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Cross River Rail

Environmental Impact Statement

Technical Report No. 1 – Transport

Part B

July 2011

Cross River Rail

TECHNICAL REPORT NO.1 – TRANSPORT PART B

JULY 2011

Contents

6 Effects of the operating Project

This chapter outlines the forecast effects of the operating Project on transport conditions between the current (base) year of 2009 and the future modelled years – 2021 and 2031. This section reports on:

- changes to the rail network and its operations including the proposed rail service plans with the Cross River Rail infrastructure included in the South East Queensland passenger rail network
- the forecast patronage and its effect on the rail network with the operating Project
- changes to rail station activity (passenger demand) and interchange in the study corridor
- the effect of the Project on ferry and bus operations in the region and with a focus on the study corridor
- the effect of the Project on the pedestrian and cycle infrastructure in the study corridor
- the performance of the regional, arterial and local road network with the Project
- the effects of the Project on rail freight and rail maintenance are also reported.

6.1 Changes to passenger rail network and operations

6.1.1 Proposed policy and operational changes

Passenger distribution in the two hour peak periods

2021 and 2031 patronage model forecasts from the Cross River Rail Project Model was used as key input to determining the 2021 and 2031 the rail operating strategies with Cross River Rail in operation.

The two hour peak period demands produced by the Cross River Rail Project Model were then broken down into hourly demands to determine peak one hour and peak shoulder (one hour) operating strategies. The peak and shoulder demands were derived from an assumed flattening of passenger demand from the current split of people travelling in the peak hour / peak shoulder hour in 2009 (ie 67% / 33%) to a 60%/ 40% split by 2021 and to a 50% / 50% split by 2031.[1]

The “with Project” operating strategies were further devised using the service planning policies identified below.

Service planning policy and supporting measures

Service plans and operating strategies for Cross River Rail have been developed to be consistent with the existing policy and planning framework that would be implemented without the Project. The service plans and operating strategies aim to achieve a robust, simple and cost-effective solution for the project.

Key service planning philosophies adopted for the 2021 and 2031 for the rail operating strategy with Cross River Rail include:

- Using a rolling-hour load average as a means for measuring passenger overloading (and a trigger for the addition of services) rather than overloading on individual services
- Adopt a regular and simple timetable to would allow passengers to adjust travel patterns to the available capacity where individual instances of crowding occur.

[1] As endorsed by the Cross River Rail Transport Advisory Group including TransLink and Queensland Rail

- Devise stopping patterns which would provide an efficient trade-off between express and all-stations running to maximise the utilisation of available track capacity over the entire peak period, while having regard to interchange and travel-time constraints. That is, to avoid current practice of reducing the number of stops on individual services in an attempt to deal with localised fluctuations in loading, as this could attract additional travel demand to the existing height-of-peak from stations further down the line.
- Where possible, increase the capacity of height-of-peak services rather than the number, to conserve track-capacity and avoid attracting passengers from shoulders to the height of peak.
- Rationalise the number of different stopping patterns to provide passengers with a more reliable and simpler to understand journey. For example, there are currently 12 stopping patterns on the Ipswich corridor, which Queensland Rail intend to reduce to three to five. This should serve to increase capacity on corridors, as a large range of stopping patterns is difficult to schedule and consumes more train paths for the same level of service due to differences in running times.
- Standardise sectorisation to enable six-car and (by 2031) nine-car operations through the Cross River Rail tunnel consisting of outer-suburban (Express Link) and intercity (Coast Link) services, while the other railway sectors generally move to high-frequency all stations operations (UrbanLink) servicing the inner suburbs. This would allow more efficient utilisation of infrastructure and fleet customised to the different tasks. Additionally, this would reduce the impact of flow-on delays on a line to the rest of the network.
- Design of the initial sectorisation to route the fastest growing lines through the new Cross River Rail tunnel, to ensure the opportunities for service lengthening that would arise with the new inner city alignment can be utilised.

Rolling stock

All 2021 rail passenger forecasts have been based on using six-car train sets, as currently operated by Queensland Rail. 2031 rail passenger forecasts have assumed that nine-car services can be operated on Cross River Rail infrastructure (including stations) as well as stop at stations north of Petrie and south of Kuraby.

Assumptions for train capacity are based on current Queensland Rail rollingstock and future potential rollingstock configurations, including:

- current six-car electric multiple unit (EMU) / suburban multiple unit (SMU) sets : 472 seated passengers (750 design capacity including a comfortable number of standees)
- current six-car interurban multiple unit (IMU) sets : 434 seated passengers (750 design capacity including a comfortable number of standees)
- future nine-car equivalent train sets (by 2031): seated capacity for 651 passenger and design capacity of 1,125
- future UrbanLink “metro-style” high capacity suburban multiple unit (HCSMU) sets: design capacity of 900 passengers, including 350 seated passengers and 550 standing passengers.

6.1.2 Proposed network changes – 2021

The following represents the key components of the proposed Cross River Rail Project in 2021:

- twin-track tunnel from Yeerongpilly in the south to the Exhibition loop in the north
- new nine-car platforms to serve Cross River Rail tracks at Yeerongpilly, Boggo Road, Gabba, Albert Street, Roma Street and Ekka stations.
- northern approach consisting of
  - a new elevated track pair from the portal, around the Exhibition loop, past Mayne Yard, and connecting to the Mains (the two tacks on the western side) before Breakfast Creek

  - a new surface freight connection between Exhibition loop and the Mains before Breakfast Creek, to allow freight to operate independently of services using Bowen Hills Station
- southern approach consisting of
  - a new narrow gauge track in the east of the alignment from the portal to Beaudesert Road (providing four passenger tracks)
  - a new dedicated dual-gauge freight track from Salisbury to Yeerongpilly operating independent of the passenger tracks.

In addition, the following list (**Table 6-1**) of currently committed and funded infrastructure was also assumed to be in place by 2021 and would be in place with or without the Project:

Table 6-1 Assumed other committed infrastructure

Corridor	2021 Committed Infrastructure Other Than CRR
Cleveland	3rd platform at Manly
Ferny Grove	Ferny Grove to Keperra duplication
Gold Coast/Beenleigh	4th platform at Kuraby Coomera to Helensvale duplication (excluding bridge section)
North Coast	Lawnton to Petrie triplication 4th platform at Petrie
Western	Duplicated extension to Springfield Corinda to Darra 3rd track

Source: Systemwide, December 2010

6.1.3 Proposed 2021 rail operating strategy with Cross River Rail

The key change for the 2021 with Project operating strategy compared to the without Project case would be the creation of a new inter-city / outer suburban sector (blue sector shown in **Figure 6-1**, **Figure 6-2** and **Figure 6-3**) servicing areas between the Gold Coast and Kuraby in the south and connecting via the Cross River Rail tunnel to growth areas in the North between Petrie and Caboolture on the North Coast and future Sunshine Coast service extensions.

Three stand alone sectors would be created once the Project is in operation in 2021 (compared to two sectors without project):

- North – south Cross River Rail sector (Blue). In this sector, Beenleigh services would be connected to Caboolture services and Gold Coast services would be connected to Petrie services. Nambour services are typically not connected to any southern services and are assumed to turn back in the south, for example Clapham Yard (Yeerongpilly).
- East – west interurban sector (Pink). In this sector, Springfield services would be connected to Shorncliffe services and Rosewood services will be connected to Airport services. This requires a change in operating paradigm as Airport services would no longer be connected to the Gold Coast services.
- Brisbane suburban sector (Green). In this sector, Ferny Grove services would be connected to Kuraby services and Doomben services would be connected to the Cleveland and Manly services.

The service plans with Cross River Rail for 2021 are illustrated in **Figure 6-1**, **Figure 6-2** and **Figure 6-3** for one hour peak, shoulder peak and off peak respectively.

In 2021, with the Project, the morning peak one hour timetable proposes 102 trains through the CBD – an increase from 79 without the project. This includes 47 services approaching the CBD from the north (8 more than without project) 19 from the west (2 more than without project), and 36 services from the south/ east, compared to 23 without the Project. Of these 36 trains, 17 would travel via the Cross River Rail tunnel and 19 would travel across the Merivale Bridge (4 less than without the Project), which would free up capacity across the Merivale Bridge and would potentially improve reliability for the Suburban Sector.

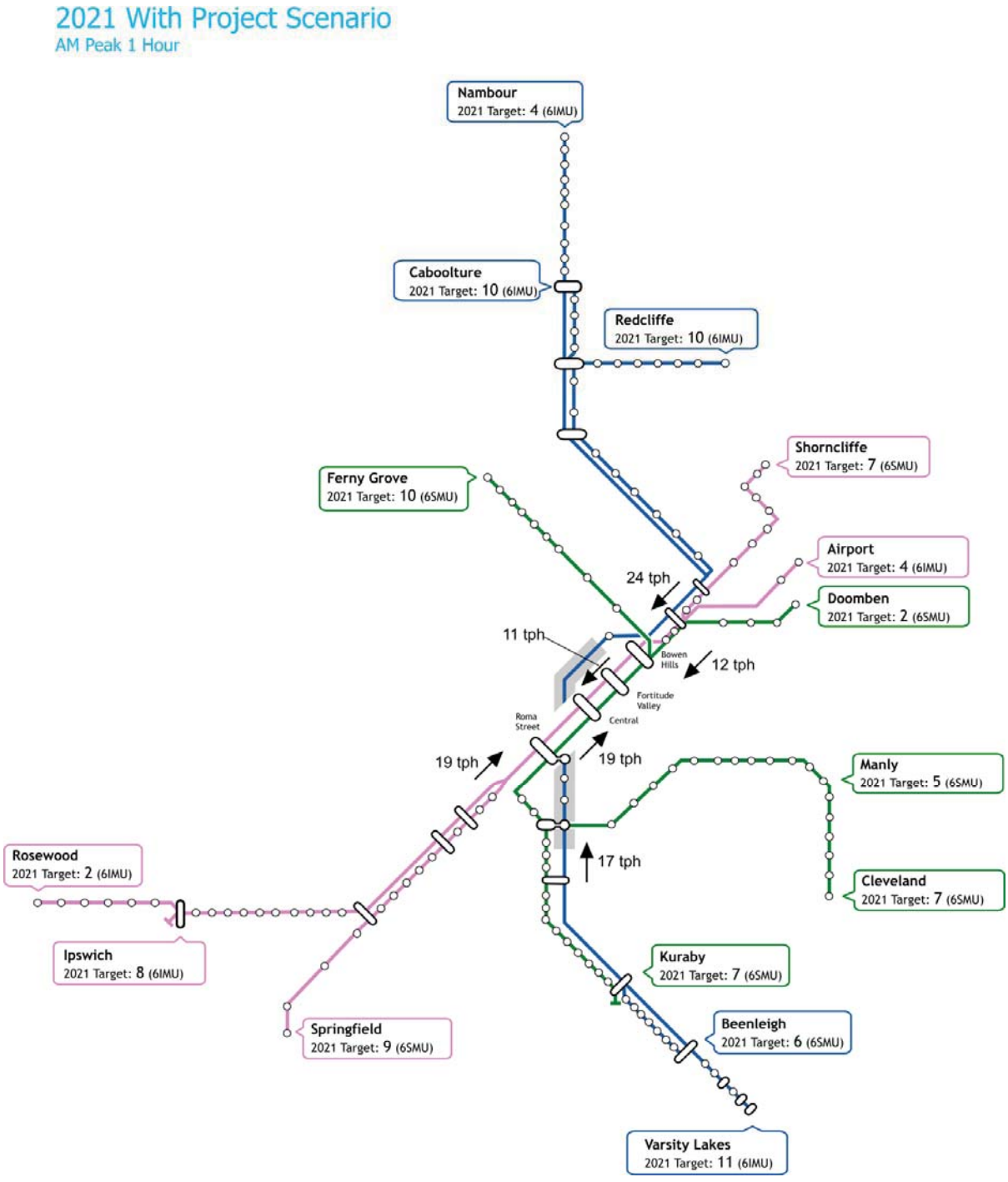

Figure 6-1 2021 Service plan with Cross River Rail – morning one hour peak

In 2021, 88 trains are proposed through the CBD (39 services from the north, 19 from the west and 30 services from the south/ east) during the morning peak hour.

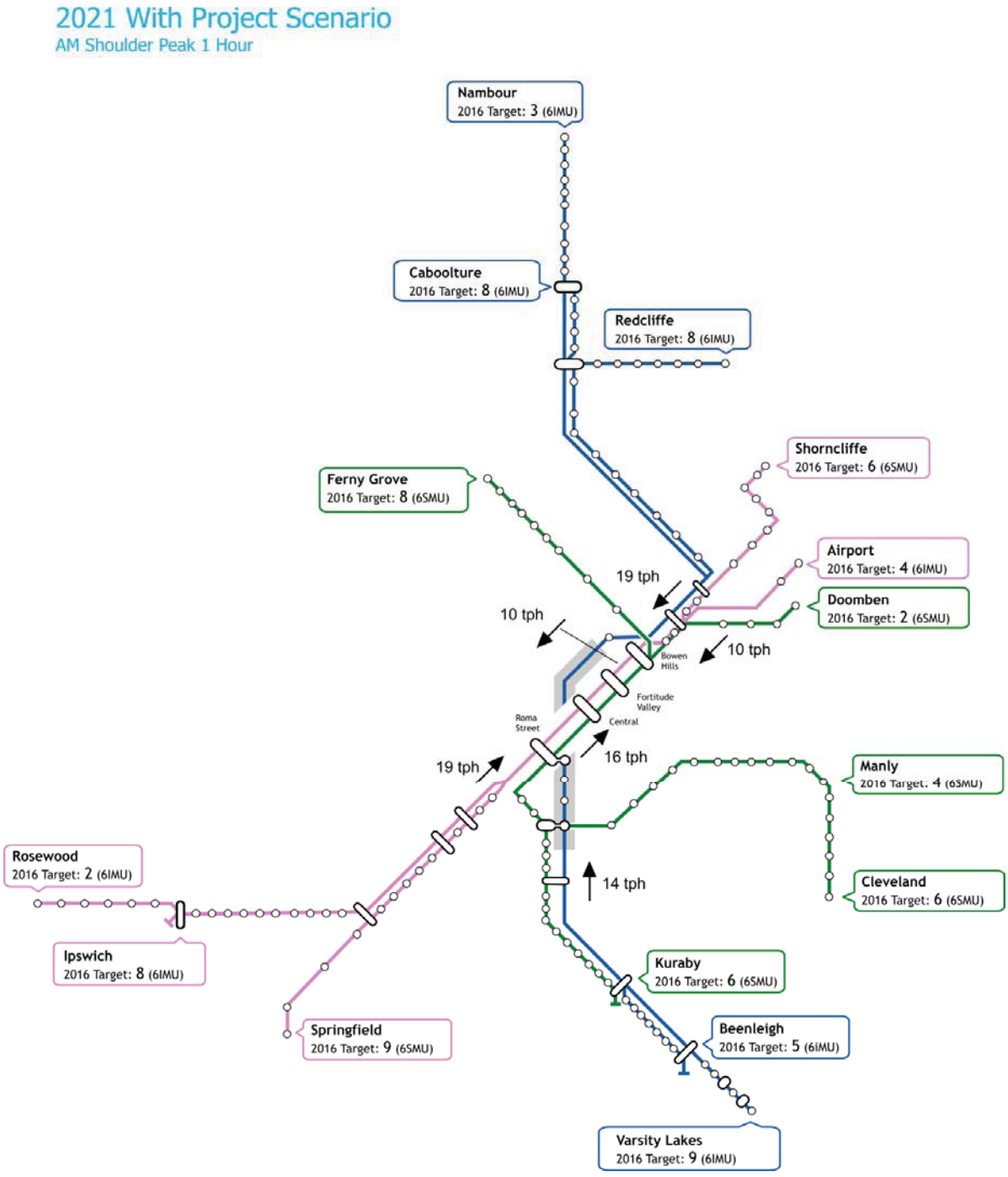

Figure 6-2 2021 Service plan with Cross River Rail – morning shoulder peak one hour

In 2021, in a typical off peak hour the train frequencies would be the same as without Project, that is, 38 trains per hour through the CBD (18 trains per hour from the north, 6 trains per hour from the west and 14 trains per hour from the south/ east). However of these 14 trains from the south/ east, 6 would travel via the Cross River Rail tunnel rather than the Merivale Bridge, freeing up capacity for other services.

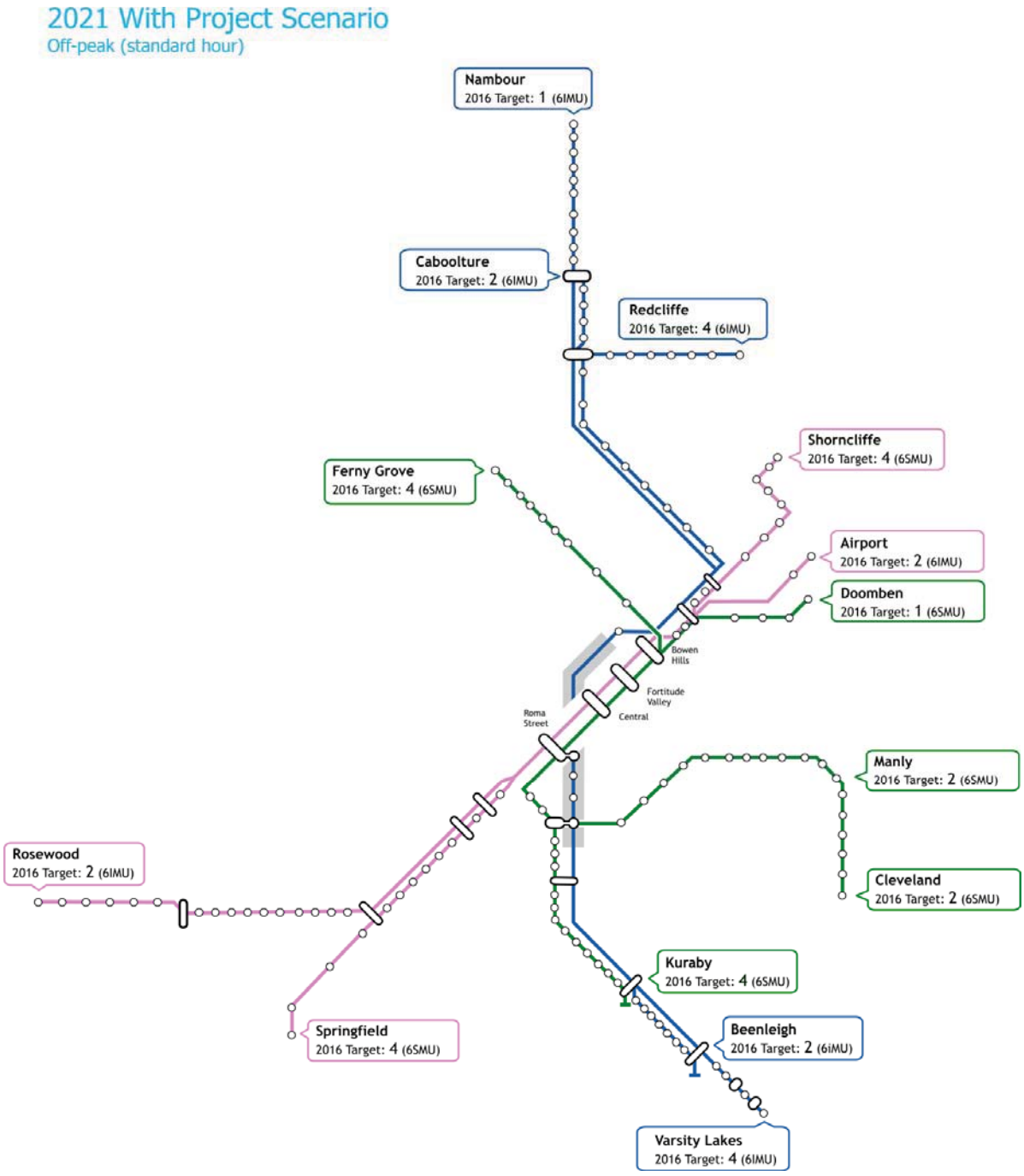

Figure 6-3 2021 Service plan with Cross River Rail – off peak one hour

6.1.4 2021 operating performance with Cross River Rail

Key features of the 2021 'with Project case' strategy compared to 'without project case' strategy include:

Increase in service numbers in the peak hours

The development of Cross River Rail allows for a fundamental transformation in rail capacity to and through the CBD. The new Cross River Rail tunnels would allow up to an additional 48 trains per hour (two way) through the CBD, creating a combined total throughput of 132 trains per hour. This equates to a 57% increase in train paths compared to the current infrastructure's maximum capacity of 84 trains per hour through the CBD. With such a step change in capacity, the Project would free up surface rail paths at existing bottlenecks such as the Park Road junction and Merivale Bridge, enabling an additional four services (or an increase of 9%) from the Gold Coast, Beenleigh and Cleveland corridors compared to the without Project case.

By 2021, with Cross River Rail in operation, 23 additional services would be added to the Brisbane metropolitan rail network during the morning peak. This is equivalent to an increase of 30% in rail capacity (passenger throughput per hour) compared to the 2021 without project scenario. In particular, this rail strategy would allow a major increase in Gold Coast, Beenleigh and Kuraby trains from 14 without project to 24 with project.

Specific examples of peak period (inbound) service frequency with Cross River Rail in operation include:

- Helensvale station – a train about every 5-6 minutes in the morning peak period (compared to a train every 10 minutes without the Project)
- Beenleigh station – trains about every 3-4 minutes in the morning peak period (compared to a train about every 6 minutes without the Project)
- Petrie station – a train about every 2-3 minutes in the morning peak period (compared to a train about every 3-4 minutes without the Project)
- Caboolture station – a train about every 4-5 minutes in the morning peak period (compared to a train about every 6 minutes without the Project).

Simpler stopping patterns

By standardising sectorisation, the Project would also allow much more simplified stopping patterns to be created across the Brisbane rail network and therefore would provide passengers with a more reliable and simpler to understand journey.

Under this operating strategy, the North Coast and Gold Coast lines would no longer have direct services to some existing Brisbane CBD stations, including South Brisbane, South Bank, Central, Fortitude Valley and Bowen Hills stations. Interchange would be required for passengers who wish to travel between the North Coast, Gold Coast and South Brisbane, South Bank, Central, Fortitude Valley and Bowen Hills stations. Vice versa, Cleveland, some Beenleigh, Ipswich, Shorncliffe, Doomben and Airport line passengers would need to interchange to access the Cross River Rail corridor. However new through journey opportunities would be created with western line services linked to Shorncliffe and Airport services, and Gold Coast/ Beenleigh trains linked to Caboolture/ Nambour trains.

Improvement in travel time

Direct connection from the North Coast / Caboolture to the Gold Coast / Beenleigh would be provided by the Project, providing a reduction of up to ten minutes in journey time to Roma Street from the Gold Coast/ Beenleigh Lines and approximately one minute journey time reduction to Roma Street from the North in 2021. However, as the Cross River Rail route would involve two less stops to Roma Street station from the North (for North/ Coast Caboolture trains), a total journey time saving of five minutes is forecast. Minor reductions in travel time (around one minute) are forecast for Ipswich/ Rosewood Services, due to reduced conflicting movements at inner city junctions.

The forecast improvement in travel time is shown in **Table 6-2**.

Table 6-2 Improvement in travel time (2021)

Origin	2021* With CRR (minutes)	2021* Without CRR (minutes)	Improvement in Travel Time (minutes)
Nambour	106	107	1
Caboolture	51	52	1
Beenleigh	46 (to Albert St)	56 (to Central)	10
Varsity Lakes	80	89	9
Rosewood	70	71	1
Ipswich	48	49	1
Springfield	44	44	0
Airport	25	25	0
Shorncliffe	38	38	0
Doomben	23	23	0
Ferny Grove	31	31	0
Cleveland	62	63	1
Manly	43	44	1

Source: Systemwide, December 2010. Note 2021 travel times based on 2016 modelling due to minimal anticipated differences in journey time variables between these years

Specific examples in travel time savings would include:

- Helensvale Station – about a 10 minute travel time saving to the CBD
- Beenleigh Station – about a 10 minute travel time saving to the CBD
- Petrie Station – about a one minute travel time saving to the CBD
- Caboolture Station – about a one minute travel time saving to the CBD
- with Cross River Rail, a trip by train from Woolloongabba to the CBD would take only two minutes, from Ekka station to Roma Street station it would only take about two minutes and from Yeerongpilly to the CBD it would take about 10 minutes (half the time it takes now)

Level of service – Improvement in service reliability

With the Cross River Rail project in place, the network is expected to be able to retain acceptable levels of utilization on the rail corridors, while also providing service growth to minimize the impacts of crowding. As a result, on time reliability across the network would improve significantly when the Project is introduced, and would only decline gradually as capacity on the corridor is gradually filled in the much longer term.

A comparison of indicative With and Without the Project on time reliability forecasts are given below in **Figure 6-4** based on simulation results for 2016 and 2031 With and Without project cases. Also shown on this figure is an example of a deferred (2021) implementation, with the assumption being that all else being equal, later implementation of the project will return performance to the With Project curve.

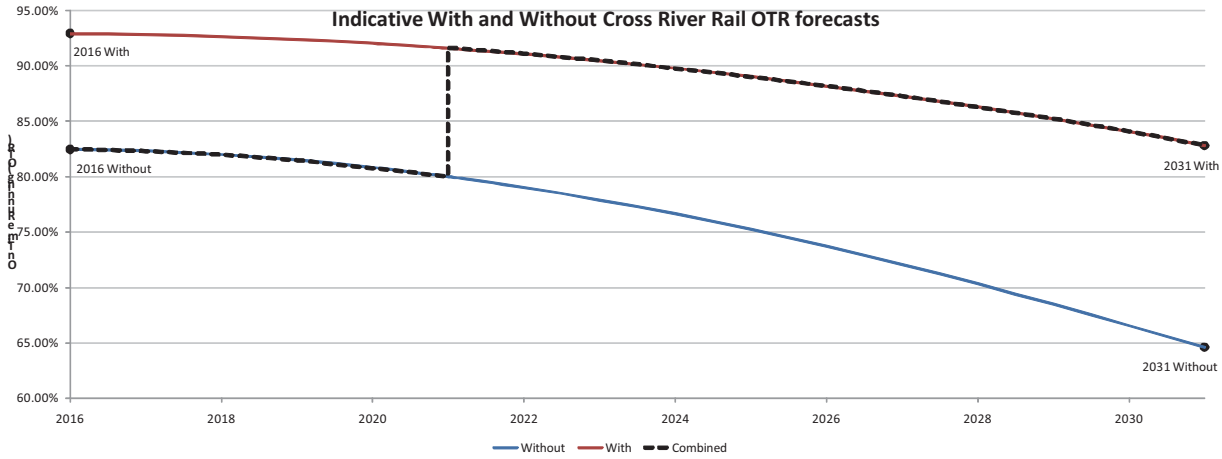

Figure 6-4 Indicative OTR figures between 2016 and 2031, With and Without Cross River Rail

The figures reflected in the above diagram are shown in Table 6-3. On time reliability would improve by around 12% in 2021 and by almost 20% (with the Project compared to without the Project) in 2031.

Table 6-3 Improvement in travel time (2021) with Cross River Rail

Scenario	Weighted network average
	On-time reliability
	(% inbound trains on-time within 4 minutes in the 2 hour AM Peak)
2016 With Project	92.9%
2016 Without Project	82.4%
Difference	10.4%
2021 With Project (indicative)	91.6%
2021 Without Project (indicative)	80.0%
Difference	11.6%
2031 With Project	82.8%
2031 Without Project	64.6%
Difference	18.2%

Rail dynamic simulations were conducted by Systemwide for both the 2031 With and Without Project Cases[2]. The results show the on time reliability (OTR) or punctuality of each line of the With Project Case compared to the Without Project Case.

[2] Refer to *Systemwide, October 2010*

Cross River Rail would bring significant reliability benefits for most lines travelling into the Brisbane CBD during the morning peak period. A graphical comparison for on time reliability results with (red) and without (blue) the Project is shown **Figure 6-5.**

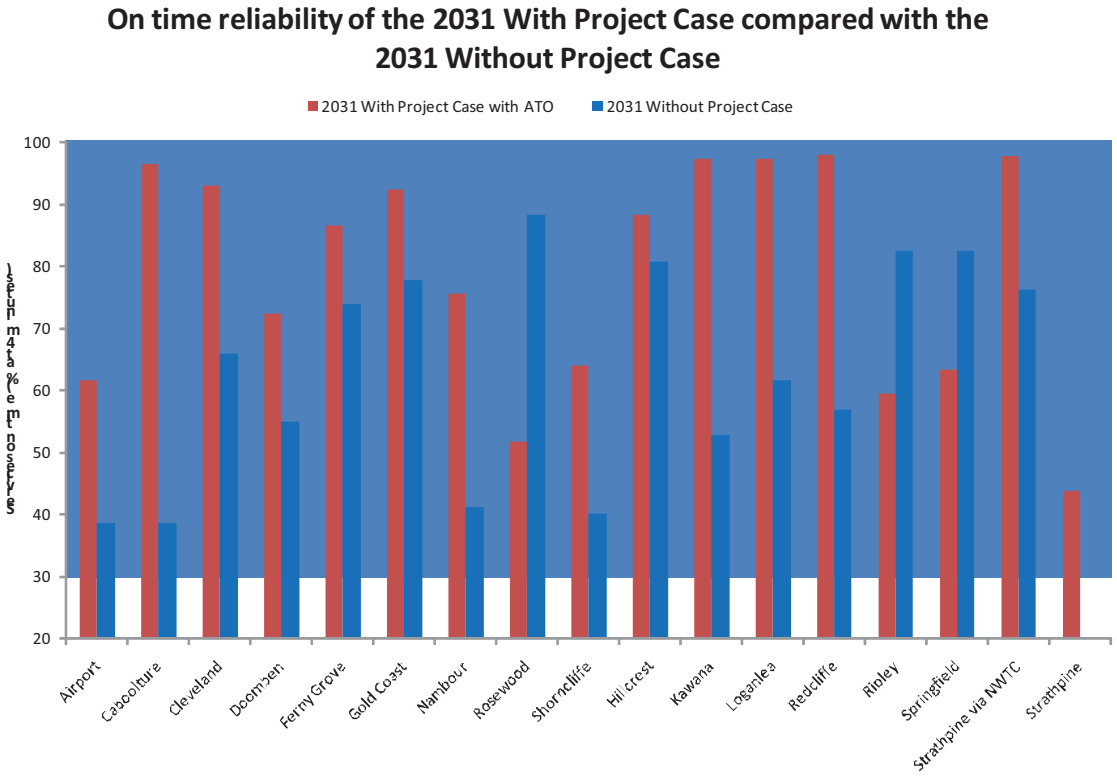

Figure 6-5 Comparison of on time reliability at four minutes between 2031 Without and With Cross River Rail
Source: Systemwide, December 2010

Note:
1. *Data is shown only for reliability comparisons between scenarios.*

Rollingstock requirement

The 2021 With Project rolling stock requirements were calculated by Systemwide using the spreadsheet method as well as the RailSys method, for comparison with the 2021 Without Project case. This is broken down in **Table 6-4.**

A total of at least 326 3-car sets would be required across the Brisbane network to support forecast 2021 operations with a Cross River Rail tunnel in place using the RailSys model method. With a 10% allocation of spares, the total fleet requirement to support forecast 2021 operations would be 359 three-car sets.

The 2021 Without Project Case requires 52 less three-car sets compared to the 2021 With Project Case.

Table 6-4 Forecast 2021 With and Without Project rolling stock requirements using the RailSys methodology

Without Project rolling stock requirement (spreadsheet methodology)	Three-car sets required	
Corridor	**2021* Without Project**	**2021 With Project**
Western corridor requirement	58	59
Southern corridor requirement	98	112
Northern corridor requirement	123	145
Total three-car sets (operations)	279	326
Spares (10% allocation)	28	33
Total three-car sets (operations)	307	359
Existing rolling stock fleet size (end 2012)	215	215
ADDITIONAL ROLLING STOCK PROCUREMENT (operations inc. spares)	52	144
Possible ICE and EMU retirement allocation	95	95
TOTAL ADDITIONAL ROLLINGSTOCK PROCUREMENT (operations inc. spares including retirements)	147	239

Source: Systemwide, December 2010

6.1.5 Proposed network changes with Cross River Rail – 2031

In addition to the infrastructure illustrated in **Table 6-1**, for 2016, the major change to the network assumed by 2031 (with or without the Project) would be a new quad track rail corridor utilising the North West Transport Corridor from Strathpine to Alderley, with a dual track extension from Alderley to Roma Street in tunnel for the Cross River Rail case only.

Other new branch lines and extensions to corridors were assumed by 2031 including:

- Varsity Lakes to Elanora (Gold Coast Line) extension
- Salisbury to Flagstone Creek branch line
- Ipswich to Ripley branch line
- Petrie to Redcliffe branch line
- Beerwah to Caloundra branch line.

Furthermore, by 2031, the introduction of nine-car operations was assumed on inter-city / outer suburban sectors (Blue and Black sectors shown in **Figure 6-6**). Lastly, in 2031 the introduction of High Capacity Suburban Multiple Unit operation on suburban sectors (Pink and Green sectors shown in **Figure 6-6**) was also assumed.

Additional infrastructure requirements by 2031

Extensive analysis has been conducted by Systemwide[3] in order to determine additional infrastructure required to operate the proposed 2031 with Project rail strategy to an acceptable standard[4]. It was found that the capacity benefits of the Project could only be achieved by removing capacity bottlenecks elsewhere on the network, such as single line sections and long signal headways. The additional infrastructure required includes:

- duplication for the remaining three sections from Manly to Cleveland
- improve signal headways between Alderley and Bowen Hills to three minutes
- platforms to cater for nine-car sets between Elanora and Loganlea, on the Flagstone Creek line and at Salisbury
- quad track from Strathpine to Caboolture
- dual track from Beerburrum to Beerwah
- platforms to cater for nine-car sets between Nambour and Strathpine
- improved headway between Ipswich and Booval
- improved headway between Beenleigh and Varsity Lakes
- freight enhancements to allow a 15 minute off-peak services to Ipswich
- electrified quad track between Corinda and Darra.

6.1.6 Proposed 2031 rail operating strategy with Cross River Rail

The key changes for the 2031 operating strategy with Cross River Rail compared to the 2016 operating strategy without the Project would include the creation of four stand alone sectors, compared to two sectors without the Project. These sectors are shown in **Figure 6-6**, **Figure 6-7** and **Figure 6-8** (representing the peak one hour, shoulder peak hour and off peak standard hour respectively) and include:

a) Inter-city sector (Black) – The black sector caters for the intercity Elanora and Caloundra services which run express through the North West Transport Corridor. This sector was chosen to provide the fastest journey between the two regional centres of the Sunshine Coast and Gold Coast and is intended to form the rail backbone of the future regional SEQ transport network. The Elanora and Caloundra intercity services would be connected and would operate mostly as through services connecting key regional centres along the route with express services.

b) North – South Cross River Rail sector (Blue) – In this sector, Caboolture services would be connected to Elanora interurban services and Redcliffe services would be connected to Flagstone Creek services. Nambour services would not be connected to any southern services and are assumed to turn back somewhere in the south, such as Clapham.

c) East – west interurban sector (Pink) – In this sector, Rosewood services would be connected to Airport services, Springfield services would be connected to Shorncliffe services and Ripley services would be connected to Doomben services. Strathpine all station services in this sector would only operate in the peak two hours. Redcliffe services in the off peak would then become all stations stopping.

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[3] Source: Systemwide, October 2010

[4] The level of service relating to on time reliability is measured by the current Queensland Rail benchmark of 92.4% on time reliability at 4 minutes during the morning peak period. (That is 92.4% of services arrive within 4 minutes of the timetabled time.)

d) Brisbane suburban sector (Green) – In this sector, Strathpine services would be connected to Loganlea services and Ferny Grove services would be connected to Cleveland services.

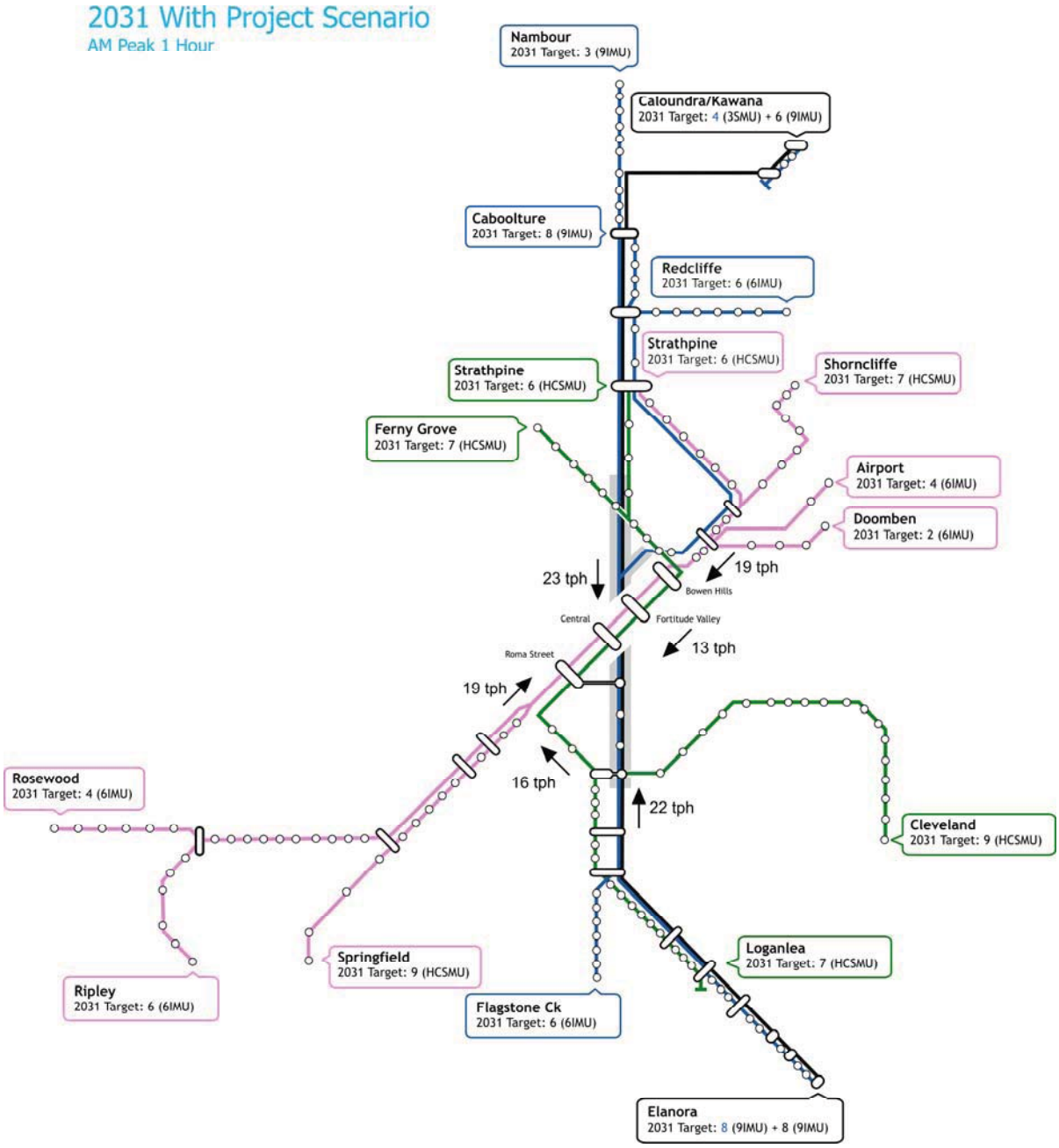


Figure 6-6 2031 Service plan with Cross River Rail – morning one hour peak

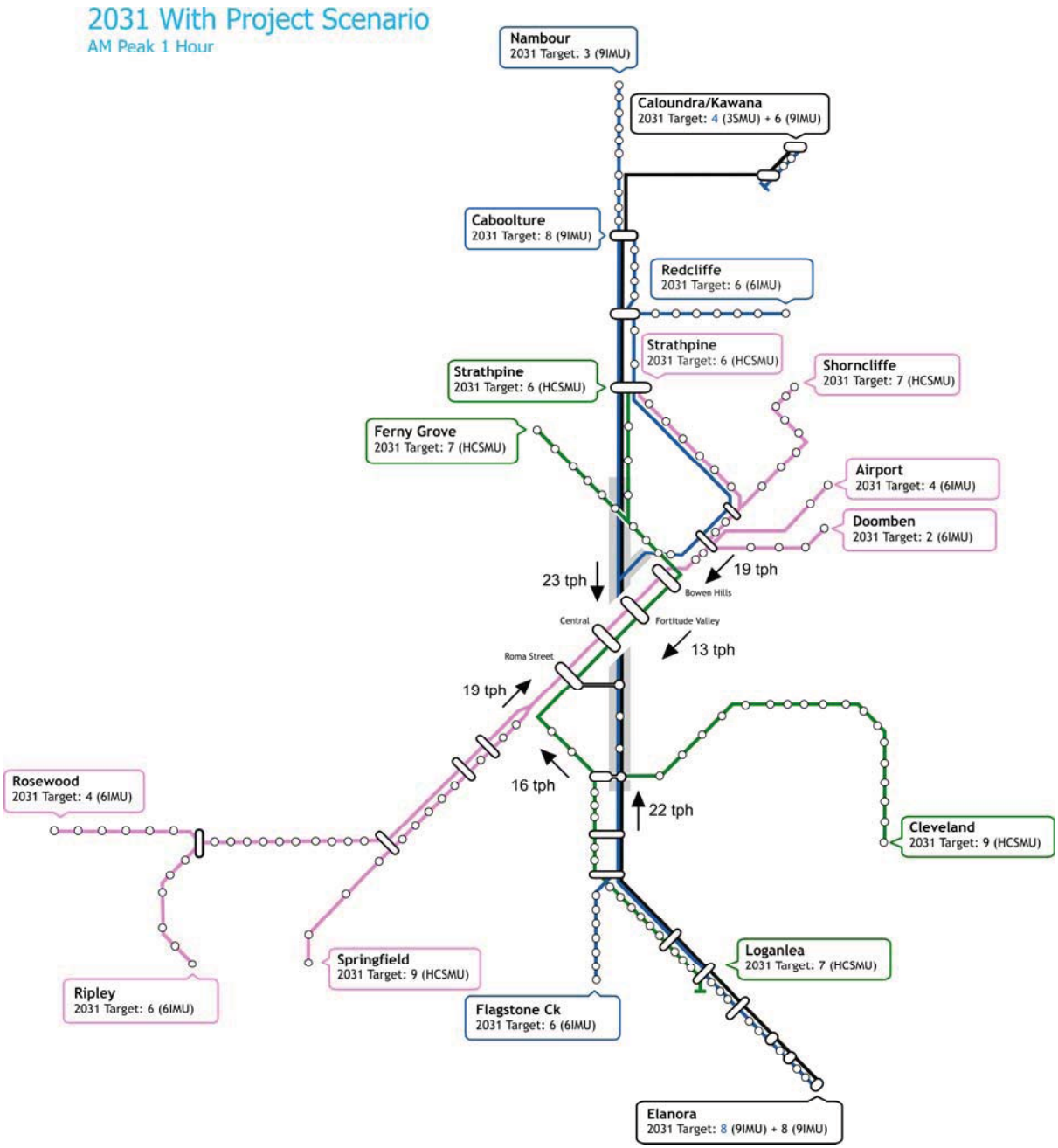


Figure 6-7 2031 Service plan with Cross River Rail – shoulder peak one hour (same as peak)

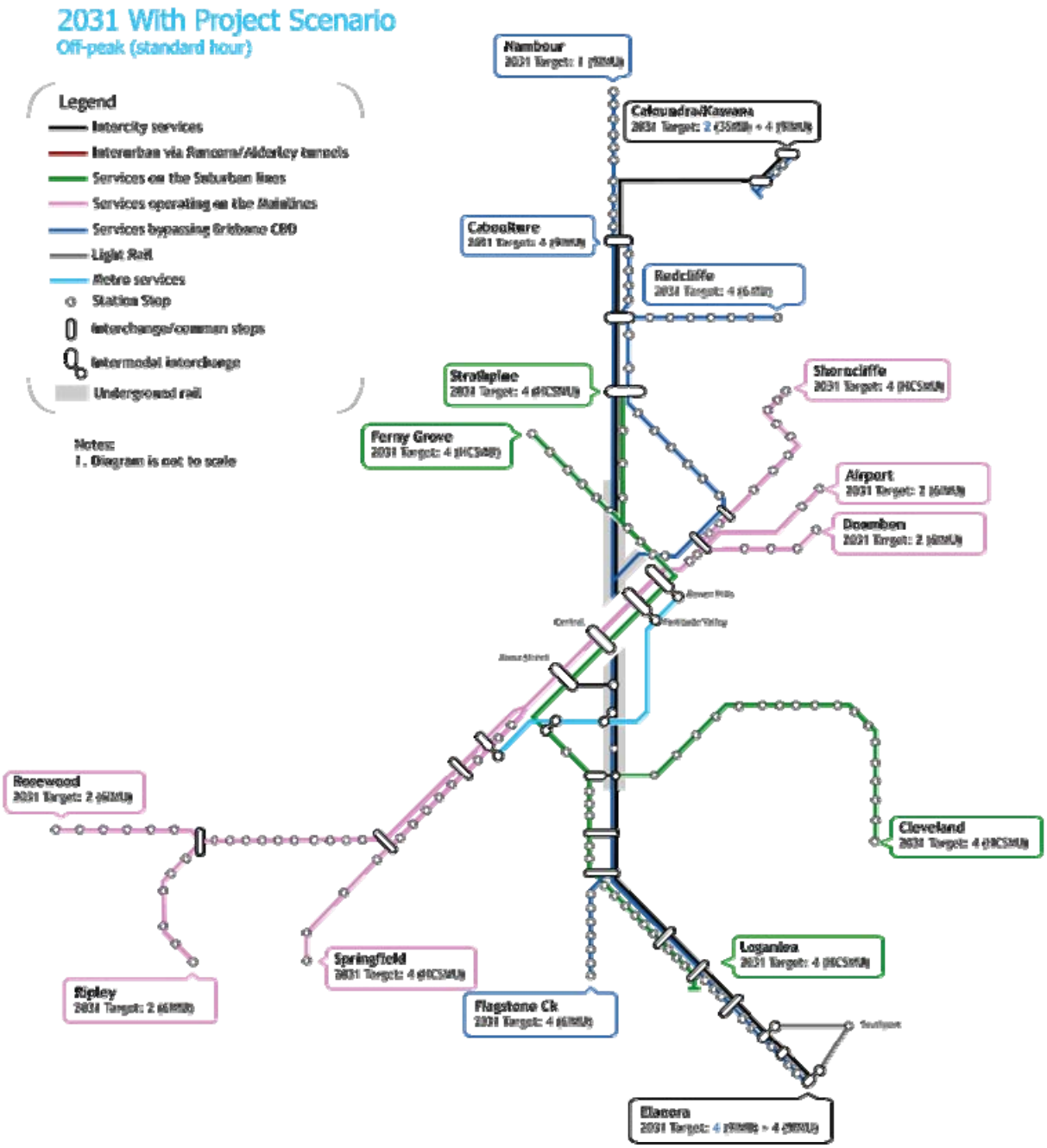


Figure 6-8 2031 Service plan with Cross River Rail – off peak one hour

6.1.7 2031 operating strategy performance with Cross River Rail

The 2031 operating strategy is expected to result in:

- a significant increase in number of services that can be run through the CBD
- a significant improvement in travel times
- a significant improvement in reliability
- increased train frequencies.

By 2031, with Cross River Rail and the North West Transport Corridor in operation, together with a series of branch lines and extensions, more services would be added to the Brisbane rail network, especially from new regional centres such as Strathpine, Caloundra, Redcliffe from the north and Ripley, Flagstone Creek and Elanora from the south.

In addition, the 2031 strategy would also allow the introduction of nine-car operation on inter-city / outer suburban sectors (Blue and Black sectors shown in **Figure 6-6**) and High Capacity Suburban Multiple Units (HCSMUs) or "metro" style trains on suburban sectors (Pink and Green sectors shown in **Figure 6-6**). By 2031, with the Project in operation, an additional 28 trains per hour could be operated on the Brisbane rail network compared to the 2031 without the Project. This would represent a 33% increase in train volume capacity, compared to the 2031 without Project scenario, and even higher when longer trains are taken into account.

Significant improvement in rail travel time

Under the 2031 With Project case, passenger travel times to the CBD would be further improved for the North Coast line, with faster express running services utilising the more direct North West Transport Corridor providing a forecast journey time reduction of up to 15 minutes to Central Station from Nambour and Caloundra. Direct connection from the North Coast / Caboolture to the Gold Coast/Beenleigh would provide up to ten minutes journey time saving from the South. This is shown in **Table 6-5**.

Table 6-5 Improvement in travel time (2031) with Cross River Rail

Origin	2031 With CRR (minutes)	2031 Without CRR (minutes)	Improvement in travel time (minutes)
Kawana	78	93	15
Nambour	97	111	14
Caboolture	46	57	11
Elanora (Inter-city)	78	86	8
Elanora (Interurban)	88	97	9
Flagstone Creek	43	43	0
Rosewood	70	72	2
Springfield	44	44	0
South Ripley	64	66	2
Airport	24	25	1
Doomben	25	25	0
Shorncliffe	39	39	0
Ferny Grove	34	32	-2
Strathpine	37	30	-7
Cleveland	62	62	0

Source: Systemwide, December 2010

With the Project in 2031, passenger travel times to the CBD will further improve for the North Coast line, with faster express running services able to utilise the more direct North West Transport Corridor providing an up to 15 minute journey time reduction to Central from Nambour and Caloundra. Direct connection from the North Coast / Caboolture to the Gold Coast / Beenleigh would still provide up to 10 minutes journey time saving from the south compared to without the Project.

Due to the proposed changes to sectorisation with the Project some journeys which are currently direct, would subsequently require an interchange. For example a passenger travelling from the Gold Coast to Brisbane Airport would no longer have a single seat journey with passengers transferring to Airport services at Roma Street. However with higher travel speeds from the Gold Coast to the CBD coupled with higher frequencies on all lines with CRR compared to without, overall journey times including transfer and wait time are expected to be comparable. Furthermore, the change in sectorisation will mean some journeys that currently require an interchange subsequently become direct (single seat) journeys, such as Ipswich to the Airport.

Lastly, average wait times per passenger are forecast to reduce, from around 8 minutes in 2009 to 6 minutes in 2021 with the Project and 4.3 minutes in 2031 with the Project.

Level of service – significant improvement in service reliability

Rail dynamic simulations were conducted by Systemwide for both 2031 With and Without Project Cases (Systemwide, December 2010*)*. The results show the on time reliability of each line for the With Project Case compared to the Without Project Case. **Table 6-6** shows that the With Project Case has a much higher forecast reliability for all lines compared with the Without Project Case, apart from the Western Line. The Caboolture, Cleveland, Gold Coast, Kawana, Loganlea, Redcliffe, and Strathpine lines would achieve the Queensland Rail on time reliability goal of 92% with the Project.

Table 6-6 2031 On Time Reliability for inbound services per line

Reliability measured at CBD/Central		Reliability at 4 minutes (%)	
Line	**2031 Without Project Case**	**2031 With Project Case**	**Difference**
Airport	38.73%	61.74%	23.01%
Caboolture	38.71%	96.41%	57.70%
Cleveland	65.85%	93.02%	27.17%
Doomben	54.99%	72.33%	17.35%
Ferny Grove	73.88%	86.67%	12.79%
Gold Coast	77.65%	92.30%	14.65%
Nambour	41.30%	75.50%	34.20%
Rosewood	88.26%	51.78%	-36.48%
Shorncliffe	40.08%	64.05%	23.98%
Hillcrest	80.84%	88.36%	7.53%
Kawana	52.87%	97.35%	44.48%
Loganlea	61.55%	97.40%	35.85%
Redcliffe	56.83%	97.98%	41.16%
Ripley	82.39%	59.49%	-22.90%
Springfield	82.48%	63.37%	-19.11%
Strathpine via NWTC	76.32%	97.83%	21.52%
Strathpine		43.72%	

Source: Systemwide, December 2010

Note: On time reliability is measured at Central/CBD from start of operation to 10:00 am

Cross River Rail would bring significant reliability benefit (34% to 57%) for the Northern services (Caboolture, Redcliffe, Nambour and Kawana). This would be due to a greater number of services in the With Project Case which leads to less overcrowding and smaller dwells at stations (especially in the inner city). In addition, the implementation of European Train Control System level two signalling in the tunnel would also improve reliability.

There are also reliability improvements for the Hillcrest, Gold Coast, Ferny Grove and Strathpine via NWTC services during the morning peak period.

It should be noted that the Without Project Case has better forecast reliability results for the western line services during the morning peak period. This is because the With Project Case would have greater loadings at Central Station which cause delays. The average dwell for all Western services during the peak for the Without Project Case would be 65 seconds compared with 83 seconds for the With Project Case. A high dwell time at Central station would cause services to queue back to Roma Street, producing more delays.

A graphical comparison is shown in **Figure 6-9**.

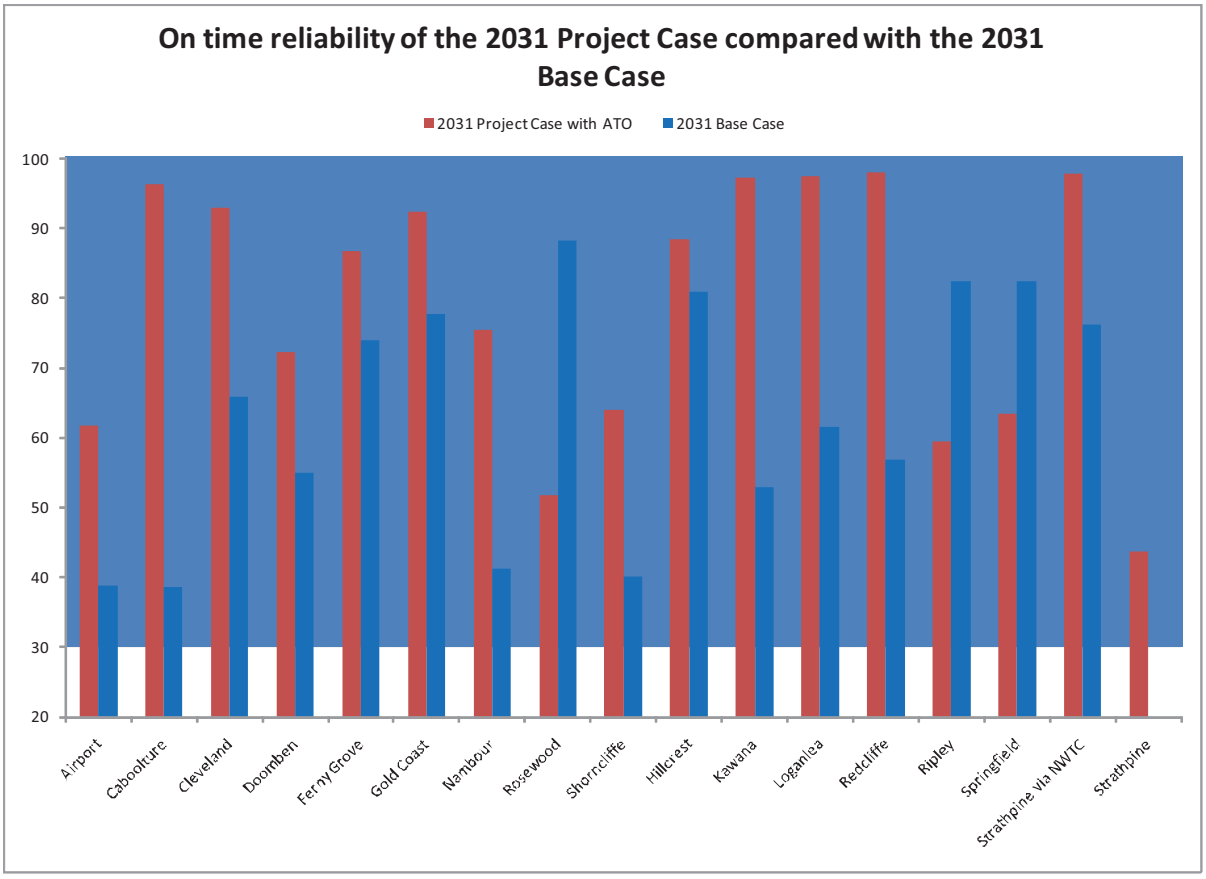


Figure 6-9 Comparison of on time reliability at four minutes between 2031 Without and With Project Cases

Source: Systemwide, December 2010

Note: This data is only shown for comparisons between scenarios.

Rollingstock requirement

The 2031 With Project rolling stock requirements were calculated by Systemwide using the spreadsheet method as well as RailSys method, for comparison with the 2031 Without Project case (Systemwide, December 2010).

A total of at least 196 stabling berths of six- and nine-car length are forecast to be required across the Brisbane network to support forecast 2031 operations with the Cross River Rail tunnel in place using the RailSys model method. The 196 berths consists of 116 x six-car berths and 79 x nine-car berths, giving a total of at least 469 x three-car sets for operations. With 10% spares, rolling stock requirements reach 518 x three-car sets to support 2031 operations.

The 2031 Without Project Case requires 130 less three-car sets compared to the 2031 With Project Case. This is illustrated in **Table 6-7**.

Table 6-7 Forecast 2031 With and Without Project rolling stock requirements using the RailSys methodology

Without Project rolling stock requirement (spreadsheet methodology)	Three-car sets required	
Corridor	**2031 Without Project**	**2031 With Project**
Western corridor requirement	71	72
Southern corridor requirement	116	180
Northern corridor requirement	152	217
Total three-car sets (operations)	339	469
Spares (10% allocation)	34	47
Total three-car sets (operations)	373	516
Existing rolling stock fleet size (end 2012)	215	215
Additional rolling stock procurement (operations inc. spares)	158	301
Possible ICE and EMU retirement allocation	95	95
Total additional rollingstock procurement (operations inc. spares including retirements)	253	395

Source: Systemwide, December 2010

6.1.8 Demand and performance of the future rail network with the Project

This section presents the rail patronage and rail performance changes associated with the Project. The following section compares the network and service performance in 2021 and 2031 With and Without the Project in the network.

Table 6-8 presents the forecast average weekday travel and total person trip growth With and Without the Project from 2009 to 2031. The total number of daily motorised trips forecast in the with Project case and the without Project case is similar. However, the public transport mode share would be higher with the project than Without the Project in both 2021 and 2031. By 2031, with the Project, 12.1% of trips are forecast to be using public transport on an average weekday whereas without the Project this is forecast to be around 11.6%.

Total rail patronage is forecast to be higher with the Project compared to without that is around 8% higher in 2021 and over 12% higher in 2031. The significant increase in rail patronage with the Project compared to without Cross River Rail indicates that crowding on trains and poor train performance without the Project is constraining growth in patronage.

Table 6-8 Average weekday trip changes with and without the Project

24 Hour	2009	2021			2031		
		Without CRR	With CRR	% change	Without CRR	With CRR	% change
Total person trips by car	5,533,200	7,009,800	6,988,400	-0.31%	7,771,700	7,736,500	-0.45%
Public transport trips	546,000	824,200	841,800	2.13%	1,074,000	1,120,800	4.37%
Public transport mode share	8.15%	9.95%	10.16%		11.60%	12.10%	
Total rail patronage (24h)	243,200	421,900	454,200	7.66%	529,500	595,400	12.44%
Number of rail trips to CBD (am peak period)	37,100	61,600	72,800	18.24%	73,700	95,100	29.04%
Total vehicle trips	4,383,200	5,652,100	5,635,500	-0.29%	6,460,200	6,431,500	-0.44%

Source: Cross River Rail Project Model

Appendix F includes additional tables showing a range of boarding and alighting information. The main points from these tables are that in the morning peak:

- a high number of rail to rail transfers at Roma Street station would occur between the Cross River Rail and surface platforms in both 2021 and 2031
- a high number transfers between rail and bus would occur at Gabba.

Also shown in **Appendix F** are boarding and alighting passengers at inner city and CBD stations in 2021 and 2031. Forecast trends are:

- significant forecast growth in patronage to the CBD compared to the without Project case. With the Project there are forecast to be 95,000 passenger alightings in the CBD during the 2031 morning peak period compared with 74,000 without the Project.
- an even distribution of passengers alighting rail services in the CBD between Roma Street, Central station and Albert Street in 2031.

Passenger rail patronage growth and performance

Table 6-9 presents the forecast change in rail patronage with the Project in the morning peak. This illustrates that with the Project in 2021, there is forecast to be around 13% more rail patronage than without the Project. In 2031 the rail patronage with the Project is over 23% higher in the morning peak than without the Project.

Furthermore, there is expected to be a decrease in average trip length and average trip time with the Project (compared to without he project) in both 2021 and 2031.

Table 6-9 Morning peak rail patronage data

AM peak	2009	2021			2031		
		Without CRR	With CRR	% change	Without CRR	With CRR	% change
Total rail passenger kilometre	1,318,600	2,292,100	2,541,300	10.87%	3,404,600	3,910,900	14.87%
Total rail passenger hours	34,000	57,300	61,000	6.34%	82,300	85,300	3.68%
Total rail patronage	67,000	108,300	122,600	13.18%	141,900	174,000	22.61%
Average rail trip length (km)	19.7	21.2	20.7	-2.04%	24.0	22.5	-6.31%
Average rail trip time (min)	30.4	31.7	29.8	-6.05%	34.8	29.4	-15.44%
Number of rail alightings in CBD	37,100	61,600	72,800	18.24%	73,700	95,100	29.04%

Source: Cross River Rail Project Model

Table 6-10 shows that the forecast morning peak period number of passengers that would board and alight at inner city and CBD stations. **Table 6-11** reports the forecast for the average weekday would almost double at most stations by 2031. Daily usage of stations would increase at a greater rate due to an increase in the number of off-peak rail trips made. Key forecast trends are:

- significant growth in patronage to the CBD compared to the without Project case. With the Project there are forecast to be 95,000 passenger alightings in the CBD during the 2031 morning peak period compared with 74,000 without the Project.
- an even distribution of passengers alighting rail services in the CBD between Roma Street, Central Station and Albert Street in 2031
- a high number of rail to rail transfers at Roma Street station occur between the Cross River Rail and surface platforms in both 2021 and 2031
- South Brisbane and South Banks stations are forecast to have less passenger activity with the Project operational compared to without. This is as passengers would use Cross River Rail to use the more conveniently located Albert Street station rather than walk across the river.

Table 6-10 Forecast growth in total passenger boardings and alightings at stations with Cross River Rail – morning peak period

Station	2009	2021		2031	
		Without CRR	With CRR	Without CRR	With CRR
Bowen Hills	3,600	6,700	6,100	7,600	7,900
Fortitude Valley	4,700	7,000	6,100	10,800	9,000
Ekka	-	-	3,100	-	1,700
Roma Street	9,300	15,300	28,100	26,700	46,300
Brisbane Central	34,500	47,300	30,500	49,300	41,600
Albert Street	-	-	27,200	-	37,300
Gabba	-	-	6,000	-	10,900
South Bank	5,300	9,700	6,400	9,900	6,500
South Brisbane	2,800	5,900	2,400	9,900	3,400
Boggo Road	1,200	3,800	6,300	5,100	8,400
Yeerongpilly	700	1,300	3,700	2,000	3,200

Source: Cross River Rail Project Model
Note:
1. Passenger boardings and alightings include transfers between all modes including rail to rail.

Table 6-11 Forecast growth in total passenger boardings and alightings at stations with Cross River Rail – average week day

Station	2009	2021		2031	
		Without CRR	With CRR	Without CRR	With CRR
Bowen Hills	12,700	25,900	18,500	32,100	29,200
Fortitude Valley	16,800	28,600	21,500	40,700	28,500
Ekka	-	-	15,400	-	6,500
Roma Street	36,500	62,200	90,600	94,600	149,900
Brisbane Central	104,300	152,500	93,300	177,600	122,300
Albert Street	-	-	93,500	-	106,100
Gabba	-	-	22,800	-	35,800
South Bank	22,900	62,800	21,100	44,400	19,600
South Brisbane	7,400	18,400	9,200	25,800	9,400
Boggo Road	3,900	11,600	17,100	17,300	24,000
Yeerongpilly	1,500	3,500	9,200	5,800	8,300

Source: Cross River Rail Project Model

Note:
1. Passenger boardings and alightings include transfers between all modes including rail to rail.

Mode share

Table 6-12 and **Figure 6-10** shows the changes to overall CBD travel demand in the morning peak with and without Cross River Rail for public transport modes. This shows rail capturing a larger share of trips to the CBD both with and without the Project and with bus and car reducing in significance as a mode of access to the CBD in the morning peak. By 2031, with Cross River Rail in operation, 59% of CBD trips are forecast to be by rail.

Table 6-12 Morning peak period mode share to the CBD

Mode	2009	2021		2031	
		Without CRR	With CRR	Without CRR	With CRR
Car	32%	33%	31%	27%	24%
Rail	36%	46%	53%	47%	59%
Bus	29%	18%	13%	23%	14%
Ferry	2%	3%	2%	3%	2%

Source: Cross River Rail Project Model

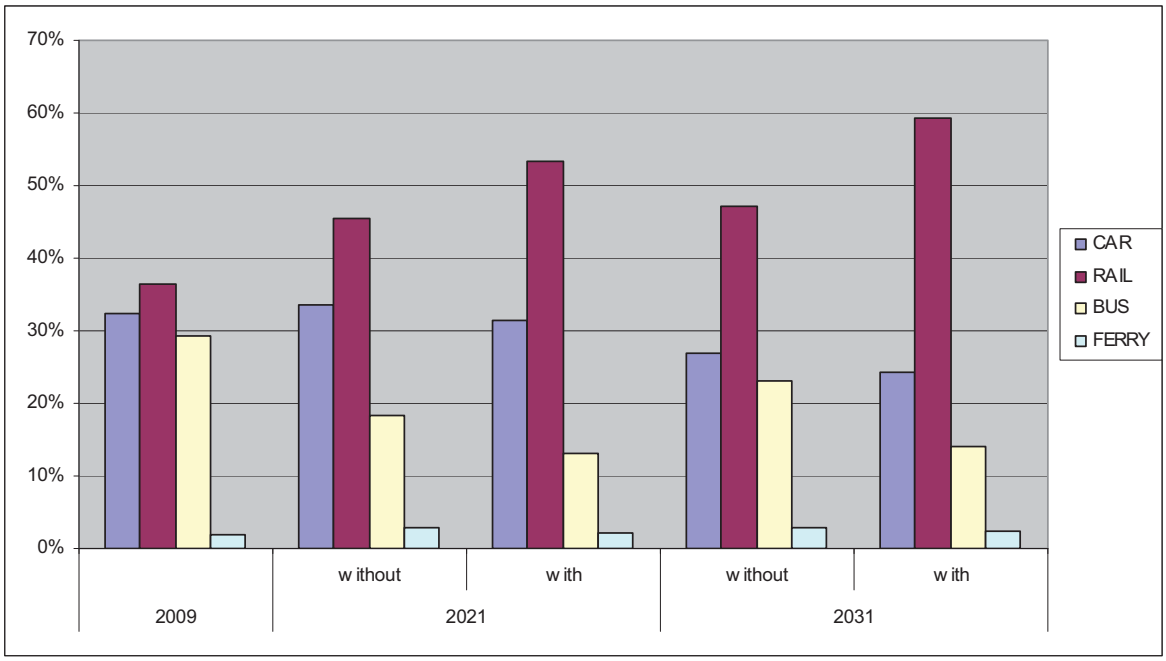


Figure 6-10 Forecast change in morning peak travel to the Brisbane Central Business District

Analysis of cross river trips in the AM peak as illustrated in **Figure 6-11**, reveals a strong trend towards more rail trips and less bus and car trips. This shows that for all cross-river trips in the CBD (from the Go Between Bridge to the Story Bridge) rail will capture almost as many as by road in 2031 (this includes major bypass roads not serving the CBD) with the Project. Without the project however rail captures less than half the number of trips as road.

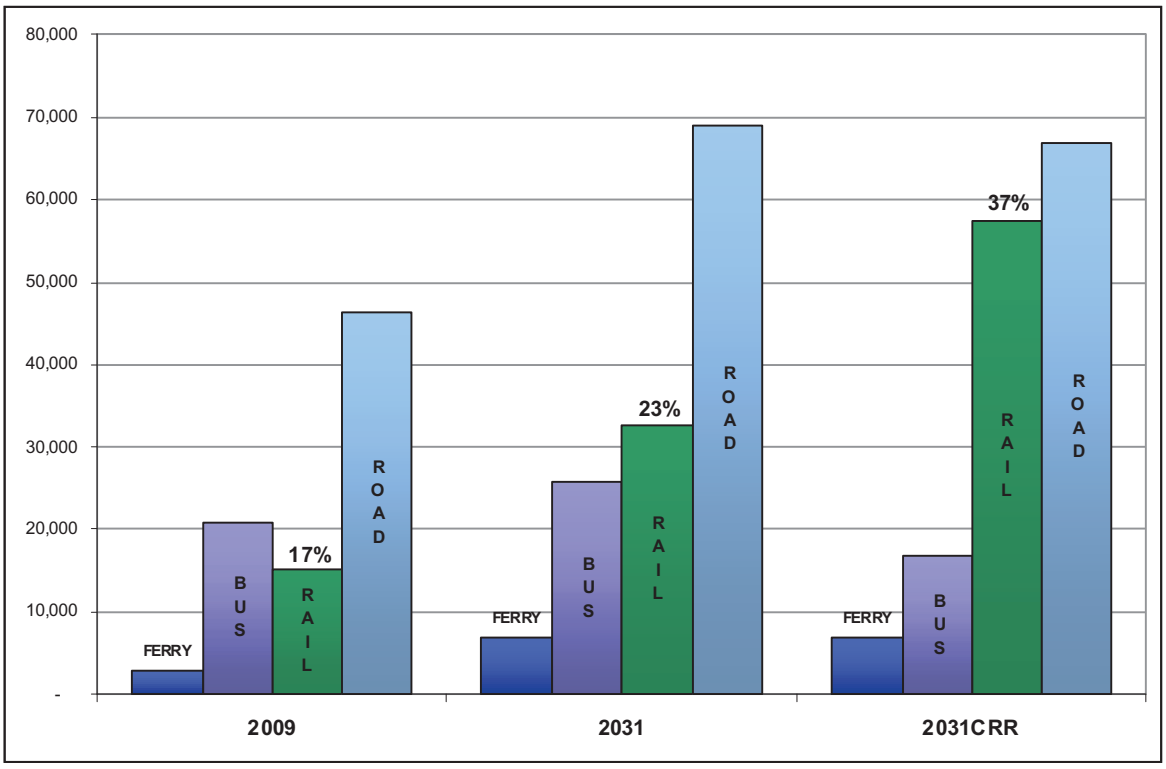


Figure 6-11 Forecast morning peak period travel demand (person trips) across the Brisbane River

Across the Brisbane Metropolitan Area, total rail patronage in 2031 is 65,000 more daily trips than without project, while total vehicle trips is around 30,000 less trips. This reinforces the trend towards mode shift from car to public transport (predominantly rail), with a shift from bus to rail also evident.

Line loadings

Table 6-13 and **Table 6-14** present the forecast rail patronage for two-way line loadings between rail stations in the inner city and on Cross River Rail for the morning peak period and the average 24 hour weekday respectively. This shows that in 2021 over 24,000 passengers would use Cross River Rail between Albert Street and Roma Street. By 2031 over 33,000 passengers would use the Project between Albert Street and Roma Street.

The busiest of section of Cross River Rail would be between Gabba and Albert Street stations. In 2021 it is forecast that this section of the Project would carry almost 91,000 passengers per day and increasing to just over 124,000 passengers in 2031.

The Project significantly reduces loadings on some parts of the network in the morning peak period, providing additional system resilience by relieving them of congestion. Examples include::

- reduction, in the order of 50% in 2031, in the number of passengers using the existing surface rail network between Park Road and Roma Street.
- a 70% reduction in the number of passengers on the surface rail network between Dutton Park and Park Road stations
- in 2031 it is forecast that almost 23,000 passengers would travel by rail between Roma Street and Alderely via the North West Transport Corridor. This has a significant effect in reducing the number of passengers using Cross River Rail between Roma Street and Ekka.

Table 6-13 Forecast growth in rail patronage with Cross River Rail – morning peak period

Segment	2009	2021			2031		
		Without CRR	With CRR	% growth	Without CRR	With CRR	% growth
Cross River Rail							
Ekka to Bowen Hills	-	-	22,500	-	-	6,600	-
Roma Street to Ekka	-	-	22,700	-	-	7,100	-
Roma Street to Alderley	-	-	0	-	-	22,700	-
Albert Street to Roma Street	-	-	24,300	-	-	33,200	-
Gabba to Albert Street	-	-	21,900	-	-	39,300	-
Park Road to Gabba	-	-	18,600	-	-	33,500	-
Yeerongpilly to Park Road	-	-	16,400	-	-	31,100	-
Surface station							
Fortitude Valley to Bowen Hills	27,400	40,600	21,100	-48%	52,600	32,700	-38%
Central to Fortitude Valley	28,000	41,900	23,300	-44%	53,300	35,800	-33%
Roma Street to Central	25,200	41,400	35,200	-15%	51,100	42,600	-17%
South Brisbane to Roma Street	15,200	25,400	17,200	-32%	32,500	18,100	-44%

Segment	2009	2021			2031		
		Without CRR	With CRR	% growth	Without CRR	With CRR	% growth
South Bank to South Brisbane	17,600	29,300	18,700	-36%	39,000	19,600	-50%
Park Road to South Bank	17,700	29,300	18,500	-37%	37,800	18,900	-50%
Dutton Park to Park Road	11,200	17,600	7,000	-60%	23,700	7,900	-67%

Source: Cross River Rail Project Model

Table 6-14 Forecast growth in rail patronage with Cross River Rail – average weekday (24 hour)

Segment	2009	2021			2031		
		Without CRR	With CRR	% growth	Without CRR	With CRR	% growth
Cross River Rail							
RNA to Bowen Hills	-	-	81,600	-	-	24,000	-
Roma Street to Ekka	-	-	77,900	-	-	23,100	-
Roma Street to Alderley	-	-	0	-	-	76,300	-
Albert Street to Roma Street	-	-	76,500	-	-	105,600	-
Gabba to Albert Street	-	-	91,000	-	-	124,200	-
Park Road to Gabba	-	-	84,600	-	-	117,400	-
Yeerongpilly to Park Road	-	-	78,300	-	-	113,000	-
Surface station							
Fortitude Valley to Bowen Hills	98,800	154,000	84,200	-45%	192,900	118,700	-38%
Central to Fortitude Valley	99,700	158,400	92,500	-42%	194,300	124,800	-36%
Roma Street to Central	82,900	144,600	122,700	-15%	181,000	138,800	-23%
South Brisbane to Roma Street	49,000	92,900	56,800	-39%	118,100	56,600	-52%
South Bank to South Brisbane	55,800	105,000	63,800	-39%	135,400	62,000	-54%
Park Road to South Bank	66,200	126,700	71,000	-44%	140,900	68,000	-52%
Dutton Park to Park Road	41,600	84,200	21,400	-75%	99,200	25,400	-74%

Source: Cross River Rail Project Model

Level of service – load factor

The introduction of Cross River Rail is forecast to reduce passenger crowding on numerous lines during peak periods providing significantly improved capacity to manage future growth in public transport demand.

With the Project the line load factors (calculated as the ratio of the number of passengers compared to seated capacity), are forecast to be significantly lower. As illustrated in **Figure 6-12**, the introduction of Cross River Rail in 2021 is forecast to reduce crowding on the Beenleigh/ Gold Coast, Ipswich and Cleveland lines which all show reductions in load factors, and specifically volume over capacity greater than 1.25 (that trains on average are carrying more than 1.25 times their seated capacity for the two hour morning peak period). There is also relief in crowding on the northern lines between Northgate and Albion.

Figure 6-13 shows changes to line load factors in 2031. By 2031 without the Project, the degree and extent of over-crowding on all approaches to the CBD would worsen. With the introduction of the Project, significant crowing relief to a large portion of the network is forecast, including the Beenleigh and Gold Coast lines, the Ferny Grove line, the North Coast line through Wooloowin and Albion, the Cleveland line and on the Merivale Bridge.

Significant overloading at Park Road and Bowen Hills during the morning peak will be eliminated as the Project allows for much of this demand to be carried in the separate North-South corridor (that is the Cross River Rail tunnel and by 2031, the North West Transport Corridor).

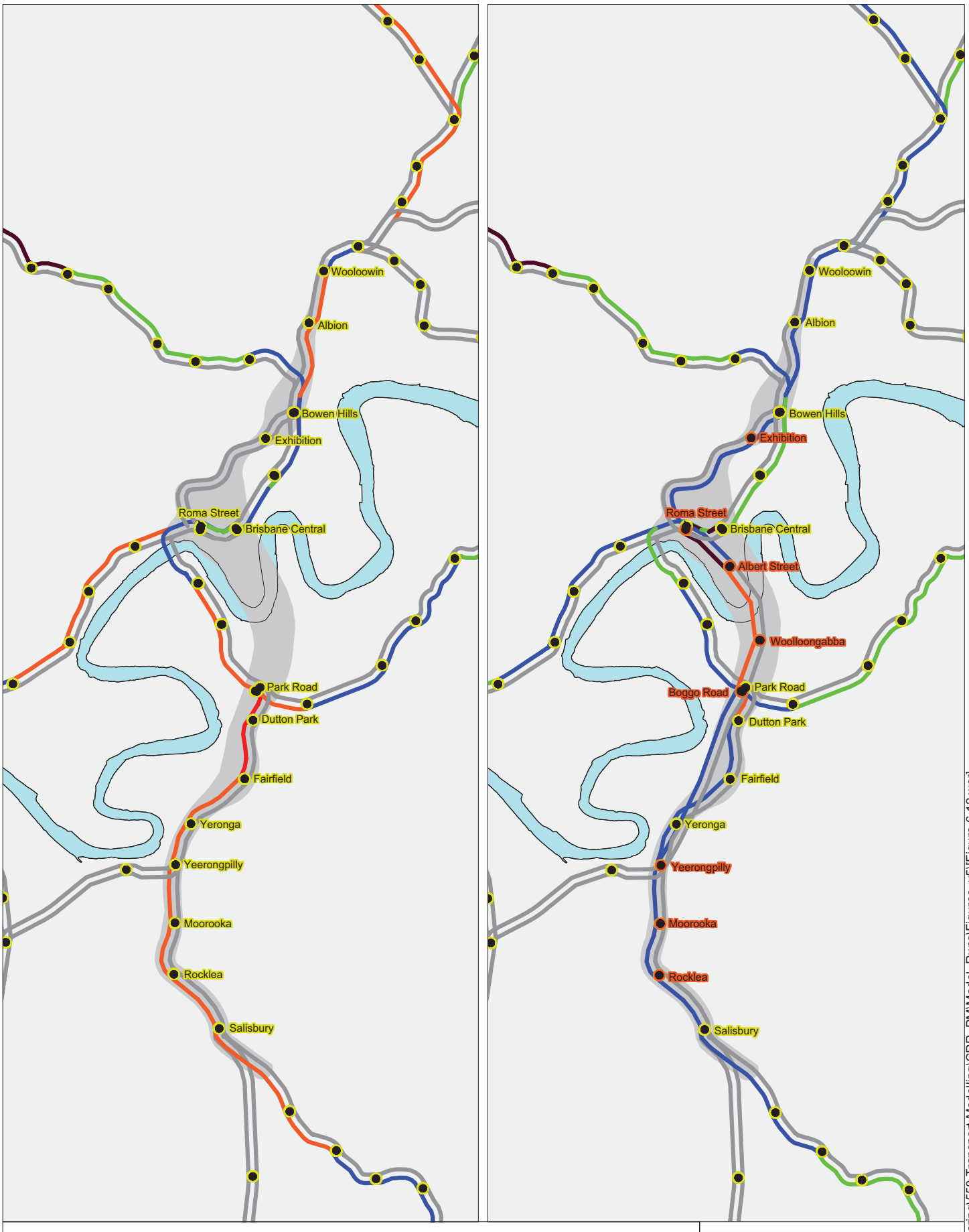
Loadings on individual services

Loadings on individual services within both 2021 and 2031 Without Project Case rail timetables were estimated by Systemwide using the Train Load Predictor (TLP) (Systemwide, December 2010).

Key findings for the 2021 With Project Case timetable (based on 2016 modelling) include:

- The Northern lines would not be over loaded although there are some standees at Caboolture (about 54 minutes from the city) on the Nambour services.
- The Western line would not be over loaded and only a few standees beyond 20 minutes.
- The Airport and Shorncliffe loadings would have no standees more than 20 minutes from the city.
- Moderate overcrowding would be expected on all Shorncliffe services between 7:30 am and 8:15 am, with standees from Boondall for much of that period.

The loadings on the Cleveland and Kuraby lines would generally good, with some standees from Wynnum Central (about 40 minutes from the city). Taken over a rolling hour standees and overcrowding would be minimal.



LEGEND

AM peak (2 hrs) seat load factor (v/c ratio)

- > 1.50
- 1.25 to 1.50
- 1.00 to 1.25
- 0.75 to 1.00
- 0.50 to 0.75
- < 0.50

Study Corridor

Railway stations

CRR railway stations

Model ID: CPM_2021_013 (without) CPM_2021_008 (with)

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-12

2021 morning peak period rail load factors with and without Cross River Rail

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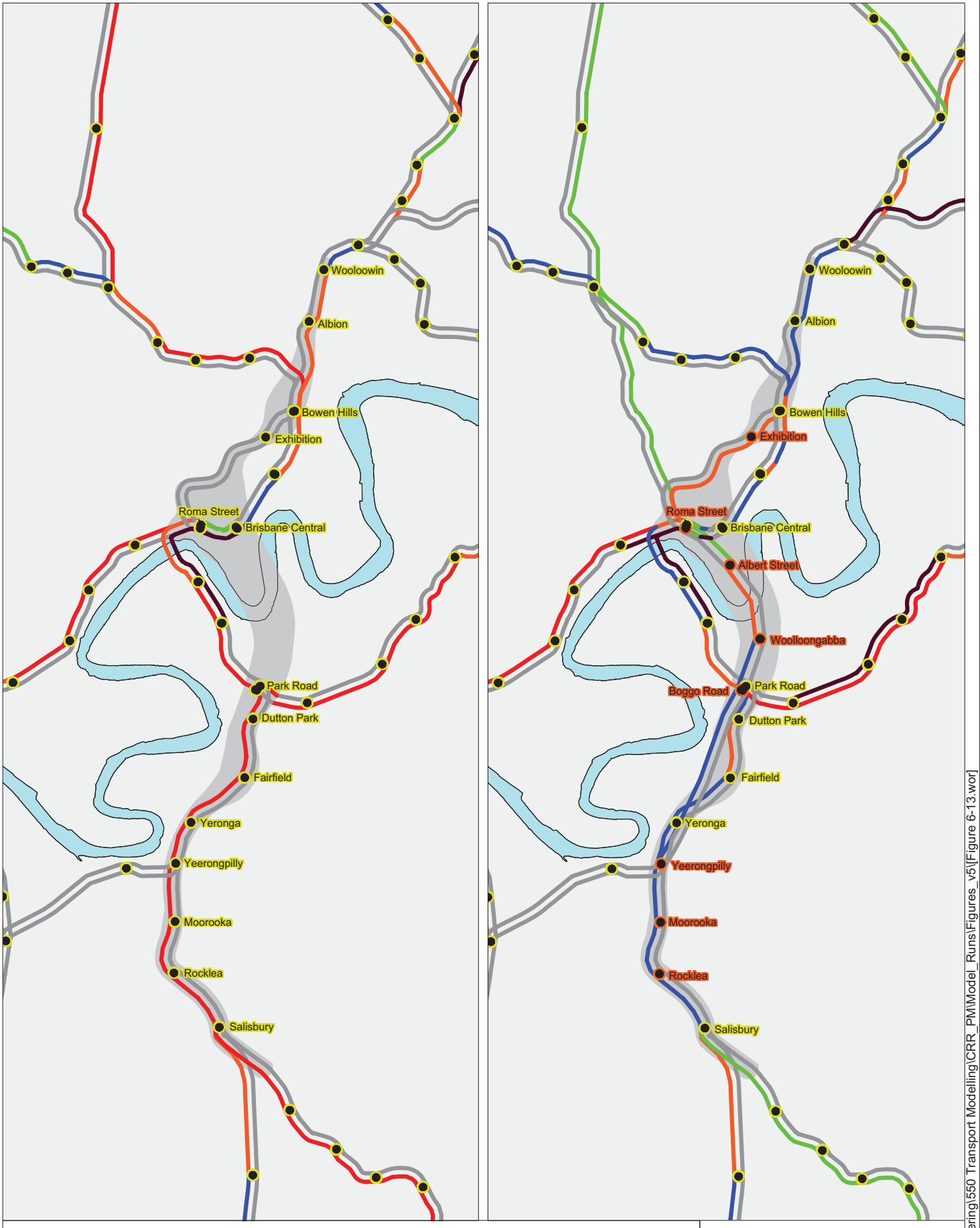
Without Cross River Rail

With Cross River Rail



LEGEND

AM peak (2 hrs) seat load factor (v/c ratio)

- > 1.50
- 1.25 to 1.50
- 1.00 to 1.25
- 0.75 to 1.00
- 0.50 to 0.75
- < 0.50

Study Corridor

Railway stations

CRR railway stations

Model ID: CPM_2031_104 (without) CPM_2031_078 (with)

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-13

2031 morning peak period rail load factors with and without Cross River Rail

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Key findings for the 2031 With Project Case timetable include:

- There would be some standees at Beerburrum and Caboolture on Nambour services, however taken over a rolling hour this would not be significant.
- There would be some standees on the Flagstone Creek services from Algester, however this would only be 24 minutes from the CBD.
- There would be a number of overloaded services on the Western corridor. However, the Western line is at capacity with 19 services in the peak hour and therefore additional services could not be added.
- The Shorncliffe line would experiences only a small amount of overcrowding. However, there would be some standees on the Shorncliffe line at North Boondall which would be about 34 minutes from the CBD.
- There would be some standees from Stafford on the North West Line which would be about 25 minutes from the city and from Mitchelton on the Ferny Grove line which would be only 26 minutes from the CBD.
- There would be some overcrowding on one Cleveland service. There would be standees from Banoon (about 33 minutes from the city) and Manly (about 43 minutes from the CBD).

