route. Potential site access locations on the east and west of the interchange and haulage routes are shown below in **Figure 5.1**.

Figure 5.1: Potential Haulage Routes



It is recommended that a Construction Traffic Management Plan (CTMP) be undertaken prior to construction works, which outlines the preferred construction vehicle routes. Furthermore, access in and out of the construction site is to be clarified by the contractor with all construction vehicles recommended to be traveling in a forward direction whilst entering and exiting the construction site. Swept path analysis are to be undertaken to ensure no conflicts occur along proposed haulage routes, in particular for ingress and egress from the construction site.

5.2.2 Traffic Impacts

The vehicles generated onto the road network as a result of the construction works is expected to be generally light vehicles from construction workers and minimal heavy vehicles trips for delivery and removal of materials, plants, and equipment when required. Heavy vehicles will be generally be restricted to semi-articulated vehicles given the layout of the external road network.

The classification of vehicles and their delivery time will vary day-to-day based on the proposed construction work. However it is recommended that heavy vehicles be restricted to non-peak periods and to be confined to rail possession periods. It should be noted that a cranes may be required to carry the proposed construction works with the cranes delivered and removed from the site during non-peak hour periods on weekends. Restricting heavy vehicle movements on the external road network during peak pedestrian and vehicle periods will minimise the impact on the external road network and various transport networks surrounding the interchange.

Given the restricted carriageway along Jannali Avenue/Mitchell Avenue and Railway Crescent, it is recommended that construction works be isolated from the roads as much as possible. However, given the limited work space surrounding the interchange, it is likely that interruptions to the traffic flow along Jannali Avenue/Mitchell Avenue and Railway Crescent are expected as a result of construction vehicles manoeuvring in and out of the construction site and in times where the construction boundary is required to extend into the road carriageway.

Where assistance is required to guide vehicles in and out of the construction site, trained traffic controllers are recommended to ensure that minimal delays are experienced on the external road network; in doing so, safety vehicles moving in and out of the construction site as well as for pedestrians are maintained at all times. In addition, it is expected that suitable detours are to be provided for vehicles, should the construction boundary extend into the carriageway for an extended length of time.

The construction of the raised pedestrian crossing on the corner of Jannali Avenue and Mitchell Avenue is recommended to be undertaken overnight with suitable detours provided to ensure minimal impact and inconvenience to traffic travelling along the road.

The traffic generated as a part of the construction works is not expected to exceed 10 vehicles per hour, or one vehicle every six minutes. Site observations indicate that the traffic flow on Railway Crescent and Jannali Avenue/ Mitchell Avenue is generally operating at a good level with minimal delays and queues. As the traffic generation from the construction works at the Jannali Interchange is expected to be minimal, the impact on the external network is expected to be negligible. In addition, disruptions and delays to the traffic flow of vehicles travelling in close proximity are expected to be generally quite low and are not anticipated to have a major impact on the level of service of the external road network.

It is recommended that a Traffic Control Plan be undertaken upon clarification of the proposed construction plan to outline the works involved, lane/road closures, impacts to traffic, pedestrians, bus services and, cyclists and mitigation measures to ensure minimal impact on the various transport modes.

5.2.3 Parking Impacts

The proposed construction works, including construction site and access points, are recommended to be clarified and designated to avoid impacts on vehicles and pedestrians surrounding the interchange, as well as ensuring impact on parking provisions at the interchange are minimally impacted. Part-time loss of parking spaces may occur during the scope of works, including on Jannali Avenue/Mitchell Avenue, with the closure expected to be dependent on the works undertaken.

It is recommended that parking be provided on the construction site for construction workers, with encouragement made for construction workers to carpool or use public transport to ensure no loss of parking spaces for interchange commuters.

5.2.4 Pedestrian / Cycle and Bus Impacts

Construction work is expected to have a minor impact on the pedestrian and cycle network given the restricted space in which construction works are to be carried out. Construction works to be undertaken in close proximity to the existing footpaths and cycle facilities would occur infrequently with closures expected to be temporary with safe and suitable detours provided as a part of the construction traffic control. Pedestrian access closures and detours are to be outlined by the subcontractor prior to construction work commencement.

