8. Construction impacts

8.1 Introduction

This chapter addresses the rail, bus, road traffic, pedestrian and cycling impacts likely to arise from the construction of the Project. It has been prepared in accordance with the 'Road Impact Assessment Report' under the general guidance of TMRs 'Guidelines for Assessment of Road Impacts of Development'. This section also includes an assessment of the impact on rail and bus services and other transport modes during the construction period.

In particular, this section sets out to address the considerations from Section 9.12 of the ToR for an EIS. Requirements from Section 9.12 relevant to this section are to describe the following information:

- the proposed spoil transport routes, receiving methods and locations
- location and scale of parking requirements.

The ToR also states that the Project's transport objectives during the construction and operation of the Project should aim to:

- maintain the safety and efficiency of all affected transport modes for the Project workforce and other transport system users
- avoid or mitigate impacts on the condition of transport infrastructure
- ensure any required works are compatible with existing infrastructure and future transport corridors.

This section 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 assessment also provides some guidelines to the requirements for traffic management that would need to be adhered to as more detailed plans are prepared and would be incorporated into the Construction Environmental Management Plans (CEMP).

8.2 Guiding principles

A summary is provided of the guiding principles to be applied to construction traffic management during construction. More detailed information of specific traffic management techniques would be contained in the Framework TMP and the individual Construction Traffic Management Plans (CTMP) for each worksite, which would be prepared prior to the commencement of construction as outlined in Element 2 of **Chapter 18 – Draft Outline EMP**.

A Framework TMP is a high level overarching document outlining the principles of construction traffic management and detailed consultation, approvals processes and monitoring. It is envisaged that the Framework TMP would be approved by TMR (Metropolitan Region) and Brisbane City Council as appropriate, and in consultation with the Brisbane Metropolitan Transport Management Centre (BMTMC), Queensland Police Services and emergency services.

Following the approval of the Framework TMP, CTMPwould be developed for each individual worksite prior to the commencement of works. Within each CTMP, detailed active TMPs and workforce car park management plans would be required.

The construction traffic arrangements of the Project would be designed to occur with the minimum possible disruption to pedestrians, traffic and other transport users. The construction traffic management objectives are, to the extent reasonable and practicable, to:

- 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
- minimise 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 pedestrian footpaths where ever possible
- minimise construction activities on the road network
- minimise traffic at construction worksites by providing remote parking for the workforce
- transport most excavated material from locations close to arterial road network connections, including the southern and northern worksites.

All construction activity undertaken or proposed for the 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
- well informed road users are more likely to be 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
- the Project should present detailed information that would assist 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 travel choices.

The 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 the reasonable and practicable minimising of impacts of construction on public transport, private traffic, pedestrians and cyclists.

Performance criteria proposed to achieve these principles, are to be included in the Framework TMP 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

- bus services and schedules during peak travel times are maintained where possible
- freight rail services and key schedules nominated by the rail network manager are maintained where possible
- haulage vehicles ie spoil haulage, fill haulage, construction equipment and associated material haulage only travel on designated construction routes, unless approved by the TMR Chief Executive in consultation with Brisbane City Council
- local roads are not used by construction vehicles, unless approved by the Chief Executive of Transport and Main Roads in consultation with Brisbane City Council
- traffic flows near construction works are maintained during peak traffic periods and managed during off-peak periods to minimise disruption
- worker parking is provided in sufficient numbers and managed to avoid impact on communities near to construction worksites. Construction workers would be encouraged to car share and use public transport where practical
- information about the timing and scale of changes to traffic and transport conditions on passenger rail and bus 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 management of such facilities.

8.3 Main construction phase

The main construction phase includes the excavation of stations and tunnels and is the busiest period of truck movements for the Project. Truck movements are related to the delivery of material and the removal of spoil

8.3.1 Delivery vehicle trip generation

The order of magnitude estimate of truck movements with respect to deliveries is listed in **Table 8-1**.

Table 8-1 Delivery vehicle trip generation – one way movements

Element	Total number of delivery trucks	Average Rate (trucks/ day)	Peak Rate (trucks/ day)
Boggo Road construction worksite	2,300	5	12
Southern Connection PA Hospital construction worksite	22,600	26	55
Woolloongabba construction worksite	10,000	12	14
George Street construction worksite	8,800	10	10
Roma Street construction worksite	9,900	12	14
Northern Busway and Rail Connections	1,100	1	3
Northern Connection	3,200	11	11

Note: Truck volumes are one way truck movements

8.3.2 Spoil vehicle trip activity and generation

Tunnel and station excavation would require the removal of approximately 1.78 million m^3 of insitu material, or approximately 4.3 million tonnes of spoil. The majority of spoil would be generated from the TBM running tunnel site at the southern worksites. However, the northern and station worksites would also generate significant volumes of spoil. Spoil removal is projected to occur over approximately 2.5 years, with major excavations occurring over a two year period.

It is proposed that spoil would be removed by road. Spoil haulage is proposed to occur 24 hours a day, seven days a week from the PA Hospital TBM service site. The Woolloongabba, and northern construction worksites would also operate during these hours but truck movement would be restricted during the commuter peak periods. For other sites, spoil haulage would generally occur between 6.30am and 10.00pm Monday to Friday and Saturday between 6.30am and 6.30pm, apart from the Boggo Road worksite where reduced hours would be used due to the close proximity of schools and residential communities. Spoil activities would not take place on Sundays or public holidays except where stated as seven days a week in **Table 8-2.** Consideration would be given to peak traffic periods in the spoil haulage planning. The detail of spoil haulage hours for each worksite are provided in **Table 8-2**.

Spoil would be stockpiled at each construction worksite as necessary when haulage of spoil does not occur.

Table 8-2 Worksite operational hours for spoil haulage

Element	Haulage operational hours	Comment
Boggo Road construction worksite	06.30 to 7.00, 9.00 to 14.00 and 16.00 to 18.30 Monday to Friday 06.30 to 18.30 Saturday None – Sunday	Not during school drop off and pick up times.
Southern Connection PA Hospital worksite	24 hours/ 7 days a week	
Woolloongabba construction worksite	24 hours/ 7 days a week Except 6.00am to 9.00am and 4.00pm to 6.00pm Monday to Friday	Not commuter peak hours Not during special events
George Street construction worksite	06.30 to 22.00 Monday to Friday Except 6.00am to 9.00am and 4.00pm to 6.00pm Monday to Friday 06.30 to 18.30 Saturday Sunday none	Not commuter peak hours Not during special events
Roma Street construction worksite	06.30 to 22.00 Monday to Friday Except 6.00am to 9.00am and 4.00pm to 6.00pm Monday to Friday 06.30 to 18.30 Saturday Sunday none	Not commuter peak hours
Northern Busway and Rail Connections	06.30 to 22.00 Monday to Friday Except 6.00am to 9.00am and 4.00pm to 6.00pm Monday to	Not commuter peak hours

Element	Haulage operational hours	Comment
	Friday 06.30 to 18.30 Saturday Sunday none	
Northern Connection construction worksite	06.30 to 22.00 Monday to Friday Except 6.00am to 9.00am and 4.00pm to 6.00pm Monday to Friday 06.30 to 18.30 Saturday Sunday none	Not commuter peak hours

It is anticipated that an average of about 80 truck and trailer ('truck and dog') combinations per day would be required for spoil haulage from the PA Hospital TBM service worksite. At the maximum advance rate for the TBM (150m per week), this increases to almost 200 loads per day. Removal of spoil from the construction of underground stations at Woolloongabba, George Street and Roma Street would require up to 40 trucks per day during the peak excavation periods for each of the stations respectively. **Table 8-3** provides the proposed spoil haulage for each worksite.

Table 8-3 Spoil trip generation – one way movements

Element	Duration	Total spoil trucks	Average rate (truck/ day)	Peak rate (truck/ day)	Peak rate (truck/ hour)	Duration of peak activity
Boggo Road construction worksite	May 16 – June 20	10,100	22	60	9	3 months July 16 – Sept 16
PA Hospital construction worksite	Jun 16 – Dec 19	76,200	84	194	9	More than 4 trucks an hour for 18 months. July 18 - Dec 19
Woolloongabba construction worksite	May 16 – Nov 19	18,000	14	41	2	12 months April 16 March 17
George Street construction worksite	Jun 16 – May 20	21,800	25	40	4	15 months July 16 - Sept 17
Roma Street construction worksite	Oct 16 – Aug 20	15,300	12	44	5	6 months Jan 17 - June 17
Northern Busway and Rail Connections	Jul 16 – Mar 20	600	2	3	1	9 months Oct 17 – June 18
Northern construction worksite	Jan 18 – Mar 20	5,000	20	20	2	9 months Jan 18 – Aug 18

Note: Truck volumes are one way truck movements

8.4 Rail Services – assessment of construction effects

The construction of the Project would include both major surface and underground works. Much of the surface rail works would interface with the existing rail network requiring works being conducted in or close to areas where passenger and freight rail services operate. The detailed construction methodology would include measures such as maximising works outside the danger zone through the isolation of the worksite from rail traffic and overhead energy by, for example overhead isolation, closing of tracks and locking of points.

Underground works would be planned to have minimal impact on rail operations. Of the stations only Roma Street and Dutton Park have construction activities that would have a direct impact on the current rail network and specific construction methods would be required to support the surface infrastructure at Park Road Station.

The extent of surface works south of the portal at Dutton Park and north of the portal at Victoria Park would be significant. Generally all passenger and freight rail services would continue to operate except when the Project 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 construction with already scheduled rail maintenance activities. Shutdowns would typically not be requested during major events such as the State of Origin, AFL or cricket games, and Riverfire.

Surface Rail works south of the southern connections worksite

South of the southern portal, all passenger services would generally continue as would freight rail services subject to formal line closures.

Roma Street Station

The construction of the connection between the existing Roma Street Station subway and the new underground station would require acquisition of the staff car park adjacent to the long distance platform, Platform 10. 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.

The Roma Street worksite would require the relocation of the passenger access to Platform 10. It is proposed that this access is relocated further west of the existing platform location. Direct access would be provided to a temporary set down area on Parkland Crescent under the Central Parkland Apartments. Car parking could be provided within the existing Roma Street Parkland commercial car park. Access to the temporary platform from the Transit Centre and other Roma Street Station platforms would be possible via the existing pedestrian subway and vertical transportation to Platform 10 and continuing along Platform 10 to its western end.

The establishment of a turnaround facility on Parkland Crescent would enable light vehicles to enter and exit the relocated passenger drop off area via the same route along Parkland Crescent, under the Central Parkland Apartments.

Surface rail works north of the northern portal

North of the northern portal, works would be required to connect to the existing rail tracks (the Exhibition Loop) adjacent to the ICB. Passenger rail services do not currently use the Exhibition Loop

to serve Exhibition Station except during the Royal Queensland Show (Ekka) and the Caravan and Camping Show.

The Exhibition Loop provides an important connection for 'out of service' passengers trains to access Mayne Yards and for North Coast line freight rail traffic between the northern lines and the western and southern lines.

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 overhead line equipment.

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. These would seek to avoid the Ekka show days and works would be designed and timed so that there was sufficient track capacity to allow typical weekday peak period rail schedules to be maintained and impacts to third party operators to be negotiated where unavoidable and minimised where possible.

Rail maintenance

Project construction works would occur within close proximity to existing railway stabling and maintenance facilities and staff access points to such facilities at Dutton Park and Normanby Yard. While accesses would generally be maintained for staff and trains throughout the construction period, any temporary closure or diversion would need to be identified 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.

8.5 Busway services – assessment of construction effects

The construction of the Project would include both surface and underground works. Much of the surface busway works would interface with the existing busway network, requiring busway and rail works being conducted in or close to areas where busway services operate. The detailed construction methodology would include measures such as maximising works outside the busway corridor and carrying out works outside of busway operational hours.

Underground works would have negligible impact on current operations. The Project works would not interfere with the existing busway operations at any of the Project stations.

During short term busway shutdowns, construction activities would be planned well in advance to minimise disruption to the network. Shutdowns would not typically be permitted during major events such as the State of Origin and other major events at Suncorp Stadium, AFL or cricket games, and Riverfire or during peak commuter travel times (ie shutdowns should be limited to night time, weekends and holiday periods).

The extent of surface works south of the portal at Dutton Park and north of the portal at Victoria Park would be significant. Generally all busway services would continue to operate except when the Project takes possession of the busway through targeted night time (outside of passenger busway operations), weekend and other longer period rail shutdowns. Given the nature of busway operations, during shutdown periods, buses would be able to access temporary stations on local streets near to the busway stations.

Surface busway works at the southern portal

South of the southern portal, busway services would generally not be impacted during Project construction activities. During construction, works would be required to realign the existing Eastern Busway and provide connections to the Project busway network. During this phase, it is likely access along the Eastern Busway, particularly west of the PA Hospital Station would be restricted. During the temporary closure of the busway between the PA Hospital and Boggo Road stations, buses would be required to leave the busway at the accesses on O'Keefe Street and Annerley Road and alternative stops would be provided at locations near to the existing stations.

Surface busway works at the northern portal

North of the northern portal, existing busway services are likely to continue with only minor disruptions. During the establishment of the Project access to the Northern Busway and busway access to the ICB, access to the Northern Busway via the accesses at Gilchrist Avenue and Bowen Bridge Road may be constrained. Any required closures of these accesses would be timed to provide access to the Northern Busway at an alternative location.

Operational management measures would be required for the INB at Herston to ensure continued and safe operation of bus services where it is proposed that haulage vehicles would access the ICB via existing and project infrastructure

8.6 Worksite assessment

Each worksite would result in a unique impact to the adjoining transportation 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 assessment is focused on the transport network in the vicinity of each worksite. The impact of construction vehicles on the wider transport network and particularly haulage routes to spoil placement sites is discussed in **section 8.8**.

The site access assessment takes account of possible alternative spoil placement sites. In the following sections for each worksite it is noted where the access to the worksite may alter between the five spoil placement sites considered:

- Brisbane Airport
- Swanbank
- Pine Mountain (Mount Gravatt)
- Larapinta
- Port of Brisbane

The spoil placement site(s) to be used out of the five sites presented in this assessment is yet to be determined. The worksites are examined in order from the south to the north. It is recognised that this assessment is based on the Project's reference design and is likely to require refinement by the Proponent to accommodate any project changes during detailed design prior to the commencement of construction.