Compared to the Without Project Case, significant overloading at Park Road Junction and Bowen Hills Junction during the morning peak would be eliminated as the Project allows a significant number of additional services to be added along the North-South corridor (that is the Cross River Rail tunnel and the North-West Transport Corridor).

Network boardings and alightings

Across the network there is a forecast increase in rail passenger boardings and alightings (including transfers) with Cross River Rail operational. As shown in **Figure 6-14** and **Table 6-15**, the biggest increase would be in Zone 1 boardings in 2031 which are forecast to increase by almost 30% on without Project forecasts. Zone 1 and 2 alightings would also be over 10% more than without project, whole a small reduction in zone 3 boardings and alightings (less than 5%) is forecast, potentially due to changes in operating patterns which would benefit longer distance commuters. Overall the Project is forecast to have an increase in total boardings and alightings of almost 5% in 2021 and over 8% in 2031 (compared to the without Project case in the same year).

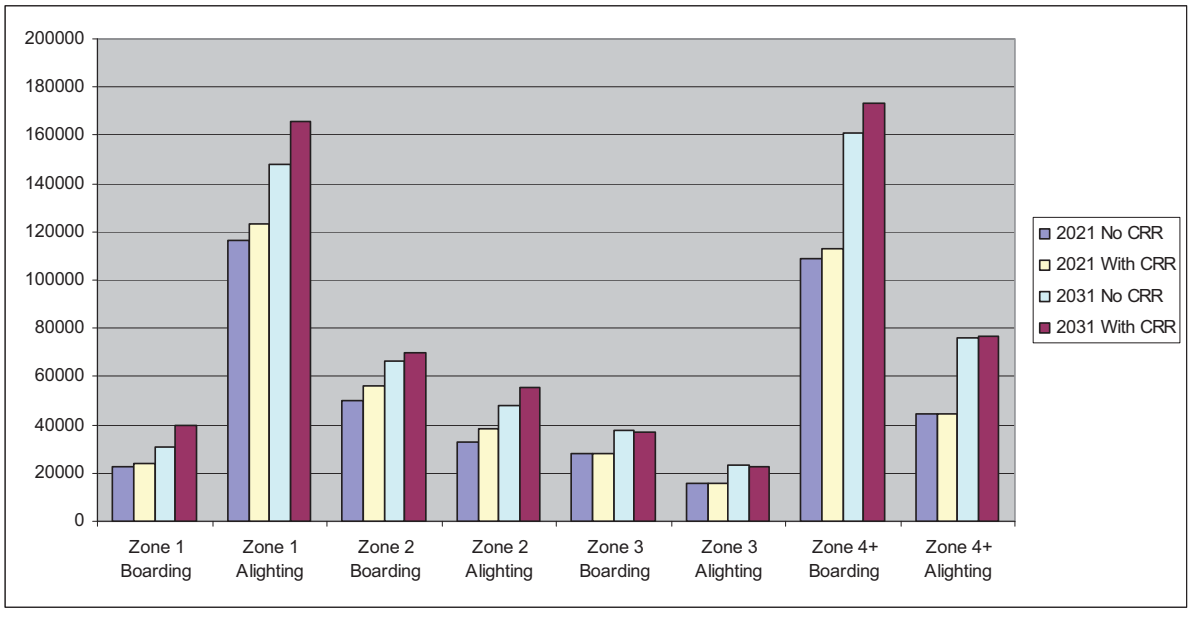


Figure 6-14 Passenger boardings and alightings morning peak 2021 and 2031 (including transfers)

Table 6-15 Network passenger boardings and alightings (including transfers) with the Project compared to without the Project (morning peak period) 2021 and 2031

TransLink Zone	2021			2031		
	Without CRR	With CRR	% change	Without CRR	With CRR	% change
Zone 1 Boarding	22,700	24,300	7.0%	31,000	39,600	27.7%
Zone 1 Alighting	116,200	123,000	5.9%	148,200	165,500	11.7%
Zone 2 Boarding	50,000	56,300	12.6%	66,200	69,800	5.4%
Zone 2 Alighting	33,200	38,300	15.4%	48,200	55,200	14.5%
Zone 3 Boarding	28,300	27,800	-1.8%	37,900	37,100	-2.1%
Zone 3 Alighting	16,000	15,600	-2.5%	23,400	22,300	-4.7%
Zone 4+ Boarding	109,100	112,900	3.5%	161,000	173,500	7.8%
Zone 4+ Alighting	44,600	44,300	-0.7%	76,300	77,000	0.9%
Total	420,100	442,500	5.3%	592,200	640,000	8.1%

Source: Cross River Rail Project Model

Changes in vehicle kilometres travelled

Table 6-16 presents forecast changes in total vehicle kilometres and public transport kilometres with and without the Project. This shows a total increase of 7% in public transport kilometres travelled in 2031 with the Project (compared to without). Car driver kilometres would reduce slightly as a result of the Project, by just under 1% in 2031. There is virtually no forecast change to commercial vehicle kilometres travelled as a result of the Project, less than one-tenth of 1%.

Table 6-16 Average weekday kilometres travelled – with and without project

Mode	2009	2021			2031		
		Without CRR	With CRR	% change	Without CRR	With CRR	% change
Public Transport Passenger Km	8,478,800	13,856,300	14,214,100	2.6%	18,507,200	19,820,200	7.1%
Car driver Km	49,930,900	67,318,400	67,025,000	-0.4%	82,829,400	82,091,500	-0.9%
Commercial vehicle Km	8,094,500	8,892,100	8,889,800	0.0%	13,975,400	13,963,300	-0.1%

Source: Cross River Rail Project Model

6.2 Changes to station activity and interchange

6.2.1 Rail to rail interchange

Forecast rail to rail interchange is presented in at **Table 6-17**. This shows virtually no change in interchange at Bowen Hills, Fortitude Valley or Central stations with and without the Project. However, Roma Street is forecast to experience significantly more rail to rail transfers in the morning peak with the Project (compared to without the Project) in both 2021 (179% more) and 2031 (267% more). Boggo Road station is also forecast to experience significantly more rail to rail transfers with the Project compared to without the Project that is 200% more in 2021 and 117% more in 2031.

Table 6-17 Rail to rail transfers with the Project compared to without the Project (morning peak period)

Station	2021			2031		
	Without CRR	With CRR	% change	Without CRR	With CRR	% change
Bowen Hills	400	400	0%	500	500	0%
Fortitude Valley	0	0	0%	0	0	0%
Brisbane Central	1,600	1,600	0%	2,900	2,900	0%
Roma Street	1,900	5,300	179%	3,000	11,000	267%
Boggo Road	400	1,200	200%	600	1,300	117%

Source: Cross River Rail Project Model

For each station within the study corridor, changes to rail passenger boardings and alightings and mode of access to rail stations are reported.

6.2.2 Rail station performance with the Project – North

Wooloowin

Table 6-18 illustrates that at Wooloowin station there are forecast to be a moderate change in overall rail passenger boardings and alightings in the morning peak in 2016 (+47%), but a reduction in 2031 (-38%) compared to the Without Project Case. This would be due to wider network operational changes assumed to be in place in 2031 to support the introduction of Cross River Rail including the southward extension of the North-West Transport Corridor in tunnel from Alderley to Roma Street. This would result in a reduction in rail service frequency through Wooloowin station from up to 31 inbound trains per hour in 2031 without the Project to 19 trains per hour inbound with the Project.

There are anticipated to be major reductions in rail to rail transfers at Wooloowin with Cross River Rail compared to without the Project, principally due to a reduction in the number of different train services calling at the station. There is forecast to be virtually no change to the number of walk/cycle and car based access to the station.

Table 6-18 Wooloowin – forecast number of passengers and mode of access (morning peak period) without and with the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	500	500	800	48%	1200	1200	1%
Rail	<50	<50	100	268%	1000	100	-93%
Bus	<50	0	<50	0%	<50	<50	-72%
Car	200	100	200	21%	200	200	5%
Total	600	700	1000	47%	2400	1500	-38%

Source: Cross River Rail Project Model

The adequacy of the pedestrian infrastructure at Wooloowin with the Project being implemented has been assessed to determine if the infrastructure could adequately cater for the forecast increase in passenger demand. A minimum pedestrian level of service D (based on Fruin's definition of pedestrian level of service) would be achieved at the station. The station capacity analysis for 2031, shown in **Table 6-19**, shows that the minimum width requirements to achieve the required level of service of D are 1.0 metres and 1.1 metres for walkways and stairs respectively. This confirms that the existing infrastructure is adequate to cater for the increased passenger activity in 2031.

As the stairs and walkways are the critical components of pedestrian infrastructure at suburban stations it assumed that the pedestrian level of service on the platforms would also be adequate (ie level of service of D or better).

Table 6-19 Minimum width requirement for level of service D at Wooloowin in 2031 (morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	**With CRR**	**Without CRR**	**With CRR**
1.2	1.0	1.4	1.1

Albion

At Albion there is a small change forecast in overall boardings and alightings in the morning peak in 2016 (+7%), but a reduction in 2031 (-24%) compared to the Without Project Case (refer to **Table 6-20)**. This is due to wider network operational changes assumed to be in place in 2031 to support the introduction of Cross River Rail including the southward extension of the North-West Transport Corridor in tunnel from Alderley to Roma Street. This means a reduction in rail service frequency through Albion station from up to 31 inbound trains per hour in 2031 without project to 19 trains per hour inbound with the project.

There are anticipated to be major reductions in rail to rail transfers at Albion with Cross River Rail compared to without the Project, principally due to a reduction in the number of different train services calling at the station, however minimal change to walk/cycle and bus/ car based access to the station.

Table 6-20 Albion – forecast number of passengers and mode of access (morning peak period) without and with the Project

AM peak	2009	2021			2031		
Mode		**Without CRR**	**With CRR**	**% Change**	**Without CRR**	**With CRR**	**% Change**
Walk/cycle	1000	1700	1900	12%	2800	2700	-4%
Rail	<50	100	<50	-98%	900	<50	-99%
Bus	0	0	<50	0%	<50	<50	-74%
Car	400	300	400	30%	400	500	6%
Total	1300	2200	2400	7%	4200	3200	-24%

Source: Cross River Rail Project Model

A station capacity analysis at Albion station shows that in 2021, the introduction of Cross River Rail would not have an impact on the level of pedestrian service. In 2031, the reduction of passengers due to Cross River Rail would improve the level of service at the station. This is shown in **Table 6-21** where the minimum width to achieve an adequate level of service D or better has been reduced.

Table 6-21 Minimum width requirement for level of service D at Albion in 2031 (morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	**With CRR**	**Without CRR**	**With CRR**
1.6	1.4	2.0	1.7

Bowen Hills

At Bowen Hills there is a small forecast change in overall rail passenger boardings and alightings in the morning peak in 2021 (-9%), and 2031 (+3%) (refer to **Table 6-22)**. This is due to wider network operational changes assumed to be in place in 2031 to support the introduction of Cross River Rail including the southward extension of the North-West Transport Corridor in tunnel from Alderley to Roma Street, bypassing Bowen Hills. This means a reduction in rail service frequency through Bowen Hills station from up to 42 inbound trains per hour in 2031 without the Project to 32 trains per hour inbound with the Project.

There is forecast to be an increase in rail to rail transfers at Bowen Hills with Cross River Rail compared to without the Project case in 2031 (around 60% more) principally due to changes in stopping patterns which would require more people to change between express and all stops trains at Bowen Hills. There is forecast to be minimal change in station walk/ cycle access to the station access, while bus access would reduce in 2031 with the Project, compared to without Project (-71%) potentially due to some passengers preferring to transfer to Cross River Rail services at Exhibition station.

Table 6-22 Bowen Hills – forecast passengers and mode of access (morning peak period) without and with the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	2,800	5,700	5,200	-8%	5,800	6,000	3%
Rail	600	800	600	-23%	1,000	1,600	59%
Bus	100	100	100	1%	700	200	-72%
Car	100	100	100	3%	100	100	0%
Total	3,600	6,700	6,100	-9%	7,600	7,900	3%

Source: Cross River Rail Project Model

Ekka

This is a proposed new Cross River Rail station and hence there are no “average” weekday conditions to compare with and without Project case performance. Nevertheless, the Ekka station is forecast to cater for over 3,100 passengers boardings and alightings in the morning peak in 2021, virtually all of whom are forecast to arrive or depart on foot. By 2031, with the Project, passenger numbers have been forecast to reduce to around 1,700 in the morning peak, principally due to assumed reductions in service frequency due to the opening of the southward extension of the North-West Transport Corridor in tunnel from Alderley to Roma Street, bypassing Ekka station (refer to **Table 6-23)**. As such services frequencies through Ekka station drop from 19 inbound trains per hour in the morning peak in 2021 to only six trains per hour by 2031. There is no forecast rail or bus access or egress at Exhibition station in the morning peak. Some car based access (around 6% of boardings/ alightings) is forecast in both 2021 and 2031.

Table 6-23 Ekka station - forecast passengers and mode of access (morning peak period) without and with the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	0	0	2,900	N/A	0	1,600	N/A
Rail	0	0	0	N/A	0	0	N/A
Bus	0	0	0	N/A	0	0	N/A
Car	0	0	200	N/A	0	100	N/A
Total	0	0	3,100	N/A	0	1,700	N/A

Source: Cross River Rail Project Model

A station capacity analysis at of Ekka station with the Project shows that in 2021 and 2031, the station design for Cross River Rail would provide adequate widths at the walkways and stairs to perform better than a level of service D (refer to **Table 6-24)**.

Table 6-24 Minimum width requirement for level of service D at Exhibition in 2031 (morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	**With CRR**	**Without** CRR	**With CRR**
-	1.0	-	1.2

6.2.3 Future rail station performance with the Project – Central

Forecast rail passenger boardings and alightings for each rail station in the central part of the study corridor for the Project case in the future years are reported below along with a breakdown in access modes to each station. An analysis of station performance in terms of the forecast pedestrian level of service on platforms and other station pedestrian infrastructure such as stairs, escalators, walkways and platforms is provided for each station in the central part of the study corridor.

Central Station

Overall station activity at Central Station is forecast to be lower in the morning peak with Cross River Rail than without as illustrated in **Table 6-25**. In 2021, passenger numbers are 35% less and in 2031, 16% less, as Cross River Rail train services would serve Roma Street and Albert Street stations in the CBD and not Central station. There is also a forecast reduction in rail to rail and rail to bus transfers at Central Station in 2021 however an increase in bus to rail transfers is forecast in 2031 with the Project. This is indicative of more interchange in general occurring in 2031 with the Project due to the splitting of services between different CBD stations. By far the greatest number of passengers would continue to walk to and from Central Station.

Table 6-25 Central Station – forecast passengers and mode of access (morning peak period) without and with the Project

AM peak	2009	2021			2031		
Mode		**Without CRR**	**With CRR**	**% Change**	**Without CRR**	**With CRR**	**% Change**
Walk/cycle	28,100	43,200	27,900	-35%	42,900	34,500	-19%
Rail	4,400	3,200	2,200	-30%	5,800	5,600	-4%
Bus	1,900	800	400	-49%	600	1,400	132%
Car	0	100	0	-100%	100	100	-1%
Total	34,500	47,300	30,500	-35%	49,300	41,600	-16%

Source: Cross River Rail Project Model

Central Station has a nominal capacity of 43,000 boardings and alightings during a 2 hour period. An assessment of the adequacy of the pedestrian infrastructure at Central Station in 2031 with the Project operational has been carried out using the ClicSim pedestrian simulation software. The modelled internal origin-destination (OD) matrix of passenger demand within Central Station during the morning peak project case is shown in **Table 6-26**. By 2021, passenger activity at Central Station (without Cross River Rail) is forecast to be over capacity in the AM peak, however with the Project, the station is expected to be able to comfortably accommodate the reduced demands, with around 30,000 boardings and alightings. By 2031, passenger activity at Central Station (without Cross River Rail) would be well beyond its comfortable capacity with around 50,000 passenger movements. However with Cross River Rail, the station would need to accommodate around 42,000 passengers. With Cross River Rail stations at Roma Street and Albert Street providing a higher level of direct access to large parts of the CBD, some of the CBD based passenger demand is able to transfer to these other stations.

Table 6-26 Central station morning peak 2031 matrix (With Project case)

Destination / Origin	Central Station Entrance	Platform 1	Platform 2	Platform 3	Platform 4	Platform 5	Platform 6	Total
Platform 1	2,512	540	225	0	0	441	0	3,718
Platform 2	2,214	420	474	0	0	427	0	3,535
Platform 3	3,733	0	0	192	114	121	475	4,635
Platform 4	2,449	0	0	157	190	93	943	3,832
Platform 5	9,292	354	405	0	0	1,307	0	11,358
Platform 6	13,407	7	7	570	586	0	1,705	16,282
Central Station Entrance	0	257	326	234	186	993	1,035	3,031
Total	33,607	1,578	1,437	1,153	1,076	3,382	4,158	46,391

The reduction in overall passenger movements at the station with the Project is forecast to improve the station's performance compared to the without Project case. This is illustrated in **Figure 6-15**. The exceptionally large flows on Platforms 5 and 6 cause prolonged congestion on these platforms as well as the escalators and stairs linking to the concourse (LOS E and F). Platforms 3 and 4 are also expected to be congested during the busiest part of the morning peak.

The analysis illustrates that the Project provides essential congestion relief to Central Station, which is at the upper limits of its capacity in 2031. Without the Project, major concerns over the ability of Central Station to cope with projected passenger demands, would mean significant constraints on rail's ability to provide access to the CBD. As such, by 2031, significant improvements would be required to Central Station to meet increased passenger demand, without the Project.

Roma Street

Table 6-27 presents the forecast number of passenger at Roma Street station. There is a forecast major increase in overall passenger boardings and alightings in the morning peak in 2021 (+83%), and 2031 (+74%) with the Project such that over 46,000 rail passenger would use the station in 2031 with the Project during the two hour morning peak period . This is due to wider network operational changes assumed to be in place in 2031 to support the introduction of Cross River Rail with Roma Street becoming a key regional multi-modal hub and the principal CBD station being served by both Cross River Rail services and legacy surface rail services.

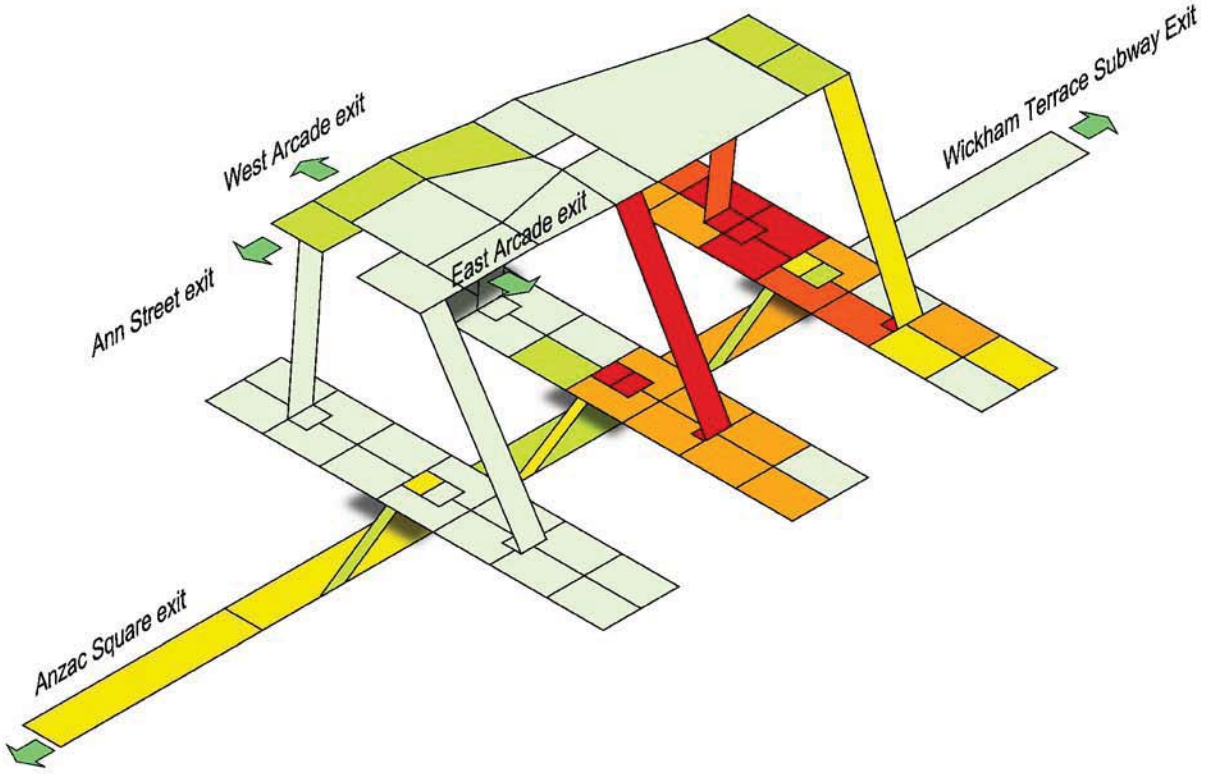
Increased passenger activity is forecast for all access modes in both 2021 and 2031 with the biggest change forecast to occur in rail to rail transfers which would increase by 129% to 2021 and 242% to 2031. Bus access and interchange is also significantly more, particularly in 2031, where double the number of transfers are forecast compared to without the Project.

Table 6-27 Roma Street – forecast passengers and mode of access (morning peak period) without and with the Project

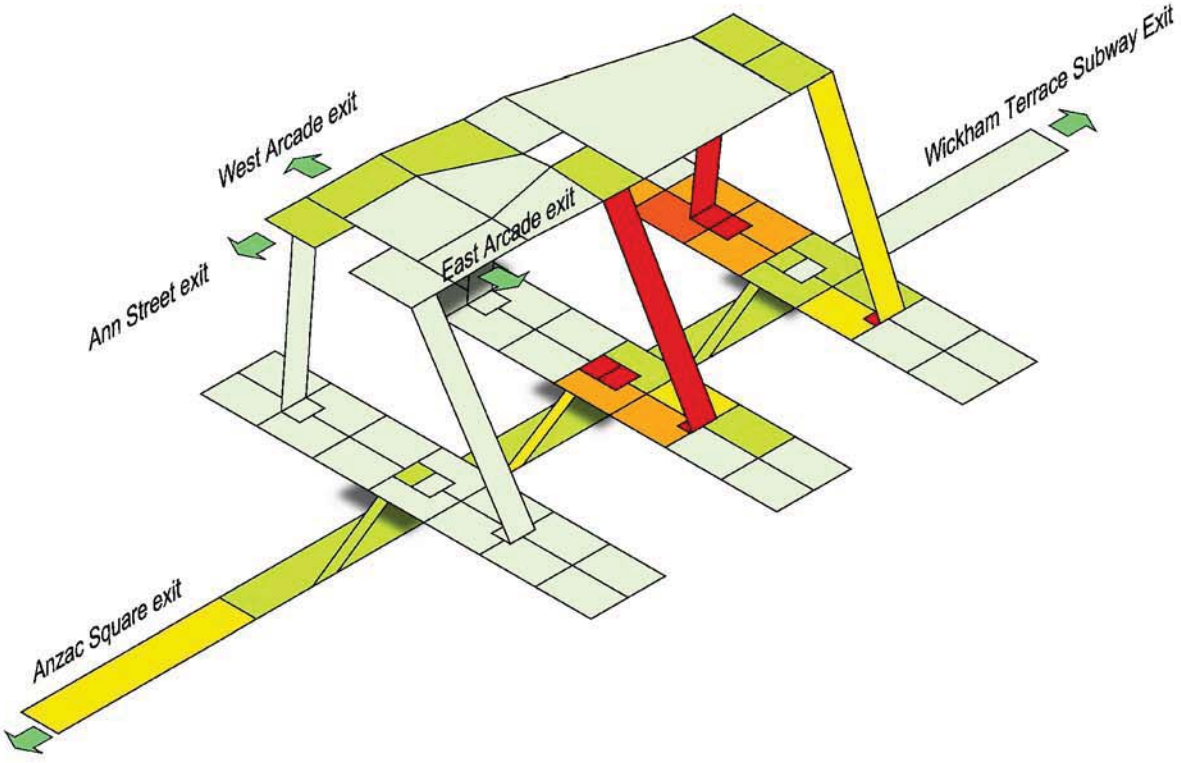
AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	5,900	10,000	17,100	71%	18,500	21,600	17%
Rail	1,800	3,800	8,700	129%	6,000	20,500	242%
Bus	1,600	1,400	2,200	57%	2,100	4,200	100%
Car	0	0	0	0%	0	0	0%
Total	9,300	15,300	28,000	83%	26,700	46,400	74%

Source: Cross River Rail Project Model

Pedestrian Levels of Service
Without Cross River Rail



Pedestrian Levels of Service
With Cross River Rail



Legend
- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-15

Central Station
Pedestrian Levels of Service
2031 Morning Peak Period
Busiest 15 minutes

CrossRiverRail

SKM aurecon
CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G089_CCR_Trans_Ped_LOS_Central_Sta_A4_TR_ver93.mxd 06/07/2011 15:25

An assessment of the adequacy of the pedestrian infrastructure at Roma Street station in 2031 with the Project operational has been carried out using the ClicSim pedestrian simulation software. The modelled internal origin-destination (OD) matrix of passenger demand within Roma Street Station during the morning peak project case is shown in **Table 6-28**.

Table 6-28 Roma Street morning peak 2031 matrix (project case)

Destination **Origin**	t Station Entrances	Platform 5	Platform 6	Platform 7	Platform 8	Platform 9	Platform 11	Platform 12	Total
Platform 5	894	0	0	0	2	0	3	167	1,066
Platform 6	1,472	0	0	24	312	91	27	0	1,926
Platform 7	1,206	0	0	0	480	25	21	23	1,755
Platform 8	1,729	66	0	0	61	0	35	337	2,228
Platform 9	3,715	901	19	83	70	115	563	3,065	8,531
Platform 11	7,099	0	28	107	1,309	198	413	0	9,154
Platform 12	7,584	218	179	352	2,064	447	133	264	11,241
Station Entrances	0	181	37	87	245	136	276	939	1,901
Total	23,699	1,366	263	653	4,543	1,012	1,471	4,795	37,802

Source: Cross River Rail Project Model

The forecast large increases in transfer volumes is expected to place additional pressure on connections to the existing platforms at Roma Street, especially the stairs and escalators linking the subway to the platforms.

Modelled average levels of pedestrian service at Roma Street during the morning peak are shown in **Figure 6-16** for the with Project case and the without Project case is reproduced for comparison purposes.

The model suggests that the proposed design of the new underground section of Roma Street Station would provide sufficient capacity to accommodate forecast pedestrian movements (with a level of service C or above for all walkable areas within the station).

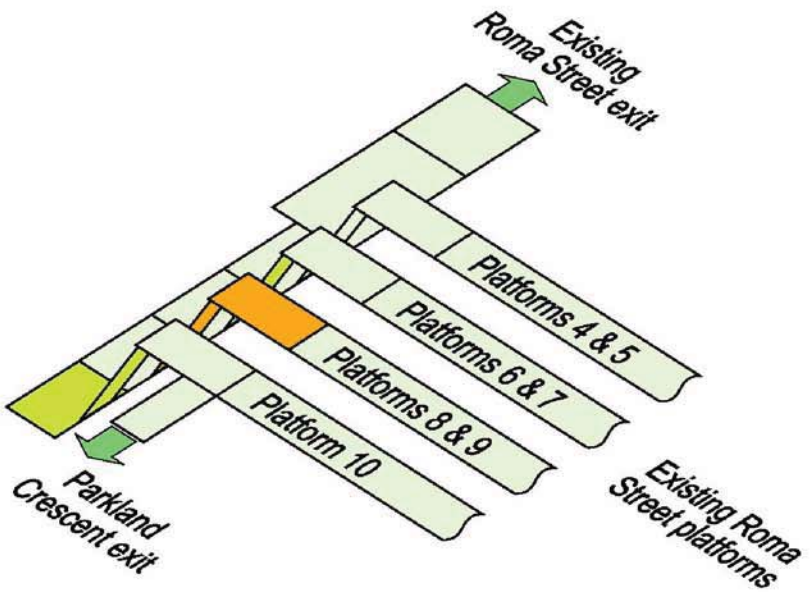
The most significant flows would occur in the northern part of the station (principally the escalators linking the mezzanine with the existing Roma Street subway). This would be due to the large forecast of interchanging passengers (approximately 10,000 interchanges from 7.00 am to 9.00 am between the surface and underground platforms. The modelled congestion levels are within acceptable bounds.

Albert Street Station

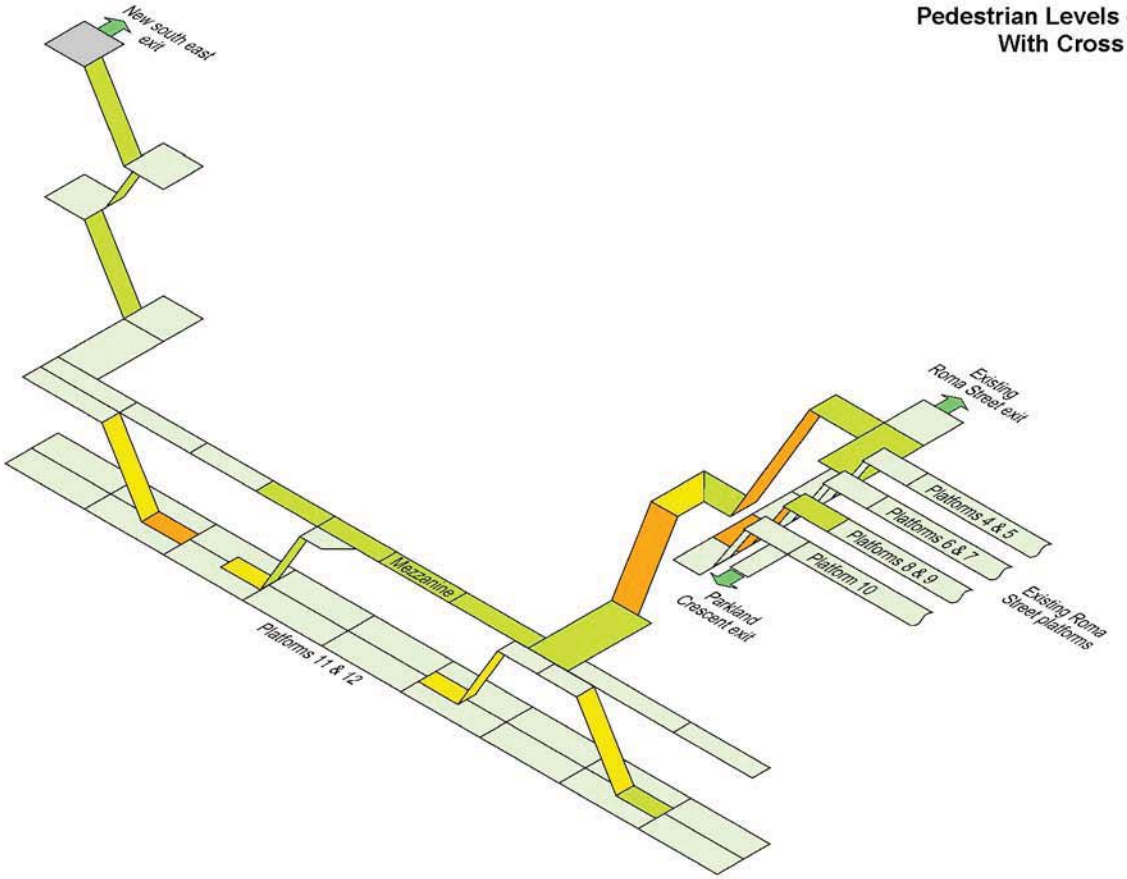
Albert Street is a proposed new Cross River Rail underground station and its forecast passenger activity in the morning peak period is shown in **Table 6-29**. The station is forecast to cater for over 37,000 rail passenger boardings and alightings in the morning peak in 2031, virtually all of which are forecast to arrive/ depart on foot. Albert Street would be the busiest Cross River Rail station (excluding transfers) and the third busiest in the network after Central and Roma Street in terms of overall boardings and alightings.

There would be negligible bus to rail transfer forecast at this station and no access by car.

Pedestrian Levels of Service
Without Cross River Rail



Pedestrian Levels of Service
With Cross River Rail



Legend
- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-16

Roma Street Station
Pedestrian Levels of Service
2031 Morning Peak Period
Busiest 15 minutes

CrossRiverRail

SKM aurecon
CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G088_CCR_Trans_Ped_LOS_Roma_St_Sta_A4_TR_ver93.mxd 06/07/2011 15:27

Table 6-29 Albert Street – forecast passengers and mode of access (morning peak period) with the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	n/a	n/a	27,000	n/a	n/a	37,100	n/a
Rail	n/a	n/a	0	n/a	n/a	0	n/a
Bus	n/a	n/a	200	n/a	n/a	200	n/a
Car	n/a	n/a	0	n/a	n/a	0	n/a
Total	n/a	n/a	27,200	n/a	n/a	37,300	n/a

Source: Cross River Rail Project Model

An assessment of the adequacy of the proposed pedestrian infrastructure at Albert Street station in 2031 with the Project operational has been carried out using the ClicSim pedestrian simulation software. The modelled internal origin-destination (OD) matrix of passenger demand within Albert Street Station during the morning peak project case is shown in **Table 6-30**.

Table 6-30 Albert Street morning peak 2031 matrix

Destination Origin	Station Entrances	Platform 1	Platform 2	Total
Platform 1	21,400	0	0	21,400
Platform 2	15,500	0	0	15,500
Station Entrances	0	600	800	1,300
Total	36,900	600	800	38,300

Source: Cross River Rail Project Model

Modelled average levels of service at Albert Street during the morning peak project scenario are shown in **Figure 6-17**.

The pedestrian modelling suggests that the proposed design of Albert Street station would generally provide sufficient capacity to accommodate forecast movements in the 2031 morning peak. The most significant passenger flows would occur in the northern part of the station, corresponding to the heavier use of the northern exit. The morning peak model suggests that there could be intermittent congestion on and around the northern escalators. During the busiest 15 minutes, the northern escalators and landings may reach level of service E. This result is based on the assumption that 58% of entering passengers and 66% of exiting passengers would use the northern exit in the morning peak (These proportions were derived from an analysis of proposed land use and employment in the vicinity of the station). If passenger flows were more evenly spread between northern and southern exits, then conditions will be less congested on the northern escalators.

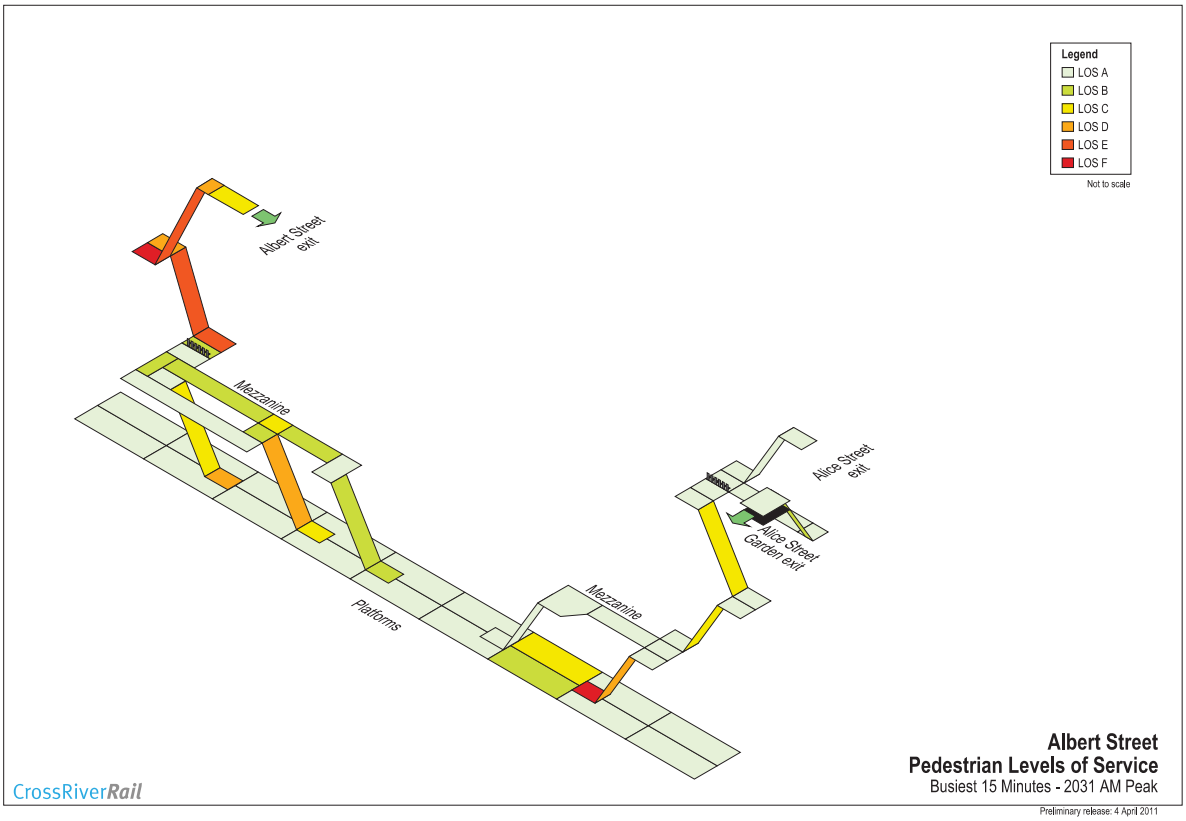


Figure 6-17 Albert Street pedestrian level of service (2031 morning peak)

Gabba Station

Gabba is a proposed new underground Cross River Rail station. The forecast rail passenger activity is shown in **Table 6-31**. The station is forecast to cater for around 6,000 passenger boardings and alightings in the morning peak in 2021, and almost 11,000 by 2031.

Gabba would be a major bus rail interchange with almost 40% of station boardings and alightings involving a bus transfer in 2021 and over 30% in 2031. By 2031, the further development of the surrounding high density mixed use precinct would see an increase in both the absolute number and the proportion of boardings and alightings by foot.

There would be little access to Gabba Station forecast by car.

Table 6-31 Gabba Station - forecast passengers and mode of access (morning peak period) with the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	n/a	n/a	3,600	n/a	n/a	7,400	n/a
Rail	n/a	n/a	0	n/a	n/a	0	n/a
Bus	n/a	n/a	2,200	n/a	n/a	3,300	n/a
Car	n/a	n/a	200	n/a	n/a	200	n/a
Total	n/a	n/a	6,000	n/a	n/a	10,900	n/a

Source: Cross River Rail Project Model

An assessment of the adequacy of the proposed pedestrian infrastructure at Gabba Station in 2031 with the Project operational has been carried out using the ClicSim pedestrian simulation software. The modelled internal origin-destination (OD) matrix of passenger demand within Gabba Station during the morning peak is shown in **Table 6-32**.

Table 6-32 Gabba morning peak 2031 matrix

Destination Origin	Station Entrances	Platform 1	Platform 2	Total
Platform 1	2,400	4	0	2,400
Platform 2	3,300	0	60	3,400
Station Entrances	0	5,100	200	5,300
Total	5,700	5,100	260	11,100

Source: Cross River Rail Project Model

Modelled average levels of service at Gabba during the morning peak for the with Project case are shown in **Figure 6-18**. The pedestrian modelling analysis suggests that the proposed Gabba Station design provides ample capacity for passenger demand during the 2031 morning commuter peak. All parts of the station would operate well within capacity across the morning peak.

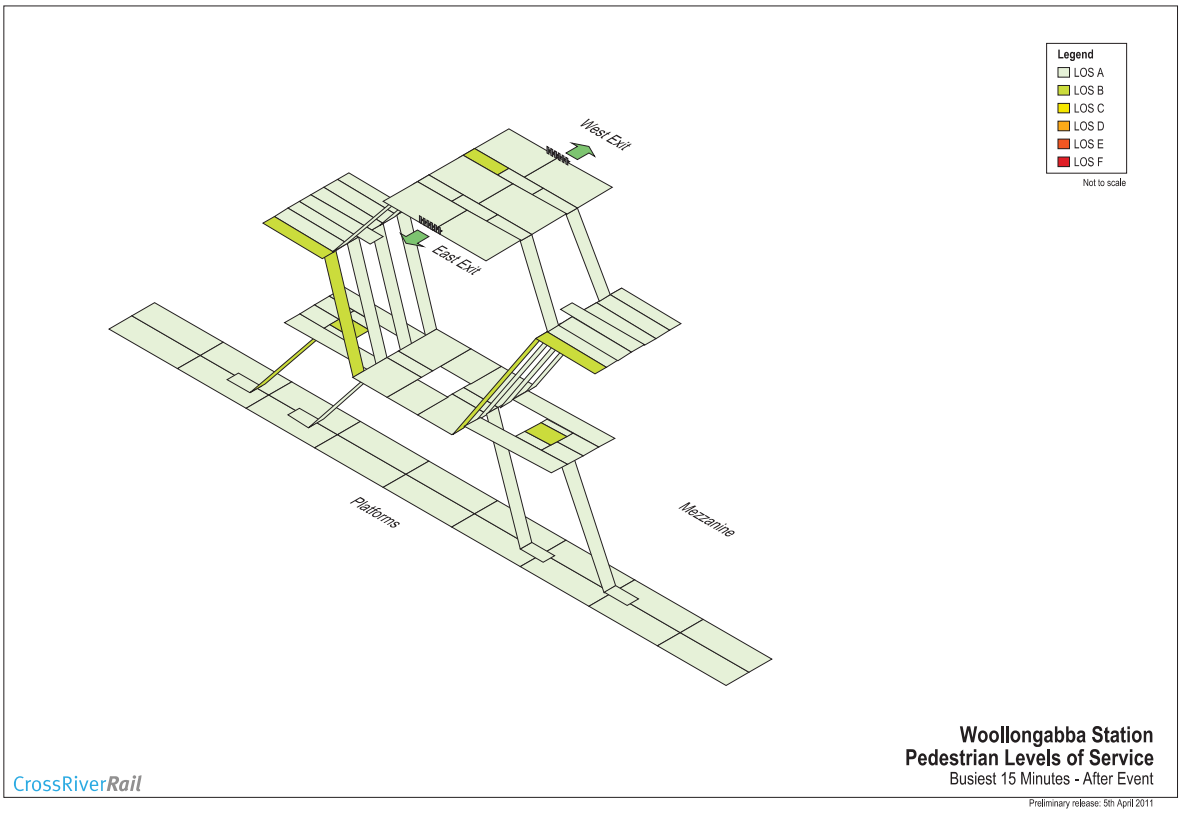


Figure 6-18 Gabba pedestrian level of service (2031 morning peak)

Maximum pedestrian activity would occur at this station after events at the nearby Brisbane Cricket Ground that has a capacity of 42,000 attendees. The following section assesses the potential performance of the Gabba Station design under event conditions. It is acknowledged that pedestrian congestion is unavoidable during special events – particularly in the post-event period – so the emphasis should be on providing infrastructure that will promote safe and efficient pedestrian throughput. The key assumptions for this assessment are:

- crowd intensities are highest in the period immediately following an event
- all escalators would operate in the peak flow direction, except for a single escalator at each end of the station which would operate in the reverse direction
- forecast mode shares for spectators at a capacity crowd of 42,000 at the Gabba are shown in **Table 6-33**
- an even distribution of pedestrians assumed between the eastern and western entrances to the station
- post-event trains were assumed to operate with a constant headway of five minutes in the north and south directions.

Table 6-33 Forecast mode shares of Gabba Stadium post-event spectators

Mode	Number of Passengers	Crowd Percentage
Rail (Northbound)	16,900	69%
Rail (Southbound)	11,900	
Bus	4,800	11%
Other transport (walking, private vehicle)	8,400	20%

Modelled passenger levels of service for the Gabba event scenario are shown in **Figure 6-19** for the busiest 15-minute interval in the post-event period.

The modelling suggests that crowding would be heaviest on the landings where passengers queue for escalators (LOS F). The escalators would be fully-utilised (LOS E) during most of the post-event period. Pedestrian movements would be highly constrained with significant queuing during the busiest times.

Platforms would operate at capacity during most of the post-event period with five-minute train headways. The model assumed a maximum pedestrian density of 2.5 pedestrians per square metre which corresponds to LOS D. Pedestrian management and safety measures would need to be in place to prevent overcrowding of the platforms.

Assuming that six escalators would be available in the peak flow direction, the theoretical maximum vertical throughput at the station is estimated to be about 36,000 pedestrians per hour. With an event rail demand of about 29,000 pedestrians, the vertical circulation could theoretically accommodate a worst-case event loading in under an hour.

The most significant capacity constraint is likely to be the number of trains able to be loaded in the post-event hour. In the analysis reported here, a five minute train headway was assumed. With an estimated maximum train load of 1,300 passengers on a nine car train, this would allow for a throughput of 15,600 passengers per hour on each platform. With a northbound passenger demand of 17,000 pedestrians, a worst-case event loading could theoretically be handled in about 65 to 70 minutes.

Overall, the analysis concludes that the station would require event crowd management to ensure escalators and platforms do not become overloaded and that passenger volumes are regulated before the gate line at ground level.

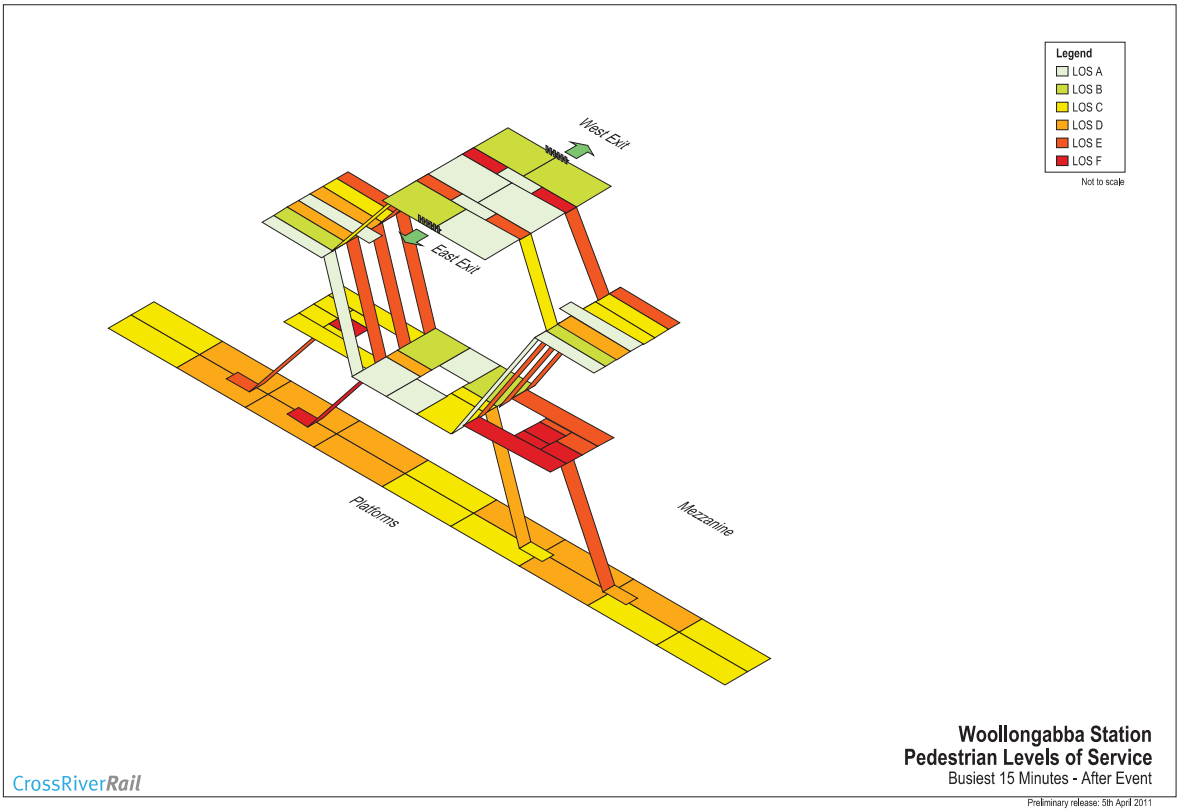


Figure 6-19 Gabba Station event scenario - pedestrian level of service (busiest 15 minutes after a Gabba event)

Boggo Road

A new Cross River Rail underground station is proposed at Boggo Road that would be integrated with the current rail and bus station. The forecast passenger activity is shown in **Table 6-34**. There is a forecast major increase in overall boardings and alightings in the morning peak in 2021 (+65%), and 2031 (+64%) with the project. This would be due to this station becoming a strategic rail hub in the south west of Brisbane and would be served by Cross River Rail services and surface rail services from Kuraby and Cleveland.

Increases would be experienced for all access modes in both 2021 and 2031 with the biggest change occurring in bus-rail transfers in 2031, which are forecast to be 180% higher with the Project than without the Project by 2031. Rail interchange would be more than 60% higher in 2031 with the Project, than without the Project. Increases in walk access to the station are forecast to be minor in both 2021 (+4%) and 2031 (+5%).

There is minimal access to the station by car forecast with or without project.

Table 6-34 Boggo Road station – forecast passengers and mode of access (morning peak period) with the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	600	1,300	1,300	4%	2,500	2,700	5%
Rail	400	800	2,000	157%	1,200	2,000	63%
Bus	200	1,700	2,800	70%	1,300	3,700	181%
Car	100	100	100	32%	100	100	24%
Total	1,200	3,800	6,300	65%	5,100	8,400	64%

Source: Cross River Rail Project Model

The adequacy of the proposed pedestrian infrastructure at Boggo Road Station was assessed using the ClicSim pedestrian simulation software. The modelled internal origin-destination (OD) matrix of passenger demand within the Cross River Rail Boggo Road Station during the morning peak is shown in **Table 6-35**.

Table 6-35 Boggo Road morning peak 2031 matrix (With Project case)

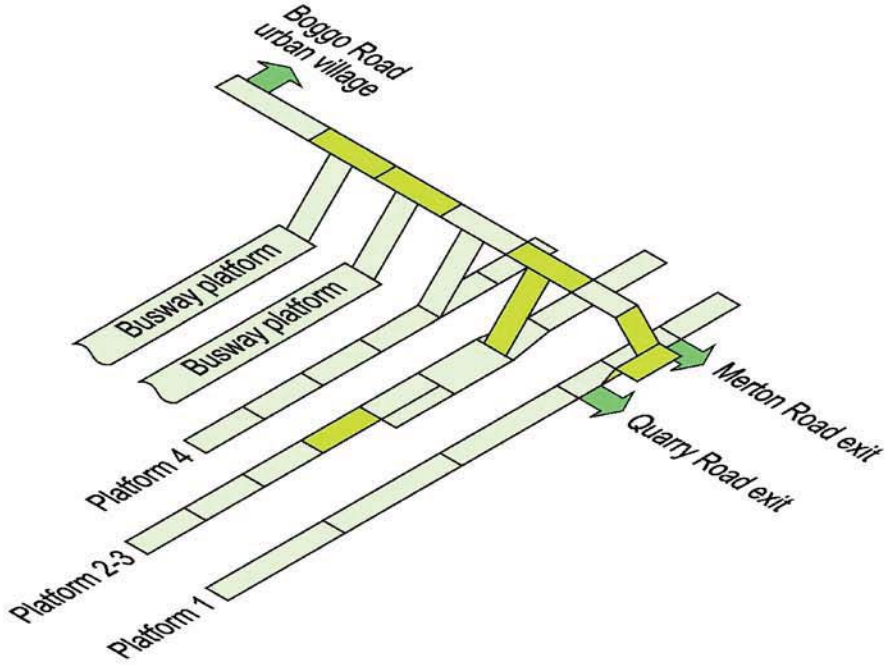
Destination / Origin	Park Road Station Entrance	Platform 1	Platform 2	Platform 3	Platform 7	Platform 8	Total
Platform 1	400	10	0	0	10	50	500
Platform 2	600	20	0	0	500	100	1,200
Platform 3	100	100	30	0	100	10	300
Platform 7	900	200	500	200	100	0	1,800
Platform 8	1,800	100	10	10	0	30	1,800
Park Road Station Entrance	0	200	300	260	1,200	200	2,200
Total	3,800	600	800	500	1,900	400	8,100

Source: Cross River Rail Project Model

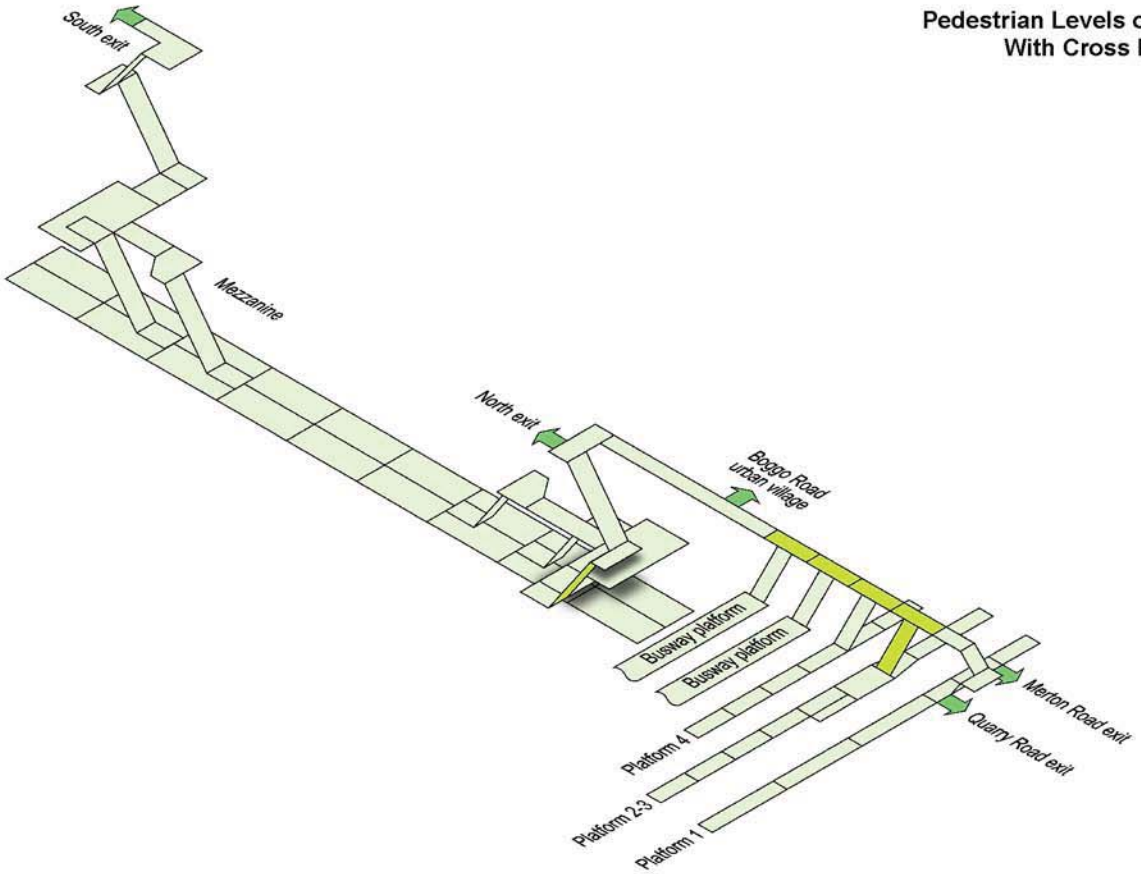
Modelled average levels of service at Boggo Road during the morning peak project scenario are shown in **Figure 6-20**. The pedestrian modelling analysis suggests that the proposed design for the underground platforms and vertical circulation elements at Boggo Road provide ample capacity for forecast 2031 morning peak conditions. (Note that the final reference design for Boggo Road station incorporates an increased walk area on the mezzanine level, a reduced platform width of 2.0m and the two escalators centred on the platform have been replaced with stairs. These design changes are not critical to the performance of the station and would not result in levels of pedestrian service that are not acceptable.)

However, the Project is forecast to increase pedestrian flows on the existing pedestrian bridge connecting the platforms. The results indicate that while the bridge is expected to be mostly uncongested (average LOS A), the bridge does reach LOS D for short periods during the busiest part of the peak. This is due to additional interchange passengers using the existing footbridge (1741 rail passengers are modelled to transfer between the Cross River Rail platforms and the existing Park Road Station during the morning peak two-hour period.

Pedestrian Levels of Service
Without Cross River Rail



Pedestrian Levels of Service
With Cross River Rail



Legend
- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F

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Figure 6-20

Boggo Road / Park Road Station
Pedestrian Levels of Service
2031 Morning Peak Period
Busiest 15 minutes

CrossRiverRail

SKM aurecon
CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G090_CCR_Trans_Ped_LOS_Park_Rd_Sta_A4_TR_ver93.mxd 06/07/2011 15:28

6.2.4 Future rail station performance with the Project – South

Forecast rail passenger boardings and alightings for each station in the southern part of the study corridor across future years for the With Project Case are reported below along with a breakdown in forecast access modes to each station.

An analysis of the station performance in terms of forecast pedestrian level of service on the key components on the pedestrian infrastructure such as stairs and walkways is also provided for each of the suburban stations in the southern part of the study corridor.

Dutton Park

In 2021 there is a small increase (+12%) in overall station activity with the project compared to without (refer to **Table 6-36)**. This is likely due to a minor increase in rail service frequencies through Dutton Park (from 4 to 6 trains per hour inbound). In 2031, there would be more significant changes proposed in train service frequency with only three to four trains per hour without project, but 13 trains per hour with project. As such, patronage would be much higher (+103%) in 2031 with the Project than without, with the majority of that increase coming from walk trips (an additional 300 trips) and some additional car based trips (an additional 58 trips). There would be virtually no rail or bus interchange happening at this station with or without the Project in any future year.

Table 6-36 Dutton Park – forecast number of passengers and mode of access (morning peak period) with and without the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	400	300	400	42%	300	600	87%
Rail	0	0	0	0%	<50	<50	-99%
Bus	0	100	<50	-95%	0	<50	0%
Car	<50	100	100	-9%	<50	100	860%
Total	400	400	400	12%	300	600	103%

Source: Cross River Rail Project Model

A station capacity analysis (**Table 6-37**) at Dutton Park station shows that even in 2031, the introduction of Cross River Rail would not have an impact .on the level of pedestrian service and pedestrian infrastructure would have sufficient capacity.

Table 6-37 Minimum width requirement for level of service D at Dutton Park in 2031 (morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	With CRR	Without CRR	With CRR
0.7	0.8	0.7	0.8

Fairfield

The forecast rail passenger activity at Fairfield is shown in **Table 6-38**. As with Dutton Park, in 2021 there is a change of rail service frequencies from 4 to 6 trains per hour through Fairfield resulting in patronage increases of 81% with the Project (compared to without project in 2021). By 2031, there would be significantly more trains services with the Project compare to without (that is 13 trains per hour, compared to only three to four without project) station patronage would increase significantly (+206%). In 2031, patronage with the project would be three times higher than without the Project with the majority of that increase coming from walk trips, with a minor increase in car based trips (an additional 54 trips). There is virtually no rail or bus interchange happening at this station with or without Project in any future year.

Table 6-38 Fairfield station - forecast number of passengers and mode of access (morning peak period) with and without the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	500	500	900	96%	300	1,100	218%
Rail	<50	0	0	0%	<50	0	-100%
Bus	<50	<50	<50	-95%	<50	<50	-19%
Car	<50	100	100	33%	<50	100	126%
Total	600	600	1,000	81%	400	1,200	206%

Source: Cross River Rail Project Model

A station capacity analysis at Fairfield station shows that with the introduction Cross River Rail in 2031 the minimum width to achieve at least a level of service D has increased to 0.9 and 1.0 metres compared to 0.7 and 0.7 metres for walkways and stairs respectively (refer to **Table 6-39)**. This would still be within the limits of the existing infrastructure and would therefore perform adequately.

Table 6-39 Minimum width requirement for level of service D at Fairfield in 2031 (morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	With CRR	Without CRR	With **CRR**
0.7	0.9	0.7	1.0

Yeronga

The forecast passenger activity at Yeronga Station is shown in **Table 6-40**. In 2021 there would be a small increase in overall station activity with the Project compared to without the Project due to increase in rail service frequencies through Yeronga (from 4 trains per hour to 6 inbound). However more significant increases in services at neighbouring Yeerongpilly Station (from 12 to 20 trains per hour) has kept the growth in the station relatively low with some potential rail passenger diverting to use Yeerongpilly instead.

In 2031, there are more significant changes proposed in train service frequency with only three to four trains per hour without the Project, but 7 trains per hour with the Project. As such, patronage would be higher in 2031 with the Project than without, with the majority of that increase coming from walk trips (an additional 154 trips) and some additional car based trips (an additional 106 trips). Rail or bus interchange at this station would be negligible both with and without the Project in all future years.

Table 6-40 Yeronga station – forecast passengers and mode of access (morning peak period) with ` and without the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	500	300	400	7%	300	500	44%
Rail	0	0	0	0%	0	0	0%
Bus	0	<50	<50	-99%	<50	<50	-92%
Car	200	200	300	22%	200	300	53%
Total	700	600	600	9%	600	800	45%

Source: Cross River Rail Project Model

A station capacity analysis at Yeronga Station shows that in 2031, the introduction of Cross River Rail would not have a significant impact on the level of pedestrian service and the pedestrian infrastructure would have sufficient capacity (refer to **Table 6-41)**.

Table 6-41 Minimum width requirement for level of service D at Yeronga station in 2031 (morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	**With CRR**	**Without CRR**	**With** CRR
0.7	0.8	0.8	0.9

Yeerongpilly

The forecast passenger activity at Yeerongpilly Station is shown in **Table 6-42**. At Yeerongpilly Station there is forecast to be a major increase in overall boardings and alightings in the morning peak in 2021 (+180%), as well as in 2031 (+63%) with the Project. This would be due to this station becoming a more strategic rail hub being serviced by Cross River Rail services and surface rail services from Kuraby. The forecast number of passengers transferring rail services at is much greater in 2021 than in 2031. This is due to the service pattern in 2021 that has less opportunity for rail passengers to use Cross River Rail services south of Yeerongpilly without interchanging. For example services from Flagstone Creek are operational in 2031 and not 2021 which includes an interchange with Cross River Rail services at Salisbury in 2031.

Increases would be experienced by all access modes in both 2021 and 2031 with the biggest change occurring in rail-rail transfers which would be over 900% higher in 2021 (with the Project compared to without) and over 300% higher in 2031 (with the Project compared to without). Increases in walk access to the station would be experienced in 2021 (+44%) and 2031 (+38%). There would be virtually no change expected in car and bus access modes, with these remaining negligible in all forecast scenarios.

Table 6-42 Yeerongpilly station - forecast number of passengers and mode of access (morning peak period) with and without the Project

AM peak	2009	2021			2031		
Mode		**Without CRR**	**With CRR**	**% Change**	**Without CRR**	**With CRR**	**% Change**
Walk/cycle	600	1,000	1,500	44%	1,700	2,300	38%
Rail	0	200	2,100	952%	200	800	304%
Bus	0	0	0	0%	0	0	0%
Car	100	100	100	-1%	100	100	2%
Total	700	1,300	3,700	180%	2,000	3,200	63%

Source: Cross River Rail Project Model

A station capacity analysis at Yeerongpilly station shows that 2021 volumes are potentially higher than in 2031. Taking the higher 2021 volumes for design purposes, the minimum walkway and stairs width would be 1.5 metres and 1.9 metres respectively (refer to **Table 6-43)**. The proposed station upgrades for Cross River Rail at Yeerongpilly would provide far in excess of minimum widths required to perform to the minimum level of service requirements.

Table 6-43 Minimum width requirement for level of service D at Yeerongpilly station using higher 2021 forecasts(morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	**With CRR**	**Without CRR**	**With CRR**
1.1	1.5	1.2	1.9

Moorooka

In 2021 there is expected to an increase in overall station activity with the project compared to without as shown in **Table 6-44**. A change from 4 to 6 trains per hour through Moorooka results in 47% more patronage in the AM peak. In 2031, there would be more significant changes proposed in train service frequency with only three to four inbound trains per hour without the Project, but 13 inbound trains per hour with the Project. As such, patronage would be significantly higher (+289%) in 2031 with the Project than without, with the majority of that increase coming from bus (an additional 400 trips), walking (an additional 230 trips) and car (an additional 60 trips). Rail to rail interchange at this station would be negligible both with and without the Project in all future years.

Table 6-44 Moorooka station - forecast passengers and mode of access (morning peak period) with and without the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	200	300	400	33%	200	400	141%
Rail	<50	0	0	0%	<50	<50	333%
Bus	100	<50	100	101%	<50	400	1810%
Car	<50	100	100	76%	100	100	108%
Total	400	400	600	47%	200	900	289%

Source: Cross River Rail Project Model

A station capacity analysis at Moorooka station shows that in 2031, the introduction Cross River Rail would not have a significant impact on the level of pedestrian service and the pedestrian infrastructure would have sufficient capacity for the forecast passenger demand (refer to **Table 6-45)**.

Table 6-45 Minimum width requirement for level of service D at Moorooka station in 2031 (morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	With CRR	Without CRR	With CRR
0.7	0.8	0.7	0.9

Rocklea

In 2021 there is forecast to be an increase in overall station activity with the Project compared to without (+61%) as shown in **Table 6-46** due to an increase in rail service frequencies through Rocklea (from four to six trains per hour inbound). In 2031, there are more significant changes proposed in train service frequency with only three to four inbound trains per hour without the Project, but 13 inbound trains per hour with the Project. As such, patronage would be significantly higher (+121%) in 2031 with the Project than without, with the majority of that increase coming from walk trips (an additional 220 trips), and some from car (an additional 35 trips). Bus and rail interchange at this station would be negligible both with and without the Project in all future years.

Table 6-46 Rocklea station - forecast passengers and mode of access (morning peak period) with and without the Project

AM peak	2009	2021			2031		
Mode		Without CRR	With CRR	% Change	Without CRR	With CRR	% Change
Walk/cycle	300	200	300	60%	200	400	129%
Rail	0	0	0	0%	<50	<50	-29%
Bus	0	<50	<50	-47%	<50	<50	-91%
Car	<50	<50	100	74%	<50	100	101%
Total	300	200	400	61%	200	500	121%

Source: Cross River Rail Project Model

A station capacity analysis at Rocklea station shows that in 2031, the introduction of Cross River Rail would not have a significant impact on the level of service and the pedestrian infrastructure would have sufficient capacity for the forecast passenger demand (refer to **Table 6-47)**.

Table 6-47 Minimum width requirement for level of service D at Rocklea station in 2031 (morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	**With CRR**	**Without CRR**	**With CRR**
0.7	0.7	0.7	0.8

Salisbury

In 2021 there is expected to be a reduction (-48%) in overall station activity with the Project compared to without as illustrated in **Table 6-48**. This is due to an assumed reduction in services stopping at Salisbury with Cross River Rail (six trains per hour inbound) compared to without the Project (12 trains per hour inbound).

In 2031, however, there are forecast to be 15 trains per hour inbound from Salisbury without the Project and up to 29 trains per hour with the Project resulting in a 15% increase in station activity. The With Project Case in 2031 includes the proposed rail extension to Flagstone Creek with Salisbury station providing an interchange opportunity between the Flagstone Creek line and the Gold Coast, Beenleigh and Kuraby lines.

The major forecast change in station access and activity is that in 2031 with and without the Project there would be a significant number of rail to rail transfers as both express and all stops services call at this station. Rail to rail transfers represent the vast majority of station activity by 2031.

Access by car would be up to 115 trips by 2031 with the Project while access by bus would be close to 400 trips in the morning peak by 2031 with the Project. Walk access would be 27% higher in 2031 with the Project compared to without, highlighting the increased attractiveness of the station due to higher frequencies and fast (express running) rail services to the CBD via the Cross River Rail tunnel.

Table 6-48 Salisbury station – forecast number of passengers and mode of access (morning peak period) with and without the Project

AM peak	2009	2021			2031		
Mode		**Without CRR**	**With CRR**	**% Change**	**Without CRR**	**With CRR**	**% Change**
Walk/cycle	100	500	400	-12%	800	1,000	27%
Rail	<50	400	<50	-98%	3,600	4,000	11%
Bus	<50	300	200	-54%	300	400	21%
Car	<50	100	100	34%	100	100	70%
Total	200	1,300	700	-48%	4,700	5,400	15%

Source: Cross River Rail Project Model

As the 2021 With Project forecasts result in less patronage than without project no further analysis of station capacity has been undertaken for this forecast year. However in 2031, with an assumed increase in train services including a range of express and all stops trains, the minimum walkway width has increased from 1.7 m to 1.9 m and the minimum stair width from 2.2 to 2.5 metres with the project (refer to **Table 6-49)**. These stair widths are not currently achievable, and the proposed operating pattern which would lead to these passenger volumes would require additional platforms and station accesses to be constructed. As such it is recommended that Salisbury Station can only accommodate the proposed 2031 timetable (as modelled) with either a new (wider) footbridge and access stairs or additional platforms to reduce the demands on the current single set of access stairs.

Table 6-49 Minimum width requirement for level of service D at Salisbury station in 2031 (morning peak period)

Walkways (m)		Stairs (m)	
Without CRR	**With CRR**	**Without CRR**	**With CRR**
1.7	1.9	2.2	2.5

6.3 Bus operations and performance with the project

Patronage modelling for Cross River Rail assumes that bus operating strategies, including service routes and frequencies, would be the same with or without project. This is to ensure a direct comparison between scenarios in terms of bus patronage, crowding and station interchange activity.

6.3.1 Future bus performance in the region

Changes in overall forecast bus patronage and performance across the Brisbane area are shown in **Table 6-50**. This shows small decreases of around 2-4% in overall bus kilometres travelled with the Project compared to without the Project in both 2021 and 2031, although a marginal increase in overall bus patronage (1.4%) in 2031 with the Project is forecast.

Also of note is that by 2031 bus trip lengths would be shorter (-3.4%) and trip times would be less (-5.15%) with Cross River Rail compared to without. This indicates that by 2031, there would be a greater number of shorter bus journeys being undertaken, which is likely to be the result of greater levels of bus-rail interchange, with passengers more likely to be using bus as a feeder mode of access to rail with the Project.

Table 6-50 Forecast trips by bus with the Project compared to without the Project in Brisbane Metropolitan Area

Parameter	2009	2021			2031		
		Without CRR	**With CRR**	**% difference**	**Without CRR**	**With CRR**	**% difference**
Motorised person trips	6,079,300	7,834,000	7,830,100	-0.05%	8,845,700	8,857,400	0.13%
Public transport trips	546,100	824,200	841,800	2.14%	1,074,000	1,120,800	4.36%
Total bus patronage	285,700	393,500	387,000	-1.65%	560,800	568,600	1.39%
% bus trips (motorised trips)	4.70%	5.02%	4.94%	-0.08%	0.32%	6.34%	6.42%
Total bus passenger kilometres	3,252,100	4,080,400	3,912,700	-4.11%	5,632,000	5,513,100	-2.11%
Total bus passenger hours	139,700	162,100	154,600	-4.63%	245,100	235,800	-3.79%
Average bus trip length (km)	11.38	10.37	10.11	-2.51%	10.04	9.70	-3.39%
Average bus trip time (minutes)	29.34	24.72	23.97	-3.03%	26.23	24.88	-5.15%

Source: Cross River Rail Project Model

Changes in bus crowding

Changes in bus crowding has been forecast through changes in bus load factors. Bus load factors are a proportion of total bus passengers divided by total seated bus capacity. The forecast 2031 morning peak with/ without Project bus load factors are illustrated in **Figure 6-21**. This shows a significant reduction in crowding on several bus routes including Ipswich Road, the South East Busway (including the Victoria Bridge and Captain Cook Bridge approaches to the CBD), Northern Busway/ Gympie Road, and Kelvin Grove Road.

Overall, buses are expected to benefit from improved levels of service as a result of the introduction of Cross River Rail primarily through reduced crowding in-vehicle, less bus congestion on several bus routes such as the South East Busway and reduced dwell times at stops and stations due to lower patronage on some corridors in peak periods.

6.3.2 Future bus operations at rail stations with the Project– North

There are no changes to proposed bus operations at any station within the northern part of the study corridor. Changes in individual station performance including interchange to and from bus have been covered above in **Section 6.2**.

6.3.3 Future bus operations at rail stations with the Project – Central

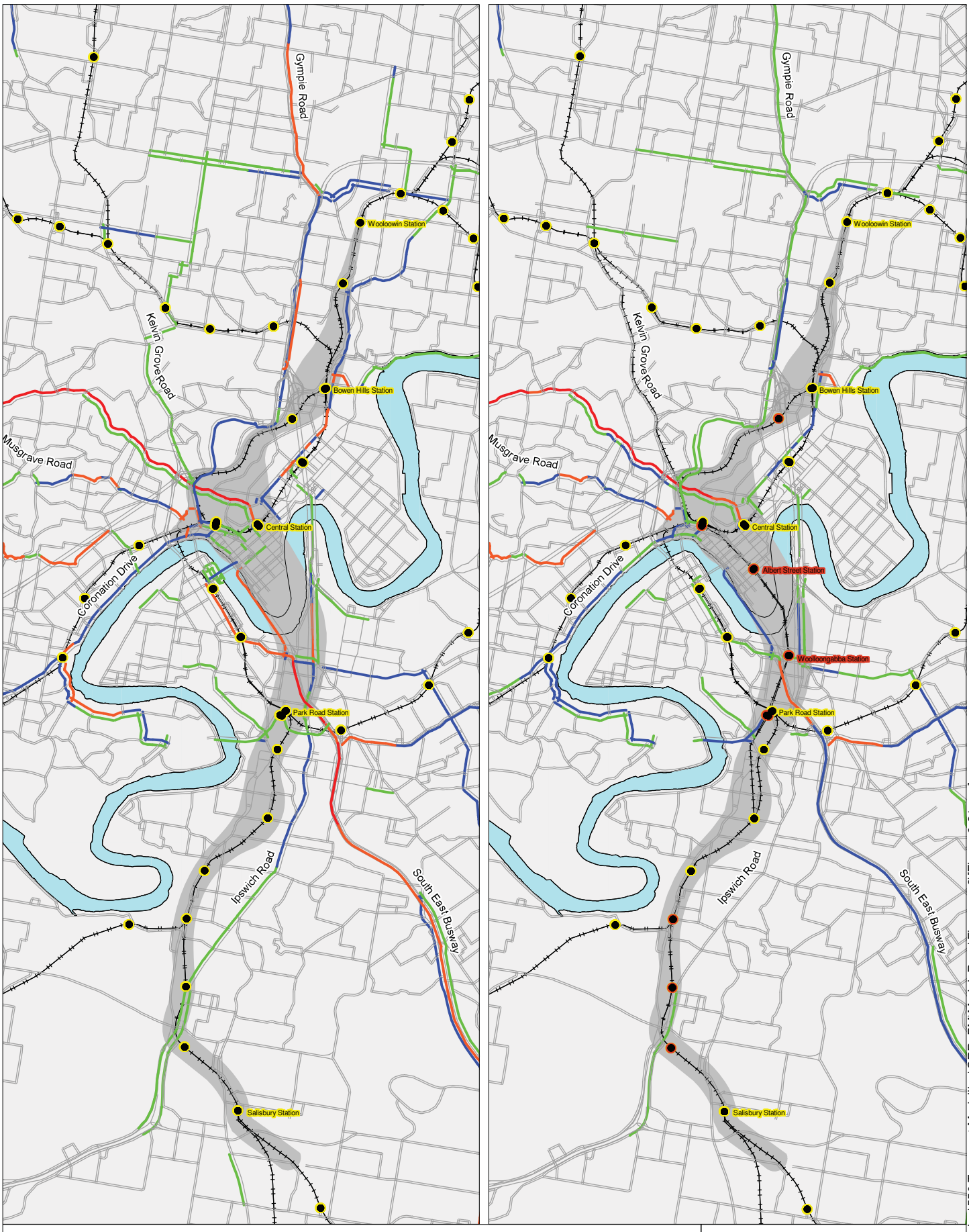
There are no proposed changes to bus operating strategies in the Central part of the study corridor as a direct result of Cross River Rail. Changes in individual station performance including interchange to and from bus have been covered above in **Section 6.2**. However, bus passenger trips to the CBD are expected to be up to 28% less in 2021 (with Project compared to without) and up to 38% less in 2031 compared to without Project. As reflected in bus load factors (**Figure 6-21**), this is forecast to result in crowding relief on buses entering the central part of the study corridor (refer to **Table 6-51)**.

Table 6-51 Changes in bus passenger trips to the CBD in morning peak

2021			2031		
Without CRR	**With CRR**	**% change**	**Without CRR**	**With CRR**	**% change**
24,684	17,800	-27.89%	36,223	22,478	-37.94%

Source: Cross River Rail Project Model

While no specific changes to bus service patterns have been identified at this stage at the Woolloongabba precinct, the Gabba Station is forecast to become an important bus-rail interchange with potential impacts on bus operations, including dwell times as larger numbers of bus passengers board and alight to interchange to or from rail services at the adjacent Cross River Rail station.



LEGEND

AM peak (2 hrs) seat load factor (v/c ratio)

- > 1.25
- 1.00 to 1.25
- 0.75 to 1.00
- 0.50 to 0.75
- < 0.50

Study Corridor

Railway lines

Railway stations

CRR railway stations

Model ID: CPM_2031_104 (without) CPM_2031_078 (with)

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-21

2031 morning peak period bus load factors with and without Cross River Rail

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CrossRiverRail

SKM aurecon
CRR JOINT VENTURE

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6.3.4 Future bus operations at rail stations with the Project – South

There are no proposed changes to bus operating strategies in the southern part of the study corridor as a direct result of Cross River Rail. New bus stops are proposed as part of essential precinct works at Yeerongpilly and Moorooka but these will replace or upgrade existing bus stops with no consequential impacts on bus routing or operations expected. A new shelter is proposed at Rocklea with no impact on bus operations.

Changes in individual station performance including any changes to bus-rail interchange demands have been covered above in **Section 6.2**.

6.4 Ferry performance with the Project

Overall passenger ferry usage and performance in 2021 and 2031 with and without Cross River Rail is summarised in **Table 6-52**. This indicates very small reductions in overall ferry patronage (around 3% less in 2021 and approximately 4% less in 2031) with Cross River Rail in operation compared to without.

Such small changes indicate that ferry and rail trips are largely un-competing and journeys largely unconnected with little or no transfer between modes.

Table 6-52 Ferry – forecast patronage

Parameter	2009	2021			2031		
		Without CRR	With CRR	% difference	Without CRR	With CRR	% difference
Motorised person trips	6,079,300	7,834,000	7,830,100	-0.05%	8,845,700	8,857,400	0.13%
Public transport trips	546,100	824,200	841,800	2.14%	1,074,000	1,120,800	4.36%
Total ferry patronage	12,800	28,700	27,800	-3.14%	30,900	29,600	-4.21%
% ferry trips (motorised trips)	0.21%	0.37%	0.36%	-0.01%	0.35%	0.33%	-0.02%
Total ferry passenger kilometres	48,500	130,800	127,100	-2.83%	133,300	127,400	-4.43%
Total ferry passenger hours	3,100	7,900	7,700	-2.53%	8,100	7,700	-4.94%
Average ferry trip length (km)	3.79	4.56	4.57	0.27%	4.31	4.31	-0.08%
Average ferry trip time (minutes)	14.74	16.55	16.59	0.24%	15.64	15.65	0.08%

Source: Cross River Rail Project Model

6.5 Pedestrian and bicycle operation with the Project

This section assesses the key changes to pedestrian and bicycle networks and operation and the performance of those networks where changes are forecast as a result of Cross River Rail.

This includes additional or reduced pedestrian demands associated with changes in station activity (including interchange) or where physical changes are proposed within the surrounding precinct to accommodate the Project.

6.5.1 Future pedestrian and cycle operations by rail station – North

Wooloowin

There would be no changes to pedestrian and cycle operations at Wooloowin station as a result of Cross River Rail.

Albion

There would be no changes to pedestrian and cycle operations at Albion station as a result of Cross River Rail.

Bowen Hills

There would be no changes to pedestrian and cycle operations at Bowen Hills station as a result of Cross River Rail.

Ekka

Ekka station would be the northern-most Cross River Rail station. This would be a two ended station with pedestrian access from O'Connell Terrace in the north and the RNA showgrounds site from the south.

The station would comprise of two stairs and a lift at the western end of the platform (connecting to a western ticket concourse underneath platform level) and another set of stairs and a lift at the eastern end of the platforms connecting to an eastern ticket concourse above platform level, leading directly onto O'Connell Terrace.

The Project reference design includes the following changes to the pedestrian and cycle network in the immediate vicinity of the station's entrances:

- a 17 m deep plaza in front of the station building and continuous wide (4.7 m) footpath on the southern side of O'Connell Terrace as well as a wider footpath on the northern side (from current 1.8 m to a proposed 3.5 m)
- widening of the current underpass at the western end of the station from its current 6m to a proposed 15 m
- new westbound kerbside cycle lane in front of the station entrance on O'Connell Terrace
- re-provision of the signalised pedestrian crossing in front of the eastern station entrance to allow safe direct crossing to and from the northern side of O'Connell Terrace
- there are changes to the height and width of pedestrians access subways underneath the station, but this are broadly similar in location and function to existing.

The proposed surface works required to implement the station are shown in **Figure 6-22** below.