General bus services in close proximity to the Jannali Interchange are generally not anticipated to be disrupted with many bus stops located outside of the potential construction zone. It is recommended a replacement bus stop be provided for commuters in close proximity to the interchange should construction works occur in close proximity to the existing bus stop located on Jannali Avenue.

6 Operation Post-Construction

6.1 Pedestrian Impact

The new entry plazas on the eastern and western side of the train station provide a suitable level configuration that will provide greater assistance to commuters entering and exiting the Jannali Train Station. The proposed plans address existing grade issues that resulted in difficult and discomforting manoeuvres for commuters.

The proposed pedestrian overbridge provides a suitable accessible path between the eastern and western sides of the station which will provide adequate connection between the northbound and southbound platforms. The pedestrian overbridge mitigates the need for pedestrians to walk approximately 150 metres from the eastern access point along Railway Crescent and Jannali Avenue, through patches of steep pedestrian paths, to gain access to the city-bound western train platform. Access to and from the station platforms from the pedestrian overbridge is achieved via proposed stairs and lifts that are to be constructed on both the eastern and western sides of the train station.

The pedestrian crossing located on the corner of Mitchell Avenue and Jannali Avenue is proposed to provide a safe crossing point for pedestrians located on the southern verge of Jannali Avenue and Mitchell Avenue who are accessing the train station/bus stop from their homes and local shops. In particular, the proposed pedestrian crossing aims at providing a suitable access point for commuters who disembark from vehicles who utilise the time-restricted parking bays on Jannali Avenue as a kiss-and-ride area. It should be noted that the proposed location of the pedestrian crossing does not address current pedestrian desire lines and does not entirely alleviate potential desire lines that may exist. Under the proposed layout, commuters may continue existing behavioural patterns by crossing Jannali Avenue 15-20 metres south of the proposed pedestrian crossing to utilise the shortest path available to gain access to the train station/bus stops.

Accessible paths from the proposed accessible parking spaces have been suitably provided to the entry plaza located on Jannali Avenue. The existing footpath from the western station access point to the north-west car parking facility is proposed to be widened and levelled to provide a suitable accessible path from the western entry plaza to the five accessible parking spaces. From the western entry plaza, the accessible path may continue to:

- Northbound trains by utilising the existing ramp (or proposed western lift) to gain access to the western station platform;
- Southbound trains by utilising the existing ramp to the western lift, which will connect commuters to the pedestrian overbridge, with commuters then continuing their journey via the eastern lift to gain access to the eastern station platform; and
- The bus stop located on Jannali Avenue within the entry plaza.

An additional bus stop is proposed on Mitchell Avenue for bus services 967 and 968. The bus stop is considered to suitably cater for manoeuvrability of all commuters with the proposed option providing a level and safe travel route from the kiss-and-ride zone and accessible parking bays, to the western entry plaza of the interchange and across a raised pedestrian crossing to the bus stop.

Connections to other bus stops located on Box Road, Railway Crescent and White Street are generally inaccessible for mobility impaired commuters from the train station platform and accessible parking spaces as the footpaths do not provide an even and comfortable movement that comply with the relevant standards (AS1428.1 for walkways, and kerb ramps, AS1428.4 for ground tactile, and AS1742.10 for general traffic control devices around the pedestrian crossings).

Pedestrian crossings are generally well provided to the various transport modes, however, it should be noted no pedestrian facilities are provided at the eastern side of the Railway Crescent bridge, despite the path currently being a key pedestrian desire line. The provision of a pedestrian crossing at the location will provide a convenient and safe crossing point for pedestrians who are traveling to/from/between:

- The train station access point on Jannali Avenue;

- Bus stops located on Jannali Avenue and White Street; and
- The car park located on Railway Crescent (located to the south of White Street).

In addition, no pedestrian paths are provided from the car parks located to the north of Box Road and to the south of White Street on Jannali Avenue from existing pedestrian infrastructure. Site observations indicated that drivers and passengers of up to 150 vehicles (parked at both the formalised bays provided or at make-shift locations) along Jannali Avenue were walking to the Jannali Interchange within the road carriageway, either in the cycle path or within the eastern travel lane. This has severe risks for the pedestrians and vastly increases the risk of vehicle and pedestrian collisions. As the car park spaces located to the north of Box Road and to the south of White Street on Jannali Avenue are considered outside the boundary of works, it is recommended that the provision of footpaths be investigated at these sections.