8.6.1 Southern Connection construction worksites

The southern connection worksites would be located primarily within the existing rail and busway corridors between Park Road Station, Dutton Park Station and the PA Hospital Busway Station. The worksite concept layout for the Southern Connection illustrated in **Figure 8-1**.

Part of the worksites would be located within the Boggo Road Urban Village and smaller, ancillary worksites would be located on Queensland Government land on the corner Park Road and Merton Street and a site between the PA Hospital Busway Station and the rail corridor.

Worksite location and proposed truck access

Truck access routes are illustrated on **Figure 8-2**. The primary access to the major worksite would be via Ipswich Road, onto O'Keefe Street and then right, into the worksite located between the PA Hospital Busway Station and the rail corridor. Through the provision of a temporary bridge located adjacent to the rail overpass, construction spoil vehicle access to the major worksite would be possible without impacting on more of the PA Hospital or along Cornwall Street. The temporary bridge and access route is illustrated in **Figure 8-3**.

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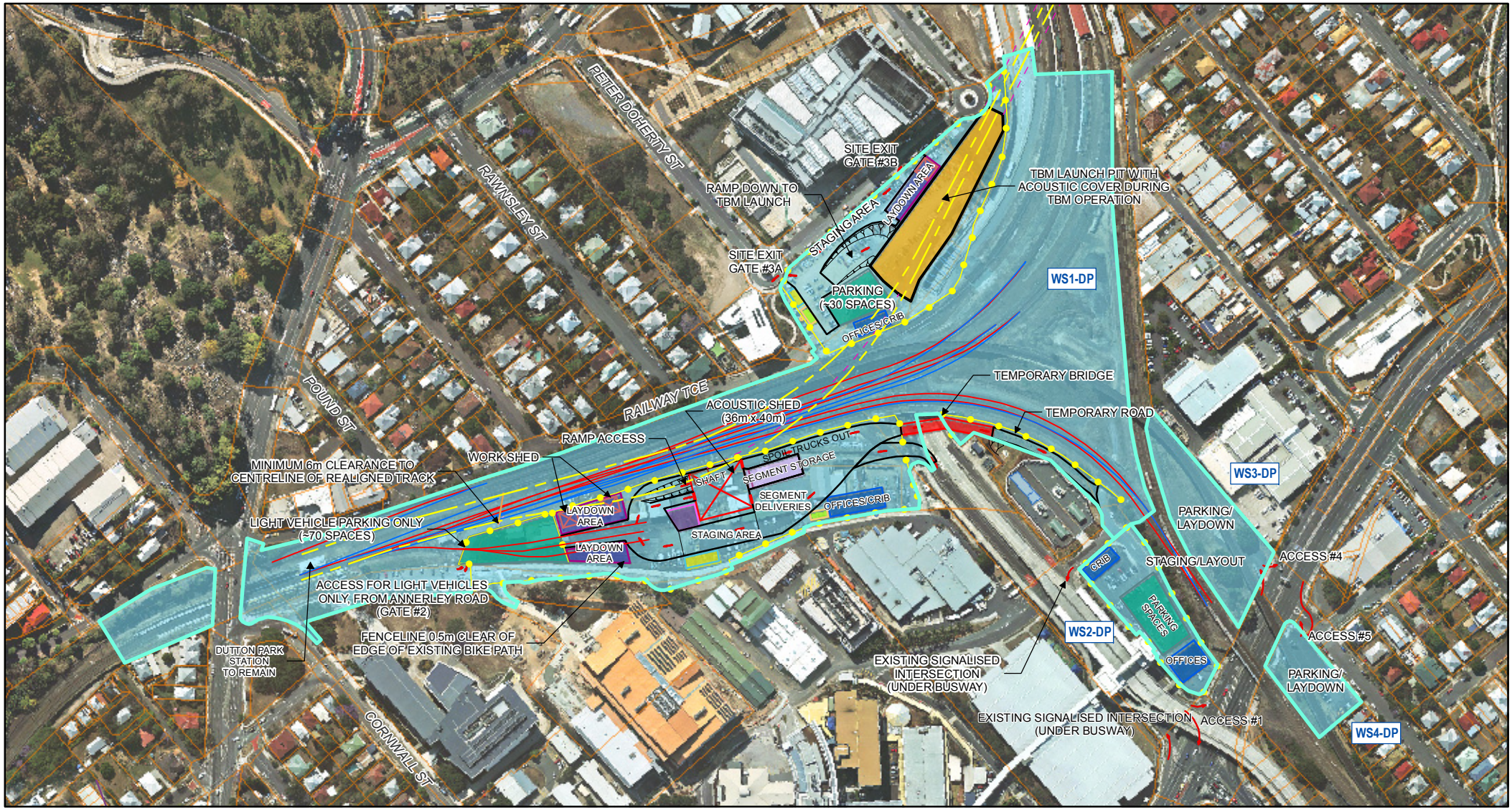

LEGEND

- BaT rail centreline
- Cadastre
- Construction worksite
- Acoustic shed
- Office/crib

Aerial Photo: Brisbane City Council 2012

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-1

Construction worksite concept layout - Southern Connection

0 50 100
Metres
1:4,000 (at A4)
Projection: GDA 1994 MGA56

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LEGEND

Haulage Routes
- Inbound - main haulage
- Inbound - alternative
- Outbound - main haulage
- Outbound - alternative

- Study corridor

Project Infrastructure
- Construction worksite
- Bus layover
- Dutton Park Station (upgraded)

Alignment
- Above ground
- Underground

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-2

Southern Connection construction worksite and haulage routes

N

0 0.1 0.2
Kilometres
1:10,000 (at A4)
Projection: GDA 1994 MGA56

Aerial Photo: Brisbane City Council 2012

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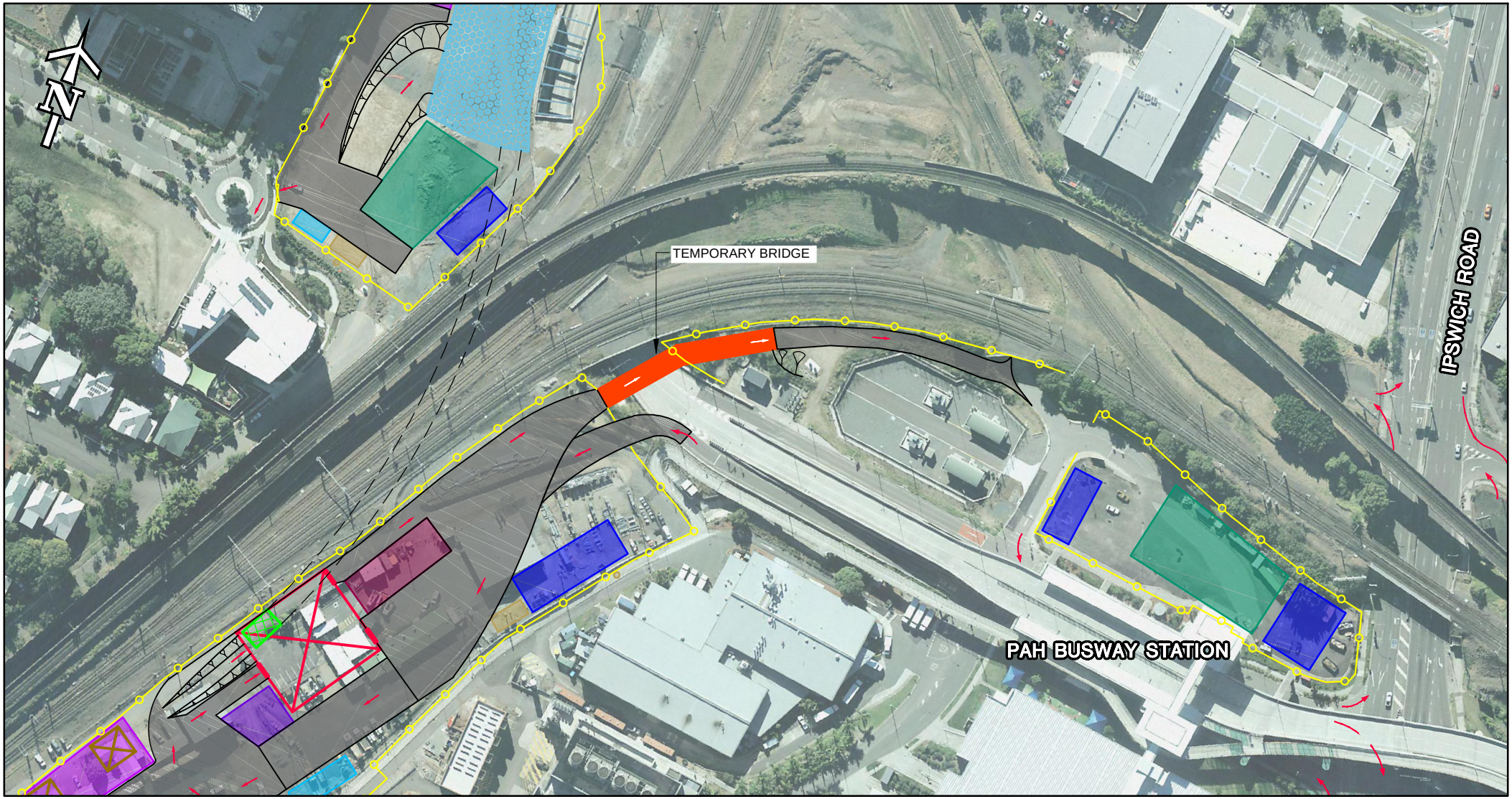


BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-3

Temporary bridge and construction traffic access at Southern Connection construction worksite

Secondary access to the major worksite at PA Hospital would be possible via Cornwall Street onto Kent Street. However, this access would not be used by heavy vehicles.

The worksite at the Boggo Road Urban Village would be accessed via Cornwall Street and Annerley Road with a right turn provided into Peter Doherty Street with the exit route via a left turn from Boggo Road to Annerley Road. This facility is required so that fully laden spoil trucks would not travel up-hill on Peter Doherty Street close to residential land uses.

Alternative access routes for spoil placement locations

Spoil placement site(s) selected from the following five that have been assessed could be accessed as follows:

- Brisbane Airport (Sugarmill Road) – accessed via O'Keefe Street and left turn to Ipswich Road, CLEM7 and Airport Link to access the Brisbane Airport precinct
- Swanbank – accessed via O'Keefe Street and then a right turn onto Ipswich Road and the motorway network to Swanbank
- Pine Mountain (Mount Gravatt) – accessed via O'Keefe Street, Old Cleveland Road, Creek Road to access Pine Mountain Road
- Larapinta – accessed via O'Keefe Street and then a right turn onto Ipswich Road and the motorway network to Larapinta.
- Port of Brisbane – accessed via O'Keefe Street, Old Cleveland Road, Creek Road, Gateway Motorway and the Port of Brisbane Motorway

Spoil from the Boggo Road worksite would access Ipswich Road via Annerley Road and Cornwall Street as illustrated in **Figure 8-2**.

Traffic staging and network changes

The southern works would be contained primarily within the existing rail corridor land, busway corridor land and the area of vacant land (Lot 2) within the Boggo Road Urban Village. A right turn is required from Annerley Road to Peter Doherty Street. This is illustrated in **Figure 8-4**.

LEGEND

- PAVEMENT
- TRAFFIC ISLAND
- FOOTPATH
- PROPOSED RETAINING WALL
- PROPERTY BOUNDARY

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-4

Provision of right turn from Annerley Road to Peter Doherty Street

Southern Connection worksite at Boggo Road network operation – impact on traffic conditions

The Boggo Road worksite would affect primarily local traffic within the Boggo Road Urban Village. With the exception of a proposed new (temporary) construction vehicle only right turn from Annerley Road into Peter Doherty Street, the construction worksite is not expected to impact on the existing road network beyond the intersection of Boggo and Annerley roads.

Overall 11 truck movements per hour (one truck every five and a half minutes) are expected at peak spoil haulage times to service the delivery and spoil haulage requirements of the site and is not expected to result in any worsening of traffic conditions. Given the relatively small scale of this construction worksite facility it is anticipated that there would be spare capacity at the intersection of Boggo Road and Annerley Road and that the intersection would not be unduly impacted particularly as spoil truck activity would not occur during the busy school drop-off and pick-up times.

Southern Connection worksite at PA Hospital network operation – impact on traffic conditions

Heavy vehicle movements to and from the Southern Connection worksite are anticipated to total around 12 inbound vehicles per hour at peak times. That is less than 1 per cent of the total traffic using the intersection of Ipswich Road and O'Keefe Street. Furthermore, workers arriving on site could contribute a further 300 vehicles inbound movements in the morning, but generally arriving on site before 6.30am and therefore prior to the morning peak hour.

As the worksite's primary access would be directly to Ipswich Road, it is expected that the construction traffic would have no discernible impacts on surrounding traffic conditions.

Pedestrians and cyclists

The Park Road Station and Boggo Road Busway Station are located to the north of the worksite. Currently pedestrian access between the busway and rail station and the Boggo Road Urban Village Precinct is via a footpath along Boggo Road. A pedestrian over bridge and station access point is provided linking Boggo Road with Quarry Street on the north side of the railway line.

The existing bicycle lanes on Annerley Road would be maintained, subject to detailed design of the proposed right turn bay from Annerley Road into Peter Doherty Street. The dedicated cycle path along Kent Street between Annerley Road and the PA Hospital would be maintained during construction. The existing Queensland Rail maintenance yard entrance off Kent Street would be used for light vehicle access to the worksite. Light vehicles would be required to cross the cycle path to access the worksite, potentially creating a conflict with cyclists. This potential conflict would be managed through appropriate signing, lighting and traffic control as necessary.

Buses

The Eastern Busway is in the vicinity of the Southern Connection worksite together with the Boggo Road and PA Hospital busway stations. The Boggo Road Busway Station is located immediately adjacent to the Park Road Station and is considered as part of an integrated interchange.