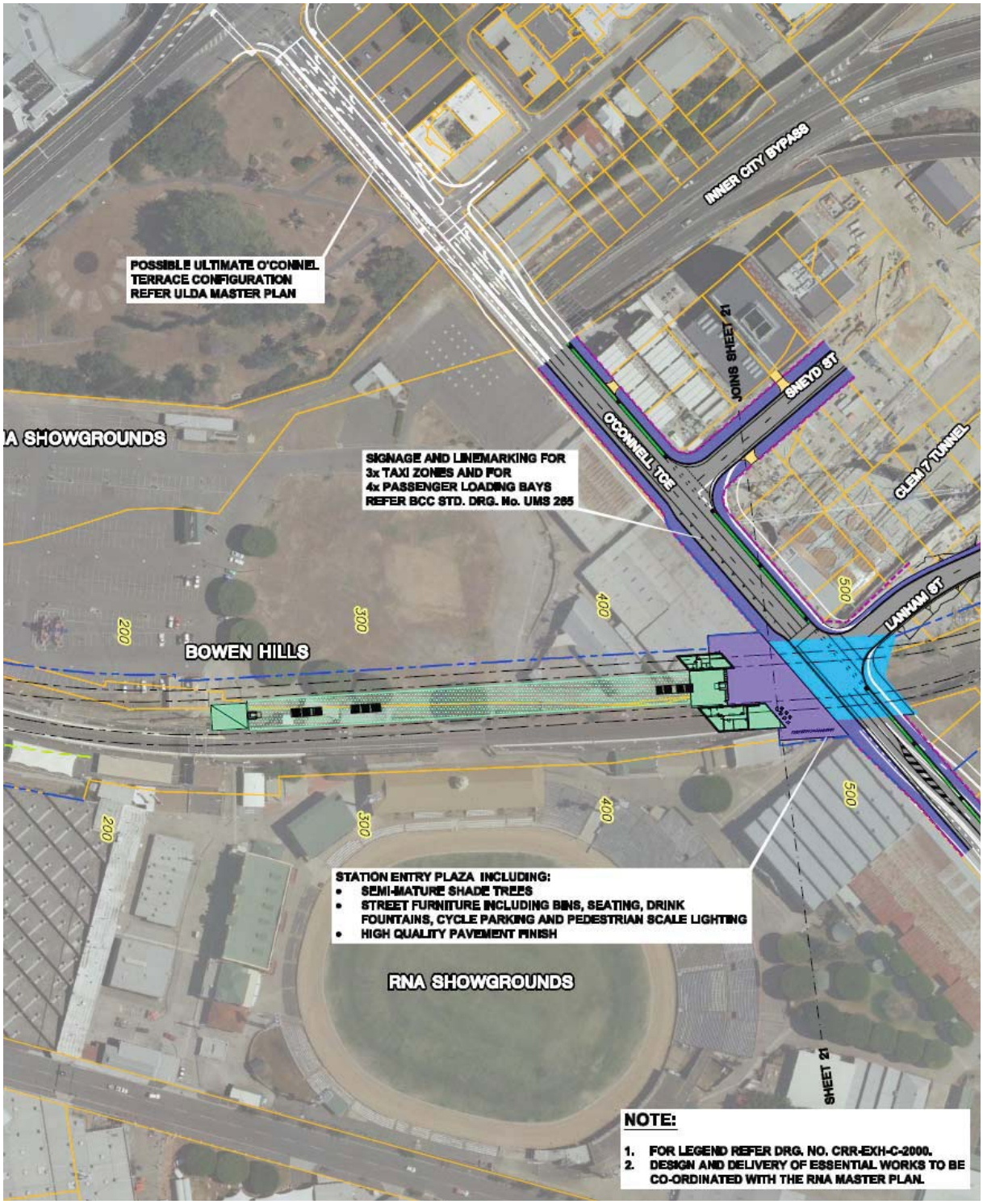


Figure 6-22 Proposed surface works around Ekka Station

Forecast rail station related walking trips in 2021 (morning peak period) are illustrated in **Figure 6-23.** This shows that with Ekka station in operation (ie with the Project) there would be significantly more public transport-related walk trips along O'Connell Terrace and crossing Bowen Bridge road, compared to without the Project.

This is based on an assumption of no new pedestrian pathway through the RNA site from the southern Ekka station entrance to the intersection of Bowen Bridge Road and Herston Road providing an alternative route to the hospitals.

As illustrated, 610 rail passengers (alighters) are forecast to cross Bowen Bridge road which would translate into around 23 passengers in a 2 minute traffic signal cycle within the height of the morning peak, compared to only 4 without Cross River Rail. This reflects current (2010) site observations where between 4 and 6 pedestrians were observed on the island in each traffic cycle (2 minute period) in the morning peak.

When combined with background pedestrian trips (including hospital staff walking from carparks on the eastern side of Bowen Bridge Road to the hospital on the western side) then it is likely that the current pedestrian refuge island (at around 9 m^2) would be insufficient to accommodate additional with Project station related pedestrian volumes.

Figure 6-23 Changes in public transport related pedestrian trips around Ekka station/ Bowen Bridge Road – 2021 AM peak 1 hour

Austroads' Guide to Road Design (Austroads, 2009) notes an absolute minimum of 0.2m^2 per waiting (queuing) pedestrian; however with umbrellas, suitcases, luggage and other equipment, 0.4 m^2 per person has been adopted for Cross River Rail planning and assessment purposes as this fits within the Fruin Level of Service band D (Furin JJ, 1977) for queuing (with a range from 0.28 to 0.65 m^2 per person).

Using 0.4 m^2 per person, then the traffic island could accommodate up to 20 people but with significant discomfort. As such, there are safety concerns with the ongoing retention of this traffic island with growing pedestrian volumes as it would create an uncomfortable waiting environment, it requires pedestrians to undertake a two-stage crossing in all directions and should the number of pedestrians on the island be greater than its capacity then overspill onto the heavily trafficked Bowen Bridge Road would be possible.

A potential mitigation measure in this location could involve a kerb build-out on the south-eastern corner of the intersection along with the removal of the traffic island as illustrated in **Figure 6-24**. The build-out effectively allows for the traffic island waiting space to be combined with the existing footway space on the south eastern corner of the intersection to create a total combined waiting zone of almost 30 square metres, with a nominal capacity for up to 75 people, providing sufficient waiting space for everyday use of the crossing and providing improved convenience, comfort and safety.

This build-out would also allow the realignment of the east-west crossing to become a direct single stage crossing, shortening the crossing distance slightly (by around 1.5m) and providing time savings for pedestrians.

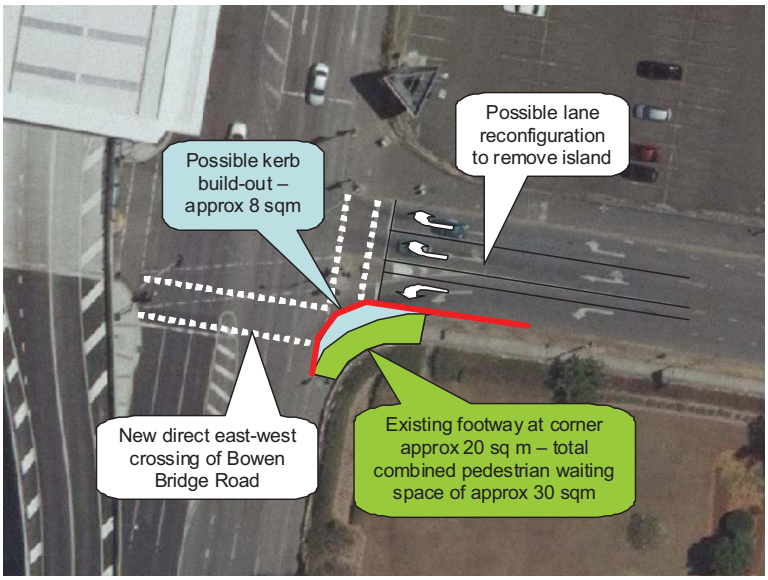


Figure 6-24 Possible enhancement to pedestrian waiting zone at corner of O'Connell Terrace and Bowen Bridge Road

This intersection arrangement has been tested in SIDRA using existing phase arrangements (2 phases) and an assumed peak period cycle time of 150 seconds with SIDRA optimised phase timings. 2021 background traffic volumes were derived from August 2010 traffic counts (post Clem 7 opening) growthed up to 2021 at 2.4% per annum in line with BSTM growth rates for the whole of Brisbane Region which is considered appropriate to take account of surrounding precinct growth.

As reported in **Table 6-53,** the result of SIDRA optimising phase timings (to allow for sufficient time for O'Connell Terrace left turn without detrimental impacts) results in no worsening of level of service beyond the LOS E likely under the do nothing scenario. While delays would increase for Bowen Bridge Road South (9.3 to 15.1 seconds) and Bowen Bridge Road North (13.3 to 21.6 seconds) and the intersection worsens slightly from LOS B to LOS C it would still be operating well within acceptable limits.

Table 6-53 Bowen Bridge Road/ O'Connell Terrace intersection analysis 2021 AM peak

Turn	Volume (veh/h)	Deg. Saturation (v/c)		Average Delay (sec)		Level of Service		Queue Distance (m)	
2021 AM		Existing layout	Remove island	Existing layout	Remove island	Existing layout	Remove island	Existing layout	Remove island
Bowen Bridge Rd (S)									
Left	30	0.389	0.439	17.2	23.0	LOS B	LOS C	117	144
Thru	1521	0.389	0.439	9.3	15.1	LOS A	LOS B	119	147
O'Connell Tce									
Left	255	0.667	0.782	66.2	66.2	LOS E	LOS E	134	142
Thru	13	0.692	0.504	65.6	53.2	LOS E	LOS D	116	105
Right	409	0.690	0.506	68.6	56.2	LOS E	LOS E	116	105
Bowen Bridge Rd (N)									
Thru	2784	0.695	0.784	13.3	21.6	LOS B	LOS C	280	356
RBH Access									
Left	19	0.197	0.176	53.8	43.8	LOS D	LOS D	12	11
Right	24	0.200	0.199	75.2	75.2	LOS E	LOS E	18	18
All Vehicles	5055	0.695	0.784	19.9	25.2	LOS B	LOS C	280	356

In the PM peak as illustrated in **Table 6-54,** the overall intersection remains a LOS C with a minor worsening of average delays for the O'Connell Terrace left turn (from 51.4 to 55.7 seconds). Nevertheless, the intersection would still operate well within capacity and this minor worsening of delay is considered appropriate in order to achieve pedestrian safety improvements through the removal of a sub-standard traffic island.

Table 6-54 Bowen Bridge Road/ O'Connell Terrace intersection analysis 2021 PM peak

Turn	Volume (veh/h)	Deg. Saturation (v/c)		Average Delay (sec)		Level of Service		Queue Distance (m)	
2021 PM		Existing layout	Remove island	Existing layout	Remove island	Existing layout	Remove island	Existing layout	Remove island
Bowen Bridge Rd (S)									
Left	25	0.665	0.665	26.7	26.7	LOS C	LOS C	261	261
Thru	2322	0.663	0.663	18.8	18.8	LOS B	LOS B	263	263
O'Connell Tce									
Left	155	0.295	0.475	51.4	55.7	LOS D	LOS E	76	81
Thru	19	0.668	0.668	56.8	56.8	LOS E	LOS E	134	134
Right	511	0.665	0.665	59.8	59.8	LOS E	LOS E	134	134
Bowen Bridge Rd (N)									
Thru	1384	0.390	0.390	14.5	14.5	LOS B	LOS B	127	127
RBH Access									
Left	41	0.383	0.383	44.5	44.5	LOS D	LOS D	22	22
Right	38	0.128	0.158	53.8	60.4	LOS D	LOS E	23	24
All Vehicles	4495	0.665	0.665	24.0	24.2	LOS C	LOS C	263	263

6.5.2 Future pedestrian and cycle operations at rail stations – Central

With Cross River Rail operational, the number of public transport passenger alightings are forecast to increase substantially in the CBD (+12% in 2021 and +16% in 2031). Average walk distances with the Project are less, however, reducing from 760 m (without the Project) to 660 m (with the Project) in 2021 and from 820 m (without the Project) to 640 m (with the Project) in 2031.

As such, despite an increase in patronage and passenger alightings in the CBD in the morning peak with the Project (compared to without the Project), the total kilometres walked (from railway stations to final destinations) is forecast to be less with the Project than without (-9% in 2031) (refer to **Table 6-55)**.

Table 6-55 Changes to average morning peak period walk trips (from public transport) in the Brisbane CBD

	2009	2016		2031	
		Without Project	With Project	Without Project	With Project
Final alightings	68,000	82,200	91,800	104,900	121,600
Ave Walk distance (KM)	0.66	0.76	0.66	0.82	0.64
Total KM walked to/ from public transport	45,200	62,600	60,800	85,600	77,500

Source: Cross River Rail Project Model

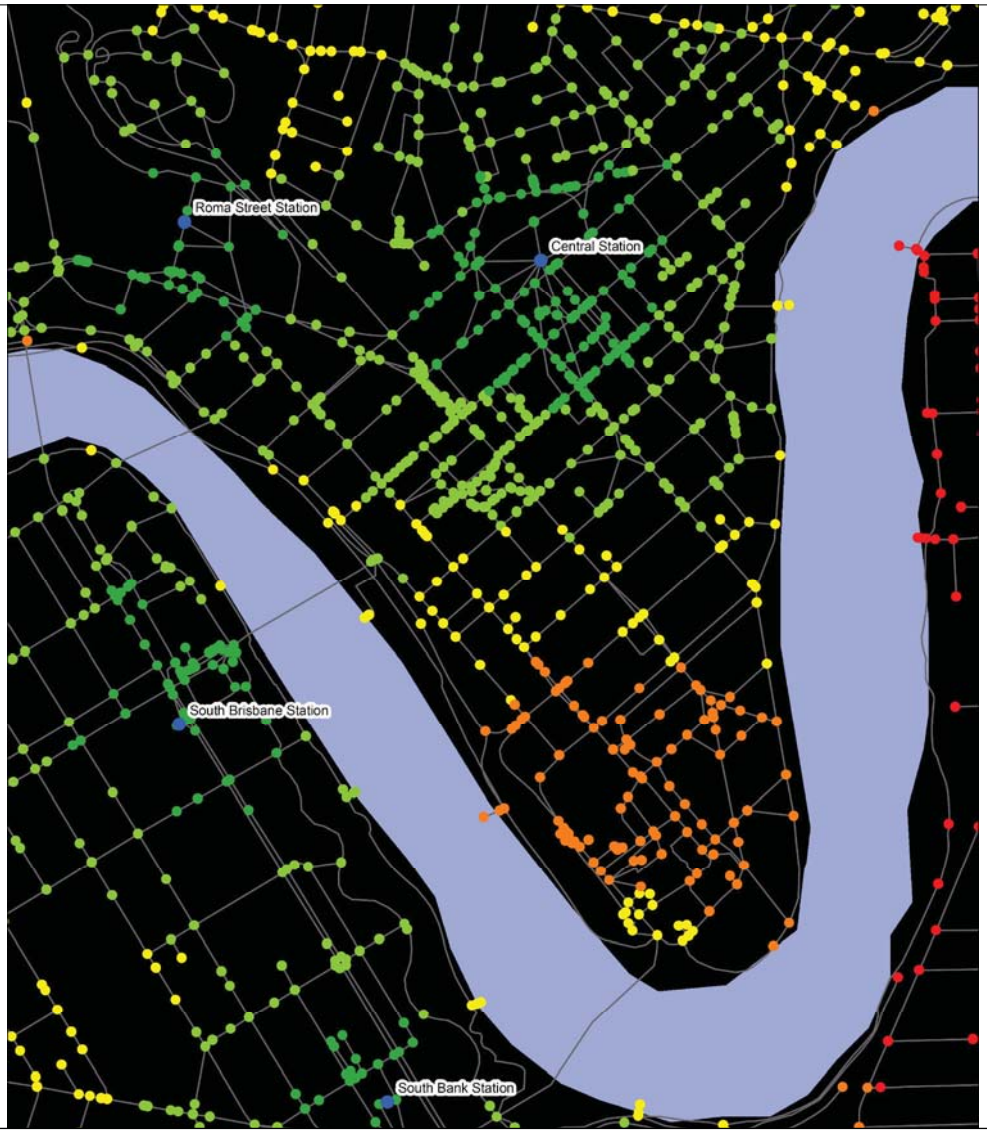
Cross River Rail is also forecast to increase the accessibility of CBD employment destinations by rail and walk trips. Without Cross River Rail as illustrated in **Figure 6-25**, there would be significant parts of the CBD further than a 10 minute walk distance to a railway station, as show in yellow and orange.

Cross River Rail, with a new station in Albert Street, would significantly improves access to CBD destinations by rail and walk, with no part of the CBD more than 15 min walk from a train station, with the vast majority within 10 minutes walk of a train station as illustrated in **Figure 6-25**.

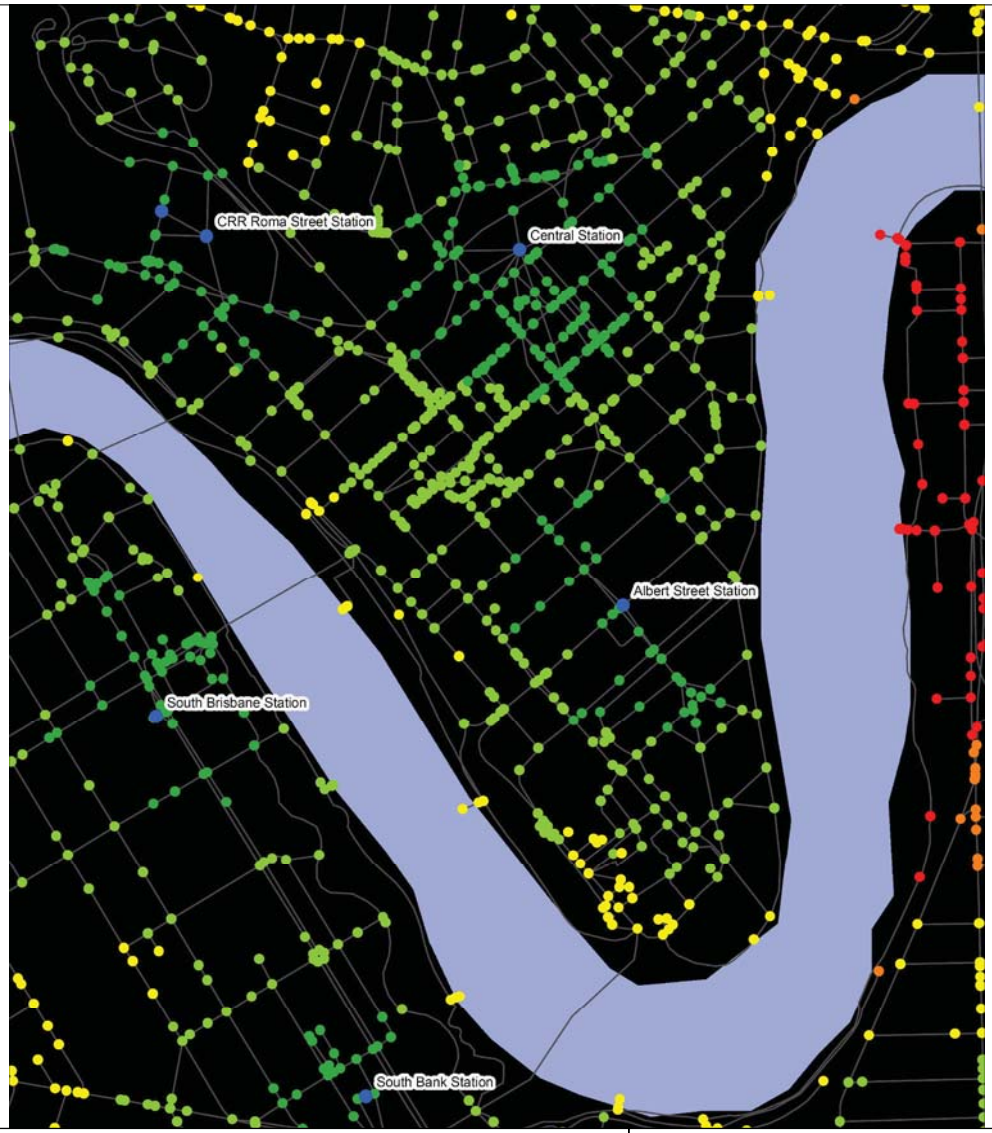
The number of employees, residents and student forecast to be brought within a 400 m catchment of a rail station in the CBD is illustrated in **Figure 6-26**. This shows over 55,000 jobs could be within a direct 400 m walk catchment of a railway station in 2031 with Cross River Rail, compared to without the Project.

In addition to this over 13,000 student places and 3,500 residents would also be within 400 m of a station where they previously would not have been.

Without Cross River Rail



With Cross River Rail



LEGEND

Walk Access to Train

- < 5 Mins
- 5 - 10 Mins
- 10 - 15 Mins
- 15 - 20 Mins
- > 20 Mins

Train Stations

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-25

Walk access time to railway stations within the CBD with and without Cross River Rail

N

CrossRiverRail

SKM aurecon
CRR JOINT VENTURE

Source: LUPTAI, Copyright, State of Queensland

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LEGEND

Resident population = 3,500
Employment (jobs) = 55,300
Students (tertiary enrolments) = 13,500

Additional Albert Street Station 400m catchment

Note - for partial zones contained in catchment the population is decreased by the proportion of the zone area not contained in catchment

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-26

Additional CBD catchment within 400m of a railway station, with Cross River Rail

N

CrossRiverRail

SKM aurecon
CRR JOINT VENTURE

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Central Station

There are no changes to the proposed walking or cycling infrastructure around Central Station as a result of the Project. Overall passenger activity at Central Station is forecast to reduce as a result of Cross River Rail providing congestion relief benefits to users of this station.

Roma Street Station

Changes to the external pedestrian network are described more fully in the road network section (**Section 6.6.3**). The key pedestrian changes as part of the Project are illustrated in **Figure 6-27** and would include:

- a new Cross River Rail station entrance on Roma Street (north east corner of the intersection with Parklands Boulevard) with a connection to a new pedestrian bridge over Roma Street linking Emma Miller Place to the Magistrates Court and George Street. This pedestrian bridge is currently committed and funded as part of Supreme and District court project.
- a new at-grade signalised pedestrian crossing of Roma Street on the eastern side of its intersection with Parklands Boulevard to facilitate direct pedestrian crossings
- new cycle lanes on Roma Street between Makerston Street and Parklands boulevard
- a new signalised mid block pedestrian crossing between Makerston Street and Parklands Boulevard
- a new signalised pedestrian/ cycle crossing of Herschel Street on the northern side of George Street
- footway widening on the northern side of Roma Street of up to 1.2 m.

The reference design as well as the committed new pedestrian bridge would lead to an increase in the number of pedestrian road crossing facilities of Roma Street (Parklands Boulevard to Makerston Street, inclusive) from the current four to seven. These proposed changes would provide significantly enhanced crossing facilities for pedestrians that assist in distributing pedestrians over a number of crossing facilities, lead to less crowding on footways and at crossings and encourage safer formalised crossing movements.

The impacts of the two new at-grade signalised pedestrian crossings on traffic are assessed in detail in **Section 6.6.3**.

In the proposed opening year of the Project in 2020/21 the reference design should be able to safely and efficiently accommodate increases in pedestrian activity associated with the railway station. The key pedestrian pinchpoints have been identified as being on the northern side of Roma Street in the morning peak period, where large numbers of pedestrians wait to cross Roma Street to access destinations to the south and east.

In 2021, in the morning peak period, around 14,500 final rail alightings to the surrounding precinct are forecast. Around 85% of final alighters or 12,300 passengers are forecast to exit via the two south facing entrances onto Roma Street within the two hour peak period as illustrated in **Figure 6-28**. Of this number, around 60% or 7,300 are forecast to use the new CRR southern entrance however the existing entrance would be the main exit for surface rail and busway passengers with a total of 7,100 forecast to use this exit in the AM peak 2 hours. This compares with an estimated 8,500 alighting passengers who would use this existing entrance without Cross River Rail. That is, Cross River Rail leads to a reduction in the usage of the existing subway by removing all southern express line passengers (ie those from the Beenleigh/ Gold Coast line) from the existing entrance.

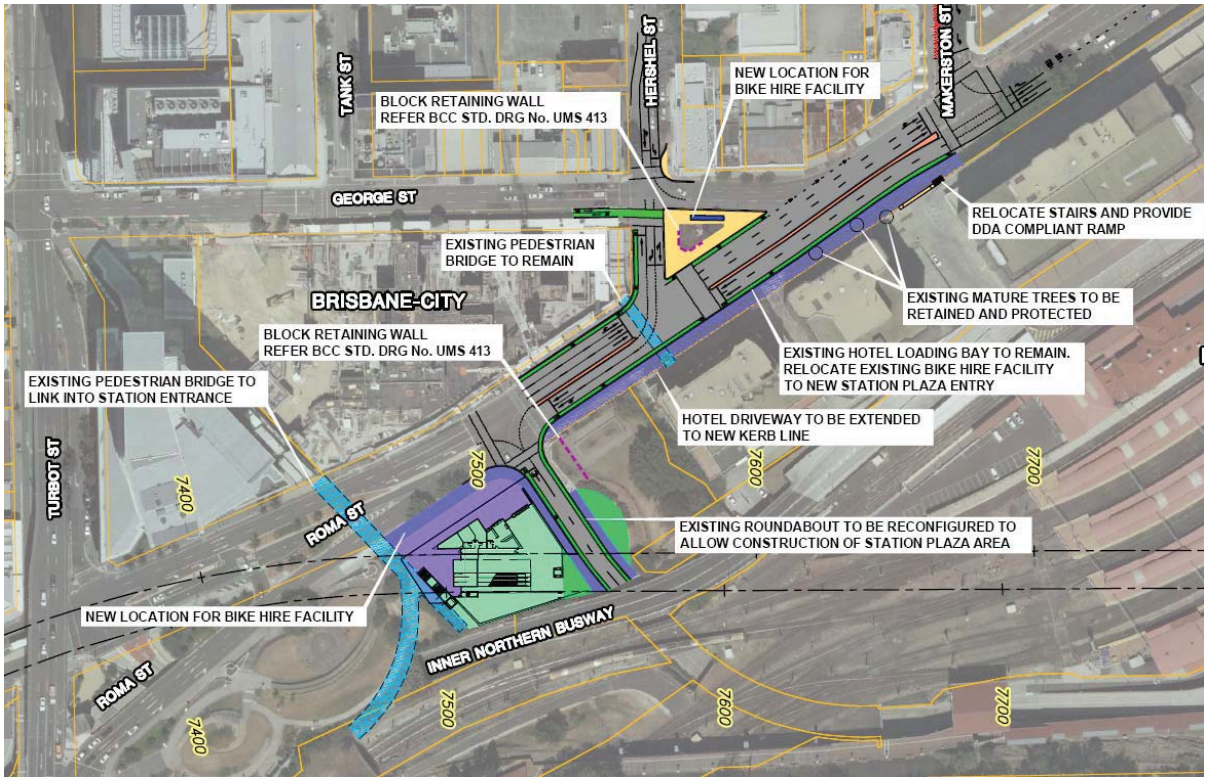


Figure 6-27 Proposed Project surface works around Roma Street station

(Source Aecom drawing number CRR-RMA-C-2002-B)

The dominant movement from the station would be alighting passengers heading south-east across Roma Street towards George Street from the existing station entrance. This is forecast to be the desire line for around 5,500 alighting passengers in the morning peak two hours in 2021. Breaking these two hour movements into two minute volumes allows an analysis of maximum likely accumulation of pedestrians on the Roma Street northern footway and at crossing points (as the maximum cycle time within the CBD is 120 seconds or two minutes). Using existing behaviour referenced in Section 4, then George Street-bound alighting passengers would continue to use either the formal crossing at Makerston Street, the overbridge at Herschel Street or the proposed at grade crossing (in lieu of informal crossing mid block). If the proposed new formal signalised crossing, then attracted around one half of the George Street bound alighters, or 2,700 pedestrian, then up to 70 pedestrians could accumulate in two minutes at this location (refer to **Figure 6-29)**.

This would require around 30 m^2,of footway queueing space assuming around 0.4 m^2 per person in order to achieve a LOS D according to Fruin criteria . The available space at this location under the reference design (with minor footway widening) would be approximately 40 sq m and therefore sufficient to accommodate this maximum accumulation and still within the LOS D. It is also worth noting that without Cross River Rail, higher levels of pedestrians would be expected in this location and without mitigation in the form of wider footways and new signalised crossing opportunities, significant pedestrian safety issues could arise without intervention by 2021 As such, the reference design would provide essential footway circulation space and safer formal crossing for pedestrians and operate well within capacity and level of service criteria.

By 2031 a further increase in alighting passenger of up to 37% could be expected, which makes the reference design's proposed kerb realignment and footway build out on the northern side of Roma Street, (between Parklands Boulevard and Makerston Street and the Transit Centre) essential. Further to that, other footway and private forecourt obstructions including garden beds, signage, bins and phone boxes could be rationalised or removed to allow a continuous minimum footway of 3 m.

This would allow 150 people per minute (two-way) to walk relatively comfortably along this footway and so providing sufficient capacity beyond 2031. The provision of adequate footway width would also encourage pedestrian activity to use all available formal road crossings of Roma Street.

Figure 6-28 Forecast 2021 AM peak 2 hour alighting passenger numbers

Figure 6-29 Forecast maximum accumulation of rail alighters on footways in 2021 AM peak 2 minutes

Albert Street

The Albert Street station would be a major new underground station in the heart of the CBD. Included in the reference design is a large new public square as well as changes to footpaths widths.

By 2031 background pedestrian volumes in the CBD are forecast to be 165% of 2009 volumes (based on an average forecast growth rate in jobs and CBD population of 2.4% per annum).

Patronage modelling for Cross River Rail forecasts over 37,000 passenger movements to and from the station in the morning peak period in 2031. Passenger modelling shows that virtually all of these movements in the morning peak would be alighting passengers due to the tidal nature of commuting to the CBD. Furthermore station pedestrian analysis suggests that around 66% of morning peak alighting passenger movements would occur at the northern entrance with 34% occurring at one of the two southern entrances on Alice Street.

Of the alighting passenger movements at the northern entrance (on Mary Street) in the morning peak period, a significant proportion would be expected to walk north along Albert Street (around 35%) or east along Mary Street (around 30%). A further 20% would be expected to walk west along Mary Street while 15% would travel south or be destined for immediately surrounding destinations (refer to **Figure 6-30)**.

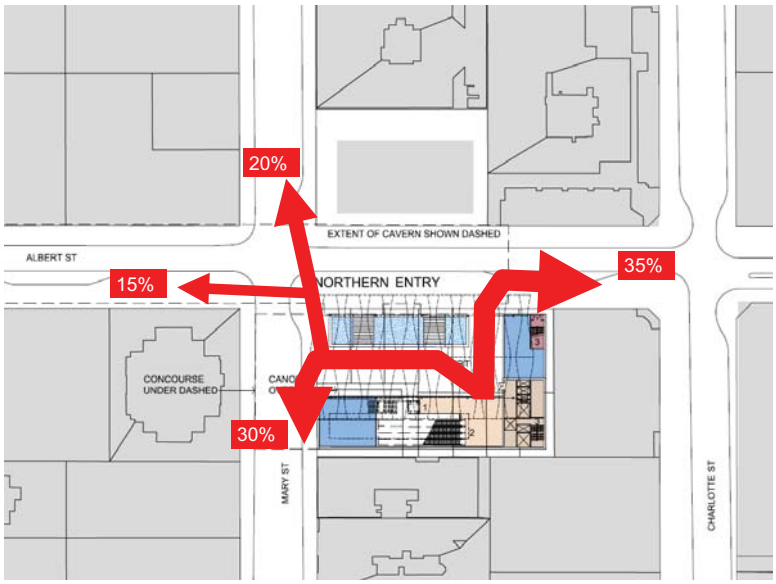


Figure 6-30 AM peak alighting movements proportions from Albert Street station northern entrance

Note:
1. Based on 2031 alighting CPM passenger forecasts

As such, several links and intersections would be expected to experience increases in pedestrian activity with increased congestion on footways as crowds move away from the station and wait for pedestrian crossing signals at nearby intersections. A detailed tabulation of pedestrian crossing volumes is contained in **Table 6-56**. This shows that on key crossings in the vicinity of the proposed station entrances, pedestrian activity increases significantly. For example in 2031 in a 90 second period (one traffic cycle), over 116 pedestrians could be expected to cross Charlotte Street on the eastern side of its intersection with Albert Street with Cross River Rail operational, an increase from 35 without Cross River Rail. Similarly, 140 pedestrians could be expected to cross Mary Street on the eastern side of its intersection with Albert Street with Cross River Rail, compared to around 30 without Cross River Rail.

Table 6-56 Changes in two-way pedestrian crossing volumes in 2031 at intersections in the vicinity of Albert Street Station

Intersection	Approach direction	Approach road name	2031 without CRR	2031 with CRR
Elizabeth Street / Albert Street	East	Elizabeth Street	27	73
	South	Albert Street	12	12
	West	Elizabeth Street	57	126
Charlotte Street/ Albert Street	North	Albert Street	6	64
	East	Charlotte Street	35	116
	South	Albert Street	14	97
	West	Charlotte Street	40	108
Mary Street / Albert Street	North	Albert Street	10	112
	East	Mary Street	28	142
	South	Albert Street	15	47
	West	Mary Street	32	63
Margaret Street/ Albert Street	North	Albert Street	8	8
	East	Margaret Street	6	6
	South	Albert Street	2	2
	West	Margaret Street	7	7
Alice Street / Albert Street	North	Albert Street	4	23
	East	Alice Street	5	52

Note:
1. Assessment is for the peak 90 seconds in the morning peak period, 2031 (Aecom October 2010)

The above crossing volumes have been assessed and combined at each of the four key street corners that are expected to experience significant increases in pedestrian volumes. This shows the forecast total potential accumulation of pedestrians in the morning peak 90 seconds (the maximum traffic signal cycle time) in 2031 on each street corner. Within each 90 second cycle however 2 traffic signals phases would occur with each phase incorporating a corresponding pedestrian crossing movement.

As such, on average, it is expected that at least one-third of the total possible pedestrian accumulation volumes would have cleared from any given street corner during the course of a 90 second cycle. Nevertheless, to be conservative, footway area required to accommodate the full 90 second accumulation is reported below.

Table 6-57 Changes in pedestrian accumulation at intersections along Albert Street as a result of the Project at key locations

Intersection	Corner	2031 without CRR volumes (90 second accumulation)	2031 with CRR volumes (90 second accumulation)	Footway area required to accommodate total possible pedestrian accumulation volumes*	Current estimated footway area
Elizabeth Street / Albert Street	SE	15	59	24	15
	SW	23	88	35	20
Charlotte Street / Albert Street	NE	24	83	33	16
	NW	28	31	12	12
	SE	21	179	72	45
	SW	23	82	33	35
Mary Street / Albert Street	NE	19	230	92	9
	NW	21	54	22	25
	SE	23	57	23	15
	SW	22	30	12	30
Alice Street / Albert Street	NE	4	65	26	25
	NW	2	3	1	12
	SE	3	7	3	12

** Note this is based on LOS D for queuing areas at an average of 0.4 sqm per person (Fruin, 1977)*

The pedestrian footway at the south-west and south-east corners of the intersection of Elizabeth Street with Albert Street would be over capacity by 2031 with Cross River Rail (refer to **Table 6-57)**. The key constraints at this location for any footway widening are the taxi rank and Myer Centre carpark exit ramp. In discussion with Brisbane City Council these facilities were deemed to be fixed obstacles for the purposes of this study. Nevertheless, the above analysis is of a design year of 2031, more than 10 years after opening, In the opening year, pedestrian volumes are forecast to be around 30% lower, which would mean that even considering the possible pedestrian accumulation over 90 seconds (rather than a likely total accumulation) then pedestrian volumes would be able to be accommodated on these street corners without intervention. As such, no widening of these corners is proposed as part of the reference design.

At the intersection of Charlotte Street and Albert Streets, in the morning peak, the capacity of the North-East and South-East corner could be exceeded in 2021 with Cross River Rail. Kerb buildouts into Albert Street and Charlotte Street on these corners have therefore been proposed in order to provide additional capacity for pedestrians.

At the intersection of Mary Street and Albert Street the north-east corner would be substantially over-capacity without additional footway space. On this corner however Cross River Rail provides a large open plaza providing sufficient waiting and circulation space.

Likewise the north-eastern corner of Alice Street and Albert Street would be over capacity with additional footway space required, and such space is proposed as part of the station forecourt itself.

Mid-block footpaths are also forecast to suffer from overcrowding with Cross River Rail operational. At present there are several pinch points and constraints along the Albert Street footway in particular, with some sections experiencing less than 2 m of unobstructed width as illustrated in **Figure 6-31**.

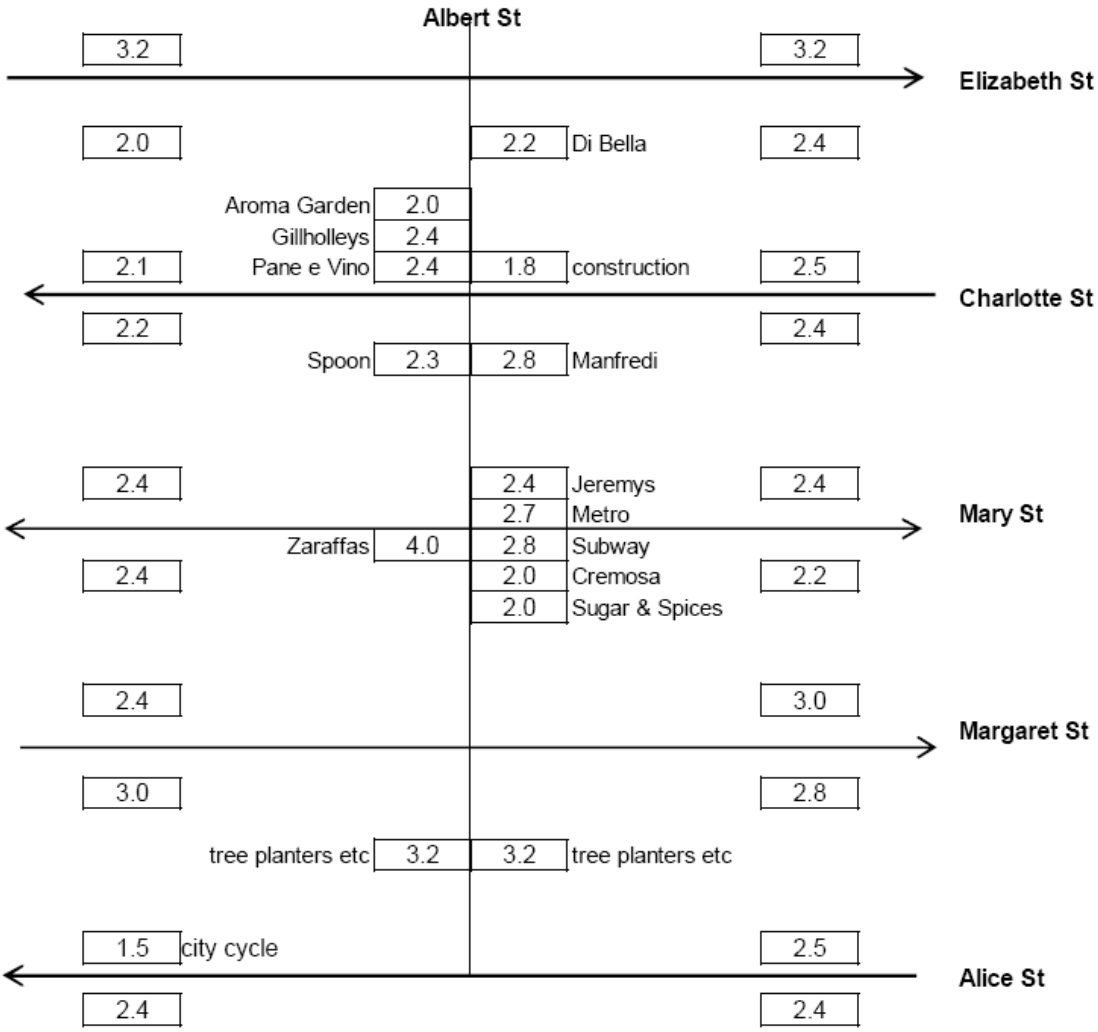


Figure 6-31 Current critical footpath widths on Albert Street

An assessment of pedestrian volumes along Albert Street has been undertaken and is presented in **Table 6-58**. This shows that without any mitigation, Cross River Rail pedestrian traffic would lead to LOS E and F on critical sections of Albert Street footway between Mary Street and Elizabeth Street by 2031. This illustrates a need to widen footways in these critical locations to be able to safely accommodate increased pedestrian demands.

Table 6-58 Impacts of Cross River Rail pedestrian volumes of pedestrian Level of Service along Albert Street

Link	Current Critical Width (m)	2031 AM peak ped volumes* without CRR (ped/min)	2031 AM peak ped volumes* with CRR (ped/min)	Pedestrian Level of Service (LOS) with CRR	Recommendations
Albert Street (Elizabeth Street to Charlotte Street) – EAST	1.8 (due to construction), 2.2 (due to on-street dining)	62	133	E (construction) D (on-street dining)	No immediate requirements for change as footway will improve with removal of construction hoarding. Also, opening year ped volumes (2021) are around one-third less than 2031. In longer term (by 2031) minor reduction in on–street dining width (0.1-0.2m) could be considered or rationalisation of cark park access ramps
Albert Street (Elizabeth Street to Charlotte Street) – WEST	2.0	98	202	F	Remove (and relocate) part of taxi loading bay to widen in critical areas as this footway link will be operating poorly even in 2021 (LOS E) without widening.
Albert Street (Charlotte Street to Mary Street) - EAST	2.4	65	190	E	Consolidate loading (and operate off peak only) to allow wider footway on eastern side
Albert Street (Charlotte Street to Mary Street) - WEST	2.3	99	72	B	No change required
Albert Street (Mary Street to Margaret Street) - EAST	2.0	46	46	B	No change required
Albert Street (Mary Street to Margaret Street) - WEST	4.0	60	69	A	No change required
Albert Street (Margaret Street to Alice Street) - EAST	3.2	10	7	A	No change required
Albert Street (Margaret Street to Alice Street) - WEST	3.2	7	27	A	No change required

Source: Aecom (Traffic Engineering Design Report), October 2010

Notes
1. ped volumes have been factored up from average flow rates to account for platooning occurring due to traffic signal phasing

As such a range of pedestrian footway widening are proposed to provide an appropriate level of service for pedestrians. The proposed reference design scheme (including these surface works) is illustrated in **Figure 6-32** and include:

- widening of the eastern footway of Albert Street between Mary Street and Charlotte Street by approximately 3.5 m
- widening of the southern 50m of the western footway of Albert Street between Charlotte Street and Elizabeth Street by approximately 2 m
- kerb buildouts of approximately 2m on all corners of the intersection of Charlotte Street and Albert Street to allow more pedestrian waiting space and shorten the crossing distance
- creation of a large pedestrian plaza on the corner of north-eastern corner of Albert Street and Mary street to create a station forecourt
- kerb buildouts at the northern side of Mary Street at its intersection with Albert Street
- widen key pedestrian crossings at Albert Street / Mary Street and Albert Street/ Charlotte Street from 3 m to 5 m
- a new station entry plaza on the north-eastern corner of Albert Street and Alice Street creating a large pedestrian waiting and circulation space
- rationalisation of street furniture and consolidation of on-street dining into discrete zones
- part time loading bays in the footway zone on the eastern side of Albert Street.

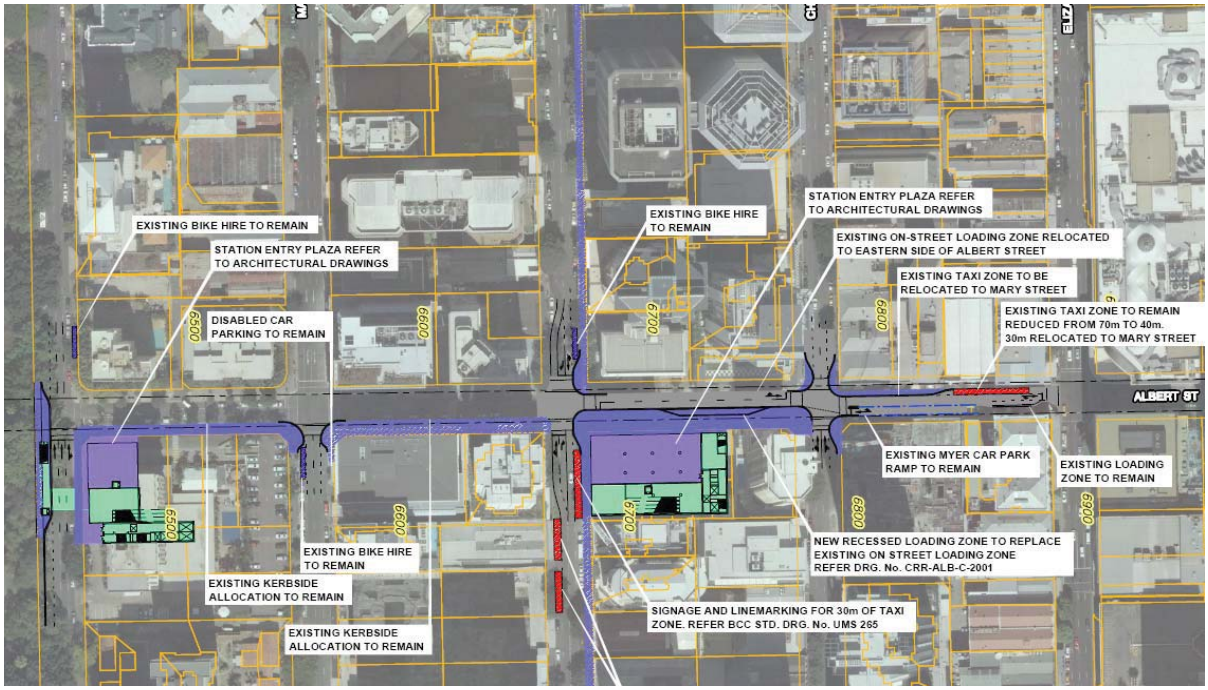


Figure 6-32 Proposed surface works around Albert Street Station

Further details regarding traffic and parking/ loading changes including impact assessment is available under **Section 6.6**.

The benefit of these proposed works to pedestrians is presented in **Table 6-59**. This shows that with the widening on Albert Street between Charlotte Street and Elizabeth Street to create 5 m of unobstructed width (on the western side) then pedestrian Level of Service will improve from an F (fail) to C – which is appropriate for inner city peak conditions. On the eastern side, with construction of the development at 123 Albert Street complete, this link would have adequate footway width for the opening year, and only by 2031, would some conflicts arise should on-street dining and the Myer Centre access ramp remain unchanged by that time. However, even if they do remain, a Level of Service D could be expected for a short section, which is not unreasonable for short peak times in a CBD environment. The eastern footway of Albert Street between Mary Street and Charlotte Street, would benefit from footway widening and loading bay consolidation achieving a Level of Service B in this critical link adjacent to the main station entrance – an improvement from Level of Service E should the widening not occur.

Overall, the proposed changes to accommodate background and Project specific pedestrian volumes in the Albert Street precinct are expected to function well in both the year of opening and in 2031.

Table 6-59 Changes to 2031 pedestrian level of service on Albert Street with CRR pedestrian volumes (with/ without footway widening)

Link	Current Critical Width (m)	2031 Pedestrian Level of Service (LOS) without widening	Proposed Critical Width (m)	2031 Pedestrian Level of Service (LOS) with widening
Albert Street (Elizabeth to Charlotte) - EAST	2.2 (due to on-street dining)	D (on-street dining)	2.2 (no change)	D C (if dining reduced by 0.1-0.2m by others)
Albert Street (Elizabeth to Charlotte) – WEST	2.0	F	5.0	C
Albert Street (Charlotte to Mary) - EAST	2.4	E	6.5	B
Albert Street (Charlotte to Mary) - WEST	2.3	B	2.2	B

Source: Aecom (Traffic Engineering Design Report), 2010
Note:
1. ped volumes have been factored up from average flow rates of account for platooning occurring due to traffic signal phasing

Gabba Station

Gabba would be a major new Cross River Rail Station serving the Woolloongabba precinct offering interchange with buses at the adjacent Woolloongabba Busway Station.

In 2021, Gabba is forecast to have 1,600 initial boardings and 2,200 final alighting passengers in the morning peak period. The forecasted passenger movement numbers to and from the station for the peak one hour are illustrated in **Figure 6-33**. These passenger movements have been further broken down into peak two minute volumes alighting (heading away from) the rail and bus stations, as illustrated in **Figure 6-34**. This shows the peak passenger accumulation expected on the footways and crossing points leading away from the station over a two minute period – the longest expected waiting time between pedestrian green phases.

Figure 6-33 Forecast 2021 Gabba Station and busway passenger movements in the morning peak hour

Figure 6-34 Forecast 2021 Gabba Station and busway passengers accumulating at pedestrian crossings over peak 2 minutes in the morning peak hour

The above analysis shows that the maximum accumulation of pedestrians would be between 10 and 20 people, requiring only 4 to 8 sq m of waiting space at the relevant crossings which is well within their current capacity. No footway widening or kerb build-outs are required in opening year to accommodate Project pedestrian demands.

Proposed changes to pedestrian and cycle operations as part of the reference design are illustrated in **Figure 6-35**. They are principally related to providing adequate pedestrian width within the land bounded by Stanley Street, Vulture Street, Main Street and the Pacific Motorway for pedestrians demands associated with events at the Gabba stadium.

These provisions would include 17 m of footway width between the station and Main Street to cater for post-event crowds (split approximately into one 10m wide footway on the northern side of the busway and one 7m wide footway on the southern side of Vulture Street). Main Street itself could continue to operate under traffic control operation during events subject to approval from the relevant authorities.

The reference design also involves a new plaza over the busway immediately south of the station to link the station entrances to the northern side of Stanley Street. However, no changes to external pedestrian crossings or footways are proposed as part of the Cross River Rail reference project.

Figure 6-35 Proposed surface works around Gabba Station

Nevertheless, there are a wide range of major changes to pedestrian and cycle access (as well as vehicle access) that may occur in the precinct as a result of redevelopment within the Woolloongabba Urban Development Area (UDA), which is now the subject of an approved Development Scheme under the Urban Land Development Authority (ULDA).

The Woolloongabba UDA includes the station site and surrounding land bounded by Vulture Street, Main Street, Stanley Street and Allen Street.

The changes to pedestrian and cycle connectivity within the precinct currently proposed as part of the Woolloongabba UDA Development Scheme are illustrated in **Figure 6-36** and include:

- new pedestrian and cycle connections along the northern side of Stanley Street extending under the Pacific Motorway to the west of the site
- new cycle connections north-south on the eastern side of the current Leopard Street.
- new signalised intersection with Vulture Street mid way between Leopard Street and Main Street providing an opportunity for mid-block crossing by pedestrians.

Given the wide range of proposed changes above and ongoing consultation over the master plan and surrounding development, analysis of Cross River Rail pedestrian and cycle access within its surrounding precinct, beyond opening year has not been carried out.

Nevertheless, at opening year, the pedestrian and cycle access to the station would function adequately with no identified requirements for external upgrades or infrastructure changes.

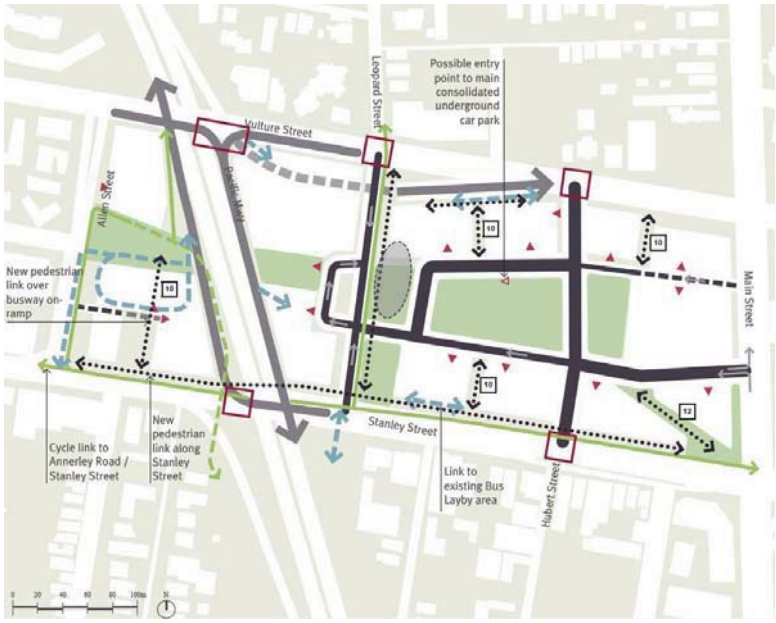


Figure 6-36 Proposed Access Plans as part of Woolloongabba UDA Development Scheme (source ULDA, 2011)

Boggo Road Station

The new Boggo Road Cross River Rail station would be co-located and connected with the existing Park Road station and the Boggo Road Busway station.

Proposed changes to pedestrian and cycle operations in the vicinity of the station as part of the Cross River Rail reference design are limited to the following as illustrated in **Figure 6-37**:

- zebra crossing of Boggo Road adjacent to the northern Cross River Rail station entrance
- zebra crossing of Pete Doherty Street adjacent to the southern Cross River Rail station entrance
- minor kerb and footway changes on the western side of Annerley Road.

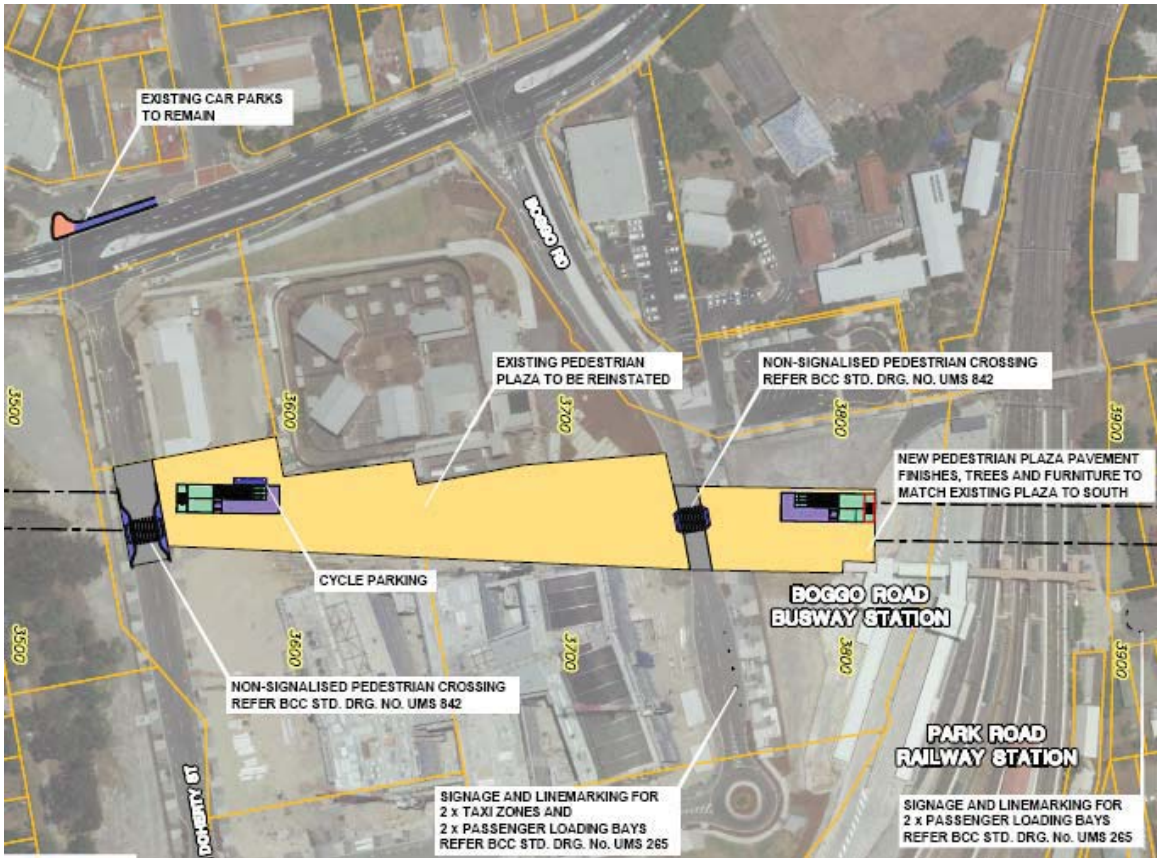


Figure 6-37 Proposed surface works around Boggo Road station

Analysis of the two proposed mid block pedestrian zebra crossings has been undertaken for, 2021. Given the large degree of change proposed within the precinct and the as-yet unconfirmed mixture of land uses proposed, 2021 was deemed the most appropriate year for analysis. Traffic analysis for the surrounding Boggo Road Urban Village was undertaken for a design year of 2016 and these volumes were “growthed up” to 2021

Pedestrian crossing volumes have been derived from initial boarding and final alighting passenger volumes from both Boggo Road (Cross River Rail) station, Boggo Road (Busway) station) and Park Road (surface railway) station. Morning peak one hour pedestrian volumes are 65% of modelled two hour peak period volumes and morning peak 1 hour traffic volumes have been derived from the Boggo Road Urban Village Traffic and Transport Report (McCormick Rankin Cagney, 2007), growthed up by 2.4% per annum from 2016 to 2021. Traffic volumes (in blue) and pedestrian volumes (in red) are illustrated in **Figure 6-38**.

The Queensland Manual for Uniform Traffic Control Devices (DTMR, 2009) sets out design and operational standards for mid block pedestrian crossings such as zebra and signalised crossings. A zebra crossing is recommended on two-lane, two-way roads where the number of pedestrians wishing to cross exceeds 65 per hour and traffic volumes exceed 600 per hour and where the volumes of pedestrians (P) multiplied by the number of vehicles (V) per hour exceeds 90,000.

Figure 6-38 Boggo Road pedestrian and vehicle crossing volumes – 2021 morning peak 1 hour

As shown in **Table 6-60**, the pedestrian volumes and the P x V at the two crossings meet the warrants for justifying a zebra crossing with only traffic volumes on Pete Doherty Street (adjacent to the southern entrance) falling below the recommended 600 per hour. Pedestrian-activated signals are not warranted at these locations.

Table 6-60 Boggo Road pedestrian and vehicle crossing demands in 2021 (AM peak hour)

Links/ area	Peak 1 hour Ped vols (P)	Peak 1 hour 2-way traffic volumes (V)	P x V
North Crossing (Boggo Road)	140	955	133,700
South Crossing (Pete Doherty Street)	295	350	103,250

6.5.3 Future pedestrian and cycle operations at rail stations – South

Dutton Park Station

There are no changes to pedestrian and cycle operations at Dutton Park station as a result of Cross River Rail.

Fairfield Station

There are no changes to pedestrian and cycle operations at Fairfield station as a result of Cross River Rail.

Yeronga Station

There are no changes to pedestrian and cycle operations at Dutton Park station as a result of Cross River Rail.

Yeerongpilly Station

Yeerongpilly is the southern most proposed Cross River Rail station. The reference project includes the relocation of the station some 200m south of it's current position to accommodate a 4-platfrom station with Willkie Street rebuilt further east of its current alignment. Changes to pedestrian and cycle infrastructure as part of the reference project are limited to the following changes which are illustrated in **Figure 6-39**:

- Yeerongpilly Station including platforms, overbridge, lifts and stairs
- covered pedestrian link along Willkie Street between relocated station and pedestrian bridge over railway
- extension of footbridge linking Yeerongpilly TOD and eastern catchment
- new (relocated) Wilkie Street, 19.5m wide, comprised of 2 x 3.0m traffic lanes and 2 x 2.5m parking lanes
- acoustic barrier along rail boundary
- Yeerongpilly Station plaza consisting of retail and dining opportunities, paving, bike racks and shade trees
- transport interchange including bus stops, taxi rank and kiss n ride/ drop off bays
- realigned Station Road as new precinct high street including high quality paving and landscaping
- acoustic barrier on rail boundary with vegetated buffer strip
- fill to raise ground level from RL10 to RL12
- possible location for future commuter carpark integrated with new development (not part of CRR scope)

Figure 6-39 Proposed surface works around Yeerongpilly Station

Analysis of pedestrian and traffic volumes in the morning peak hour, in 2016 are shown in **Figure 6-40.** These volumes have been derived from 2021 strategic model outputs. This shows the majority of passengers accessing or leaving the station to the east with around 670 two-way passenger movements, compared to an estimated 380 (two-way) movements to/ from the west.

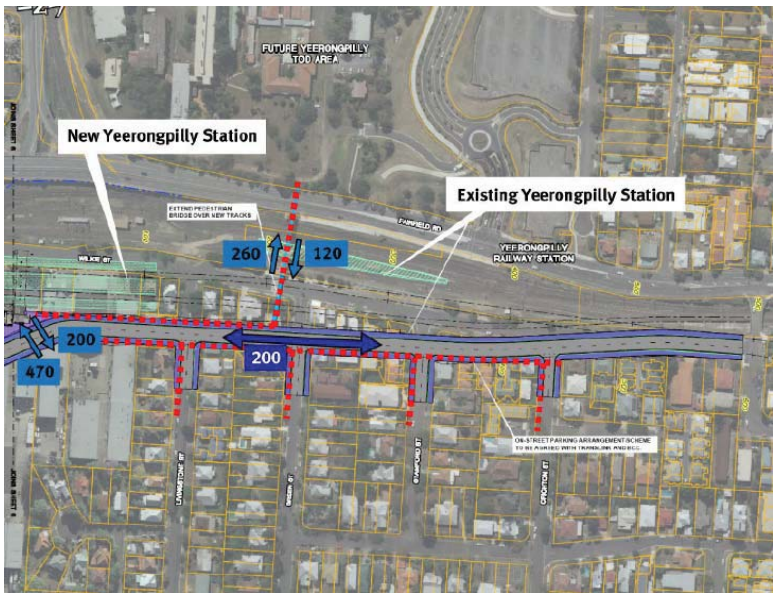


Figure 6-40 Yeerongpilly pedestrian and vehicle crossing volumes – 2021 morning peak hour (with Project)

The Queensland Manual for Uniform Traffic Control Devices (DTMR, 2009) sets out design and operational standards for mid block crossings such as zebra and signalised crossings. A zebra crossings is recommended on two-lane, two-way roads where the number of pedestrians wishing to cross exceeds 65 per hour and traffic volumes exceed 600 per hour and where the volumes of pedestrians multiplied by the number of vehicles (per hour) exceeds 90,000.

As shown in **Table 6-61**, the pedestrian volumes meet and far exceeds the warrant for requiring a pedestrian crossing however the vehicle volumes are lower than the warrant. Nevertheless, given that P x V meets the MUTCD warrants for justifying a zebra crossing and that there is currently a pedestrian crossing in vicinity of the existing station entrance then this pedestrian realigned/ relocated crossing is considered appropriate, with minimal impacts to pedestrians or vehicles anticipated.

Table 6-61 Yeerongpilly pedestrian and vehicle crossing demands in 2016 (morning peak hour)

Links/ area	Peak 1 hour Ped vols (P)	Peak 1 hour 2-way traffic volumes (V)	P x V
Wilkie Street pedestrian crossing	670	200	134,000

Pedestrian-activated signals are not warranted at this location.

Moorooka Station

There are some minor changes to pedestrian and cycle operation at Moorooka station as a result of the Cross River Rail reference design. These are illustrated in **Figure 6-41** and include:

- new relocated 2 m wide DDA compliant lift, stair and overpass structure to provide access to the station platform from Ipswich Road
- new station concourse with improved passenger facilities including ticketing, information and cycle parking.

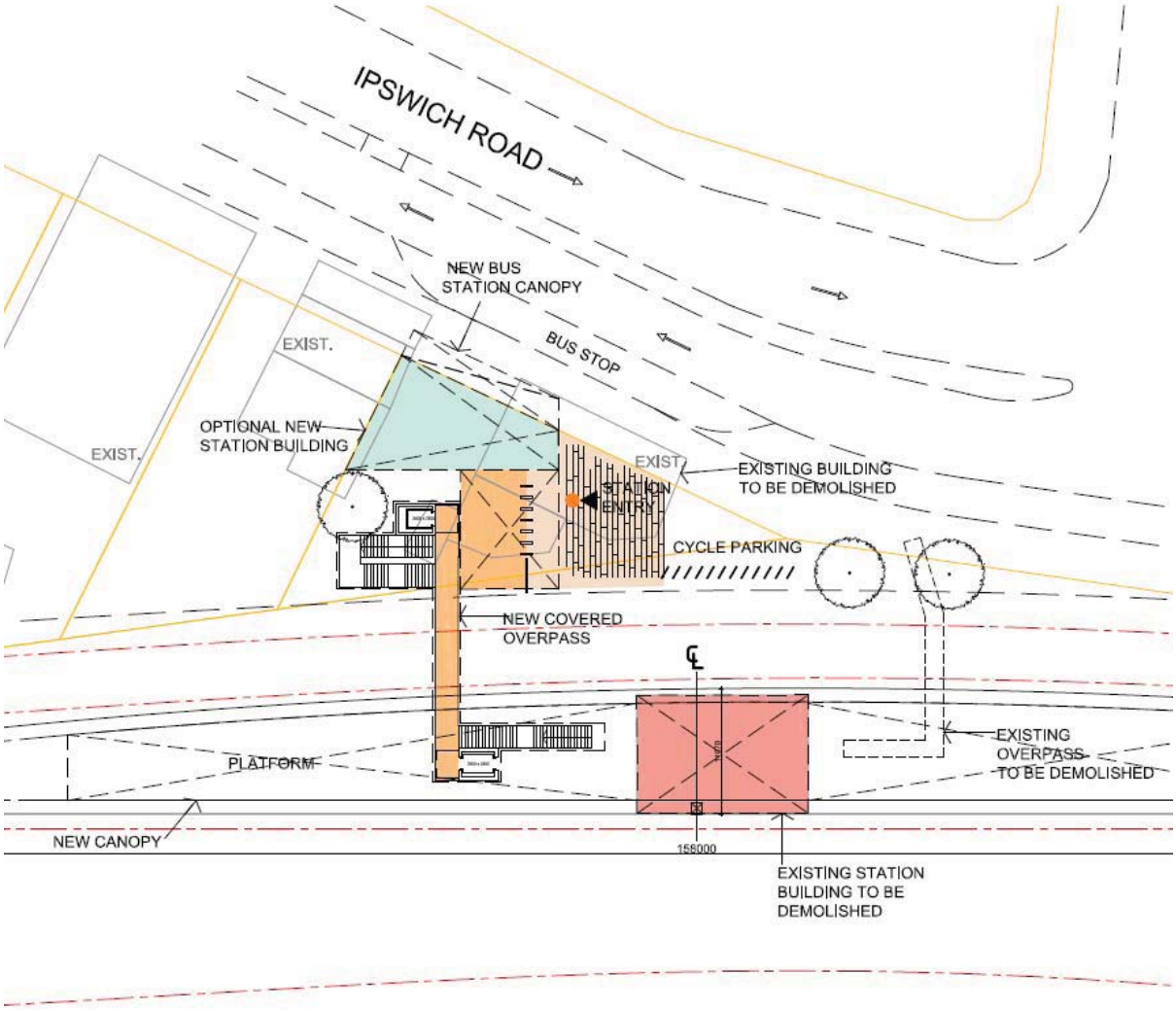


Figure 6-41 Proposed surface works around Moorooka station

There are expected to be several effects of these proposed changes including:

- improved platform access due to the new station concourse being directly aligned with the existing pedestrian crossing
- access to platforms is now DDA compliant allowing improved pedestrian access for a wider range of passengers
- wider bridge (from current 1.5 to 2 m) provides more comfortable pedestrian environment and higher capacity – allows 80 pedestrians per minute (2-way)
- cycle parking provides improved cycle access opportunities.

Rocklea Station

Approximately 250 m north-west of Rocklea station, the reference design includes changes to road and footway in the vicinity of the Ipswich Motorway southbound on-ramp. However all pedestrian and cycle access routes are to be maintained with no detrimental impacts identified.

At Rocklea station itself, the existing platforms would remain in their current position but with changes to access associated with additional tracks to the north and south as illustrated in **Figure 6-42**. To the north the additional passenger rail track requires the relocation of pedestrian access walkway linking platform 1 (southbound platform) to Railway Parade. All current accesses to the station are maintained. At 2 m wide, the proposed new overpass is wider than the existing overpass (1.8 m) and provides lift access to all platforms as well as to the northern and southern access points, allowing full DDA compliant access to the platforms from both directions.

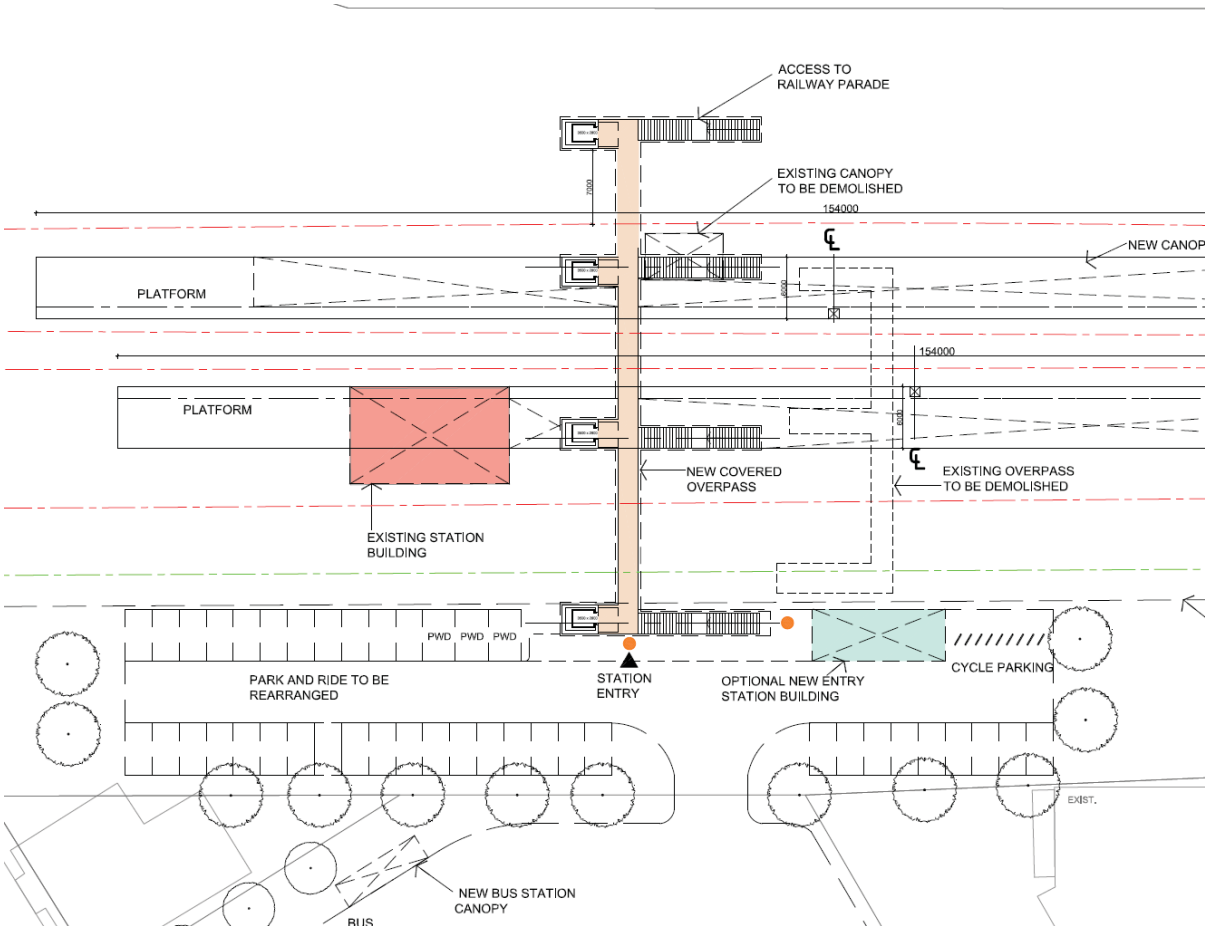


Figure 6-42 Proposed surface works around Rocklea station

Salisbury Station

600 m north of Salisbury station, the current pedestrian level crossing (adjacent to the Beaudesert Road Service Road level crossing of the railway tracks) would be removed due to an additional two tracks and increased train movements in this area (refer to **Figure 6-43)**. There is a lack of convenient alternative pedestrian and cycle crossings in this area with the adjacent Beaudesert Road overpass lacking in footpath provision, the Salisbury station overbridge is 600 m south and has no DDA compliant means of access and the Rocklea station overbridge is 750 m to the north-west. As such a new pedestrian overbridge with lifts and stairs is proposed in this location to maintain access between the east and west, in particular to ensure access between Nyanda High School on the eastern side of the railway tracks and the residential suburb of Rocklea on the western side.

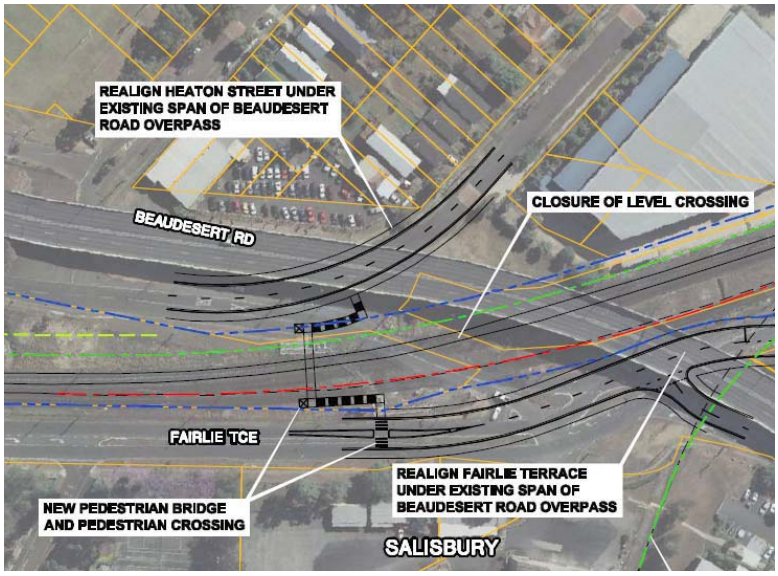


Figure 6-43 Proposed grade separated pedestrian crossing between Rocklea and Salisbury stations

Additional railway tracks immediately west of Salisbury station require an additional span of pedestrian bridge to maintain connectivity to Dollis Street and this is included in the reference design.

This provides continued access to the station from the west. No lifts or ramps are included in this extended bridge structure and Salisbury station would continue to be non-DDA compliant.

A major redevelopment of Salisbury Station is anticipated in conjunction with the Salisbury to Beaudesert Rail project which could involve new, relocated platforms and additional tracks. As such, minimal changes are proposed as part of the Cross River Rail project as they may be made redundant.

6.6 Regional, arterial and local road network with the Project

The impact of Cross River Rail on the regional and arterial road network has been assessed through analysis of the following:

- differences in traffic volumes with/ without project in 2021 and 2031 for the whole of the model area (Brisbane Metropolitan Area). This is to highlight any overall trends in numbers of trips by car and overall mode split across Brisbane as a result of the project.
- changes in traffic volumes and level of service at selected links along 5 screenlines and a CBD cordon within the study area. This is to indentify any key differences in vehicle volumes With the project compared to Without on specific links within and across the study area.
- analysis of any changes in traffic volumes on State-Controlled Roads within or immediately surrounding the study corridor in the AM peak and over 24 hours to determine whether the project leads to an increase of 5% or more in traffic on these key road links and hence trigger the requirement for more detailed analysis of impacts and mitigation measures in line with DTMR's Guidelines for the Assessment of the Road Impacts of Development
- in line with the Terms of Reference (**Section 3.1.5**), an assessment of the strategic network impacts relative to the underlying principles of Road Impact Assessment (RIA) has been undertaken in **Section 6.6.1** of this report
- in addition to the assessment of impacts at the strategic regional road level outlined above, local traffic impacts were assessed through analysis of

- modelled park and ride and kiss and ride demands to railway stations within the corridor With the project relative to Without (% differences) broken down to vehicle trips per minute in peak periods. A qualitative assessment of the expected impacts of any additional trips related to Cross River Rail relative to the available road, parking and loading infrastructure was then undertaken.
- modelled impacts of permanent road capacity changes in the CBD. In line with discussions with Brisbane City Council, changes to road network capacity in the CBD to accommodate widened footways and additional pedestrian crossings was assessed using a combination of SIDRA and TRANSYT traffic modelling software.

6.6.1 Regional road network and performance with the Project

Changes at the regional level

While only small percentage changes in road network volumes and performance on a typical weekday with the Project in operation are forecast at the Brisbane metropolitan area level, overall cumulative benefits are significant.

By 2031, the reduction in private vehicle use associated with the Project (compared to the without the Project) is forecast to reach 275 million vehicle kilometres per annum which has been estimated to equate to 30,000 litres less fuel and 3,000 tonnes less carbon dioxide per annum (Source CRR Business Case, 2010).

Table 6-62 which shows that there would be less than 1% fewer vehicle trips on the network with Cross River Rail in place compared to without Cross River Rail in both 2021 and 2031. However, this would equate to around 30,000 less trips on the road network each weekday by 2031.

Table 6-62 Average weekday trip changes with and without project in the Brisbane Metropolitan Area

Average weekday (24Hours)	2009	2021			2031		
		Without CRR	With CRR	% change	Without CRR	With CRR	% change
Total vehicle trips	4,383,200	5,652,100	5,635,500	-0.29%	6,460,200	6,431,500	-0.44%

Source: Cross River Rail Project Model

Changes to road freight

The provision of increased rail freight capacity as a result of Cross River Rail will help facilitate a mode shift from road transport to rail transport. Rail freight operations modelling (Systemwide, December 2010) provides an estimation of the future rail demands and capacity both with and without the Project.

Without the project, the increase in passenger services needed to try to meet demand means that rail freight paths will diminish. In this situation the predicted future freight demands will not be able to be met using rail and it is therefore likely to divert to road.

However, with the Project, the provision of increased rail capacity, including a dedicated rail freight corridor between Salisbury and Park Road, will mean more freight demand can be transported by rail, rather than road.

In the freight analysis undertaken for the project, the number of truck trips is forecast to decrease by approximately 900,00 trips per year by 2031 (compared to without project in the same year). These savings in vehicles trips and kilometres travelled have substantial cumulative benefits in terms of road maintenance, amenity, fuel and emissions.

Changes within the study corridor

Within and surrounding the study corridor itself, traffic volumes crossing selected major links along 5 screenlines and the "CBD cordon" have been captured and reported in **Table 6-63**. This shows that across all screenlines, two-way traffic volumes in the morning peak periods are less

With the project than Without the Project. The CBD river screenline and CBD cordon are modelled to have up to 2-3% less vehicle traffic With the project compared to Without the project in both forecast years (2021 and 2031).

Table 6-63 2-way vehicle volume changes in the AM peak period (7am-9am) on selected screenlines

Location	2009*	2021			2031		
		Without CRR	With CRR	% change	Without CRR	With CRR	% change
Screenline Inner North	26,700	39,800	39,100	-1.69%	45,900	45,500	-0.87%
Screenline Inner South	33,100	37,200	35,500	-4.47%	43,500	41,900	-3.72%
Screenline Outer North	39,900	42,500	42,100	-0.97%	45,400	44,400	-2.27%
Screenline Outer South	33,800	41,300	40,700	-1.49%	47,300	46,500	-1.75%
CBD cordon	96,200	85,500	83,200	-2.65%	89,500	87,200	-2.57%
Screenline CBD river crossings	46,300	60,200	58,400	-2.95%	68,900	67,200	-2.50%

Notes:
1. *Inner North includes Kelvin Grove Road, Lutwyche Road, Airport Link, Abbotsford Road*
2. *Inner South includes Annerley Road, Ipswich Road, M3, Logan Road*
3. *Outer North includes Samford Road, South Pine Road, Shand Street, Webster Road, Lutwyche Road, Sandgate Road*
4. *Outer South includes Fairfield Road, Ipswich Road, M3, Logan Road*
5. *CBD cordon is bounded by the Brisbane River, Hale Street, Inner City Bypass, Constance Street*
6. *CBD River Crossings include the Go Between Bridge, William Jolly bridge, Victoria Bridge, Captain Cook Bridge, Storey Bridge and Clem Jones Tunnel*

Changes in two-way road traffic volumes in the AM peak period for specific State Controlled Road links have been separately tabulated in **Table 6-64**. This illustrates a consistent yet minor modelled reduction in road traffic volumes on State Controlled Roads in and immediately surrounding the study corridor in the AM peak. Over a 24 hour period, the same links were examined however with no discernible difference (less than 0.5%) in volumes With or Without the Project.

Table 6-64 2-way vehicle volume changes in the AM peak period (7 am-9 am) on State-Controlled Road links

Location	2009	2021			2031		
		Without CRR	With CRR	% change	Without CRR	With CRR	% change
M3 Pacific Motorway (north of O'Keefe Street)	20,400	18,600	17,800	-4.51%	20,500	20,200	-1.46%
Gympie Road (north of Stafford Road)	9,500	4,700	14,600	-0.55%	16,000	15,700	-1.92%
M3 Pacific Motorway (north of Klumpp Road)	20,300	22,700	22,500	-0.93%	25,200	24,900	-1.16%
Captain Cook Bridge	20,900	20,000	19,100	-4.60%	21,500	21,200	-1.60%

To further analyse the impacts of the Project on the road network, a comparison of traffic performance on individual links in 2021, expressed as Level of Service for both the With and Without project cases is shown in **Figure 6-44**. Level of Service from strategic modelling is based on modelled speeds relative to free flow speeds. This figure illustrates very few differences in network performance across the network in and around the study corridor in 2021.

While minor reductions in vehicle volumes are reported across screen lines above, this translates into negligible difference in the performance of the road network.

In 2031, (as shown in **Figure 6-45**) there is a similar trend to 2021, whereby there is a negligible difference in road network performance at the strategic level With the Project compared to Without the Project.

In line with **Section 3.1.5** of the Cross River Rail Terms of Reference an assessment of the operational impacts of the scheme in general accordance with TMR's guidelines for the Assessment of Road Impacts of Development must be undertaken.

An assessment of the Cross River Rail project relative to the nine underlying principals of the above guidelines is outlined in **Table 6-65**.

Given the overall minor reductions reported in individual road link volumes in both 2021 and 2031 With the Project compared to Without the project, overall road network performance is expected to be very similar in the same year and well below a 5% increase at which a Road Impact Assessment would normally require further analysis and mitigation. As such no further analysis of the traffic volume changes or impacts on the State Controlled Road network has been undertaken as part of this study.

Nevertheless, **Section 6.6.2**, **Section 6.6.3** and **Section 6.6.4** detail the local road network changes which are expected to result from the Project including changes in parking and loading demands around stations along with an assessment of any permanent operational changes in road network capacity or operations.

Furthermore, temporary construction-related changes to road capacity or operations is outlined and assessed in **Section 7**.

Road crash cost savings

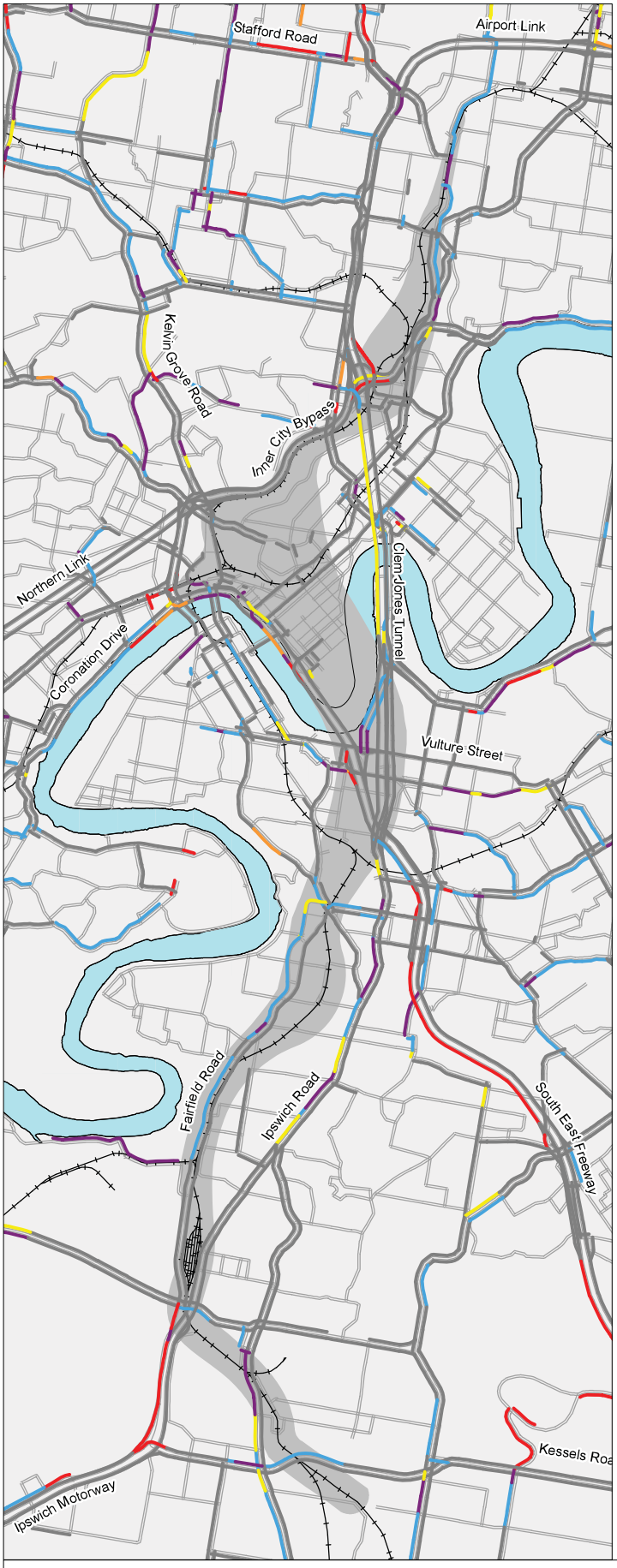
Road crashes and their costs vary by vehicle kilometres travelled and the type of road (motorway, arterial, local). Furthermore, the type of crash also varies by the speed of traffic/vehicle. Only changes to private vehicles are significant, with VKT reducing by up to 1% in 2031 when the Project is in the network.