The raising and levelling of the station platform is anticipated to provide additional manoeuvrability benefits for commuters to the Jannali Train Station, which will improve the uneven condition currently along the platforms. In addition, the pedestrian paths along the northern and southern verges of the Railway Crescent Bridge are proposed to be widened as a part of the preferred option. The raising of the station platforms and the widening of the pedestrian footpaths will improve pedestrian comfort and manoeuvrability within the Jannali Interchange.

6.1.1 Performance assessment

The performance assessment has been conducted to assess the impact of 2036 +15% design volumes on the existing station. This will identify any constrained locations to be addressed in the design development for future facilities. A range of assumptions is made based on professional experience, observations, data collation and discussions with TfNSW. These include:

- Passenger distribution is the same as the survey period.
- Train frequency remains the same
- Passenger growth is as per TfNSW forecast
- 10% of passengers require purchase of tickets as a conservative assessment
- The busiest one minute period would experience flows of twice the average flows in the peak 5 minute period.
- The majority of regular passengers tend to disembark trains close to the access points of the platform. This has been observed throughout the network
- Pedestrian Level of Service (LOS) E represents the maximum capacity of facilities and is both unavoidable and acceptable at station access points for short periods due to passenger surges. (i.e. disembarking passengers through an exit point)

6.1.1.1 Pedestrian Level of Service

Fruin's Level of Service is a series of density and flow rate bands that correspond to levels of service between A (best level of service) and F (worst), dependent also on location. It was developed by John J Fruin PhD.

The values of parameters for a given pedestrian Level of Service (LoS) in a station vary according to different areas of the station, as varying densities of pedestrians are acceptable according to the location. The level of service for the platforms, stairs, service area and pedestrian access adjacent to Jannali Station are thus assessed separately in line with the separate categories used in, Fruin's Level of Service (LOS), as outlined in **Table 6.1**.

Table 6.1: Fruin's Level of Service

Fruin's Level of Service	Walkway		Stairs		Queue
	Density (m ² /ped)	Flow rate (ped/min/m)	Density (m ² /ped)	Flow rate (ped/min/m)	Density (m ² /ped)
A	>3.24	<23	>1.85	<16	>1.21
B	2.32-3.24	23-33	1.39-1.85	16-23	0.93-1.21
C	1.39-2.32	33-49	0.93-1.39	23-33	0.65-0.93
D	0.93-1.39	49-66	0.65-0.93	33-43	0.28-0.65
E	0.46-0.93	66-82	0.37-0.65	43-56	0.19-0.28
F	<0.46	>82	<0.37	>56	<0.19

The total number of pedestrians expected in the 2036 +15% design AM peak 15 minute period on Platform 1 (Table 3-5) has been distributed to each platform and entrance, in line with the existing directional splits. This includes whether they are entering or exiting the station, and whether they are walking or waiting on the platform. These variables are assessed by each station component in the following sections.

For areas where pedestrians are walking, such as the stairs, service area and footpath, the LOS is calculated using the flow rate values which measure the volume of pedestrians moving through the space per minute per effective metre width. Effective width excludes 165 millimetres from walls to allow for handrails and the area people do not typically occupy along walkways. The LOS for the queues is measured in density of m² per pedestrian.

For LoS calculations, areas have been calculated from site plans and a feature and level survey commissioned by Cardno. In terms of the usage platform area, non-accessible buildings on the platform and a 0.9m safety zone from the edge of the platform have been excluded.

6.1.1.1.1 Key Areas

As can be seen in Table 6.1, pedestrian capacity limitations are generally brought about by passage width and queuing areas. In many instances, walkways and queuing areas are shared, as in the platform and service area. The constraining parameter is walkway capacity. Walking requires more space per person than queuing and therefore assessments in shared walkway/ queuing areas are calculated on walkway capacity.

The following sections each outline the pedestrian assessment in each of the separate areas of Jannali Station including:

- Platforms 1 and 2;
- Access points to all platforms;
- Stairs to Platform 1;
- Footpaths adjacent to Jannali Station.