During construction of the Project busway and the realignment of the Eastern Busway, short term temporary closure of the busway between the PA Hospital and Boggo Road busway stations would be required. It is anticipated that the closure would be required for a short period of time and should be carried out over a holiday period such as Christmas or Easter. During the temporary closure of the busway between the PA Hospital and Boggo Road busway stations, buses would be required to leave the busway at the accesses on O'Keefe Street and Annerley Road and alternative stops would be provided at locations near to the existing stations.

Bus services that travel along the Eastern Busway that would be affected by this closure include:

- 29 (Woolloongabba to UQ)
- 66 (RBWH to UQ)
- 104 (Corinda to PA Hospital)
- 105 and 108 (Indooroopilly to CBD)
- 107 (City to Fairfield)
- 139 (Sunnybank to UQ)
- 169 (Eight Mile Plains to UQ)
- 209 (Carindale to UQ).

Rail

In order to facilitate the establishment of the Project southern portal and surface networks and the necessary amendments to Dutton Park Station would require temporary, short term shutdowns of parts of the rail network.

All existing passenger and freight services would generally continue around and within the southern connection worksite during the construction phase. When works are required to connect the Project surface rail networks to the existing network, rail shutdowns on the passenger network would be required. Where possible, these shutdowns would be carried out over weekends or at night to minimise impacts on operations.

Parking

Workforce car parking has been identified at a number of locations within and near to the southern connection worksite. These sites include:

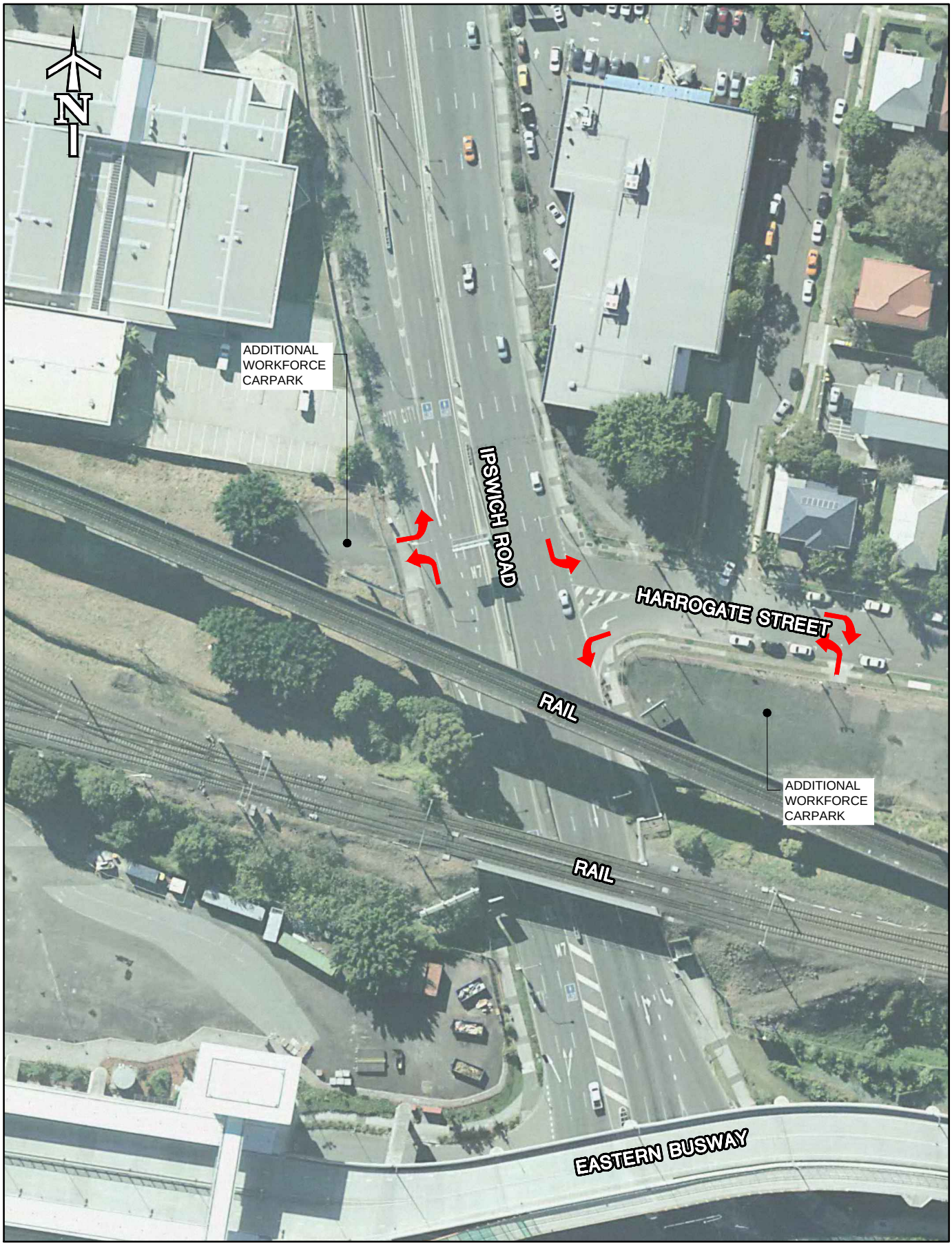
- 70 spaces within the main worksite
- 30 spaces within the Boggo Road Urban Village Project worksite
- 60 spaces within the ancillary worksite adjacent to the PA Hospital Busway Station
- 100 spaces within an area of Queensland Rail corridor land accessed off Ipswich Road
- 50 spaces within an area of TMR land on the corner of Ipswich Road and Harrogate Street.

These identified workforce car parks provide for a total of 310 spaces. The peak workforce for the southern connection worksite is anticipated to be 200. The additional 110 spaces would be used to accommodate site visitors and overflow requirements during peak periods at the other Project worksites. Where required during peak periods, a shuttle would be used to transport workers from this car park to the other worksites. Accesses to these workforce car parking areas are illustrated in **Figure 8-5**.

The streets adjacent to the worksite on the south side of the railway line are within Dutton Park Traffic Area. It operates between 7.00am to 7.00pm, 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.

The presence of on-street parking controls Monday to Friday should discourage any on-street parking by the workforce. However, with no parking controls on weekends there is a risk that inappropriate and unnecessary on-street car parking by the workforce could occur. Inappropriate on-street car parking should be controlled through the Workforce Code of Behaviour and the Construction Workforce Car Parking Plan (refer Chapter 18 – Draft Outline EMP).



BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-5

Access to workforce car parks at the Southern Connection

Access, servicing and provision for adjacent development

The adjacent significant land uses to the worksite include:

- PA Hospital, including various health, research, community and light industrial facilities
- 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 western side of the worksite) – mixed-use area including residential, retail, commercial, environmental research and recreational facilities. The Boggo Road Markets also occur in this precinct on Sunday mornings.

Access to all identified adjacent developments would be maintained during the works.

Emergency services

The worksite is located adjacent to the PA Hospital, which receives emergency service vehicles. As the emergency entry to the PA Hospital is accessed off Cornwall Street, it is not anticipated that the Project would have adverse impacts on emergency service vehicles accessing the hospital.

Similarly access to the police station at Boggo Road would not be impacted.

Emergency services would be advised of all changes to routes through processes established under the Framework Traffic Management Plan.

Special events

Special events are not known to occur in the area adjoining the worksites. Should that change, any special events which may be impacted by the works would be managed under process established under the Framework Traffic Management Plan.

Table 8-4 provides a summary of construction impacts and proposed mitigation at the Southern Portal worksites.

Table 8-4 Construction impacts and proposed mitigations for the Southern Connection worksite

Location	Impacts	Proposed remedial measures
Eastern Busway	Short term temporary closure of Eastern Busway	Manage closure through consultation with TransLink with shutdowns carried out on weekends, at night or during holiday periods and to provide alternative routes.
Rail Corridor	Short term temporary shutdown of passenger rail operations	Managed shutdowns by Queensland Rail and TransLink. Shutdowns should be carried out on weekends or at night.
Construction workforce car parking	Provision of sufficient parking spaces	To provide workforce car parks with sufficient space and with efficient access to Ipswich Road.

8.6.2 Woolloongabba construction worksite

The Woolloongabba worksite would be required to construct the Woolloongabba Station cavern, platforms, vertical transport, ventilation equipment and shafts, station entrance building and associated surface works to provide for station accessibility. The Woolloongabba worksite concept layout is illustrated in **Figure 8-6**.

Worksite location and proposed truck access

The worksite would be located on the existing GoPrint 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 8-7**.

Ipswich Road is 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 sites at Swanbank via the Ipswich Motorway and Mount Gravatt via Old Cleveland Road.

Truck access to the worksite is proposed via Ipswich Road with a left turn off Main Street into the site via the existing access road approximately half way between Stanley Street and Vulture Street. Access out of the site would via the existing access road on Leopard Street, right turn onto Vulture Street and then a right turn on to Main Street. Detailed haul routes would be determined by the Proponent during the development of CTMPs for this worksite, and would be subject to review by relevant stakeholders.

Alternative access routes for alternative spoil placement locations

Spoil placement site(s) selected from the following five that have been assessed could be accessed as follows:

- Brisbane Airport (Sugarmill Road) – accessed via Leopard Street, right turn onto Vulture Street, Wellington Road, Shafston Avenue, CLEM7 and Airport Link to access the Brisbane Airport precinct.
- Swanbank – accessed via Leopard Street, right turn onto Vulture Street and then a right turn on to Main Street, Ipswich Road and the motorway network to Swanbank.
- Pine Mountain (Mount Gravatt) – accessed via Leopard Street, right turn onto Vulture Street and then a right turn on to Main Street, Ipswich Road, O'Keefe Street, Old Cleveland Road, Creek Road to access Pine Mountain road.
- Larapinta – accessed via Leopard Street, right turn onto Vulture Street and then a right turn on to Main Street, Ipswich Road and the motorway network to Larapinta.
- Port of Brisbane – accessed via Leopard Street, right turn onto Vulture Street, Wellington Road, Wynnum Road, Port of Brisbane Motorway.

Traffic staging and network changes

Surface works would be contained within the existing GoPrint site with access provided by entrances and exits on Ipswich Road and Leopard Street for the duration of the construction activities at this worksite. No changes to the surrounding road networks are proposed as part of the Project worksite at Woolloongabba.

Network operation – impact on traffic conditions

Heavy vehicle movements to and from the Woolloongabba worksite are anticipated to total around 3 vehicles per hour at peak haulage times. Furthermore, workers arriving on site could mean a further 130 vehicles movements in the morning, but generally arriving on site before 6.30am and therefore prior to the morning 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

- BaT rail centreline
- Cadastre
- Construction worksite
- Acoustic shed
- Office/crib

Aerial Photo: Brisbane City Council 2012

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-6

Construction worksite concept layout - Woolloongabba Station

N

0 25 50
Metres
1:1,500 (at A4)
Projection: GDA 1994 MGA56

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LEGEND

Haulage Routes
- Inbound - main haulage
- Inbound - alternative
- Outbound - main haulage
- Outbound - alternative

- Study corridor

Project Infrastructure
- Construction worksite
- Underground station
- Bus layover

Alignment
- Above ground
- Underground

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-7

Woolloongabba construction worksite and haulage routes

N

0 0.1 0.2
Kilometres
1:7,500 (at A4)
Projection: GDA 1994 MGA56

Aerial Photo: Brisbane City Council 2012

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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 a footpath 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.

Construction activities occurring adjacent to Leopard Street, Vulture Street and Main Street would maintain existing shoulder widths for cyclists. Should this not be 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 are outlined in the following sections.

Buses

The Woolloongabba Busway Station and the Eastern Busway are located in the vicinity of the Woolloongabba worksite, immediately to the south of the GoPrint site and to the north of Stanley Street. The Woolloongabba Busway Station also provides a layover for buses; and turnaround facility for bus routes. This busway station provides for interchange between bus routes. On-street bus services are also available along Main Street, to the east of the worksite. The area contains one of the highest frequencies of bus routes within Brisbane.

As the worksite would be contained within the GoPrint site, the Woolloongabba Busway Station and busway operations would not be directly impacted by construction activities. Some minor delays may be experienced for buses traveling along Main Street and Vulture Street with construction vehicles entering and exiting the worksite. TransLink would be advised of any changes to routing or potential change to travel times through processes established under the CTMP.

Parking

The Woolloongabba construction worksite would be located in the Gabba Traffic Area. On-street parking on surrounding streets is limited to two hours across the precinct (with some exceptions). Parking restrictions apply Monday to Friday 7.00am to 7.00pm and on days when events are held at the adjacent Gabba Stadium with on-street parking limited to 15 minutes from 7.00am to 10.00pm. 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 the Project construction works on the site. Project workforce parking would be provided within the Woolloongabba worksite for 130 car spaces. Access to the car parks would be from the Leopard Street worksite entrance.

The workforce at the Woolloongabba worksite would peak at 150 workers. The construction worksite would be able to accommodate the peak parking demand. Where additional spaces are required during the peak, additional capacity would be available within the overflow workforce car parks at the southern portal worksite.

The presence of on-street parking controls Monday to Friday should discourage any on-street parking by the workforce. However, with no parking controls on weekends there is a risk that inappropriate and unnecessary on-street car parking by the workforce could occur. Inappropriate on-street car parking

should be controlled through the Workforce Code of Behaviour and the Construction Workforce Car Parking Plan (refer Chapter 18 – Draft Outline EMP).

Overall, 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 Woolloongabba Station would not alter existing property access or restrict access to any adjacent property. The proposed right turn from the Dental Hospital into Vulture Street would be combined with the proposed site egress point from the GoPrint site. Vehicles accessing the existing Dental Hospital and Land 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 access point should not be used by heavy vehicles associated with the Project worksite.

Emergency services

Whilst the Woolloongabba Project worksite would be located near to the Mater Hospital complex it 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 consulted of all changes to routes through processes established under the CTMP.

Special events

The Gabba Stadium is located to the east 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 worksite.

During events, short term management strategies would be developed for the site under processes identified in the CTMP. Strategies would include a short term pause in trucking activities at the site or additional traffic control measures such as active pedestrian management. Specific processes would be developed in the CTMP for the Woolloongabba worksite. **Table 8-5** provides a summary of construction impacts and proposed mitigation at the Woolloongabba worksite.