Based on this change (a reduction of up to 275 million kilometres per year in 2031), up to two lives and 24 serious crashes a year could be avoided as a benefit of the Project. (Crash rates from Austroads, 2010).

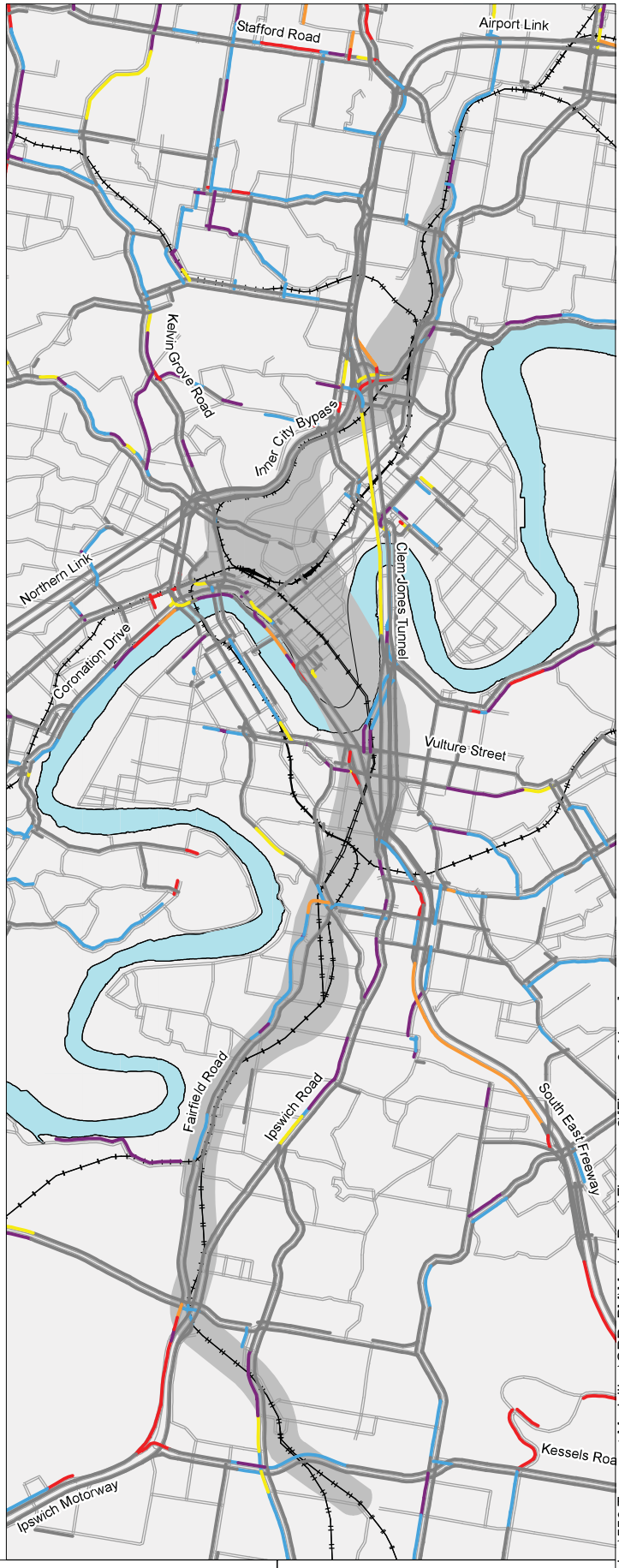
Table 6-65 Road impact assessment principals

Road Impact Assessment Underlying Principals (DMR, 2006) section 1.4	Response/ Assessment/ Comment
Principal 1 - development must not compromise the intention for DMTR to provide and maintain a safe and efficient State Controlled Road (SCR) network	Cross River Rail is forecast to lead to minor reductions in traffic across the greater Brisbane road network on a typical weekday (around 0.5% in 2031). More significant reductions in traffic were observed on State Controlled Roads in the AM peak period (up to 3% on some links) but with a negligible reduction over a 24 hour period (less than 0.5%). Overall, the Project is consistent with this principal.
Principal 2 - DTMR will invest in the road network to accommodate growth where possible however if a development will generate a high proportion of additional traffic then development contributions may be required	Cross River rail would not lead to a high proportion of additional traffic – see Principal 1 response above. As such, CRR is in agreement with this principal.
Principal 3 - in general DTMR considers a development's road impacts to be insignificant if it generates an increase in traffic on SCR of less than 5% of current daily traffic	As per principal 1 response, above, Cross River Rail would lead to sometimes minor but consistent reductions in road traffic volumes on both the SCR and non-SCR road network across Brisbane and the study corridor in particular. As such the Project agrees with this principal.
Principal 4 - when determining road impacts, DTMR requires development proponents to adopt only those intervention levels that it would use for planning and investment purposes	As no increases in road network usage are forecast, no strategic (SCR) road network interventions are considered necessary or justifiable as a result of Cross River Rail thereby meeting this principal.
Principal 5 - development that is consistent with DTMR's plans should not cause significant impacts to the road system	Cross River Rail does not cause any identifiable impacts on the road system and therefore meets this principal.
Principal 6 - if developments are inconsistent with DTMR's plans in terms of scale and intensity of use, then DTMR may set conditions of development approval for mitigation works or contributions	Cross River Rail does not cause any identifiable impacts on the road system and therefore must be considered consistent with TMR's road plans and thereby agreeing with this principal.
Principal 7 - mitigation measures do not have to be infrastructure solutions and could include transport modal choice, traffic management, alternative route selection or alternative staging of development	Cross River Rail does not cause any identifiable impacts on the road system, and as such no mitigation measures are proposed. In fact Cross River Rail is considered a mitigation measure for ongoing growth and development within the region offering additional non-road capacity and an attractive alternative to private vehicle travel. As such the Project is consistent with this principal
Principal 8 - developers are required to provide all roadworks associated with a direct connection between the development site and the SCR network and to address the developments specific road impacts on the SCR network	No permanent connections to the State Controlled Road network are required as a result of this development. Minor modifications to the alignment of the Ipswich Motorway (southbound) on ramp are proposed and reported in section 6.6.4 with no detrimental impacts identified. As such, the Project meets this principal.
Principal 9 - the use of bring forward methodology to mitigate development impacts identified in the RIA may no be acceptable to DTMR and other mitigation measures may be required	Cross River Rail does not cause any identifiable impacts on the road system, and as such no mitigation measures are proposed, including bring forward of works. As such, the Project is in agreement with this principal

Without Cross River Rail



With Cross River Rail



LEGEND

AM peak (2 hrs) level of service
for directional links carrying more than 1000 vehicles

- LoS A
- LoS B
- LoS C
- LoS D
- LoS E
- LoS F

Study Corridor

Model ID: CRR_2021_001X (without) BEN2021_013_008_HWY (with)

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-44

2021 morning peak period road traffic level of service with and without Cross River Rail

N

CrossRiverRail

SKM aurecon
CRR JOINT VENTURE

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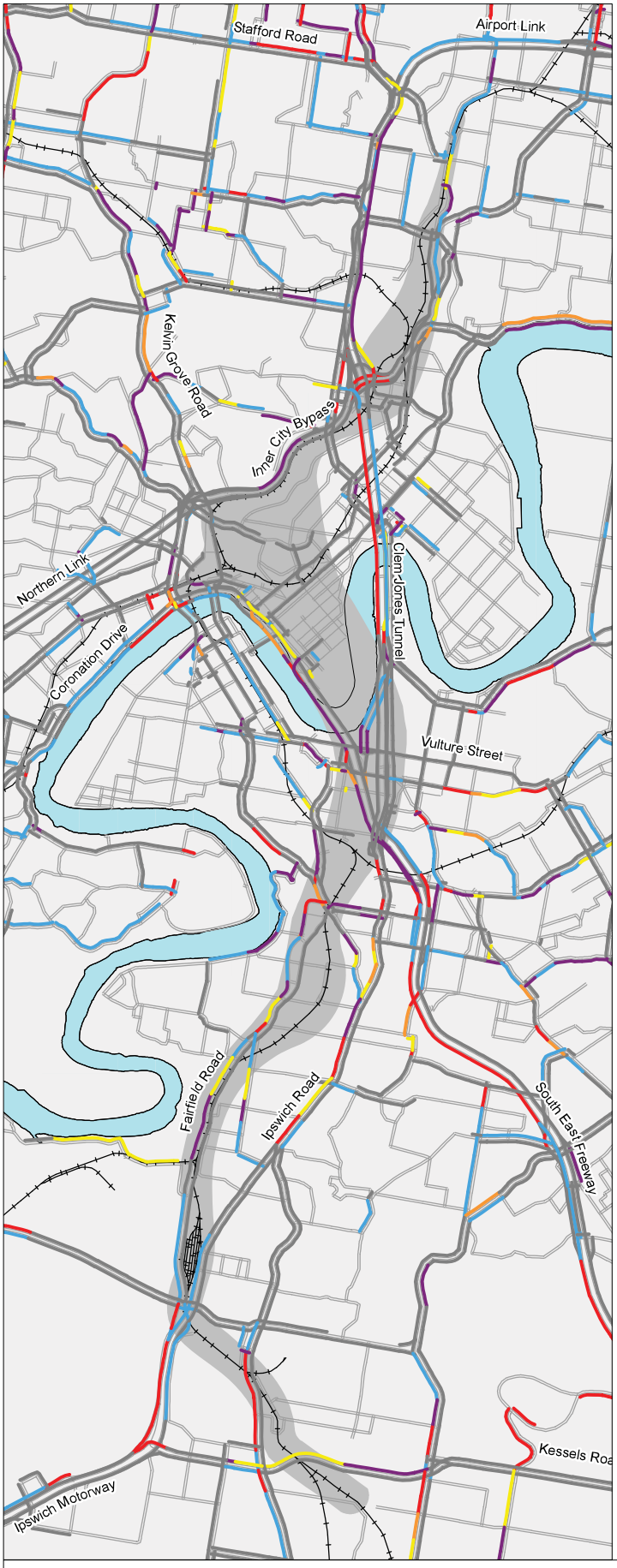
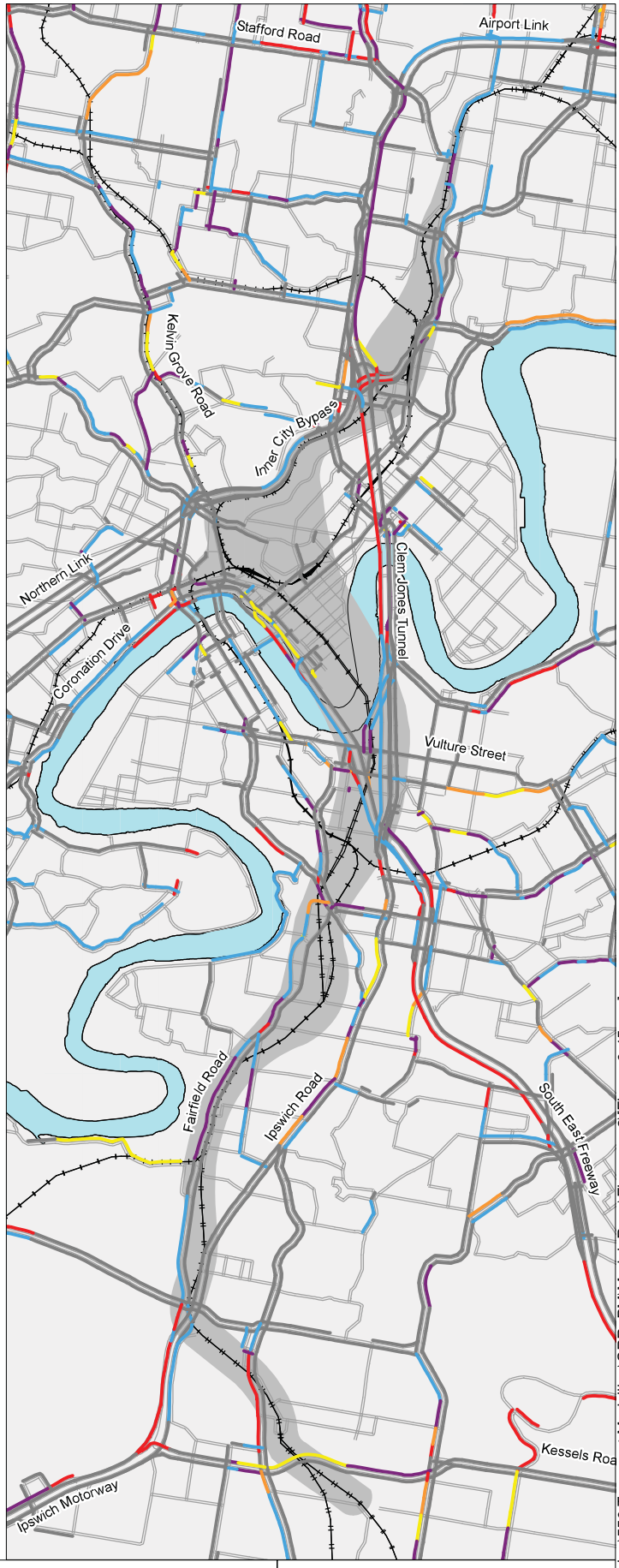
Without Cross River Rail



With Cross River Rail



LEGEND

AM peak (2 hrs) level of service
for directional links carrying more than 1000 vehicles

LoS A
LoS B
LoS C
LoS D
LoS E
LoS F

Study Corridor

Model ID: CRR_2031_012X (without) BEN2031_104_078_HWY (with)

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-45

2031 morning peak period road traffic level of service with and without Cross River Rail

N

CrossRiverRail

SKM aurecon
CRR JOINT VENTURE

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6.6.2 Future local road and traffic changes with the Project – North

The commentary below outlines the key impacts of any required road network changes in the vicinity of stations within the northern area of the study corridor and analysis of modelled changes to park 'n' ride and kiss 'n' ride demands and their potential impact on the local and regional road network. The full output tables tabulating park 'n' ride and kiss 'n' ride demands for all scenarios can be found in **Appendix F.**

Wooloowin Station – vehicle access changes and demands

Road network changes

There are no physical road network changes as a result of Cross River Rail in the vicinity of Wooloowin station.

Park 'n' ride demands

Forecast daily park 'n' ride demands are expected to increase slightly from 168 park 'n' ride trips (or 140 spaces assuming average occupancy of 1.2 people per car) in 2009, to 191 park 'n' ride trips in 2031 equating to 160 vehicles. This is around 4% more than without Cross River Rail, Given current park 'n' ride capacity for 190 vehicles, then negligible park 'n' ride parking impacts are forecast with or without Cross River Rail and no mitigation measures are recommended.

Kiss 'n' ride (including taxi)

Little change in peak or daily kiss 'n' ride activity is forecast at Wooloowin with or without the Project. In 2009, 80 kiss 'n' ride drop-offs were forecast in the morning peak, and this is expected to increase slightly to 86 in 2031 with Cross River Rail (compared to 80 without Project). Daily kiss 'n' ride trips remain virtually constant over time at around 165 trips per day, with or without Cross River Rail. As such, no additional kiss 'n' ride infrastructure or mitigation is recommended at Wooloowin Station.

Albion

Road network changes

There are no physical road network changes as a result of Cross River Rail in the vicinity of Albion Station.

Park 'n' ride demands

Modelled daily park 'n' ride demands are expected to increase from 660 park 'n' ride boarding trips in 2009 (or 550 cars assuming 1.2 people per car), to 790 park 'n' ride trips in 2031, equating to over 650 vehicles. Differences in park 'n' ride demand are around 6% higher with Cross River Rail in 2031. Given current park 'n' ride capacity of around 300 cars which is not expected to change, then park 'n' ride overspill parking impacts are forecast with or without Cross River Rail and mitigation is recommended regardless of Cross River Rail. Measures could include on-street parking controls including two hour parking with resident only parking zones.

Kiss 'n' ride (including taxi)

Little change in peak or daily kiss 'n' ride activity is expected at Albion with or without the project. In 2009, 180 kiss 'n' ride drop-offs were modelled across the day, and this is expected to increase slightly to 209 in 2031 with Cross River Rail. Daily kiss 'n' ride trips are around 7% more in 2031 with Cross River Rail compared to without. Given the range of kiss 'n' ride opportunities on all sides of the station, no additional kiss 'n' ride infrastructure or mitigation is proposed at Albion Station.

Bowen Hills

Road network changes

There are no physical road network changes as a result of Cross River Rail in the vicinity of Bowen Hills Station.

Park 'n' ride demands

There are no forecast park 'n' ride trips at Bowen Hills Station in 2009 or in any future year, with or without Cross River Rail. As such, no mitigation is required.

Kiss 'n' ride (including taxi)

Minor changes in peak and daily kiss 'n' ride activity are expected at Bowen Hills. In 2009, 240 kiss 'n' ride drop-offs were modelled across the day (around 130 of these in the morning peak period) and this is expected to increase to 254 in 2031 with Cross River Rail (6% more than without project). The above daily demands translate to AM peak kiss 'n' ride demands (with the project) of 148 trips over 2 hours (or 2 to 3 drop offs per minute in the peak 15 minutes). The small percentage increase in modelled kiss and ride trips With project compared to without, combined with the available opportunities for kiss and ride pick up and drop off on Hudd Street means that no additional kiss 'n' ride infrastructure or mitigation is recommended at Bowen Hills Station.

Ekka

Road network changes

O'Connell Terrace immediately adjacent to the Ekka Station northern entrance will be rebuilt as part of Cross River Rail due to the need to provide a wider, and higher bridge over the rail corridor, This will re-provide all existing road capacity (that is 2 westbound lanes and 1 eastbound lane) with space for an additional eastbound lane in the future when required.

However due to the bridge being raised approximately 2 m to meet modern rail clearance standards, re-grading of O'Connell Terrace is required for around 70 m to the east and 150 m to the west to meet the new bridge level. As such, current accesses off O'Connell Terrace will need to be re-graded and future accesses approved under the RNA Showgrounds masterplan (**Figure 6-46**) may not now be achievable.

For example the proposed main access road off O'Connell Terrace, immediately west of the O'Connell Terrace rail overbridge would be located close to the crest of the new re-graded O'Connell Terrace and due to the gradient of the topography on the alignment of this proposed road, would necessitate a steep incline to meet the raised O'Connell Terrace.

Furthermore, the widening of the rail corridor to the west to accommodate 2 additional tracks and a 12 m wide island platform means the railway corridor now encroaches on the area currently designated for this access road. As such, this is likely to be unachievable in its current location. Nevertheless, an alternative access road is already included in the RNA Showgrounds masterplan, approximately 200 m further west along O'Connell Terrace. Reconfiguration of internal access roads, carpark entrances and vehicle loading zones may be required to ensure an operable alternative.

Within the RNA site, two existing (combined) vehicle and pedestrian access roads under the rail corridor will be retained. The northern-most access road is currently made up of 2 x 9 m bridge spans, with a height clearance of around 3.4 m. This would be reduced to 2 x 5 m spans but with a height clearance of around 3.7 m.

Further analysis of the impacts on this reduced width may be required; however the reference design includes additional spans of the viaduct to the west which could be designated for pedestrian use if additional cross-corridor capacity was required during events (eg the Ekka show). 90 m south of this bridge is a second rail crossing/ subway and a major RNA showgrounds north-south pedestrian spine – one which forms a key link in the RNA masterplan.

This link also provides access for light service vehicles outside of busy pedestrian times (ie in non-event mode). This subway is comprised of 2 narrow (approx 3 m) wide spans with around 2.8 m of height clearance. The Cross River Rail reference design allows for a 15 m wide subway with a height clearance of 3.3 m providing a significant improvement in access under the railway in this location.

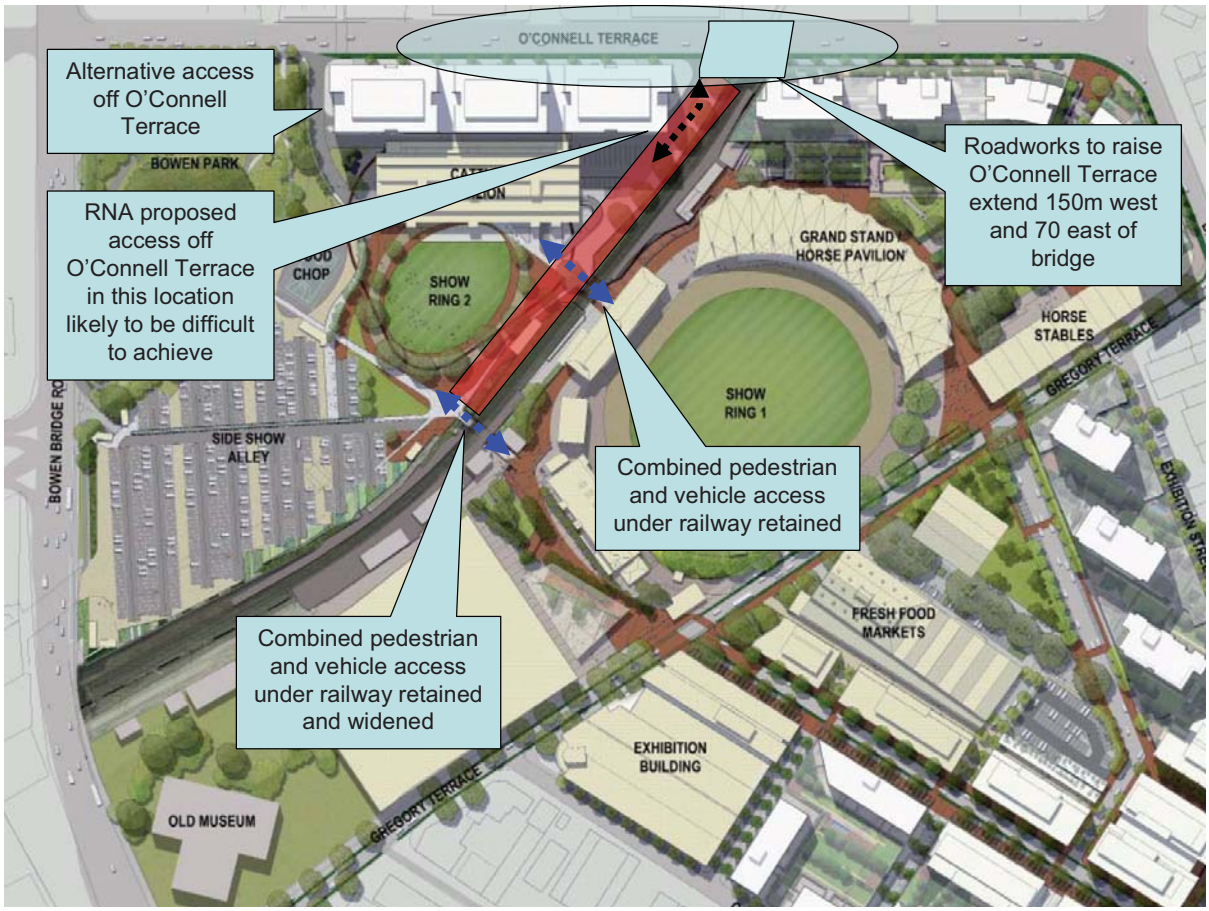


Figure 6-46 Proposed changes to vehicle accesses relative to RNA Showgrounds master plan

Park 'n' ride demands

There are no forecast park 'n' ride trips at Ekka station in any future year, with Cross River Rail. As such, no mitigation is required.

Kiss 'n' ride (including taxi)

In 2021, there are forecast to be 240 kiss 'n' ride drop off in the morning peak period and 410 over the full day. In 2031, there is a reduction in station usage, including kiss 'n' ride due to wider network operational changes resulting in a reduction in train services. As such, 190 morning peak period drop offs are forecast in 2031, with 320 drop off trips expected across the day. In 2021 (the busiest forecast year of analysis for this station), 240 kiss 'n' ride drop off trips over two hours equates to around three cars per minute in the busiest 15 minutes of the peak period. With three taxi bays and four passenger drop off bays proposed adjacent to the station's northern entrance on the southern side of O'Connell Terrace, sufficient capacity is predicted with no detrimental impacts on surrounding road performance.

6.6.3 Future local road and traffic changes with the Project – Central

Central Station

Road network changes

There are no physical road network changes as a result of Cross River Rail in the vicinity of Central Station.

Park 'n' ride demands

There are no forecast park 'n' ride trips at Central Station in any future year, with Cross River Rail. As such, no mitigation is required.

Kiss 'n' ride (including taxi)

Minor changes in peak and daily kiss 'n' ride activity are forecast at Central station. In 2009, around 180 Kiss 'n' Ride drop off trips were modelled in the morning peak. By 2031, this number is expected to be around 220 trips without Cross River Rail and 240 trips with Cross River Rail. Cross River Rail therefore causes an 8% reduction in kiss 'n' ride trips in 2031. The increase in 2031 could be the result of greater number of overall passengers on the public transport network as a whole. Overall, this kiss and ride activity equates to 4 kiss 'n' ride vehicles per minute in the peak 15 minutes.

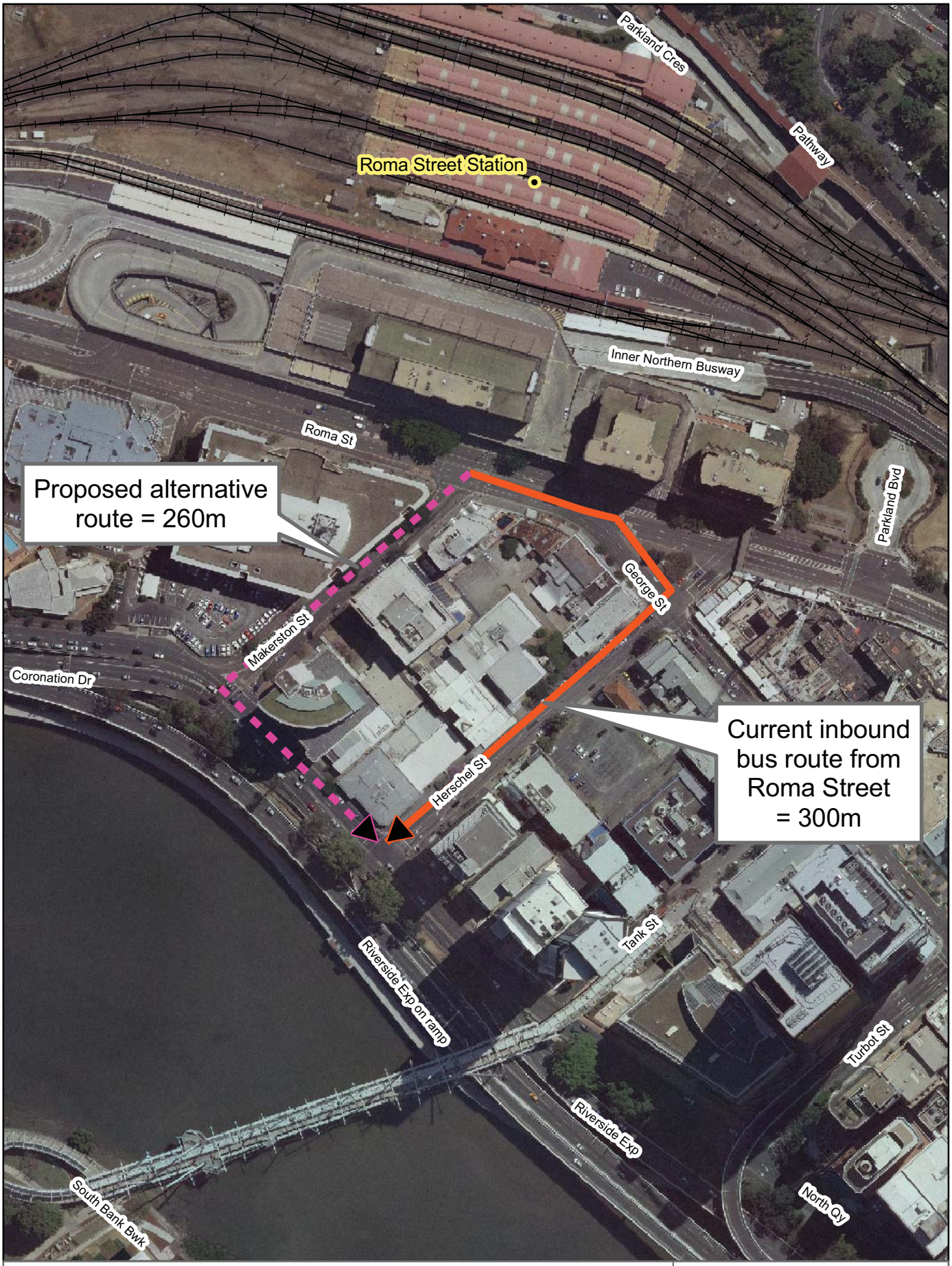
While vehicle drop off opportunities around Central station are limited, the difference between With and Without cases is not significant, and it is reasonable to expect that Kiss and Ride trips will continue to make use of existing short term loading opportunities in surrounding streets with no detrimental impact on traffic operations. As such no dedicated Kiss and Ride infrastructure is recommended at Central station as a result of Cross River Rail.

Roma Street

Road network changes

Road network changes at Roma Street have been discussed in **Section 6.5.2**. Road network changes at Roma Street for Cross River Rail include:

- a new right turn from Roma Street west to Makerston Street for buses only.
- closure of the current right turn for buses from Roma Street to George Street and from George Street to Herschel Street combined with a new signalised pedestrian crossing of Herschel Street on the northern side of George Street
- minor modifications to the intersection of Roma Street and Herschel Street to accommodate a new pedestrian crossing on the western side of the intersection
- minor modifications to the intersection of Roma Street and Parklands Boulevard to accommodate a new pedestrian crossing on the eastern side of the intersection.



LEGEND

- Study Corridor
- Railway Station
- Railway Line
- Current Route
- Proposed Route

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-47

Proposed Redirection of Inbound Buses from Roma Street

0 25 50 75 100 Meters

N

1:2,500 at A4

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G093_CCR_Trans_Roma_St_Diversion_A4_ver93.mxd 06/07/2011 15:30

The key change to vehicle circulation as part of the reference design will be the redirection of buses from Herschel Street to Makerston Street in the eastbound (inbound) direction. Outbound buses will continue to use George Street and Roma Street and are unaffected by the proposal). The redirected inbound buses (**Figure 6-47**) are expected to experience a slight reduction in route distance with the current route from Roma Street to North Quay via Herschel Street approximately 300 m long, compared to the proposed route from Roma Street to North Quay via Makerston Street which is approximately 260 m, a saving of 40 m, and one set of traffic signals. As such, bus journey times are forecast to be no worse than at present, with marginal time savings possible.

There are no other changes to vehicle access or circulation as part of the reference design, with all existing turning movements, private accesses and on street parking and loading opportunities remaining as present. However changes to intersection configurations have been assessed to determine the extent of any potential traffic impact of additional pedestrian crossings

Traffic modelling has been undertaken by AECOM (AECOM, October 2010) to assess the traffic impacts of the above changes. Morning and evening peak TRANSYT modelling was undertaken for five scenarios, namely:

- 2010 existing situation
- 2016 Without Cross River Rail case. Assumed existing road layout with traffic demand increased to 103.7% of existing (2010) and pedestrian demand increased to 115.3% of existing (2010).The 2016 volumes/ performance results have reported below for 2021 (approx opening year) given the minimal growth in vehicle traffic over the 6 years from 2010 to 2016 and subsequent low growth (less than 4% anticipated) between 2016 and 2021 which is within daily traffic variations.
- 2016 With Cross River Rail case. Assumed proposed road layout with traffic demand increased to 104.9% of existing (2010) and pedestrian demand increased to account for Cross River Rail. As per above, 2016 modelling results have been used as indicative of 2021 (approx opening year) traffic conditions and likely impacts with CRR changes.
- 2031 Without Cross River Rail case. Assumed existing road layout with traffic demand increased to 113.4% of existing (2010) and pedestrian demand increased to 164.4% of existing (2010).
- 2031 With Cross River Rail case. Assumed proposed road layout with traffic demand increased to 118.2% of existing and pedestrian demand increased to account for Cross River Rail.

At the intersection of Roma Street and Makerston Street the current right hand (through) bus lane would be converted to a bus-only right turn lane which would require a new right turn signal phase to be added to this intersection. However the new phase adds only marginally to overall AM peak delays in overall level of service with the intersection remaining LOS A in 2021 and worsening only slightly from LOS A to LOS B in 2031 (AM peak).

The Degree of Saturation is slightly better with the Project compared to without and the intersection is within capacity in both 2021 and 2031, with a DOS x value of 0.68 (well below the 0.95 which is considered the maximum desirable). In the PM peak overall intersection delays are the same or better with project compared to without, with LOS A expected in 2021 and LOS B in 2031. Degree of Saturation is slightly worse with the project to compared to without, in the PM peak, but still well within desirable maximum capacity with a DOS value of 0.71 in 2031 PM peak (with Project) (refer to **Table 6-66** and **Table 6-67)**.

Table 6-66 Changes to traffic conditions with / without project at intersection of Roma Street and Makerston Street – morning peak

AM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
Roma Street East Through & Left	0.41	B	0.43	B	0.00	B	0.46	B	0.65	C
Roma Street East Through	0.30	A	0.31	A	0.33	A	0.34	A	0.50	A
Makerston Street South	0.63	F	0.65	F	0.64	E	0.71	F	0.68	F
Roma Street West Through	0.40	A	0.41	A	0.44	A	0.45	A	0.63	B
Roma Street West Bus Lane	0.50	A	0.50	A	0.60	A	0.60	A	0.80	A
INTERSECTION TOTAL	0.63	A	0.65	A	0.64	A	0.71	A	0.68	B

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

Table 6-67 Changes to traffic conditions with / without project at intersection of Roma Street and Makerston Street – evening peak

PM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
Roma Street East Through & Left	0.34	B	0.38	B	0.00	A	0.42	B	0.45	B
Roma Street East Through	0.43	A	0.45	A	0.47	A	0.50	B	0.63	A
Makerston Street South	0.59	F	0.61	F	0.64	F	0.66	F	0.71	F
Roma Street West Through	0.30	A	0.32	A	0.31	A	0.34	A	0.41	B
Roma Street West Bus Lane	0.03	A	0.03	A	0.03	A	0.04	A	0.04	A
INTERSECTION TOTAL	0.59	B	0.61	B	0.64	A	0.66	B	0.71	B

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

The intersection of Roma Street and Herschel Street would have a new direct pedestrian crossing installed on the Roma Street western approach as a result of the reference design but no change to lane configuration or access arrangements. This leads to a slight increase in average intersection delays in 2021 but negligible change in 2031 AM peak, with the intersection performing well (LOS A) in all years, regardless of the project. There is a slight increase in the Degree of Saturation value but still well within desirable maximum capacity in all years, with a DOS value of 0.58 forecast in 2031 am peak, with the project.

In the PM peak, Transyt forecasts an improvement in intersection performance with less average delay in 2021 and 2031 and an improvement in overall Level of Service from LOS B to LOS A in both 2021 and 2031 PM peaks. Similarly, Degree of Saturation values improve with the project compared to without, in the PM peak, from 0.57 to 0.51 in 2031 (refer to **Table 6-68, Table 6-69, Table 6-70, Table 6-71)**.

Table 6-68 Changes to traffic conditions with / without project at intersection of Roma Street and Herschel Street – morning peak

AM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
Car Park Exit North	0.12	A	0.12	A	0.12	A	0.14	A	0.14	A
Roma Street East Through & Left	0.40	B	0.41	B	0.23	A	0.46	B	0.30	B
Roma Street East Through	0.32	C	0.33	C	0.37	B	0.36	C	0.53	C
Herschel Street South Through & Right	0.42	C	0.44	C	0.25	B	0.47	C	0.32	B
Roma Street West Through & Left	0.33	A	0.34	A	0.54	A	0.37	A	0.58	A
INTERSECTION TOTAL	0.42	A	0.44	A	0.54	A	0.47	A	0.58	A

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

Table 6-69 Changes to traffic conditions with / without project at intersection of Roma Street and Herschel Street – PM peak

PM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
Car Park Exit North	0.12	A	0.12	A	0.13	A	0.14	A	0.16	A
Roma Street East Through & Left	0.52	C	0.51	C	0.17	A	0.57	C	0.19	B
Roma Street East Through	0.34	C	0.36	C	0.45	B	0.40	C	0.51	B
Herschel Street South Through & Right	0.42	D	0.43	D	0.28	C	0.48	D	0.29	C
Roma Street West Through & Left	0.24	A	0.25	A	0.33	A	0.27	A	0.38	A
INTERSECTION TOTAL	0.52	B	0.51	B	0.45	A	0.57	B	0.51	A

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

The intersection of Roma Street and Parklands Boulevard would be modified to include a new pedestrian crossing on the Roma Street eastern approach to the intersection under the reference design. This would involve longer clearance times from Parklands Boulevard as vehicles must wait for pedestrians to cross before proceeding left through the intersection. Nevertheless, as the conflicting left turn is a minor movement, and with revised signal timings, overall intersection delays are slightly better in both 2021 and 2031 with project compared to without, and an overall Level of Service B in all scenarios and years in the AM peak. Degree of Saturation improves with the above changes, with the DOS value reducing from 0.93 in 2031 without project to 0.79 with project. In the PM peak, there is a similar result, with LOS B in all cases and an improvement on Degree of Saturation.

Table 6-70 Changes to traffic conditions with / without project at intersection of Roma Street and Parklands Boulevard – morning peak

AM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
Parklands Bvd North Left & Right	0.92	F	0.95	F	0.70	E	0.93	F	0.79	E
Roma Street East Through	0.25	A	0.26	A	0.18	A	0.29	A	0.21	B
Roma Street East Right turn	0.26	B	0.28	B	0.36	C	0.34	B	0.65	F
Roma Street West Through & Left	0.26	A	0.28	A	0.43	B	0.39	A	0.58	B
Roma Street West Through	0.37	A	0.37	A	0.49	A	0.37	A	0.53	A
INTERSECTION TOTAL	0.92	B	0.95	B	0.70	B	0.93	B	0.79	B

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

Table 6-71 Changes to traffic conditions with / without project at intersection of Roma Street and Parklands Boulevard – evening peak

PM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
Parklands Bvd North Left & Right	0.93	F	0.96	F	0.66	E	0.92	F	0.71	E
Roma Street East Through	0.19	A	0.20	A	0.25	A	0.22	A	0.32	B
Roma Street East Right turn	0.21	B	0.23	B	0.22	C	0.30	B	0.35	C
Roma Street West Through & Left	0.19	A	0.21	A	0.27	B	0.26	A	0.37	B
Roma Street West Through	0.35	A	0.35	A	0.43	B	0.36	A	0.50	A
INTERSECTION TOTAL	**0.93**	**B**	**0.96**	**B**	**0.66**	**B**	**0.92**	**B**	**0.71**	**B**

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

The proposed modifications to the intersection of George Street and Herschel Street maintain all current movements for general traffic but remove the conflicting bus contra-flow lane. A new pedestrian and cycle crossing of the Herschel Street (North) leg is also provided. As a result of removing the bus contra flow lane, the overall intersection and the phasing arrangement is simplified from 5 phases to 3 phases. In the AM peak the performance of the intersection improves substantially from an expected Level of Service D in 2021 and F in 2031 (without project) to LOS B in 2021 and 2031 with the project. Degree of Saturation, similarly improves significantly from a DOS value of 0.85 in 2021 and 1.00 in 0231 (without project) to 0.55 and 0.59 with the project changes (refer to **Table 6-72**).

Table 6-72 Changes to traffic conditions with / without project at intersection of Herschel and George streets – morning peak

AM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
Herschel Street North Through	0.22	A	0.23	A	0.15	A	0.25	A	0.20	A
George Street East Through & Left	0.81	F	0.84	F	0.46	C	1.00	F	0.41	B
George Street East Through & Right	0.83	D	0.85	D	0.37	B	0.97	F	0.45	B
George St Through (Proposed Layout Only)	-		-		0.55	B	-		0.49	B
Herschel Street South Left Turn	0.32	B	0.34	B	0.45	C	0.38	C	0.59	C
Herschel Street South Through & Left	0.65	D	0.66	D	0.39	C	0.70	E	0.47	C
Contraflow Bus Lane (Existing Layout Only)	0.32	C	0.34	C	-		0.37	C	-	
INTERSECTION TOTAL	0.83	D	0.85	D	0.55	B	1.00	F	0.59	B

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

In the evening peak, similarly, the reference design changes to the intersection would work well, with the proposed design reducing overall delays when compared to the do-minimum options and improving the Level of Service from LOS D in 2031 evening peak without project to LOS C in 2031 evening peak (with project). Degree of Saturation is also better in both 2021 and 2031 with the project compared to without (refer to **Table 6-73**).

Table 6-73 Changes to traffic conditions with / without project at intersection of Herschel and George streets – evening peak

PM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
Herschel Street North Through	0.19	A	0.20	A	0.12	A	0.22	A	0.14	A
George Street East Through & Left	0.59	D	0.58	D	0.50	C	0.71	D	0.67	D
George Street East Through & Right	0.53	C	0.55	C	0.33	C	0.60	C	0.65	D
George St Through (Proposed Layout Only)	-		-		0.67	C	-		0.67	C
Herschel Street South Left Turn	0.34	D	0.35	D	0.54	E	0.40	D	0.56	D
Herschel Street South Through & Left	0.72	F	0.73	F	0.48	D	0.78	F	0.46	D
Contraflow Bus Lane (Existing Layout Only)	0.49	F	0.52	F	-		0.56	F	-	
INTERSECTION TOTAL	0.72	C	0.73	C	0.67	C	0.78	D	0.67	C

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

Analysis of journey time results from Transyt, shows that in 2021 the proposed design provides a general improvement in network journey times with the exception of the eastbound movement along Roma Street in the AM peak (an increase from 37 to 53 seconds). This increase in delay is due to the new pedestrian crossing facility provided at the Herschel Street intersection which reduces the available phase green time for this movement.

By 2031, whilst the design provides a general improvement to journey times in the network during the evening peak, the morning peak sees an increase in journey times along Roma Street (from 66 to 84 seconds westbound and from 40 to 56 seconds eastbound). This would be as a result of the additional pedestrian crossing facilities along Roma Street and the substantial increase in pedestrian volumes. The increased pedestrian volumes require a higher percentage of the phase splits to be given to the side roads such as Parklands Boulevard and Makerston Street at the expense of the Roma Street corridor. In both 2021 and 2031 however, the greatest journey time savings are found at the intersection of George Street and Herschel as a result of the removal of the two bus only right turn phases. In the morning peak in particular this change would provide a 50% reduction in journey times along the George Street corridor.

Overall the physical road network changes proposed as part of the reference design are considered appropriate in order to provide for the required additional pedestrian crossing opportunities needed to mitigate the additional pedestrian demands generated by the project, with acceptable impacts on traffic. Despite some additional delays for some traffic movements, overall road network performance is good, with intersections performing within capacity (better than without Project in some instances) providing benefits for pedestrians, buses and some car drivers.

Park 'n' ride demands

There are no forecast park 'n' ride trsips at Roma Street Station in any future year, with Cross River Rail. As such, no mitigation is required.

Kiss 'n' ride (including taxi)

Daily kiss 'n' ride activity is expected to increase from 170 in the morning peak in 2009 to up to 270 in the morning peak by 2031 without the project. Cross River Rail does not increase overall kiss 'n' ride demands and in fact in 2031, leads to a negligible reduction in kiss 'n' ride trips at Roma Street (4 trips). These 270 drop off trips in the morning peak equates to around four vehicle trips per minute in the busiest 15 minutes. Given current capacity for at least six taxis and kiss 'n' ride vehicles within the ground floor area of the Transit Centre carpark then no additional facilities would be required.

Albert Street

Road network changes

Road network changes at Albert Street have been discussed in **Section 6.5.2** in relation to pedestrian improvements. A summary of the road traffic and parking/ loading changes is listed here:

- minor reductions in lane capacity at the intersection of Albert Street/ Mary Street and Albert Street/ Charlotte street, including removal of the dedicated right turn lane from Charlotte Street (east) in order to widen footway
- conversion of redundant carriageway to footway at the corner of Margaret Street and Albert Street on the Margaret Street "exit" side where existing full time kerbside uses prevent through traffic using these lanes. No change to capacity on the Margaret street western approach to the intersection.
- removal of the left lane of Alice Street at Albert Street where there is current kerbside uses at all times (ie no loss of traffic lane)
- relocation of 30 m of taxi loading zone from Albert Street into Mary Street in order to widen approximately 5 0m of the western side of Albert street between Charlotte Street and Elizabeth Street with no change to lane configurations or traffic capacity at the intersection of Albert Street and Elizabeth Street
- loss of 4 x 2 hour parking bays on Alice Street
- loss of 2 x 2 hour parking bays on south side of Mary Street (west of Albert Street) due to alignment of proposed new westbound lane
- loss of 1 x 5m loading bay on south side of Mary Street (west of Albert Street) due to alignment of proposed new westbound lane
- loss of 2 x loading bays on the north side of Mary Street (east of Albert Street) due to new 30m taxi loading zone
- loss of 2 x loading bays and 2 x 2 hour parking bays on the south side of Mary Street (east of Albert Street) for additional taxi loading
- removal of 15 m of loading zone from the western side of Albert Street and 10m from the eastern side of Albert Street (between Mary Street and Charlotte Street) but reprovision of 30m of timed (off peak) footway loading zone on the eastern side of Albert Street
- loss of 3 x motorcycle spaces removed on the south side of Charlotte Street (west of Albert Street)
- loss of 1 x loading bay on the north side of Charlotte Street (west of Albert Street)
- loss of 1 x 2 hour parking bay on the north side of Charlotte Street (east of Albert Street)
- reduction in taxi loading bay on western side of Albert Street (between Charlotte Street and Elizabeth Street) from 70m to 40m with 30m relocated to Mary Street.

Traffic modelling in Albert Street has been undertaken using SIDRA to assess the impacts of the proposed capacity changes at the intersection of Albert Street / Mary Street and Albert Street/ Charlotte Street. Both morning and evening peaks have been modelled, with and without project. SIDRA is a traffic intersection modelling tool which optimises signal phasing to minimise impacts on level of service and related various performance indicators such as delay. Although SIDRA takes some account of signal coordination such as the extent of vehicle platooning, it does not model network operations therefore any results indicating degrees of saturation in excess of 1.0 must be viewed with some caution as they may indicate conditions which would generate traffic redistribution to other routes in the CBD and wider city frame network. SIDRA is considered to be an appropriate analysis tool for comparative analysis given the similarities between the proposed and existing intersection layouts and volumes.

At the intersection of Albert Street and Charlotte Street, minor modifications are proposed which would reduce the capacity of Charlotte Street from three lanes to two lanes in order to accommodate substantial increases in pedestrian activity as outlined in **Section 6.5.2**. For example pedestrians crossing north-south across Charlotte Street at this location are forecast to increase from 30 people every 90 second signal cycle (in 2010 morning peak) to 55 in 2021 morning peak and 116 in 2031 morning peak.. That would be almost four times the current number.

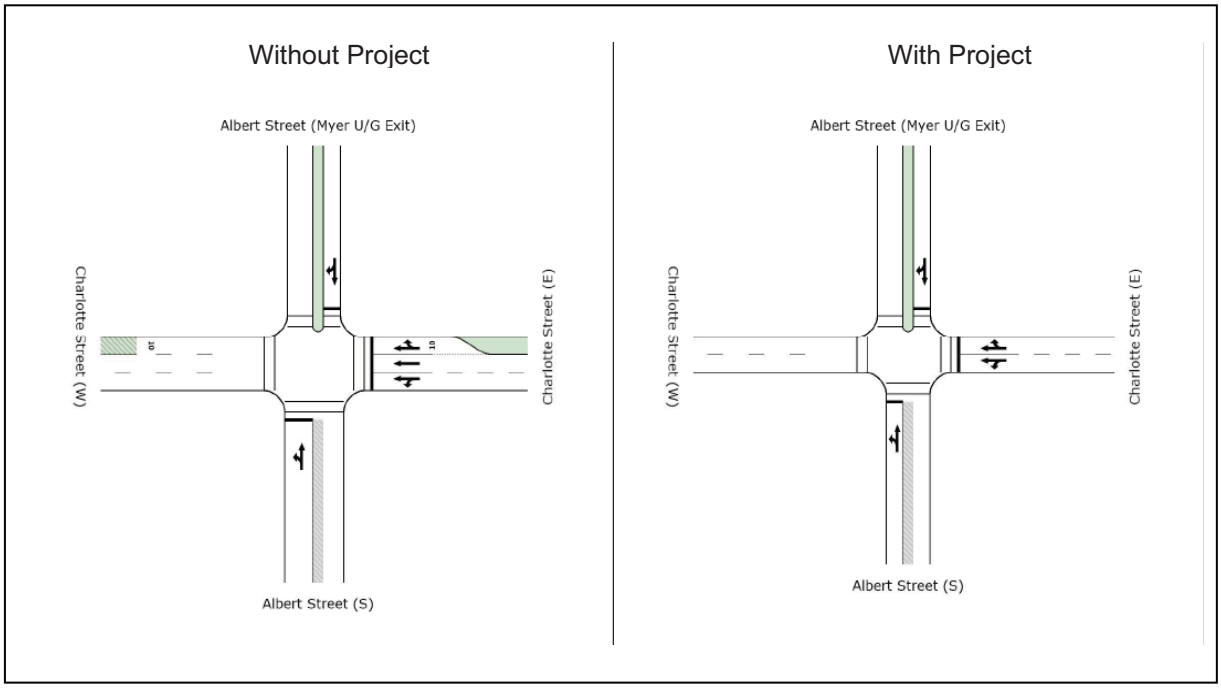


Figure 6-48 Proposed changes to intersection geometry at Albert Street/ Charlotte Street intersection

The impact of the proposed changes to intersection configuration and lane capacity are summarised in **Table 6-74** . This shows virtually no change in Level of Service or Degree of Saturation in 2021, but a slight worsening of both indicators in 2031 with the Project compared to without – for example LOS C in both periods with project compared to LOS B without. Nevertheless the intersection would still be within theoretical capacity and impacts for vehicles are considered to be minor and necessary in order to mitigate potential impacts to pedestrian safety and comfort, should footway widening not be achieved.

Table 6-74 Level of Service (LOS) and Degree of Saturation (DOS) at Albert Street/ Charlotte Street intersection

Albert/ Charlotte	2021* AM		2021* PM		2031 AM		2031 PM	
	Without CRR	With CRR	Without CRR	With CRR	Without CRR	With CRR	Without CRR	With CRR
LOS	B	B	B	B	B	C	B	C
DOS	0.56	0.59	0.58	0.65	0.71	0.80	0.74	0.93

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

At the intersection of Albert Street and Mary Street, minor modifications are proposed which would reduce the capacity of Albert Street southbound from two lanes to one lane in order to accommodate footway widening on the eastern footway. However, reconfiguration of Mary Street could increase capacity for eastbound traffic providing a dedicated right turn lane and through traffic lane. These changes are proposed to allow for a consistent widening of Albert Street eastern footway to accommodate increased pedestrian numbers resulting from Cross River Rail and background growth in pedestrian activity. As reported in **Section 6.5.2**, around 140 pedestrians could be expected on this footway in 2031 AM peak (90 seconds) compared to 20 in 2010. This would require between 3 and 4 m of clear footway width in order to achieve a Level of Service C or better in peak times. At present there is often less than 3 m of footway available due to on-street dining and street furniture.

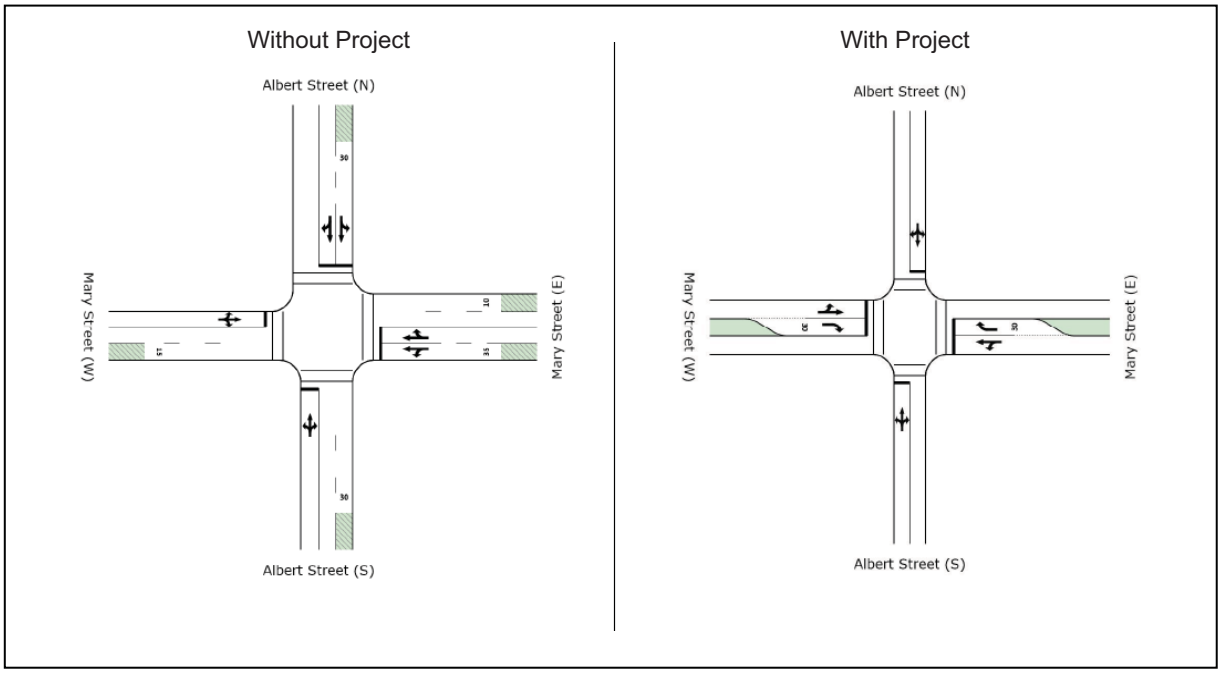


Figure 6-49 Proposed changes to intersection geometry at Albert Street/ Mary Street intersection

The impacts of these proposed changes on vehicular traffic are outlined in **Table 6-75**. This shows no change in Level of Service due to the project in either 2021 or 2031 (morning or evening peaks). It also reveals minor improvements in Degree of Saturation in the morning peaks in 2021 and 2031 (with project compared to without project) although with a slight worsening of Degree of Saturation in the evening peaks (for both 2021 and 2031) as a result of the project. Nevertheless, the intersection would performs within capacity, in 2031 with the Cross River Rail project.

Table 6-75 Level of Service (LOS) and Degree of Saturation (DOS) at Albert Street/ Mary Street intersection

Albert/ Mary	2021* AM		2021* PM		2031 AM		2031 PM	
	Without CRR	With CRR	Without CRR	With CRR	Without CRR	With CRR	Without CRR	With CRR
LOS	B	B	B	B	B	B	B	B
DOS	0.53	0.49	0.49	0.53	0.63	0.60	0.58	0.64

Source: Aecom, October 2010 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

In addition to the traffic impacts addressed above, a wide range of parking and loading changes are proposed to accommodate the Albert Street Cross River Rail station and the related footway widening works. Changes to parking and loading bays could have a detrimental impact to businesses in terms of access to goods and customers. The keys issues associated with each of the proposed road network (including parking and loading) changes are summarised in **Table 6-76** along with a conclusion and recommendation of mitigation, where appropriate.

Table 6-76 Overall summary of design changes and impacts/ mitigation measures

Proposed Reference Design change	Likely impact and proposed mitigation
Minor reductions in lane capacity are proposed at the intersection of Albert Street/ Mary Street and Albert Street/ Charlotte street, including removal of the dedicated right turn lane from Charlotte Street (east) in order to widen footways.	These impacts have been considered in detail above and concluded to be minor in their impacts – these are considered to be small and incremental changes required where in a city environment pedestrian volumes outstrip car volumes– eg at the Charlotte Street/ Albert Street intersection pedestrian volumes are expected to outnumber car volumes by 15 to 1 by 2031 (with CRR) Not doing so, could would lead to footway over-crowding and consequential pedestrian safety concerns.
Conversion of redundant carriageway to footway at the corner of Margaret Street and Albert Street on the Margaret Street “exit” side where existing full time kerbside uses prevent through traffic using these lanes. No change to capacity on the Margaret street western approach to the intersection.	This is an efficient use of space with no detrimental impact on traffic. This is expected to lead to positive benefits to both cars and pedestrians as the pedestrian crossing distance is reduced which means shorter clearance times allowing conflicting left and right turning traffic across the pedestrian streams to clear the intersection sooner.
remove the left lane of Alice Street at Albert Street where there is current kerbside uses at all times (ie no loss of traffic capacity).	This results in no loss of capacity (only loss of parking and loading addressed separately) and therefore no detrimental impacts on traffic operations.
Reduction in taxi loading bay on western side of Albert Street (between Charlotte Street and Elizabeth Street) from 70m to 40m in order to widen approximately 50m of the western side of Albert street between Charlotte Street and Elizabeth Street.	30 m of this taxi loading zone is proposed to be relocated and therefore expected to offset the loss of taxi loading from this location. The Mary Street location can then function as a secondary taxi loading zone and/ or taxi holding area. There is still a possibility of taxis joining the shortened Albert Street taxi rank however and overspilling into the through lane, and as such this is considered a short term solution only. Longer term changes to close this link to general traffic and or better manage taxi queuing should be further considered in conjunction with Brisbane City Council.
No change to lane configurations or traffic capacity at the intersection of Albert Street and Elizabeth Street.	no detrimental impacts in terms of traffic or parking/ loading at the intersection of Albert Street and Elizabeth Street.
There is a loss of 4 x 2 hour parking bays on Alice Street.	This is considered a minor impact as retail and commercial activity is very low at this end of the CBD.

Proposed Reference Design change	Likely impact and proposed mitigation
Loss of 2 x 2 hour parking bays on south side of Mary Street (west of Albert Street) due to alignment of proposed new westbound lane	This is considered a minor detrimental impact, necessary to accommodate footway widening.
Loss of 1 x 5m loading bay on south side of Mary Street (west of Albert Street) due to alignment of proposed new westbound lane	This is considered to be a detrimental impact however this 5m loading bay could be relocated 15m west of its current location through removal of 1 additional 2 hour parking bay (immediately west of the 2 listed above on the south side of Mary Street).
Loss of 2 x loading bays (10m) on the north side of Mary Street (east of Albert Street) due to new 30m taxi loading zone.	This is considered a minor detrimental impact, given that on-street loading demand in this location is likely to be reduced by the removal of the adjacent buildings to accommodate the Cross River Rail station entrance.
Loss of 2 x loading bays (10m) and 2 x 2 hour parking bays on the south side of Mary Street (east of Albert Street) for additional taxi loading.	The loss of these parking and loading bays in favour of additional taxi loading is seen to be beyond the requirements to mitigate the reduction of taxi loading in Albert Street and it is recommended that these bays remain as they currently are.
Removal of 15 m of loading zone from the western side of Albert Street and 10m from the eastern side of Albert Street (between Mary Street and Charlotte Street).	Re-provision of 30m of timed (off peak) footway loading zone on the eastern side of Albert Street is likely to sufficiently compensate for this loss of loading – particularly given that the current 10m loading bay is immediately adjacent to buildings which will be removed to accommodate the Cross River Rail station entrance, thereby reducing on street loading demands overall.
Loss of 3 x motorcycle spaces removed on the south side of Charlotte Street (west of Albert Street).	It is possible that minor kerb design alterations could mean these motorcycle bays (which are currently being converted to CityCycle bays) can be retained as is and further design refinement is recommended
Loss of 1 x loading bay on the north side of Charlotte Street (west of Albert Street).	Minor changes to kerb geometry could result in this loading bay being retained and therefore further design refinement is recommended to maintain this bay.
Loss of 1 x 2 hour parking bay on the north side of Charlotte Street (east of Albert Street).	Minor changes to kerb geometry could result in this parking bay being retained and therefore further design refinement is recommended to maintain this bay.

Overall, with the mitigation measures identified above, there is likely to be only a small reduction in on-street parking (7 x 2 hour bays) and only a minor loss (5 m) of loading bay capacity which would be mitigated by the reduction in on-street loading demands associated with the removal of several older buildings to accommodate the Cross River Rail northern entrance itself. There would also be no loss of taxi loading capacity and overall, such changes to the road network including parking and loading are not considered detrimental.

Park 'n' ride demands

There are no forecast park 'n' ride trips at Albert Street station in any future year, with Cross River Rail. As such, no mitigation is required.

Kiss 'n' ride (including taxi)

By 2031, with Cross River Rail there is expected to be up to 150 kiss 'n' ride drop off trips per day (80 in the morning peak), In the morning peak, this equate to less than 1 vehicle per minute which is not expected to require any dedicated taxi or kiss 'n' ride bays. Nevertheless, additional taxi parking is proposed adjacent to the northern entrance, on Mary Street to cater for Cross River Rail and other surrounding taxi demands as well as to replace the loss of taxi capacity on Albert Street (approaching Elizabeth Street),

Gabba

Road network changes

The implementation of Cross River Rail requires permanent realignment of the bus layover zone on the South East Busway (Woolloongabba spur), immediately west of Woolloongabba Busway Station. Nevertheless, minor changes to layout of the layover area will result in no net loss of bus layover parking or operational flexibility.

No changes to traffic signals or external site accesses are proposed as part of Cross River Rail however it is noted that wider network changes are being investigated by the Department of Transport and Main Roads, the Urban Land Development Authority and Brisbane City Council in anticipation of major new mixed use development occurring on the site adjacent to the proposed station. These changes are no required to support the implementation of Cross River Rail and therefore have not been assessed as part of this report.

Park 'n' ride demands

There are no forecast park 'n' ride trips at Gabba Station in any future year, with Cross River Rail. As such, no mitigation is required.

Kiss 'n' ride (including taxi)

By 2031, with Cross River Rail there is expected to be up to 460 kiss 'n' ride drop off trips per day (250 kiss and ride drop offs in the morning peak. This equate to around three to four vehicles per minute (in the busiest 15 minutes). In the short term, before the development of the Woolloongabba UDA precinct, which will include a range of internal roads, kiss 'n' ride and taxi access can occur on the Stanley Street service road immediately opposite the station on the southern side of Stanley Street.

Boggo Road

Road network changes

Changes to the road network in the vicinity of the station are limited to the following as illustrated in **Figure 6-37**:

- new zebra crossing of Boggo Road adjacent to the northern Cross River Rail station entrance
- new zebra crossing of Pete Doherty Street adjacent to the southern Cross River Rail Station entrance
- minor kerb and footway changes on the western side of Annerley Road.

The forecast performance of these changes was reported in **Section 6.5.2** with the conclusion that they were appropriate for the volumes of pedestrians and vehicles forecast, with no detrimental impacts envisaged.

Park 'n' ride demands

Forecast park 'n' ride trips at Park Road station would be relatively low with up to 75 daily park 'n' ride trips (18 in the morning peak) modelled in 2009 to 114 in 2031 (25 in the morning peak) with Cross River Rail. Without Cross River Rail these demands would expected to be marginally less, (that is around 5% less in 2031).

Kiss 'n' ride (including taxi)

Daily kiss 'n' ride activity is forecast to increase from 190 drop offs per day (100 drop offs in the morning peak in 2009 to up to 500 per day (230 in the morning peak by 2031 with the project. These 230 morning peak drop off trips equates to around four per minute in the peak 15 minutes. Cross River Rail would not significantly increase overall kiss 'n' ride demands, for example in 2031, daily drop off volumes are forecast to be 3% more with the project. Nevertheless, 2 x taxi bays and 2 x passenger loading bays (kiss 'n' ride bays) are proposed on the northern side of Boggo Road which is considered sufficient to meet kiss 'n' ride demands with or without the Project out to 2031.

6.6.4 Future local road and traffic changes with the Project – South

Dutton Park

Road network changes

There are no physical road network changes as a result of Cross River Rail in the vicinity of Dutton Park Station.

Park 'n' ride demands

There are no forecast park 'n' ride demands at Dutton Park Station in 2009 or any forecast year.

Kiss 'n' ride (including taxi)

Daily kiss 'n' ride activity is forecast to increase from 180 drop offs per day (100 in the morning peak) in 2009 to up to 220 per day (110 in the morning peak) by 2031 with the Project. Cross River Rail would not significantly increase overall kiss 'n' ride demands, for example in 2031, AM drop off volumes are forecast to be 5% more with the project. These 110 morning peak trips equate to one to two vehicles per minute in the peak 15 minutes. Given the current taxi facility for two vehicles and kiss 'n' ride drop off and pick up opportunities on Kent Street, no detrimental traffic or parking impacts are forecast.

Fairfield

Road network changes

There are no physical road network changes as a result of Cross River Rail in the vicinity of Central station.

Park 'n' ride demands

Park 'n' ride demands at Fairfield station are not forecast to change between 2009 and 2031 with or without project with around 14 daily park 'n' ride trips modelled (5 in the morning peak) modelled in 2009 and up to 16 in 2031 with or without Cross River Rail. While only 7 formal park 'n' ride bays exist, streets to the north of the station are already included in the Dutton Park two hour parking zone, which limits on street commuter parking and there are virtually no differences in parking demands with or without the Project.

Kiss 'n' ride (including taxi)

Daily kiss 'n' ride activity is forecast to increase from 150 drop offs per day (80 in the morning peak) in 2009 to up to 230 per day (120 in the morning peak) by 2031 with the project. In 2031, this activity is expected to be around 25% higher than without Cross River Rail. However these 120 morning peak drop off trips (in 2031 with project) equates to around 1-2 vehicles per minute in the peak 15 minutes, which can easily be accommodated on Midmay Street and Lagonda Street.

Yeronga

Road network changes

There are no physical road network changes as a result of Cross River Rail in the vicinity of Central Station.

Park 'n' ride demands

Park 'n' ride trips at Yeronga Station are relatively high with up to 410 daily park 'n' ride trips (170 in the morning peak) forecast in 2009 up to 510 in 2031 (180 in the morning peak) with Cross River Rail. Without Cross River Rail these demands are expected to be marginally less, around 7% less in 2031. Currently there are 64 formal park 'n' ride spaces with further on street parking totalling 160 cars. As such, either with or without Cross River Rail there is likely to be increased parking demands on street around Yeronga Station, well in excess of current park 'n' ride capacity. As such, on street parking controls may be required to manage demands at and around this station.

Kiss 'n' ride (including taxi)

Daily kiss 'n' ride activity is forecast to increase from 120 drop offs per day (60 in the morning peak) in 2009 to up to 210 per day (110 in the morning peak) by 2031 with the project. Cross River Rail is forecast to lead to an increase in daily kiss 'n' ride demands, by around 40% in 2031 (although this equates to only 35 trips in the morning peak period or 1 car approximately every 3 minutes. As such no mitigation is proposed with taxis and Kiss 'n' Ride vehicles able to use the short term drop off zone on Lake Street.

Yeerongpilly

Road network changes

Several road changes are required to accommodate Cross River Rail at Yeerongpilly as illustrated in **Figure 6-50**.

These road network changes include:

- Wilkie Street is proposed to be realigned to the east to accommodate additional railway tracks including a reverse curve north of Crichton Street to tie back into "old" Wilkie Street south of Cardross Street
- On-street parking is to be retained on Wilkie Street with provision for indented bus bays immediately north of the Wilkie Street entrance to Yeerongpilly Station.
- Provision for recessed taxi bays and kiss and ride bays is proposed on Wilkie Street immediately south of the station entrance
- New bus laybys on Fairfield Road to cater for existing and new bus services
- Given the above changes on Wilkie Street reflect the same connectivity to east-west local roads with no changes to overall vehicle permeability or connectivity, the impact of these changes on their own are not considered to have any detrimental impact on traffic flow or efficiency. While the proposed reverse curve may result in a minor speed reduction at this location, this is unlikely to have a detrimental effect on traffic safety and efficiency given the surrounding low speed residential environment.

- The additional bus laybys on Fairfield Road are expected to have a positive benefit to general traffic as they are expected to replace existing nearby bus stops which are not indented and therefore result in through traffic being delayed by stopping buses.
- Loss of off-street parking will have some overspill impacts, which are addressed further below.

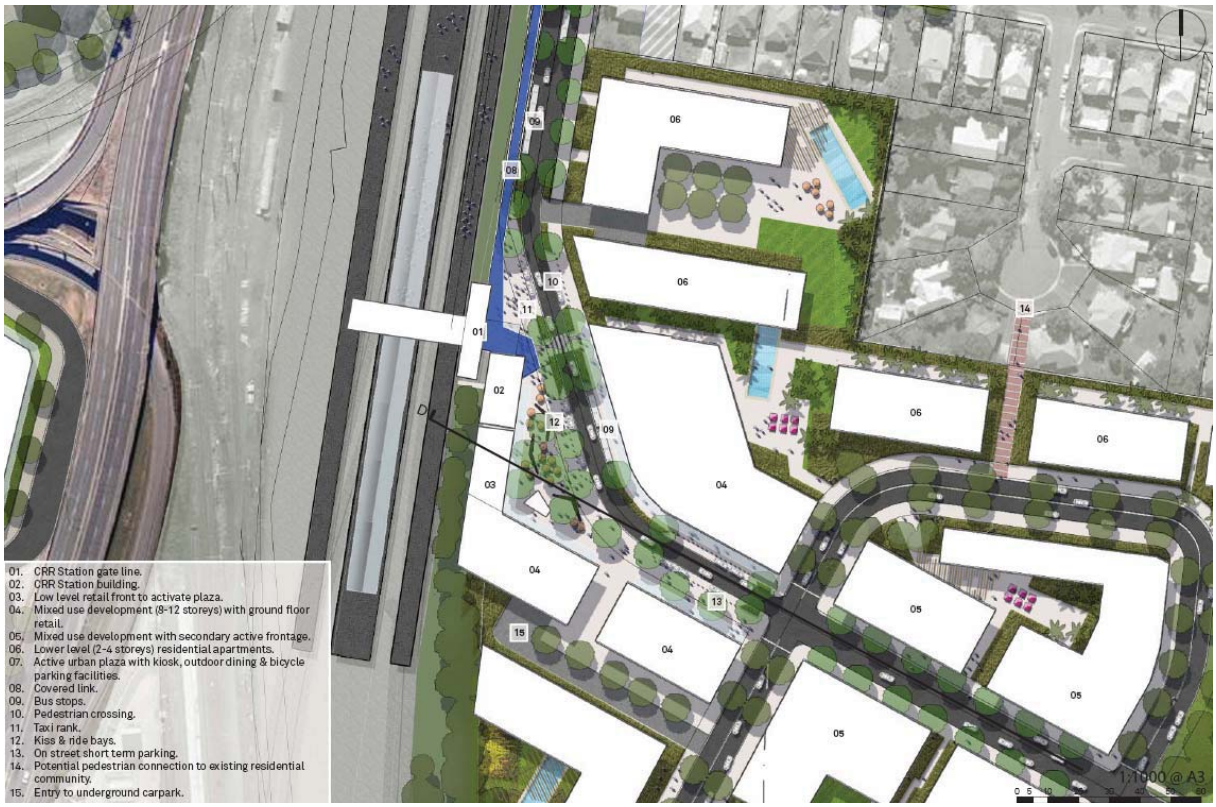


Figure 6-50 Proposed changes to road network around Yeerongpilly Station

Park 'n' Ride demands

Park 'n' ride trips at Yeerongpilly station are modelled as being relatively low in 2009 with up to 64 daily park 'n' ride trips (31 in the morning peak) predicted however the 2009 TransLink park and ride survey found over 90 informal park and ride cars as well as 24 formal park and ride car – a total demand of 114 cars. The Cross River Rail patronage model predicts 110 daily park and ride boarding trips in 2031 (50 in the morning peak) with Cross River Rail, and without Cross River Rail these demands are expected to be around 6% less in 2031 across the weekday. However given the above under-prediction of 2009 demands, this is considered to be an under-estimation of demand.

Furthermore, 24 existing formal park 'n' ride bays would be removed as part of the Project and as such this parking would likely transfer onto surrounding streets. Also, the introduction of fast, frequent Cross River Rail services from Yeerongpilly would mean travel times from this station being up to half the travel time of adjacent stations including Yeronga which is forecast to have high park and ride demands, at over 400 cars per day in 2031. Some of this demand is likely to transfer to Yeerongpilly.

The above patronage model limitations combined with likely travel behaviour changes beyond that predicted in the transport model could lead to relatively high demands for park and ride parking around Yeerongpilly which would require mitigation. Further investigation of potential on street commuter parking restrictions is recommended, for example through the introduction of a weekday resident parking scheme in surrounding streets. An area extending to Park Road in the East, School Road and Cook Street in the North, the Queensland Tennis Centre in the west and Station Road/ Lucy Street in the south (representing the core 400-500m catchment of the station) is recommended for consideration of such a scheme.

Kiss 'n' ride (including taxi)

Daily kiss 'n' ride activity is forecast to increase from 100 drop offs per day (50 in the morning peak) in 2009 to up to 230 per day (120 in the morning peak) by 2031 with the Project. Cross River Rail results in a 50% increase in overall daily kiss 'n' ride demands at this station which translates into around 45 additional morning peak period drop off trips, or around 1 additional car every 2 minutes. Total morning peak drop offs trips equates to one to two cars per minute. The Cross River Rail reference design includes provision for two taxi bays and 4 passenger loading (kiss 'n' ride) bays which is expected to be sufficient for 2031 demands.

Moorooka

Road network changes

No road network changes are proposed at/ around Moorooka Station. .

Park 'n' ride demands

Park 'n' Ride trips at Moorooka Station are relatively low with up to 40 daily park 'n' ride trips (20 in the morning peak) modelled in 2009 to up to 50 in 2031 (24 in the morning peak) with Cross River Rail. Without Cross River Rail these demands are expected to around 4% less in 2031. There are no formal parking bays at Moorooka currently or in future years. Such parking demands are relatively small and given the very small change between with and without project cases, no mitigation is proposed.

Kiss 'n' ride (including taxi)

Daily kiss 'n' ride activity is expected to increase from 95 drop offs per day (45 in the morning peak) in 2009 to up to 190 per day (100 in the morning peak) by 2031 with the project. Cross River Rail results in a 65% increase in overall kiss 'n' ride demands at this station which translates into around 40 additional morning peak period drop off trips or around one additional car every two minutes. Total 2031 morning peak kiss 'n' ride demand with project translates to between one and two trips per minute. These can satisfactorily be accommodated within existing on street parking zones on Ipswich Road with no further works proposed.

Rocklea

Road network changes

Road changes are required at the intersection of Muriel Avenue, Fairfield Road and Sherwood Road to accommodate additional rail tracks (refer to **Figure 6-51**). In order to accommodate an additional two rail tracks underneath the Ipswich Motorway, the existing road (and motorway on ramp) would need to be reduced to one lane. As such a new underpass is required under the Ipswich Motorway with the remaining one lane road used for local access to Station Street.

These proposed changes maintain connectivity for all traffic (including pedestrians) to the Station Street precinct while also providing a higher speed higher capacity motorway on-ramp. Minor changes proposed to the geometry of the traffic island at Muriel Avenue (approaching Fairfield Road) do not impact on lane capacity and also allows for a short length of cycle lane. As such the impacts of these changes are considered negligible.

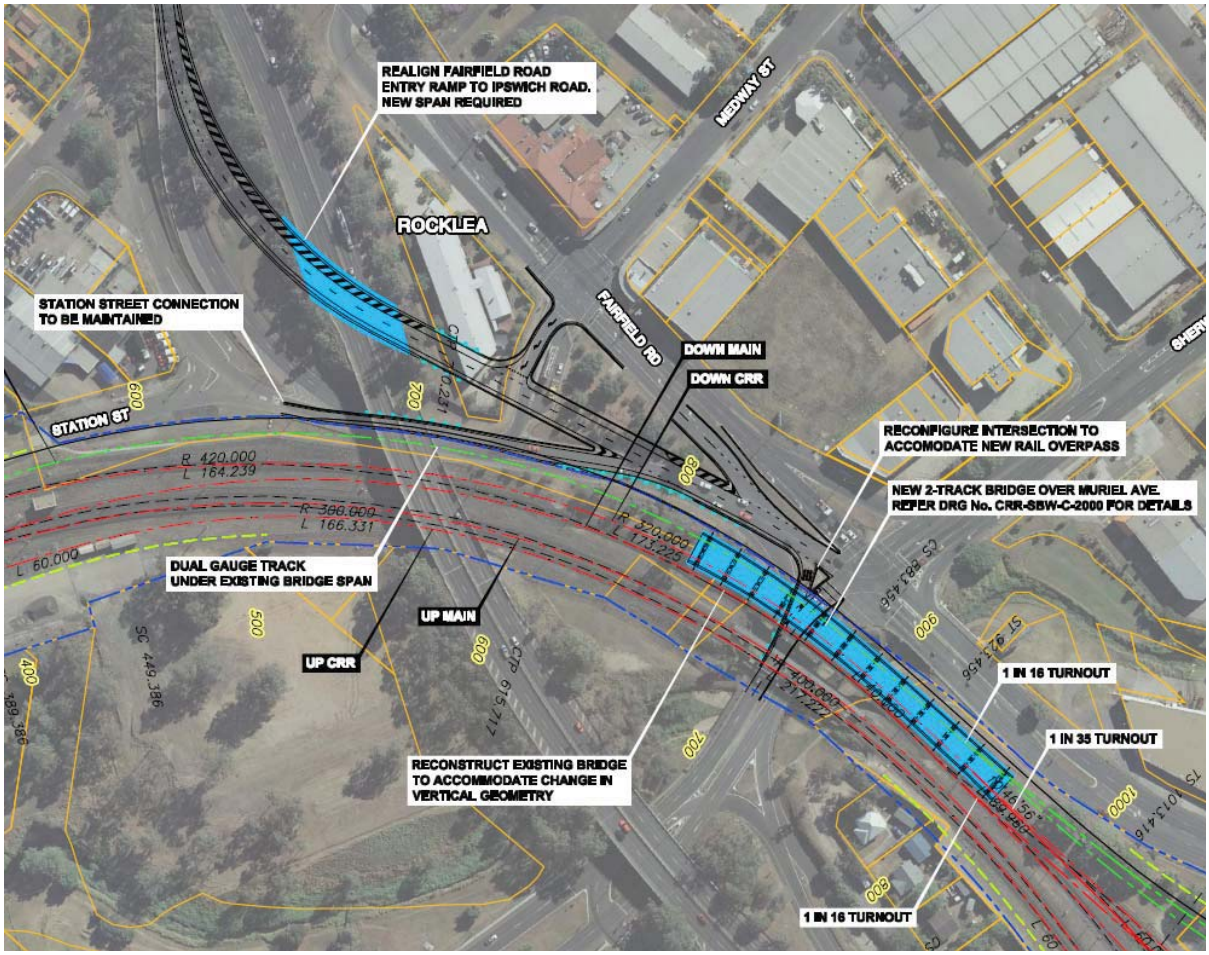


Figure 6-51 Proposed changes to road network in Rocklea

Further south, the reference design requires the closure of the Beaudesert Road Service Road Open Level Crossing due to an additional 2 railway tracks and assumed more frequent train operations. Alternate access is illustrated in **Figure 6-52**. On the southern side of the crossing, access to northern destinations is via Beaudesert Road Service Road (on the eastern side of Beaudesert Road) and the then by turning right at the intersection of Beaudesert Road and Lillian Avenue. This represents a maximum diversion of around 800 m.

LEGEND

- Study Corridor
- Railway Station
- Railway Line
- Alternative route north from south of road closure
- Alternative route south from north of road closure

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 6-52

Alternate Routes due to Closure of Beaudesert Road Service Road Closure

0 50 100 150 200 Meters

1:5,000 at A4

N

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G092_CCR_Trans_Beaudesert_Rd_Service_Rd_Closure_A4_ver93.mxd 06/07/2011 15:33

The proposed diversion routes shown above mean additional local traffic using the intersection of Beaudesert Road and Lillian Avenue and the intersection of Muriel Avenue and Gladstone Street. As such, a traffic analysis was undertaken at each, with a proposed signalisation solution adopted. The results of the intersection analyses are outlined below. This has been undertaken using TRANSYT software with a signal coordination strategy in place from Musgrave Road to Muriel Avenue. For further information refer to Aecom Salisbury traffic report (Aecom, 2011)

A diagram illustrating the proposed signalisation of Muriel Avenue and Gladstone Street is provided in **Figure 6-53**. The results of TRANSYT analysis for the intersection of Muriel Avenue and Gladstone Street (as shown in **Table 6-77**) shows an improvement in overall intersection performance by 2031 AM and PM peaks with the proposed signalisation. This is principally due to delays experienced by Gladstone Road traffic without signalisation either with or without diverted traffic. As such, while the proposed signalisation would lead to some minor delays for Muriel Avenue traffic, overall intersection Level of Service and Degree of Saturation is that same or better in both peaks. Queues on the Muriel Street east approach do not extend beyond 49m in either peaks (in 2031) which is well within the 144m distance between this and the adjacent intersection of Muriel Ave and Beaudesert Road. As such, no queuing impacts on adjacent intersections are forecast.

Table 6-77: Intersection of Muriel Ave and Gladstone Street

AM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
AM	45	A	49	A	61	A	83	F	82	B
PM	59	A	64	A	65	A	111	C	84	B

Source: Aecom, March 2011 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

Figure 6-53 Proposed signalisation of the intersection of Muriel Avenue and Gladstone Street

The proposed diversion route to the south of the Open Level Crossing would involve vehicles using the intersection of Lillian Avenue, Tranmore Street and Beaudesert Road. As such a signalisation option has been proposed and tested for this location, as illustrated in **Figure 6-54**. A summary of the intersection traffic analysis is presented in **Table 6-78**. This shows that in the AM peak there is little difference between the options with the intersection performing well in all scenarios/ years with LOS A in all scenarios.

Queues in the AM peak were also modelled with a maximum inbound queue on Beaudesert Road in 2031 (with project) of 175m which is not likely to create any queuing impact on the next signalised intersection, some 600m south. In the PM peak, only in 2031 is there a noticeable difference with Degree of Saturation over 92% with the proposed project change (although this is specifically related to the left turn from Lillian Ave and is not considered to be of significant concern).

The overall intersection Level of Service remains LOS B in 2031 with the proposed additional diverted traffic and the intersection signalised. Maximum queues on the north approach of Beaudesert Road are forecast to be around 190m in 2031 (PM peak) which would not cause queuing impacts on the upstream intersection some 1050m north.

Table 6-78: Intersection of Beaudesert Road and Lillian Avenue

AM peak	2010 Existing		2021* Without CRR		2021* With CRR		2031 Without CRR		2031 With CRR	
Approach Name	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**	**DOS**	**LOS**
AM	45	A	49	A	61	A	83	A	82	A
PM	44	A	48	A	60	A	87	A	92	B

Source: Aecom, March 2011 (*note 2021 results are based on 2016 modelling due to very low background traffic growth forecast between 2016 and 2021)

Park ‘n’ ride demands

There are no forecast park ‘n’ ride trips at Rocklea Station with or without Cross River Rail in any years. However there is a formal car parking facility with capacity for 40 vehicles which could accommodate overspill from other stations.