6.1.1.1.2 Platforms

Jannali Station is configured with two separate platforms. Citybound trains depart from platform 1 on the western side of the station, and outbound trains depart from platform 2.

As pedestrian movements in stations are travelling to/from trains, they are dependent on the train timetables. The peak pedestrian flow occurs in platoons throughout the peak period as each train arrives at or departs from the station. In the AM period, platform 1 caters for the majority of passengers and has the largest design consideration, whereas platform 2 has much lower volumes and ample spare capacity.

Passengers entering the station accumulate on the platforms until the train arrives. The time that exiting passengers spend on the platforms is dependent on the train timetable and frequencies.

In terms of service frequency as of November 2014 the following weekday services operate in the AM period between 6:00am to 9:30am:

- Jannali to Bondi Junction via City, 20 services
- Jannali to Cronulla, 14 services

In off-peak periods during the day, services generally operate every 15 minutes in each direction.

With 20 city-bound trains and 14 Cronulla bound trains in the AM peak, there is an average of 10.5 minutes and 15 minutes between trains arriving on each of Platforms 1 and 2 respectively.

On platforms, entering pedestrians walk along the platform and then wait for the train to arrive, demonstrating both walking and queuing behaviour.

Passengers exiting the station arrive on the platforms as per the train frequencies, and walk along the platform to the exit. Based on site observations, exiting passengers generally disembark the train close to the access points located centrally along both platforms.

The LOS calculations and results for the platforms are shown in **Table 6.2**.

Table 6.2: Design Peak House (2036+15%) Platform LOS

	Platform 1 (city bound)	Platform 2 (outbound)
Trains per hour	5.7	4
Average time between trains	10.5 mins	15 mins
Maximum anticipated volume of pedestrians on platform, at a given time	314	90
Area (usable)	521m ²	475m ²
m ² / ped	1.7m ²	5.2m ²
LOS	Walkway C Queuing A	Walkway A Queuing A

The volume on platform one was conservatively estimated to be 80% of the peak 15 minute demands, however 10.5 minutes is only 70% of the time period. The value calculated falls between the peak 5 minute volumes (Peak 5/ 5 x 10.5) and the average value of the 15 minute period (15 minute volumes/ 15 x 10.5) and is conservative on the high side. Platform 2 is calculated on the peak 15 minute period as this aligns with the train frequency.

It is clear from **Table 6.2** that capacity on each platform has sufficient area for the pedestrian demands, however it is noted that Platform 1 would be approaching capacity if train frequency did not increase to spread demand. The design volume analysis indicates that Platform 1 would operate with a walkway LOS C, while the LOS results for queuing on each platform, and platform 2 walkway, are all A.

It should also be noted that in the future development of the interchange, the usable area of the platforms will be affected by the construction of staircases or other fixtures that create hidden areas underneath. For security reasons, areas underneath staircases should be barricaded to prevent entry, and this will reduce the usable platform areas.

6.1.1.1.3 Platform 1 Access

Platform 1 operates with two access points in the AM peak period. The 2014 pedestrian surveys indicated that 11% of pedestrians access via the north access point, with the remaining 89% of pedestrians using the main entrance. Almost all of the exiting passengers do so from the main access point.

The main access to Platform 1 is via the service area. An opening on the platform of approximately 1.5 metres width is allocated for passage – the analysis below assumes this width for this access, as well as for the access to the service area from the street. This area is relatively constrained, however it largely operates as an entry point only, with a low amount of exit movements at any one time period. The north access point is 2.6m wide.

The assessment of the flow rate and LOS of each access to platform 1 is shown in **Table 6.3**.

Table 6.3: Platform 1 (west side of station, City-bound trains) access LOS

	Main Access (89% of platform 1 pedestrians)	North Access (11% of platform 1 pedestrians)
Design volume of pedestrians through access in design peak 5 minute, 2036 +15%	146	18
Pedestrians through each access / 1 min, assuming uneven distribution in which twice the average rate occurs at the busiest 1-minute period.	59	9
Width of access	1.5m	2.6m
Flow rate (peds/min/metre width)	39.3	3.5
LOS	C	A

6.1.1.1.4 Platform 2 Access

Platform 2 is configured with a 2.5m and 1.0m wide access point. Volumes are significantly less than Platform 1. The 2036 +15% AM period peak 5 minute volumes of 47 passengers would easily be accommodated by the existing access points.