Table 8-5 Construction impacts and proposed mitigation for the Woolloongabba worksite

Impacts	Proposed remedial measures
Potential demand from construction workforce on on-street parking.	Minor shortfall in construction car parking availability at Woolloongabba would be offset by availability at the southern portal worksite.

8.6.3 George Street construction worksite

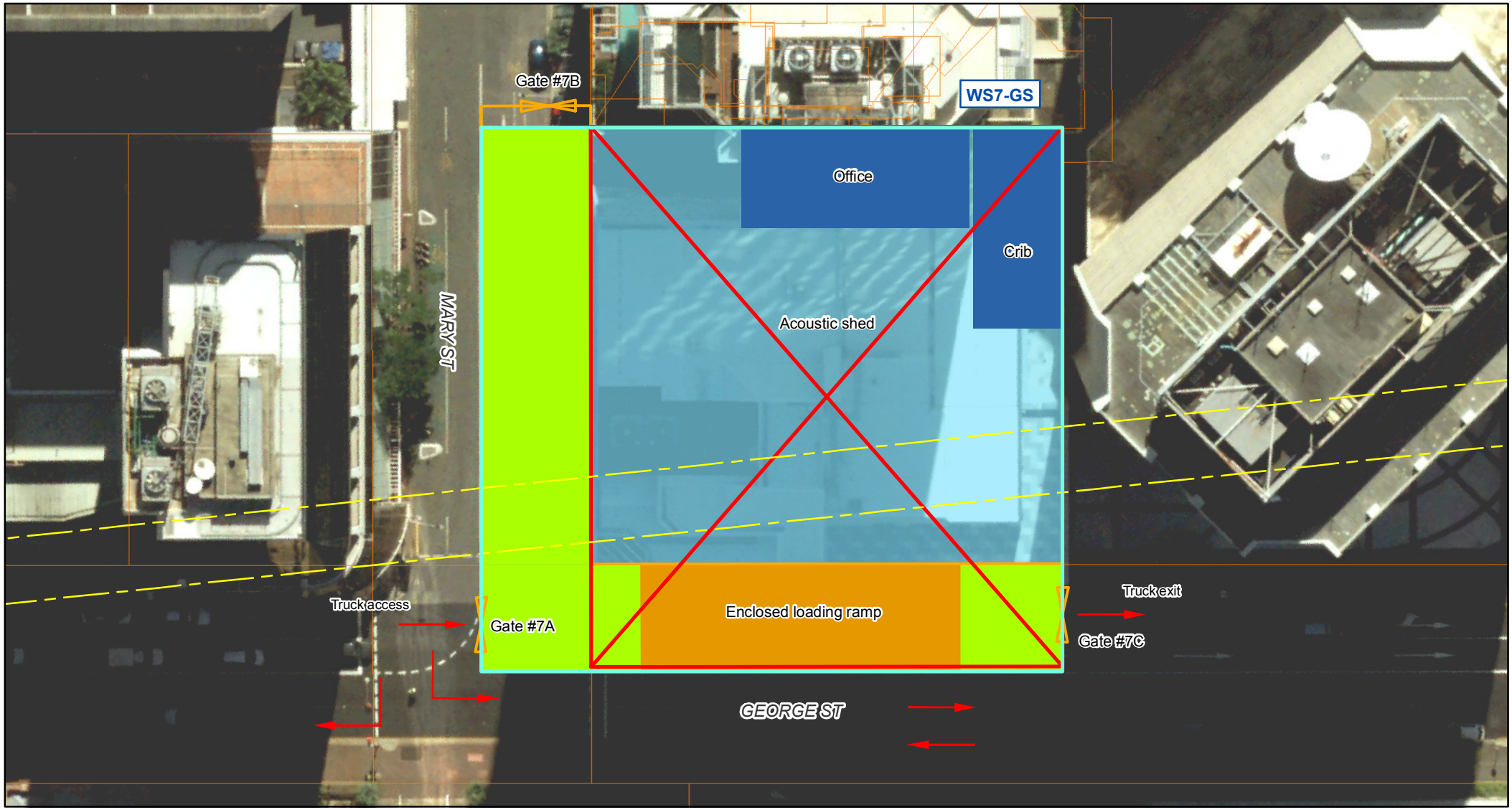
The George Street worksite is required to construct the underground station. The worksite would occupy 63 George Street and would have frontages on George Street and Mary Street. 63 George Street is illustrated in **Figure 8-8**.

It is recommended that a working group comprising the Queensland Government, represented by DTMR and DSDIP, and the Brisbane City Council, be established for the purpose of developing and implementing a CBD Construction Traffic Management Plan. That CTMP would need to address

issues relating to cumulative construction traffic in the area bounded by Elizabeth Street, Albert Street, Alice Street and William Street.

It is proposed to establish this worksite in stages. The staged possession of George Street and Mary Street would vary depending on the work being carried out at the time. Construction works would require the establishment of a station cavern below street level. Once a sufficient depth below the road level has been achieved, a deck would be placed over the cavern and where possible, the road returned to public use. Generally, two traffic lanes would remain open on George Street and Mary Street. Complete closure of both roads may be required for short periods of time, such as weekends or several weeks over holiday periods, whilst the cavern is being established. **Figure 8-9** illustrates the general worksite layout that would be operational for the majority of the construction programme.

Figure 8-8 Location of the proposed worksite at 63 George Street



LEGEND

- BaT rail centreline
- Cadastre
- Construction worksite
- Acoustic shed
- Office/crib

Aerial Photo: Brisbane City Council 2012

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-9

Construction worksite concept layout - George Street

N

0 10 20
Metres
1:500 (at A4)
Projection: GDA 1994 MGA56

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Worksite location, proposed truck access and truck volumes

Heavy vehicle movements to and from the George Street worksite are anticipated to total around fiver vehicles per hour at peak haulage times.

Access to the site would be via the Riverside Expressway, exiting at the Elizabeth Street exit, turning right onto George Street and into a site access on George Street. Access out of the site would be via George Street, right on Alice Street and then on to the Riverside Expressway. This is illustrated in **Figure 8-10**. The access to the site along George Street requires the establishment of a construction traffic lane in the southbound direction between Elizabeth Street and Margaret Street. This would require an existing one-way section of George Street between Elizabeth Street and Charlotte Street to be converted to two-way operation to facilitate a construction traffic only lane in the southbound direction. This construction traffic lane would be on the northern side of George Street and would require the removal of all kerb side activity such as loading and kerbside car parking between Elizabeth Street and Margaret Street.

Detailed assessment of truck turning paths, if required, would be undertaken as part of the development of the CTMPs, and may require modification of the routes shown.

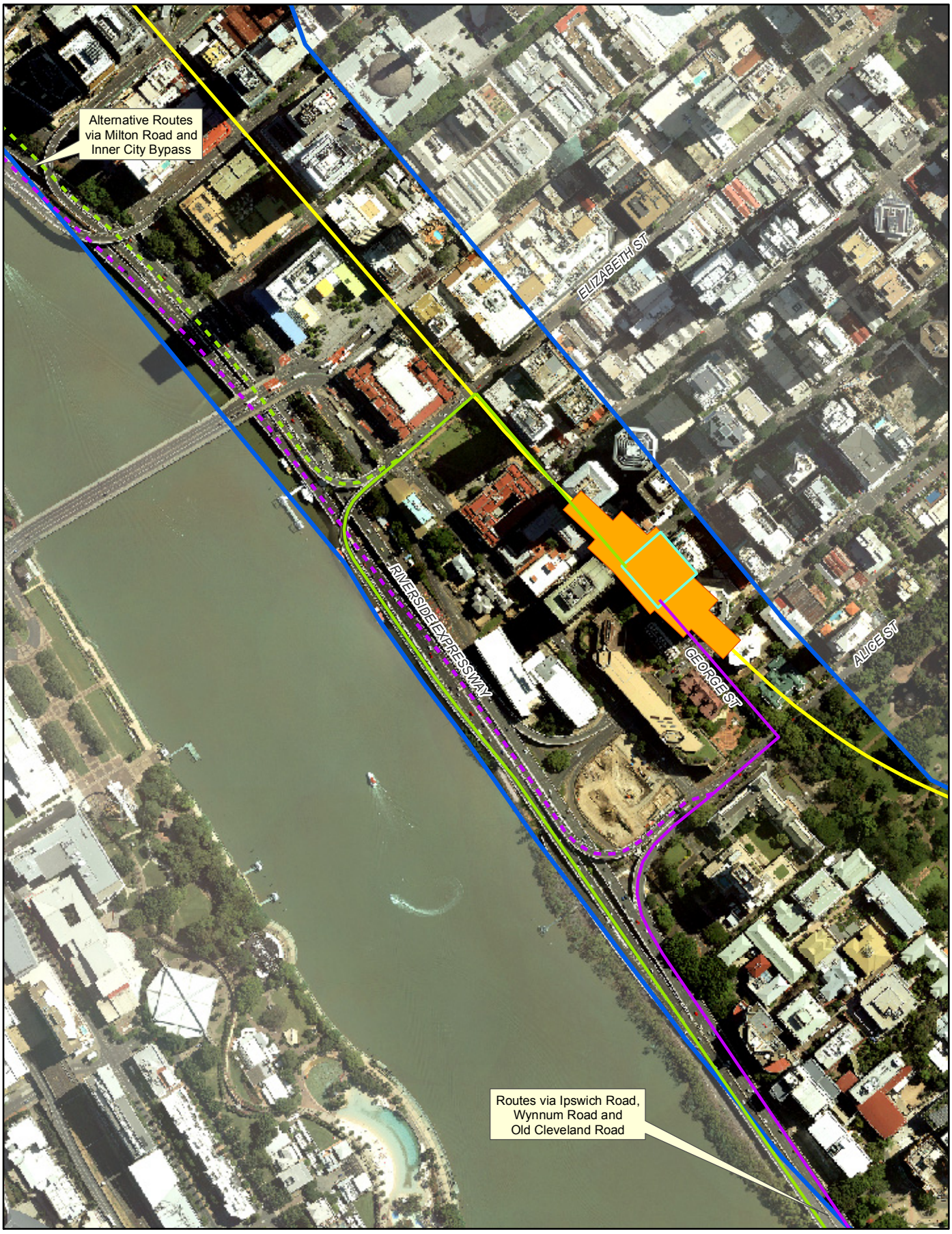
Access routes to spoil placement sites

Truck movement to all spoil placement locations would access the worksite via the Riverside Expressway, Elizabeth Street and the construction traffic lane along George Street. All trucks exiting the worksite to travel to all spoil placement sites would use George Street, Alice Street and the Riverside Expressway.

Alternative access routes for spoil placement locations

Spoil placement site(s) selected from the following five that have been assessed could be accessed as follows

- Brisbane Airport (Sugarmill Road) – accessed via George Street, Alice Street, Riverside Expressway, Hale Street, ICB and Airport Link to the Brisbane Airport precinct.
- Swanbank – accessed via George Street, Alice Street, Milton Road and the motorway network to Swanbank.
- Pine Mountain (Mount Gravatt) – accessed via George Street, Alice Street, Riverside Expressway, Ipswich Road, O'Keefe Street, Old Cleveland Road, Creek Road to access Pine Mountain road.
- Larapinta – accessed via George Street, Alice Street, Riverside Expressway, Ipswich Road and the motorway network to Larapinta.
- Port of Brisbane – accessed via George Street, Alice Street, Riverside Expressway, Vulture Street, Shaftson Avenue, Wynnum Road, Port of Brisbane Motorway.



LEGEND

Haulage Routes
- Inbound - main haulage
- Inbound - alternative
- Outbound - main haulage
- Outbound - alternative

- Study corridor

Project Infrastructure
- Construction worksite
- Underground station

Alignment
- Underground

Aerial Photo: Brisbane City Council 2012

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-10

George Street construction worksite and haulage routes

N

0 0.05 0.1
Kilometres
1:5,000 (at A4)
Projection: GDA 1994 MGA56

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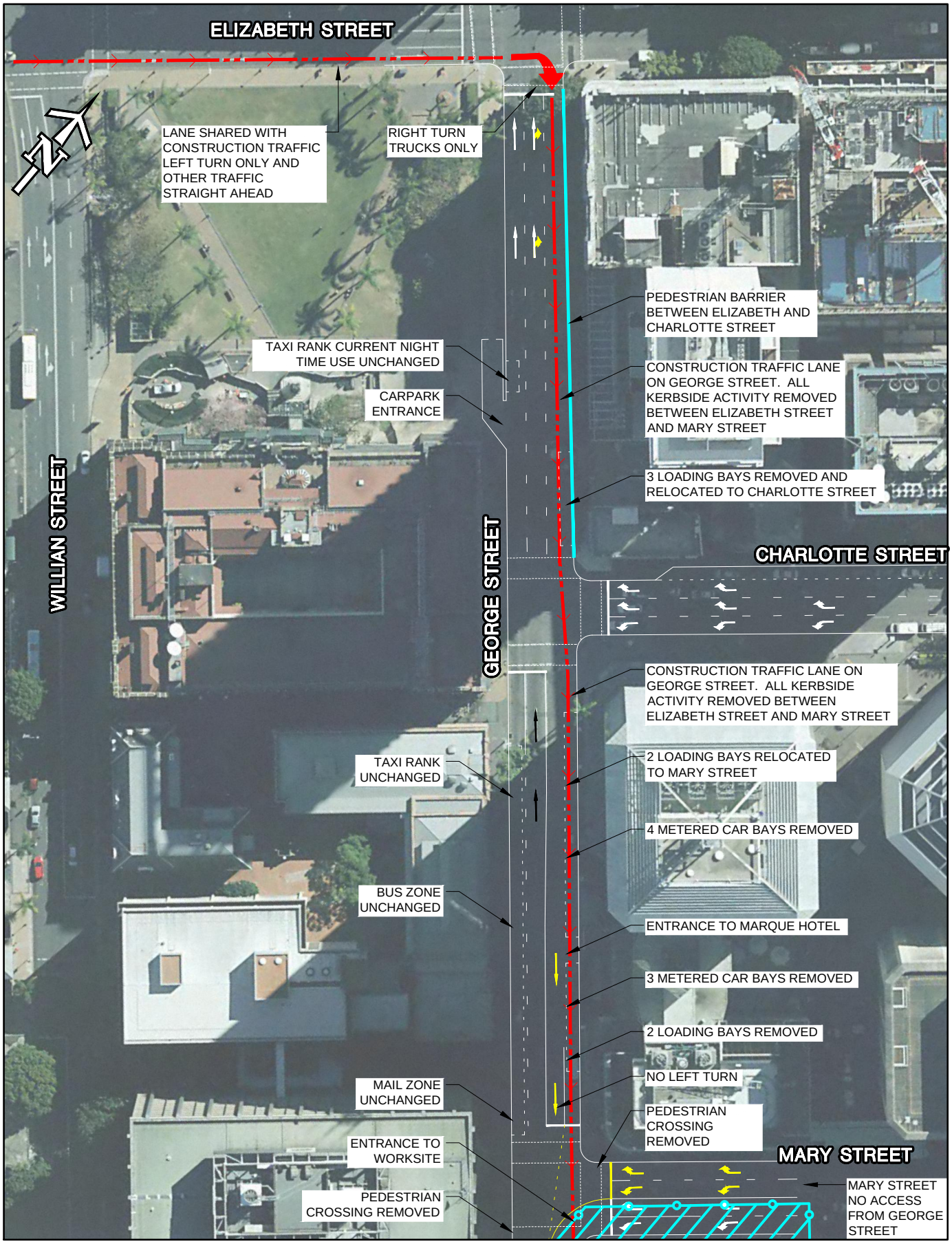
Traffic staging and network changes