Kiss ‘n’ ride (including taxi)

Daily kiss ‘n’ ride activity is expected to increase from 66 drop offs per day (30 in the morning peak) in 2009 to up to 130 per day (70 in the morning peak) by 2031 with the project. Cross River Rail results in a 60% increase in overall kiss ‘n’ ride demands at this station which translates into around 24 additional morning peak period drop off trips, or around 1 additional car every three minutes. Such drop off demand can be readily accommodated within the existing park ‘n’ ride area

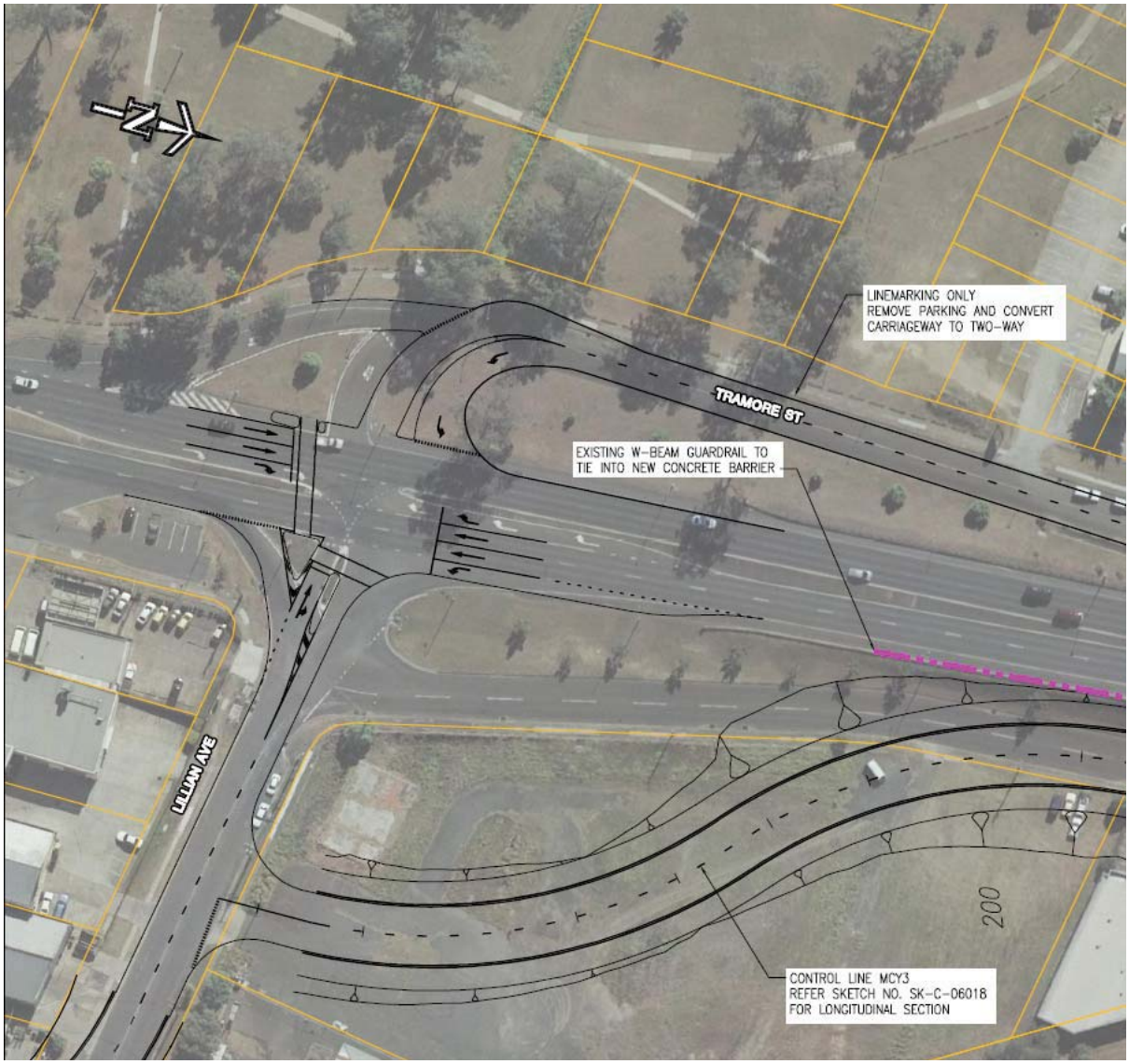


Figure 6-54 Proposed signalisation of the intersection of Beaudesert Road and Lillian Avenue

Salisbury

Road network changes

Changes are required to Dollis Street immediately west of Salisbury Station in order to accommodate an additional freight rail track on the western side of the current tracks. This realignment improves the geometry of the road, removing 3 tight curves found in the current alignment..

Park 'n' ride demands

Park 'n' ride demands at Salisbury Station are forecast to remain at around 60 trips per day or around 30 trips in the morning peak period. There would be very small differences in park 'n' ride demands modelled with and without the Project, for example potentially up to five vehicles (or 2%) less in 2031 morning peak period without project compared to with. Given current off street parking capacity for around 50 vehicles, then no detrimental on street parking impacts are predicted with or without Cross River Rail in future years.

Kiss 'n' ride (including taxi)

Daily kiss 'n' ride activity is expected to increase from 110 drop offs per day (50 in the morning peak) in 2009 to up to 160 per day (80 in the morning peak) by 2031 with the project. Cross River Rail results in a 65% increase in overall kiss 'n' ride demands at this station which translates into around 32 additional morning peak period drop off trips, or around 1 additional car every two to three minutes. Kiss 'n' ride trips can be accommodated within the existing park 'n' ride car park or on Dollis Street, Olivia Avenue or Lillian Avenue immediately adjacent to the station.

6.7 Impacts on freight rail operations

This section presents an assessment of the effect of the Project on rail freight operations carried out by Systemwide (Systemwide, December 2010). The demand for rail freight is the same as for the Without Project case presented in **Chapter 5** of this report.

6.7.1 Network effects

The Project provides for a dedicated dual gauge freight track from Salisbury to Park Road, by providing additional passenger tracks through this corridor and removing passenger services from this line. This would provide the missing section of a dedicated freight route through the southern Brisbane rail network, from Acacia Ridge to the Port of Brisbane. This freight line would provide significant advantages for freight rail operations, including removing peak period curfews and allowing all projected 2031 freight demand to be accommodated on rail.

The inclusion of the North West Transport Corridor in the 2031 Project case diverts a number of passenger services away from the North Coast Line such that rail freight could operate effectively on the North Coast Line throughout the day.

6.7.2 Outcomes

Table 6-79 provides a comparison of freight operability outcomes between Without and With the Project. This clearly shows the increased freight capability With the Project north of Salisbury and on the North Coast Line.

Note that many assumptions have been made as part of this analysis (Systemwide, December 2010), and detailed freight timetables have not been created. Hence, the difference between scenarios is more descriptive than the exact forecast trains per hour.

Table 6-79 Forecast freight trains to meet demand not impacted by constraints outside the CRR scope

	Trains per week to match demand (both directions) – within CRR scope only					
	2021			**2031**		
	Demand	**Without CRR**	**With CRR**	**Demand**	**Without CRR**	**With CRR**
North Coast	264	264	264	322	16	322
Salisbury - Tennyson	172	24	172	209	24	209
Tennyson - Port (IM)	78	3	78	94	3	94
Tennyson - Port (Coal)	197	197	197	232	198	232
Tennyson to Port TOTAL	275	201	275	326	201	326

Source: Systemwide, December 2010

Note:
1. Demand paths assume current length consists

Whilst some forecast paths are below the demand requirement, this analysis provides an underestimation of the number of possible paths. Rail freight could have the capability to meet demand due to factors such as:

- lower off-peak frequencies pre-morning peak and post-evening peak
- lower off-peak frequencies on weekends
- increased capacity of freight services (length or carrying capacity)
- flighting
- less restrictions on freight operating hours.

6.8 Impacts on rail maintenance

It is anticipated that rail maintenance would remain the responsibility of the rail asset manager Queensland Rail who are currently maintaining the existing rail network. Maintenance operations would be similar to their current practises except where Cross River Rail infrastructure differs from their current infrastructure and operating arrangements. The key differences include:

- underground tunnels – the extent of underground tunnels is significantly longer than existing tunnels
- underground stations – stations are at greater depth than existing stations
- signalling and control systems – new systems are proposed as part of CRR
- rollingstock – rollingstock to operate on CRR will be required to meet a specification which will be different than the remainder of the network
- incident response procedures – because of the length of tunnels involved new procedures will need to be in place
- maintenance procedures – because of the nature of the proposed infrastructure new maintenance procedures are anticipated.

Underground tunnels

Existing tunnels are relatively short compared to CRR. The new tunnels would differ in features that involve special maintenance requirements. Services would operate 18 hours per day and 7 days per week with the non service times being generally available for maintenance activities.

The design has adopted where relevant low maintenance features which would reduce the requirement for personnel to enter the constrained tunnel environment although it is noted than the environment that the tunnels provide are designed with specific attention for personnel access and safety.

The key features of the tunnels that would require revised maintenance practises include:

- proposed overhead power supply system
- track support systems
- fire and emergency evacuation and access systems
- tunnel drainage and discharge systems
- communication and train control systems
- floodgates and control systems
- tunnel ventilation.

Tunnel route maintenance

Compared to the existing maintenance of ballasted surface tracks with wired OHLE catenaries, the tunnel route maintenance would be very different with much less active work attention. Using non-ballasted track and fixed rail OHLE for traction power, most of the regular maintenance work would consist of non-active inspection and monitoring work during the nightly four to six hour maintenance periods.

In the longer term, the maintenance would need to include renewals of track components and other electrical and mechanical components. At various periods of 15 to 25 years, depending on curvature and traffic density, some sections of rail would need to be transposed or replaced along with rail pads and some fastenings. These activities, including renewals of OHLE contact insert-wire are no more frequent than surface track maintenance

The tunnel route maintenance would be a much lower impact than surface ballasted tracks, and apart from the possibility of periodic dust wash-downs, it is not anticipated that any new types of maintenance or new major maintenance impacts would be introduced.

Underground stations

Station facilities would include typical facilities provided and maintained in existing major rail stations as well as facilities that are unique to CRR or new to QR. The depth of underground CRR stations is significantly greater than existing stations and this results in greater emphasis on vertical transportation of patrons.

Lifts and escalators are fitted to existing stations but the scale and importance for CRR stations is more significant. Management and maintenance processes will need to reflect this importance. Other new facilities proposed in CRR underground stations include:

- platform screen doors
- airconditioned platforms
- ventilation and smoke control systems
- incident management responses
- communication and train control systems
- flood control facilities.

Maintenance practises would need to be identified during detailed design to ensure all facilities can be safely maintained.

Above ground station facilities would be similar to existing QR stations and no special maintenance requirements are envisaged.

Rollingstock

Rollingstock that operates on CRR would be required to have specific capabilities and features that are not universally available on all rollingstock in the existing fleet. Features required for CRR are not expected to involve any significant change in maintenance practises and procedures.

Signalling and control systems

New signalling and train control systems are anticipated to be in place for CRR. These systems would need to be installed and integrated into the rail network. The introduction of new systems would be part of a broader process of implementation within QR. The process would require the identification and implementation of appropriate maintenance practises and procedures.

6.9 Cumulative effects

The cumulative operational effects of the Project have been compared against other rail project and land use development projects. The cumulative construction effects of other projects are considered in the construction road traffic impacts chapter of this report.

6.9.1 Cumulative operational effects with known rail projects

Two network scenarios that have been tested and compared with the Project and these include:

- the removal of the North West Transport Corridor (NWTC) from Roma Street to Strathpine and the removal of the Hillcrest branch line. To facilitate this scenario a significant increase in capacity (number trains) would be provided between Bowen Hills and Roma Street via Exhibition. The Project provides a capacity of 6,100 seats during the morning peak period in 2031 whilst this network scenario provides over 20,000 seats (equivalent to 12 trains with the Project and 33 trains in this network scenario test).
- the inclusion of the Brisbane Subway. The Brisbane Subway is a strategy of the Draft Connecting SEQ 2031 Integrated Regional Transport Plan for South East Queensland. The priority corridor for delivery would be from Toowong to West End to Bowen Hills/Newstead. The corridor would be under the CBD. For the purpose of this scenario test CBD Brisbane Subway stations have been located at Queen Street, Anzac Square and Riverside.

Table 6-80 presents the forecast 2031 daily patronage of these network scenarios.

Table 6-80 Forecast 2031 daily patronage for network scenarios

	2031 With Project	Alternative networks	
		No NWTC (rail) and Hillcrest line	Brisbane Subway included
Daily PT users	1,120,900	1,134,200 (+1.2%)	1,212,200 (+8.1%)
Daily rail users	595,400	563,800 (-5.3%)	629,200 (+5.7%)
Albert St daily alightings (CRR)	55,100	47,600 (-13.6%)	55,100 (0%)

No North West Transport Corridor

Key forecasted differences due to the removal of the North West Transport Corridor in 2031 are:

- minimal change to daily public transport users
- the daily number of rail users is forecast to decrease by 5.3% to 563,800 passengers
- the number morning peak period rail passengers alighting in the CBD would decrease by 7%
- the number of rail passengers entering the CBD from the north[5] would decrease by 10% to 45,000 passengers during the morning peak period two hours

[5] Considering city bound rail trips between Fortitude Valley and Central, Exhibition and Roma Street and between Strathpine and Roma Street for the With Project case.

- the number of daily passengers alightings at Albert Street would decrease by 14% to 47,600 passengers. A decrease of 11% is forecast during the morning peak period
- the line between Bowen Hills and Roma Street would carry over 23,000 passengers in the southbound direction (towards Roma Street) during the morning peak period and the Exhibition line would carry 23,000 passengers compared to around 6,000 in the With Project case
- a significant increase in the seated load factor on the Ferny Grove line such that between Windsor and Bowen Hills in the city bound direction during morning peak period the seated load factor would increase to almost 175% compared to 120% in the With Project case.

The removal of the North West Transport Corridor and Hillcrest Line would have a significant effect on rail patronage, the usage of CBD stations, usage of the Exhibition loop and crowding on the Ferny Grove line.

Inclusion of the Brisbane Subway

Table 6-1 shows that the inclusion of the Brisbane Subway has been forecast to increase daily public transport and rail usage in 2031 compared to the With Project case. Key changes to note are:

- increase in public transport usage of 8%
- increase in rail usage of almost 6%
- alighting at CBD rail stations (not including Brisbane Subway stations) would decrease by 4% but with no change at the Albert Street Cross River Rail station
- change in Cross River Rail line loadings would be minimal
- forecast transfers between rail and the Brisbane Subway would be low with a total of 1,000 transfers during the morning peak period compared with a total of around 100,000 rail alighting during the same period.

The Brisbane Metro would have an impact on public transport and rail patronage but not a significant effect on Cross River Rail patronage.

6.9.2 Cumulative operational effects with known land use development projects

The purpose of the land use scenario test is to forecast the changes in transport demand of the Project, should the assumed base case land use developments be exceeded to the assumed extent. The changes to the assumed land use scenario do not alter the total population, jobs or education places within the region, but this alternative scenario would provide a redistribution of land use.

The land use scenarios that are the subject of this test is the The River City Blueprint scenario that exceeds the assumed land use development

The River City Blueprint is an initiative of the Brisbane City Council and Queensland Government to co-ordinate planning for population and employment growth within the inner 5km of Brisbane. In part, the initiative stems from the Smart Cities: Rethinking the City Centre Report prepared by the Smart State Council in 2007. The Blueprint establishes a strategic plan for the state's capital and aligns land use, transport and infrastructure planning with key economic, residential and cultural precincts in inner Brisbane.

The creation of a joint vision, close working arrangements and a strong partnership between the state government and Brisbane City Council provides a unique opportunity to coordinate and integrate planning and infrastructure activities across government. The Blueprint provides 'planned' and 'plausible' planning scenarios for the inner city with a planning horizon that extends to 2031. For the purpose of examining the cumulative effects of increased land use development the River City Blueprint 'plausible' planning scenario was used that is illustrated in **Figure 6-55**.

Key areas of growth in the 'plausible' planning scenario that would be connected by Cross River Rail are:

- an expanded Brisbane CBD
- a transformed northern precinct of Kelvin Grove, Herston, Bowen Hills and Fortitude Valley
- a transformed southern precinct of Woolloongabba, Dutton Park and St Lucia.

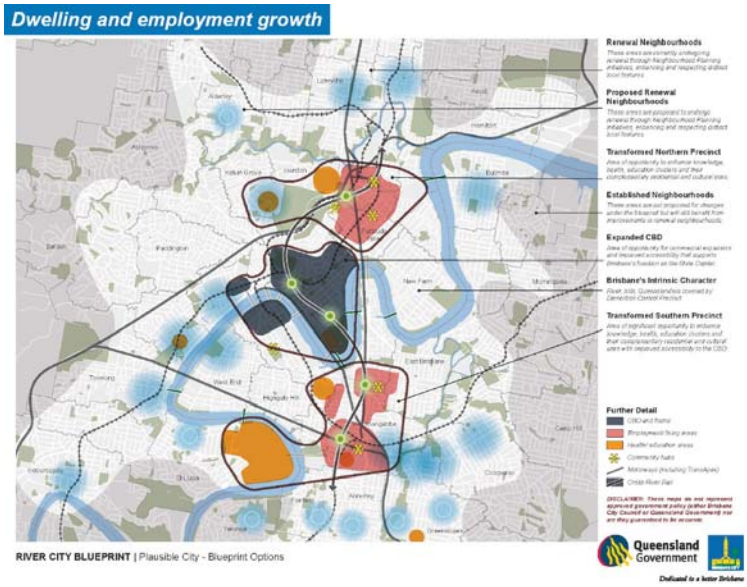


Figure 6-55 River City Blueprint, Plausible City – Blueprint Options[6]

The assessment shows that the River City Blueprint land use scenario would result in an insignificant change in daily total public transport and rail use within the region (Brisbane Statistical Division). The targeted growth areas of the River City Blueprint would generate a change to the patronage forecast at specific Cross River Rail stations. Compared to the 2031 with Project case, this would include:

- a 2% increase (increased to 106,900 passengers) in rail alightings during the morning two hour peak period within the CBD
- an increase of over 50% in morning peak period rail alightings at Boggo Road. This is a forecast total of 7,500 rail passengers alighting at Boggo Road station.
- a forecast total of 9,500 rail passenger alightings at Woolloongabba station during the two hour morning peak period compared to the With Project case. This is an increase of over 80% compared to the With Project case.

These patronage changes as a result of higher CBD and inner city employment than assumed, would be unlikely to require a change to the Project station design proposals.

6 Connected City Strategy, River City Blueprint Forum 5 June 2010, a joint initiative of Brisbane City Council and Queensland Government

7 Construction rail and road impacts

7.1 Introduction

This chapter details the rail and road traffic impacts expected to arise from the construction period of Cross River Rail (the Project). The section has been prepared following the structure of a "Road Impact Assessment Report" under the general guidance of TMR's "Guidelines for Assessment of Road Impacts of Development". This chapter also includes an assessment of the impact on rail service during the construction period.

In particular, this chapter sets out to address the considerations of Section 3.1.6 of the Director General's requirements for the EIS. The requirements of Section 3.1.6 of the EIS are as follows:

The transport implications for both impacts and mitigation measures of construction activities should be described with respect to:

- existing rail services (passenger and freight), use of rail stations and railway maintenance regime
- any pre-construction demolitions
- construction worksite traffic generation, operational service requirements and access
- local and regional traffic flows from temporary and permanent road traffic changes, including road and lane closures at construction worksites and the specific measures proposed to mitigate these impacts
- an assessment of the likely impacts of construction on other public transport modes, road network, cycle and pedestrian networks potentially affected by the project, including travel time delays
- arrangements to ensure safety and operational integrity of the rail and adjacent road network, pedestrian and cycle accessibility and mobility, and access to public transport infrastructure during construction including for individuals with a disability
- access for police and other emergency services
- the provision of adequate access to businesses, public facilities, schools, major community facilities, churches, parks and private residences by private vehicle, public transport, bicycle and foot impacted by the project
- construction workforce parking and other existing public parking
- effects of construction traffic (including the transport of spoil from the project and materials to the project – number, types of vehicles, composition, trip timing and routes on the road network or public transport systems if appropriate.

An RIA should be undertaken for the construction of the project in general accordance with TMR's 'Guidelines for Assessment of Road Impacts of Development' (2006).

The chapter sets out what is currently considered to be a feasible traffic arrangement, given the available information and current state of design specified in **Section 7.3**. The assessment examines the implications and traffic impacts arising from that scenario. It is noted that the traffic arrangement proposed in this is likely to require refinement as the detailed design stages of the project progress, and particularly at such time as construction contractors are appointed to the project. The contractor is likely to propose their own methods of managing traffic, and where these differ from those presented in this chapter, approval from relevant stakeholders would be required.

The chapter seeks to not only detail the impacts and mitigation measures currently proposed, but also to establish a protocol for the management of change as the design, assessment and approval process moves forward and throughout the construction stage. The chapter also provides some guidelines to the requirements for traffic management that would need to be adhered to as more detailed plans are prepared.

7.1.1 Assumptions

The information and assessment provided in this chapter were based on reports, drawings and verbal advice provided by AECOM, in their role as project designer. The following sources of information were used:

- Draft Reference Design Construction Issues Report, (17/9/10) AECOM
- Traffic Engineering Design Report, (16/9/10) AECOM
- Civil Infrastructure Report, (13/9/10) AECOM
- Attachment V, Constructability Report Drawings, (7/10/10) AECOM
- CRR Memo – Updated Estimated Rates Spoil Production (29/3/11) AECOM
- Construction Program, Methodology and Issues for the Updated Reference Design (30/03/11) AECOM
- Construction worksite sketches – SK-EIS-01051 to SK-EIS-010165 AECOM (06/04/2011).

7.1.2 Guiding principles

A summary is given of the guiding principles to be applied to the construction traffic management during construction. More detailed information of specific traffic management techniques would be contained in the Framework Traffic Management Plan and the individual Construction Traffic Management Plans for each worksite, which would be prepared prior to the commencement of construction.

The construction traffic arrangements of the Project would be designed to occur with the minimum possible disruption to pedestrians and traffic. The construction traffic management objectives are:

- minimise disruption to pedestrians, cyclists, public transport users and motorists
- ensure the Brisbane CBD and urban road network can continue to function from a traffic perspective
- limit impact to bus routes and stops
- minimise changes to traffic operation and kerbside access;
- minimise disruption to access for adjoining property
- maximise road safety related to construction
- minimise construction activities on the surface roads and footpaths where ever possible
- minimise traffic at construction worksites by providing remote parking for the workforce
- extract most excavated material from locations close to arterial road network connections, including Yeerongpilly, Northern Portal and Woolloongabba worksites.

All construction activity undertaken or proposed for the Cross River Rail project would need to comply with the following principles:

- safe provision for vehicular and pedestrian traffic (construction related and general public) must be made at all work sites
- delays to traffic at each work site should be minimised
- works should be coordinated to ensure that road users do not encounter several delays in quick succession

- a well informed road user is likely to be more successful in avoiding delay and more tolerant of unavoidable delay. Road users should therefore be kept informed about
  - the locations of works
  - the delays they are likely to encounter
  - any alternative routes which might be suitable.

(This would allow drivers to make informed decisions regarding whether to travel, when to travel, which mode to use and which route to use)

- the Project should present a professional and helpful face to road users throughout any construction or maintenance process
- road users including pedestrians impacted by construction should have the opportunity to make informed decisions about their activities.

The Cross River Rail project requires construction work to be undertaken adjacent to and connecting with the proposed station locations at busy positions within the CBD and at other locations in the inner Brisbane urban area. Therefore the main emphasis is on minimising the impact of construction on public transport, private traffic, pedestrians and cyclists. The design and operation of temporary traffic management layouts would be undertaken with reference to the hierarchy of access proposed in **Section 3.3.**

Motorists and pedestrians expect a high level of safety and service when using the existing road infrastructure. This requires efficient, effective and reliable traffic management strategies to be put in place which:

- achieve uniform traffic throughput
- minimise changes to pedestrian routes and movement
- ensure reliable and consistent travel times
- provide clear information to allow motorists to make appropriate decisions in relation to their journey.

These traffic management goals would be achieved by:

- strategic advance planning
- implementation of traffic management plans that minimise the extent of traffic disruption
- providing a high level of comfort to users
- ensuring a smooth traffic flow
- minimise the number of conflicts and unclear information that may lead to incidents
- continuously monitoring the traffic and pedestrian systems to anticipate incidents before they occur (eg traffic congestion).

7.1.3 Detailed planning and approvals

A Framework Transport Management Plan is recommended as a high level overarching document outlining the principals of construction traffic management and detailed consultation, approvals processes and monitoring. This part of the EIS Technical Report is in effect the forerunner to a Framework Transport Management Plan for the construction of Cross River Rail. It outlines the key impacts, including likely level of disruption and required considerations to help mitigate any negative impacts.

For this project it is envisaged that the Framework Transport Management Plan would be approved by the Department of Transport and Main Roads (Metropolitan Region) and BCC as appropriate, and in consultation with the Brisbane Metropolitan Transport Management Centre (BMTMC), Police and Emergency Services. While the framework plan should outline the likely level of disruption to the rail

network and the principals for accessing the rail system, specific rail shutdowns (track possessions) would be sought and approved through Queensland Rail and their Scheduled Closure Access System.

Subsequent to the approval of the Framework Transport Management Plan, Construction Traffic Management Plans (CTMP) would be developed for each individual worksite by the selected contractor(s) and approved by the same stakeholders outlined above, prior to the commencement of works. Within each CTMP, detailed active transport management plans and workforce car park management plans would be required.

Separate to the overall traffic and transport management approval process, any changes to the road network should be subject to road safety audits, to be undertaken at the following stages to ensure an independent check of road network changes as a result of construction:

Detailed design stage	At this stage, the geometric design, traffic signing scheme, line marking plans, lighting plans and landscaping plans would be assessed in relation to the operation of the road.
Pre-opening stage	Prior to opening a site, an inspection would be made for all relevant conditions at night and during the day for all likely road users to ensure that the construction has addressed earlier audit concerns and to check for any hazardous conditions that were not apparent at the feasibility or design stages.
Road safety audits of temporary work	Cross River Rail would undertake regular safety audits of work zones to ensure all work site safety arrangements are in place.
Road safety audit procedure	All road safety audits would be undertaken in accordance with Austroads Guide to Road Safety Part 6 January 2009.

Performance criteria proposed to achieve the above objectives, are to be included in the Framework Transport Management Plan and addressed in each CTMP, including:

- disruptions to the operation of passenger and freight rail services, the road network and the public transport network due to construction works are avoided during peak periods and minimised during off-peak periods.
- passenger rail services and schedules during peak travel times are maintained.
- freight rail services and key schedules nominated by the rail network manager are maintained.
- haulage vehicles ie. spoil haulage, fill haulage, construction equipment and associated material haulage) only travel on designated construction routes defined in this EIS chapter, unless approved by the relevant traffic authority
- local roads are not used by construction vehicles, unless approved by the relevant traffic authority in consultation with the local community serviced by such roads.
- traffic flows near construction works are maintained during peak traffic periods and managed during off-peak periods to minimise disruption.
- construction traffic is managed and worker parking is provided in sufficient numbers and managed to avoid impact on communities near to construction worksites.
- information about the timing and scale of changes to traffic and transport conditions on passenger rail operations and the road network in the vicinity of construction works is provided in good time to the local community, commuters and on request to other people interested in the construction works.
- safe access is maintained for passers-by and for passengers to and from public transport facilities, including rail stations, busway stations and bus stops.
- pedestrian and cycle access to community facilities is not disrupted by construction works, unless approved by the relevant traffic authority in consultation with the manager of the community facilities.

7.1.4 Hierarchy of access

In identifying the most appropriate form of traffic management for each site, consideration would be given to all road users. To ensure consistency with the final road layout a hierarchy of access would be applied to developing traffic management arrangements.

This hierarchy is:

- incidents (emergency vehicles)
- events
- pedestrians
- service vehicles
- cycles
- public transport – buses
- coaches
- taxis
- kiss n' ride
- private cars
  - shoppers / short stay
  - commuters.

Consideration would be given to the worksite access points and located such that the impact related to access is transferred to roads of lesser strategic importance.

7.1.5 Trucks

The strategy for minimising the impact of truck movements across the Project includes the following principles:

- truck routes minimise the amount of time they spend on the local road network – ie use the most direct route between the worksite and the arterial network
- truck routes are chosen to use roads where capacity is generally available and hence trucks add a minimum of congestion to the network
- selection of appropriate truck sizes to form an effective balance between the need to: enhance pedestrian safety, ensure sufficient manoeuvrability, balance carrying volume and axle loads and to minimise the number of truck movements overall
- ensure truck movements occur where they minimise the impact to bus operations
- ensure pedestrian conflicts at driveway crossings are managed
- hours of truck operation are restricted where the requirement to stop traffic using Stop/Slow control would result in flow on impacts to the adjoining road network, where the impact of truck movements results in significant traffic congestion, or where the noise impacts of truck operations results in significant disruption to residential noise receivers.

7.1.6 Pedestrians and cyclists

The strategy for minimising impact to pedestrians and cyclists at all worksites includes the following principles:

- management of pedestrian and vehicular access to and past worksites to ensure safe entry and exit procedures. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals, modification to existing signals, or on occasions police presence.
- maintenance of access to existing properties and buildings, which may require temporary crossovers
- minimise visual, noise and air pollution associated with the works by site screening, acoustic shrouds or covered work zones, secured tidy site compounds and dust and spillage minimisation for sites and truck movements.

7.1.7 Traffic and transport communication

Priority would be given to providing adequate guidance to drivers, pedestrians and cyclists, consulting authorities and the community, prior to commencement of the work and in responding appropriately to issues and events as they arise during the construction works. This would be achieved by:

- directional signage and line marking to direct and guide drivers and pedestrians past work sites and on the surrounding network. This would be supplemented by portable Variable Message Signs (VMS) where required to advise drivers of potential delays, traffic diversion, speed restrictions, alternate routes, etc.
- public notification of proposed traffic changes by newspaper, radio, internet site, and community liaison.
- co-ordination with the BCC and TMR's Traffic Management Centre in the event of incidents or undue congestion.

Traffic and transport communication would be designed to:

- provide timely, accurate and comprehensive traffic and transport information
- influence road users to adopt different travel modes in the area
- allow and accommodate community feedback regarding traffic issues
- manage traffic impacts to protect affected residential and business amenity
- ensure media are well informed and aid in traffic impact minimisation.

7.2 Construction activity overview

7.2.1 Introduction

There are four general stages of construction envisaged across the project worksites, namely Enabling Works, Demolition, Main Construction and Fit out. An overview of these is presented in the following sections. Additional detail on the construction methodology for the project can be found in the Reference Design Construction Issues Report (AECOM 10/9/2010), the Construction Program, Methodology and Issues for the Updated Reference Design report (AECOM 30/3/2011) and the worksite drawings (SK-EIS-01051 to SK-EIS-01065).

The information presented in this section is intended to summarise the construction methodology from a traffic perspective, and is not intended to supersede or replace any information contained within the relevant AECOM reports.

7.2.2 Stage 1 enabling works

These works include the termination and relocation of engineering services such as power water etc and would require a range of different traffic management measures. Although some of these may be significant the duration is expected to be relatively small.

The enabling works include a wide range of activities and include:

- protection works for adjacent developments and facilities, buildings, existing stations, engineering services
- termination of existing engineering services (power, sewer, water, communications, etc.)
- relocation of engineering services
- local road changes including traffic signals
- construction worksite access road construction
- station and construction utility requirements
- construction worksite erection (sheds, sewer, water, power, communications, etc.

This range of activities would require careful planning and co-ordination to minimise disruption and ensure the program is delivered on time. Details would be confirmed as part of the Traffic Management Plan for each station when the scope of this work is confirmed.

Termination of existing engineering services

Upon taking vacant possession of developments all services would be terminated. It is envisaged that these would be very short term activities of less than a day per service for each site and that they would mostly occur on a weekends or overnight, utilising the TMR standards including TMR MRS02 Provisions for Traffic, MRTS Provisions for Traffic, as well as MUTCD, **Chapter 3**.

Protection of adjacent developments

It is likely that the worksites and associated operations and traffic management would have an impact on adjacent properties. All reasonable efforts should be made to minimise impacts. Where practical, access should be maintained to existing off-road accesses. Consideration should also need to be given to access for waste collection, deliveries and the emergency services (and any associated evacuation plans).

At worksites where building are demolished there would be protocols established by the Project for dealing with associated issues such as noise, vibration and structural integrity.

Traffic management measures associated with these activities potentially include:

- provision of loading zones for delivery of materials such as scaffolding
- partial and or full closure of public places to underpin existing development.

Local road changes

It is likely that some road and footpath works would be required to enable the traffic management layouts identified in the Construction Traffic Management Plans. Additional detail would be provided within those plans once developed.

This enabling work would be required before establishment of the worksites and would need to be programmed by the relevant contractor. Site occupancy and operations would not be permitted until this enabling is completed.

Surface track works and existing rail stations

Adjustment to existing rail station access points, including pedestrian access bridges, pick up and drop off points, road realignment etc would take place prior to commencement of reconstruction of existing surface rail stations or significant diversion of existing rail lines. The details of these enabling works are yet to be determined, and traffic management techniques would be determined in the corresponding Traffic Management Plans to be developed prior to commencement of construction.

Station utility requirements

The new stations and each construction worksite would require utility services. Provision would need to be made for these and any associated connection works.

The power supply requirements would also include power supply cables for the TBMs. Each station would also require its own power. Connecting the transformers / sub-stations to existing power lines may require works on the adjacent road network.

Temporary construction power supply may be installed as part of a preliminary site works prior to commencement of the primary contract to ensure that the contractor has adequate high voltage power supply approximately six months prior to commencement of excavation works.

Depending on the location of supply sources, this may require:

- footpath trenching, together with opening / modifying manholes at existing supply points
- road crossings, which are assumed, would be feasible via underbore or under temporary lane closures and night work, with steel plates installed during the day, prior to backfilling and pavement rehabilitation.

Water / drainage, and telecommunications supply to the station worksites are likely to be more minor.

These works may have an impact on the traffic management needs and would require early scoping and identification.

Construction utility works

Construction of the Cross River Rail stations, associated infrastructure and above ground rail tracks is likely to have an impact on a range of existing utility services. This is more likely where works take place on the footpath or in the road, as well as within the existing rail corridor. Depending on the size and extent of current services either diversions or protection may be appropriate.

The likely impacts would be:

- footpath trenching
- road crossings
- footpath / road closures.

The scale of this work is yet to be identified. However activities most likely to cause disruption could include sewer and water main works. At this stage the worksites for utility services termination and diversion have not been developed. It is expected that although services diversion activities could be quite disruptive it would only be for a relatively short period of time (for example one to two months).

7.2.3 Stage 2 demolition

There would be a need for demolition works for existing buildings to accommodate the station access points, ventilation shafts and other sub surface works. During demolition these activities often need to initially occur on street until sufficient space is available on site. Once space is available on site it is expected that there would be minimal need for construction zones.

To enable demolition it assumed that vehicles would access the site from the road crossing driveways, however where existing kerbside parking or loading is provided consideration would be given to converting this to a works zone to facilitate access.

Any spoil and other demolition material would be removed using the approved haulage routes to the arterial road network. Although demolition may require specific approvals they would only be for a relatively short period of time of a few weeks. The frequency of truck movements are expected to not exceed that of the excavation stage.

All other controls and restrictions are expected to be consistent with typical working hours and the approvals processes would be the same as documented in this assessment.

7.2.4 Stage 3 main construction

The main construction phase includes the excavation of stations and tunnels and is expected to generate the busiest period of truck movements for the project.

The following spoil trip generation rates and delivery rates for each of the core worksites have been developed using the following assumptions:

- critical case conforms to segment delivery during peak rates of tunnel advance; with total materials delivered to site estimated to be approx. 15% of the volume excavated
- assume density of reinforcement and concrete delivered equivalent to density of excavated material, ie approx. 2400 kg/m³
- assume that peak rates mentioned in first bullet point are analogous to deliveries during a major concrete pour, as might occur during concrete casting at any of the station sites
- 20T capacity trucks – deliveries six days/week.

Note that apart for the tunnel drives, it is unlikely that periods of peak material deliveries would conform to periods of peak excavation.

The order of magnitude estimate of truck movements with respect to deliveries is listed in **Table 7-1**:

Table 7-1 Delivery vehicle trip generation

Element	Average Rate (trucks/day)	Peak Rate (trucks/day)
Southern Portal main worksite	23	57
Fairfield Vent Shaft	2	4
Boggo Road worksite	10	24
Woolloongabba worksite	23	57
Albert Street northern worksite	3	6
Albert Street southern worksite	12	30
Roma Street southern worksite	12	30
Roma Street central worksite	3	6
Roma Street northern worksite	3	6
Northern Portal	8	20

Source: AECOM 17/9/10

Table 7-2 provides details of the spoil trips generated for each worksite.

Table 7-2 Spoil trip generation

Element	Vol (m^3)	Average Rate (m^3/wk)	Peak rate (m^3/wk)	Average rate (t/wk)	Peak rate (t/wk)	Average rate (truck/day)	Peak rate (truck/day)
Southern Portal main worksite	375,000	7500	18750	18000	45000	86	214
Fairfield Vent Shaft	11,500	1000	2500	2400	6000	12	29
Boggo Road worksite	155,000	3125	7813	7500	18750	36	89
Woolloongabba worksite	437,000	7500	18750	18000	45000	86	214
Albert Street northern worksite	60,000	800	2000	1920	4800	9	23
Albert Street southern worksite	130,000	2000	5000	4800	12000	23	57
Roma Street southern worksite	125,000	2000	5000	4800	12000	23	57
Roma Street central worksite	15,000	800	2000	1920	4800	9	23
Roma Street northern worksite	21,000	800	2000	1920	4800	9	23
Northern Portal	96,000	2625	6563	6300	15750	30	75

Source: AECOM 29/3/11

Notes:

1. *Assumes spoil haulage 7 days/week, Assumes density = 2.4T/m^3 and 30T trucks*

7.2.5 Stage 4 station fit-out

Following the completion of the main construction works, the fit out and commissioning would take place. Station fit-out includes activities such as:

- mechanical and electrical installation and fit-out
- internal station platforms, ventilation and operational systems
- vertical transportation (escalators and lifts)
- platforms
- pedestrian walkways,
- fire and life safety equipment
- emergency egress passages,
- electrical cabling and equipment,
- gate line
- floor and wall finishes
- architectural and urban design elements.

As these works are generally internal to the station the impact is largely in terms of traffic movements, parking and site access.

Rail tracks, overhead wiring, fire and life safety systems and other similar systems would be installed via the running tunnels, from either end. Surface rail track would take place via various access points adjacent to the rail corridor.

The measures previously identified such restrictions on parking, and possible use of consolidation centres would reduce the impact of these works. Further detail would be provided at the CTMP stage.

7.3 Project sections and construction approach

The major scheme elements identified in the AECOM 'Draft Reference Design Construction Issues' Revision C are summarised in **Table 7-3.**

Table 7-3 Cross River Rail - Underground Portion - Major Scheme Elements (All dimensions inside to inside)

Element	Tunnel length (approx.) (m)	Form	Likely Construction Techniques
Yeerongpilly Portal	350	Dive structure immediately to east of existing rail corridor. Then portal and driven (TBM) tunnel to north.	Reinforced concrete retaining wall; soldier pile wall at immediate portal retaining re-aligned Wilkie Street. Elsewhere reinforced (i.e. soil nails) or un-reinforced cuttings. Short length of cut & cover tunnel and TBM Launch site, with TBM assembled in the cut and cover tunnel north of Wilkie Street.
Yeerongpilly – Boggo Road tunnels	3,000	2 x single track running tunnels; with cross-passages at approx. 240 m c/c (note 3)	TBM tunnels in rock (Note 4); mined cross passages. Pre-cast concrete segmental TBM tunnel linings; cast insitu concrete or shotcrete cross passage linings
Intermediate Ventilation Shaft	30	Approx. 30 m x 20 m shaft - tunnel supply + exhaust; emergency egress stairs; lift; tunnel sump. Surface expression includes ventilation tower to take ventilation openings above flood levels.	Secant pile walls with cast reinforced concrete skin. Cast in-situ reinforced concrete internal structure.

Element	Tunnel length (approx.) (m)	Form	Likely Construction Techniques
Boggo Road Station	250	Cut and cover station box (portions constructed top-down – see next column); entrances and tunnel ventilation at each end of the station	Soldier pile wall or the like retaining structures. Capping beam on piles at topslab level. Pre-cast beams and cast insitu top slab. Conventional reinforced concrete slabs and skin-wall at depth. Top-down construction to minimize surface impacts (Note 5). TBM push-through station box
Boggo Road – Woolloongabba Station tunnels	900	2 x single track running tunnels; with cross-passages at approx. 240 m c/c (Note 3)	TBM tunnels in rock (Note 4); mined cross passages. Pre-cast concrete segmental TBM tunnel linings; cast insitu concrete or shotcrete cross passage linings
Gabba Station	250	Cut and cover station box in central section of site from busway in the south to Vulture Street freeway off-ramp in the north. Cavern profiles at each end. Tunnel ventilation reticulated back into box from station ends	Secant pile walls (Note 6) with cast reinforced concrete skin. Numbers of piles taken to depth to carry future development loads
Gabba Station – Albert Street Station tunnels	1,600	2 x single track running tunnels; with cross-passages at approx. 240 m c/c (Note 3)	TBM tunnels in rock (Note 4); mined cross passages. Pre-cast concrete segmental TBM tunnel linings; cast insitu concrete or shotcrete cross passage linings.
Albert Street Station	250	Station cavern approx. 250 m long; entrances and tunnel ventilation in off-line shafts at each end. Two shaft-cavern connecting adits at each end - one passenger; one ventilation / services / egress	Mined station cavern - minimum two top-headings; potentially full-width bench. Shaft at southern end - shallow rock anticipated - temporary walls retaining soil near-surface; cast insitu walls. Secant pile wall for northern shaft (deeper rock).

Element	Tunnel length (approx.) (m)	Form	Likely Construction Techniques
Albert Street – Roma Sreett tunnels	800	2 x single track running tunnels; with cross-passages at approx. 240 m c/c (Note 3)	TBM tunnels or roadheader tunnels or in rock (Notes 4, 7); mined cross passages. Cast insitu concrete roadheader tunnel linings or pre-cast concrete segmental TBM tunnel linings; cast insitu concrete or shotcrete cross passage linings.
Roma Street Station	250	Station cavern approx. 250 m long; entrance and tunnel ventilation in on-line shaft at south end. Entrance in shaft providing connection to existing subway towards centre of station. Ventilation and egress shaft beyond northern end of station.	Mined station cavern - possibly two top-headings; potentially full-width bench. Shafts - shallow rock anticipated - temporary walls retaining soil near-surface; cast insitu walls.
Roma Street – North Portal tunnels	1,300	2 x single track running tunnels; with cross-passages at approx. 240m c/c (Note 3)	TBM tunnels or roadheader tunnels or in rock (Notes 4, 7); mined cross passages. Cast insitu concrete roadheader tunnel linings or pre-cast concrete segmental TBM tunnel linings; cast insitu concrete or shotcrete cross passage linings. Possibility for drill + blast in areas distant from sensitive receivers.
Northern Portal	300	Shallow tunnels transition to cut and cover and then trough structures for NB and SB-tracks. Provision for future NW line (tunnel stubs; provision for future ventilation facility)	Temporary walls retaining soil near-surface; cast insitu walls.

Notes:
1. *n/a*
2. *n/a*
3. *Nominal cross-passage spacing*
4. *Vertical alignment arranged to maintain approx. 1 dia cover*
5. *Top-down construction through majority of box length; open box to track level providing access at southern end of box*
6. *Anticipate full groundwater cut-off required*
7. *Mined tunnels – either road header or drill & blast where viable*

As well as the above tunnelled sections of the Project, worksites would be required to support surface rail upgrades to the south and north of the tunnel.

Southern surface works

Two southern worksites would be required at Clapham Yard and Salisbury to support surface rail upgrade works as part of the Project. These works would include additional train stabling, additional tracks, new bridges and viaducts as well as an upgrade to Moorooka station.

Additional satellite sites would support surface works for the new Ipswich Motorway southbound on ramp in the vicinity of Fairfield Road and works associated with Muriel Avenue in Rocklea.

Northern surface works

The northern surface works would be centred on Mayne Yard where a number of separate worksites would be required to support various sections of surface rail tracks and rail viaduct through Mayne Yard, as well as the new Ekka Station and new O'Connell Terrace road-over-rail bridge.

7.4 Existing conditions

The existing road traffic conditions for each of the main worksites are provided in **Table 7-4** below. The table summarises the main traffic considerations arising at each of the worksites. Additional detail, where relevant to the existing conditions, is provided in **Section 7.7** as well as the Pavement Assessment and Traffic Modelling sections of this assessment.

Table 7-4 Existing conditions

Worksite	Location	Surrounding Streets	BCC Road Class	BCC Area Zones	Parking Facilities	Bus Stop
Northern Portal	The Northern Portal would be located in Victoria Park, adjacent to the Centenary Pool complex	Gregory Tce	Suburban Route	Parkland Area / Character Residential Area	Controlled On Street Parking	School Buses and Private Charter. TransLink buses use Gregory Terrace.
		Inner City Bypass W/B	Suburban Route			
Roma Street	The Roma Street Station would be located within the Roma Street Parklands and the existing infrastructure for the current rail Station	Albert St	District Route	The City Centre / Parkland	On Street Parking with Event Restriction Parking	TransLink services use Roma Street while private charter buses also service the area.
		Wickham Tce	District Route			
		Roma Street	Suburban Route			
Albert Street	The Albert Street Station would be within the Albert Street corridor between Alice and Mary Street	Alice Street	Suburban Route	The City Centre	On Street Parking with Event Restriction Parking	City Circle Bus Service and various bus routes on Albert Street and Mary Street.
		Albert Street	District Route			
		Mary Street	Suburban Route			
		Edward Street	Suburban Route			

Worksite	Location	Surrounding Streets	BCC Road Class	BCC Area Zones	Parking Facilities	Bus Stop
Woolloongabba	The Gabba Station would be located between Stanley Street, Main Street, Vulture Street and Leopard Street	Leopard St	All roads are zoned Arterial Routes	General Industry Area, Medium and High Density Residential Areas	On Street Parking with Event Restriction Parking	Woolloon-gabba Busway Station servicing South-East Busway and various buses utilise Main Street
		Main Road				
		Wellington Rd				
		Stanley Street				
		Vulture Street				
		Vulture Street Exit Ramp				
Boggo Road	This station would be located in the Boggo Road Urban Village east of Annerley Road	Boggo Road	Local Access	Low-Medium Density Res Area / General Industry Area & Emerging Community Areas	On Street Parking with Event Restriction Parking	Boggo Road Busway Station servicing University of Queensland and the Eleanor Schonell Bridge to Princess Alexandra Hospital
		Peter Doherty St	Local Access			
		Annerley Road	Arterial Route			
Southern ventilation shaft	The southern ventilation shaft would be located immediately east of Fairfield Road; between Sunbeam Street and Bledisloe Street	Fairfield Road	Arterial Route	Low-Medium Density Res Area	No parking controls	Fairfield Road caters for various bus routes
		Sunbeam Street	Local Access			
		Bledisloe Street	Local Access			
Yeerongpilly / South Portal	The south portal worksite would be located east to the rail line between Station Road and Wilkie Street	Wilkie Street	District Access	Low-Medium Density Res Area / General Industry Area	On Street Parking with Event Restriction Parking	Wilkie Street and Green Street current bus route for Buses 105, 107,108
		Station Street	District Access	General Industry Area		
		Lucy Street	District Access	General Industry Area		
		Livingston Street	Local Access	Low-Medium Density Res Area		

Worksite	Location	Surrounding Streets	BCC Road Class	BCC Area Zones	Parking Facilities	Bus Stop
		Green Street	District Access	Low-Medium Density / Character Res Area		
		Bow Street	Local Access	Low-Medium Density Res Area		
		Park Lane	Local Access	Low-Medium Density Res Area		

7.5 Rail services – assessment of construction effects

The construction of Cross River Rail would include both major surface and underground works. Much of the surface rail works would interface with the existing rail network, which would result in extensive sections of rail construction being carried out in or close to areas where passenger and freight rail services operate. The detailed construction methodology would need to include measures such as maximising works outside the danger zone through the isolation of the work site from rail traffic and overhead energy by, eg overhead isolation, closing of tracks and locking of points.

Underground works would have minimal impact on current operations. Of the Cross River Rail stations within the tunnel only Roma Street has construction activities that would have a direct impact on the current rail network.

The extent of surface works south of the portal at Yeerongpilly and north of the portal at Victoria Park would be significant. Generally all passenger and freight rail services would continue to operate except when Cross River Rail takes possession of the tracks through targeted night time (outside of passenger rail operations), weekend and other longer period rail shutdowns.

Construction activities requiring a railway shutdown would be planned well in advance to minimise disruption to the network as a whole by, for example coordinating Cross River Rail construction with already scheduled rail maintenance activities. Shutdowns would not typically be permitted during major events such as the State of Origin, Ekka, Broncos home games and Riverfire.

Surface Rail works south of the southern portal

South of the southern portal, all passenger services would generally continue with the exception of a temporary closure of Moorooka Station for around 12 months. This closure would affect around 350 passengers whom currently use Moorooka Station during the morning two-hour peak period. Other stations south of the Yeerongpilly portal (Yeerongpilly, Rocklea and Salisbury) would only be closed when the track is subject to a shutdown.

The existing passenger access points to the stations in this section would be maintained with the exception of Yeerongpilly Station. At this station the existing pedestrian footbridge that provides access to the station platforms from Wilke Street would be extended across the work site to the re-aligned Wilke Street.

There is not expected to be any significant impact (including rail shutdown periods) on freight operations that use the Tennyson loop to access the rail corridor at Yeerongpilly. This applies to rail freight services that operate between locations to the west of Brisbane through to the Port of Brisbane. Rail freight services that could be impacted are those that use track between the Tennyson loop and Salisbury (estimated to be 132 two-way freight movements in 2007).

Surface rail works north of the northern portal

The extent of rail infrastructure alterations north of the northern portal, in the immediate vicinity of Mayne Rail Yard is significant and complex. A regular and frequent series of nightly and weekend shutdowns would be required and the possibility of longer shutdown periods at Easter or Christmas may have to be considered.

However works would be designed and timed so that there was sufficient track capacity to allow typical weekday peak period rail schedules to be maintained.

Exhibition Station and the Exhibition Loop

Passenger rail services do not currently serve Exhibition Station except during the Royal Queensland Show (Ekka) and the Caravan and Camping Show. Construction works could result in Exhibition Station being closed for one Ekka and Caravan and Camping Show although this would depend on the detailed construction staging arrangement chosen by the contractor. Should construction require a station closure, alternative transport would need to be provided. Construction works may need to be temporarily suspended at Exhibition Station when the Ekka is held as access for materials delivery would be reduced due to large crowds and access restrictions.

Freight and other passenger rail operational movements could continue on the Exhibition Loop during the construction period except during shutdown periods. Diesel freight trains would be able to continue to operate when shutdowns are limited to the removal of electrical power from the OHLE.

Roma Street Station

The construction of the major connection between the existing Roma Street Station subway and the new underground station would require acquisition of all of the staff car park at the city end of the railway heritage building that occupies Platform 3. These connection works would also require the existing passenger toilets in the subway be relocated.

The major vertical shaft and works at the northern end of the station would require the demolition of the existing baggage handling facility and the rubbish disposal area on Platform 10.

Works at Roma Street Station may also need the temporary diversion of trains to other platforms.

Rail maintenance

Cross River Rail construction works would occur within close proximity to a number of existing railway stabling and maintenance facilities and staff access points to such facilities. While accesses would generally be maintained for staff and trains throughout the construction period, any temporary closure or diversion would need to be indentified in detail in each CTMP and require prior approval of Queensland Rail.

Surface works would be carried out and managed such that all emergency service and maintenance vehicles would still be able to access the rail corridor at all times.

7.6 Worksite assessment

Each worksite would result in a unique impact to the adjoining road network. This section identifies traffic impacts and changes that would be required in order to complete the expected construction activities at each of the worksites. The worksites are examined in order from the north to the south. It is recognised that this is a preliminary assessment based on the current information available and likely to require refinement by the contractor, once appointed.

7.6.1 Mayne Yard

Mayne Yard worksite is required to enable a number of construction activities occurring north of O'Connell Terrace, including re-alignment of existing rail tracks, adjustment to embankments, piling and earthworks, construction of a rail flyover and as a materials depot and construction consolidation yard.

The Mayne Yard is wholly located in privately owned land by Queensland Rail. The Mayne Yard is a critical operational area for Queensland Rail and construction activities need to be managed to result in a minimum of impact to rail operations. A number of level crossings operating within the yard are a key area of traffic management concern.

Worksite location and proposed truck access

Mayne Yard worksite can be accessed by a number of different vehicular access points. The following access points are proposed to be used by the Project:

- main access and egress via Lanham Street/O'Connell Terrace . This access point is likely to be modified due to construction staging of the O'Connell Terrace bridge, however access for 19m heavy vehicles will be maintained at all times
- potential alternative access and egress at particular stages of construction via McDonald Road and Queensland Rail access point off Grafton Street
- access and egress via Mayne Road and the Queensland Rail Main Control driveway
- Queensland Rail track access point/s from Abbotsford Road, approximately 50m south west of its intersection with Allison Street.

Considerable reconfiguration of the Mayne Yard is proposed as existing rail tracks are removed, relocated and reconfigured under several different rail staging configurations. It is likely that existing internal circulation roads, pedestrian access routes and level crossings within Mayne Yard, serving various sections of Queensland Rail operations, would be reconfigured and adjusted by the Project.

A figure showing the access routes and worksite location is shown in **Figure 7-1** below. These routes represent the main routes used for major haulage. In addition to haulage, potential delivery vehicle routes are also shown in the figure. The delivery routes would be developed in more detail by the contractor, adopting the guiding principles outlined in **Section 7.3**.

Traffic staging and network changes

As all identified Project works occur off the road network, there are no identified network changes required at this worksite.

The Mayne Yard works would be delivered under a number of construction and traffic stages, which would require modifications to the internal circulation routes within Queensland Rail land. The construction traffic staging and internal traffic modifications require further development.

Works arising from the Exhibition Station worksite, located at the southern edge of the Mayne Yard worksite, particularly in relation to the reconstruction of O'Connell Terrace and Lanham Street, would impact on access to the Mayne Yard. The AECOM "Design Refinement Report – Northern Surface Works – O'Connell Terrace Bridge (21/2/2011) details potential impacts and construction staging. However, the Project would be involve the reconstruction of O'Connell Terrace and Lanham Street in a manner which maintained vehicle access at all times to enable emergency vehicle access to the Clem7 Tunnel, and the Mayne Yard worksite/ Queensland Rail operations.

Network operation – impact on traffic conditions

The following changes to existing traffic conditions are anticipated:

- an increase in the volume of heavy vehicle traffic on Albion Road corridor, during an early stage of work. It is noted that this corridor carries an existing high volume of heavy vehicles, particularly associated with cement trucking.
- an increase in the use of the Queensland Rail gate access from Abbotsford Road. Access is via a shoulder lane and indented bus bay area.
- a slight increase in traffic on identified haul routes resulting from project traffic.
- additional demand on the O'Connell Terrace and Lanham Street traffic signals from construction vehicles.

Traffic modelling of the impact of construction heavy vehicles on the adjacent arterial road network has been undertaken, and is detailed in **Section 7-8**.

Pedestrians and cyclists

Generally there would be no impact to existing pedestrian or cyclist movements on the external road network due to the operation of the Mayne Yard worksite itself. However the reference design requires the reconstruction of O'Connell Terrace over the railway line (see **Section 7.7.2**) and as such temporary changes to pedestrian and cycle movement would be anticipated.

It is also anticipated that there would be adjustments to the internal movement of pedestrians between Queensland Rail staff car parking and buildings within the Mayne Yard. General mitigation measures and guiding principles established in this document would be used to inform more detailed planning, once construction sequencing is developed.

Buses

No impacts to existing bus operations resulting from operation of the Mayne Yard worksite are anticipated.

There may slight impact to the existing bus stop in an indented lay-by, northbound in Abbotsford Road, where construction vehicles would be entering and exiting the existing Queensland Rail property access gate. This may result in buses being delayed in accessing the stop while construction vehicles are manoeuvring into or out of the gate. Site observations suggest that this bus stop is not a high demand stop, and no specific mitigation measures are proposed.

Parking

Existing Queensland Rail staff parking areas within Mayne Yard would be impacted by the Project. It is anticipated that existing Queensland Rail staff parking may be relocated to alternative areas within the Queensland Rail Mayne Yard site. This may result in some additional walk distance between car parking and local destinations within the Yard.

Additional Project workforce parking is proposed to be provided within the Mayne Yard worksite to accommodate 50 workforce parking spaces, and the Project workforce would use the current Mayne Yard access (Lanham Street) off O'Connell Terrace as the main site access point. A further 45 carparks are proposed on O'Connell Terrace, creating a total of 95 dedicated carparking spaces for the workforce at the Mayne and O'Connell Terrace worksites. Estimates of peak workforce numbers on site at these two worksites total 156, which is expected to last for between 50% and 75% of the construction time of the Project. The proposed carparking would accommodate around two thirds of the projected peak on site workforce number which is considered reasonable given:

Some of the workforce could be expected to/ encouraged to car pool

Some of the workforce, subject to shift hours, could be encouraged to use public transport to access the worksites given that the RBWH busway station of Bowen Hills Station are in close proximity to the worksite

Some of the workforce could use commercial off street parking such as at the RNA Showgrounds

Surrounding streets are included within the Brisbane Central Traffic Area (with some limited exceptions) and as such parking on surrounding streets is generally limited to 2 hours and as such unsuitable for all day workforce parking and

Excess parking at the northern portal site (ie approx 40 carparking spaces in excess of peak workforce numbers) could be used to accommodate overspill parking demand from the Mayne Yard and O'Connell Terrace worksites.

LEGEND

- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-1

Mayne Rail Yards Heavy Vehicle Access and Egress Routes

0 100 200 300 400 m

N

1:12,000 at A4

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0150_CRR_Haulage_Routes_Mayne_Railyard_A4_TR.mxd 07/07/2011 15:40

Access, servicing and provision for adjacent development

No impacts on adjacent development are proposed.

The existing emergency access point to the Clem Jones Tunnel via O'Connell Terrace and Lanham Street would be maintained at all times. Access for Queensland Rail operations including the Main Control room would be maintained at all times. Any temporary adjustment required to access for adjacent developments or Queensland Rail would be developed having regard to the processes identified within this document.

Emergency services

It is expected that Queensland Rail have existing protocols related to emergency services access to and from the various activity areas within Mayne Yard. This would also include emergency evacuation routes from the various activity areas within Queensland Rail property. The Yard also provides its own emergency function to the rest of the rail network, storing materials and plant and equipment that are required to facilitate emergency repairs to the network.

Any adjustment to existing emergency service access, egress or evacuation from the Mayne Yard would only be contemplated through consultation with Queensland Rail, and any change notified to all emergency service providers. There is an emergency vehicle access to the Inner City Bypass with access to and from Lanham Street. It is not proposed to close or modify this access point at any stage of construction.

Special events

No public special events take place within Mayne Yard, and as such there is no impact related to Special Events.

Other

Existing material set down areas and truck manoeuvring areas within the Mayne Yard may be modified during various construction stages. There may be a requirement to share set down areas with the Project. The Project would establish its own compounds within the overall Mayne Yard Queensland Rail property boundaries. Adjustments to existing Queensland Rail material set down areas and truck manoeuvring spaces would be undertaken to ensure a minimum of disruption to Queensland Rail functions.

Table 7-5 provides a summary of construction impacts and mitigation at Mayne Yard.

Table 7-5 Summary of construction impacts and mitigation

Location	Impacts	Remedial measures
Mayne Yard	Use of Abbotsford Road bus bay for construction vehicle access to Queensland Rail property gate Adjustment to internal Queensland Rail staff parking and provision of an additional 50 spaces for the Project workforce parking Adjustment to existing Queensland Rail truck turning and material set down areas Adjustment to existing level crossings within Mayne Yard Adjustment to emergency service access to Queensland Rail buildings and building evacuation routes Change to Queensland Rail staff pedestrian access routes between car parking and buildings Small increase in heavy vehicle volumes on site access and egress routes	Consultation with Queensland Rail on all proposed internal access modifications Close liaison with emergency service providers regarding changes to access

7.6.2 Ekka Station and O'Connell Terrace worksites

The Ekka Station worksite would be required in order to reconstruct the Exhibition Station platforms, new tracks on the Exhibition Loop rail line and for surface works related to widening of the rail corridor. The O'Connell Terrace worksite adjoins the Ekka Station worksite, and is required in order to reconstruct O'Connell Terrace rail over-bridge, and the surface levels of the adjoining road for up to 300m adjacent to the existing rail bridge.

Worksite location and proposed truck access

The Ekka Station worksite would be located off-road within the existing RNA show grounds and would generally be located on the northern side of the railway corridor. To the immediate south of the rail corridor a worksite containing workshops, storage, offices and car parks would be located with an additional site for Project workforce car park on the corner of O'Connell Terrace and Tufton Site. Access to the main worksite would be directly to and from O'Connell Terrace. Access to the worksite would be facilitated via a ramp from the worksite gates.

The O'Connell Terrace worksite would be accessed from O'Connell Terrace, Sneyd and Tufton Streets.

A diagram showing the heavy vehicle access routes to this worksite is shown in **Figure 7-2** below. These routes represent the main routes used for major haulage. In addition to haulage, potential delivery vehicle routes are also shown in the Figure, The delivery routes would be developed in more detail by the contractor, adopting the guiding principles outlined in **Section 7.3**.

There are no traffic or network changes required for the Ekka Station worksite, as this worksite is off-road.

The O'Connell Terrace worksite would require a staged construction approach within O'Connell Terrace which may require short term full or partial closures to undertake traffic switches, during periods of low traffic (eg over night). The Reference Design provides for a temporary bridge over the railway line to maintain access to and from Lanham Street for Queensland Rail and Project activities. This temporary bridge would be accessed from Tufton Street with all movements permitted at the intersection of Tufton Street and O'Connell Terrace. The Lanham Street signalised intersection would be closed and signals decommissioned during construction. Sneyd Street would also be closed north of O'Connell Terrace during some elements of the construction staging, with traffic detoured via Wren Street.

Local access within O'Connell Terrace would be maintained. Detours would be advised to all road users including emergency service providers, with a communications plan to be developed.

Network operation – impact on traffic conditions

Additional construction traffic resulting from the Ekka Station construction worksite on both Bowen Bridge Road and O'Connell Terrace is not anticipated to have any significant impact on existing traffic conditions. A total of 13 truck movement per hour at peak times is expected to be generated by the two worksites which would result in around one truck movement every five minutes on average.

Staged construction traffic management arrangements put into place at the intersections of Lanham Street and Sneyd Street with O'Connell Terrace may result in delays for vehicles at these intersections, as well as increased volumes of traffic in Wren Street and Tufton Street during some stages of construction.

Pedestrians and cyclists

Pedestrian access along O'Connell Terrace is currently provided by a footpath on the northern side of the rail overbridge. Although there is a footpath along the southern side of O'Connell Terrace, there is no footpath or width provided on the southern side of the rail overbridge and pedestrians are required to cross at the Lanham Street traffic signals, or alternatively to walk in the westbound through traffic lane. Observation of adjoining land uses suggests that pedestrian volumes along O'Connell Terrace are low.

Alternative pedestrian access across the railway may be required during some stages of reconstruction, with pedestrians required to detour via Gregory Terrace, through the RNA showgrounds or via the proposed temporary Lanham Street/ Queensland Rail access bridge. A communication strategy would be implemented to advise pedestrians of the alternative arrangements.

The existing cycle lane eastbound along O'Connell Terrace would be modified by the construction activity. It is assumed that the cycle lane would be removed, at least in some stages of construction, with cyclists required to share road space with vehicles. Consideration would be given in detailed design to ensure cyclists have adequate warning of the need to merge with through traffic and occupy the lane, to avoid the situation where they may get squeezed as a result of an isolated section of road narrowing.

Buses

The Route 393 bus travels along O'Connell Terrace with up to 4 services per hour. Staged construction activity on the rail bridge may result in minor delays as for general traffic. The bus routing via Campbell and Sneyd Streets would be required to detour via Wren Street during part of the construction process. Any short term closure of O'Connell Terrace (to enable a traffic switch) would be likely to occur outside of bus service hours.

A communication strategy would be developed to advise bus passengers of any change to bus stops and liaison with TransLink would be undertaken to ensure the disruption to bus trips and bus passengers is minimised.

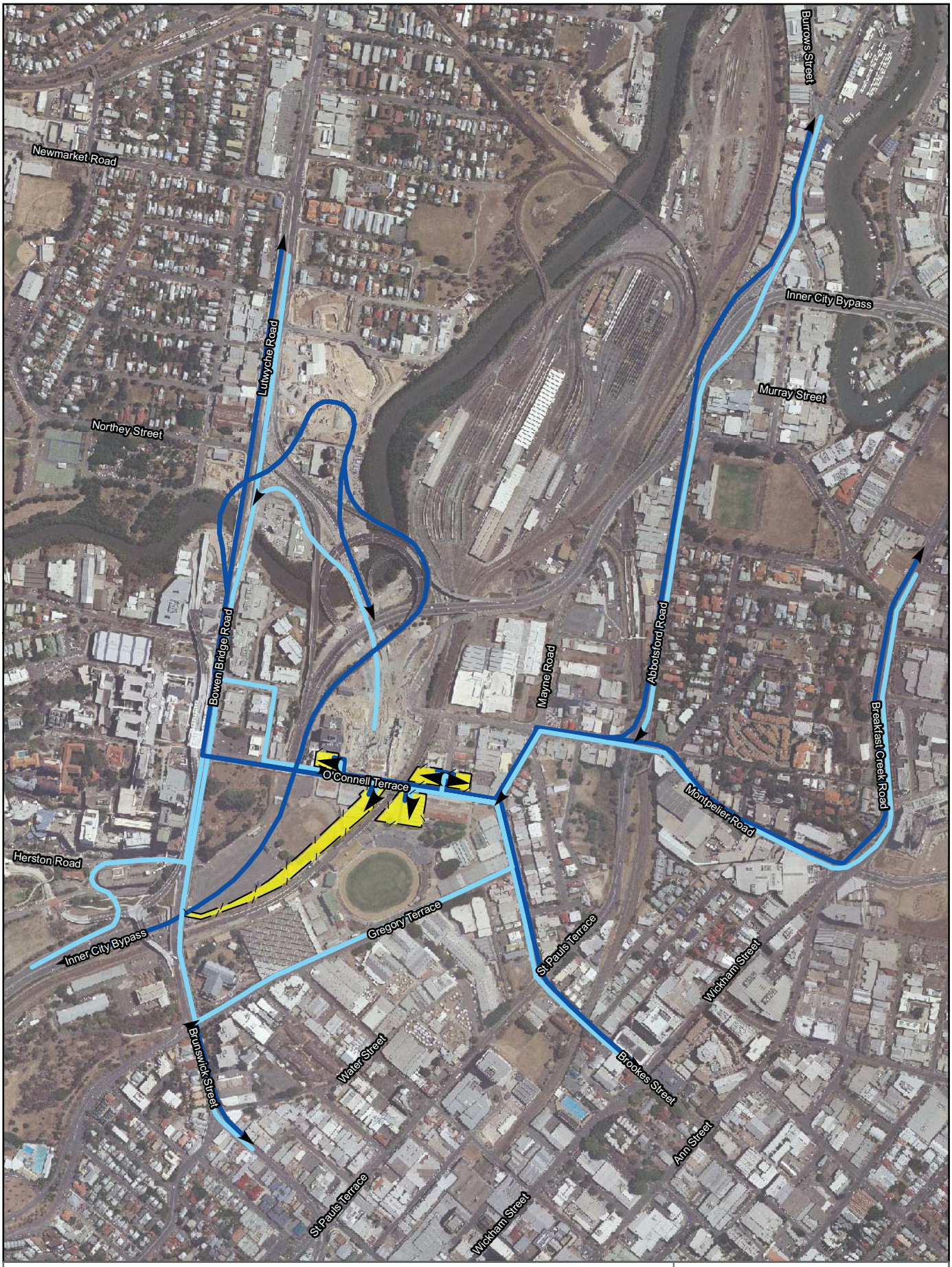
Parking

The Ekka Station worksite would occupy spaces currently used as all day parking within the RNA Showgrounds that is typically used by staff from the hospital. The available all day parking within the site is not fully utilised, so any loss of spaces due to worksite occupation may be able to be accommodated onsite. There is a limited amount of on-street parking currently provided in O'Connell Terrace east of Tufton Street that may need to be suspended during construction.

Workforce parking would be provided within the Ekka Station worksite with a capacity of 15 vehicles, and a second car parking area would be provided on land located on the north east corner of Tufton Street and O'Connell Terrace, comprising some 30 spaces. A discussion of worksite parking demand covering both the Mayne Yard and O'Connell Terrace/ Ekka Station worksites was included in **Section 7.7.1**. This concludes that overall parking numbers across these and the northern portal worksites would accommodate projected demand with limited on street parking impacts due to on-street parking restricted to two hours through the Brisbane Central Traffic Area.

The existing layout of parking within the RNA Showground's may require modification to ensure construction vehicle access to and from the worksite can be achieved without construction vehicles having to travel down rows of parked vehicles, which may otherwise present a safety hazard.

There is limited on street parking currently provided in O'Connell Terrace east of Tufton Street. Dependant on the scope of reconstruction work, this parking may need to be suspended during construction activity.



LEGEND

- Inbound Haulage Routes
- Alternate Inbound Haulage Routes
- Outbound Haulage Routes
- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-2

Ekka Station and O'Connell Terrace Construction Site and Haulage Routes

0 100 200 300 400 m N

1:10,000 at A4

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0168_CRR_Haulage_Routes_Exhibition_A4_TR.mxd 06/07/2011 15:57

Access, servicing and provision for adjacent development

Key adjacent development includes:

- RNA Showgrounds on the southern side of O'Connell Terrace
- businesses fronting O'Connell Terrace east of Tufton Street
- emergency vehicle access to Clem7 Tunnel via Lanham Street and Sneyd Street
- Queensland Rail access to Mayne Yard via Lanham Street.

There is anticipated to be no change to existing access to RNA Showgrounds access, however, driveway access points directly onto O'Connell Terrace, particularly east of the rail overbridge, are likely to be closed during construction. The main access west of Sneyd Street would not be impacted. Access to Queensland Rail Mayne Yard would be maintained at all times via Lanham Street, however construction at this intersection is likely resulting in staged traffic management arrangements. This may include additional delays in accessing or egressing Lanham Street onto O'Connell Terrace. Similarly, access for emergency services to the Clem7 Tunnel via Lanham Street and Sneyd Street would remain open at all times, however emergency service vehicles may have to use alternative routes to access these points if short term O'Connell Terrace overbridge closures are in place.

No change to existing access for businesses fronting O'Connell Terrace east of Tufton Steeet is anticipated, with no full closures of O'Connell Street rail overbridge expected.

Emergency services

Emergency Service vehicles would be impacted by any short term closure of O'Connell Terrace rail overbridge, and notice of any closure would be advised through procedures established by the Traffic and Transport Liaison Group. Access to the Clem Jones Tunnel emergency vehicle access points would be maintained at all times. **Table 7-6** provides a summary of construction impacts and mitigation at the Ekka Station and O'Connell Terrace worksites.

Table 7-6 Summary of construction impacts and mitigation for the Ekka Station and O'Connell Terrace worksites

Location	Impacts	Remedial measures
O'Connell Terrace	Staged construction activity within the O'Connell Terrace worksite (including short term closures to enable traffic switches to occur) as well as closure of Sneyd Street and detours via Wren Street. Potential pedestrian detours due to reconstruction of the rail overbridge. Suspension of eastbound cycle lane during construction. Detours for Queensland Rail Mayne Yard vehicles via Tufton Street and a temporary bridge to facilitate access to Lanham Street. Removal of some off-street car parking spaces in RNA showgrounds. Potential reconfiguration of RNA showgrounds car park. Potential suspension of existing on-street car parking in O'Connell Terrace east of Tufton Street. Potential closure of direct driveway access to RNA showgrounds east of rail overbridge where driveways occur within worksite area	Diversions (to enable traffic switches to occur) to be timed to occur at periods of low traffic. Communications Plan to be developed to advise motorists of delays and to avoid the area, as well as pedestrian detours. Detailed Construction Traffic Management plan to be developed; Considerate design to avoid cycle safety issues. Reconfiguration of existing RNA Showground parking to accommodate adjustment in parking provision. Special Events to be considered during development of the Construction Traffic Management Plan.

7.6.3 Northern portal worksite

The Northern Portal worksite would be located on the eastern side of Victoria Park, parallel to the existing Exhibition railway line to the north. The worksite forms a rectangular area between the Victoria Park Land Bridge to the south and the substation No.4 and associated office buildings to the north.

The worksite is required to construct the Northern Portal entrance structure and associated surface works to provide for tunnel accessibility. Excavation of the running tunnels via Road Header towards Roma Street Station. Installation of tunnel track and overhead wiring is also likely to be undertaken from this worksite.

Worksite location and proposed truck access

The northern portal work site would be located on land bounded by the Exhibition railway line and ICB in the north and the Victoria Park Land Bridge to the west.

Site access route for major construction vehicles including spoil haulage is proposed to use the Centenary Motorway from the south-west, and access the ICB from Milton Road (or Legacy Way), and then take the Herston Road off ramp onto Bowen Bridge Road, then a right turn into Gregory Terrace. Access to the construction worksite driveway would be via a direct right turn into the construction worksite from Gregory Terrace. Egress from the site would follow the same route, with a left turn into Gregory Terrace. An existing driveway onto Bowen Bridge Road would also allow left in and out turn movements from Bowen Bridge Road (northbound), immediately south of the northern busway access point.

A diagram showing the proposed spoil haulage route is shown in **Figure 7-3**. In addition to haulage, potential delivery vehicle routes are also shown in the Figure, The delivery routes would be developed in more detail by the contractor, adopting the guiding principles outlined in **Section 7.3**.

Traffic staging and network changes

The current intersection of the access driveway and Gregory Terrace would be maintained. The internal access road would need to be upgraded to allow for heavy vehicle access, principally through road widening and suspension of existing parking activity within the road width. A direct right turn into the work site driveway is proposed. Other treatments proposed to facilitate the right turn would include the provision of a passing lane in the kerb side lane of Gregory Terrace through suspension of kerbside parking and Keep Clear markings in the northbound lanes of Gregory Terrace.

Queensland Rail access roads currently provides access for maintenance to both sides of the rail track - one from the ICB westbound and one under Bowen Bridge Road to the southern side of the railway from the east. Construction works would require the underpass to be closed (to accommodate additional railway tracks), however alternative access could be provided via the construction worksite itself.

Network operation – impact on traffic conditions

At the peak of construction, 95 truck movements per day or around eight per hour could be expected. In addition up to 80 private vehicle movements could be expected during the AM peak hour as a result of workers arriving by car.

- Overall, however the operation of the northern portal construction worksite is likely to result in a negligible increase in Gregory Terrace/Bowen Bridge Road traffic including heavy vehicle traffic.
- When construction vehicles right turn into the driveway from Gregory Terrace, some minor delay could be experienced by westbound motorists on Gregory Terrace itself however one through-lane would be maintained at all times to match existing capacity.

Pedestrians and cyclists

As the Northern Portal worksite would occupy land which has an existing pedestrian and cyclist shared path, north of the land bridge, an alternative off road shared pedestrian and cyclist path shall be provided to travel on the eastern side of the tennis courts, linking to the existing shared path on the eastern side of the proposed site access driveway to Gregory Terrace. A suitable crossing facility including drop kerbs will be provided at the shared path intersection with the driveway access point.

Pedestrian footpath and on-road cycle lanes are provided along both sides of Gregory Terrace. No change to these is proposed.

Signalised pedestrian crossings are available at the intersections of Gregory Terrace/ Rogers Street and Gregory Terrace/ Bowen Bridge Road/ Brunswick Street. An underpass is also provided at the St Joseph's College to enhance the safety for pedestrians when crossing to the Victoria Park. There is no proposed change or impact to this part of pedestrian network.

An off-road cycle lane in the south of the worksite provides connection to the broader Normanby and Victoria Park bikeways with the Victoria Park Land Bridge. The cycle lane runs parallel to the Inner City Bypass linking and ends at the southern end of Victoria Park. There is no impact to this part of the cycle lane.

Buses

Bus stops exist on both side of the Gregory Terrace further to the south of the worksite driveway access point. Bus services along Gregory Terrace include:

- 321 (Kalinga to City)
- 331 (City to Bracken Ridge – outbound PM peak only)
- 332 (City to Chermside – outbound PM peak only)
- 341 (City to Carseldine – outbound PM peak only).

The combined bus services have a frequency of up to 20 buses an hour during the afternoon peak. 331, 332 and 341 inbound services operate through Water Street during the morning peak.

No impact to existing bus operations is anticipated to result from the proposed construction activity.

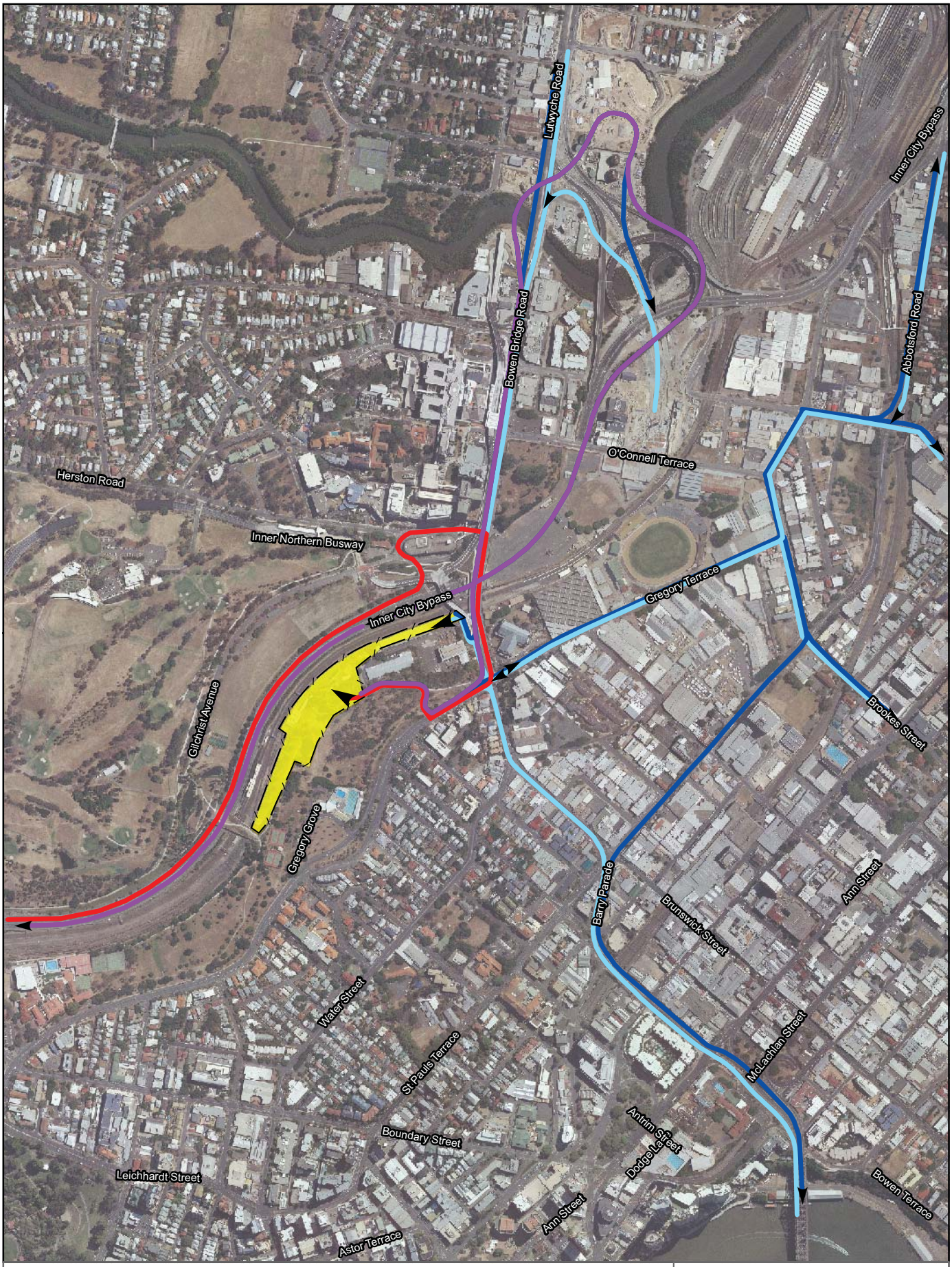
Parking

The existing car park related to the Centenary Aquatic Centre would not be impacted by the Project and would continue to be available for its users.

The car park in the vicinity of the electrical substation currently provides approximate 200 spaces that is used by Energex and Brisbane City Council staff. This car parking would be predominantly maintained for its current use. It is proposed that some car parking spaces adjacent to the driveway entrance would be removed to facilitate two way truck movement along the driveway. The southern section of parking associated with a Brisbane City Council facility would be removed, however this is not expected to result in any impact as the area currently occupied by the depot would be occupied by the Project, with Brisbane City Council uses being transferred to an alternative location.

Controlled (resident only or time limited) on-street parking is currently available on the southern side of Gregory Terrace adjacent to an existing residential unit development, as well as being available on the northern side of Gregory Terrace and in adjacent side streets. It is proposed to temporarily suspend four car parking spaces on the southern side of Gregory Terrace adjacent to the driveway entrance. This would allow southbound vehicles on Gregory Terrace to pass a stationary right turning construction vehicle, helping to minimise the impact of construction vehicles on traffic using Gregory Terrace.

The Northern Portal worksite would be located in the Brisbane Central Traffic Area. Within this traffic area, on-street parking is generally limited with a two hour period (with some exceptions). Parking restrictions apply Monday to Friday 7.00 am to 6.00 pm and Saturday 7.00 am to 12 noon.



LEGEND

- Inbound Haulage Routes
- Outbound Haulage Routes
- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-3

Northern Portal Haulage Routes

0 100 200 300 400 m

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N

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0169_CRR_Haulage_Routes_Northern_P_A4_TR.mxd 06/07/2011 16:10

Workforce parking for the Project is proposed within the worksite, with 40 spaces being provided in the former Brisbane City Council facility and another 40 spaces being provided within the Project worksite adjacent to the Energex building.

Estimates of peak workforce demands at this worksite total 39 workers. As such the 80 proposed car parking spaces is more than double peak workforce numbers and excess capacity could be used to accommodate any overspill from the nearby Ekka Station and O'Connell Terrace worksites. Given the presence of on-street parking restrictions on the surrounding streets and over-supply of workforce parking provision, no parking overspill to surrounding residential streets is envisaged.

The traffic movements resulting from this workforce parking are expected to be of similar magnitude to the existing parking movements associated with the current use of the land that the worksite would be located on.

Access, servicing and provision for adjacent development

The adjacent developments to the worksite include:

- Centenary Aquatic Centre and Terrace Tennis Courts (next to the worksite on the south)
- Energex substation No.4 (next to the worksite on the north)
- Herston Golf Course (further to the west and separated from the worksite by the Inner City Bypass and the Exhibition Loop railway line)
- Brisbane Girls Grammar School (further to the south of the worksite)
- St Joseph's College, Queensland National Ballet, and residential development, etc (to the east of the worksite on the southern side of Gregory Terrace)

There would be impact on pedestrian and cyclist access through the park due to the occupation of land by the Project worksite. Alternative pedestrian and cyclist shared path shall be provided past the worksite area. Minor impact may occur for the staff vehicles using the internal access road due to an increase in vehicles utilising the driveway. It is noted that the Substation has alternative access directly to and from Bowen Bridge Road, and that utilization of this access point for left in and left out movements may reduce the impact on staff resulting from increased traffic on the Gregory Terrace driveway entrance.

Given the defined haulage route, the construction vehicles are unlikely to impact any of the other adjacent developments.