6.1.1.1.5 Platform 1 Service Area

The service area primarily operates as a through passage area with tickets sales from the ticket office and ticket vending machine. The ticket purchase area adjacent to Platform 1 serves the whole station; there are no ticket purchasing facilities on Platform 2 and as such, any customers requiring a ticket for outbound services would have to travel to Platform 1 first.

The introduction of the Opal card across the rail network has significantly reduced the demand for ticket purchases and queuing at Stations on the Sydney Trains network. It is anticipated that fare payment for services will continue to be required by infrequent travellers who do not have an Opal card. The assessment is based on the assumption that 10% of passengers purchase a ticket. It is expected that the percentage is less, however this needs to be verified by TfNSW ticket purchase and Opal data if this becomes available. Based on a 45 second service time estimate for ticket purchases, two ticket purchase facilities would be required to accommodate the peak demand (see **Table 6.4**).

Table 6.4: Platform 1 Service Area queuing and walkway LOS

	Booking office
Design no. of pedestrians departing by train per AM peak 5 minute period	211
Estimated proportion of passengers purchasing a ticket	10%
Number of pedestrians required to purchase a ticket in peak 5 minute period. (95%)	21 (20)
Time to buy a ticket at 45 seconds	945 seconds
Number of TVM's / ticket windows required to service 95% demand in 5 minutes	3
Peak queue assumption	4 per TVM (12)
Design pedestrian flow rate through service area (per min).	59
Length of Area	4.3m
Pedestrian walking speed assumption	1.0m/s
Time to walk through service area	4.3 seconds
Walkthrough pedestrians within the service area at an average moment	4.3
Pedestrians in service area at peak times (ticket queue plus walkthrough)	16.3
Area	13m ²
m ² / ped	0.8m ²
LOS	Walkway D Queuing C

The analysis shown in **Table 6.4** indicates that if 10% of travellers were required to purchase a ticket in the peak 5 minute period, three machines would be required to service the demand to ensure that 95% of passengers did not wait more than five minutes. If the TVM's were located in the existing service area, this would result in a significantly congested walkway. As such it would be ideal to separate or increase the size of the through passage area and service area.

It is expected that the percentage of passengers required to purchase a ticket in the design year would be considerably less, if any at all.

6.1.1.1.6 Stairs to Platform 1

The stairs near to the main entrance provides approximately 2.0m of width between handrails. These stairs facilitate approximately 89% of volumes to/ from Platform 1. Pedestrian movements are heavily biased towards the station. Movements generally do not conflict as the peak entry and exit movements occur just before and just after the arrival of trains. However, to be robust, the analysis below assumes the total entry and exit volumes. The stairs LOS at design peak hour volumes is outline in **Table 6.5**.

Table 6.5: Platform 1 stair capacity and LOS (Platform stair LOS)

Stairs to Platform 1	
No of pedestrians using the stairs in peak 5 minute period	164 (Average 32.8 per minute)
Pedestrians on stairs / 1 min, assuming uneven distribution in which twice the average rate occurs at the busiest 1-minute period	65.6
Effective width of stairs	1.87m
Flow rate Average/ Peak (peds/min/m)	17.5/ 35.0
LOS Average/ Peak	B/ D

6.1.1.1.7 Footpaths

Footpaths surrounding the station generally have sufficient capacity with the consideration of dispersement of pedestrians to the local area from the station access points. Ideally, all surrounding footpaths would have a minimum width of 1.8m to facilitate the passing of two wheelchairs, prams or other movement aids.

It is noted that the footpaths on each side of the rail bridge are relatively narrow, however they are provided on both sides of the carriageway. Assuming 10% of the 3.5 hour AM peak period of 1,039 people used the bridge in a 5 minute period, there would be an average of 20 people per minute. This could easily be accommodated by the existing paths on both sides of the bridge.

6.1.1.1.8 Summary of LoS Results

The assessment of the stations critical areas indicates there is sufficient capacity to accommodate 2036 +15% volumes with the existing layout. If ticket purchases represented 10% of future volumes, arrangements should be made to separate these facilities away from main thoroughfares. It is also expected that train frequencies would be increased to accommodate future demand, therefore spreading demands over a greater time period and reducing the passenger density of the Platform 1. Overall an average LOS C would be achieved during the AM peak period.