Establishment of the worksite would require a number of changes to the local road layouts that are illustrated in **Figure 8-11**. These changes allow for a dedicated construction traffic lane on George Street between Elizabeth Street and Margaret Street. These changes would be in place for the duration of the Project's construction at George Street. The impact of these changes is included in **section 8.8**. Necessary amendments to the existing traffic layout include:

- conversion of one lane on George Street between Elizabeth Street and Charlotte Street from northbound to southbound to provide for a construction traffic lane
- closure of two lanes on George Street outside 63 George Street to facilitate truck access through an enclosed loading bay. One traffic lane in each direction would remain in operation on George Street between Mary Street and Margaret Street
- closure of two traffic lanes on Mary Street at the approach to George Street due to space requirements of the worksite and the need for a secondary vehicular access to the worksite. This would result in two lanes remaining operational on Mary Street that would facilitate the left and right turn movements to George Street
- restricted turn movements at the intersection of George Street and Mary Street. No right turn and no left turn from George Street into Mary Street
- all other turn movements that are currently permitted would not be restricted due to construction works
- access to all property would be maintained including the Rendezvous Hotel that is located on George Street between Charlotte Street and Mary Street
- removal of kerbside activity, such as eight loading bays and 13 metered car parks, on the northern side of George Street between Elizabeth Street and Margaret Street. Kerbside activity on the southern kerb of George Street remains unchanged except between Margaret Street and Mary Street where one loading bay and six metered car parks would be removed. Alternative loading bays would be provided. Locations for alternative loading bays include converting metered car parking on Charlotte Street and Margaret Street close to the intersection with George Street. This would provide appropriate alternative facilities
- removal of kerbside activity (loading bay with capacity for four cars) from Mary Street adjacent to the work site. Alternative loading bays should be provided, such as converting metered car parking adjacent to 21 Mary Street. This would provide appropriate alternative facilities
- provision of a pedestrian kerbside barrier between Elizabeth Street and Charlotte Street to prevent pedestrians from entering the construction traffic lane
- use of traffic management measures such as traffic control officers so that construction traffic does not block the intersection of George Street and Mary Street and the access to the Rendezvous Hotel
- temporary (short term) closure of George Street (between Margaret Street and Mary Street) and Mary Street at the worksite would be required to enable the establishment of the station cavern and the cavern deck. It is expected that such short term closure would be limited to several weeks and could take place during quieter holiday periods such as at Christmas and New Year whilst also avoiding peaks in retail activity.

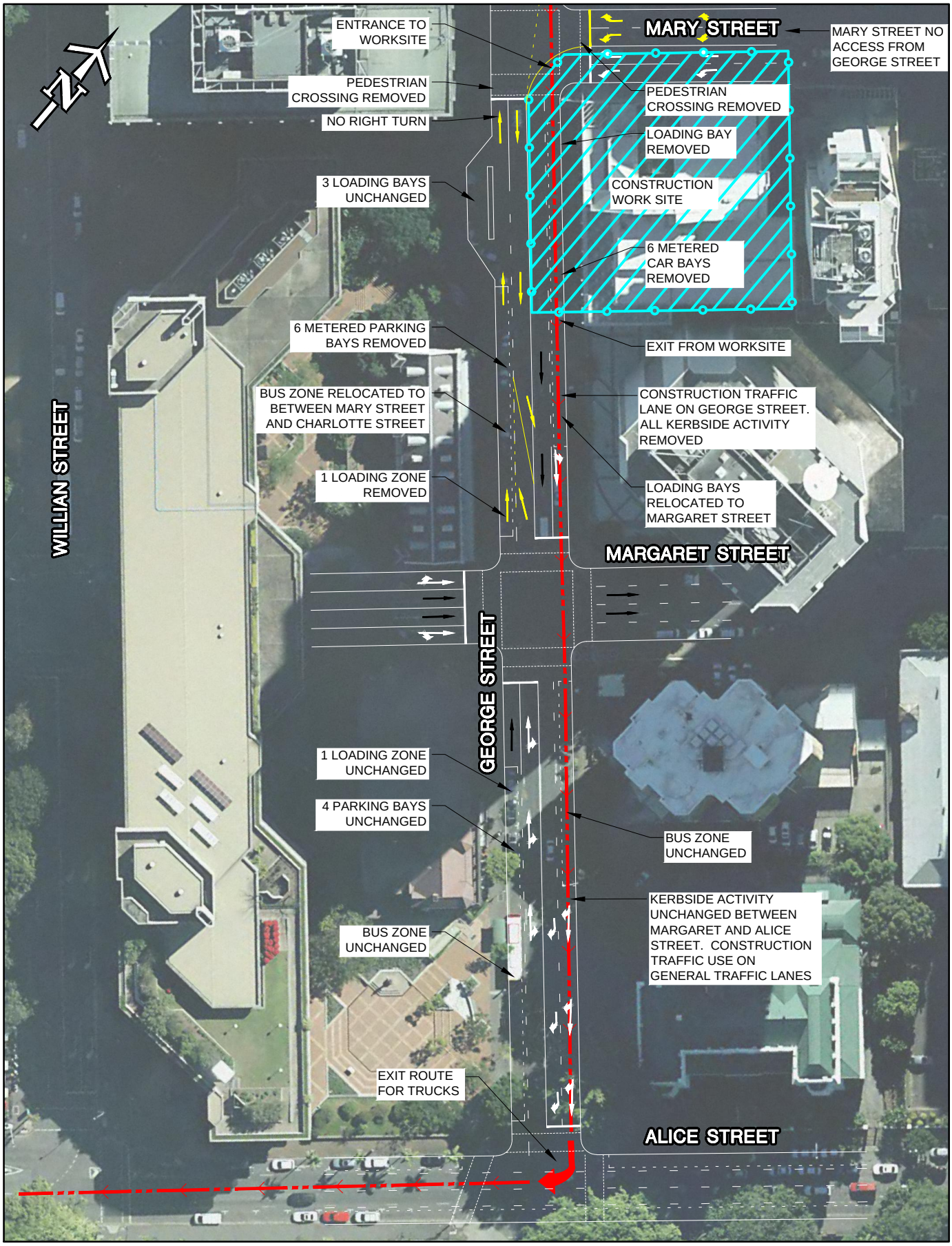


BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-11

(continued over page)

George Street traffic arrangement during construction



BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-11

(continued from previous page)

George Street traffic arrangement during construction

Pedestrians and cyclists

The George Street worksite would require the closure of footpaths along the frontage of the worksite on both George Street (ie between Mary Street and Margaret Street) and Mary Street. This measure would be required due to the amount of space required by the worksite and as a safety measure to reduce the risk of conflict between pedestrians and construction activities such as truck movements.

Pedestrians would be required to cross to the southern footpath on George Street in order to walk past the worksite. The southern footpath has sufficient capacity for an increase in use. The pedestrian LoS in both the morning and evening peak periods for footpaths and pedestrians crossings would be appropriate. Management measures would be put in place along George Street (between Elizabeth Street and Alice Street) to encourage pedestrian to cross George Street prior to the intersection of George and Mary Street. Such measures could include signage, pedestrian barriers at the worksite and the mobilisation of traffic control officers at the worksite

The CTMP must consider the safety of pedestrians on George Street. Measures such as the provision of barriers on George Street between Elizabeth Street and Charlotte Street should be considered. Barriers would mitigate the risk of pedestrians inadvertently stepping into the path of a construction vehicle.

Buses

One bus stop, Stop 108, is located on George Street near to the Project worksite, between Mary and Margaret streets. The bus stop is used by:

- Bus 261 (Eight Mile Plains to City), morning peak only
- Bus P331 (CBD to Bracken Ridge), evening peak only
- Bus P332 (CBD to Chermside), evening peak only
- Bus P341 (CBD to Carseldine), evening peak only
- Bus P344 (CBD to Carseldine), evening peak only
- Bus P384 (CBD to The Gap), evening peak only.

Stop 108 is located on the western side of George Street and is only used during peak hours. While it won't be directly impacted by the worksite footprint, it may be necessary to relocate it during construction to better facilitate traffic movement along George Street past the worksite. It is suggested that the services use an alternative stop 115 that is located between Mary Street and Charlotte Street. Currently, stop 115 is served by the City Loop and the P457, P458 and P459 services.

The City Loop bus service travels north along George Street. With the exception of the construction phase required to establish the station cavern, including perimeter piling and installation of the deck, it is anticipated that this service would not be impacted.

There is one bus stop, Stop 123, located on George Street south of the worksite that receives southbound travelling buses. This bus stop receives the following terminating buses only during peak hours:

- Bus P384 (The Gap to CBD)
- Bus P331 (Bracken Ridge to CBD)
- Bus P344 (Carseldine to CBD)
- Bus P332 (Chermside to CBD).

This bus stop would not be impacted to by the Project worksite.

Parking

No onsite workforce car parking is proposed at the George Street worksite. Due to the Brisbane CBD location, the workforce would be expected to use the public transport services available at this location. Alternatively, within the Brisbane CBD there are over 10,000 publicly accessible commercial car spaces available (Brisbane City Council, 2009) that could be used by the workforce. There is also an abundance of commercial car spaces available within the CBD fringe at Spring Hill, Petrie Terrace and South Bank. There are number of commercial car multi-deck car parks located on Charlotte Street, Margaret Street and Elizabeth Street that are a short walk from the worksite.

The George Street worksite is located in the Brisbane Central Traffic Area. On-street parking on surrounding streets is restricted with a two hour time limit across the traffic area unless signed otherwise. Parking restrictions apply Monday to Friday 7.00am to 6.00pm and Saturday 7.00am to 12.00pm. The Project workforce would not be able park on the streets in the vicinity of the worksite.

The George Street worksite and associated activities would require the removal of:

- eleven 2 hour limit car parking spaces on George Street between Mary Street and Margaret Street
- five loading bays on George Street between Mary Street and Margaret Street
- three loading bays on George Street between Elizabeth Street and Charlotte Street to facilitate the provision of the southbound lane
- four loading bays on Mary Street

Access, servicing and provision for adjacent development

The George Street worksite would require the staged closure of parts of George Street and Mary Street. While it is not anticipated that these closures would require the closure of any basement car parking access for nearby buildings, some impacts to access may be experienced. In particular, the worksite and associated road closures and realignments would require the removal of a number of loading bays on George Street. To be effective, loading bays need to be located near to the buildings they are servicing. Consequently, alternative locations would need to be sought near to the existing loading bays with 13 metered car parks on Charlotte Street, Mary Street and Margaret Street being converted to loading bays.

It is not proposed to amend or remove the indented loading zone on George Street outside 80 George Street.

Access would be maintained to the basement car park entrances located on Mary Street adjacent to the Project worksite and to the car park associated with the Rendezvous Studio Hotel on George Street. Any impacts to access, particularly during the demolition of 63 George Street, the establishment of the worksite or when construction vehicles are accessing the worksite, would be managed through the CTMP.

Emergency services

The worksite associated with the construction of the George Street Station 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 and consulted of all changes to routes through processes established under the CTMP.

Special events

The worksite is located within the Brisbane CBD and would be subject to a number of events carried out on the local streets. Site access would need to be coordinated with events that require road closures, such as Riverfire, ANZAC Day parade and other parades or protests. Any special events which may be impacted by the works would be managed under the CTMP and Traffic and Transport Liaison Group.

A summary of the construction impacts and proposed mitigation measures is provided in **Table 8-6**.