Emergency services

The worksite associated with construction of the Northern Portal is not anticipated to have significant adverse impact on emergency service access to adjacent land uses.

Should detours be required under a temporary traffic control scenario for this worksite, these would apply to emergency services as well.

Emergency services would be advised of all changes to routes through processes established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Special events

Given the railway boundary of the worksite, the predominantly parkland and residential adjoining land use of the locality, it is unlikely that the Ekka or other community events that occur within the surrounding streets or adjacent to the worksite would be unduly impacted. Any special events which may be impacted by the works would be managed under a process established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Table 7-7 provides a summary of construction impacts and mitigation at the northern portal worksites.

Table 7-7 Summary of construction impacts and mitigation for the Northern Portal worksite

Location	Impacts	Remedial measures
Northern Portal (Gregory Terrace)	Removal of four on street parking spaces adjacent to worksite driveway on Gregory Terrace; Construction traffic turn right directly off Gregory Terrace into worksite driveway Suspension of parking in worksite access driveway adjacent to Substation Closure of existing shared cycle pedestrian path on and off road at worksite Minor increase in traffic including volume of heavy vehicles in Gregory Terrace, between worksite and Bowen Bridge Road.	Provision of "Keep Clear" markings for northbound Gregory Terrace at worksite driveway entrance Provision of alternative shared cycle pedestrian footpath past worksite

7.6.4 Roma Street worksites

The Roma Street worksites are required in order to construct an underground station and platforms for the Cross River Rail running tunnels. Connections to the surface and to the Roma Street Station would also be constructed. The worksite is proposed to consist of three separate work areas, one at each end of the proposed new Cross River Rail station and one to construct a subway connection with the existing Roma Street Station. A fourth area for material set down, workforce parking and site offices have also been identified in the existing car park at the north western end of the Roma Street Parklands. The worksite is located within a busy transport precinct, as well as being within the CBD.

For the purposes of this assessment, it is assumed that the end state traffic conditions including adjustments to Roma Street, George Street and the intersections with Herschel Street would not be constructed until the main station construction and fit out has been completed. The construction of these final end state surface works would result in minor impacts over a short period of time, which would be addressed through the Construction Traffic Management Plan to be developed for the project and is not covered in this assessment.

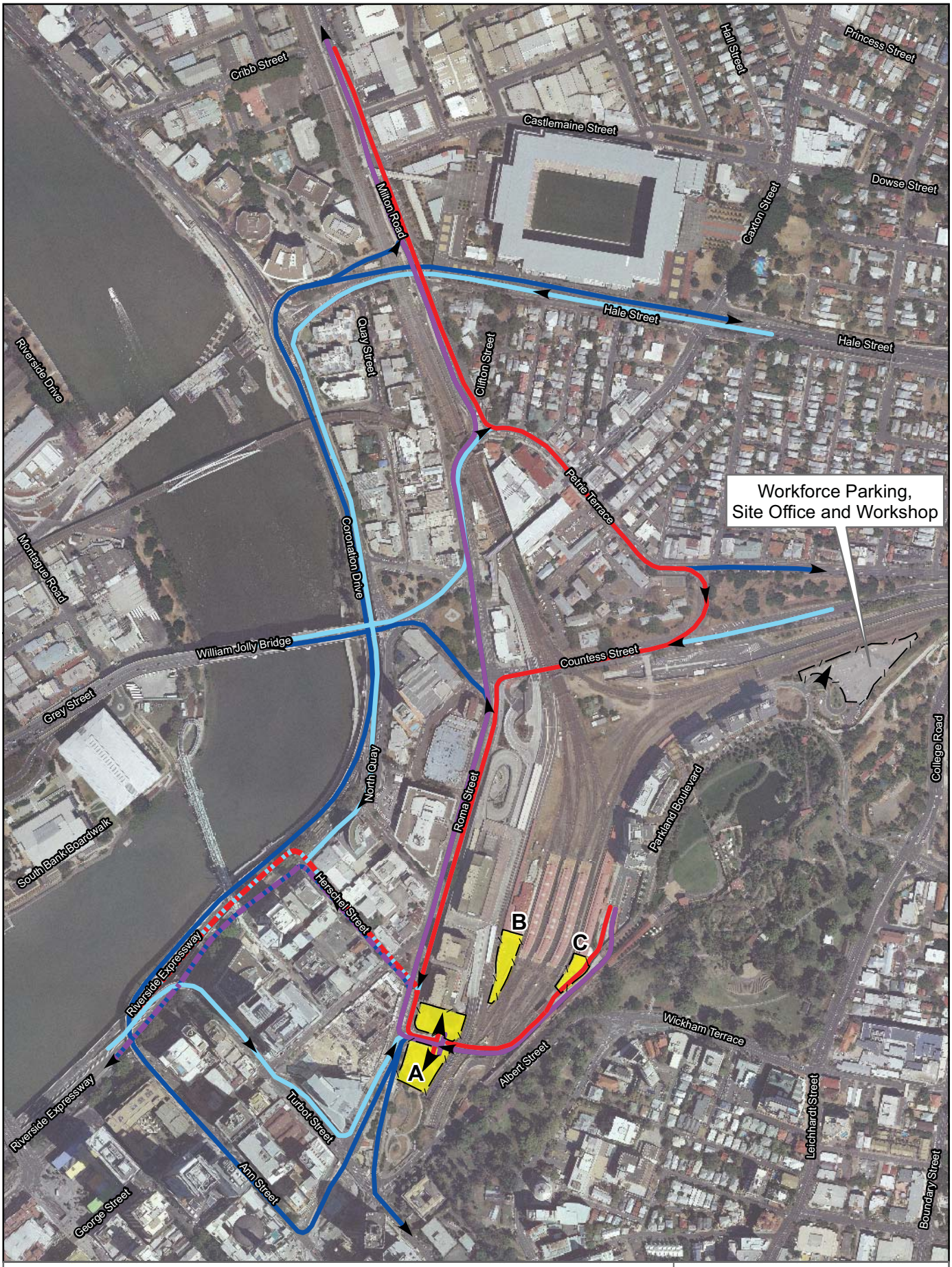
Worksite location and proposed truck access

Construction worksite A (Roma Street south) – in parkland adjacent to the intersection of Roma Street and Parklands Boulevard (Emma Miller Place). Access to this construction worksite would be directly from Parklands Boulevard. Construction worksite B (Roma Street central) – in an existing car park that serves the Station Masters building between Platforms 7 and 8 of Roma Street Station. Access to this construction worksite would be from Parklands Boulevard. Construction worksite C (Roma Street north) – adjacent to the long distance Platform 10 and station luggage storage area on Parklands Crescent. Access would be via Parklands Crescent.

In addition an area would be provided for workforce parking, site offices and workshops. This area would be located in an existing car park at the north western corner of Roma Street Parklands and accessed from College Close. Access to College Close is vial Parkland Crescent and Parkland Boulevard. A diagram showing the potential truck access routes is shown in **Figure 7-4**.

It is noted that the truck routes shown represent one feasible way of routing trucks carrying spoil to and from the worksites. The contractor, in determining their Construction Traffic Management Plans, may propose other alternative routes. Heavy vehicle routes for the delivery of plant and materials are likely to have varied origins and destinations, and as such are likely to approach and depart the worksites using a variety of routes. The selection of routes would conform to the guiding principles outlined in **Section 7-3**.

Detailed assessment of truck turning paths, if required, would be undertaken as part of the development of the Construction Traffic Management Plans, and may require modification of the routes shown.



LEGEND

- Inbound Haulage Routes
- Alternate Inbound Haulage Routes
- Outbound Haulage Routes
- Alternate Outbound Haulage Routes
- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-4

Truck Access Routes to Roma Street Construction Site

0 50 100 150 200 250 m

1:7,000 at A4

N

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0170_CRR_Haulage_Routes_Roma_St_A4_TR.mxd 06/07/2011 16:20

Traffic staging and network changes

The construction of the Roma Street Station occurs predominantly off road and would require two changes to the road network.

The first network change would involve the closure of the existing roundabout located in Parkland Boulevard, north of Roma Street. This closure is identified as an end state change, which is brought forward to the construction stage. The roundabout serves two known purposes:

- to provide for u-turns for vehicles over 4.5m in height entering Parklands Boulevard from Roma Street (and not able to proceed under the railway bridge)
- to facilitate the traffic movement from Parklands Boulevard southbound, to be able to access the long distance Platform 10 car park by continuing straight ahead from the Parkland Boulevard ramps to the roundabout, performing a u-turn, and then proceeding back to Parkland Parade. This movement is required as the geometry of the Parklands Boulevard/Parklands Crescent intersection is too tight to permit a direct turn between those movements. It is noted that an alternative movement is available by using Parkland Parade from the western side of the units.

The existing roundabout in Parkland Boulevard is proposed to be removed in the end state, and this would be bought forward to the construction stage. The removal of the roundabout would prevent any existing u-turn movements which are currently performed at this roundabout.

When travelling southbound on Parklands Boulevard towards the intersection of Parklands Crescent, there is no right turn from Parklands Boulevard into Parklands Crescent. Similarly, for southbound traffic on Parklands Crescent, there is no right turn into the Parklands Boulevard ramps. Traffic wishing to perform these turn movements is directed to proceed to the roundabout located north of Roma Street. Removal of the roundabout would require a longer detour in order to undertake the u-turn movement, ie via southbound in Roma Street, right into Ann Street, right into George Street, right turn into Roma Street and then northbound in Parklands Boulevard.

Given the length of this movement, the low volume of vehicles who currently undertake this movement would be advised to undertake a detour in Parklands Boulevard, directly into Parklands Crescent from the College Close end. Alternatively vehicles may adjust their point of access to the precinct.

The location of Worksite C would require occupation of the westbound lane of Parkland Crescent, between the long distance platform and the Parkland Boulevard intersection. It is proposed to manage this closure by utilising the eastbound lane in a contra flow traffic arrangement, controlled by portable traffic control signals. All westbound traffic on Parkland Boulevard would be held at a traffic signal, just east of the Parkland Crescent intersection while the eastbound Parkland Crescent movement runs. This would result in minor delays in accessing and egressing the station.

Network operation – impact on traffic conditions

The following network impacts on existing traffic conditions are anticipated:

- minor increase in heavy vehicle flows on the adjacent arterial and local road network (around 10 vehicles per hour at peak times)
- increase in traffic in Parkland Crescent, particularly in the eastbound direction
- increase in traffic in Parkland Boulevard, between Parkland Crescent
- potential for minor delays in Parkland Boulevard/Parkland Crescent depending on traffic control method adopted.

Additional detail relating to impact of heavy vehicle haulage operation on the adjacent road network, including SIDRA modelling of critical intersections, is contained in **Section 7-8**.

Pedestrians and cyclists

The Roma Street worksites are located in areas with high pedestrian and cycle use. The following impacts are anticipated:

Worksite A (Roma Street south) – Parkland Boulevard/Emma Miller Place Park

Pedestrian connectivity along Parkland Boulevard would be maintained throughout the period of works. A footpath of minimum 1.2 m width would be maintained along the western side of Parkland Boulevard through the worksite. This would provide a similar facility to that which exists currently. No pedestrian footpath on the eastern side of Parkland Boulevard is proposed during the construction phase, consistent with the existing situation.

Staged construction activities occurring within the existing alignment of Parkland Boulevard may require the location of the footpath to be modified slightly to the east or west of its current alignment.

The Worksite A boundaries would encroach into the existing footpath width fronting Roma Street, south of Parkland Boulevard during the early stage of works. This would require a temporary reduction in width, including potentially extending the footpath into the adjacent traffic lane via a reduction in the existing lane widths.

Public access into parts of Emma Miller Place Park would be closed during the period of works, with the a section of the park being an active worksite.

An existing bus shelter on Roma Street, approximately 15m east of Parkland Boulevard would be removed.

An existing cycle lane southbound in Parklands Boulevard on the approach to Roma Street traffic signals would be removed.

There are three main elements of cyclist activity that occur around Roma Street Station that may be impacted by construction. The CityCycle bicycle hire scheme operates from two locations on Roma Street, outside the station, as well as in the adjacent street of Makerston Street. No change or impact to this scheme or cyclists using it has been identified.

Parkland Boulevard is a cycle route which provides a link between the CBD and areas to the north and west. This route is also near the cycle end of trip facilities, located in Roma Street near Ann Street. As such, Parkland Boulevard carries a number of cycle movements, particularly commuter cyclists during the peak traffic periods.

The removal of the roundabout and construction of the worksite within Emma Miller Place parkland is not anticipated to impact on cycle activity within Parkland Boulevard and this route would remain open to cyclists during construction. It is likely that staged construction activities within Parkland Boulevard would require traffic control adjacent to the worksite. Traffic control plans developed for the site would take into consideration the potential for cyclists to be travelling at speed downhill southbound on Parkland Boulevard.

Worksite B (Roma Street central) - Roma Street Station rail station concourse

Construction of the connection with the existing Roma Street Station pedestrian concourse would result in a temporary restriction of the available width while works are undertaken and the connection established. It is expected that the worksite would extend into the existing station concourse by approximately 2 m, however there may be periods of short term work, such as potentially escalator installation, where additional encroachment occurs.

Given the existing concourse width and average passenger flows, it is not expected that an encroachment of 2 m would result in significant disruption to flows in the concourse. However, should the encroachment result in an excessive restriction of the existing width such that significant pedestrian congestion results during peak hour pedestrian periods, then works would be restricted during these periods, and undertaken overnight or during periods of lower pedestrian flows.

Worksite C (Roma Street north) – Adjacent to long distance Platform 10

The creation of worksite C would close the pedestrian footpath on the southern side of Parkland Crescent. A pedestrian detour would be required commencing at The Parkland Boulevard/Roma Street intersection and diverting pedestrians though the Roma Street Station.

The creation of a worksite adjacent to long distance Platform 10 of Roma Street Station is not anticipated to impact on cycle activity, although cyclists would have to follow detours put into place for vehicles due to the closure of the westbound lane of Parklands Crescent.

Buses

The following bus impacts have been identified:

- coach access and egress from the long distance platform would be required to follow detours put in place for all vehicles
- there would be no change to bus access to the Quality Inn
- a bus shelter on Roma Street north of Parklands Boulevard would be removed. Inspection of the bus shelter and bus stop flag appears to indicate that this shelter is not in active use as a bus stop, however this needs to be confirmed.
- bus U-Turn via College Crescent would be maintained.

Parking

Onsite workforce parking totalling 45 spaces is proposed at the Roma Street worksites. Five of these would be provided at worksite A with the majority provided at the proposed workforce car parking area at College Close. At the peak of construction an estimated workforce of 137 would be on site at any one time. Parking provision would accommodate around one third of this number.

Given the site's location in the CBD, a proportion of the workforce would be expected to use the many public transport services at Roma Street Station. Alternatively the workforce could make use of nearby public car parks such as those located within the Roma Street Transit Centre as a suitable alternative close to the worksites.

The Roma Street worksite would be located in the Brisbane Central Traffic Area. As such, on-street parking on surrounding street is restricted with a two hour time limit across the traffic area unless signed otherwise. Parking restrictions apply Monday to Friday 7.00 am to 6.00 pm and Saturday 7.00 am to 12.00 noon such that the Project workforce would not be able park on the streets in the vicinity of the worksite.

The existing Station Masters car park between platforms 7 and 8 would be removed for the duration of work.

The car park adjacent to the long distance Platform 10 would be retained. However, the existing kerb uses such as taxi rank and pick up/set down areas may require modification, particularly on the eastern end. The extent of change required at this location would become known during the detailed design stages of the project, and documented in the Construction Traffic Management plans developed for this worksite. Some loss of existing timed parking may occur as a result of any reconfiguration of kerb uses.

Access, servicing and provision for adjacent development

No change to access to or from the Quality Inn is anticipated.

All existing access to the Station Masters car park located adjacent to Platform 7 and 8 would be removed. Staff and visitors to the Roma Street Station would be required to utilise alternative access and parking areas. These potential alternate access areas include the car park adjacent to Platform 1, which has lift access to the Station concourse.

Access along Parkland Crescent to the car parking, pick up and set down areas for the long distance platforms would be retained, although with a detour. Some modification to the pick up and set down areas may be required at the eastern end of the existing kerb length in this area.

The detour required due to removal of the roundabout may require service vehicles which service the Parklands Crescent apartments and parkland area to use alternative routes to access their destinations.

Emergency services

Station evacuation plans may require adjustment given the changes to pedestrian and vehicle access proposed, as well as worksites occupying land potentially used as an assembly point.

All network changes resulting from the works would be advised to Emergency Service providers and Queensland Rail.

Special events

Roma Street is often impacted by special events, predominantly sporting events held at Suncorp Stadium. These events often require traffic control measures to provide for additional pedestrian capacity between Suncorp Stadium and Roma Street Station, as well as entertainment areas located further south.

In such cases, short term management strategies would be developed for the site under processes identified in the Framework Traffic Management Plan. Strategies may include a short term stop to trucking activities at the site or additional traffic control measures. Specific processes would be developed in the Construction Traffic Management Plan for the Roma Street worksites. Construction activities occurring in the mezzanine level of the Roma Street Station would be suspended during special events to provide for maximum pedestrian capacity through the station.

Other

Roma Street Station worksites are located within the CBD and hence have the potential to result in cumulative impacts if adjacent land is redeveloped at the same time as Project construction is taking place. Although no concurrent development has been identified at this preliminary stage, should cumulative impacts arise these would be managed through processes established in the Framework Traffic Management Plan. **Table 7-8** provides a summary of construction impacts and mitigation at the Roma Street worksites.

Table 7-8 Summary of construction impacts and mitigation for the Roma Street worksite

Location	Impacts	Remedial measures
Roma Street	Removal of the station masters carpark between platform 7 and 8 Closure of pedestrian access between Parkland Boulevard and Parkland Crescent Removal of existing roundabout in Parkland Boulevard Removal of some carparking spaces in College Crescent carpark and adjacent to long distance Platform 10 due to kerb space modification Station evacuation plans likely to require adjustment Changes to the way westbound vehicles access the long distance platform from Parkland Boulevard Minor increase in heavy vehicle flows on the adjacent arterial and local road network Potential for minor delays in Parkland Boulevard/Parkland Crescent.	Provide pedestrian detour through Roma Street Station Provide vehicle contra flow on the eastbound direction of Parkland Crescent at its intersection with Parkland Boulevard to the south east of Roma Street Parklands

7.6.5 Albert Street worksite

The Albert Street worksite would be located within the Brisbane CBD and would be required in order to construct the Albert Street station cavern, platforms, ingress and egress stairwells and escalators, gateline, ventilation equipment and shafts, station entrance building and associated surface works to provide for station accessibility.

Worksite location and proposed truck access routes

There are two worksites required to construct the Albert Street Station. The northern worksite would be located on the eastern side of Albert Street, to the north of Mary Street. A second, larger worksite would be located to the south, occupying the space currently utilised by the “Royal on the Park” Hotel, and bounded by Alice Street to the south, Albert Street to the west and Margaret Street to the north.

A diagram showing the worksites and proposed heavy vehicle access routes for spoil haulage and potential routes for deliveries is provided in **Figure 7-5**. Further detailed assessment of truck turning paths is required to ensure the nominated routes are feasible and that truck turning paths are safe with respect to cyclists movements and pedestrian waiting areas at traffic signals. This work would be undertaken by the contractor in determining the Construction Traffic Management Plans.

Traffic staging and network changes

Construction activity would take place predominantly off-road behind hoardings at the back of current footways.

The key exception is the construction of a pedestrian underpass under Alice Street which would be undertaken through a series of lane closures and possible diversions in a staged manner. Access for vehicles and pedestrians on Alice Street would be maintained and it is expected that at least rwo traffic lanes would remain open on Alice Street during peak times. Temporary lane closures and suspension of parking and loading in the vicinity of the underpass would be inevitable to construct this major new piece of pedestrian infrastructure.

Network operation – impact on traffic conditions

The northern Albert Street worksite is forecast to generate only two heavy vehicle trips per hour at peak times, and as such is unlikely to create any negative traffic impact on or near the adjacent signalised intersection of Mary Street and Albert Street.

The southern Albert Street worksite is forecast to generate up to six heavy vehicle trips per hour in peak times. Likewise this is unlikely to generate any negative traffic impacts on adjacent intersections including Albert Street/Margaret Street or Albert Street/Alice Street.

The closure of a lane on Alice Street will lead to some delays for traffic including buses on Alice Street for a temporary period, possible a couple of months. Detailed traffic management strategies including signing of alternative routes would form part of the CTMP for this site.

Additional detail regarding any changes to Level of Service of critical intersections as a result of heavy vehicle operations for the Project is contained in **Section 7.8**.

LEGEND

- Inbound Haulage Routes
- Alternate Inbound Haulage Routes
- Outbound Haulage Routes
- Alternate Outbound Haulage Routes
- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-5

Albert Street Construction Site and Access Routes

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CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0171_CRR_Haulage_Routes_Albert_St_A4_TR.mxd 06/07/2011 16:28

Pedestrians and cyclists

There is anticipated to be a minor impact to pedestrians due to the temporary occupation of footpaths for construction activities such as demolition and site clearance for example. However establishment of the worksite is likely to involve site hoardings at or near the back of footway allowing pedestrian access to be maintained along frontage footways. However, some disruption will be caused by construction vehicles crossing footpaths to access work sites. This would be most noticeable at Albert Street north where haulage vehicles may need to traverse the western footway of Albert Street however this would be only two vehicles per hour.

Businesses that are within the proposed worksite would not be trading, and any changes to footways such as temporary narrowing or short term closure would not impact on those businesses.

No significant impact to cyclists or cycle facilities is expected. The CityCycle station in Margaret Street would continue to operate as existing. Some cycle parking and other street furniture however would be removed in Albert Street north of Mary Street however it is anticipated that much of the demand for this cycle parking is generated by the cycle shop currently operating in this area, and since the cycle shop would be removed by the Project, the demand for this cycle parking would be reduced.

Buses

There are existing bus routes and bus stops in Margaret and Alice Streets. Bus loading in Alice Street would need to be relocated permanently as construction of the pedestrian underpass would require the permanent closure of the kerbside lane for a new station entrance. However alternative bus loading bays could be provided in Albert Street (east side) between Alice Street and Margaret Street following demolition of the Royal on the Park hotel and establishment of the worksite behind a hoarding. While the construction of the underpass could impact on bus routes operating along Alice Street for a period of a few months, alternative route strategies would be investigated in the detailed CTMP to mitigate these impacts.

Parking

The Albert Street worksite would be located in the Brisbane Central Traffic Area. As such, on-street parking on surrounding street is restricted to a two hour time limit across the traffic area unless signed otherwise. Parking restrictions apply Monday to Friday 7.00 am to 6.00 pm and Saturday 7.00 am to 12.00 noon. As such, impacts of workforce car parking on surrounding streets are expected to be negligible.

On site car parking for 12 cars would be provided for the Project workforce at the southern worksite and accessed from Margaret Street. Peak workforce numbers are expected to total 137 people. As such, excess staff park demands would need to be accommodated within the many existing CBD public parking facilities.

Given the site's location in the CBD, a proportion of the workforce would be expected to use the many public transport services that serve the CBD with rail services at Central Station and bus services at the Queen Street bus station and many on-street bus stops.

The impacts of workforce parking on surrounding streets, given the presence of the Brisbane Central Traffic Area and the good provision of public transport, are expected to be negligible.

A number of other, more permanent changes to parking and loading changes would be required to facilitate construction of the reference design, including.

The existing taxi rank in Alice Street, on the eastern side of Albert Street, would require relocation or removal given the need to provide a construction driveway entrance/exit into Alice Street. It may be possible to consolidate the existing Hotel driveways into an area of kerb suitable for this need without loss of taxi spaces. However it is noted that with the removal of the Royal in the Park Hotel, demand for the taxi rank would reduce.

Existing on street car parking spaces on the southern side of Margaret Street, east of Albert Street, would require suspension during construction activity, in order to provide for a construction driveway crossing. It is estimated that approximately three spaces would require removal.

Existing on street car parking spaces on the northern side of Mary Street, east of Albert Street, would also require suspension to provide for turning movements into the worksite and for materials set-down/works zone in Mary Street. It is estimated that approximately four spaces would require removal.

Access, servicing and provision for adjacent development

There are existing building basement accesses located adjacent to project worksites, particularly in Mary Street, east of the Albert Street intersection, in Albert Street north of Mary Street, and in Margaret Street east of the Albert Street intersection. No impact to the operation of these driveways is anticipated.

Emergency services

Emergency services would not be directly impacted by the proposed construction activity. Any proposed change in traffic conditions, including staged construction in Mary Street, would be communicated to emergency services through the Traffic and Transport Liaison Group.

Adjacent building evacuation plans may require amendment as a result of the temporary closure of footpaths.

Special events

Albert Street and the approach trucking routes have not historically been used for march or protest routes. As such it is unlikely that there would be any community events that occur within the surrounding streets or adjacent to the worksite.

Special events such as ‘River Fire’ and New Years Eve fireworks display on the Brisbane River, or other major special events in the Botanical Gardens can result in an increased pedestrian movement along Albert Street. These and other major events within the CBD may impact on the worksite or the truck routes identified to serve the worksites. In such cases, short term management strategies would be developed for the site under processes identified in the Framework Traffic Management Plan. Strategies may include a short term stop to trucking activities at the site or additional traffic control measures.

Table 7-9 provides a summary of construction impacts and mitigation at the Albert Street worksite.

Table 7-9 Summary of construction impacts and mitigation for the Albert Street worksite

Location	Impacts	Remedial measures
Albert Street	Removal of three on street parking spaces in Margaret Street Adjustment to the existing taxi stand in Alice Street, east of Albert Street Short term disruption of footpaths in Albert and Mary Streets Removal of existing street furniture including bike racks and seats in Albert Street Staged construction across Alice Street resulting in closure of one or two lanes	Pedestrian detours implemented Taxi stand relocated if required Advanced signage and communications strategy Alternative bus routing (to avoid Alice Street east)

7.6.6 Woolloongabba worksite

The Woolloongabba worksite would be located within the existing Go-Print site between Leopard Street, the Eastern Busway and Vulture Street. This worksite would be required in order to construct the Gabba Station cavern, platforms, ingress and egress stairwells and escalators, gateline, ventilation equipment and shafts, station entrance building and associated surface works to provide for station accessibility. In addition, the Woolloongabba worksite would be the location of a TBM launch site and extraction point, as well as associated tunnel fit-out. This would require construction works within the Go-Print site and adjacent sections of Busway.

The requirement to undertake excavation underneath the existing Busway presents a particular challenge in the construction of this Station.

Worksite location and proposed truck access

The worksite would be located on the existing Go-Print site between Leopard Street, Eastern Busway, Vulture Street and the Vulture Street freeway exit ramp.

The worksite and proposed heavy vehicle spoil and potential delivery vehicle access routes are shown **Figure 7-6**.

Ipswich Road has been nominated as the preferred haul route for feasibility assessment purposes, as it avoids sections of the Pacific Motorway which experience congestion in the peak periods and provides the most direct access to and from the spoil disposal site at Swanbank via the Ipswich Motorway. Detailed haul routes would be determined by the contractor during the development of Construction Traffic Management plans for this worksite, and would be subject to further review by relevant stakeholders.

Traffic staging and network changes

It is required to excavate across the current layover zone adjacent to the South East Busway (Woolloongabba spur), extending from the boundary of the existing Go-Print site to the northern edge of the Busway itself. Main activities involve piling and decking, to provide a structure that can be excavated from the main Go-Print worksite.

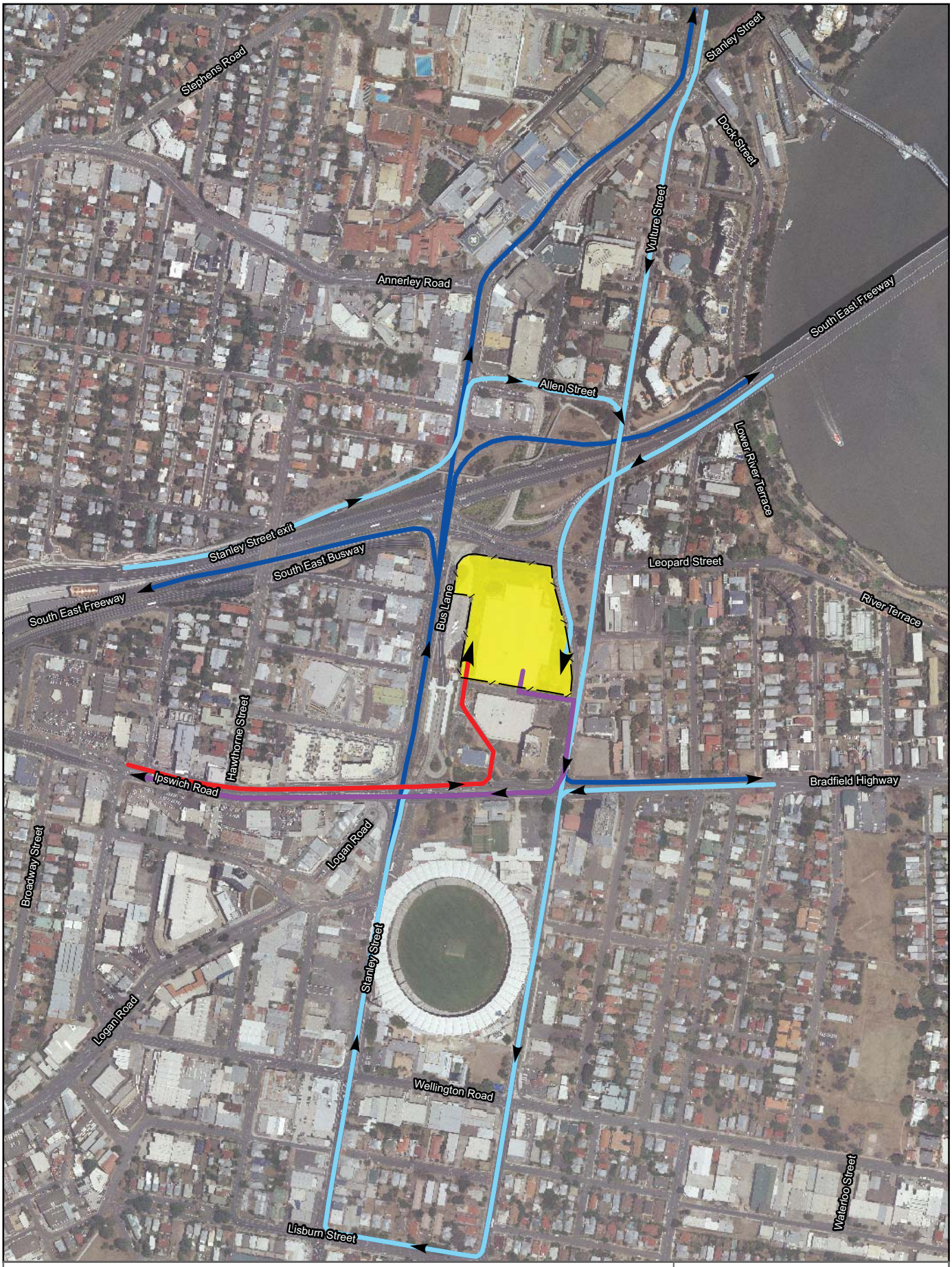
Construction works would be undertaken in stages to ensure Busway operations are maintained. The first proposed construction stage is to reduce the level of the Go-Print site to existing Busway level. A detour for layover buses around the staged construction area would be provided within the Go-Print site if required.

A worksite would be established within the bus layover area to allow piling and decking activities to take place. It is envisaged that speed restriction would be placed on all buses in the vicinity of the worksite. Construction vehicles would enter and exit the Bus layover worksite directly from the Go-Print site.

Network operation – impact on traffic conditions

Heavy vehicle movements to and from the Gabba worksite are anticipated to total around 14 vehicles per hour at peak times. Furthermore, workers arriving on site could mean a further 70 vehicles movements in the morning, but generally arriving on site before 6.30 am and therefore prior to the AM peak hour.

Given that the worksite replaces the current Goprint site and the majority of traffic movements would occur outside peak hours, the total traffic generated by the site is expected to be minimal with no discernible impacts on surrounding traffic conditions.



LEGEND

- Inbound Haulage Routes
- Outbound Haulage Routes
- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-6

Woolloongabba Construction Site and Access Routes

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CrossRiverRail

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Pedestrians and cyclists

The area adjoining the proposed Woolloongabba worksite is not an area with high pedestrian or cycle trip generators, except during special events. There is currently pedestrian provision along Leopard Street and the southern side of the Vulture Street off-ramp (linking to Leopard Street via a ramp). The existing footpath on Leopard Street would be maintained during the works and the link to Vulture Street off-ramp would be closed. During the closure of the Vulture Street off-ramp footpath pedestrian would be diverted to either Stanley Street or Vulture Street.

Construction activities occurring adjacent to Leopard Street, Vulture Street and Main Street would maintain existing shoulder widths for cyclists and where this is not possible; cycle detours would be signposted around the construction activities and worksites north of Stanley Street.

The footpath along the western side of Ipswich Road, north of Stanley Street is proposed for a construction vehicle driveway crossing. Due to the existing low pedestrian volume outside of special event periods, active traffic management of this crossing is not proposed. Arrangements during special events is outlined below.

Buses

The key bus facility in the vicinity of the Woolloongabba worksite is the Woolloongabba Busway Station and the South East Busway located immediately to the west of the Go-Print site and to the east of Stanley Street. The Woolloongabba Station also provides a layover facility for buses; and turnaround facility for bus routes. This bus station provides for interchange between bus routes. On-street bus services are also available along Main Street, to the south of the worksite. The area contains one of the highest frequencies of bus routes within Brisbane.

It is anticipated that buses on the Busway would experience a minor increase in running time due to the detours and speed restrictions imposed during the staged construction across the Busway layover area. This stage of construction would be relatively short compared to the overall construction program. TransLink would be advised of any changes to routing or potential change to travel times through processes established under the Framework Transport Management Plan.

Parking

The Woolloongabba construction worksite would be located in the The Gabba Traffic Area. As such, on-street parking on surrounding streets is limited to two hours across the precinct (with some exceptions). Parking restrictions apply Monday to Friday 7.00 am to 7.00 pm and when on days when events are held at the adjacent Gabba Stadium with on-street parking limited to 15 minutes from 7.00 am to 10.00 pm.

There is no on-street car parking available on Leopard Street, Vulture Street, Stanley Street or Main Street adjacent to the site. In addition there are no park and ride car spaces provided at Woolloongabba Busway Station. No change to existing on-street parking is proposed.

Parking within the existing Goprint site would be removed as a result of Cross River Rail construction works on the site. Project workforce parking would be provided within the Woolloongabba construction worksite with the provision of 72 car parking spaces. Workforce access to the car parks would be from the Vulture Street off-ramp and from northbound Main Street site access points.

Peak workforce estimates at the Woolloongabba construction worksite total 137 workers. The construction worksite parking would be able to accommodate over half of the peak workforce. Given the site's location adjacent to the Woolloongabba busway station, a proportion of the workforce would be expected to use bus services to access the construction worksite. Other workforce personnel could car pool or park in nearby off-street parking stations, or be bussed from the Yeerongpilly worksite.

Given the presence of on-street parking controls Monday to Friday, the impact of workforce parking on the surrounding streets on these days is expected to be small. However, with no parking controls on weekends (except when events are on at the Gabba), overspill parking is likely to occur on Saturdays (and potentially also Sundays when some work would occur within an acoustic shed) and as such amendments to the Gabba Traffic Area to include additional controls at least on Saturdays would be recommended to mitigate the impact.

Overall however, the impact of workforce parking on the surrounding community is expected to be minimal.

Access, servicing and provision for adjacent development

The worksite associated with construction of the Gabba Station would not alter existing property access point or restrict access to any adjacent developments. However, the proposed right turn from the Dental hospital into Vulture Street would be combined with the proposed site egress point from the Go-Print site. Vehicles accessing the existing Dental Hospital and Land Care centre from the Vulture Street off-ramp would be required to undertake a right turn directly into the driveway approximately 50m east of the slip lane entrance. This driveway would be shared with construction vehicles exiting the worksite, and would require modification to ensure turns in and out can be accommodated safely.

Emergency services

The worksite associated with construction of the Gabba Station is not anticipated to have significant adverse impact on Emergency Service vehicles. When detours are put into place for all traffic, this would apply to emergency services as well. Emergency services would be advised of all changes to routes through processes established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Special events

The Brisbane Cricket Ground (or “Gabba”) is located to the south of the worksite and hosts major AFL and Cricket events in Brisbane. During an event, traffic control measures are required to provide for additional pedestrian capacity in the surrounding streets. Stanley Street south of Main Street is closed to general purpose vehicles and is only accessed by Buses and Emergency vehicles. Spectators cross Main Street and Stanley Street under Police control. Pedestrian access between the Gabba stadium and Woolloongabba busway station would not be impacted by the location or extent of the Woolloongabba construction worksite.

During Gabba stadium events, short term management strategies would be developed for the site under processes identified in the Framework Transport Management Plan. Strategies may include a short term stop to trucking activities at the site or additional traffic control measures such as active pedestrian management. Specific processes would be developed in the Construction Traffic Management Plan for the Woolloongabba worksite. **Table 7-10** provides a summary of construction impacts and mitigation at the Woolloongabba worksite.

Table 7-10 Summary of construction impacts and mitigation for the Woolloongabba worksite

Location	Impacts	Remedial measures
Woolloongabba	Minor Changes to access off slip lane off Vulture Street off ramp to facilitate a gated construction worksite entrance. Staged traffic management in the Woolloongabba spur of the South East Busway, including relocation of bus layover area potentially resulting in minor increase to running time for buses. New driveway access point from Ipswich Road northbound into worksite. Possible closure of existing pedestrian path on the southern side of Vulture Street off-ramp including connection with Leopard Street.	Communication strategy do be developed. Detailed Construction Traffic Management Plan including details of staged traffic management in Vulture Street off-ramp and South East Busways to be developed.

7.6.7 Boggo Road worksite

The worksite is proposed to consist of two separate work areas, one at each end of the proposed new Cross River Rail station. The northern work area would be located on vacant land to the south of the integrated Boggo Road busway station and Park Road Station. It is also bounded by Dutton Park Primary School to the west and the Boggo Road to the south. The southern work area is located adjacent to the southern wall of the old Boggo Road Goal, and includes vacant land on the opposite (southern) side of Peter Doherty Street.

The location of the worksite and proposed spoil haul routes and potential delivery routes is shown in **Figure 7-7.**

Worksite location and proposed truck access

Heavy vehicles would approach the construction worksite from various directions, predominantly from the south due to height restrictions imposed by the rail bridge crossing Annerley Road immediately north of Dutton Park State School. The use of Annerley Road between Ipswich Road and Rusk Street to the south-east of the worksite would be avoided in order to minimise impacts on residential and other sensitive receivers along that route. The preferred heavy vehicle access from the south is via Cornwall Street as it provides the most direct link to Ipswich Road, the proposed combined haul route for all construction worksite south of the river.

Traffic staging and network changes

During the construction, temporary possession of Boggo Road would be required for the excavation underneath Boggo Road. Traffic in Boggo Road would be diverted onto a side track to the north of the existing Boggo Road alignment.

Peter Doherty Street will be closed to through access for the duration of construction. During this time, all non-construction vehicles in the precinct will be required to detour via Boggo Road, as the Project worksite boundaries will effectively close Peter Doherty Street to through access.

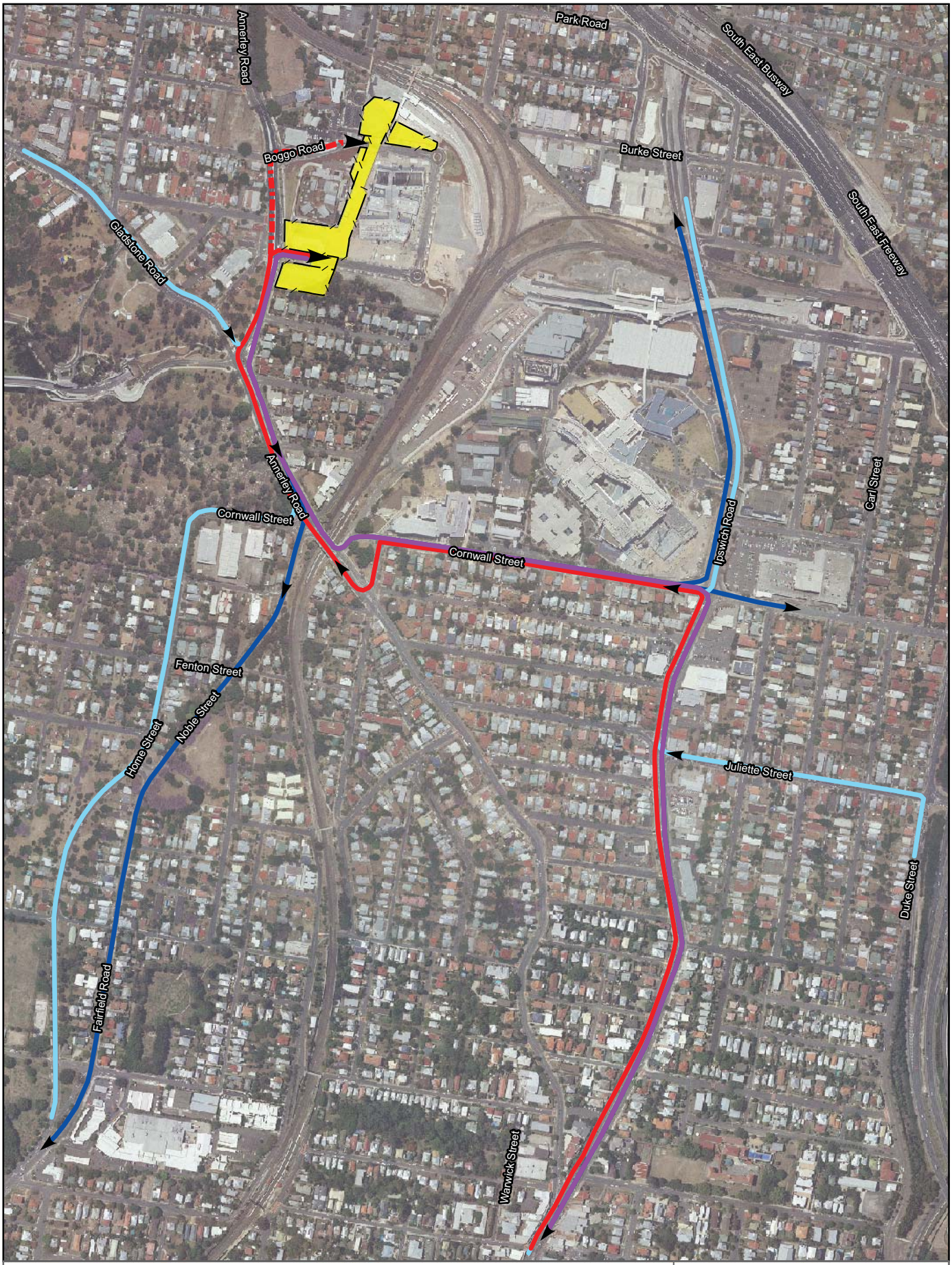
A new right turn bay is proposed for the intersection of Annerley Road and Peter Doherty Street for the period of construction. This new right turn phase would run at the same time as the northbound right turn phase at Annerley Road/Boggo Road intersection, minimising any impact on network operation. The right turn would allow access to the gated Project worksite, although space would be available for a non-construction vehicle to turn around prior to reaching the gate if it accidently turned into Peter Doherty Street.

Further detailed assessment of the existing road geometry and width is required in order to ensure there is adequate width to provide a right turn bay, and that the bay would have sufficient length to cater for the expected volume of turning heavy vehicles without queuing into the adjacent traffic lane. Should the proposed new right turn be found not to be feasible, then the right turn vehicle movements would be directed to use the existing Boggo Road right turn instead.

Network operation – impact on traffic conditions

The staged construction of the Boggo Road Station would primarily affect local traffic within the Boggo Road Urban Village precinct. With the exception of the proposed new right turn from Annerley Road northbound into Peter Doherty Street, the worksite is not expected to have any significant impact on the existing road network beyond the Boggo Road/Annerley Road intersection.

Detailed assessment of the Boggo Road/Annerley Road signalised intersection has not been undertaken, as the Boggo Road Urban Village precinct is not fully occupied and hence the traffic generation from this development unknown. However, given the scale of the facility it is anticipated that there would be spare capacity at the Boggo Road/Annerley Road intersection and that the addition of construction vehicle turning movements to the intersection would not result in a significant amount of congestion being created as a result.



LEGEND

- Inbound Haulage Routes
- Alternate Inbound Haulage Routes
- Outbound Haulage Routes
- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-7

Truck Access Routes to Boggo Road Construction Site

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CrossRiverRail

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Detailed assessment of the proposed right turn from Annerley Road northbound to Peter Doherty Street has not been undertaken due to the preliminary nature of the investigation into feasibility of that movement from a road space and geometry perspective. It is expected that the right turn into Peter Doherty Street would run at the same time as the right turn into Boggo Road, thus minimising any impact on overall network performance.

The construction traffic volumes generated by the worksite elsewhere in the Fairfield Road corridor are not expected to be significant, with potentially only minor increase over the existing traffic volumes and congestion at the Annerley Road / Cornwall Street intersection.

Pedestrians and cyclists

The Park Road Station and Boggo Road Busway station is located to the north of the worksite. There is currently pedestrian access between the busway and rail station and the Boggo Road Urban Village Precinct provision via a footpath along Boggo Road to gain access to the stations. A common over bridge and station access point is provided linking Boggo Road with Quarry Street on the other side of the railway line. During construction, the pedestrian footpath linking to Boggo Road would be diverted to the east of the worksite with temporary access around the worksite.

The existing pedestrian area between Boggo Road Gaol and the recently completed Ecoscience building would be closed during construction. Alternative access for pedestrians within the centre would be managed for pedestrians to move between the southern areas of the building and Boggo Road. The pedestrian footpaths on both sides of Peter Doherty Street would be closed, with pedestrians detoured via Boggo Road to Annerley Road.

The existing bicycle lanes in Annerley Road would be maintained, subject to detailed design of the proposed right turn bay from Annerley Road into Peter Doherty Street.

Buses

The key bus facility in the vicinity of the Boggo Road station worksite is the Eastern Busway and the Boggo Road Busway station located immediately adjacent to the Park Road railway station, and which is integrated into one interchange.

On-street bus services are also available along Annerley Road, to the west of the worksite, which combine to create a frequency of up to 17 buses an hour in peak direction during the peak time periods. This is comprised of the following bus routes:

- 105, 107, 108 (all services from Yeronga/ Fairfield to city)
- 112 (Mt Gravatt to City)
- 196/197 (Fairfield to New Farm via City)
- 198 (West End – Dutton Park – West End loop)
- 202 (Carindale to City).

Some minor impact could be expected during the construction of the ventilation outlet into the busway area. Such construction should be undertaken at night time where possible or alternatively during bus operational hours with buses operating under stop-go or signal control around a hoarded off work area. Such disruption would be short term and minor in impact.

TransLink would be advised of any changes to routing or potential changes to travel time through processes established under the Framework Transport Management Plan.

Parking

On-street parking bays exist along both sides of Peter Doherty Street and East Street near the worksite. An un-covered car parking area (under construction) is also provided to the east of the Boggo Road Urban Village Building off East Street.

The streets adjacent to the worksite on the south side of the railway line are within Dutton Park Traffic Area. It operates between 7.00 am to 7.00 pm, Monday to Friday (excluding public holidays):

- a two hour parking limit applies to all unsigned roads within the area
- a four hour parking limit applies to disability parking bays
- loading bays and 30 minute parking zones are provided near business precincts.

A 28-bay park and ride facility currently exists at Park Road Station and no park and ride facility is provided at Dutton Park Station.

There is expected to be suspension of existing on street car parking in Peter Doherty Street, estimated at seven spaces, as well as suspension of all loading and short term parking pick up/set down areas in existing lay-bys in Boggo Road. These loading and short term pickup/setdown areas may be relocated to the southern side of Ecoscience building, with a corresponding reduction in time restricted parking spaces.

Workforce parking for 30 cars would be provided within the boundaries of the proposed worksite in Peter Doherty Street. At the peak of construction, a workforce of up to 137 personnel would be expected on site at any one time. The proposed on site car parking provision would not be able to cater for the total parking demand. Given the site's location adjacent to the Boggo Road busway station and Park Road Station, a proportion of the workforce would be expected to use bus and rail services to access the worksite.

Given the presence of surrounding on street parking controls and limited off street commercial parking options, overspill workforce parking would need to occur at the Yeerongpilly worksite (approximately 4km to the south) where sufficient additional off street workforce parking is proposed, with a shuttle bus connection recommended.

Given the presence of on-street parking controls Monday to Friday, the impact of workforce parking on the surrounding streets on these days is expected to be small. However, with no parking controls on Saturday, overspill parking is likely to occur and as such amendments to the "Dutton Park Traffic Area" to include additional controls on Saturday would be recommended.

Access, servicing and provision for adjacent development

The adjacent major developments to the worksite include:

- Dutton Park Primary School (to the north of the worksite)
- Boggo Road Gaol (on the western side of the worksite) – now a Queensland Heritage Building is currently closed for redevelopment
- Boggo Road Urban Village (on the eastern side of the worksite) – would be a unique, mixed-use area including residential, retail, commercial, environmental research and recreational facilities.

Access to all identified adjacent developments would be maintained during the works.

Emergency services

The worksites associated with construction of Boggo Road Station are not anticipated to have significant adverse impacts on Emergency Service vehicles. If detours are put into place for all traffic, this would apply to emergency services as well.

Emergency services would be advised of all changes to routes through processes established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Existing evacuation plans from the Ecoscience building in Boggo Road Urban Village Precinct may require modification, due to changes in availability of assembly areas resulting from construction activity.

Special events

No special events are known to occur in the area adjoining the worksites, Any special events which may be impacted by the works would be managed under process established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Table 7-11 provides a summary of construction impacts and mitigation at the Boggo Road worksite.

Table 7-11 Summary of construction impacts and mitigation at the Boggo Road worksite

Location	Impacts	Remedial measures
Boggo Road	Removal of on street parking in Peter Doherty Street and Boggo Road; Closure of footpaths between the Gaol and Ecoscience building, as well as both sides of Peter Doherty Street; Temporary diversion of pedestrian access between Boggo Road and the Busway; Staged construction traffic in Boggo Road; Closure of through access in Peter Doherty Street with detours via Boggo Road; Creation of a new right turn bay and phase at the intersection of Annerley Road and Peter Doherty Street; and Increase in heavy vehicle traffic in the Boggo Urban Village Precinct and minor increase in congestion at the Boggo Road/Annerley Road intersection.	Pedestrians detoured via Boggo Road to reach Annerley Road Pick up/set down and loading areas in Boggo Road relocated to the southern side of the Ecoscience building

7.6.8 Worksite for the southern ventilation and emergency access building

The worksite would be located adjacent to the southbound side of Fairfield Road, north of Venner Road, in existing road verge and landscaped areas.

The worksite would be required to construct an emergency access stairwell, ventilation equipment and associated surface works to provide for emergency egress from the running tunnels.

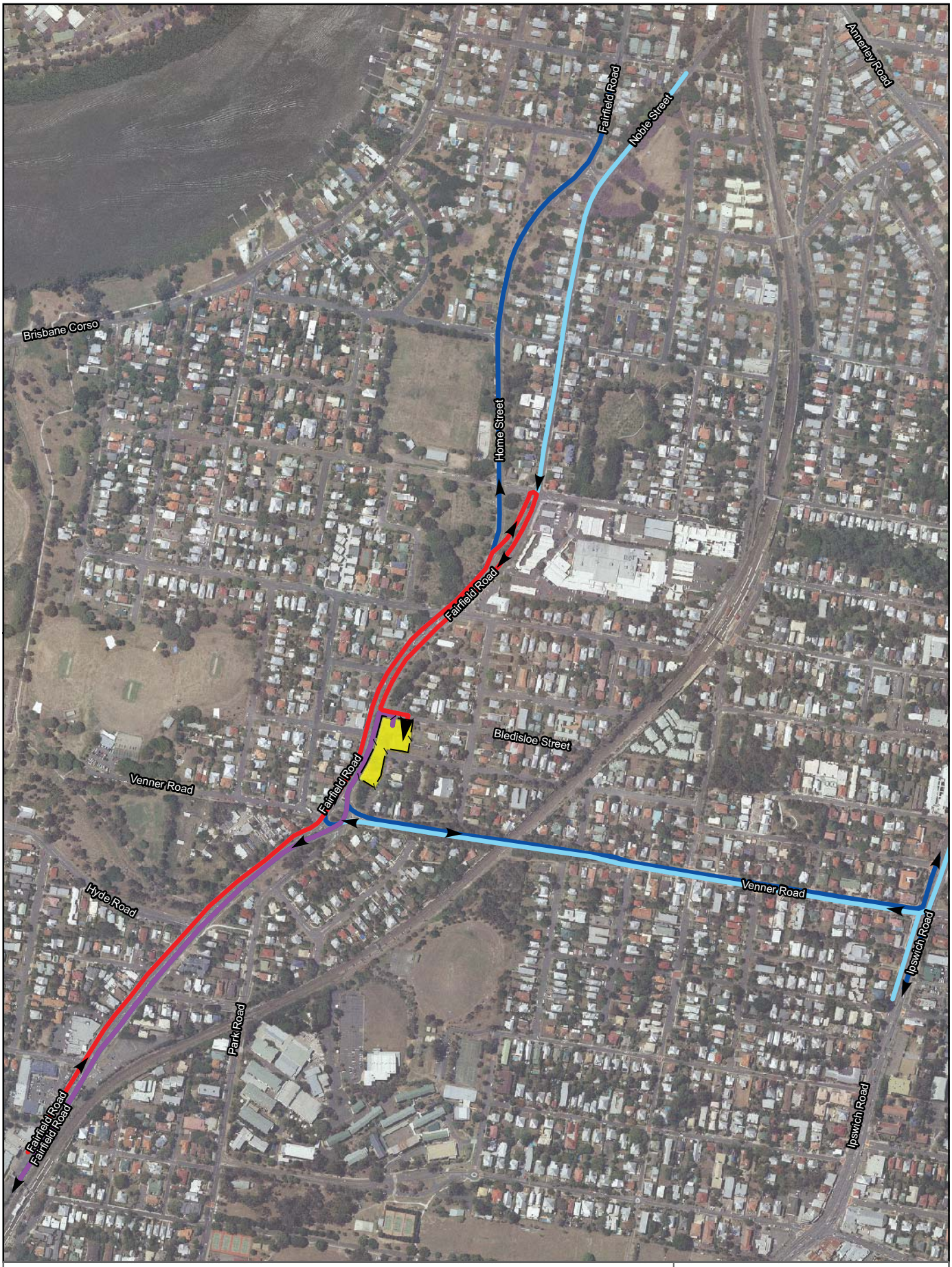
Worksite location and proposed truck access

The worksite would be located on the eastern side of Fairfield Road, in a landscaped area between Fairfield Road and Railway Road, south of Bledisloe Street. Access to the site will be to and from Bledisloe Street from a left in/left out arrangement onto Fairfield Road.

The location of the worksite requires a permanent adjustment to the alignment of Railway Road, which will be diverted approximately 10m to the east between Bledisloe Street and Sunbeam Street.

Heavy vehicle access will be from Fairfield Road, with northbound vehicles undertaking a U-turn at a modified Brougham Street intersection, in order to access the Bledisloe Street from the southbound carriageway of Fairfield Road. This modified intersection results in a minimum of construction impacts onto local residents by removing the need for heavy vehicles to traverse local roads.

The proposed heavy vehicle haul routes and potential routes for delivery vehicles, as well as the location of the worksite is shown in **Figure 7-8** below.



LEGEND

- Inbound Haulage Routes
- Outbound Haulage Routes
- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-8

Southern Ventilation Shaft Construction Site and Haul Routes

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CrossRiverRail

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Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0174_CRR_Haulage_Routes_Fairfield_A4_TR.mxd 06/07/2011 16:46

Traffic staging and network changes

A temporary new right turn would be provided from the one way northbound section of Fairfield Road adjacent to Brougham Street. This right turn function is to enable vehicles to effectively U-turn without using residential streets and to overcome the geometric constraints at the existing signalised intersection at Fairfield Road/Brougham Street for northbound. U-Turns are currently banned for northbound Fairfield Road due to geometry and signal phasing conflicts. This median adjustment would be installed only for construction and would be removed at the completion of works.

This new right turn would require a minor adjustment to the existing median island configuration to provide a short slip lane, with a hold line in Brougham Street. This layout would be adopted in order to maintain the existing restriction to straight ahead movements from Brougham Street across Fairfield Road northbound and to minimise the impact on the existing turning head function of Brougham Street between the north and southbound directions of Fairfield Road, A diagram showing a potential configuration is shown in **Figure 7-9** below, and is subject to further detailed assessment and discussion with Council:

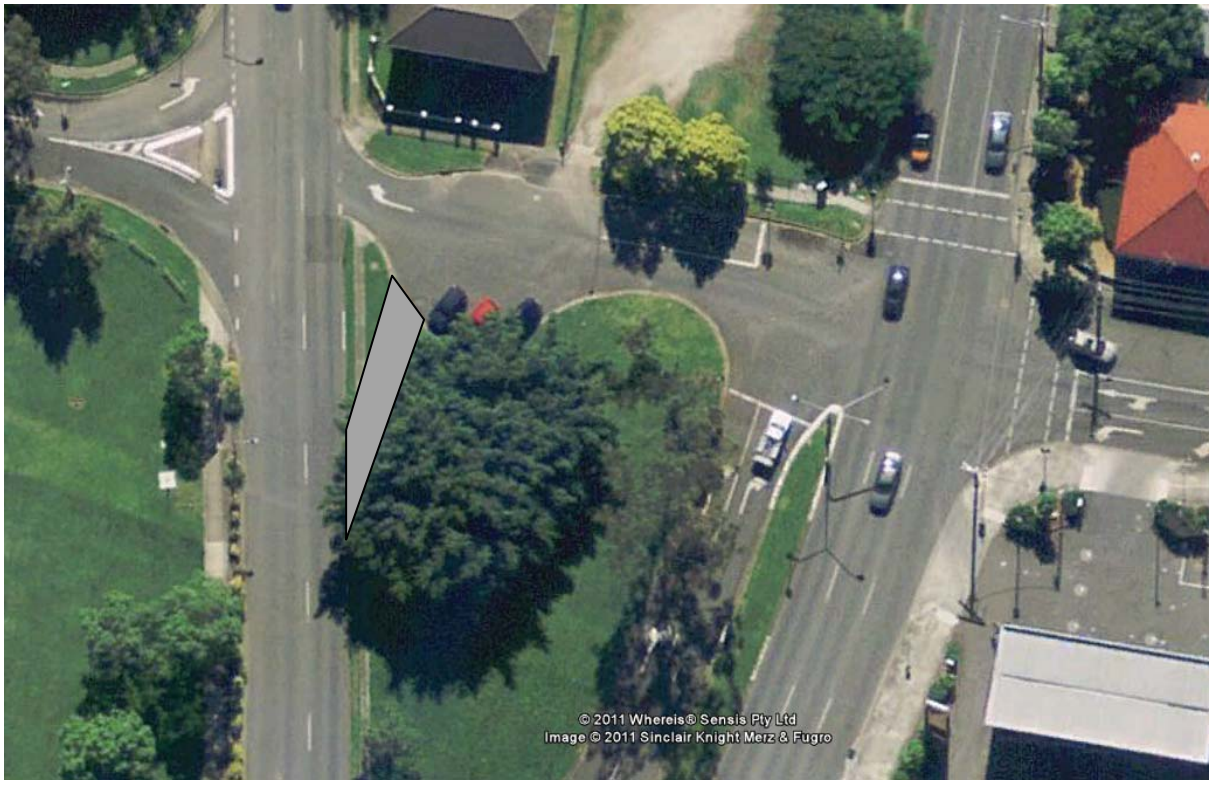

Figure 7-9 Brougham Street potential median adjustment

Image source: Google Maps

An alternative facility for providing a u-turn for heavy vehicles is available via the existing facility in the median approximately 500 m north of Brougham Street (immediately south of Stimpson Street). Should the proposed adjustment to the median at Brougham Street prove unfeasible, vehicles would continue northbound in Fairfield Road and u-turn at this existing facility.

The location of the worksite on the eastern side of Fairfield Road will require the closure of through vehicle access along Railway Road during construction. Upon completion of construction, Railway Road would be re-opened however it would be permanently realigned to the east and offset to the existing alignment north of Bledisloe Street and south of Sunbeam Street.

The temporary closure of through access along Railway Road will require vehicles with a destination in Sunbeam Street and Railway Road south of Sunbeam Street to travel via Bledisloe Street to Cross Street, and then via Sunbeam Street to reach their destination. This change is expected to impact approximately 5 residences.

Network operation – impact on traffic conditions

Construction traffic volumes generated by the construction worksite are not expected to be significant, with potentially only minor increase over the existing traffic volumes and additional traffic movements at the Brougham Street/Fairfield Road intersection (ie around three trucks per hour at peak times).

Pedestrians and cyclists

Pedestrian footpaths are provided on both sides of Fairfield Road. The location of the worksite on the southbound side of Fairfield Road will require this footpath to be closed for the duration of construction activity.

Pedestrian detour routes would be implemented via Bledisloe,Street, Cross Street and Railway Road, with advance warning provided at the intersections of Fairfield Road and Venner Road and Ashby Street.

No changes to cycle facilities in the area are proposed.

Buses

On street bus services are available along Fairfield Road, with a combined service frequency of 10 buses an hour in the peak direction during the weekday peak periods.

The bus stops adjacent to the work site are located near the Fairfield Road / Venner Road intersection with the provision of an indented bus bay in the southbound direction adjacent to the worksite. Additional stops are available for each direction of Fairfield Road (Home Street) north of Brougham Street. One other bus stop is located within the Fairfield Gardens shopping centre carpark near the Brougham Street / Gardens access intersection. The bus services which serve these bus stops are listed below:

- 105 (Indooroopilly to City)
- 107 (Yeronga to City)
- 108 (Indooroopilly to City, only weekday peak hours)
- 196/197 (Fairfield to New Farm via City).

The location of the worksite on the eastern side of Fairfield Road will require space currently occupied by an indented bus bay. It is proposed that the bus stop will be relocated approximately 150m to the north, to the northern side of Bledisloe Street, for the duration of construction. Given the temporary nature of the relocation, a bus bay facility is not proposed at the relocated stopping point. Bus patrons accessing the relocated bus stop would be required to travel via the pedestrian detour in Bledisloe/Cross/Sunbeam and Railway Roads when accessing the bus stop from Venner Road.

Buses on Fairfield Road may experience a minor increase in running time due to any changes in speed restrictions during construction, and due to the relocation of the indented bus bay having a minor increase in congestion for the southbound traffic movement.

TransLink would be advised of any changes to routing, bus stops or potential changes to travel time through processes established under the Framework Traffic Management Plan.

Parking

Provision for 14 parking spaces for the workforce would be made within the worksite boundary adjacent to Fairfield Road. At the peak of construction, some a workforce of 39 would be expected on site. Assuming each member of the workforce drove, some 25 cars could be expected to overspill onto surrounding streets at the height of construction. There are no on street parking controls in the vicinity of the proposed worksite with the workforce able to park legally on-street without any restriction.

In order to minimise impact on the surrounding community, the workforce would be encourage to park at the nearby Yeerongpilly worksite (where sufficient additional off street parking is proposed) and transferred by bus or specifically discouraged from parking on-street. In any case a total overspill of only 11 cars is expected in peak times (without alternative transport strategies in place). Given that such workforce parking overflowing onto the streets would be short term, with the majority of the workforce parking accommodated on-site over most of the construction period at this worksite, the overall impact is not expected to be significant.

The proposed adjustment to the traffic island at the northern corner of Brougham Street / Fairfield Road intersection, may impact on informal parking related to the Iglesia Evangelica Pentecostal Church. Any informal parking which currently exists between the north and southbound lanes of Fairfield Road would be suspended during construction in order to facilitate the u-turn movement.

Access, servicing and provision for adjacent development

The proposed temporary closure and permanent alignment adjustment to Railway Road will have an impact on approximately 5 residences located in Sunbeam Street and Railway Road south of Sunbeam Street. This will require a short diversion for these properties to use Bledisloe Street, Cross Street and Sunbeam Street instead of Railway Road. No other changes to access are anticipated.

With the exception of impact to possible informal parking at the Iglesia Evangelica Pentecostal Church discussed in **Section 7.8.6** above, the construction traffic is unlikely to have any impact on any other developments.

Emergency services

This worksite is not anticipated to have significant adverse impacts on Emergency Service vehicles. Should local detours be put into place for all traffic, this would apply to emergency services as well.

Emergency services would be advised of all changes to routes through processes established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Special events

Sporting games are generally held in Fairfield Park and Yeronga Park to the north west of the proposed worksites. The construction vehicles would have minimal impact to this as the construction work would only operate from Monday to Friday.

In any cases of major event take place in during the construction period, short term management strategies would be developed for the site under processes identified in the Framework Traffic Management Plan. Strategies may include a short term stop to trucking activities at the site or additional traffic control measures, as identified through the TTLG.

Table 7-12 provides a summary of construction impacts and mitigation for the southern ventilation and emergency access building worksite.

Table 7-12 Summary of construction impacts and mitigation for the worksite for the southern ventilation and emergency access building

Location	Impacts	Remedial measures
Worksite for the southern ventilation and emergency access building	Provision of new slip lane right turn/intersection adjustments at Fairfield Road one way northbound into Brougham Street. Removal on informal street and median parking in Brougham Street between Fairfield Road north and southbound. Minor increase in heavy vehicle flows on Fairfield Road and Brougham Street. Closure of footpath on eastern side of Fairfield Road with diversion via side streets. Relocation of existing indented bus stop for southbound Fairfield Road north of Vernon Street. Change in access arrangements for five residences in Sunbeam Street and Railway Road, south of Sunbeam Street with vehicles detoured via Cross Street.	Pedestrian detours to be signposted including advance warning Existing southbound bus stop to be relocated approximately 150m to the north of Bledisloe Street.

7.6.9 Yeerongpilly Station / southern portal worksite

Yeerongpilly would be the location of the southern tunnel portal and the worksite from where a TBM drive and associated tunnel fit-out would be managed. This worksite occurs primarily at surface level, and would require the diversion of the existing Wilkie Street. The existing Yeerongpilly Rail Station would remain operational throughout the construction period with some modifications to Station access, prior to being relocated approximately 250m to the south of its existing location.

Worksite location and proposed truck access

The tunnel worksite would be located between the existing Queensland Rail tracks, Wilkie Street, Cardross Street and Moolabin Creek.

Spoil haulage vehicles would approach the main worksite predominately from the south via Ipswich Motorway, Ipswich Road, a left turn at Lucy Street and directly into the worksite. Other heavy vehicles including materials delivery vehicles would take variable approach and departure routes to the worksite, using Ipswich Road and Lucy Street as the final approach to the worksite. Access from the west along Sherwood Road is restricted by the 3.8m high bridge clearance in this area, reinforcing Ipswich Motorway/ Ipswich Road as the principal heavy vehicle approach route form the south and west.

As the Southern Portal worksite will be occupying the large area of industrial land currently accessed via Lucy Street, as well as closing through vehicle access between Fairfield Road and Ipswich Road, the volume and composition of traffic using Lucy Street will be significantly different from that which currently occurs. There is scope to modify the Lucy Street approach geometry of the intersection to better accommodate construction traffic, including consideration of provision of a wide single approach lane should this be required. These adjustments would only be considered following further detailed design and examination of turning movements at the intersection.

During the site establishment phase, temporary construction access may be required to access Wilkie Street via Fairfield Road and Cardross Street. Access to Wilkie Street via Cardross Street may also be required for one-off requirements such as the delivery of TBM machines. These short term occurrences would be detailed in the Construction Traffic Management Plan developed by the contractor and subject to additional approval at that time.

A diagram showing the location of the worksites and heavy vehicle access routes including for spoil and deliveries is shown in **Figure 7-10**.

Traffic staging and network changes

Road and construction works at the Southern Portal worksite would be undertaken in a number of stages, to provide a minimum disruption to existing road network and to maintain access to adjacent land uses. The following traffic stages are anticipated:

- construction of new Wilkie Street approximately 50 m to the east of its current alignment, with new intersections being created with Crichton Street, Stamford Street, Green Street and Livingston Street. New Wilkie Street would contain a on street parking and loading (and bus stops) adjacent to the existing station. Construction of a new pedestrian overbridge between new Wilkie Street and the Yeerongpilly Rail Station would occur.
- diversion of traffic off old Wilkie Street onto new Wilkie Street, and closure of access from Wilkie Street to Station Street and Lucy Street south of Livingstone Street to general traffic. The old Wilkie Street would be utilised for construction worksite. The main period of tunnel construction would then follow.
- re-opening of Lucy Street connection to new Wilkie Street, following completion of all main construction activities.

Due to the location of the worksite in Lucy Street, Lucy Street itself would be closed to through traffic for the duration of construction preventing direct access between Fairfield Road and Ipswich Road. During this time, general traffic would be required to divert to the south, via Fairfield Road/ Muriel Avenue intersection to access Ipswich Road/ Ipswich Motorway and destinations to the south and east. A signage scheme would be implemented to provide advance warning to motorists of the changes. Vehicles over 3.8m would need to be directed further south, to Granard Road (part of the Brisbane Urban Corridor) in order to travel east.

Network operation – impact on traffic conditions

Given that the entire industrial area south of Livingstone Street to Lucy Road is proposed to be purchased and occupied by Cross River Rail, the impact of closure of this link to non-construction traffic is expected to be minor. It may result in additional traffic using School Road to travel between Fairfield and Ipswich Roads. School Road is traffic calmed, and if a weight limit is not currently in place this may be an option for consideration by the road authority to limit the impact of any diverted traffic on this route.

Traffic generated by the southern portal worksite is expected to peak at 14 heavy vehicle movements per hour. Traffic movements associated with worker parking could exceed 400 vehicles however the majority of these would be expected to arrive before 6.30 am, and therefore not coincide with peak hour traffic. The impact on traffic operations is considered negligible.

Traffic modelling has been undertaken to determine the impact of additional heavy vehicles on the existing road network, and this is detailed in **Section 7.8**.

A communication strategy would be developed to advise motorists of the changes to traffic conditions.

Pedestrians and cyclists

Pedestrian access between Wilkie Street and Lucy Street would be closed by the Project, with pedestrians and cyclists required to use alternative routes as per general traffic.

Pedestrian access along new Wilkie Street between Yeerongpilly Rail Station and Cardross Street would be maintained, and access to the Station from new Wilkie Street would be maintained through provision of a new pedestrian foot bridge. There may be the need for pedestrian diversions during the construction phase of new Wilkie Street, and these would be signposted locally with appropriate diversion routes put into place.

LEGEND

- Inbound Haulage Routes
- Outbound Haulage Routes
- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-10

Southern Portal Construction Site
Location and Heavy Vehicle Haul Routes

0 50 100 150 200 250 m

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CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0175_CRR_Haulage_Routes_Southern_P_A4_TR.mxd 06/07/2011 16:51

Buses

Five bus stops have been identified to be impacted by the proposed re-alignment of Wilkie Road. Due to the staged construction bus stops would not be closed until the re-aligned Wilkie Road is open and hence impact on buses would limited.

Buses operating to and from Yeerongpilly Rail Station operate in Livingstone Street and Wilkie Street. Closure of Wilkie Street to non-construction traffic south of Livingstone Street would not impact on bus operations.

Bus Operations would be advised of any changes to routing or potential changes to travel time through processes established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Parking

On-street parking currently exists on both sides of all streets near the worksite. The end state parking arrangements for the new Wilkie Street would be installed prior to the diversion of traffic onto this route. There may be adjustments between the existing and proposed provision of parking and kerb space utilistation, however as this reflects the final design the impacts are not considered to be construction related.

Workforce parking would be provided onsite, with up to 500 spaces to be provided during the tunnel fit out stage. During other stages of work, approximately 420 spaces would be available. At the peak of construction a workforce of 118 would be working at the Yeerongpilly worksites at any one time. As such the parking provision is generous and the site could function as a central parking area for several worksites, including those at Fairfield, Boggo Road and also Woolloongabba, Albert Street and Roma Street.

The Yeerongpilly worksite is not located in a controlled parking area however a resident parking zone is proposed by the Project to be implemented prior to the start of rail operations associated with the Project in order to control commuter parking. This scheme could be introduced prior to construction commencing to further mitigate any potential workforce parking impacts on residential streets.

Access, servicing and provision for adjacent development

Construction of new Wilkie Street involves demolition of the existing adjoining residential properties. As the properties would be removed prior to the construction of the new street, the impact on adjacent land users would be minimised. However, some local diversions may be required during the construction process.

Access to Yeerongpilly Station would remain open at all times.

Emergency services

The worksite at Yeerongpilly is not anticipated to impact on Emergency Service vehicles except when local detours are put into place for all traffic, including the closure of access between Lucy Street and Cardros Street, this would apply to emergency services as well.

Emergency services would be advised of all changes to routes through processes established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Special events

The Queensland Tennis Centre is located to the west of the worksite and hosts all major tennis tournaments in Brisbane. During an event, spectators arriving by Public Transport, exit Yeerongpilly Station via footpath overbridge and travel towards the west.

During the event mode of Queensland Tennis Centre, short term management strategies would be developed for the site under processes identified in the Framework Traffic Management Plan.

Strategies may include a short term stop to trucking activities at the site or additional traffic control measures. Specific processes would be developed in the Construction Traffic Management Plan for the Yeerongpilly worksite.

Table 7-13 provides a summary of construction impacts and mitigation at the Yeerongpilly worksite.

Table 7-13 Summary of construction impacts and mitigation for the Yeerongpilly worksite

Location	Impacts	Remedial measures
Southern Portal	Closure of through access from Fairfield Road to Lucy Street, for non-construction vehicles; Potential increase in volume of vehicles using School Road to travel between Ipswich Road and Fairfield Road; and Short term pedestrian and vehicle detours during the reconstruction of Wilkie Street.	Communication Plan to be developed Local detours and diversions to be signposted

7.6.10 Worksite at the Clapham Rail Yard

Clapham Rail Yard worksite is required to support all surface works required as part of widening of the rail corridor and track re-alignment in the southern part of the Project.

Clapham Rail Yard would continue to operate as a live Queensland Rail operations site during construction. The detailed staging of rail track re-alignment and sequencing is at a preliminary stage and has not been covered in this assessment.

Contamination issues are anticipated to be encountered when working in the yard. The existing ground level of the yard is required to be raised with imported fill material to ensure it meets the appropriate flood levels.

The worksite would be used as a materials consolidation and set down area, to serve other surface works areas in the southern part of the Project.

Moorooka Station, located on the eastern side of the Clapham Rail Yard, is proposed to be closed during some stages of the construction process, and during that time a shuttle bus may be used to transfer passengers to other adjacent railway stations.

Worksite location and proposed truck access

The worksite that would be at the Clapham Rail Yard would be located between Ipswich Road and Fairfield Road, with access for construction traffic proposed from both arterial roads.

Existing commercial and industrial properties located on the western side between the rail yard and Fairfield Road are proposed to be occupied by the Project as worksite. This occupation would remove the existing land uses. The worksite would use existing or new direct driveway access points onto Fairfield Road. One direct driveway access point has been nominated to and from Fairfield Road. Fairfield Road has a centre turning lane along the length of the proposed worksite. This centre turning lane would provide provision for the right turn into and out of the driveway while minimising impact on through traffic.

An additional site access point is proposed to the western side of Clapham Rail Yard worksite via Chale Street. Chale Street has a seagull intersection type treatment with Fairfield Road, with a dedicated right turn bay to provide access from Fairfield Road. The Chale Street/Fairfield Road intersection currently provides for a high percentage of heavy vehicle turning movements due to the industrial nature of the surrounding land use, and this utilisation would be continued by the Project.

On the eastern side of the rail yard, existing residential properties between the rail yard and Ipswich Road south of Hamilton Street would be removed by the project and the space occupied as worksite. An additional worksite access point directly from the worksite to Ipswich Road south of Hamilton Street proposed. This would be constructed as left in/left out junction with Ipswich Road.

Additional worksite access points from the eastern side of the worksite to Ipswich Road would be provided using the existing side street of Unwin Street. Unwin Street is a left in left out intersection with Ipswich Road, and the Project is not proposing to modify the permissible turning movements. A diagram showing the location of the worksites and heavy vehicle access routes is shown in **Figure 7-11**. Additional detail showing the extent of worksite and exact location of proposed access points can be obtained from the constructability drawings prepared for the project.

Traffic staging and network changes

As the majority of construction work in Clapham Yard occurs off road, there would be only one traffic stage. No network changes are proposed for this worksite.

Network operation – impact on traffic conditions

A period of higher construction traffic would be expected during earthworks towards the start of the program, and this would reduce as the program proceeded when only track works would be performed. Due to the nature of the track work activity, most of this work would take place at night or during periods of rail shutdowns, and as such construction traffic trip generation would mostly occur outside of peak traffic periods. In any case a maximum of nine truck movements per hour at peak times is expected which would not impact significantly on the surrounding road network and traffic conditions.

Pedestrians and cyclists

As the works occur mainly off road, no impact to pedestrians or cyclists is anticipated. Appropriate pedestrian accessibility would incorporated into the Hamilton Road/Ipswich Road signalised intersection, as agreed with the road authority. Heavy vehicle use of driveway crossings in Fairfield Road would be similar to the existing use, and as such no pedestrian management measures are proposed.

Buses

No bus operations are anticipated to be impacted as a result of the Clapham Rail Yard worksite. Arrangements for a shuttle bus operation during periods of Moorooka Rail Station closure would be made to provide pick up and set down from near to the existing Moorooka Railway Station.

Parking

The worksite at the Clapham Rail Yard would provide 50 car parking spaces for the workforce. The peak workforce for the southern surface worksites, would total around a workforce of 156. This includes the workforce that would be located at the Clapham Yard, Moorooka viaduct worksite, Ipswich Motorway worksite, Rocklea Station worksite, and Salisbury worksite.

With 50 workforce car park spaces at the Clapham Yard worksite and a further 40 at Salisbury the majority of peak workforce car parking would be accommodated off street. Furthermore, there are a range of options for additional off street car parking as demand warrants, particularly at the Clapham Rail Yard, due to the large site area.

Alternatively, shuttle buses from Yeerongpilly could be used to supplement on site parking provision. While there is no timed parking controls around Clapham Yard, parking options are very limited with no parking on Fairfield Road and limited parking on Chale Street, the only two likely surrounding streets to potentially attract overspill workforce parking. As such the likelihood of overspill parking from Clapham Yard is low and the impacts likely to be minimal.

No change to existing on street parking as a result of the Clapham Rail Yard worksite would be required.

Access, servicing and provision for adjacent development

Given that the project intends to acquire and occupy the majority of the adjacent land between the Clapham Rail Yard and the Ipswich and Fairfield Road corridors, the impact on adjacent development would be limited. No significant adverse impacts are anticipated.

LEGEND

- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-11

Clapham Rail Yard Construction Site Location and Heavy Vehicle Haul Routes

0 50 100 150 200 250 300 m

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CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0176_CRR_Haulage_Routes_Clapham_A4_TR.mxd 07/07/2011 15:53

Emergency services

The worksite at the Clapham Rail Yard is not anticipated to have significant adverse impacts on Emergency Service vehicles. If local detours are put into place for all traffic, this would apply to emergency services as well.

Emergency services would be advised of all changes to routes through processes established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Table 7-14 provides a summary of construction impacts and mitigation at the Clapham Rail Yard worksite.

Table 7-14 Summary of construction impacts and mitigation for the worksite at Clapham Rail Yard

Location	Impacts	Remedial measures
Clapham Rail Yards	Creation of a new driveway crossing and left in left out junction on Ipswich Road, south of Hamilton Road. Closure of Moorooka Station. Adjustment to kerbspace arrangements adjacent to Moorooka Station to pick up and set down passengers. Minor increase in the volume of heavy vehicles on Ipswich and Fairfield Roads.	Shuttle bus service to transport Moorooka Station passengers to adjacent stations.

7.6.11 Other southern surface work sites

Worksites would be required at Moorooka, Rocklea and Salisbruy to support the southern surface works that include works to road and rail infrastructure.

The Moorooka worksite would be located between Ipswich Road and the railway line south of Moorooka Station. This site would support construction of a range of bridges and viaducts south of Clapham Yard. The Rocklea worksite would support the construction of a new Ipswich Motroway on ramp. A second worksite at Rocklea would support track widening and Rocklea station upgrade works, while a major worksite at Salisbury would be the main southern rail upgrade worksite.

The Salisbury worksite is expected to function as the main material worksite for these separate satellite worksites, south of Clapham Rail Yard. As such, the remainder of this section addresses this main worksite only.

Worksite location and proposed truck access

The worksite would be located less than 50m east of Beaudesert Road via Lillian Avenue. The intersection of Lillian Avenue and Beaudesert Road would be signalised as part of the Project. Such signalisation should occur at the start of the construction programme to allow safe access for construction vehicles to/ from the worksite from the north and south. Proposed truck delivery access routes are shown in **Figure 7-12.**

Traffic staging and network changes

The Salisbury worksite would be located off road. Upon completion of track works and decommissioning of the worksite the works to the roads would commence within the worksite to realign the Service Road through the worksite itself.

Network operation – impact on traffic conditions

The volume of construction traffic accessing the worksite would vary throughout the Project program. Due to the nature of the track work activity, most of this work would take place at night or during periods of rail shutdowns, and as such construction traffic trip generation would mostly occur outside of peak traffic periods.

LEGEND

- Potential Material Delivery Inbound Routes
- Potential Material Delivery Outbound Routes
- Worksite Extent
- Worksites

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-12

Salisbury Construction Worksite Location and Heavy Vehicle Haul Routes

0 50 100 150 200 250 m

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CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0177_CRR_Haulage_Routes_Salisbury_A4_TR.mxd 06/07/2011 17:02

Pedestrians and cyclists

As the works would occur mainly off road, no impact to pedestrians or cyclists is anticipated. Appropriate pedestrian accessibility would be incorporated into the Lillian Avenue/ Beaudesert Road signalised intersection, as agreed with the road authority.

Heavy vehicle use of the driveway from Lillian Avenue would be similar to the existing depot use, and as such no pedestrian management measures are proposed.

Buses

Bus operations would not be impacted as a result of this worksite.

Parking

The Salisbury worksite would have a capacity for 40 cars.

As outlined in **Section 7.7.10**, an estimate of workforce numbers has been provided for all southern surface worksites, with an approximate peak workforce of 156. This includes worksites at Clapham Rail Yard, Moorooka, Ipswich Motorway, Rocklea Station, and Salisbury.

With 50 spaces at Clapham Yard and a further 40 at Salisbury the majority of workforce car parking can be accommodated off site. Furthermore, there are a range of options for additional off site car parking as demand warrants, including along the western periphery of the Salisbury worksite, due to the absence of adjacent businesses or residences. While there is no timed parking controls around the Salisbury worksite, parking is not currently over subscribed and there would be availability for workforce on-street parking that would be remote from other uses. As such the impact of any overspill parking at Salisbury is likely to be minimal.

No change to existing on street parking would be required as a result of the Salisbury worksite.

Access, servicing and provision for adjacent development

The impact on adjacent development would be limited as the site already contains a depot use requiring parking, loading and servicing. No significant adverse impacts are anticipated.

Emergency services

The Salisbury worksite is not anticipated to have significant adverse impacts on Emergency Service vehicles. If local detours are put into place for all traffic, this would apply to emergency services as well.

Emergency services would be advised of all changes to routes through processes established under the Framework Traffic Management Plan and Traffic and Transport Liaison Group.

Table 7-15 provides a summary of construction impacts and mitigation at the Salisbury worksite.

Table 7-15 Summary of construction impacts and mitigation for the Salisbury worksite

Location	Impacts	Remedial measures
Salisbury	Consolidate existing driveways from Lillian Avenue into a single entry point. Possible minor increase in the volume of heavy vehicles on Lillian Avenue and its intersection with Beaudesert Road.	Signalisation of Lillian Avenue and Beaudesert Road

7.7 Construction workforce parking

This section provides a summary of workforce parking requirements. A more detailed assessment of the impacts of parking and potential mitigation at each construction worksite was provided in **Section 7.7**.