6.2 Parking Demand and Supply

The preferred option proposed to relocate to non-compliant accessible parking spaces from the Jannali Avenue car park to formalise five AS2890.6 compliant accessible parking spaces at the north-west car park to provide a convenient location for commuters to and from the various transport modes within the interchange and alleviates existing deficiencies in regards to no compliant accessible parking spaces being located within close proximity to the interchange. The preferred option proposes to widen and upgrading existing footpaths between the car park and the station platforms to allow level access to both the eastern and western platforms with suitable accessible paths connecting the parking bays to the train station platforms and bus stops. The formalisation of the five accessible parking spaces is to result in a loss of 6 parking spaces at the north-west car park, however two parking spaces are to be gained at the Jannali Avenue car park, resulting in a net decrease in four commuter parking spaces. Despite observation showing a high demand in car parking surrounding the interchange, the loss of four commuter parking spaces is anticipated to be absorbed by on-street parking on the external road network which may lead to extended walking distances between the interchange and car parking locations.

It should be noted that approximately two time-restricted on-street parking spaces are anticipated to be lost along Jannali Avenue to accommodate the 'No Stopping' clearance on the northbound approach to the proposed pedestrian crossing. The parking bays are currently catering to the local shops and informal kiss-and-ride movements. In addition, two unrestricted on-street parking spaces are to be lost along the southern kerb of Mitchell Avenue to cater for proposed bus stop location. The two spaces are generally occupied by customers/owners of the Jannali Car Clinic located on Mitchell Avenue.

The loss of the two time-restricted parking spaces catering to the local shops is expected to have a minor impact on the local shop customers as the parking spaces along the shop fronts are generally fully occupied during normal working hours. In addition, the loss of the two unrestricted parking spaces along Mitchell Avenue are expected to minimally disrupt parking for Jannali Car Clinic as the clinic generally utilises all on-site capacity for car parking. The loss of parking spaces may result in greater parking distances on the wider road network for customers and owners of local businesses which may result in long undesirable walking distance which may have adverse effects.

No other loss or gain in parking numbers are anticipated surrounding the Jannali Interchange as part of the proposed works.

6.3 Traffic Impact

The proposed scope of works is not anticipated to have a direct increase in traffic generation. It is anticipated that as a result of the works, access to and from the station will be slightly shifted towards active forms of transport given the upgrade and increase in infrastructure surrounding the interchange, which will encourage safe and easy walking and cycling alternatives than vehicle transport modes.

Furthermore, additional trips are not anticipated to be generated as a result of the proposed kiss-and-ride zone at the north-west car park as any trips associated with existing kiss-and-ride trips would be currently experienced on the external road network. The proposal of the kiss-and-ride zone will see a diversion of existing kiss-and-ride movements at the interchange rather than an increase in trip generation.

It is anticipated that should vehicle trips increase as a part of forecast patronage growth, the vehicle trips will be generally confined to kiss-and-ride trips given the limited parking capacity around the station. It is projected that the increase in patrons will predominately access the interchange using active transport forms.

As a result, future traffic increase on the external road network is expected to be very minimal and will have a negligible impact on the external road network level of service given the generally free-flowing nature of the traffic on the surrounding roads.

6.4 Buses

The Jannali Interchange is well supported by bus services with five bus stops located in close proximity to the Jannali Train Station. The number of bus stops and their locations within the interchange encourage use of public transport as a viable transport mode to and from the interchange.

An additional bus stop is proposed to be located along the southern verge of Mitchell Avenue in close proximity to the pedestrian crossing that will serve bus routes 967 and 967 that currently stop on Railway Crescent, just north of White Street. The additional bus stop provides commuters with a disembarking location from bus services closer to the Jannali Train Station which is suitably catered with an accessible path connecting to other transport modes at the interchange. It is recommended that the proposed bus stop location maintain appropriate 'No Stopping' clearance from the pedestrian crossing and be designed in compliance with RMS Technical Direction TDT 2002/12c.