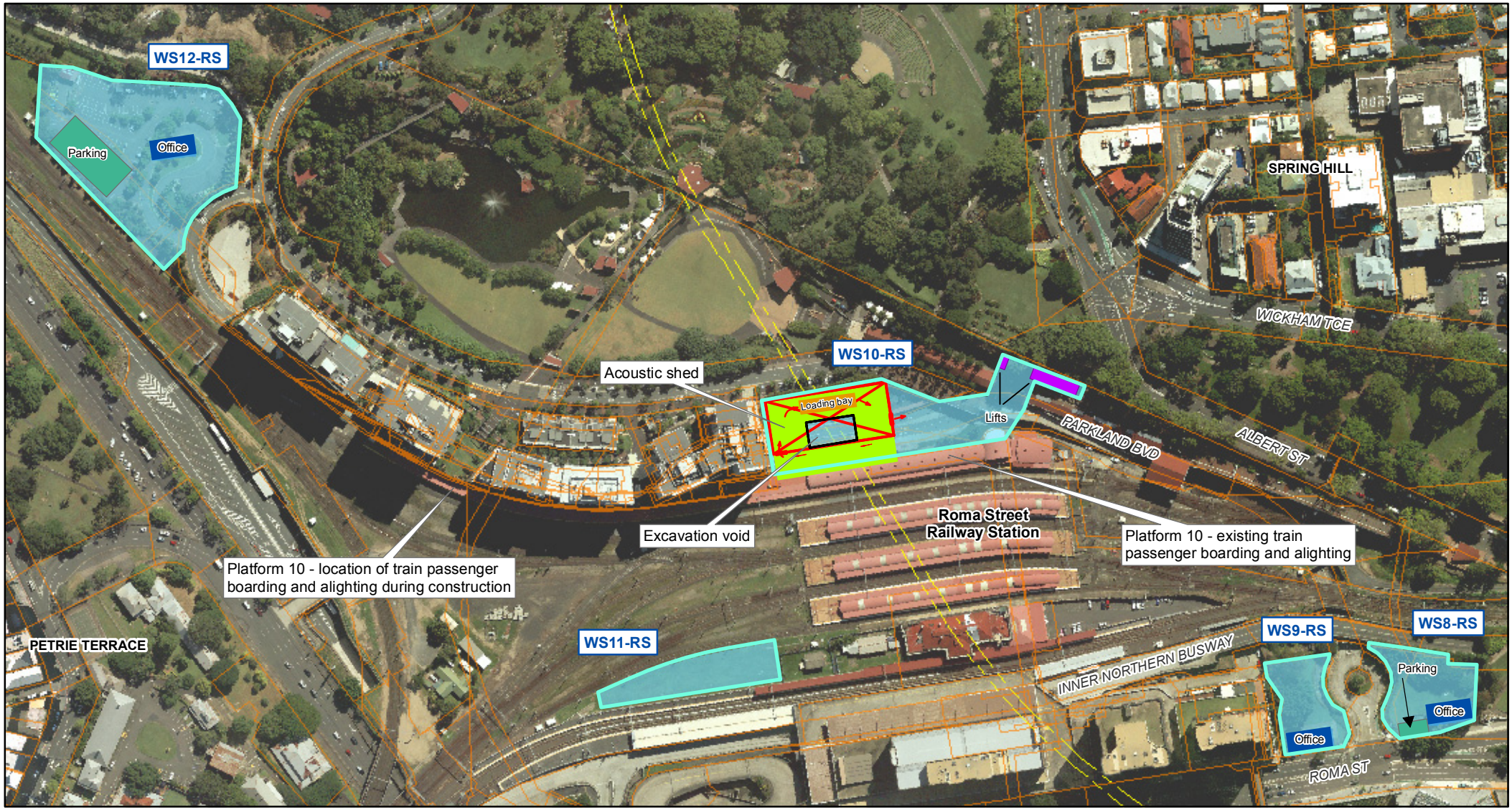
Table 8-6 Construction impacts and proposed mitigation for the George Street worksite

Impacts	Proposed remedial measures
Traffic changes as a result of staged lane closures of George Street and Mary Street in the vicinity of the construction worksite and short term (several weeks) full closure.	Alternative routes would be available within the CBD. The closure would only be required for a short duration (several weeks) during the construction period and should be carried out during holiday periods and/ or weekend and night times.
Introduction of a construction traffic lane on George Street between Elizabeth Street and Mary Street. Removal of two traffic lanes on both George Street and Mary Street in the vicinity of the construction worksite.	Alternative routes are available for the removal of turning movements at the intersection of George Street and Mary Streets. Presence of the construction traffic lane would not to generate a significant worsening of traffic operational performance.
Removal of some turning movements at the intersection of George Street and Mary Street.	Use of traffic management measures such as traffic control officers so that construction traffic does not block the intersection of George Street and Mary Street and the access to the Rendezvous Hotel.
Impacts to pedestrian movements along George and Mary streets and pedestrian safety.	Provision of a kerbside pedestrian barrier between Elizabeth Street and Charlotte Street to prevent pedestrian from entering the construction traffic lane. Pedestrian access would be diverted (and actively encouraged from Elizabeth Street) along the western footpath of George Street and the northern footpath of Mary Street. This footpath has sufficient capacity for the change in pedestrian demand.
Some closure of kerbside activity along George Street.	Reassigning some metered car parking on Charlotte Street, Mary Street and Margaret Street to loading activities.
Relocation of one bus stop located between Margaret Street and Mary Street.	Relocate bus stop to existing bus zone between Mary Street and Charlotte Street.

8.6.4 Roma Street construction worksite

The Project station at Roma Street will be connected to the existing railway and busway platforms via the subway. The primary worksite would be located within the car park and access road (Parklands Crescent) adjacent to Roma Street Station Platform 10 that is illustrated in **Figure 8-13**.

The worksite concept layout for Roma Street is illustrated in **Figure 8-12**.



LEGEND

- BaT rail centreline
- Cadastre
- Construction worksite
- Acoustic shed
- Office/crib

Aerial Photo: Brisbane City Council 2012

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-12

Construction worksite concept layout - Roma Street

N

0 50 100
Metres
1:3,000 (at A4)
Projection: GDA 1994 MGA56

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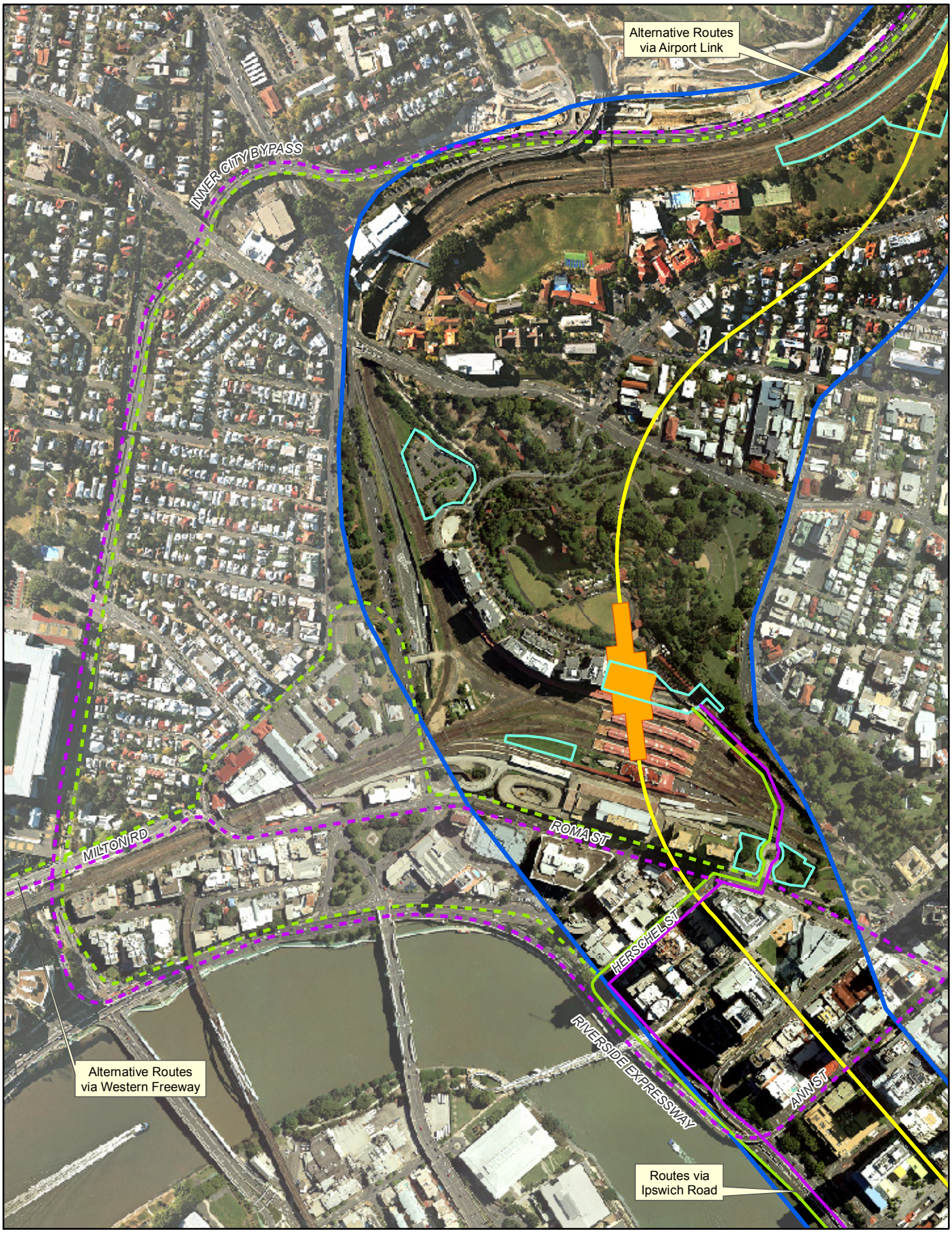
Figure 8-13 Car park and access roads adjacent to Roma Street Station platform 10

Worksite location and proposed truck access

The primary worksite would be in the current car park adjacent to the long distance Platform 10 and station luggage storage area on Parklands Crescent. Access would be via Parklands Crescent and Roma Street. A diagram showing the potential truck access routes is shown in **Figure 8-14**. To limit the impact of trucks on lower order roads, safe and direct access would be provided from the Riverside Expressway to the worksite via Herschel Street. To provide sufficient space for one truck and dog at the intersection stop line on Herschel Street between George Street and Roma Street, the existing contra flow bus lane on George Street would be removed (refer to **Figure 8-15**). To facilitate this change, bus routes could be changed to be via Saul Street in order to access North Quay.



LEGEND

Haulage Routes
- Inbound - main haulage
- Inbound - alternative
- Outbound - main haulage
- Outbound - alternative

Study corridor

Project Infrastructure
- Construction worksite
- Underground station

Alignment
- Underground

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-14

Roma Street construction worksite and haulage routes

N

0 0.1 0.2
Kilometres
1:7,500 (at A4)
Projection: GDA 1994 MGA56

Aerial Photo: Brisbane City Council 2012

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BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-15

Existing contra flow bus lane on George Street

Alternative access routes for spoil placement locations

Spoil placement site(s) selected from the following five that have been assessed could be accessed as follows

- Brisbane Airport (Sugarmill Road) – accessed via Roma Street, Herschel Street, Riverside Expressway, Hale Street, ICB and Airport Link to the Brisbane Airport precinct.
- Swanbank – accessed via Roma Street, Milton Road and the motorway network to Swanbank.
- Pine Mountain (Mount Gravatt) – accessed via Roma Street, Herschel Street, Riverside Expressway, Ipswich Road, O'Keefe Street, Old Cleveland Road, Creek Road to access Pine Mountain road.
- Larapinta – accessed via Roma Street, Herschel Street, Riverside Expressway, Ipswich Road and the motorway network to Larapinta.
- Port of Brisbane – accessed via Roma Street, Herschel Street, Riverside Expressway, Vulture Street, Shaftson Avenue, Wynnum Road, Port of Brisbane Motorway.

Traffic staging and network changes

The location of the Roma Street worksite would require the closure of Parkland Crescent between Platform 10 and its intersection with Parkland Boulevard. Access to the Roma Street Parkland precinct would continue to be available from College Road and Parklands Boulevard.

The closure of Parklands Crescent would result in alternative access routes being required to access the Platform 10 and the car parks and servicing areas associated with the Roma Street Parkland apartment buildings. This closure would be managed through:

- establishment of a turn-around facility on Parkland Crescent under the Central Parkland Apartment buildings. This would provide a turning head at the end of Parklands Crescent that becomes a cul-du-sac during the operation of the Roma Street worksite. This turning head would utilise an existing loading bay associated with Platform 10 and is illustrated in **Figure 8-16**.

Figure 8-16 Existing loading bay on Parklands Crescent

Noting that other construction methods may be adopted, vehicular, pedestrian and cycle access must be maintained to Roma Street Parkland such that:

- residents and their visitors can access the car parking associated with the Roma Street Parkland apartments
- the public can continue to access and visit the Roma Street Parkland
- long distance rail services can be accessed from Platform 10
- pedestrian and cyclists can continue to access the off-road bicycle facilities that connect Roma Street Parkland (and hence Roma Street) to the northern suburbs via off-road shared bicycle and pedestrian paths.

An alternative access should take into account that the intersection of College Road, Gregory Terrace and Parklands Boulevard is currently operating at capacity during the commuter peak periods. This intersection currently has limited access so it is not an alternative access route to Roma Street and the CBD.

Network operation – impact on traffic conditions

The following network impacts on existing traffic conditions are anticipated:

- through-access along Parkland Crescent would be removed resulting in vehicles accessing the relocated access to Platform 10 and the car parking and servicing activities associated with the Roma Street Parkland apartments from the northern intersection of Parklands Boulevard and Parklands Crescent.

Additional detail relating to impact of heavy vehicle haulage operation on the adjacent road network, including traffic modelling of critical intersections, is contained in **section 8.9**.

Rail operations

The Roma Street worksite would require the relocation of the access to Platform 10. It is proposed that passenger facilities and boarding and alighting operations of long distance trains be relocated further west along the existing platform. All operational facilities such as the ticket office and baggage facilities would be relocated further west along the existing platform. The existing pedestrian connectivity along Platform 10 to the existing passenger subway at Roma Street Station would not be altered.

Other arrangements required to facilitate the temporary re-location of passenger boarding and alighting facilities associated with the long distance platform include:

- alternative set-down areas can be provided on Parkland Crescent under the Central Parkland Apartments utilising the turning head previously described
- mobility impaired passengers would either use the alternative set-down area or be transferred from the Roma Street Station entrance by use of motorised buggies
- suitable alternative car parking arrangement exist through using the commercial car park associated with the Roma Street Apartments that is accessed from Parklands Crescent. A number of these car parks would be reserved for use by Queensland Rail staff and customers. Pedestrian connectivity between this car park and Platform 10 would be enhanced through the provision of a suitable pedestrian road crossing facility such as a zebra crossing.
- the establishment of a turnaround facility on Parkland Crescent would enable light vehicles to enter and exit the relocated passenger drop off area via the same route along Parkland Crescent, under the Central Parkland Apartments

- an area of vacant land within the Roma Street Parkland, north of the Central Parkland Apartments, is proposed to be established as a car park. It is anticipated that this car park would be used by Queensland Rail employees and for other operational purposes such coach set-down and pick-up activities

Pedestrians and cyclists

The Roma Street worksites are located in areas with high pedestrian and cycle use. During the construction phase the location of the worksite outside Platform 10 would require the closure of Parkland Crescent for through traffic, including cyclists. This would also close the existing pedestrian connection between Roma Street Station and the Parklands. However, pedestrian and cycle use through the Parklands, including along Parklands Boulevard, would be maintained during the construction phase.