The identified construction workforce is expected to generate a peak parking demand of approximately 1,050 vehicles across all construction worksites based on a conservative assumption that each member of the workforce would drive.

A total of 858 parking spaces are to be provided across the construction worksites catering for the majority of the peak workforce.

- Overall the level of car parking provided is expected to be sufficient to cater for overall workforce parking demands across the construction programme with additional certainty to be provided through selected mitigation measures including:
- Providing a dedicated bus option for the workforce at Woolloongabba, Boggo Road and Fairfield, from the major carpark at Yeerongpilly.
- Seeking changes to the operational dates of existing Traffic Areas including Dutton Park Traffic Area and Gabba Traffic Area to include Saturdays.
- Seeking to extend and make permanent the current event-only Traffic Area around the Queensland Tennis Centre, to cover potential commuter parking streets around Yeerongpilly.
- Encourage the workforce to car pool or catch public transport where possible, particularly to Roma Street and Albert Street construction worksites.
- Manage on site parking at Roma Street and Albert Street in particular to prioritise members of the workforce with no other option (due to equipment or work type etc).
- The contractor would be responsible for the management of car parking as specified within their Construction Traffic Management Plan. On-street car parking conditions should be monitored on the streets surrounding all work sites, with additional mitigation measures to be investigated if required.
- Workforce parking and associated management for surrounding residential or commercial areas, addressing issues such as safety, access and amenity, will be fully addressed in the Construction Traffic Management Plans prepared by the construction contractor.

Overall carparking numbers are summarised in **Table 7-16**.

In addition to provision for the workforce each construction worksite car park would also provide a small number of parking space for visitors and deliveries.

Table 7-16 Construction workforce parking

Site	Peak number of vehicles	Length of peak	Suggested car park site
Surface works south	156	Peak at 50-75% of timeline	Clapham Yards (west of Fairfield Road) – 50 car parks Salisbury (Lillian Avenue/Beaudesert Road) – 40 car parks
Yeerongpilly worksite	118	Peak at 50-75% of timeline	Yeerongpilly construction worksite (capacity for over 400 vehicles) with access from Ipswich Road to Lucie Street. Propose traffic area in Yeerongpilly to prevent workforce on-street parking
Worksite at Fairfield	39	Peak at 60-85% of timeline	Construction worksite – 14 car parks.
Boggo Road Station	137	Peak at 50-75% of timeline	Construction worksite – 30 car parks. The majority of the workforce would use a shuttle bus from the Yeerongpilly construction worksite. On street car parking discouraged due to Dutton Park traffic area.
Gabba Station	137	Peak at 50-75% of timeline	Construction worksite – 72 car parks. Excess workforce would use a shuttle bus from the Yeerongpilly construction worksite. On-street car parking discouraged due to Gabba traffic area.
Albert Street Station	137	Peak at 50-75% of timeline	Minor number (12) of car parks on site. Majority of workforce to use off-street public car parks. On street car parking discouraged through Brisbane Central traffic area.
Roma Street Station	137	Peak at 50-75% of timeline	45 car parks on site. Excess workforce to use off-street public car parks. On street car parking discouraged through Brisbane Central traffic area.
Northern portal site	39	Peak at 60-85% of timeline	80 car park accessible from Gregory Terrace and Bowen Bridge Road
Surface works north	156	Peak at 50-75% of timeline	Provision for 45 car parks at O'Connell Terrace and 100 at Mayne Yards construction worksites.
Total	1,056		

Note:
1. Assumes all workforce drives. Workforce source: AECOM 30/11/10

7.8 Traffic operation assessment/capacity analysis

Construction of the Project is expected to result in impacts to existing traffic conditions resulting from construction vehicles using the road network, and from adjustments to road layouts resulting in changed traffic conditions/detours or local diversions for general motorists.

In order to assess the impacts on existing road traffic conditions, a mix of quantitative and qualitative assessment methodologies have been utilised.

Key intersections on the road network where the impact of spoil haulage and delivery vehicles is expected to be greatest have been selected for quantitative assessment using SIDRA intersection modelling. The impact determined at these key intersections is intended to demonstrate the worst case scenario outcome, and other non key intersections therefore having lower levels of impact.

7.8.1 Assessment methodology

In addition to the worksite assessment discussed in **Section 7.7**, the traffic operation assessment has focused mainly on the impact of generated construction vehicles to the relevant road network and critical intersections on the road network which is expected to demonstrate the greatest impacts.

In order to demonstrate the expected changes in traffic conditions on affected roads and intersections, the trips likely to be generated from each worksite has been calculated based on figures provided by AECOM in the Draft Reference Design Construction Issues Report and subsequent Memo “Estimated Rates of Spoil Production for Updated Reference Design (29/03/2011)”. In addition to the spoil haulage trip figures provided by AECOM, an estimation of delivery vehicle traffic for plant, materials and equipment has been made and included in the assessed volume, including for non spoil generating worksites. This delivery vehicle volume has been based on an assumed 15% of the spoil haulage volume, a figure obtained from the AECOM report. For surface worksites such as Clapham and Mayne Yards, where AECOM has not provided figures on proposed construction vehicle volumes, these have been strategically estimated based on volumes experienced and/or assessed for similar Project worksites.

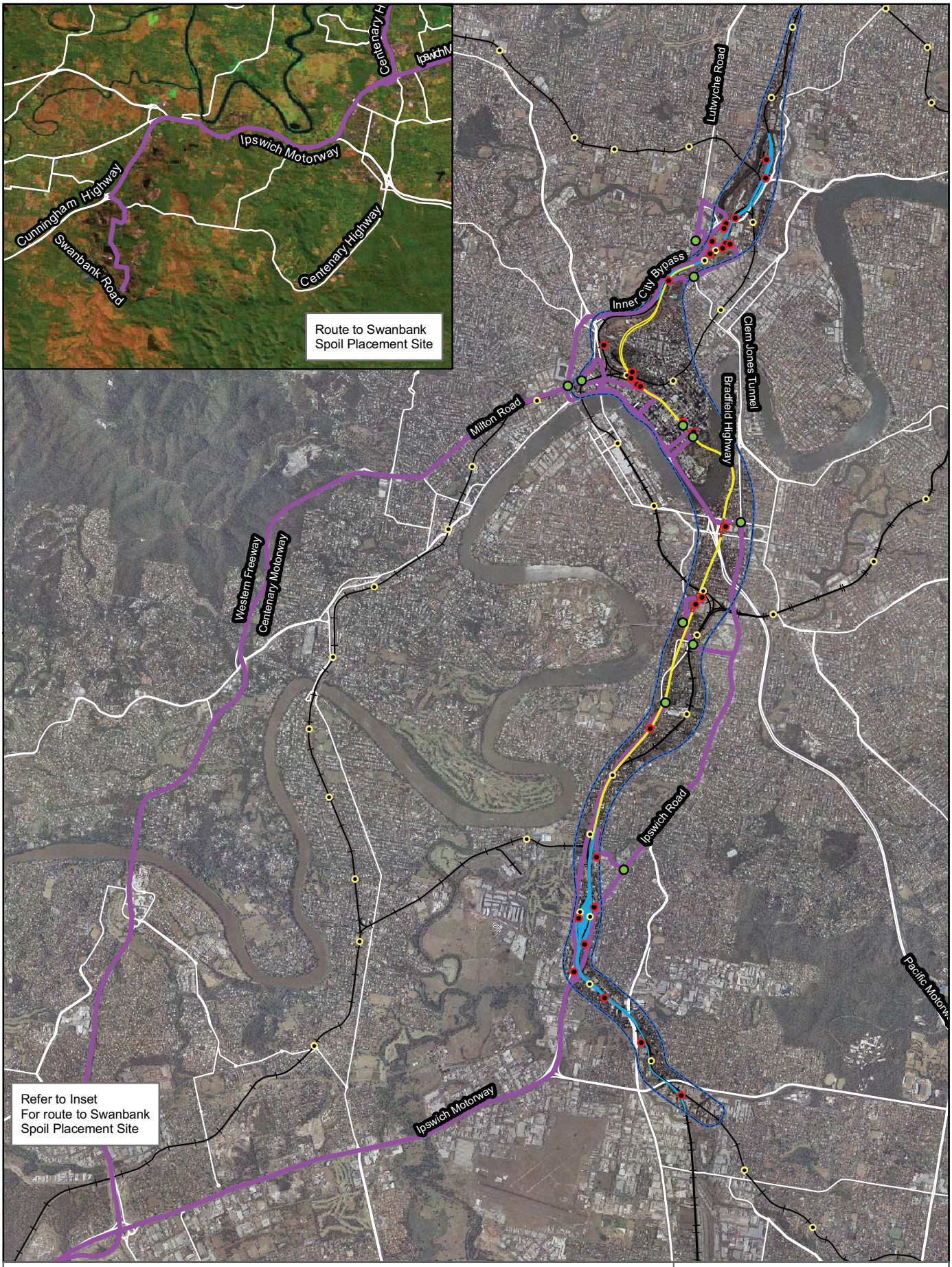
For the purpose of this worst case scenario assessment, the peak rate of generated haulage movements has been used, and all worksites have assumed to be operating at full capacity concurrently. Due to the Project program critical path being related to the time taken for TBM’s to drive the underground route, it is considered very unlikely that all worksites would be operating at full capacity concurrently, and hence the modelling is considered to represent a conservative approach.

The construction heavy vehicle traffic has been distributed to the proposed haulage route, as shown in **Figure 7-13** below.

For the purposes of the assessment, the haul route has been broken down into a number of smaller links to show the expected peak truck volume on each section of the haulage route. A spoil disposal location in Swanbank has been assumed for the purposes of the assessment.

Key intersections which are likely to have the greatest impact have been selected for SIDRA analysis. Analysis has been conducted for both with and without construction vehicle cases to identify the affect of additional heavy vehicles. The maximum number of Project construction vehicles has been applied for each intersection in peak hours to simulate the worst case scenario. Given that modelling has been undertaken for the peak periods, this can be used to determine whether trucking during the peak periods is acceptable.

The existing traffic volumes have been determined from reference to published TMR traffic data and BCC electronic (signal loop) traffic counts. The current traffic volumes have been adjusted to the future year of 2016 using a compounding growth rate of 2.4%. This growth rate has been derived from the strategic estimation of total traffic generation in Brisbane over the next 6 years.



LEGEND

- Study Corridor
- Station
- Track
- Underground Station

Alignment

- Above Ground
- Underground

- Haul Route
- Modelled Intersections
- Worksite

0 1 2 3 4 Km

1:75,000 at A4

N

CROSS RIVER RAIL
TRANSPORT TECHNICAL REPORT

Figure 7-13

Combined Haulage Routes

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0114_CRR_Haulage_Routes_A4_TR.mxd 06/07/2011 17:06

7.8.2 Peak hour haulage

Haulage of spoil and delivery of plant and materials to all worksites is proposed at all times within the hours of site operation, including those coinciding with regular morning and evening peak traffic periods.

The spoil haulage routes have been designed to minimise impacts to the flows of other traffic. Traffic modelling has been undertaken which demonstrates the expected impact to peak hour traffic flows that would result from haulage and delivery activity.

It is noted that worksites which require STOP/SLOW or other manual traffic control in order to enable heavy vehicles to access or egress worksites may have restrictions placed on them that prevent use of this traffic control, and hence limit access, during the peak periods. As a result, these worksites would not generate truck movements during those periods. However for the purposes of this assessment, all worksites trip generation has been assumed to occur during the peaks and all worksites have been modelled as operating concurrently.

7.8.3 Construction traffic generation

Assessment of the trip generation of each worksite was undertaken, which combined the trips generated by spoil haulage with those associated with deliveries. A rate of delivery vehicles equal to 15% of spoil production was assumed in order to estimate the number of delivery vehicle movements. Peak daily and peak hourly total heavy vehicle trips have been calculated for each worksite.

Trip generation of non-core worksites (surface worksites) was not available at the time of the assessment. The likely generation rates have been estimated based on the size of each surface worksite. The results are summarised in **Table 7-17**.

Table 7-17 Peak daily and peak hourly trip generation from each worksite

Worksites		Peak spoil movements (daily)	Peak delivery (daily)	Peak total (daily)	Peak total (hourly)	Sum of each worksite
Core (tunnel worksites)						
Northern Portal		75	20	95	8	8
Roma Street	North	23	6	29	2	10
	Central	23	6	29	2	
	South	57	15	72	6	
Albert Street	North	23	6	29	2	8
	South	57	15	72	6	
Woolloongabba		214	57	271	14	14
Boggo Road		89	24	113	9	9
Fairfield Vent		29	8	37	3	3
Southern Portal		214	57	271	14	15
Non-core (surface worksites)						
O'Connell Tce		-	-	60	4	4
Mayne Yard		-	-	143	9	9
Clapham Yard		-	-	143	9	9

Source: AECOM 23/3/11 (core worksites) and SKM/AURECON estimates (non-core worksites)

7.8.4 Intersection analysis

Intersections

All intersection along the haul routes were examined to determine which of those were critical and hence warranted detailed SIDRA analysis, with twelve intersections being selected. The modelled intersections have been indicated in the haulage route diagram **Figure 7-13** above.

In consideration of the worst case scenario, construction vehicle trips from multiple worksites occur at certain intersections. The hourly peak rates of the combined spoil and delivery heavy vehicle trips were used for analysis. The following **Table 7-18** lists the worksites which result in cumulative traffic impacts from spoil haulage. It should be noted that due to the diverse range of origin and destination of delivery truck movements, almost all intersections have components of delivery traffic from all worksites incorporated into the worst case scenario construction traffic loading as well.

Table 7-18 Construction vehicle overlap at intersections from relevant worksites

Intersection modelled	Haulage and deliveries contributing to traffic generation
Bowen Bridge Rd/ O'Connell Tce	Northern Portal, Exhibition Station, Mayne Yard
Bowen Bridge Rd/ Gregory Tce	Northern Portal, Exhibition Station, Mayne Yard
Albert St/ Mary Street	Albert Street
Albert St/ Alice St	Albert Street
Main St/ Vulture St	Woolloongabba
Milton Rd/ Upper Roma St	Roma Street
Milton Rd/ Hale St	Northern Portal, Exhibition Station, Mayne Yard, Roma Street
Milton Rd/ Castlemaine St	Northern Portal, Exhibition Station, Mayne Yard, Roma Street
Annerley Rd/ Gladstone Rd	Boggo Road
Annerley Rd/ Cornwall St	Boggo Road
Fairfield Rd/ Brougham St	Boggo Road, Fairfield Vent
Ipswich Rd/ Lucy St/ Durack St	Boggo Road, Woolloongabba, Yeerongpilly, Roma Street outbound

SIDRA modelling

SIDRA modelling has been undertaken in order to quantify the impact of spoil haulage operations on the adjoining road network. SIDRA version 5 was used to analyse the intersections for both AM and PM peak periods before and during the construction phase, for the forecast traffic year 2016.

Intersections layout reflect the existing arrangement (2010) used for 2016 analysis.

Traffic volumes for intersection analyses were collected from Brisbane City Council for the period between 16th August 2010 to 20th August 2010, and average weekday traffic volumes were considered for analysis. Where data did not distinguish between lanes which contained both through and left or right turn movements, the volume of turning movement was estimated based on engineering principles and local experience.

For consistency, the time period 7:30 to 8:30am and 4:30 to 5:30pm was adopted as the peak hour periods for all the intersections.

2010 traffic volumes have been adjusted for the forecast traffic year 2016 using a compounding growth rate of 2.4 percent which was derived from the strategic model used for forecasting on the Project.

Classification of vehicles was not provided in the available data, and so the percentage of heavy vehicles was estimated from the strategic forecast model used for the project.

Phasing arrangements for all the intersections reflect current signal plans provided by Council. The cycle times and phase splits have been determined by SIDRA to obtain an optimised result. Due to the real world signal timings operating in a coordinated and linked environment, this may result in the SIDRA modelling showing a better result than may be obtained in the field. However, the objective of this assessment is to demonstrate the relative change in level of service and delay/queuing as a result of construction activity, and as such this approach is considered suitable.

The following section details the results obtained for each intersection comparing base case and construction period for both AM and PM peak.

SIDRA outputs

Bowen Bridge Road/O'Connell Terrace/RBH

Figure 7-14 shows the Bowen Bridge Road/O'Connell Terrace/RBH intersection.

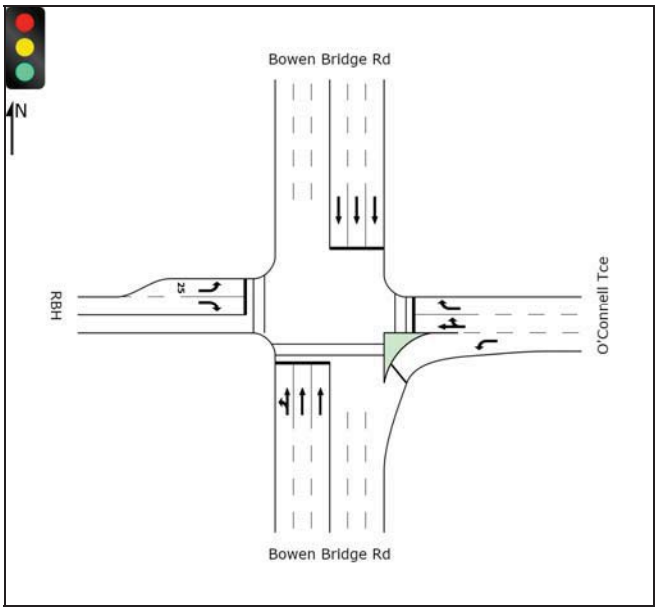


Figure 7-14 Bowen Bridge Road/O'Connell Terrace/RBH

Table 7-19 AM Peak – Bowen Bridge Road/O'Connell Terrace/RBH

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Bowen Bridge Rd (S)	0.379	8.8	90.7	0.388	8.8	93.5
O'Connell Tce	0.567	47.5	89.9	0.603	47.9	89.9
Bowen Bridge Rd (N)	0.680	11.8	196.7	0.681	11.9	197.2
RBH	0.130	45.0	11.4	0.130	45.0	11.4
All	0.680	16.0	196.7	0.681	16.1	197.2

Table 7-20 PM Peak – Bowen Bridge Road/O'Connell Terrace/RBH

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Bowen Bridge Rd (S)	0.628	12.5	152.0	0.664	13.3	156.2
O'Connell Tce	0.629	39.8	82.6	0.622	37.1	81.5
Bowen Bridge Rd (N)	0.370	9.9	80.6	0.387	10.5	81.1
RBH	0.226	33.0	13.6	0.211	30.4	12.7
All	0.630	16.2	152.0	0.664	16.4	156.2

Table 7-19 and **Table 7-20** show that the overall performance of this intersection appears to be good compared to base case scenario, with a minor increase in degree of saturation and with only small increases in queue length. This intersection would not be significantly affected due to construction vehicles on Bowen Bridge Road and O'Connell Terrace.

Bowen Bridge Road/Gregory Terrace/Brunswick Street

Figure 7-15 shows the Bowen Bridge Road/Gregory Terrace/Brunswick Street intersection.

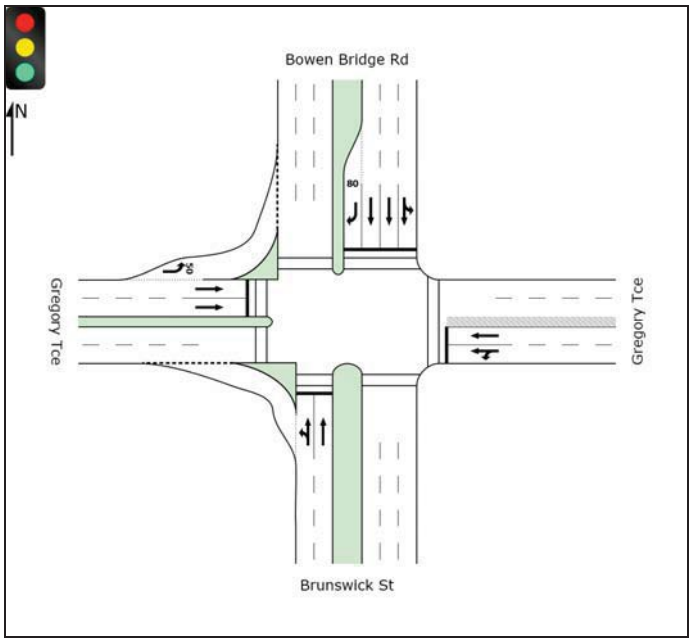


Figure 7-15 Bowen Bridge Road/Gregory Terrace/Brunswick Street

Table 7-21 AM Peak – Bowen Bridge Road/Gregory Terrace/Brunswick Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Brunswick St (S)	0.955	69.3	265.7	0.958	70.4	268.9
Gregory Tce (E)	0.209	44.4	36.1	0.209	44.4	36.1
Bowen Bridge Rd (N)	1.000	13.4	152.9	1.000	13.8	162.6
Gregory Tce (W)	0.745	27.0	81.7	0.769	28.3	89.1
All	1.000	28.1	265.7	1.000	28.7	268.9

Table 7-22 PM Peak – Bowen Bridge Road/Gregory Terrace/Brunswick Street

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Brunswick St (S)	0.872	30.6	280.8	0.921	40.9	324.0
Gregory Tce (E)	0.365	42.7	59.3	0.348	39.9	56.5
Bowen Bridge Rd (N)	0.871	13.5	115.7	0.877	14.2	118.7
Gregory Tce (W)	1.000	32.7	107.1	1.000	31.3	108.4
All	1.000	25.0	280.8	1.000	28.6	324.0

Table 7-21 and **Table 7-22** show that the degree of saturation above 0.9 is considered an over saturated intersection where the delay and queuing can fluctuate dramatically. This intersection is under considerable pressure in the base case and could be described as over capacity. The addition of construction vehicles during the AM and PM peak periods would result in a minor increase in congestion at the intersection, with average delay for all approaches increasing by 0.6 seconds in the AM peak and 3.6 seconds in the PM peak. Overall, the change in delay is considered relatively minor.

Albert Street/Mary Street

Figure 7-16 shows the Albert Street/Mary Street intersection.

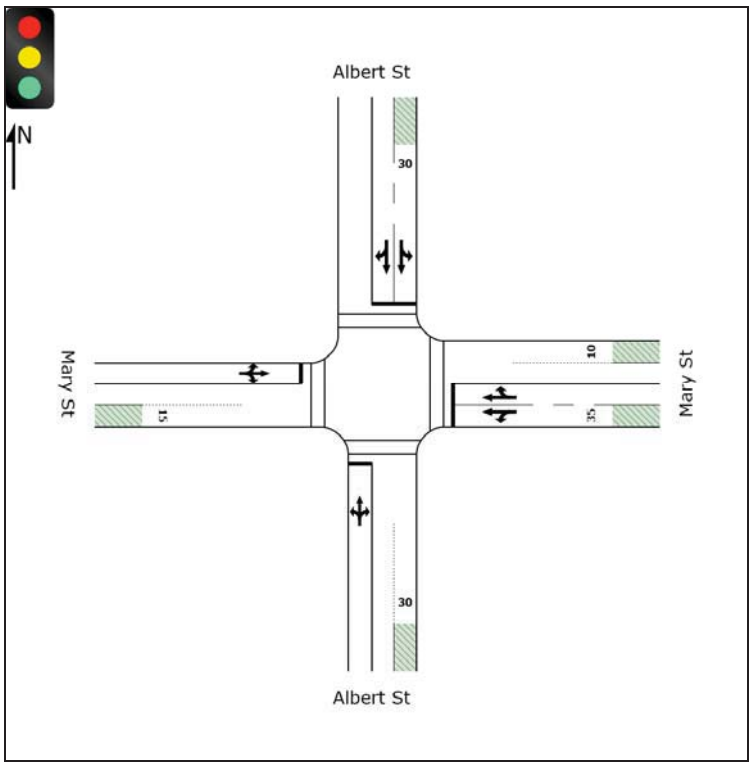


Figure 7-16 Albert Street/Mary Street

Table 7-23 AM Peak – Albert Street/Mary Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Albert St South	0.548	22.1	101.2	0.570	22.3	106.1
Mary St East	0.601	11.6	76.0	0.601	11.6	76.0
Albert St North	0.071	16.7	15.8	0.088	16.8	20.0
Mary St West	0.165	10.2	17.8	0.165	10.2	17.8
All	0.601	15.5	101.2	0.601	15.6	106.1

Table 7-24 PM Peak – Albert Street/Mary Street

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Albert St South	0.550	22.3	82.9	0.581	22.6	88.1
Mary St East	0.473	11.3	57.5	0.47.	11.3	57.5
Albert St North	0.575	20.7	122.4	0.591	20.9	127.2
Mary St West	0.298	11.5	27.7	0.298	11.5	27.7
All	0.575	16.8	122.4	0.591	17.0	127.2

The results in **Table 7-23** and **Table 7-24** shows that this intersection would perform well in base case, with negligible change expected as a result of construction traffic.

Albert Street/Alice Street

Figure 7-17 shows the Albert Street/Mary Street intersection.

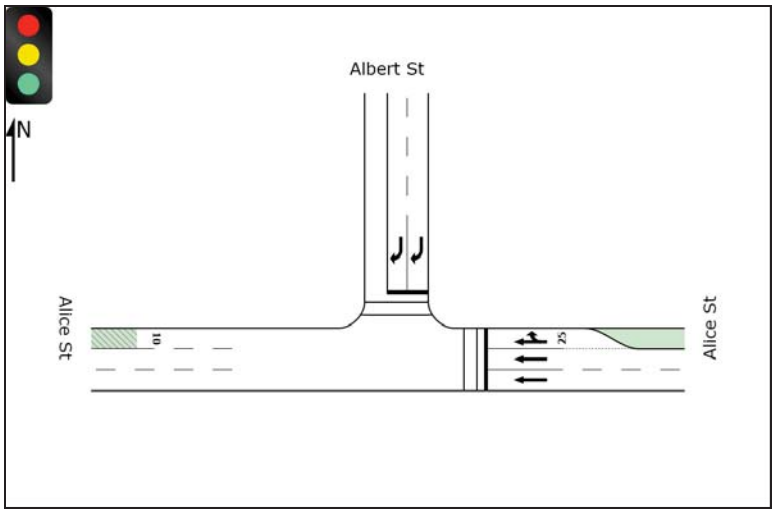


Figure 7-17 Albert Street/Alice Street

Table 7-25 AM Peak – Albert Street/Alice Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	**Degree of Saturation**	**Average Delay (s)**	**Queue (m)**	**Degree of Saturation**	**Average Delay (s)**	**Queue (m)**
Alice St East	0.241	1.6	9.4	0.241	1.2	9.4
Albert St North	0.201	37.4	28.9	0.219	37.8	31.6
All	0.241	7.0	28.9	0.241	7.3	31.6

Table 7-26 PM Peak – Albert Street/Alice Street

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Alice St East	0.434	2.0	20.2	0.434	2.0	20.2
Albert St North	0.625	38.8	91.3	0.641	39.0	93.9
All	0.625	11.8	91.3	0.641	11.9	93.9

The results in **Table 7-25** and **Table 7-26** shows that this intersection would perform well in base case, with negligible change expected as a result of construction traffic.

Main Street/Vulture Street

Figure 7-18 shows the Main Street/Vulture Street intersection.

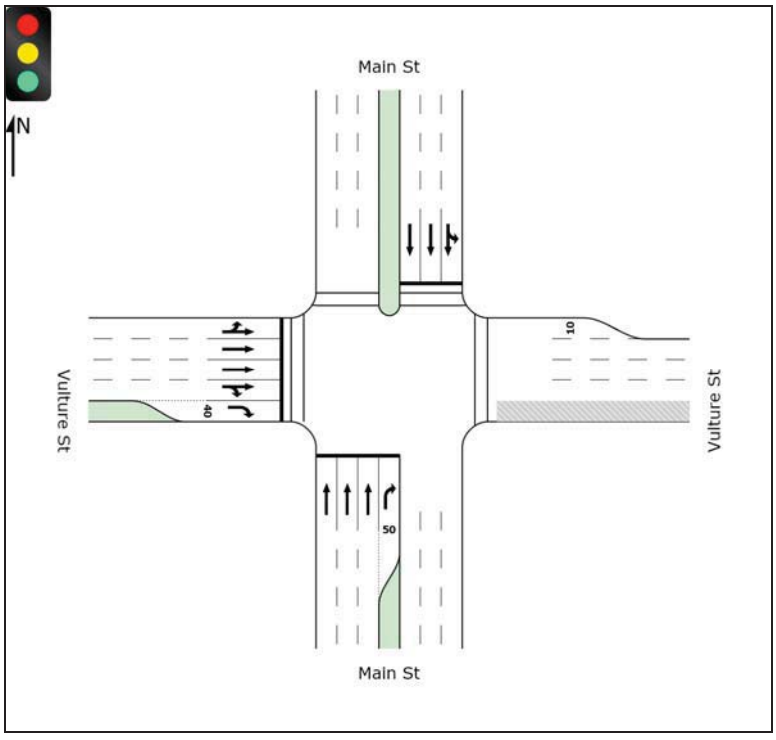


Figure 7-18 Main Street/Vulture Street

Table 7-27 AM Peak – Main Street/Vulture Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Main St South	1.047	24.8	92.7	1.047	24.8	92.7
Main St North	0.903	38.6	131.7	0.903	38.6	131.7
Vulture St West	0.677	20.2	102.0	0.690	20.6	104.8
All	1.047	26.9	131.7	1.047	27.1	131.7

Table 7-28 PM Peak – Main Street/Vulture Street

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Main St South	0.909	25.4	88.5	0.909	25.4	88.5
Main St North	0.860	42.2	120.8	0.860	42.2	120.8
Vulture St West	0.885	31.7	250.6	0.895	33.2	260.8
All	0.909	32.3	250.6	0.909	33.1	260.8

The results in **Table 7-27** and **Table 7-28** shows that during the AM peak, Main Street south and north is over saturated in the base case scenario and for the PM peak the overall performance of the intersection is very constrained. In the construction scenario there is a minor change to average delay and queuing, however the overall impact on intersection operation as a result of construction traffic would be relatively minor.

Milton Road/Upper Roam Street/Petrie Terrace

Figure 7-19 shows the Milton Road/Upper Roam Street/Petrie Terrace intersection.

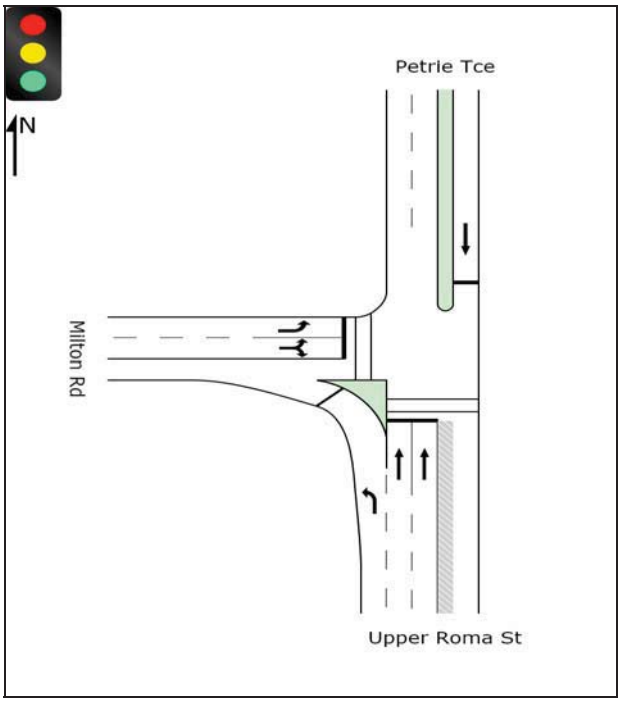


Figure 7-19 Milton Road/Upper Roma Street/Petrie Terrace

Table 7-29 AM Peak – Milton Road/Upper Roma Street/Petrie Terrace

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Upper Roma St (S)	0.651	13.5	69.9	0.676	13.7	73.3
Petrie Tce	0.067	9.2	8.8	0.067	9.2	8.8
Milton Rd	0.680	23.9	74.6	0.695	24.3	77.3
All	0.680	17.1	74.6	0.695	17.4	77.3

Table 7-30 PM Peak – Milton Road/Upper Roma Street/Petrie Terrace

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Upper Roma St (S)	0.757	6.9	110.3	0.757	6.9	110.3
Petrie Tce	0.033	5.3	6.4	0.033	5.3	6.4
Milton Rd	0.736	40.0	81.3	0.761	41.0	85.4
All	0.757	12.5	110.3	0.761	12.8	110.3

The results in **Table 7-29** and **Table 7-30** show that the performance of this intersection is satisfactory in both base case and construction period. With only a minor change in degree of saturation and queue length there would be negligible change as a result of construction-related traffic.

Milton Road/Hale Street

Figure 7-20 shows the Milton Road/Hale Street intersection.

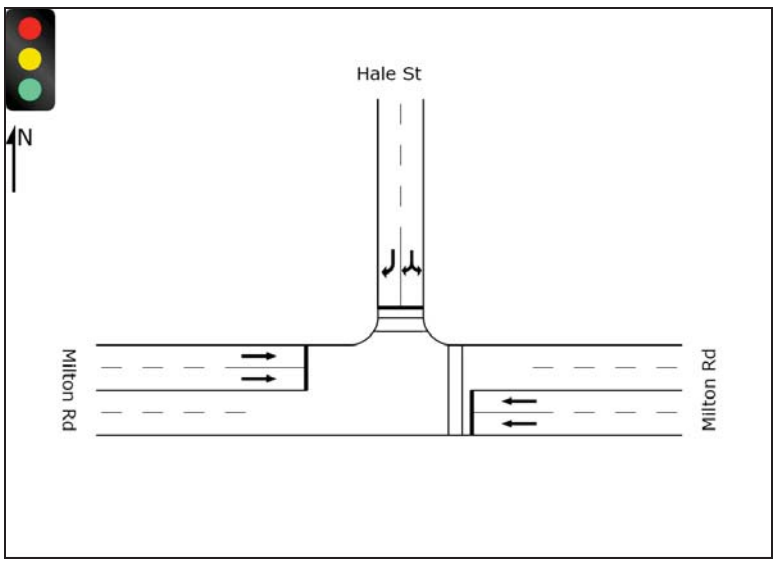


Figure 7-20 Milton Road/Hale Street

Table 7-31 AM Peak – Milton Road/Hale Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Milton Rd East	0.671	19.5	75.3	0.705	22.3	85.0
Hale St	0.832	28.0	158.9	0.809	26.3	162.5
Milton Rd West	0.798	22.9	98.5	0.836	27.0	112.5
All	0.832	24.5	158.9	0.836	25.5	162.5

Table 7-32 PM Peak – Milton Road/Hale Street

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Milton Rd East	0.807	24.7	90.2	0.825	25.5	94.1
Hale St	0.794	23.8	146.4	0.812	25.1	156.0
Milton Rd West	0.534	19.8	54.8	0.552	20.0	57.3
All	0.807	23.3	146.4	0.825	24.3	156.0

This intersection is generally busy during the peak periods. Milton Road connects the City with the western suburbs and Hale Street connects the northern suburbs with western suburbs. The performance of this intersection is approaching practical limits of capacity in both the AM and PM peaks in the base case (refer to **Table 7-31** and **Table 7-32**). With additional construction traffic there would be a very minor increases in the degree of saturation and average delays at this intersection although little anticipated impact on overall intersection performance.

Milton Road/Castlemaine Street

Figure 7-21 shows the Milton Road/Castlemaine Street intersection.

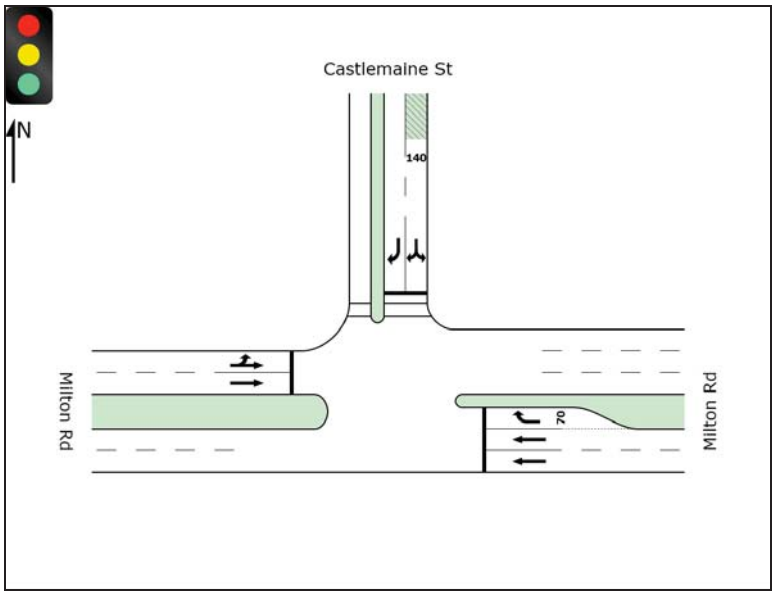


Figure 7-21 Milton Road/Castlemaine Street

Table 7-33 AM Peak – Milton Road/Castlemaine Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Milton Rd East	0.856	11.3	146.9	0.856	11.3	154.7
Castlemaine St	0.839	67.6	69.3	0.839	67.6	69.3
Milton Rd West	0.846	39.2	724.6	0.870	42.8	743.5
All	0.856	26.6	724.6	0.870	28.2	743.5

Table 7-34 PM Peak – Milton Road/Castlemaine Street

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Milton Rd East	0.791	8.6	195.3	0.795	8.7	206.3
Castlemaine St	0.605	48.9	42.9	0.643	52.2	45.6
Milton Rd West	0.700	27.0	421.8	0.690	25.9	444.8
All	0.791	16.8	421.8	0.795	16.7	444.8

This intersection is located approximately 180 m west of Milton Road/Hale Street intersection and as such carries a very similar traffic volume to Milton Road/Hale Street. The modelling results demonstrate significant queuing on Milton Road in the AM and PM peaks (refer to **Table 7-33** and **Table 7-34**). The addition of construction traffic would result in a small increase in the queuing and delay on some approaches.

Annerley Road/Gladstone Road/Boggo Busway

Figure 7-22 shows the Annerley Road/Gladstone Road/Boggo Busway intersection.

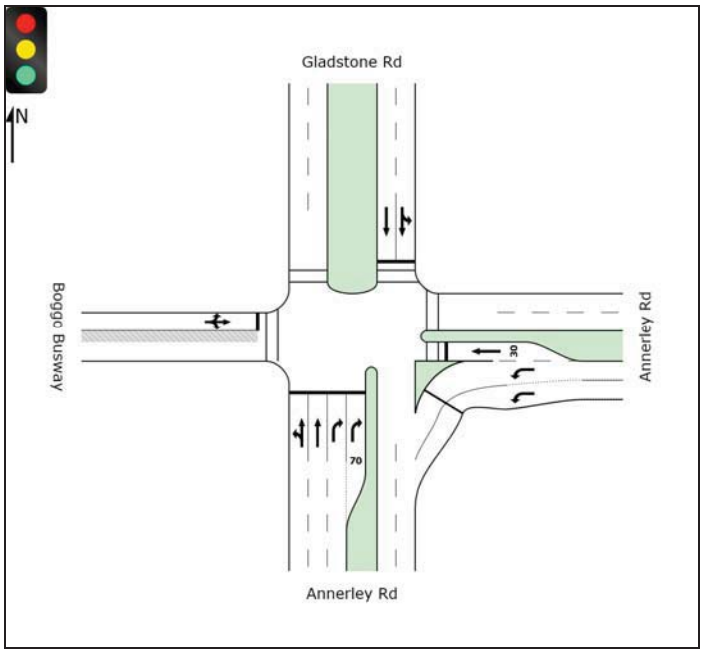


Figure 7-22 Annerley Road/Gladstone Road/Boggo Busway

Table 7-35 AM Peak – Annerley Road/Gladstone Road/Boggo Busway

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Annerley Rd (S)	0.938	24.5	602.4	0.937	24.2	604.0
Annerley Rd (E)	0.259	21.0	79.4	0.263	20.7	80.4
Gladstone Rd	0.911	79.4	218.2	0.941	88.0	230.2
Boggo Busway	0.213	81.7	13.7	0.213	81.7	13.7
All	0.938	31.9	602.4	0.941	32.9	604.0

Table 7-36 PM Peak – Annerley Road/Gladstone Road/Boggo Busway

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Annerley Rd (S)	0.577	21.3	172.0	0.593	21.6	178.1
Annerley Rd (E)	0.902	67.0	358.8	0.913	69.9	373.8
Gladstone Rd	0.901	51.5	423.1	0.901	51.5	423.1
Boggo Busway	0.100	83.7	6.1	0.100	83.7	6.1
All	0.902	46.1	423.1	0.913	47.1	423.1

This intersection is under significant pressure in the 2016 base case with long delays and queues on several approaches. The addition of construction traffic would result in a minor increase in delay and queuing (refer to **Table 7-35** and **Table 7-36**).

Annerley Road/Fairfield Road/Cornwall Street

Figure 7-23 shows the Annerley Road/Fairfield Road/Cornwall Street intersection.

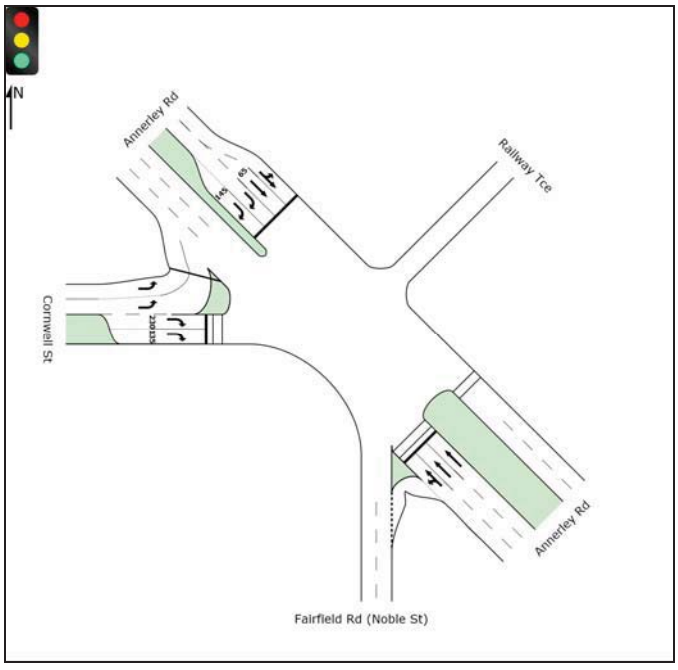


Figure 7-23 Annerley Road/Fairfield Road/Cornwall Street

Table 7-37 AM Peak – Annerley Road/Fairfield Road/Cornwall Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Annerley Rd SE	0.946	57.4	321.5	0.953	59.8	331.7
Annerley Rd NW	0.613	36.2	133.9	0.627	36.2	138.2
Cornwall St	0.946	59.7	459.8	0.946	59.7	459.8
All	0.946	53.4	459.8	0.953	54.2	459.8

Table 7-38 PM Peak – Annerley Road/Fairfield Road/Cornwall Street

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Annerley Rd SE	0.418	24.1	91.4	0.425	24.2	93.2
Annerley Rd NW	1.284	178.1	924.2	1.284	184.1	924.2
Cornwall St	0.784	33.3	92.8	0.784	33.3	92.8
All	1.284	118.9	924.2	1.284	122.4	924.2

The results in **Table 7-37** and **Table 7-38** show that this intersection is over capacity in both the AM and PM peak in the future year scenario. The addition of construction traffic would result in only a minor change to the overall operation of the intersection.

Fairfield Road/Brougham Street

Figure 7-24 shows the Fairfield Road/Brougham Street intersection.

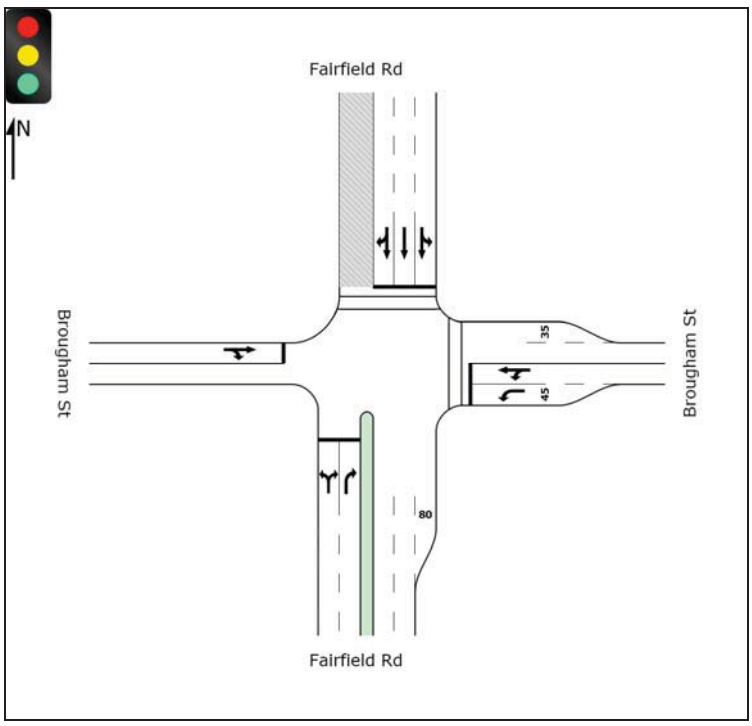


Figure 7-24 Fairfield Road/Brougham Street

Table 7-39 AM Peak – Fairfield Road/Brougham Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Fairfield Rd (S)	0.303	41.2	24.2	0.303	41.2	24.2
Brougham St (E)	0.090	32.8	9.1	0.090	32.8	9.1
Fairfield St (N)	0.278	6.5	34.6	0.279	6.5	34.8
Brougham St (W)	0.014	40.2	0.8	0.053	45.7	3.1
All	Base 2016 (2 right turn lanes)			2016 (1 right turn lane)		

Table 7-40 PM Peak – Fairfield Road/Brougham Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Fairfield Rd (S)	0.605	54.8	54.7	0.605	54.8	54.7
Brougham St (E)	0.195	45.3	23.6	0.195	45.3	23.6
Fairfield St (N)	0.596	4.7	83.2	0.597	4.7	83.4
Brougham St (W)	0.019	54.2	1.1	0.072	60.4	4.2

The results in **Table 7-39** and **Table 7-40** show that the performance of this intersection is satisfactory in both with and without the construction traffic cases. With only a minor change in delay and queue on Brougham Street approach, this intersection would not be impacted significantly by construction traffic.

Ipswich Road/Lucy Street/Durack Street

Figure 7-25 shows the Ipswich Road/Lucy Street/Durack Street intersection.

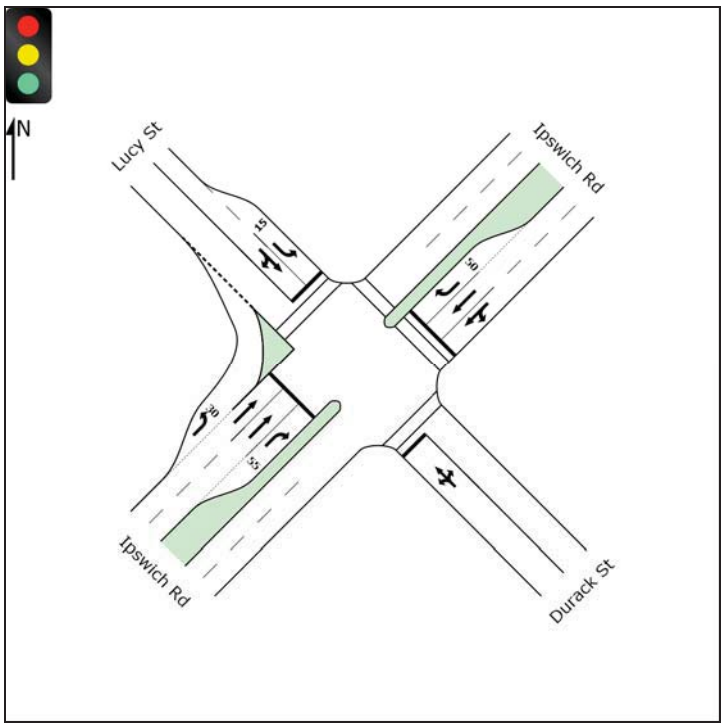


Figure 7-25 Ipswich Road/Lucy Street/Durack Street

Table 7-41 AM Peak – Ipswich Road/Lucy Street/Durack Street

AM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Durack St	0.510	72.2	66.9	0.511	72.2	66.9
Ipswich Rd East	0.735	16.9	229.9	0.759	17.8	249.1
Lucy St	0.544	73.4	53.1	0.658	76.8	70.4
Ipswich Rd West	1.000	78.2	820.5	1.017	88.5	878.2
All	1.000	53.5	820.5	1.017	59.6	878.2

Table 7-42 PM Peak – Ipswich Road/Lucy Street/Durack Street

PM PEAK	Base 2016			2016 With Construction Vehicles		
Approach	Degree of Saturation	Average Delay (s)	Queue (m)	Degree of Saturation	Average Delay (s)	Queue (m)
Durack St	0.295	70.2	39.2	0.279	69.1	38.9
Ipswich Rd East	0.929	34.6	423.4	0.955	44.6	484.3
Lucy St	0.849	83.1	102.9	0.952	99.9	131.8
Ipswich Rd West	0.913	50.5	470.7	0.953	57.8	514.2
All	0.929	44.7	470.7	0.955	53.7	514.2

The results in **Table 7-41** and **Table 7-42** show that Ipswich Road is oversaturated in both AM and PM peak period in the future year scenario. Lucy Street currently provides access to a number of industrial and commercial properties, which are proposed to be acquired by the project and hence traffic generated by these sites would be reduced. Also, the link to Wilkie Street and Fairfield Road is proposed to be temporarily suspended by the Project for the duration of construction activity.

The reduction in traffic that is expected to result from these two project changes to the volume of traffic using Lucy Street is considerable, but has not been included in the modelling as it cannot be quantified at this time. Thus the results shown above are likely to be overly conservative.

Given the Project would be responsible for a large proportion of the remaining traffic using Lucy Street approach to Ipswich Road, if the intersection fails to perform in the future year, Council could adjust the signal timings so that the delay associated with construction vehicle traffic was quarantined to the side road approach, reducing the impact on Ipswich Road itself.

7.8.5 Summary

Peak hour modelling (refer **Table 7-43**) shows minor increases in delay that would occur at critical intersections in the road network due to haulage and delivery activities. The forecast increases would not require a suspension of peak hour trucking activity.

Table 7-43 Summary of intersection performance due to haulage activity

Intersection	Increase in average intersection delay value (SIDRA calculated)	Conclusion
Bowen Bridge/O'Connell Terrace	No change	Acceptable
Bowen Bridge/Gregory Terrace	Less than 5 seconds	Minor increase in delay
Albert Street/Mary Street	No change	Acceptable
Albert Street/Alice Street	No change	Acceptable
Main Street/Hale Street	Less than 5 seconds	Minor increase in delay
Milton Road/Castlemaine Street	Less than 5 seconds	Minor increase in delay
Milton Road/Vulture Street	Less than 5 seconds	Acceptable
Milton Road/Upper Roma/Petrie Terrace	No change	Acceptable
Annerley Road/Fairfield Road	Less than 5 seconds	Minor increase in delay
Annerley Road/ Gladstone Road	Less than 5 seconds	Minor increase in delay
Fairfield Road/Brougham Street	No change	Acceptable
Ipswich Road/ Lucy Road	10 seconds	Modelling does not take traffic reduction into account from changing land use. Signal timings can be adjusted to quarantine delay to side road approach.

7.9 Pavement assessment

Assessment has been undertaken to analyse the pavement impacts of the heavy vehicle movements to and from the proposed worksites. This assessment has been conducted in accordance with TMR's Guidelines for Assessment of Road Impacts of Development.

The worksites identified in **Section 7-7** of this assessment use a series of common routes for trucks to travel between spoil placement locations and the worksites.

The haul routes have been broken down into a series of smaller sections to enable the assessment of pavement impacts arising from truck volumes.

Each of the segments which have been assessed is listed in the following **Table 7-44**.

Table 7-44 Segments for pavement impact assessment

Segment No.	Assessed Road Name	Section	Distance
Segment 1	Gregory Terrace	Energex substation access to Browen Bridge Rd	0.2km
Segment 2	Milton Road	Petrie Tce to Mt. Coot Tha Rd	3.2km
	M5 (Western Freeway)	Mt. Coot Tha Rd to Ipswich Mwy interchange	12.5km
Segment 3	Margaret Street	George St to Albert St	0.2km
	Alice Street	Albert St to South-east Fwy on ramp	0.3km
	South-east Freeway	Alice St on ramp to Coronation Dr	1.3km
Segment 4 Segment 5	Ipswich Road (a)	Vulture St to Albert St (Clem 7 on ramp)	1km
	Ipswich Road (b)	Albert St (Clem 7 on ramp) to Cornwall Street	2.5km
	Ipswich Road	Cornwall Street to Lucy Street	3.5km
Segment 6	Ipswich Road (c)	Lucy St to Ipswich Mwy	1.2km
Segment 7	Ipswich Motorway (a)	Fairfield Rd on/off ramp to BUC on/off ramp	1.5km
	Ipswich Motorway (b)	BUC on/off ramp to Centenary Hwy interchange	6.5km
Segment 8	Ipswich Motorway (c)	Centenary Hwy interchange to Logan Mwy	4.5km
Segment 9	Fairfield Road	Brougham St to Ipswich Mwy on/off ramp	4.5km
Segment 10	Lucy Road	Yeerongpilly Rail Station to Ipswich Rd	0.8km
Segment 11	Annerley Road	Boggo Rd to Cornwall St	0.6km
Segment 12	ICB mainline NB	Hale St to Browen Bridge off ramp	2km
	ICB mainline SB	Browen Bridge on ramp to Hale St	2km
	Hale St SB off ramp	At Milton Rd	0.1km
	Hale St NB on ramp	At Milton Rd	0.2km
	ICB NB off ramp	At Browen Bridge Rd	0.5km
	ICB SB on ramp	At Browen Bridge Rd	0.5km
	Bowen Bridge Road	O'Connell Tce to Northey St (ICB ramps)	0.6km
Segment 13	Roma Street	Parkland Bvd to Upper Roma St	0.5km
	Upper Roma Street	Countess St to Petrie Tce	0.3km
	Countess Street	Petrie Tce to Roma St	0.3km
	Petrie Terrace	Milton Rd to Countess St	0.3km

Each of the sections which have been assessed in terms of existing AADT and Equivalent Standard Axles (ESA) and proposed construction traffic expressed in ESA. The resulting change in ESA is then calculated as a measure of expected pavement impact.

The heavy vehicle type to be used at each worksite would vary to suit the road conditions, site constraints and the type of construction being undertaken at the time. The sources of heavy vehicle trip generation also vary across Project sections. For the core (tunnelled) worksites, the most intensive construction activity from a heavy vehicle trip generation perspective is during the period of tunnel and station excavation. For the Northern and Southern surface sections of the project, the most intensive period of trip generation would occur during the main construction and earthworks.

The predicted heavy vehicle trip generation for each worksite, is shown in **Table 7-45**.

Table 7-45 Heavy Vehicle Trip Generation

Worksites		Spoil Removal Total (m^3)	Spoil Movements Required	Material Delivery Total (m3)	Delivery Movements Required	Movements Generated Total
Core (Tunnel worksites)						
Northern Portal		96,000	7,680	14,400	1,728	9,408
Roma Street	North	21,000	1,680	3,150	378	2,058
	Central	15,000	1,200	2,250	270	1,470
	South	125,000	10,000	18,750	2,250	12,250
Albert Street	North	60,000	4,800	9,000	1,080	5,880
	South	130,000	10,400	19,500	2,340	12,740
Woolongabba		437,000	34,960	65,550	7,866	42,826
Boggo Road		155,000	12,400	23,250	2,790	15,190
Fairfield Vent		11,500	920	1,725	207	1,127
Southern Portal	Main	375,500	30,000	56,250	6,750	36,750
Non-core (Surface worksites)						
O'Connell Tce		-	-	-	-	7,200
Mayne Yard		-	-	-	-	17,100
Clapham Yard		-	-	-	-	17,100

Source: AECOM 29/3/11 (core worksites) and SKM/AURECON estimated (non-core worksites)

The following assumptions have been made in order to calculate the total generated construction vehicle volumes:

- critical case conforms to segment delivery during peak rates of tunnel advance; with total materials delivered to site estimated to be approx. 15% of the volume excavated
- assume density of reinforcement and concrete delivered equivalent to density of excavated material, ie 2.4T/m^3
- assume 30T capacity trucks will be used for spoil delivery, and 20T capacity trucks will be used for material delivery
- detail information of non-core worksite is currently unknown, however the required total truck movements have been estimated based on the size of each worksite.

The existing traffic load for each of the sections has been determined from reference to published TMR and BCC traffic data and where this has not been available by reference to the traffic volumes used in the Project demand forecast model (2009 base year Brisbane Strategic Transport Model). The values indicate a likely trend base on examination of each road classification and findings from on site survey. Volumes are expressed as Equivalent Standard Axles (ESA) and Annual Average Daily Traffic (AADT).

Based on TMR Guidelines for Assessment of Road Impacts of Development manual, a design horizon of 2016 has been adopted in order to calculate the annual ESAs (Equivalent Standard Axles) for the without development case (the majority of spoil excavation appears to occur in the period 2015 – 2018). A compounding growth rate of 2.4% has been applied to estimate the AADT for 2016. This number has been derived from the strategic estimation of total traffic generation in Brisbane over the next six years.

The construction traffic generated from each site has been applied to the proposed haul routes and each truck movement is shown as undertaking 2 movements per trip. That is, the vehicle undertakes one inbound and one outbound movement to and from the worksite for every trip. For the purposes of the assessment, both spoil trips and delivery trips have been included. The calculation of the annual ESAs without development and percentage increase in ESAs due to the additional heavy vehicle movements are shown below in **Table 7-46**:

Table 7-46 Percentage increase in AADT of construction vehicles

Segment No.	Assessed Road Name	Existing 2010 AADT	Horizon 2016 AADT	CV%	2016 ESA without	Total Additional Trucks	% Increase in ESA
Segment 1	Gregory Tce	11,000	13,000	2%	123,000	9,408	7%
Segment 2	Milton Road	49,000	56,000	8%	2,126,000	36,401	2%
	M5 (Western Fwy)	66,500	79,000	9%	3,261,000	36,401	1%
Segment 3	Margaret Street	7,987	9,209	6%	242,013	18,610	2%
	Alice Street	15,000	17,000	6%	444,000	18,610	3%
	South-east Fwy	110,000	130,000	4%	2,159,000	31,508	1%
Segment 4 Segment 5	Ipswich Road (a)	29,000	33,000	7%	1,159,000	58,500	4%
	Ipswich Road (b)	30,000	35,000	8%	1,312,000	58,500	3%
	Ipswich Road (c)	41,000	47,000	9%	1,985,000	68,520	3%
Segment 6	Ipswich Road (c)	41,000	47,000	9%	1,985,000	124,352	6%
Segment 7	Ipswich Mwy (a)	70,500	83,000	11%	4,175,000	124,807	3%
	Ipswich Mwy (b)	70,500	83,000	11%	4,175,000	124,807	3%
Segment 8	Ipswich Mwy (c)	65,000	77,000	10%	3,654,000	154,740	4%
Segment 9	Fairfield Road	28,600	33,000	7%	1,127,000	1,173	1%
Segment 10	Lucy Road	3,200	4,000	10%	190,000	36,850	19%
Segment 11	Annerley Road	30,000	35,000	5%	781,000	15,289	2%
Segment 12	ICB mainline NB	40,500	47,000	6%	1,383,000	14,062	1%
	ICB mainline SB	43,500	50,000	7%	1,661,000	14,062	1
	Hale St SB off ramp	17,000	20,000	9%	854,000	14,062	1%
	Hale St NB on ramp	13,500	16,000	8%	615,000	14,062	1%
	ICB NB off ramp	8,500	10,000	4%	190,000	14,062	7%
	ICB SB on ramp	11,000	13,000	5%	296,000	14,062	5%
	Bowen Bridge Rd	42,000	48,000	5%	1,139,000	14,062	1%
Segment 13	Roma Street	18,300	21,000	5%	478,000	12,898	2%
	Upper Roma St	22,000	25,000	6%	700,000	12,898	2%
	Countess St	39,000	45,000	4%	940,000	15,190	1%
	Petrie Tce	22,000	25,000	5%	605,000	15,190	1%

Notes:
Existing ESA = AADT x CV% x 365 days/year x ESA factor (CV ratio)
Development ESA = Annual additional truck movements x ESA factor (loaded or unloaded or both)

For the purpose of the assessment, the following assumptions have been made:

- assume heavy vehicle ESA factor of 1.3 for base annual ESA calculation
- total additional truck movements evenly spread out over 6 years program duration
- delivery movements occur six days per week
- as the combination of 30T and 20T trucks will be used for spoil and material delivery respectively, tri-axle semi-tipper (loaded capacity 26.5T) is assumed to be used for the purpose of assessment in general. The truck has 4.970 ESA ratio when loaded and 0.555 ESA ratio when unloaded
- existing link flows are AADT and sum both directions of travel (truck movements are doubled on two way haul routes to determine % increase)
- given the CV growth for each link has not been separately determined in this assessment, the forecast growth rate of 2.4% has been applied, therefore CV% in design horizon 2016 has the same growth as general traffic.

The results indicate most of the road links would lead to an increase of ESA of less than 5% which is a general threshold below which changes are considered negligible (as this is generally within normal day to day variances in traffic volumes). Three links show a slightly higher increase of between 5 and 8% (considered minor), and the Lucy Street link shows an increase of around 20%. Therefore, with the exception of the Lucy Street link, only minor deterioration in pavement condition could be expected for all other road links, and given the relatively short duration of construction in the context of pavement design lifespans, this level of impact is considered acceptable. Due allowance would need to be made by the contractor to repair any road surface impact due to wear and tear during construction, such as in the immediate vicinity of major worksite entrances where heavy vehicle turning is likely to deteriorate pavements. Lucy Street, being the main construction access road for the major Yeerongpilly/ Southern Portal worksite is programmed to be realigned and reconstructed as part of the post project works included in the reference design.

7.10 Safety

Maximising the safety outcomes of the Project is a primary objective when planning for construction traffic. Safety would be managed through processes put into place across the project (macro level), as well as at each individual worksite, taking into consideration the individual needs and demands of the construction activities occurring (micro level).

This section summarises proposed safety measures to be adopted by the project at the whole of project level, as well as the consideration given to safety at each of the worksites.

7.10.1 Whole of project safety considerations

Project control documentation

Project documents such as the traffic specific Framework Traffic Management Plan, Construction Traffic Management Plans, Traffic Control Plans, as well as general plans such as Project Safety Plans would be developed by the contractor and used to ensure safety of all road users.

The documents would reference systems and processes to be put into place by the Project to manage safety outcomes at all stages of construction.

Vehicle types and impact on safety

Vehicle types used for haulage of spoil and delivery of plant and materials to worksites can have a impact on safety, particularly with respect to vulnerable users such as pedestrians and cyclists. In areas of high pedestrian and cycle activity, articulated or dog trailer vehicles can present a hazard to these road users, due to the swept paths and vehicles tracking across kerbs at intersections, as well as road users failing to observe the trailer component of the vehicle when crossing the road.

For this reason, consideration would be given in developing the CTMP's for Roma Street and Albert Street worksites to avoid the use of truck and dog combinations for the haulage of spoil material, and single unit tippers used instead.

Single unit trucks would also be used in preference to articulated trucks for deliveries accessing these two station sites, where appropriate. However it is recognised that due to the size of many of the loads required to be delivered to worksites, this is not always possible or practical.

Truck/cyclist and truck/pedestrian conflicts

There is the potential with increased volumes of truck traffic at certain locations in the project that Truck/Cycle or Truck/Pedestrian conflict may arise. Specific instances where this may occur include where trucks are required to undertake left turns at intersections or site driveways (truck/cycle conflict), the existing road width is narrowed due to construction activity (truck/cycle conflict) or trucks enter and exit worksite driveways (truck/pedestrian conflict).

The design of driveways for the Project would take into consideration the potential for truck/pedestrian conflicts and the design of road narrowing would take into consideration cycle safety.

Road Safety Audit procedure

A Road Safety Audit Process is a formal procedure for checking the design, implementation and operation of road works from a safety perspective. The establishment of quality systems provides the philosophy underpinning the Road Safety Audit Process. The overriding objective of the process is to ensure that all existing road schemes and future routes operate at an acceptable level of safety, with safety being an integral part of the road network development process.

The benefits of road safety audits are that:

- the likelihood of accidents on the road and the adjacent network can be reduced
- the severity of accidents can be reduced
- road safety is given greater prominence in the minds of road designers
- the need for costly remedial work is reduced
- the total cost of a project to the community, including accidents, disruption and trauma, is reduced.

Road Safety Auditors can be commissioned people or organisations with responsibility for the safety of the workforce and the public and could include the contractor, TMR or Cross River Rail with the main criteria being that the auditor is independent and accredited.

Stages when road safety audits are undertaken

Road safety audits would be undertaken at the following stages:

Detailed Design Stage	At this stage, the geometric design, traffic signing scheme, line marking plans, lighting plans and landscaping plans are available and would be looked at in relation to the operation of the road.
Pre-Opening Stage	Prior to opening a site, an inspection would be made for all relevant conditions at night and during the day for all likely road users to ensure that the construction has addressed earlier audit concerns and to check for any hazardous conditions that were not apparent at the feasibility or design stages.
Road Safety Audits of temporary work	Cross River Rail would undertake regular safety audits of work zones to ensure all worksite safety arrangements are in place. These audits would be additional to the daily inspections by site staff. Particular attention would be given to OH&S guidelines, work areas adjacent to the road, movement of construction traffic, vehicle speeds, and all warning devices/systems.
Road Safety Audit Procedure	All road safety audits would be undertaken in accordance with Austroads Guide to Road Safety Part 6 January 2009.

Pedestrian security / safety / lighting

All worksites would take consideration of issues of pedestrian safety and security. Any hoardings, or other fixed site boundaries would have the lighting as required by current standards. In situations where street lighting is obscured by worksite arrangements additional lighting would be provided to meet, or exceed current standards.

Consideration would also be given in design to the layout of any hoarding / fence lines to maximise sight lines for pedestrians, and design out hiding places and blind spots to improve pedestrian personal security. Any gantry arrangements or tunnels would have internal lighting.

Consideration would be given to relocating or supplementing existing CCTV cameras if the worksite creates blind spots.

Provision for vulnerable users

Vulnerable users are defined as groups such as school children, the elderly and mobility impaired persons. Where worksites have an impact on footpaths, consideration would be given to the requirements of all pedestrians and especially vulnerable users. DDA requirements would be adopted with drop kerbs, etc provided at crossings. Footpath widths are required to allow two way pedestrian traffic allowing for pushchairs and wheelchairs.

Where high numbers of vulnerable users use a footpath, special provision and design consideration may be required to mitigate impacts.

7.10.2 Specific worksite considerations

The Traffic Engineering Design Report prepared by AECOM for the Project provides a specific assessment of historical accident performance at several locations. A review of historical accident rates and incorporated noted safety issues in design of relevant traffic management arrangements was undertaken to inform specific worksite assessment. The following sections summarise the safety review undertaken, and significant patterns observed.

Roma Street Station

There have been thirteen accidents near to the Transit Centre involving pedestrians and/or cyclists with the majority appearing to be jay walking related as demonstrated by those between the Makerston and George Street intersections and to the east of the Parklands Boulevard intersection.

There have been a number of ‘loss of control’ type accidents at the Parklands Boulevard intersection. The is also a noticeable number of right-turning accidents from the turning pocket into Parkland Boulevard suggesting that a filter right-turn ban may be needed. Away from the station precinct and area of works there are a very large of right angle collision accidents at Ann Street / George Street and Turbot Street / George Street which may indicate a red light running issue and/or a need to increase clearance times.

Overall the crash record is relatively low for an area of two intersecting major roads. The nature and distribution of incidents occurring in the past five year period as supplied by DTMR has been reported in the AECOM Traffic Engineering Design Report. Note that this crash history search pre-dated the lowering of speed limits in the CBD to 40km/h in 2010.

Albert Street Station

There were 27 incidents involving pedestrians, which is three more than the number of vehicle collisions. Most of these incidents occurred at mid-block locations where pedestrians were attempting to undertake informal crossings. The nature and distribution of incidents occurring in the past five year period as supplied by DTMR has been reported in the AECOM Traffic Engineering Design Report. Note that this crash history search pre-dated the lowering of speed limits in the CBD to 40km/h in 2010.

Some incidents also involved multiple pedestrians, including incidents along Albert Street, Alice Street and on Charlotte Street which involved a vehicle striking three pedestrians. A similar accident on Elizabeth Street resulted in the deaths of three pedestrians.

The intersection of Elizabeth Street and Albert Street has recorded the highest accident rate with approximately twice as many accidents involving pedestrians as compared to vehicles only. There were 20 accidents located near this intersection. The accident record shows the majority occurring as either informal mid block crossings to and from the bus stops outside the Myer Centre and in the northern approach / shared zone. From site observation it seems likely that the current arrangement whereby the first 5-10 m of the approach has dropped kerbs but the rest has the carriageway flush with the footpath is confusing for users and is creating contradictory expectations of priority between vehicles and pedestrians.

There were only two reported incidents involving cyclists, one at the corner of Margaret Street and Albert Street, and the other along Charlotte Street without any discernable pattern.

There were 24 reported incidents involving motorists, most of which occurred at intersections rather than mid block. There is a pattern along Elizabeth Street and Alice Street of crashes occurring due to a vehicle attempting to turn into a side street from a far lane. The area that appears to be the most incident prone is the intersection of Alice Street and Albert Street, with six crashes being reported. There have been two fatalities at the intersection of Albert Street and Elizabeth Street.

Woolloongabba

The crash history for the past five years on the roads surrounding the site is dominated by traffic incidents at the four corner intersections at Vulture / Main, Main / Stanley, Leopard / Stanley / Motorway off-ramp and Vulture/Leopard. There are a small number of pedestrian and cyclist incidents particularly around Main Street and the eastern part of Stanley Street although a pattern is difficult to define. A high number of lane change type crashes are notes on Vulture Street on the approach to Main Street, indicative of difficult merge conditions with eastbound Vulture Street traffic merging across the Pacific Motorway Vulture Street off-ramp lanes, in order to turn southbound into Main Street. A copy of the collision diagram for the local area is included in the AECOM Traffic Engineering Design Report.

7.11 Environment

The environmental issues associated with construction road traffic such as dust, noise, vibration and emissions are covered in greater detail elsewhere in this report. Specific issues and processes related to construction vehicle hours of operation, dust control and over dimension vehicles are provided in this section.

7.11.1 Construction vehicle noise

The following working hours have been assumed:

- 'typical' above ground works site, outside acoustic sheds – 6:30am to 6:30pm Monday to Saturday; no works on Sundays or public holidays
- temporary road and railway possessions outside peak hours – 24 hours/day, seven days/week
- tunnel works and works carried out inside acoustic sheds, or distant from sensitive receivers – 24hours/day, seven days/week
- road haulage elsewhere – at any time of the day or night between 6.30 am Monday to 6.30 pm Saturday, with no haulage on Sundays or public holidays.

Source: AECOM Reference Design Construction Issues Report 17/9/10

The bulk of construction vehicle movements would occur in line with these working hours, however exceptions may occur where vehicles journey commences prior to 6.30 am in order to arrive onsite by 6.30 am and where trips commence from the site at 6.30 pm and continue until the vehicle reaches the end of its journey.

Construction vehicle trips and changes to general traffic through detours and other temporary traffic arrangements would occur 24 hours/day and seven days/week. Changes to road network conditions which have the potential to result in significant disruption to travel time or congestion would be scheduled to occur outside of peak hours and over night, where feasible.

Major routes include all roads under the care and control of TMR or private motorway operators, as well as arterial routes under the care and control of BCC.

7.11.2 Dust control

All truck bodies carrying dust generating loads would be covered while in transit. Wheal washing would be used where there is the potential for mud and dirt to be tracked from worksites onto adjoining roads. Unsealed haul roads would be watered to suppress dust generation.

7.11.3 Over-dimension vehicles

Over-dimension vehicle movements would be controlled in accordance with processes managed by TMR and BCC. The FTMP developed for the project would outline the systems and processes to be followed by all over mass or over dimension vehicles accessing project worksites.

7.12 Whole of Project mitigation measures

This section provides information on mitigation measures proposed at the whole of project level.

7.12.1 Inter-Agency consultation and liaison

Implementing a project of this scale involves significant interaction between Cross River Rail, various organisations and the general public. Effective communication and co-ordination would be fundamental to delivering the Project. Proactive management by Cross River Rail and its delivery partners would reduce issues in the long term and support the effective delivery.

Based on previous experience it is suggested that a number of groups are established:

- Traffic and Transport Liaison Group/s (TTLG)
- Network Co-ordination Liaison Group.

Traffic and Transport Liaison Group

A Traffic and Transport Liaison Group (TTLG) would be formed to ensure that all Authorities affected by construction traffic are aware of the proposed construction activities, upcoming works and related transport implications and have the opportunity to comment on the mitigation measures proposed prior to implementation.

The participants may vary depending on the worksite and potential issues and areas affected, however the core group may consist of:

- Cross River Rail
- BCC and TMR including the BMTMC
- Police, Fire and Ambulance
- Brisbane Transport
- Translink
- Queensland Rail
- Taxi Council
- Bus and Coach Association
- Contractor’s Traffic Manager.

The number of TTLG's would depend on the chosen procurement strategy including for example the number of primary contractors and the physical extent of works contracts. As a minimum, it is envisaged that 2 TTLG's could be established, one for the central section and once covering the southern surface works area.

It is proposed that this group would undertake the consultation functions which would otherwise occur at forums such as Council Traffic Committee, when determining traffic management measures to be put in place to manage construction activities.

Network Co-ordination Liaison Group

A dedicated Cross River Rail-specific Network Co-ordination Liaison Group (NCLG) could be established to provide a strategic and tactical forum for ensuring the Project works are coordinated with other development and public works; and would aim to mitigate impacts on local business, residents and CBD visitors by ensuring that construction impacts arising from the Project are integrated and balanced against the construction impacts of other works occurring within the project corridor. Alternatively the NCLG functions outlined here may be undertaken within an existing forum.

The activities that the NCLG could focus on include:

- BCC or TMR road construction works
- redevelopment of existing buildings/sites, especially within the CBD
- major services relocations

The participants of this group may include organisations such as:

- Department of Transport and Main Roads
- Brisbane City Council
- Department of Local Government and Planning
- Urban Land Development Authority
- Queensland Rail
- TransLink
- major special event proponents
- major CBD redevelopment proponents – ie land owners etc.

The scope of this group would be more strategic in its approach and would be concerned with longer term plans such as the end state arrangements.

The NCLG would co-ordinate with other existing groups and initiatives, to ensure an integrated planning approach before and during the Project construction.

7.12.2 Communications with the community

The construction of the Cross River Rail project is an important issue for affected land owners, local communities, people living and working in the vicinity of the proposed works and road users affected by construction activity or increased vehicle movements.

The Cross River Rail Project Team is committed to ensuring that all interested and affected parties have the opportunity to understand the nature of the proposed works, to express their comments and to have their concerns and issues understood and taken into consideration during the design and delivery stages of the project.

A Community Involvement Plan (CIP) for the Cross River Rail project would be developed to address issues of importance raised by the community and major stakeholders during both the design and construction phases. This would assist in developing an environment of commitment and cooperation between the project team and all stakeholders, including the community.

Community Liaison Group

Public involvement and communication would be important. For each construction location it is suggested that representatives of businesses and owners, Chamber of Commerce and local residents, via Precinct Committees, would be consulted via the Community Liaison Group (CLG). These groups would be managed and coordinated centrally by Cross River Rail. The CLG provides the opportunity for resident groups and other community based stakeholders to be briefed and provide feedback on construction changes proposed.

Existing businesses and residents

Existing owners of potentially affected properties would be consulted with as part of the discussions with the CLG and throughout the construction work. The project would endeavour to maintain access to properties for both pedestrians and vehicles for residents and businesses and this may be achieved via temporary alternate access arrangements.

Any works affecting access ways and footways would undertaken in stages (part of a street block or corner site), which would assist in limiting the extent of disruption at any one time.

Notification of traffic switches or disruptive works

A range of communication strategies have been proposed to allow both timely advice, regarding the proposed works and to allow feedback where appropriate from effected parties. This would enable the identification of any issues and allow them to be addressed and mitigated if possible. Details of the full notification of proposals would be developed in a Cross River Rail Communication Plan, however it is envisaged that these would consist of:

- website (currently available and providing an on-line forum
- designated contacts from Cross River Rail and the contractor (and substitutes) for the duration of the works
- signposting
- public notices in major regional and local newspapers
- letter box drops of premises surrounding the worksite.

Advance warning, detour and directional signage

Signposting forms an important element of advising road users to changes to traffic conditions. As part of the staging and communication strategies to be implemented on both the high volume roads and in areas where a more localised traffic impact would occur, adequate and proper signage advising and directing traffic would be undertaken.

Signposting schemes would be used to permit easy and safe passage for vehicles, pedestrians and cyclists, including users of all public transport facilities, to access their destination with minimal disruption. Signs would be installed in advance of works being undertaken to ensure sufficient notice. Regulatory signs would not be installed and uncovered prior to being required.

Signposting changes are composed of the following types:

- information (i.e. permanent and portable VMS, other information signs)
- regulatory (signs with legal meaning and which control the flow of traffic)
- warning (can give advance notice of road hazards ahead to ensure motorists are prepared for changes etc)
- road work (road work signposting as per the TMR Guidelines and appropriate Australian Standards)
- guide signs (to inform of appropriate routes and destinations).

The Project would be responsible for ensuring a system is in place to inform all relevant parties when changes are made to the traffic arrangements. Advice would include information about upcoming traffic switches, anticipated delays to traffic, and extended times of work or any likely major disruptions.

7.12.3 Mitigation measures for construction works within the rail corridor

Construction works in the rail corridor would need to be staged into manageable, safe and reliable increments acceptable to Queensland Rail and so Queensland Rail must be part of the process to plan and agree the many operational interfaces between the new and existing rail infrastructure during the planning, demolition and construction phases. Much of the surface rail works would be carried out through rail shutdowns and track possessions conforming to Queensland Rail policy.

Specific rail passenger and operational mitigations measures would include:

- Rail network shutdowns are to be agreed with Queensland Rail through the Scheduled Closure Access System, prior to the commencement of works within the rail corridor, to minimise disruption to the rail network.
- Early and on-going notification is to be provided to Queensland Rail, rail passengers, rail freight operators and local communities of the timing and duration of rail shutdowns, likely disruptions to rail services and alternative arrangements to be implemented.
- Bus replacement services are to be provided where passenger rail operations are interrupted, such as during rail network shutdown periods or temporary closures of Exhibition, Yeerongpilly, Moorooka, Rocklea and Salisbury stations.
- Disruption to rail passenger services is to be avoided to the extent reasonable and practicable during major events, such as the Ekka (Exhibition Station), the Brisbane International tennis tournament (Yeerongpilly Station) and at Suncorp Stadium (Roma Street Station). Where disruptions are unavoidable, bus shuttle services are provided between appropriate stations to the major event venues, or to bypass the disrupted section in the network.
- Pedestrian access for Queensland Rail staff between Mayne Rail Yard and Bowen Hills Station is to be maintained.
- Road access to and within Mayne Rail Yard is maintained during construction works.
- To the extent reasonable and practicable, existing access to the rail corridor for maintenance and emergency service vehicles is to be maintained. Where necessary, alternative access arrangements are to be provided in consultation with Queensland Rail and other rail operators.
- Provision of temporary alternative passenger facilities including toilets at Roma Street and baggage handling facility at Roma Street where disrupted duration construction works

7.12.4 Mitigation measures for construction works on the road network

Each construction worksite would have a Construction Traffic Management Plan prepared to implement measures that avoid where practicable, or minimise and mitigate, traffic problems arising during the construction phase. Prior to implementation of the Construction Traffic Management Plans they would be subject to a review by the relevant agencies (Brisbane City Council and TMR) followed by any necessary amendment by the contractor with final approval given by BCC, TMR and the police.

Road and traffic related mitigation measures that should be addressed in these plans include:

- Local communities and road users are to be notified of proposed changes to local traffic access arising from Project works. This includes, but is not limited to, the provision of clear signage identifying changed traffic conditions, and public advertisements (local and regional newspapers, Project website) describing the proposed changes, the duration of the changes, and possible alternative routes to avoid the impacts of the proposed changes.
- Project works in or near road corridors are to be screened with solid barriers to minimise distractions for motorists.

- Access to properties adjoining or near to Project works, is maintained. Where changes to property access are required, alternative access arrangements are to be identified in consultation with property owners and occupants.
- Access for delivery vehicles to local businesses near Project works is to be maintained. Where changes to access for delivery vehicles are required, alternative access arrangements are to be identified in consultation with local businesses. In particular, access for delivery vehicles is to be maintained to businesses
  - at O'Connell Terrace, Bowen Hills
  - at Roma Street, Albert Street, Alice Street and Mary Street in the Brisbane CBD
  - at Allen Street, Stanley Street and Vulture Street at Woolloongabba
  - at Boggo Road Urban Village off Annerley Road, Dutton Park
  - in the industrial area between Ipswich Road and Moolabin Creek at Moorooka
  - in the area between Fairfield Road and Clapham Rail Yard, Yeerongpilly.
- Two lanes of traffic are to be retained in each direction on Fairfield Road during peak periods.
- Access for emergency services vehicles is to be maintained for the duration of construction works to
  - Royal Brisbane and Women's Hospital (RBWH) via O'Connell Terrace
  - Princess Alexandra Hospital (PAH), via Cornwall Street
  - Mater Hospital, via Stanley Street.

Public and active transport mitigation measures proposed include:

- Traffic management measures are to be implemented near to Project works to minimise disruption and delays to bus services.
- Safe and functional access for pedestrians and cyclists is to be maintained near Project works, including for the elderly, children and people with mobility difficulties including vision and hearing impairments. This measure is to consider relevant Crime Prevention through Environmental Design (CPTED) principles.
- Safe and functional pedestrian and cycle access is to be maintained to public transport facilities near Project works. This measure would address the needs of children, elderly and people with mobility difficulties including vision and hearing impairments. In particular, access is to be maintained to
  - Exhibition Station, during Ekka events
  - Bowen Hills Station, including along O'Connell Terrace from the RBWH
  - Roma Street Station from Roma Street and from the Roma Street Parkland
  - Botanic Gardens, QUT and the parliamentary precinct
  - CBD streets including Albert Street, Mary Street, Margaret Street and Alice Street
  - Woolloongabba busway station
  - Park Road Station and Boggo Road busway station, particularly to/from the Boggo Road urban village
  - Yeerongpilly Station
  - Moorooka, Rocklea and Salisbury Stations
- Bus replacement services are to be provided when passenger rail operations are interrupted, eg during rail network shutdown periods or temporary closures of Exhibition, Yeerongpilly, Moorooka, Rocklea and Salisbury Stations.

- Safe pedestrian and cycle access is to be maintained near construction works to community facilities, such as schools, child care facilities, churches, aged care accommodation, open space, sport and recreation, health care and shopping facilities. This is to consider the particular needs of children, elderly and people with mobility difficulties, including vision and hearing impairments. In particular, access is to be maintained to
  - RNA Showgrounds
  - RBWH
  - Open space areas, such as Victoria Park, Roma Street Parkland, Botanic Gardens and Robinson Park
  - Schools near to Project works, such as Brisbane Girls Grammar School, St Josephs College, Brisbane Grammar School, Dutton Park State School, Nyanda State High School
  - Grosvenor Hall Child Care centre
  - Churches such as St Fabians Church at Yeerongpilly
- In areas of high pedestrian and cycle activity such as Roma Street and Albert Street work sites, articulated or dog trailer vehicles could present a hazard to road users, due to the swept paths and vehicles tracking across kerbs at intersections, as well as road users failing to observe the trailer component of the vehicle when crossing the road. CTMPs for these location should limit use of dog trailers.
- The design of driveways for Cross River Rail would take into consideration the potential for truck/pedestrian conflicts and the design of road narrowing would take into consideration cycle safety.
- Where pedestrian and cycle access to community facilities is changed, local access strategies are to be developed in consultation with local communities, community facility managers and relevant stakeholder groups, including Vision Australia.
- Safe, alternative access is to be provided for bikeways disturbed by construction works, including but not limited to
  - the bikeway in Victoria Park
  - the bikeway through Roma Street Parkland
  - off-road bikeway in Robinson Park at Fairfield
- Local communities, including but not limited to, residents, businesses, users of community facilities and public transport passengers, are to be notified about changes to pedestrian and cycle access near construction works, and public advertisements (local and regional newspapers, Project website) describing the proposed changes, the duration of the changes and possible alternative routes to avoid the impacts of the proposed changes.