6.5 Cyclist

The installation of sheltered bike racks at the train station entrances on Jannali Avenue and Railway Crescent is considered an appropriate measure and location to encourage commuters to take active forms of transport to and from the Jannali Interchange. The bicycle lockers that are currently provided at the interchange for commuters along Railway Crescent is considered to continue encouragement to cyclists for those who prefer a safe location to lock their bicycles.

6.6 Kiss-and-Ride and Taxi

The proposed kiss-and-ride location, despite being in close proximity to the western station access point, is located outside the current path of vehicles travelling on the external road network and will unlikely attract many kiss-and-ride traffic. Vehicles are likely to continue current trends of momentarily stopping kerbside or at pedestrian crossings to allow patrons to embark and disembark vehicles rather than use the formalised kiss-and-ride provision.

No changes are proposed to the taxi rank located on Railway Crescent. The location of the bay is considered appropriate, with the bay located away from the northbound and southbound carriageways, with suitable pedestrian connections to and from the train station via the proposed pedestrian overbridge.

6.7 Property Access

No residential property access are anticipated to be affected by the proposed scope of works.

It should be noted that the two eastern driveways of the Jannali Car Clinic, which are approximately nine metres in width, may potentially be narrowed to adequately cater the proposed bus stop and shelter. The reduction of the driveway width should be minimised as much as possible during the detailed design phase of the bus stop, with swept path analysis to be undertaken to determine the adequacy of the reduction of width.

7 Mitigation Measures

7.1 Construction Mitigation Measures

The construction works are to be completed and phased with consideration given to minimise the impact on the traffic, pedestrian and public transport surrounding the Jannali Interchange.

It is recommended that a Construction Traffic Management Plan (CTMP) and a Traffic Control Plan (TCP) be undertaken and submitted to Council's Local Traffic Committee and RMS and, Sutherland Shire Council respectively. The studies are recommended to outline the:

- Construction timeline;
- Heavy vehicle routes and arrangements (ensuring vehicles enter and exiting the construction site in a forward direction only),
- Location of access points to and from the external road network (including swept path analysis if required);
- Provisions to ensure pedestrian safety and traffic fluency;
- Installation of signage and traffic calming devices required used to manage traffic whilst construction is being undertaken;
- Pavement marking, fencing and barriers required; and
- Any detours expected for traffic and pedestrians (if applicable).

To ensure minimal impact to the existing transport modes surrounding the station, the following recommendations are proposed to be undertaken:

- Heavy vehicles be restricted to non-peak periods and to be confined to rail possession periods;
- Construction boundary is not to extend into the external road network where possible;
- Suitable vehicle and pedestrian paths be maintained throughout the construction of the proposed upgrade to ensure safe and easy access throughout the interchange;
- Construction of the pedestrian crossing on Jannali Avenue/Mitchell Avenue to be undertaken overnight with suitable detours provided to ensure minimal impact and inconvenience to traffic travelling along the road;
- A temporary bus stop location be provided for commuters in close proximity to the interchange should construction works occur in close proximity to the existing bus stop located on Jannali Avenue;
- Workers be inducted prior to commencement of works, which include detailing permitted access routes, driver and worker protocols, emergency procedures, work, health and safety requirements and environmental measures;
- Parking be provided within the construction site to workers, with encouragement made for construction workers to carpool or use public transport;
- Qualified traffic controllers be used during construction works to ensure safe and efficient movement of vehicle and pedestrian traffic on the external road as well as in and out of the construction site; and
- Fencing and barriers to be installed between construction site and outside construction zone to ensure safety and easy navigation of pedestrians and cyclists.

7.2 Operation Mitigation Measures

The proposed upgrades to the Jannali Interchange are expected to generally improve the integration of the various transport modes within the interchange and are anticipated to provide a safer passage between the transport modes.

Despite the improvements in the level of transport integration at the interchange, the following transport and access assessments should be considered to ensure safe operation at the interchange:

- Road Safety Audit to be undertaken to assess the design and safety of the location of the proposed pedestrian crossing on Jannali Avenue/Mitchell Avenue; and
- The proposed bus stop location maintain appropriate 'No Stopping' clearance from the pedestrian crossing and be designed in compliance with RMS Technical Direction TDT 2002/12c.