An alternative pedestrian access between the station and the Parklands would be provided via the eastern end of the existing Platform 10 and the Roma Street Parkland boardwalk. This work would involve the establishment of a pedestrian connection and vertical transportation up to the pedestrian boardwalk on Parkland Boulevard. No changes to pedestrian or cycle networks along Roma Street would be required for the Project.

During construction, delays to pedestrian and cycle movement around the worksite may be experienced with construction vehicles entering and exiting the worksites. This would most likely be experienced at the eastern intersection of Parklands Boulevard and Parkland Crescent.

To avoid conflict occurring between construction traffic and cyclists the following measures would be required:

- ao construction truck activity to and from the worksite during the commuter peak periods
- the use of traffic control officers to stop trucks accessing Parklands Boulevard when cyclists are approaching
- no overtaking of cyclists permitted should a construction truck encounter a cyclist on Parklands Boulevard between Roma Street and the worksite access on Parklands Crescent.

In the event that Parklands Boulevard would be closed for a period of time, provision would be made for pedestrian and cyclists to access the off-road bicycle facilities that connect Roma Street Parkland (and hence Roma Street) to the northern suburbs via Victoria Park.

Buses

The following bus impacts have been identified:

- coach access and egress from the long distance platform 10 would be required to follow detours put in place for all vehicles
- the existing contra flow bus lane on George Street (to the immediate east of Roma Street) would be removed. To facilitate this change, bus routes could be changed to be via Saul Street in order to access North Quay.

There would be no change to bus access to the Traders Hotel and the bus u-turn facility via College Close would be maintained.

Parking

140 car parks would be located at the Roma Street worksite for the workforce and worksite visitors. The location of these worksite car parks are shown on **Figure 8-12**. Alternatively, the workforce could use the many public transport services at Roma Street Station. Also, within the Brisbane CBD andSpring Hill and Petrie Terrace there commercial public car parks that could be used by the workforce. The Roma Street Transit Centre commercial car park is within walking distance of the worksite.

The Roma Street worksite would be located in the Brisbane Central Traffic Area. 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 7.00am to 6.00pm and Saturday 7.00am to 12.00 noon such that the Project workforce would not be to able park on the streets in the vicinity of the worksite.

The car park adjacent to the Platform 10 and the car park located on College Close within the Roma Street Parkland grounds would be removed for the Project. The car park adjacent to the Platform 10 includes:

- 2 disabled car spaces
- 30 regular car spaces with 3 hour parking, Monday to Friday, 7.00am to 10.00pm and Saturday and Sunday, 7.00am to 7.00pm.
- 10 spaces for Roma Street Parkland Permits only
- a passenger set down zone
- Queensland Rail authorised parking zone, approximately 10 spaces

As discussed previously suitable alternative car parking arrangement exist through using the commercial car park associated with the Roma Street Apartments that is accessed from Parklands Crescent.

The ancillary worksite located within the Roma Street Parklands would result in the loss of approximately 140 public car spaces. This car parking is particularly well used when events are held in the Parkland. The existing Roma Street Parkland staff car park close to College Road would be made available to provide additional public car parking capacity when events are held and at other times as required.

Access, servicing and provision for adjacent development

It is proposed that access to Platform 10 would be relocated immediately west of its current location. Locating the platform access further west would enable direct access to the platform from Parkland Crescent under the Central Parkland Apartments. It is proposed that temporary set down arrangements would be provided on Parkland Crescent and car parking would be provided within the existing Roma Street Parkland public car park.

The major worksite would require the removal of 10 car parking spaces dedicated to Roma Street Parkland permit holders. Alternative spaces could be provided within the proposed car park to be established on the vacant site to the north of the Central Parkland Apartments.

The closure of Parkland Crescent through the Platform 10 car park would remove the ability for westbound access along this road to the Central Parklands Apartments' car parks. Access to the apartments' car parks would still be possible from the northern access to Parkland Crescent.
A turn around facility would be provided on Parkland Crescent at the western boundary of the worksite.

Any proposal to close Parklands Boulevard for a period of time would require reasonable vehicular access for the car parking associated with the Central Parkland Apartments.

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 and agreed with 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 the CTMP. 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 CTMP 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.

Table 8-7 provides a summary of construction impacts and proposed mitigation at the Roma Street worksites.

Table 8-7 Construction impacts and proposed mitigation for the Roma Street worksite

Impacts	Proposed remedial measures
Access to Platform 10 and associated vehicle parking, pedestrian and cycle access through Roma Street Parkland	Access to Platform 10 would be relocated to the west of its existing location. Parking would be provided within the Roma Street Parkland public car park. Provision of new pedestrian access from Roma Street Station up to the Parkland Boulevard pedestrian concourse. Access for vehicles, pedestrians and cyclists would be maintained through the Parklands. Traffic management measures would be implemented where there is potential for conflict with construction traffic.
Loss of car parking and passenger drop off and pick up adjacent to Platform 10	Suitable alternative car parking arrangement exists through using the commercial car park associated with the Roma Street Apartments (fee of $4.00 per hour) that is accessed from Parklands Crescent. A number of these car parks would be reserved for use by Queensland Rail staff and customers. Use of an area of vacant land within the Roma Street Parkland, north of the Central Apartments, is proposed to be established as a car park. It is anticipated that this car park would be used by Queensland Rail employees and for other operational purposes such coach set-down and pick-up activities.

Impacts	Proposed remedial measures
Loss of car parking in Roma Street Parkland.	The existing Roma Street Parkland staff car park close to College Road would be made available to provide additional public car parking capacity when events are held and at other times as required.
In the event of a contractor requiring to close other roads in Roma Street Parkland such as Parklands Boulevard for a period of time.	Vehicular, pedestrian and cycle access must be maintained to Roma Street Parkland such that: • Residents and their visitors can access the car parking associated with the Roma Street Parkland apartments • The public can continue to access and visit the Roma Street Parkland • Queensland Rail long distance rail services can be accessed from platform 10. • Pedestrian and cyclists can continue to access the off-road bicycle facilities that connect Roma Street Parkland (and hence Roma Street) to the northern suburbs via off-road shared bicycle and pedestrian paths.

8.6.5 Northern Connections construction worksites

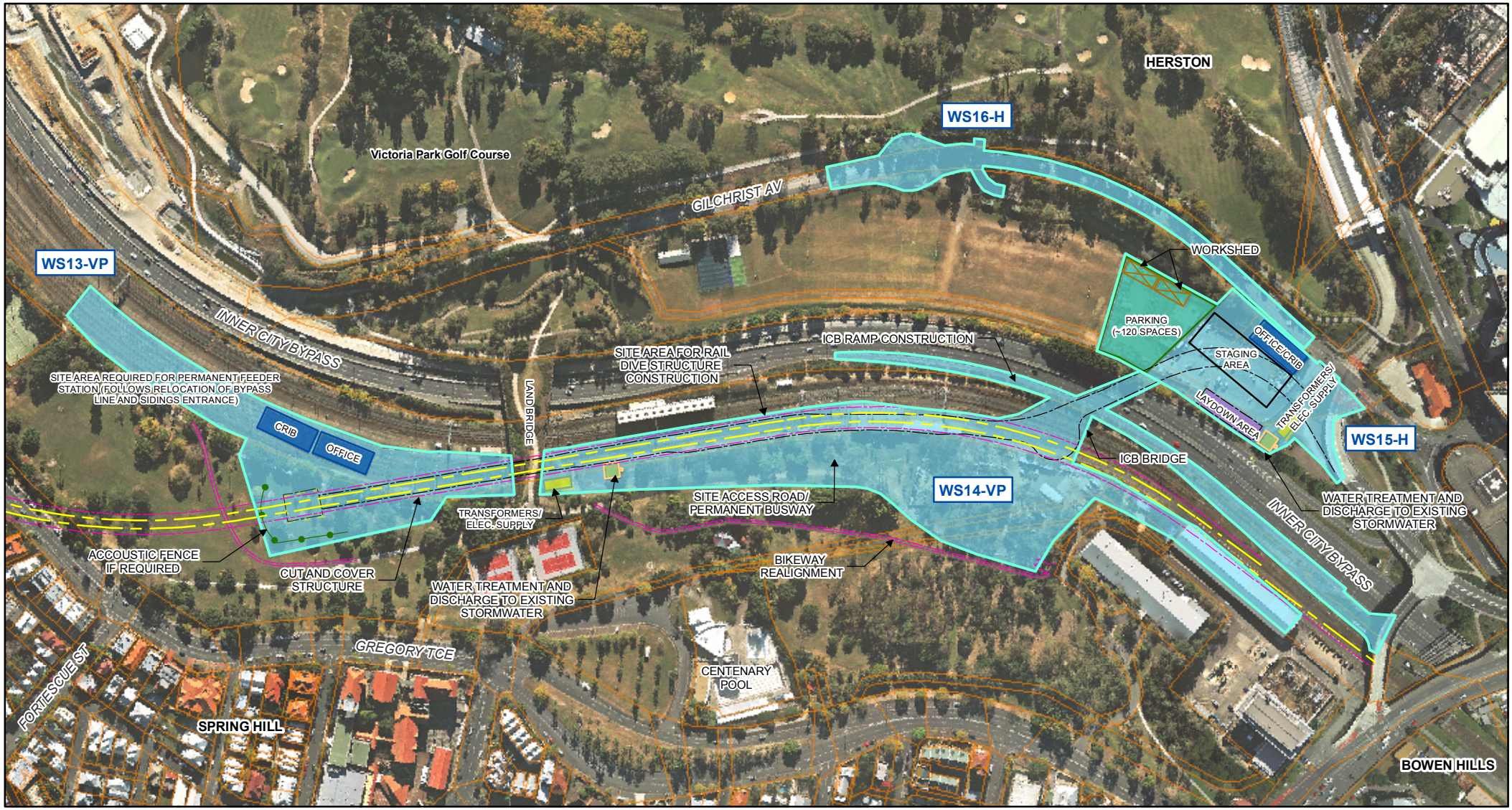
The Northern Connection worksite would be located at Victoria Park, parallel to the existing Exhibition railway line to the north. The worksite is located within the Normanby Yard and Victoria Park extending from Bowen Bridge Road to west of the Land Bridge. The width of the worksite varies dependent on existing constraints, such as the Energex substation, the Centenary Pool complex and the tennis courts, and the Project surface requirements, such as the tunnel transition structure, the busway and worksite infrastructure.

A second worksite would also be located in Victoria Park on the opposite of the rail corridor and the ICB. It would be located off Gilchrist Avenue, to the north of the ICB. This worksite would be located on land that is owned by Brisbane City Council and currently used for construction workforce car parking for the Legacy Way project.

The Northern Connection worksite concept layout is illustrated in **Figure 8-17**.

Worksite location and proposed truck access

As a component of the Project, it is proposed that the busway access between the Northern Busway and the ICB (westbound) would be established towards the start of the construction programme to provide an efficient site access route. It is also proposed to construct at an early stage the busway bridge over the rail corridor and ICB to allow for efficient access between the two worksites. These early works would result in construction related traffic to these northern worksites being able to directly access the ICB and so not impacting on the local road work including Herston Road and Gregory Terrace. The construction traffic routes between the northern worksites and accessing the ICB via Gilchrist Avenue is illustrated in **Figure 8-18**.



LEGEND

- BaT rail centreline
- Cadastre
- Construction worksite
- Office/crib

Aerial Photo: Brisbane City Council 2012

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-17

Construction worksite concept layout - Northern Connection

0 75 150
Metres
1:4,000 (at A4)
Projection: GDA 1994 MGA56

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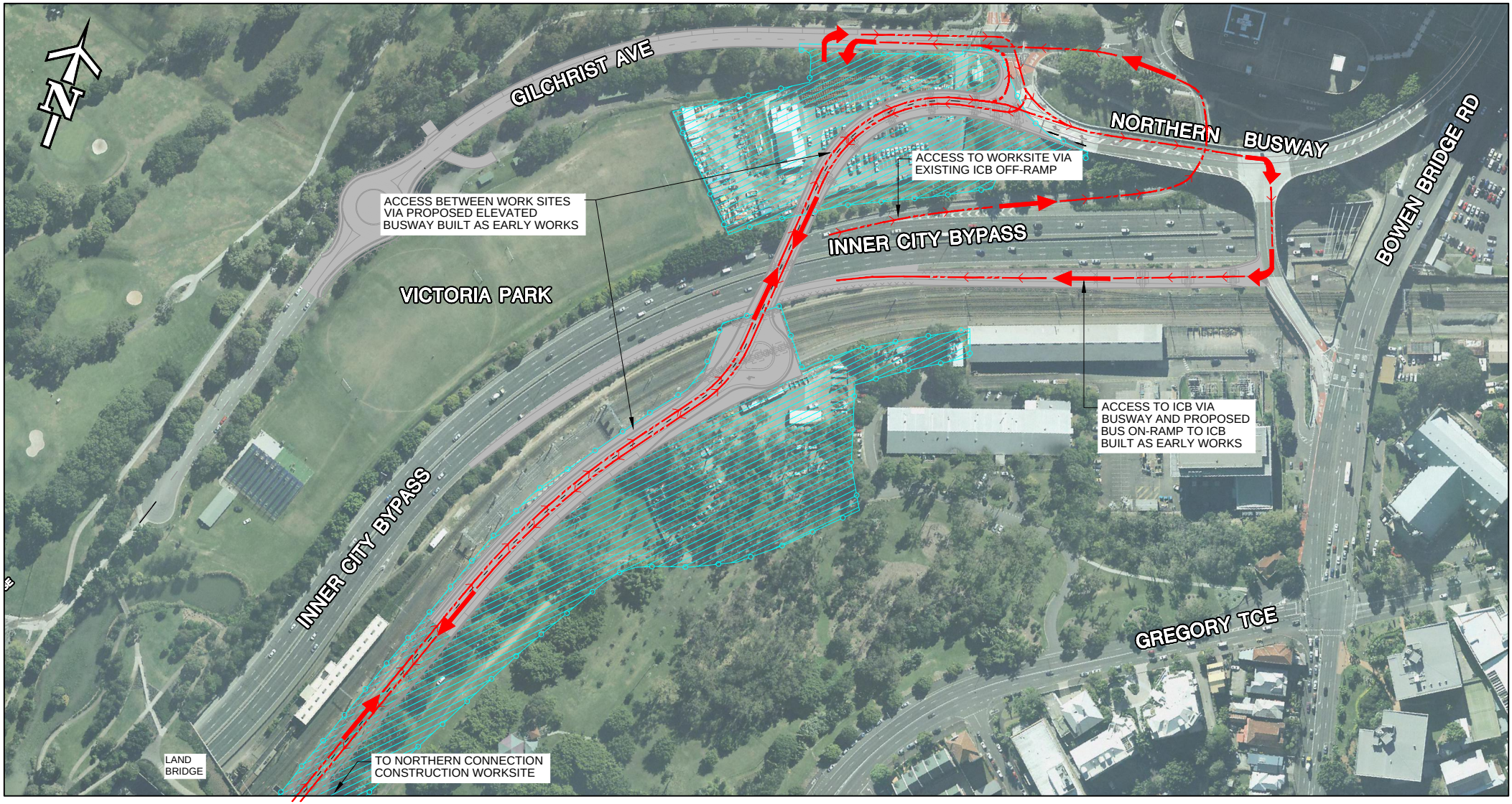