7.12.5 Specific construction traffic design principles

To facilitate the design and approval of the traffic management a number of general design principles and constraints would be established to cover the worksites for all stations and surface works. This would be supplemented by particular constraints, or clearly identified exceptions for each station/worksite (refer to **Table 7-47**). The absolute minimum requirements are listed in AS 1742.3 Manual of Uniform Traffic Control Devices.

Table 7-47 General minimum traffic constraints

Constraint	Requirement	Comment
Minimum single lane widths (straight)	Three metres plus 0.5 m clearance on each side - total four metres	Assumed < 60 km/hr 85%ile actual travel speeds. Assumed no vertical obstruction adjacent to traffic lane. Assumed low heavy vehicle / bus and coach movements.
Minimum paired lane width (one way)	Six metres plus 0.5m clearance on each side - total seven metres.	
Minimum single two way road width	7.5m	Assumed no vertical obstruction adjacent to traffic lane. Assumed low heavy vehicle / bus and coach movements.
Minimum clear footway width (midblock)	Three metres Note AS 1742 states that the same width as existing should to be retained	Absolute min 2.1m, subject to adequate footpath capacity and to meet disabled access requirements. Note AS 1742 states that the same width as existing should to be retained.
Minimum footway width at crossing / intersections.	3.6 m	Note AS 1742 states that the same width as existing should to be retained. Note clear footway widths at intersection not usually widened, unless kerb extension etc. Normal default footpath width 3.5m / 3.6m. Pedestrian (Zebra) crossing width 3.6m min.
All construction traffic access	To enter / exit worksite in a forward direction	Traffic controllers must be used to assist any vehicle which cannot enter or leave a worksite in a forward direction.
No road closures – road or pavement		May require special consideration. Identified in site specific assessment.
General Maximum truck size	Single unit truck 12.5 m Truck and dog combination	Truck and dog combination vehicle, subject to confirmation of adequate truck manoeuvring and compatible operation on access roads/driveway crossings.
On site parking	Limited	Workforce parking to be provided at selected large consolidation worksites, with workforce parking provided at other worksites where space allows . Contractor to develop solutions to minimise the need for the workforce to drive private vehicles to worksites.

Worksites

All worksites would be clearly defined with the use of hoardings or other clearly identifiable site boundaries. The TMPs to be developed would identify the boundaries with the footpath and road controls. Activities within the worksite are excluded from the TMPs except in relation to ensuring the movement of construction traffic in and out of the worksite is physically possible.

Where worksite boundaries are identified in plans the assumption is that this marks the extreme outside edge of the hoarding and all barriers, protection, etc is inside of the site boundary line.

Worksites include any gantries, or other structures associated with the site layouts. The site specific TMPs would consider these interactions and the impacts of gantries, etc on the road and footpaths.

In providing any hoarding and gantry structure consideration would be given to ensuring sight lines for side roads, vehicle accesses, signposting, and traffic signals are maintained.

Hoardings

The design of hoardings would have an important impact on the success of pedestrian and vehicle management measures. The following considerations would be taken into account in designing hoardings:

- surfaces are bright
- smooth surfaces are used which allow pedestrians to brush past without snagging (this reduces shying from the edge)
- surfaces are regularly cleaned and inspected
- removal of graffiti and advertisements
- adequate lighting provided
- protection against collapsing after being struck from passing vehicles
- where adjacent to road edge a minimum hoarding offset of 500 mm from the road edge with design feature to prevent pedestrians walking alongside the kerb
- take into consideration any BCC preference for concertina style driveway gates rather than fixed rigid gates.

Details of site control and hoarding arrangements that apply within Brisbane Council area would need to be considered.

Site security, site access and signage

The issues to be considered in determining the location of site accesses are:

- safety of travelling public
- safety of the construction workforce and equipment
- impact on local communities in terms of safety, noise and road damage
- ease of access for emergency vehicles;
- site security.

The worksites and depots would have appropriate arrangements to discourage entry without approval and minimise vandalism. All access points to fenced compounds and depots would have lockable gates.

Appropriate information signs would e provided at worksites to identify the project and contact persons. These matters are key to the provision of a site that is safe for the public and the workforce.

Truck routes

Designated access routes for construction and spoil vehicles would be via the arterial road network where practicable. Details of all routes used for access and haulage during construction would be developed in consultation with the relevant local government authority and detailed in the appropriate section of the site specific TMPs.

Spoil haulage routes would be developed by the contractor in a format such that a suite of individual instructions and maps are provided to contract operators for all points of origin to respective destinations and return. The anticipated route for these vehicles has been assumed as traveling between the worksite and expected spoil placement locations in Swanbank. In addition, layover areas would be nominated should vehicles need to ‘store’ prior to arriving at the spoil removal sites. Approximate travel times during various periods of the day would be developed for each route as a guide to operators and also assist in more consistent and uniform arrival rates at each site.

Management of truck movements

The locations of entries, exits, turning restrictions, slip lanes, traffic lights, signage and the like would be established in line with the requirements of the Environmental Assessment and in consultation with the TMR and BCC. Truck movements into and out of the various sites would be generally be under flag control to protect pedestrians and reduce risk to on road travellers.

Construction zones and call forward areas

Due to restricted space within the worksite there may be requirements for some on road parking / waiting / unloading by construction traffic. Where this does not interfere with traffic lanes, such as where there is current parking, provision may be made for a dedicated construction zone. The contractor would minimise the number and extent of these zones in order to control the scale of the worksite and to minimise adverse impacts from queued construction vehicles on street. Residential areas would be avoided.

During times of continuous construction traffic activity, such as during excavation or a concrete pour, it is likely call forward areas would be required to assist construction traffic management and minimise disruption to other road users. These areas would be located close to the worksite area but away from residential areas.

Design construction vehicle

To minimise the number of truck movements the largest vehicle possible would be used, whilst being consistent with the constraints of the access routes, safety and site constraints. It is suggested that the standard vehicle would be either a 'truck and dog' or a semi trailer. As access to and from some worksites may be constrained this would be reviewed on a site by site basis, with the use of trailer truck combinations such as 'truck and dog' discouraged at worksite locations or haul routes with high pedestrian volumes due to pedestrian safety considerations.

Workforce access and parking

There are varying availabilities of space at the designated station worksites and provision of space for working parking is of a relatively low priority given the range of activities required within the site boundaries. Some sites have good access to public transport, reducing the need for onsite parking, such as Roma Street, Albert Street, Woolloongabba, Dutton Park, and Yerongpilly. There is also the potential for identifying parking at large worksites with dedicated site transfers to other restricted worksites (e.g. Yerongpilly, Clapham Yard, Mayne Yard and Woolloongabba) via scheduled bus services or shuttle bus.

Similar arrangements are anticipated for all stages. During the fit-out stage materials and equipment required by trades persons may need to be stored remotely and transferred to site.

The initial assumption is that there is no provision either on the frontage road or within the worksite for workforce parking unless explicitly stated. Where workforce parking is likely to occur on street in locations with competing parking for business and residents mitigation measures such as changed parking restrictions or resident parking schemes may be required during construction to minimise impact on local amenity.

Construction consolidation centre / depot

To mitigate the impact of construction traffic the Project would consider the provision of construction consolidation centres / depots to receive deliveries, and arrange for the coordinated central distribution to the worksite. Previous experience of these facilities elsewhere internationally has shown up to a 70% reduction in construction traffic movements where external marshalling of supplies and equipment is undertaken. This type of facility may improve security for the workforce and materials where 24 hour operation is envisaged. The location of possible sites needs to evaluated using information of the volume and types of materials as well as the workforce numbers with potential indicative opportunities being at the Mayne Yard, Northern Portal, Woolloongabba, Yerongpilly and Clapham Rail Yards.

Driver training

Truck drivers should be fully aware of the worksite and traffic management site access requirements including any truck noise management measures required. Taking account of current best practice drivers should all receive specific cycle awareness training.

The contractor would ensure that drivers receive a daily briefing on their routes, and worksite destinations in the form of toolbox talks – (daily briefing by the site foreman to the workforce on the activities and risks for the day).

7.12.6 Specific traffic control at worksite measures

Construction activities in areas that are normally open to and used by the public require special consideration to ensure that the safety of the public and the workforce is maintained. The operational requirements that apply to the construction activities are discussed in this section and address the method by which safety and efficiency is achieved and maintained.

Policy and responsibilities

It is the policy of Cross River Rail that work zones provide for the safe operation of road workers and the safe passage of vehicular and pedestrian traffic. Traffic control devices are provided to warn, instruct and guide road users safely through, around or past worksites on roads including footpaths. A key feature is the need to carefully plan the staging of the work so that the workforce and traffic are separated as far as possible. Traffic control at worksites would be in accordance with latest TMR Guidelines and where relevant Australian Standard AS 1742.3. These documents form the basis of all activities that involve temporary changes to road users facilities.

It is the responsibility of all project personnel to ensure that road works related to the construction of the Project are carried out in a safe and efficient manner. The contractor(s) would prepare all of the documentation for the CIP, FTMP and CTMP's including the specific Traffic Control Plans (TCPs) for all work which involves any impediment to road users. TCPs would be prepared by qualified personnel.

Where work requirements necessitate temporary speed limits, the contractor would review and submit for any required speed zone approvals before the temporary speed limit is intended to be implemented.

Appropriate road authority approvals will be required. In most cases, this will be Brisbane City Council, the Department of Transport and Main Roads and/ or the Brisbane Metropolitan Transport Management Centre.

The contractor would then arrange for the supply and erection of appropriate temporary speed zoning signs. Following erection of the signs, arrangements would be made to cover the signs when the speed zones are not in use.

Traffic control techniques

The traffic control techniques to be employed would include:

- temporary road deviations or detours;
- raised pavement markers and clear line marking;
- channelisation using traffic cones, safety barriers or lane delineators;
- directional, information and regulatory sign posting; and
- time of day routines to optimise traffic and construction activities.

A program for the regular inspection of traffic infrastructure work would be implemented by the Construction Manager. This would ensure the controls in place continue to provide safe traffic management for the traveling public, contractor employees or subcontractors. All controls would comply with current BCC and TMR guidelines.

Approved clothing for work personnel

Clothing would be in accordance with the requirements of Australian Standard AS 1742.3.

Plant and equipment

Arrangements would be made to ensure all plant and equipment working near traffic or pedestrians is properly highlighted and protected to ensure public safety.

Other traffic control devices

Details of other traffic control devices are given in the MUTCD. These devices include barrier boards, plastic mesh fencing, temporary post mounted delineators, cones, flaps, traffic warning lamps, temporary pavement markings, boom gates and portable traffic signals. These items would be provided as required. However it is intended that the duration of the project would justify "permanent" solutions for the duration of the contract.

Traffic controllers and temporary traffic signals

These devices would be identified in specific site TMPs and TCPs if required. These would be utilised/installed if necessary in accordance with the MUTCD. Their design installation and operation would be in accordance with relevant TMR and BCC guidelines and procedures.

Use of variable message signs including permanent VMS

These would be used to inform drivers where necessary to avoid particular roads or areas where activities associated with construction would cause disruption. Where they are used this would be accordance with documented BCC and TMR procedures and guidance.

The placement of temporary VMS would consider pedestrian safety and disabled access needs when placed on footpaths. A road occupancy license may be required when a portable VMS is proposed to be installed in a parking or loading bay.

7.12.7 Specific spoil haulage route related measures

Spoil haulage would have to be managed appropriately to minimise any adverse impacts on the road network and the community. The haulage operations would need to be detailed in the contractors Construction Traffic Management Plan, and would need to be based on detailed analysis that looks at any potential impact that the operations may have on the road users and the community.

The main issues for transporting materials from the sites would include:

- minimising truck traffic in local streets, by providing direct access to major roads, such as Ipswich Road, and specifying haulage routes on the major road network
- minimising the effect on residential communities, by using routes through residential areas only where there is no practical alternative and preferably not operating after hours on these routes
- minimising congestion effects by operating off peak only
- minimising the effect on businesses and conflicts with pedestrians, by avoiding busy commercial areas if a suitable alternative exists
- avoiding conflicts with major events and peak holiday traffic.

With these mitigations in mind it is recommended that the suggested haul routes be re-visited following further discussion with Brisbane City Council and the Department of Transport & Main Roads.

7.12.8 Specific worksite traffic inspection measures

Road inspections would be carried out regularly to ensure the safe movement of traffic and the protection of persons and property through and/or around a worksite.

Inspections would ensure all signs and devices are properly located, oriented and maintained in an effective condition and the layout is satisfactory and not confusing to motorists or pedestrians.

Records would be maintained of all traffic guidance schemes and any adjustments made to such schemes, together with dates and times the schemes were erected varied and removed.

Inspection reports recording dates and times of inspections of traffic schemes would be recorded on a suitable pro-forma. Reports are to be prepared of all worksite inspections consistent with requirements of WorkCover and generally by OH&S Committee members.

In all cases of accidents or near miss incidents, an Employee Incident / Accident Report would be submitted to the Site Safety Representative, who would carry out an investigation and report for the Project Director. The Site Safety Representative is also responsible for carrying out hazard analyses and developing appropriate safe work methods as detailed in the Occupational Health Safety and Rehabilitation Plan.

Inspection of roadwork traffic schemes

The requirement to inspect traffic control is stipulated in Appendix A of Australian Standard 1742.3. There are three main types of inspection:

- pre-start and pre-close down inspections of short term traffic control;
- weekly inspections of long term traffic control, and
- night inspections of long term traffic control.

The responsibility and frequency of inspections is summarised in **Table 7-48**.

Table 7-48 TCP inspections

Inspection	Responsibility	Frequency
Pre-start and pre-finish	Traffic Supervisor (Contractor)	Daily
Weekly audit	Traffic Engineer (Contractor)	Twice a week
Night audit	Traffic Engineer (Contractor)	Once a week
Pre-opening inspections	Traffic Manager, Traffic Engineer (Contractor)	Prior to opening any new temporary roadwork site or major adjustment

Note: the authority responsible for the approval of the TCP may also conduct an audit of the site traffic control

7.12.9 Specific emergency incident planning measures

An emergency is defined as:

“An unforeseen event which requires urgent action to protect life or property, or an occasion when emergency services (Police, Fire Brigade, Ambulance or State Emergency Services) take control of a portion of the road network”

Examples of emergencies could include:

- traffic accidents
- hazardous spillages
- power failures
- terrorist attacks
- flood
- fire
- structural damage to a rail line, building, road tunnel or bridge.

In the event of an emergency occurring, the Brisbane Metropolitan Transport Management Centre should be consulted to determine the appropriate procedure and responses required.

All details of emergencies that occur within any Project-related road construction zone are to be recorded and forwarded to the Transport Management Centre within seven days of the incident occurring, with details of where the incident occurred, any contributing factors related to the ROL and any actions that have been taken with respect to the ROL conditions.

Each Cross River Rail TMP would include an Incident Management Plan which would provide a response in the event of an incident near or adjacent to the worksite or within the worksite. There may be specific features in a locality that require consideration in relation to possible incidents such as at Woolloongabba that would require more detailed consideration. The Incident Management Plan would include details of how the worksite could be closed down in event of an incident.

Accidents / incidents and complaints

The ROL database would maintain records of traffic accidents and incidents reported at worksites. Any complaints received regarding delays at worksites should be referred to the TTLG for investigation, the drafting of replies, and record purposes.

The person in charge of the worksite would continue to be responsible for dealing with complaints regarding safety issues. Where action is considered necessary to address the matters of the complaint, an appropriate recommendation would be forwarded to the Project Traffic Manager.

7.13 Conclusion

This report, in line with TMR Guidelines for the Assessment of Road Impacts of Development satisfies the Coordinator-General's requirements for assessment of the construction traffic impacts, of the Cross River Rail project. The assessment is also based on worksite information and drawings provided by AECOM, which have been developed concurrently with the preparation of this report.

This assessment has been prepared in advance of the appointment of a contractor responsible for construction of the Project and assumes what appears to be a feasible construction arrangement, based on the information currently available. At such time as a contractor is appointed, adjustment to the proposed construction traffic management may be required.

This section proposes a structure of how changes to the proposed construction traffic management would be managed throughout the Project construction period.

The assessment focuses on the impact of the operation of the worksites associated with tunnelling, underground station construction, as well as surface worksites associated with widening of the rail corridor and reconstruction of existing railway stations.

Detailed information relating to short term road works associated with widening of the rail corridor was not available at the time of preparation of this assessment. These short-term impacts would be addressed through preparation of specific Construction Traffic Management Plans prior to the commencement of work.

7.13.1 Individual worksite assessments

Table 7-49 provides a summary of the assessments for each worksite.

Table 7-49 Individual worksite assessments

Location	Impacts	Remedial measures
Mayne Rail Yard	Use of Abbotsford Road bus bay for construction vehicle access to Queensland Rail property gate Adjustment to internal Queensland Rail staff parking and provision of an additional 50 spaces for the Project workforce parking Adjustment to existing Queensland Rail truck turning and material set down areas Adjustment to existing level crossings within Mayne Yard Adjustment to emergency service access to Queensland Rail buildings and building evacuation routes Change to Queensland Rail staff pedestrian access routes between car parking and buildings Small increase in heavy vehicle volumes on site access and egress routes	Consultation with Queensland Rail on all proposed internal access modifications Close liaison with emergency service providers regarding changes to access
O'Connell Terrace	Staged construction activity within the O'Connell Terrace worksite (including short term closures to enable traffic switches to occur) as well as closure of Sneyd Street and detours via Wren Street. Potential pedestrian detours due to reconstruction of the rail overbridge. Suspension of eastbound cycle lane during construction. Detours for Queensland Rail Mayne Yard vehicles via Tufton Street and a temporary bridge to facilitate access to Lanham Street. Removal of some off-street car parking spaces in RNA showgrounds. Potential reconfiguration of RNA showgrounds car park. Potential suspension of existing on-street car parking in O'Connell Terrace east of Tufton Street. Potential closure of direct driveway access to RNA showgrounds east of rail overbridge where driveways occur within worksite area	Diversions (to enable traffic switches to occur) to be timed to occur at periods of low traffic. Communications Plan to be developed to advise motorists of delays and to avoid the area, as well as pedestrian detours. Detailed Construction Traffic Management plan to be developed; Considerate design to avoid cycle safety issues. Reconfiguration of existing RNA Showground parking to accommodate adjustment in parking provision. Special Events to be considered during development of the Construction Traffic Management Plan.
Northern Portal (Gregory Terrace)	Removal of four on street parking spaces adjacent to worksite driveway Construction traffic turn right directly off Gregory Terrace into worksite driveway Suspension of parking in worksite access driveway adjacent to Substation Closure of existing shared cycle pedestrian path on and off road at worksite Minor increase in traffic including volume of heavy vehicles in Gregory Terrace, between worksite and Bowen Bridge Road.	Provision of 'Keep Clear' markings for northbound Gregory Terrace at worksite driveway entrance Provision of alternative shared cycle pedestrian footpath past worksite

Location	Impacts	Remedial measures
Roma Street	Removal station masters carpark between platform 7 and 8 Closure of pedestrian access between Parkland Boulevard and Parkland Crescent Removal of existing roundabout in Parkland Boulevard Removal of some carparking spaces in College Crescent carpark and adjacent to Platform 10 due to kerb space modification Station evacuation plans likely to require adjustment Changes to the way westbound vehicles access the long distance platform from Parkland Boulevard Minor increase in heavy vehicle flows on the adjacent arterial and local road network; Potential for minor delays in Parkland Boulevard/Parkland Crescent.	Provide pedestrian detour through Roma Street Station Provide vehicle contra flow on the eastbound direction of Parkland Crescent at its intersection with Parkland Boulevard to the south east of Roma Street Parklands
Albert Street	Removal of three on street parking spaces in Margaret Street, and four spaces in Mary Street. Adjustment to existing taxi stand in Alice Street, east of Albert Street Closure of footpaths in Albert and Mary Streets Removal of existing street furniture including bike racks and seats in Albert Street Staged construction across Alice Street resulting in closure of one or two lanes	Pedestrian detours implemented Taxi stand relocated if required Advanced signage and communications strategy Alternative bus routing (to avoid Alice Street east)
Woolloon-gabba	Minor Changes to access off slip lane off Vulture Street off ramp to facilitate a gated construction worksite entrance. Staged traffic management in the Woolloongabba spur of the South East Busway, including relocation of bus layover area potentially resulting in minor increase to running time for buses. New driveway access point from Ipswich Road northbound into worksite. Possible closure of existing pedestrian path on the southern side of Vulture Street off-ramp including connection with Leopard Street.	Communication strategy do be developed; and Detailed Construction Traffic Management Plan including details of staged traffic management in Vulture Street and South East Busway to be developed.
Boggo Road	Removal of on street parking in Peter Doherty Street and Boggo Road; Closure of footpaths between the Gaol and Ecoscience building, as well as both sides of Peter Doherty Street; Temporary diversion of pedestrian access between Boggo Road and the Busway; Staged construction traffic in Boggo Road; Closure of through access in Peter Doherty Street with detours via Boggo Road; Creation of a new right turn bay and phase at the intersection of Annerley Road and Peter Doherty Street; and Increase in heavy vehicle traffic in the Boggo Urban Village Precinct and minor increase in congestion at the Boggo Road/Annerley Road intersection.	Pedestrians detoured via Boggo Road to reach Annerley Road Pick up/set down and loading areas in Boggo Road relocated to the southern side of the Ecoscience building

Location	Impacts	Remedial measures
Worksite for the southern ventilation and emergency access building	Provision of new slip lane right turn/intersection adjustments at Fairfield Road one way northbound into Brougham Street. Removal on informal street and median parking in Brougham Street between Fairfield Road north and southbound (to facilitate truck U turn). Minor increase in heavy vehicle flows on Fairfield Road and Brougham Street. Closure of footpath on eastern side of Fairfield Road with diversion via side streets. Relocation of existing indented bus stop for southbound Fairfield Road north of Vernon Street. Change in access arrangements for five residences in Sunbeam Street and Railway Road, south of Sunbeam Street with vehicles detoured via Cross Street.	Pedestrian detours to be signposted including advance warning Existing southbound bus stop to be relocated approximately 150m to the north of Bledisloe Street.
Southern Portal	Closure of through access from Fairfield Road to Lucy Street, for non-construction vehicles Potential increase in volume of vehicles using School Road to travel between Ipswich Road and Fairfield Road Short term pedestrian and vehicle detours during the reconstruction of Wilkie Street	Communication Plan to be developed Local detours and diversions to be signposted
Clapham Rail Yards	Creation of a new driveway crossing and left in left out junction on Ipswich Road, south of Hamilton Road. Closure of Moorooka Station. Adjustment to kerbspace arrangements adjacent to Moorooka Station to pick up and set down passengers. Minor increase in the volume of heavy vehicles on Ipswich and Fairfield Roads.	Shuttle bus service to transport Moorooka Station passengers to adjacent stations..
Salisbury	Consolidate existing driveways from Lillian Avenue into a single entry point. Possible minor increase in the volume of heavy vehicles on Lillian Avenue and its intersection with Beaudesert Road.	Signalisation of Lillian Avenue and Beaudesert Road

7.13.2 Intersection modelling

The majority of Project construction work would occur off road therefore the predominant traffic impact would be related to the haulage of spoil from tunnel and mined station worksites. Haulage routes have been determined which attempt to minimise the impact of truck operations on the existing road and network and its performance. The impact of construction traffic, including spoil haulage and deliveries of plant and equipment, has been assessed in relation to peak hour traffic volumes in a traffic forecast year of 2016 (assumed year of start of construction).

Critical intersections on the haul road routes have been assessed using SIDRA modelling to determine the change resulting from construction traffic. The assessment of critical intersections has been undertaken to demonstrate the worst case scenario of impacts (refer to **Table 7-50**).

Table 7-50 Assessment of critical intersections

Intersection	Increase in average intersection delay value (SIDRA calculated)	Conclusion
Bowen Bridge/O'Connell Terrace	No change	Acceptable
Bowen Bridge/Gregory Terrace	Less than 5 seconds	Minor increase in delay
Albert Street/Mary Street	No change	Acceptable
Albert Street/Alice Street	No change	Acceptable
Main Street/Hale Street	Less than 5 seconds	Minor increase in delay
Milton Road/Castlemaine Street	Less than 5 seconds	Minor increase in delay
Milton Road/Vulture Street	Less than 5 seconds	Acceptable
Milton Road/Upper Roma/Petrie Terrace	No change	Acceptable
Annerley Road/Fairfield Road	Less than 5 seconds	Minor increase in delay
Annerley Road/ Gladstone Road	Less than 5 seconds	Minor increase in delay
Fairfield Road/Brougham Street	No change	Acceptable
Ipswich Road/ Lucy Road	10 seconds	Modelling does not take traffic reduction into account from changing land use. Signal timings can be used to quarantine delay to side road approach.

The assessment shows that no restriction to trucking operations during the peak traffic periods would be required. However, any works which require STOP/SLOW or other traffic control in order for a vehicle to manoeuvre into or out of a worksite may have impacts greater than those modelled, and the use of traffic control may require further detailed assessment in order to demonstrate acceptability of operation during peak traffic periods.

Pavement assessment

The impact of construction traffic in relation to existing Equivalent Standard Axles (ESA) has been assessed as a measure of contribution towards road pavement life span reduction, based on average annual weekday traffic (AAWT) volumes. The assessment finds that the contribution of Project traffic loadings is less than 5% increase to the existing truck axle loads for each of the specific network links examined, with the exception of 3 links, which range between 5-8%, and the Lucy Street link between Ipswich Road and the southern portal worksite, which has an approximate increase of 20%. Given the relatively short duration of construction in the context of a 20 year pavement design lifespan, this level of impact would not warrant pavement strengthening or remedial measures.

7.13.3 Overall conclusion

Each worksite has been examined to determine the impact of construction on pedestrians and cyclists, buses, parking, adjacent development and access, emergency services, special events and impact on general traffic operation. Specific mitigation measures have been proposed for each worksite where the impacts are significant. Overall, the impacts of construction are considered to be manageable, with a minimum of change to existing traffic conditions. In addition to specific mitigation measures, strategic whole of project mitigation measures to manage traffic safety and network impacts have been proposed. These macro level measures and guiding principles are intended to address the way traffic is managed, stakeholders are consulted and changes are communicated to all road users in a way that ensures impacts are minimised. The combination of whole of project and specific worksite management measures proposed would result in a minimum of impacts to existing traffic conditions, and is considered to be a feasible way of managing the construction traffic impacts of the project.

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Appendix A Technical terms

B-Double: A long articulated heavy vehicle.

Brisbane Metropolitan Area: Brisbane and the surrounding area extending to Caboolture in the north, Beenleigh in the south, Ipswich in the west and Redlands in the east. Also known as the Brisbane Statistical Division (BSD).

Brisbane Strategic Transport Model (BSTM): A computerised, calibrated transport planning model that forecasts travel demand and traffic flows based on demographic and land use parameters and transport network characteristics.

Bulk freight or bulk cargo: Bulk freight is material that is transported unpackaged in large quantities. This material is usually dropped or poured into a bulk carrier ship's hold, railroad car, or tanker truck/trailer/semi-trailer body rather than being transported in shipping containers (see Inter Modal Freight). Bulk freight is classified as liquid or dry and can include grain, coal, and petroleum.

Busway: A busway provides a high level of service characterised by bus stations and dedicated right of way for buses.

Central Business District (CBD): An area at the centre of Brisbane of extensive commercial, retail, finance and government activity located within an area that extends from Eagle Terrace (near William Jolly Bridge) to Kemp Place (near the Story Bridge) including all land to the south and east of Ann and Turbot Streets.

Central Business District (CBD) railway stations): Include Central, Roma Street and Albert Street stations.

CLICsim: A software package used to forecast pedestrian flows and level of service within a railway station. CLICsim version 2.0.0 was used.

Commercial Vehicle (CV): Medium or heavy commercial vehicle commonly referred to as a truck, and specifically equivalent to an AustRoads Class 3 to Class 12 vehicle.

Connecting SEQ 2031: The draft Integrated Regional Transport Plan for South East Queensland 2010-2031

Consists: The make up of a train including the number of locomotives and carriages or wagons

Containerised freight (see Inter Modal Freight)

Cycle Time: The time taken for one complete sequence of signal phases at an intersection.

Dangerous Goods: Good defined under the Australian Dangerous Goods Code as either dangerous goods or too dangerous to be transported.

Degree of Saturation (X value): This is the calculated ratio between the demand flow rate and the capacity for each movement. When the maximum X value for any movement is above 95% then the intersection is regarded as over saturated or operating above its practical capacity. This means that it will take more than one cycle of the signals to progress through the intersection. X values above 1.0 typically indicate that several movements will fall within this category.

Demographics: Results from the study of the characteristics of human populations, such as size, growth, density, distribution, vital statistics and land use

Dual gauge line: A railway line capable of accommodating trains with 2 different wheel gauges. In Queensland dual gauge tracks are capable of accommodating standard gauge trains (1435mm wheel spacing) and narrow gauge trains (1067 mm wheel spacing).

Elasticity: Elasticity is the ratio of the incremental percentage change in one variable with respect to an incremental percentage change in another variable; for example change in demand with change in fare price.

EMME: A software transport-modelling package that is used widely for travel demand forecasting both in Australia and internationally

Feeder bus: A term used to describe a bus service which provides passengers access to another public transport service via an interchange or transfer at a station, usually a faster, higher capacity mode such as a train or busway.

Flighting: Where one train follows closely behind a lead train – usually used to allow 2 freight trains to efficiently proceed through an urban rail network

Full journey: A full journey for tolling purposes includes a movement between the west and east connections of Northern Link, and the respective return journey.

High Frequency Priority (HFP): The HFP network is intended to form the core of the South East Queensland public transport network. HFP services could be bus or rail operating at a frequency of every 15 minutes or better between the hours of 6 am and 9 pm seven days a week

High Occupancy Vehicle (HOV): Vehicle carrying more than one occupant (generally two or more occupants) and taxis and buses.

Induced Traffic Demand: The responses of the travelling public to improvements in network connectivity or reduced congestion. This can result in increased vehicle kilometres on the road network

Inland Rail Route: A proposed inland freight railway between Melbourne and Brisbane via Parkes and Moree (bypassing Sydney) partly on existing railway and partly on new railway

Inner city station: The inner city railway stations consist of: South Bank; South Brisbane; Roma Street; Albert Street; Central; and Fortitude Valley

Integrated Regional Transport Plan (for South East Queensland) or IRTP: A multi-modal strategic transport planning document outlining the preferred means of meeting and managing travel demand across the South East Queensland region. The first IRTP for SEQ was released in 1997 with a draft replacement called “Connecting SEQ 2031” released in 2010.

Integrated ticketing: One ticket than can be used on multiple public transport modes.

Intermodal Freight Transport: The transportation of freight in an intermodal container or vehicle, using multiple modes of transportation (eg rail, ship, and truck), without any handling of the freight itself when changing modes. The method reduces cargo handling, and so improves security, reduces damages and losses, and may allow freight to be transported faster. Also known as containerised freight.

Kiss n Ride. A term used to describe a passenger trip to or from a station including the related pick up or drop off activity by private vehicle, including taxis.

Level of Service (LOS): Traffic conditions as perceived by drivers. A key measure of the performance of the road network, it can be measured at a mid-block point or at an intersection.

Line Loading: the number of passengers on a public transport route or line. Usually over a specified time period (peak 1 hour or peak 2 hour period) rather than on an individual service

Load Factor: the ratio of passengers on a public transport line or route segment relative to the available capacity over a specified time period (usually peak 1 hour or 2 hour peak period). Capacity can be expressed as seated capacity and hence the term Seated Load Factor is used, or total assumed capacity including standing space and referred to as Total Load Factor.

Main Lines: The railway tracks generally used for express rail services

Major Activity Centre: Major activity centres accommodate key district concentrations of employment, services, limited comparison and major convenience retail.

Metro: A metro is a high-frequency, high-capacity passenger transport system independent of traffic or pedestrians.

Nation Building Program: A $37 billion. 6 year Federal Government funding program for land transport, including a range of road and rail programs and projects across the National Land Transport Network. This network is based on national and inter-regional land transport corridors that are of critical importance to national and regional growth.

Network volume difference plots: Identify the increase or decrease in total vehicles on each link of a road network as the result of a new road project.

North Coast Line: The North Coast railway line is a narrow gauge railway line in Queensland. It runs from Brisbane, along the Queensland coast to as far north as Cairns. The railway passes through the numerous towns and cities of eastern Queensland including Nambour, Gladstone, Rockhampton, Mackay and Townsville.

(Rail) On Time Reliability: A key rail performance indicator by measuring whether rail services adhere to published timetables.

Orbital or ring road network: Part of the overall road system that allows people to travel around rather than through a city centre.

Park n Ride: A term used to describe commuter carparking at stations.

Principal Activity Centre: Principal activity centres accommodate key concentrations of employment, business, major comparison and convenience retail, government regional offices, regional health, education, cultural and entertainment facilities.

Priority Intersection: Un-signalised intersection.

Rail corridor: the extent of land or land parcel within which the rail tracks are located.

Rail (or railway) track: a combination of rails, fasteners, sleepers and ballast (or slab track), plus the underlying subgrade.

Rail patronage: The number of people using the rail system as part of a trip.

RailSys : RailSys is developed by University of Hannover and RMCon and is used worldwide as a simulation tool to assist in rail network planning. RailSys is used for analysis, planning and optimization of operational procedures and facilities in rail transport networks.

Rail user: See rail patronage

Road Hierarchy: The classification of roads into major and minor routes to safely and efficiently manage the movement of people and goods while maintaining the liveability of urban areas. Council's draft Transport Plan 2006 – 2026 uses a five level hierarchy.

Screenline: An imaginary border or line over which the number of vehicles or public transport passengers is counted or modelled. Often rivers or major roads are used as screenlines. Analysing differences in volumes across a screenline allows any minor variations in volumes on individual routes along the screenline to be ignored and only overall strategic changes to be identified and reported.

Sector (rail): a group of railway lines and services which generally share a common section of track, but which are separate to other sectors

Sectorisation: The process of dividing a complex rail network into set of different sectors with the aim of reducing crossover and conflict between sectors

Select link plots: Highlight the distribution of origin and destinations of users of a particular road link selected for examination.

SIDRA: A computer analysis package that is a widely accepted tool for specifically assessing the operation of intersections.

Signal Phase: A phase is the part of a signal cycle which commences at the start of the green time for a specific pattern of traffic movement and ends at the start of the green time for another specific pattern of traffic movement, of which some individual movements may be common to both traffic movement patterns. Signal Phasing is the complete sequence of these patterns which apply in a repeating cycle at a specific intersection.

South East Queensland: The geographical region comprising the local government areas of Beaudesert, Boonah, Brisbane, Caboolture, Caloundra, Esk, Gatton, Gold Coast, Ipswich, Kilcoy, Laidley, Logan, Maroochy, Noosa, Pine Rivers, Redcliffe, Redland and Toowoomba.

Specialist Activity Centre: Specialist activity centres have a primary non-retail or commercial function, such as specialised economic activity, employment and/or education.

Spoil: material (such as rock and soil) removed during excavation and mining (including tunnelling) and dredging

Study corridor: the defined corridor of interest which extends from Wooloowin in the north to Salisbury in the south, generally following the existing rail corridors, as well as covering a large part fo the Brisbane CBD as well as the suburb of Woolloongabba

Suburban Lines: The railway tracks generally used by all stops suburban rail services

Traffic Area: A regulated parking area.

Traffic Zone: A traffic analysis zone is the unit of geography used in conventional transportation planning models. The size of a zone and the spatial extent of zones can vary ranging from very large areas such as suburbs to small city blocks or buildings. Traffic zones in the Cross River Rail Patronage Model are based on Census Collection Districts, the smallest level at which census demographic data is available, further sub-divided in some locations where more detailed investigation was relevant and data was available.

Train Load Predictor (or TLP): A computer software programme developed by Systemwide to provide accurate prediction of passenger loadings for a given timetable to optimise service plan development and strategic investment decisions.

TransApex: Brisbane City Council's proposed tri-axis based framework of strategic road connections that would allow Brisbane's cross-city travel movements to bypass the CBD and inner suburbs

Transit Lane: Otherwise known as a High Occupancy Vehicle (HOV) lane, these lanes are available for travel by buses and other vehicles with a specified minimum occupancy eg T2 lane (2 or more persons) or T3 lane (3 or more persons).

TransLink (TransLink Transit Authority): A statutory authority created in July 2009 and responsible for the planning, marketing and integration of public transport services, fares and ticketing throughout South-East Queensland (from Noosa in the north to Coolangatta in the south and Helidon in the west).

Trip: A one-way journey by an individual using one or many transport modes.

Twenty foot Equivalent Unit or TEU is an inexact unit of cargo capacity often used to describe the capacity of container ships and container terminals. It is based on the volume of a 20-foot-long (6.1 m) intermodal container, a standard-sized metal box which can be easily transferred between different modes of transportation, such as ships, trains and trucks

Western Line: The railway line linking Brisbane and Ipswich with Toowoomba

Appendix B Acronyms and abbreviations

AADT Annual average daily traffic

AWDT Average week day traffic

ABS Australian Bureau of Statistics

am Before Noon

ATC Australian TradeCoast

BCC Brisbane City Council

BL Bus Lane

BLTIP Brisbane Long Term Infrastructure Plan

BMT Brisbane Multi-modal Terminal

BSD Brisbane Statistical Division

BSTM-MM Brisbane Strategic Transport Model – Multi Modal version

BUG Brisbane Urban Growth model

CBD Central Business District

CCTV Closed Circuit Television

CLEM7 Clem Jones Tunnel (previously known as the North-South Bypass Tunnel)

CPI Consumer Price Index

CPM Cross River Rail Patronage forecast Model

CRR Cross River Rail

CTMP Construction Traffic Management Plan

CV Commercial Vehicle

DOS Degree of Saturation

DIP Queensland Department of Infrastructure and Planning

DTMR Queensland Department of Transport and Main Roads

E/B Eastbound

EIS Environmental Impact Statement

EMU Electric Multiple Unit (Type of rail passenger rolling stock)

GST Goods and Services Tax

HV Heavy Vehicles

HFP High Frequency Priority

ICB Inner City Bypass

ICRCS Inner City Rail Capacity Study

IM Inter Modal

IMEX Import/ Export

IMT Inter Modal Terminal

IMU Interurban Multiple Unit (Type of rail passenger rolling stock)

INB Inner Northern Busway

IRTP Integrated Regional Transport Plan (for South East Queensland). Also known as Connecting SEQ 2031

JV Joint Venture

Km/h Kilometres per hour

LOS Level of Service

MTPA Million Tonnes Per Annum

NIEIR National Institute of Economic and Industry Research

N/B Northbound

NB Northern Busway

NSBT North-South Bypass Tunnel (now know as CLEM7)

OTR On Time Reliability

PIFU Planning, Information and Forecasting Unit

pm After noon

PT Public Transport

RAPID Real Time Advanced Priority and Information Delivery

RCM RiverCity Motorways

S/B South bound

SEQ South East Queensland

SEQIPP South East Queensland Infrastructure Plan and Program (2010-2031)

SEQTS South East Queensland Travel Surveys

SIDRA Signalised and un-signalised Intersection Design and Research Aid

SMU Suburban Multiple Unit (Type of rail passenger rolling stock)

T2 or T3 Transit Lane

TEU Twenty-foot Equivalent Unit

TLP Train Load Predictor

TBM Tunnel Boring Machine

TMP Traffic Management Plan

TOD Transit Oriented Development

VMS Variable Message System

VHT Vehicle hours travelled

VKT Vehicle kilometres travelled

VOC Vehicle operating costs

V/C Volume over Capacity

VPH Vehicles per hour

W/B West Bound

Appendix C EIS Terms of Reference

Relevant Transport extract from:

"Terms of reference for an environmental impact statement - Cross River Rail project"

August 2010Under Part 4 of the Queensland State Development and Public Works Organisation Act 1971

3. Environmental values and management of impacts

This section should detail the environmental protection and mitigation measures incorporated in the planning, construction, rehabilitation, commissioning, operations and decommissioning of all facets of the project. Measures should prevent, or where prevention is not possible, minimise environmental harm and maximise environmental benefits of the project. Preferred measures should be identified and described in more detail than other alternatives.

The objectives of subsequent sections are to:

- describe the existing environmental values of the study area that may be affected by the project, using background information and/or new studies to support this description, including reference to all definitions of environmental values set out in relevant legislation, policies and plans
- describe the potential adverse and beneficial impacts of the project on the identified environmental values and the measures taken to avoid, minimise and/or mitigate adverse impacts and maximise beneficial impacts
- describe any cumulative impacts on environmental values caused by the project, either caused by this project or by combination with other known existing or planned projects, where cumulative impacts may occur over one or several locations over one or several periods of time
- present objectives, standards and measurable indicators that can be used to help protect the identified environmental values
- examine viable alternative strategies for managing impacts, with these alternatives presented and compared in view of the stated objectives and standards to be achieved
- discuss the available techniques to control and manage impacts in relation to the nominated objectives.

Where negative impacts of the project cannot be avoided or adequately minimised or mitigated, proposals to offset impacts should be presented that are not inconsistent with the *Queensland Government Environmental Offset Policy* (2008),

The mitigation measures, monitoring programs etc., identified in this section of the EIS should be used to develop the EMP for the project (see section 8 - Environmental management plan).

3.1 Transport

The transport assessment is to be presented for each mode affected by the project as appropriate. These assessments should provide sufficient information to allow an independent assessment of how existing and planned transport infrastructure will be affected by project transport at the local and regional level.

3.1.1 Description of existing transport network

The existing transport network and operations relevant to the project should be described (at a level of detail appropriate for the impact of the project), in terms of:

- the regional rail network (passenger and freight) and rail infrastructure including:
  - rail operations
  - patronage (peak and daily)
  - rail capacity and levels of service
  - stations and facilities associated with the project
- the regional, arterial and local road network, to the extent relevant to the project, including:
  - road traffic composition and movement patterns
  - road capacity, degree of saturation and levels of service
  - freight traffic volumes, composition and existing designated freight routes
- other public transport services (bus and ferry) and their interactions with the rail network, and relevant information on passenger numbers and infrastructure
- bicycle and pedestrian movements and their interactions with the rail network, and relevant information on movement numbers and infrastructure.

3.1.2 Transport network performance

The performance of the relevant existing regional bus, ferry and rail network (passenger and freight) should be described in terms of:

- capacity and constraints to capacity
- current operations—service plans, travel speeds (peak, daily and composition), levels of service
- connectivity with other public transport and active transport.

The performance of the existing road network, relevant to the project, should be described in terms of:

- traffic demands (through, local and regional context)
- traffic flows, speeds and travel times—peak, daily, composition
- cycle and pedestrian network
- interaction with public transport
- vehicle access, parking and loading in the study corridor and adjacent areas.

3.1.3 Patronage forecasting methodology

The methodology used for rail patronage and wider road traffic network, pedestrian and cycle forecasting should be described in regard to:

- broad land use patterns — a description of the population, employment and demographic forecasts used and assumed generation rates and an explanation of the rationale for the assumptions applied
- the scope and validity of the transport models used
- the provision of forecasts for relevant opening year and design years
- an analysis of trends in household travel behaviour
- network improvements — which planned or proposed rail, other public transport, pedestrian, cyclist and road upgrades have been included in the modelling for each time period
- an explanation of how and what alternative future scenarios were considered
- effects of the project on other public transport services (locally and regionally).

3.1.4 Future base rail transport conditions (no project)

Future conditions on the rail network of relevance to the project should be outlined from appropriate models for relevant design years such as the anticipated opening year, and relevant design years, without the project in place, in terms of:

- description of the rail network
- future demand for all transport modes, including forecast rail movement volumes and speeds
- operational and access requirements
- network performance for all transport modes within the local and regional network
- other public passenger transport service options (including levels of service and utilisation of bus passenger transport capacity)
- alternative rail operational configurations or network upgrades (e.g. longer trains, upgraded signalling, improved rolling stock) and the extent to which these alternatives may support or delay the need for CRR.

3.1.5 Effects of the operating project

The effects of the proposed works on the rail network should be investigated for future model years, including rail passenger sensitivity demands and comparison with the future base rail transport conditions (no project), as follows:

- changes to rail passenger capacity, operations and levels of service in the anticipated opening year and other relevant design years
- impacts on rail freight operations
- changes to patronage of existing rail stations and interchanging with other public transport modes
- impacts to rail maintenance operations.

The effects of the project on other transport modes and precinct plans should also be identified including:

- impacts to traffic (including vehicle access, parking, operations, maintenance and increase demand on road-related infrastructure) on the road network, including the local road network that interact with the project as well as the regional road network
- impacts to patronage of other public transport modes (bus and ferries)
- changes to pedestrian and cycle movements that interact with the project (particularly around rail stations).

A Road Impact Assessment Report (RIA) should be undertaken for the operation of the project in general accordance with TMR's 'Guidelines for Assessment of Road Impacts of Development' (2006). Traffic assessments must include details of the number, composition, trip timing and routes used. All assertions made should be supported by calculations, maps at appropriate scale and /or consultation undertaken with relevant stakeholders.

3.1.6 Construction transport impacts

The transport implications for both impacts and mitigation measures of construction activities should be described with respect to:

- existing rail services (passenger and freight), use of rail stations and railway maintenance regime
- any pre-construction demolitions
- construction site traffic generation, operational service requirements and access
- local and regional traffic flows from temporary and permanent road traffic changes, including road and lane closures at construction sites and the specific measures proposed to mitigate these impacts
- an assessment of the likely impacts of construction on other public transport modes, road network, cycle and pedestrian networks potentially affected by the project, including travel time delays
- arrangements to ensure safety and operational integrity of the rail and adjacent road network, pedestrian and cycle accessibility and mobility, and access to public transport infrastructure during construction including for individuals with a disability
- access for police and other emergency services
- the provision of adequate access to businesses, public facilities, schools, major community facilities, churches, parks and private residences by private vehicle, public transport, bicycle and foot impacted by the project
- construction workforce parking and other existing public parking
- effects of construction traffic (including the transport of spoil from the project and materials to the project – number, types of vehicles, composition, trip timing and routes) on the road network or public transport systems if appropriate.

An RIA should be undertaken for the construction of the project in general accordance with TMR's 'Guidelines for Assessment of Road Impacts of Development' (2006).

Appendix D Network assumptions

Table D1 Network Assumptions (within Brisbane Metropolitan Area) used in patronage modelling

Year	Type	Project
By 2021	Rail	Darra to Springfield railway - Stages 1 and 2 (Darra to Richlands) as well as stage 3 (Richlands to Springfield)
	Busway	Eastern Busway - Buranda to Main Avenue
	Busway	Northern Busway - Kedron to Chermside
	Rail	Lawnton to Petrie third track
	Rail	Moreton Bay Rail Link (Petrie to Kippa Ring)
	Rail	Keperra to Ferny Grove duplication
	Road	AirportLink Toll Road
	Road	Gateway bridge duplication, and Gateway South Upgrade to 6 and 8 lanes
	Road	Clem7 Toll Road
	Road	Northern Link Toll Road
	Road	Brisbane Urban Corridor upgrade to 6 lanes
	Road	Kingsford Smith Drive upgrade to 6 lanes and Breakfast Ck Rd upgrade to 6 lanes
	Bus	UQ to Toowong and Indooroopilly bus priority
	Road	Airport Drive upgrade to 6 lanes
	Road/ Bus	Pacific Mwy upgrade to 8 lanes inc T2 lanes (Springwood Busway station to Hyperdome)
	Road/ Bus	Old Cleveland Road upgrade to 6 lanes including bus lanes (Coorparoo to Carindale)
	Road/ Bus	Old Clevelend Road upgrade to 6 lanes including T2 lanes (Carindale to Capalaba)
	Road/ Bus	Finucane Rd/ Shore Rd upgrade to 6 lanes including T2 lanes (Capalaba to Cleveland)
	Busway	South East Busway Extension - Eight Mile Plains to Underwood, Bus Lanes to Springwood
	Rail	Sandgate to Shorncliffe duplication
	Road	Ipswich motorway upgrade (Rocklea to Darra) 6 lanes
	Road/ Bus	Centenary Mwy upgrade to 8 lane (inc T2) - Ips Mwy to Toowong roundabout)
	Road	Logan Mwy upgrade to 6 lanes (Ipswich Mwy to Gateway Mwy)
	Road	Port of Brisbane Mwy upgrade to 4 lanes
	Road	Ipswich Mwy upgrade to 6 lanes (Dinmore to Darra)
	Road	Pacific Mwy upgrade to 8 lanes inc T2 lanes (Gateway Mwy to Springwood)
By 2031	Rail	Ipswich to Springfield rail - Ipswich to Yamanto, Yamanto to Ripley TC, Ripley to Springfield
	Rail	NWTC rail (Strathpine to Alderley in Base Case; Strathpine to Roma Street in With Project Case)
	Rail	Salisbury to Flagstone rail
	Rail	Manly to Thornside duplication, Ormiston to Cleveland Duplication, Birkdale to Wellington Point duplication

Year	Type	Project
	Road	North South motorway
	Road	Stafford Rd 6 lanes
	Road	Riverside Expressway 8 lanes
	Road	Gateway Mwy upgrade to 6 lanes (Bruce Hwy to Nudgee Road)
	Road	Centenary Mwy upgrade to 4 lanes (south of Logan Mwy)
	Road	Gateway Mwy Extension south to Southern Infrastructure Corridor
	Road	Mt Lindsey Hwy updrgae to 4 and 6 lanes (Browns Plains to Jimboomba)
	Road/ bus	Mains Road upgrade to 6 lanes inc bus lanes

Appendix E Without Project case patronage forecasts

Table E1 Growth in line loadings AM peak (7-9am) – study corridor

AM peak		2009	2021		2031	
Line segment	**Direction**	**Line loading**	**Forecast line loading**	**% growth**	**Forecast line loading**	**% growth**
Dutton Park to Park Road	Northbound	9,600	15,900	66%	20,900	118%
Park Road to South Bank	Northbound	15,300	24,900	63%	31,900	109%
South Bank to South Brisbane	Northbound	13,800	22,000	60%	29,200	112%
South Brisbane to Roma Street	Northbound	11,300	17,600	57%	21,500	91%
Roma Street to Central	Northbound	17,200	28,100	63%	30,800	79%
Central to Fortitude Valley	Northbound	5,700	9,400	65%	13,000	127%
Fortitude Valley to Bowen Hills	Northbound	3,600	6,300	77%	8,500	139%
Bowen Hills to Fortitude Valley	Southbound	23,800	34,300	44%	44,100	85%
Fortitude Valley to Central	Southbound	22,300	32,400	46%	40,300	81%
Central to Roma Street	Southbound	8,000	13,300	66%	20,300	153%
Roma Street to South Brisbane	Southbound	3,900	7,800	101%	11,000	182%
South Brisbane to South Bank	Southbound	3,800	7,400	93%	9,800	158%
South Bank to Park Road	Southbound	2,400	4,400	82%	5,900	142%
Park Road to Dutton Park	Southbound	1,600	1,700	8%	2,800	76%

Source: Cross River Rail Project Model

Table E2 Growth in line loadings average weekday (24 hours) – study corridor

24 Hours		2009	2021		2031	
Line segment	**Direction**	**Line loading**	**Forecast line loading**	**% growth**	**Forecast line loading**	**% growth**
Dutton Park to Park Road	Northbound	21,400	43,500	103%	51,900	142%
Park Road to South Bank	Northbound	34,300	64,200	87%	71,300	108%
South Bank to South Brisbane	Northbound	28,100	53,100	89%	69,900	149%
South Brisbane to Roma Street	Northbound	23,900	45,500	90%	59,500	149%
Roma Street to Central	Northbound	40,100	70,600	76%	90,300	125%
Central to Fortitude Valley	Northbound	50,300	78,400	56%	99,300	97%
Fortitude Valley to Bowen Hills	Northbound	49,300	75,600	53%	98,400	99%
Bowen Hills to Fortitude Valley	Southbound	49,500	78,400	58%	94,500	91%
Fortitude Valley to Central	Southbound	49,400	80,000	62%	95,000	92%
Central to Roma Street	Southbound	42,800	74,000	73%	90,700	112%
Roma Street to South Brisbane	Southbound	25,100	47,400	88%	58,600	133%
South Brisbane to South Bank	Southbound	27,700	52,000	88%	65,500	137%
South Bank to Park Road	Southbound	31,900	62,500	96%	69,600	118%
Park Road to Dutton Park	Southbound	20,200	40,700	101%	47,300	134%

Source: Cross River Rail Project Model

Table E3 Station boardings and alightings (7am-9am)

AM peak	2009			2021				2031			
Station	**Forecast**			**Forecast**			**% change total**	**Forecast**			**% change total**
	board	alight	total	board	alight	total		board	alight	total	
Wooloowin	520	108	628	560	135	695	11%	1,748	673	2,421	286%
Albion	1,025	323	1,348	1,416	772	2,188	62%	2,849	1,326	4,175	210%
Bowen Hills	808	2,751	3,559	1,871	4,821	6,692	88%	2,097	5,535	7,632	114%
Fortitude Valley	468	4,214	4,682	1,000	6,029	7,029	50%	1,243	9,570	10,813	131%
Central	4,370	30,119	34,489	4,775	42,551	47,326	37%	5,763	43,576	49,339	43%
Roma Street	1,679	7,593	9,272	3,036	12,220	15,256	65%	4,466	22,232	26,698	188%
Park Road	581	623	1,204	1,933	1,906	3,839	219%	2,477	2,668	5,145	327%
Dutton Park	270	145	415	102	281	383	-8%	67	245	312	-25%
Fairfield	466	125	591	507	53	560	-5%	339	44	383	-35%
Yeronga	521	169	690	496	96	592	-14%	421	134	555	-20%
Yeerongpilly	362	329	691	698	626	1,324	92%	605	1,348	1,953	183%
Moorooka	325	79	404	283	92	375	-7%	140	102	242	-40%
Rocklea	99	208	307	82	146	228	-26%	51	160	211	-31%
Salisbury	172	53	225	893	447	1,340	496%	2,672	2,050	4,722	1,999%

Table E4 Station boardings and alightings (24 hour)

24 hours	2009			2021				2031			
Station	**Forecast**			**Forecast**			**% change total**	**Forecast**			**% change total**
	board	alight	total	board	alight	total		board	alight	total	
Wooloowin	1,099	1,283	2,382	1,352	1,298	2,650	11%	5,481	5,069	10,550	343%
Albion	2,540	2,495	5,035	4,044	3,500	7,544	50%	6,502	5,790	12,292	144%
Bowen Hills	5,884	6,782	12,666	12,277	13,609	25,886	104%	12,428	19,649	32,077	153%
Fortitude Valley	7,875	8,972	16,847	13,642	14,910	28,552	69%	20,114	20,563	40,677	141%
Central	54,017	50,331	104,348	77,089	75,372	152,461	46%	91,178	86,394	177,572	70%
Roma Street	17,763	18,717	36,480	31,603	30,581	62,184	70%	48,028	46,557	94,585	159%
Park Road	2,072	1,778	3,850	5,372	6,209	11,581	201%	7,488	9,833	17,321	350%
Dutton Park	496	484	980	485	899	1,384	41%	914	470	1,384	41%
Fairfield	596	540	1,136	804	860	1,664	46%	755	744	1,499	32%
Yeronga	1,036	946	1,982	1,383	1,354	2,737	38%	1,365	1,240	2,605	31%
Yeerongpilly	590	907	1,497	1,602	1,858	3,460	131%	2,822	3,025	5,847	291%
Moorooka	753	603	1,356	563	576	1,139	-16%	522	476	998	-26%
Rocklea	557	520	1,077	590	331	921	-14%	456	389	845	-22%
Salisbury	359	352	711	2,846	3,496	6,342	792%	5,822	5,607	11,429	1507%

Source: Cross River Rail Project Model

Table E5 Kiss and Ride and Park and Ride demands – 2009

2009	PNR BOARDING					KNR BOARDING					PNR ALIGHTING					KNR ALIGHTING				
Station	AM	OP	PM	EV	24H	AM	OP	PM	EV	24H	AM	OP	PM	EV	24H	AM	OP	PM	EV	24H
Wooloowin	84	54	8	22	168	80	54	9	24	167	3	62	74	29	168	3	62	72	30	167
Albion	290	266	34	72	662	91	59	9	25	184	11	298	244	109	662	3	68	80	33	184
Bowen Hills	0	0	0	0	0	128	83	6	26	243	0	0	0	0	0	2	82	115	44	243
Exhibition - CRR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central	0	0	0	0	0	178	118	13	38	347	0	0	0	0	0	4	123	160	60	347
Roma Street	0	0	0	0	0	167	97	10	35	309	0	0	0	0	0	3	104	149	53	309
Roma Street - CRR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Albert St - CRR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woolloongabba - CRR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Park Road	18	41	6	10	75	99	63	7	21	190	2	41	17	14	74	2	75	83	30	190
Boggo Road - CRR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dutton Park	0	0	0	0	0	97	57	6	20	180	0	0	0	0	0	2	68	80	29	179
Fairfield	5	6	1	2	14	79	43	8	21	151	0	6	5	2	13	3	59	65	24	151
Yeronga	173	162	23	50	408	63	33	6	15	117	10	183	157	59	409	2	49	48	17	116
Yeerongpilly	31	22	3	8	64	51	28	5	13	97	1	26	27	10	64	2	40	40	15	97
Moorooka	20	13	2	5	40	45	30	6	14	95	1	15	17	6	39	2	40	37	15	94
Rocklea	0	0	0	0	0	31	22	4	9	66	0	0	0	0	0	1	31	25	10	67
Salisbury	29	18	3	7	57	48	42	7	16	113	1	21	26	9	57	2	54	41	16	113

Source: Cross River Rail Project Model

Notes: AM = morning peak (7.00am to 9.00am); OP = daytime Off-Peak (9.00am to 4.00pm); PM = evening peak (4.00pm to 6.00pm); EV = Evening off-peak (6.00pm to 7.00am)

Table E6 Kiss and Ride and Park and Ride demands – 2021

2021 without CRR	PNR BOARDING					KNR BOARDING					PNR ALIGHTING					KNR ALIGHTING				
Station	AM	OP	PM	EV	24H	AM	OP	PM	EV	24H	AM	OP	PM	EV	24H	AM	OP	PM	EV	24H
Wooloowin	86	60	10	23	179	70	40	7	19	136	3	66	80	30	179	2	46	64	24	136
Albion	257	334	46	72	709	97	51	9	24	181	18	361	235	95	709	3	61	86	31	181
Bowen Hills	0	0	0	0	0	169	75	8	32	284	0	0	0	0	0	2	72	163	46	283
Exhibition - CRR	0	0	0	0	0	200	87	9	38	334	0	0	0	0	0	3	83	194	54	334
Central	0	0	0	0	0	274	127	18	54	473	0	0	0	0	0	5	125	265	77	472
Roma Street	0	0	0	0	0	308	135	19	59	521	0	0	0	0	0	5	136	297	83	521
Roma Street - CRR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Albert St - CRR	0	0	0	0	0	107	51	6	21	185	0	0	0	0	0	2	51	102	30	185
Woolloongabba - CRR	0	0	0	0	0	263	126	12	51	452	0	0	0	0	0	4	124	252	71	451
Park Road	18	55	5	8	86	137	69	6	26	238	2	56	16	13	87	2	71	127	39	239
Boggo Road - CRR	0	0	0	0	0	138	69	6	26	239	0	0	0	0	0	2	72	127	39	240
Dutton Park	0	0	0	0	0	128	63	6	24	221	0	0	0	0	0	2	66	116	36	220
Fairfield	2	6	0	1	9	104	50	9	25	188	0	6	2	1	9	3	63	91	31	188
Yeronga	146	226	33	53	458	85	39	7	20	151	12	252	133	60	457	3	55	71	24	153
Yeerongpilly	30	41	4	10	85	69	34	7	18	128	2	46	26	11	85	3	46	59	21	129
Moorooka	18	20	2	5	45	55	32	7	18	112	1	22	17	6	46	2	41	49	19	111
Rocklea	0	0	0	0	0	38	22	5	12	77	0	0	0	0	0	2	30	32	13	77
Salisbury	24	14	3	6	47	44	32	8	16	100	1	17	22	7	47	3	41	39	17	100

Source: Cross River Rail Project Model

Notes: AM = morning peak (7.00am to 9.00am); OP = daytime Off-Peak (9.00am to 4.00pm); PM = evening peak (4.00pm to 6.00pm); EV = Evening off-peak (6.00pm to 7.00am)

Table E7 Kiss and Ride and Park and Ride demands – 2031

2031 without CRR	PNR BOARDING					KNR BOARDING					PNR ALIGHTING					KNR ALIGHTING				
Station	AM	OP	PM	EV	24H	AM	OP	PM	EV	24H	AM	OP	PM	EV	24H	AM	OP	PM	EV	24H
Wooloowin	98	50	10	26	184	80	46	8	21	155	3	56	91	34	184	2	57	69	26	154
Albion	309	297	51	86	743	106	54	10	25	195	18	328	280	117	743	3	70	89	33	195
Bowen Hills	0	0	0	0	0	141	63	8	28	240	0	0	0	0	0	2	65	132	41	240
Exhibition - CRR	0	0	0	0	0	167	74	10	32	283	0	0	0	0	0	2	76	157	48	283
Central	0	0	0	0	0	221	109	16	45	391	0	0	0	0	0	4	110	213	64	391
Roma Street	0	0	0	0	0	266	123	17	52	458	0	0	0	0	0	4	124	258	73	459
Roma Street - CRR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Albert St - CRR	0	0	0	0	0	85	43	6	18	152	0	0	0	0	0	2	43	81	25	151
Woolloongabba - CRR	0	0	0	0	0	253	136	14	54	457	0	0	0	0	0	5	133	242	76	456
Park Road	24	68	7	10	109	123	68	7	27	225	3	68	21	17	109	3	67	116	40	226
Boggo Road - CRR	0	0	0	0	0	118	64	6	26	214	0	0	0	0	0	2	63	110	39	214
Dutton Park	0	0	0	0	0	107	60	6	23	196	0	0	0	0	0	2	59	99	36	196
Fairfield	3	5	1	1	10	93	54	11	28	186	0	6	3	1	10	3	65	88	32	188
Yeronga	142	233	39	62	476	75	44	10	22	151	16	251	144	65	476	3	56	67	24	150
Yeerongpilly	34	50	5	13	102	73	45	10	22	150	2	53	33	15	103	4	58	64	24	150
Moorooka	23	24	3	6	56	61	39	9	20	129	1	25	22	7	55	3	53	51	21	128
Rocklea	0	0	0	0	0	42	25	6	13	86	0	0	0	0	0	2	38	32	14	86
Salisbury	26	14	3	7	50	47	30	7	16	100	1	16	24	8	49	3	43	38	17	101

Source: Cross River Rail Project Model

Notes: AM = morning peak (7.00am to 9.00am); OP = daytime Off-Peak (9.00am to 4.00pm); PM = evening peak (4.00pm to 6.00pm); EV = Evening off-peak (6.00pm to 7.00am)

Appendix F With Project case patronage forecasts

Table F1 AM peak rail boardings / alightings by line – with Cross River Rail

Line	2021		2031	
	Boarding	Alighting	Boarding	Alighting
Sunshine Coast	4,250	1,820	13,740	3,620
Caboolture	7,940	1,830	23,010	8,140
Redcliffe	11,150	2,120	7,610	3,640
Shorncliffe	4,410	570	6,230	680
Airport	160	480	340	1,820
Doomben	310	190	550	680
Ferny Grove	8,220	1,930	7,830	2,280
NORTH TOTAL	36,440	8,940	59,310	20,860
Inner North	17,060	14,280	16,030	12,680
CBD	12,770	79,940	21,380	112,740
Inner South	7,250	12,810	9,870	17,250
INNER TOTAL	37,080	107,030	47,280	142,670
Ipswich	14,170	5,340	20,890	10,020
Springfield	12,640	5,600	17,700	10,310
Cleveland	12,300	4,290	13,550	5,550
Hillcrest	-	-	7,180	2,130
Beenleigh	16,740	6,110	13,050	6,470
Gold Coast	11,940	4,010	27,030	7,960
SOUTH TOTAL	67,790	25,350	99,400	42,440
TOTAL	141,310	141,320	205,990	205,970

Source: Cross River Project Model

Table F2 AM peak period (7am – 9am) alightings by access/egress modes – with Cross River Rail

Station	2021				2031			
	Final alightings	Transfer to bus	Transfer to rail	Total alightings	Final alightings	Transfer to bus	Transfer to rail	Total alightings
Park Rd	200	750	850	1,800	400	720	880	1,900
Boggo Rd – CRR	300	720	380	1,400	800	1,680	420	2,900
South Bank	5,300	100	-	5,400	5,500	-	-	5,500
South Brisbane	2,000	100	-	2,000	3,200	100	-	3,300
Gabba – CRR	2,200	900	-	3,200	4,400	1,060	40	5,500
Albert St – CRR	26,000	160	40	26,100	35,500	200	-	35,800
Roma St	5,900	570	4,330	10,800	7,700	660	5,640	14,000
Roma St – CRR	8,600	540	860	10,000	12,100	1,930	5,370	19,400
Ekka – CRR	1,900	-	-	1,900	1,000	-	-	1,000
Central	25,700	100	1,100	26,900	31,900	790	2,810	35,500
Fortitude Valley	5,200	-	-	5,200	8,100	-	-	8,100
Bowen Hills	4,200	90	310	4,600	4,600	70	830	5,500
CBD TOTAL	66,200	1,370	6,330	73,800	87,200	3,580	13,820	104,700
TOTAL	87,500	4,030	7,870	99,300	115,200	7,210	15,990	138,400

Source: Cross River Project Model

Note: CBD stations defined as Roma Street and Central

Table F3 CBD and inner city rail AM peak boardings / alightings by station – with Cross River Rail

Area	Rail station name	2021		2031	
		Boarding	Alighting	Boarding	Alighting
Inner North	Northgate	4,200	2,700	4,400	3,000
	Nundah	600	100	1,100	200
	Toombul	1,000	600	1,600	800
	Eagle Junction	6,000	4,400	2,200	1,000
	Wooloowin	900	200	1,200	300
	Albion	1,700	700	2,300	900
	Bowen Hills	1,500	4,600	2,400	5,500
	Ekka – CRR	1,200	1,900	700	1,000
Total		17,100	15,200	15,900	12,700
CBD	Fortitude Valley	800	5,200	900	8,100
	Central	3,600	26,900	6,000	35,500
	Roma Street	3,100	10,800	7,200	14,000
	Roma St – CRR	4,200	10,000	5,800	19,400
	Albert St	1,100	26,100	1,500	35,800
Total		12,800	79,000	21,400	112,800
Inner South	South Brisbane	400	2,000	200	3,300
	South Bank	1,000	5,400	1,000	5,500
	Park Road	1,200	1,800	1,100	1,900
	Gabba – CRR	2,900	3,200	5,500	5,500
	Boggo Rd – CRR	1,900	1,400	2,600	2,900
Total		7,400	13,800	10,400	19,100

Source: Cross River Project Model

Table F4 Line Loadings with and without Cross River Rail

Location		2021			2031		
		Without CRR	With CRR	change	Without CRR	With CRR	change
Dutton Park to Park Road	Northbound	15,900	6,600	-58%	20,900	7,200	-66%
Park Road to South Bank	Northbound	24,900	16,000	-36%	31,900	16,300	-49%
South Bank to South Brisbane	Northbound	22,000	13,900	-37%	29,200	14,400	-51%
South Brisbane to Roma Street	Northbound	17,600	12,400	-30%	21,500	12,100	-44%
Roma Street to Central	Northbound	28,100	25,500	-9%	30,800	30,100	-2%
Central to Fortitude Valley	Northbound	9,400	7,900	-16%	13,000	12,000	-8%
Fortitude Valley to Bowen Hills	Northbound	6,300	4,500	-29%	8,500	6,800	-20%
Bowen Hills to Albion	Northbound	3,500	3,700	6%	5,600	4,500	-20%
Yeerongpilly to Boggo Road (CRR)	Northbound	-	14,800	-	-	28,300	-
Boggo Road to Gabba (CRR)	Northbound	-	16,200	-	-	29,300	-
Gabba to Albert Street (CRR)	Northbound	-	17,700	-	-	32,200	-
Albert Street to Roma Street (CRR)	Northbound	-	6,300	-	-	12,000	-
Roma Street to Strathpine (CRR)	Northbound	-	-	-	-	2,600	-
Roma Street to Ekka (CRR)	Northbound	-	2,600	-	-	900	-
Ekka to Albion (CRR)	Northbound	-	2,200	-	-	500	-
Albion to Ekka (CRR)	Southbound	-	20,300	-	-	6,100	-
Ekka to Roma Street (CRR)	Southbound	-	20,000	-	-	6,200	-
Strathpine to Roma Street (CRR)	Southbound	-	-	-	-	20,100	-
Roma Street to Albert Street (CRR)	Southbound	-	17,900	-	-	21,200	-
Albert Street to Gabba (CRR)	Southbound	-	4,200	-	-	7,100	-
Gabba to Boggo Road (CRR)	Southbound	-	2,400	-	-	4,200	-
Boggo Road to Yeerongpilly (CRR)	Southbound	-	1,600	-	-	2,800	-

Location		2021			2031		
		Without CRR	With CRR	change	Without CRR	With CRR	change
Albion to Bowen Hills	Southbound	27,800	30,700	10%	33,200	22,300	-33%
Bowen Hills to Fortitude Valley	Southbound	34,300	16,500	-52%	44,100	25,900	-41%
Fortitude Valley to Central	Southbound	32,400	15,500	-52%	40,300	23,800	-41%
Central to Roma Street	Southbound	13,300	9,800	-26%	20,300	12,500	-38%
Roma Street to South Brisbane	Southbound	7,800	4,800	-38%	11,000	6,000	-45%
South Brisbane to South Bank	Southbound	7,400	4,700	-36%	9,800	5,200	-47%
South Bank to Park Road	Southbound	4,400	2,500	-43%	5,900	2,600	-56%
Park Road to Dutton Park	Southbound	1,700	400	-76%	2,800	700	0%

Source: Cross River Project Model

Table F5 Load factors (as a proportion of seated capacity) with and without Cross River Rail

Location		2021			2031		
		Without CRR	With CRR	change	Without CRR	With CRR	change
Dutton Park to Park Road	Northbound	153%	126%	-27%	182%	125%	-57%
Park Road to South Bank	Northbound	146%	116%	-30%	186%	138%	-48%
South Bank to South Brisbane	Northbound	129%	100%	-29%	171%	122%	-49%
South Brisbane to Roma Street	Northbound	103%	89%	-14%	126%	103%	-23%
Roma Street to Central	Northbound	94%	79%	-15%	95%	117%	22%
Central to Fortitude Valley	Northbound	31%	26%	-5%	40%	47%	7%
Fortitude Valley to Bowen Hills	Northbound	21%	15%	-6%	26%	27%	1%
Bowen Hills to Albion	Northbound	16%	17%	1%	23%	25%	2%
Yeerongpilly to Boggo Road (CRR)	Northbound	-	122%	-	-	115%	-
Boggo Road to Gabba (CRR)	Northbound	-	133%	-	-	119%	-
Gabba to Albert Street (CRR)	Northbound	-	145%	-	-	131%	-
Albert Street to Roma Street (CRR)	Northbound	-	52%	-	-	49%	-

Location		2021			2031		
		Without CRR	With CRR	change	Without CRR	With CRR	change
Roma Street to Strathpine (CRR)	Northbound	-	-	-	-	13%	-
Roma Street to Ekka (CRR)	Northbound	-	22%	-	-	23%	-
Ekka to Albion (CRR)	Northbound	-	18%	-	-	13%	-
Albion to Ekka (CRR)	Southbound	-	123%	-	-	145%	-
Ekka to Roma Street (CRR)	Southbound	-	121%	-	-	147%	-
Strathpine to Roma Street (CRR)	Southbound	-	-	-	-	94%	-
Roma Street to Albert Street (CRR)	Southbound	-	109%	-	-	82%	-
Albert Street to Gabba (CRR)	Southbound	-	25%	-	-	27%	-
Gabba to Boggo Road (CRR)	Southbound	-	15%	-	-	16%	-
Boggo Road to Yeerongpilly (CRR)	Southbound	-	9%	-	-	11%	-
Albion to Bowen Hills	Southbound	130%	114%	-16%	135%	124%	-11%
Bowen Hills to Fortitude Valley	Southbound	120%	87%	-33%	137%	110%	-27%
Fortitude Valley to Central	Southbound	113%	81%	-32%	125%	101%	-24%
Central to Roma Street	Southbound	46%	47%	1%	63%	53%	-10%
Roma Street to South Brisbane	Southbound	47%	47%	0%	71%	60%	-11%
South Brisbane to South Bank	Southbound	44%	45%	1%	64%	52%	-12%
South Bank to Park Road	Southbound	27%	24%	-3%	38%	26%	-12%
Park Road to Dutton Park	Southbound	17%	17%	0%	29%	29%	0%

Source: Cross River Project Model

Table F6 Average weekday (24 hour) rail patronage data

Parameter	2021			2031		
	Without CRR	With CRR	% change	Without CRR	With CRR	% change
Total rail passenger kilometre	9,645,100	10,174,200	5.49%	12,741,900	14,179,700	11.28%
Total rail passenger hours	226,200	227,800	0.71%	291,400	292,500	0.38%
Total rail patronage	421,900	454,200	7.66%	529,500	595,400	12.45%
Average rail trip length (km)	22.9	22.4	-2.18%	24.1	23.8	-1.03%
Average rail trip time (min)	32.2	30.1	-6.52%	33.0	29.5	-10.71%
Average rail trip speed (km/h)	42.63	44.67	4.79%	43.73	48.47	10.85%

Source: Cross River Project Model

Table F7 Network boardings and alightings with the Project compared to without the project (average weekday – 24hours)

TransLink Transit Authority Zone	2021			2031		
	Without CRR	With CRR	% change	Without CRR	With CRR	% change
1 - Boarding	304,800	295,700	-2.99%	370,800	389,400	5.02%
1 - Alighting	305,500	297,900	-2.49%	377,000	396,300	5.12%
2 - Boarding	175,700	202,300	15.14%	252,300	276,200	9.47%
2 - Alighting	175,700	200,200	13.94%	248,400	271,100	9.14%
3 - Boarding	120,000	118,600	-1.17%	167,200	165,100	-1.26%
3 - Alighting	125,500	124,200	-1.04%	172,300	170,000	-1.33%
>3 - Boarding	352,300	348,600	-1.05%	502,100	525,900	4.74%
>3 - Alighting	345,900	342,700	-0.93%	494,800	519,200	4.93%
Total	1,905,400	1,930,200	1.30%	2,584,900	2,713,200	4.96%

Source: Cross River Project Model

Table F8 Station boardings and alightings with the Project compared to without Cross River Rail (morning peak period)

AM peak	2021			2031		
	Without CRR	With CRR	% change	Without CRR	With CRR	% change
Wooloowin	695	1,020	47%	2,421	1,504	-38%
Albion	2,188	2,352	7%	4,175	3,187	-24%
Bowen Hills	6,692	6,075	-9%	7,632	7,887	3%
Fortitude Valley	7,029	6,056	-14%	10,813	8,950	-17%
Central	47,326	30,535	-35%	49,339	41,558	-16%
Roma Street	15,256	13,820		26,698	21,161	
Roma Street - CRR		14,232			25,188	
ROMA STREET TOTAL	15,256	28,052	84%	26,698	46,349	74%
Albert St - CRR		27,220			37,256	
Gabba - CRR		6,036			10,930	
Park Road	3,839	2,995		5,145	2983	
Boggo Road - CRR		3,337			5446	
BOGGO/ PARK RD TOTAL	3,839	6,332	65%	5,145	8,429	64%
Dutton Park	383	428	12%	312	633	103%
Fairfield	560	1,014	81%	383	1,173	206%
Yeronga	592	645	9%	555	806	45%
Yeerongpilly	1,324	3,711	180%	1,953	3,175	63%
Moorooka	375	552	47%	242	942	289%
Rocklea	228	368	61%	211	466	121%
Salisbury	1,340	699	-48%	4,722	5,429	15%

Source: Cross River Project Model

Table notes: Morning peak period is 7.00am to 9.00am

Table F9 Station boardings and alightings with the Project compared to without Cross River Rail (24 hours)

24 hours	2021			2031		
	Without CRR	With CRR	% change	Without CRR	With CRR	% change
Wooloowin	2,650	2,675	1%	10,550	4,072	-61%
Albion	7,544	7,496	-1%	12,292	9,631	-22%
Bowen Hills	25,886	18,476	-29%	32,077	29,237	-9%
Fortitude Valley	28,552	21,490	-25%	40,677	28,525	-30%
Central	152,461	93,309	-39%	177,572	122,269	-31%
Roma Street	62,184	48,930		94,585	74,194	
Roma Street - CRR	0	41,708		0	75,728	
ROMA STREET TOTAL	62,184	90,638	46%	94,585	149,922	59%
Albert St - CRR	0	93,517		0	106,100	
Gabba - CRR	0	22,833		0	35,811	
Park Road	11,581	7,174		17,321	7,410	
Boggo Road - CRR	0	9,882		0	16,624	
BOGGO/ PARK RD TOTAL	11,581	17,056	47%	17,321	24,034	39%
Dutton Park	1,384	1,274	-8%	1,384	1,943	40%
Fairfield	1,664	2,141	29%	1,499	2,658	77%
Yeronga	2,737	2,413	-12%	2,605	2,716	4%
Yeerongpilly	3,460	9,197	166%	5,847	8,348	43%
Moorooka	1,139	1,264	11%	998	2,138	114%
Rocklea	921	921	0%	845	1,265	50%
Salisbury	6,342	2,847	-55%	11,429	15,608	37%

Source: Cross River Project Model

Table F10 Rail to rail transfers with the Project compared to without Cross River Rail (24 hour)

Station	2021			2031		
	Without CRR	With CRR	% change	Without CRR	With CRR	% change
Bowen Hills	1,900	1,900	0%	2,000	2,000	0%
Fortitude Valley	300	300	0%	600	600	0%
Brisbane Central	4,500	4,500	0%	8,200	8,200	0%
Roma Street	9,700	8,900	-8%	14,900	19,100	28%
Roma Street - CRR		5,200			13,800	
ROMA ST TOTAL	9,700	14,100	45%	14,900	32,900	121%
Albert Street - CRR		0			0	
Gabba - CRR		0			0	
Park Road	1,100	1,400		1,600	1,200	
Boggo Road - CRR		1,100			1,400	
PARK RD/ BOGGO RD TOTAL	1,100	2,500	127%	1,600	2,600	63%

Source: Cross River Project Model

Table F11 Kiss and Ride and Park and Ride demands – With Cross River Rail 2021

2021 with CRR	PNR BOARDING					KNR BOARDING					PNR ALIGHTING					KNR ALIGHTING				
Station	**AM**	**OP**	**PM**	**EV**	**24H**	**AM**	**OP**	**PM**	**EV**	**24H**	**AM**	**OP**	**PM**	**EV**	**24H**	**AM**	**OP**	**PM**	**EV**	**24H**
Wooloowin	92	58	10	25	185	89	46	8	22	165	3	66	84	32	185	2	55	79	29	165
Albion	300	351	48	82	781	122	60	10	29	221	18	383	271	109	781	3	74	107	38	222
Bowen Hills	0	0	0	0	0	182	81	9	36	308	0	0	0	0	0	3	78	176	51	308
Exhibition - CRR	0	0	0	0	0	244	108	12	48	412	0	0	0	0	0	4	105	234	69	412
Central	0	0	0	0	0	262	126	19	53	460	0	0	0	0	0	5	125	254	76	460
Roma Street	0	0	0	0	0	291	133	20	57	501	0	0	0	0	0	5	135	281	80	501
Roma Street - CRR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Albert St - CRR	0	0	0	0	0	95	50	7	20	172	0	0	0	0	0	2	50	92	29	173
Woolloongabba - CRR	0	0	0	0	0	252	128	13	51	444	0	0	0	0	0	5	125	241	73	444
Park Road	21	60	6	10	97	123	68	7	26	224	3	61	19	15	98	2	68	114	39	223
Boggo Road - CRR	0	0	0	0	0	129	70	7	27	233	0	0	0	0	0	2	71	119	41	233
Dutton Park	0	0	0	0	0	122	66	6	25	219	0	0	0	0	0	2	68	111	38	219
Fairfield	4	11	1	2	18	112	56	10	28	206	0	11	4	1	16	3	70	99	34	206
Yeronga	168	234	33	61	496	101	48	9	24	182	12	266	149	70	497	3	64	85	29	181
Yeerongpilly	34	42	5	11	92	98	45	8	23	174	2	47	29	14	92	3	61	83	29	176
Moorooka	22	22	2	5	51	89	43	8	24	164	1	24	20	7	52	3	59	74	28	164
Rocklea	0	0	0	0	0	61	30	6	17	114	0	0	0	0	0	2	44	49	19	114
Salisbury	28	15	3	6	52	68	38	9	20	135	1	18	25	8	52	3	53	56	23	135

Source: Cross River Rail Project Model

Notes: AM = morning peak (7.00am to 9.00am); OP = daytime Off-Peak (9.00am to 4.00pm); PM = evening peak (4.00pm to 6.00pm); EV = Evening off-peak (6.00pm to 7.00am)

Table F12 Kiss and Ride and Park and Ride demands – With Cross River Rail 2031

2031 with CRR	PNR BOARDING					KNR BOARDING					PNR ALIGHTING					KNR ALIGHTING				
Station	**AM**	**OP**	**PM**	**EV**	**24H**	**AM**	**OP**	**PM**	**EV**	**24H**	**AM**	**OP**	**PM**	**EV**	**24H**	**AM**	**OP**	**PM**	**EV**	**24H**
Wooloowin	101	52	11	27	191	86	48	8	22	164	4	59	94	35	192	3	59	74	27	163
Albion	338	310	51	90	789	115	57	10	27	209	18	343	304	124	789	3	74	96	35	208
Bowen Hills	0	0	0	0	0	148	68	9	29	254	0	0	0	0	0	2	70	139	43	254
Exhibition - CRR	0	0	0	0	0	190	86	11	37	324	0	0	0	0	0	3	88	178	55	324
Central	0	0	0	0	0	238	124	20	49	431	0	0	0	0	0	5	125	231	70	431
Roma Street	0	0	0	0	0	264	130	21	53	468	0	0	0	0	0	5	131	258	74	468
Roma Street - CRR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Albert St - CRR	0	0	0	0	0	81	46	7	17	151	0	0	0	0	0	2	46	78	25	151
Woolloongabba - CRR	0	0	0	0	0	245	146	16	54	461	0	0	0	0	0	6	144	234	78	462
Park Road	25	71	7	11	114	112	76	8	26	222	3	71	22	18	114	3	75	105	39	222
Boggo Road - CRR	0	0	0	0	0	114	80	8	27	229	0	0	0	0	0	3	79	106	40	228
Dutton Park	0	0	0	0	0	112	74	7	25	218	0	0	0	0	0	3	74	103	39	219
Fairfield	5	8	1	2	16	117	67	13	33	230	1	8	5	2	16	4	80	107	38	229
Yeronga	183	220	40	67	510	111	61	12	28	212	16	241	177	76	510	4	78	96	34	212
Yeerongpilly	46	43	5	14	108	121	64	12	31	228	2	47	42	18	109	5	84	103	36	228
Moorooka	24	16	2	6	48	101	55	11	27	194	1	18	21	7	47	4	74	84	31	193
Rocklea	0	0	0	0	0	68	37	8	19	132	0	0	0	0	0	3	53	54	21	131
Salisbury	34	17	3	8	62	79	44	10	23	156	1	19	31	10	61	4	61	65	26	156

Source: Cross River Rail Project Model

Notes: AM = morning peak (7.00am to 9.00am); OP = daytime Off-Peak (9.00am to 4.00pm); PM = evening peak (4.00pm to 6.00pm); EV = Evening off-peak (6.00pm to 7.00am)


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