LEGEND

- PROPOSED WORKS
- CONSTRUCTION WORKSITE LIMIT
- CONSTRUCTION WORKSITE BOUNDARY

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-18

Infrastructure to be used by construction traffic at the Northern Connection construction worksites

By utilising this early infrastructure site access route, major construction vehicles including spoil haulage would use the Centenary Motorway from the south-west (for access to possible spoil placement sites at Swanbank or Larapinta), and access the ICB from Legacy Way. From the Legacy Way and ICB construction vehicles would access the Gilchrist Avenue worksite by utilising the existing off-ramp from the ICB.

Some access to the worksite would be required via Gregory Terrace, particularly prior to the completion of the busway infrastructure that would link the two worksites together. Construction traffic associated with Gregory Terrace would access the arterial road network, such as the ICB, Airport Link and CLEM7 via Bowen Bridge. Construction traffic would not proceed to the east of Victoria Park (towards Spring Hill and the CBD).

A diagram showing the proposed construction truck access route is shown in **Figure 8-19**. This illustrates the major proposed route to the ICB and alternative routes that maybe needed including access to the north via Bowen Bridge Road and Airport Link. In addition to haulage, potential delivery vehicle routes are also shown.

Alternative access routes for spoil placement locations

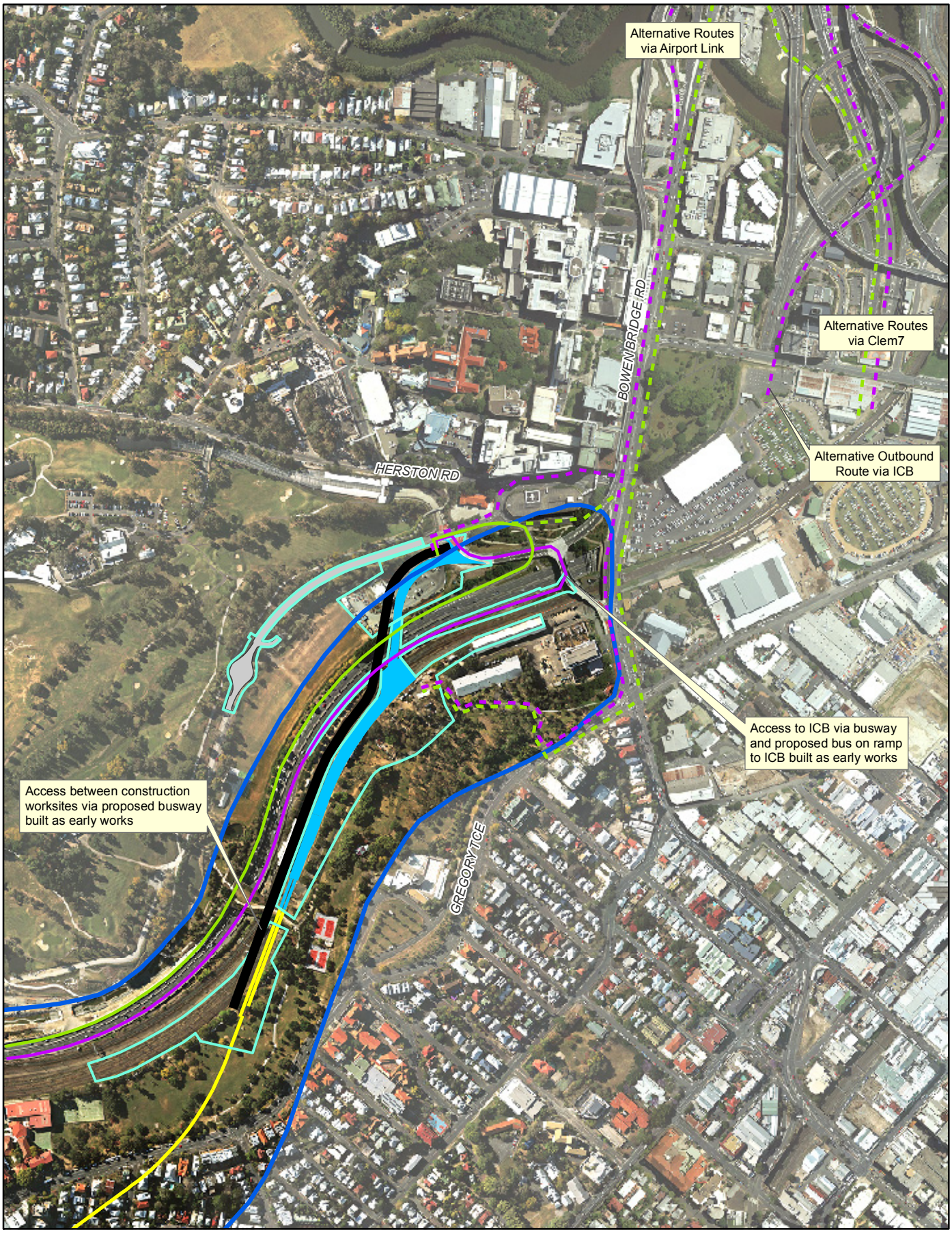
Spoil placement site(s) selected from the following five that have been assessed could be accessed as follows:

- Brisbane Airport (Sugarmill Road) – accessed via Herston Road, Bowen Bridge Road and Airport Link to access the Brisbane Airport precinct.
- Swanbank – accessed via busway infrastructure constructed at the start of the main construction, ICB, Legacy Way and the motorway network to Swanbank.
- Pine Mountain (Mount Gravatt) – due to poor connectivity through or around the CBD this spoil placement site would not be accessed from the Northern worksites
- Larapinta – accessed via busway infrastructure constructed at the start of the main construction, ICB, Legacy Way and the motorway network to Larapinta.
- Port of Brisbane – due to poor connectivity through or around the CBD this spoil placement site would not be accessed from the Northern worksites

Traffic staging and network changes

Before the completion of the Northern Busway to ICB access ramp (westbound) and the Project busway bridge over the ICB and railway corridor the following alternative routes would be required that are illustrated in **Figure 8-19**:

- Gilchrist Avenue worksite egress to the ICB would be via Herston Road and Bowen Bridge Road.
- the Northern Connection construction worksite at Victoria Park would be accessed via Gregory Terrace and Bowen Bridge Road to connect with the ICB, Airport Link or CLEM7. The current intersection of the Victoria Park 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 from Gregory Terrace 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. This site access would only be required prior to the construction of the busway infrastructure that would be used by construction traffic.



LEGEND

Haulage Routes
- Inbound - main haulage
- Inbound - alternative
- Outbound - main haulage
- Outbound - alternative

- Study corridor

Project Infrastructure
- Construction worksite
- Bus layover

Alignment
- Above ground
- Underground

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-19

Northern Connection construction worksite and haulage routes

N

0 0.1 0.2
Kilometres
1:7,500 (at A4)
Projection: GDA 1994 MGA56

Aerial Photo: Brisbane City Council 2012

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Queensland Rail local access roads currently provide 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.

Once the busway bridge has been established, the primary access for spoil vehicles to the worksite would be via the worksite off Gilchrist Avenue. A direct access between the Project busway network and the Northern Busway would be established within the smaller worksite. This would enable spoil vehicles to avoid traveling on Bowen Bridge Road, Gregory Terrace and Herston Road.

Network operation – impact on traffic conditions

Some impacts to traffic conditions may be experienced. In particular, the establishment of the Northern Busway to ICB (westbound) ramp would result in some disruptions to traffic on the ICB but this should be limited to managed night time or weekend lane closures.

Once works, including the ICB to Northern Busway access ramp and the Project busway bridge, are completed, impacts on traffic conditions would be minimal. Works would be contained within the Project's worksites. Construction vehicle access would primarily be via existing busway infrastructure or the ICB. Prior to completion of these works there would be some impact to Gregory Terrace. To prevent straight ahead vehicles being blocked by right turning construction vehicles it is proposed to temporarily suspend four car parking spaces on the southern side of Gregory Terrace adjacent to the driveway entrance. This would minimise the impact of construction vehicles on traffic using Gregory Terrace.

Pedestrians and cyclists

Victoria Park, including the Land Bridge, experiences regular use by pedestrians and cyclists. Annual average daily counts from 2013 show that 905 cyclists and 477 pedestrians use the Land Bridge each day. The Project's construction and operations would not require the closure of the Land Bridge for pedestrians and cyclists.

The construction worksite located to the south of the rail corridor within Victoria Park has an existing pedestrian and cyclist shared path. An alternative off-road shared pedestrian and cyclist path would be provided to travel through Victoria Park. This alternative route would continue to provide connectivity from Bowen Bridge Road to Roma Street via Normanby and Roma Street Parkland. This alternative bikeway would be connected to the Land Bridge.

TMR proposes to construct The North Brisbane Bikeway that will link Brisbane's CBD to the northern suburbs. A stage of this bikeway is planned to be completed by the end of 2015 that would connect the existing bikeway from Victoria Park at Gilchrist Avenue, Herston to O'Connell Terrace, Bowen Hills. Construction of the Project would require temporary closure of this bikeway at Gilchrist Avenue. Alternative facilities for cyclists should be provided to enable them to travel between the bikeway to the east of Gilchrist Avenue to the existing bikeway to the north west of Gilchrist Avenue at Victoria Park.

Pedestrian footpaths and on-road cycle lanes are provided along both sides of Gregory Terrace. No change to these facilities are proposed.

Buses

Construction works associated with the northern portal are expected to have minimal impact on the operation of bus services on Gregory Terrace. Some busway operational changes may be required during the construction of the Northern Busway to ICB access and the Project busway access to the Northern Busway such as night time or weekend closures. These arrangements would be developed in consultation with TransLink and Brisbane Transport and detailed in the CTMP.

Rail

In order to facilitate the establishment of the Project northern portal and connections to the existing tracks of the Exhibition Loop at Victoria Park a series of temporary, short term shutdowns of the Exhibition Loop would be required. The shutdowns would typically be no longer than 48 hours over weekends. All existing passenger and freight services would generally continue around and within the northern connection worksite during the construction phase so limiting any disruption to freight and passenger services.

Parking

Onsite parking for 120 spaces would be provided for the construction workforce at the worksite accessed from Gilchrist Avenue. This is consistent with the peak workforce requirements at this worksite. No construction workforce car parking outside the worksite is proposed. This would not impact on the parking operations associated with the hospital precinct at Herston. In the event that additional spaces are required during this peak period, such as for site visitors, it is anticipated that space would be made available within the worksite or through utilising on-street parking opportunities that are controlled through time-limited and monetary restrictions (paid).

The northern worksites would be located in the Brisbane Central Traffic Area and the Herston Permit Area. Within the Brisbane Central Traffic Area on-street parking is generally limited with a two hour period (with some exceptions). Parking restrictions apply Monday to Friday 7.00am to 6.00pm and Saturday 7.00am to 12 noon. Any workforce parking on local streets would be subject to these parking restrictions.

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 Energex substation (accessed from Bowen Bridge Road and Gregory Terrace) currently provides approximately 200 spaces that is used by Energex and Brisbane City Council staff. This car parking would be 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.

Access, servicing and provision for adjacent development

The location of the Project worksite would impact on pedestrian and cyclist access through Victoria Park. Alternative pedestrian and cyclist shared path should be provided past the worksite area. Given the defined haulage routes, 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 an adverse impact on emergency service access to adjacent land uses. This includes emergency vehicle access to the Royal Children's Hospital and the RBWH. Emergency services would be advised of all changes to routes through processes established under the Framework TMP.

Special events

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 the CTMP.

Table 8-8 provides a summary of construction impacts and proposed mitigation at the northern portal worksites.

Table 8-8 Summary of construction impacts and proposed mitigation for the Northern worksites

Impacts	Proposed remedial measures
Pedestrian and cycle access at Victoria Park - closure of existing shared cycle and pedestrian path.	Realignment of shared paths around the worksites to enabled continued access during construction. Where required, implementation of traffic controllers at locations where there is potential conflict between cyclists, pedestrians and construction traffic.
INB Short term temporary closure of Inner Northern Busway	Manage closure through consultation with TransLink with shutdowns carried out on weekends, at night or during holiday periods and to provide alternative routes.
Rail Corridor Short term temporary shutdown of passenger rail operations	Managed shutdowns by Queensland Rail and TransLink. Shutdowns should be carried out on weekends or at night.
Construction traffic turn right from Gregory Terrace into construction worksite driveway	Suspension of parking in worksite access driveway adjacent to Substation. Temporary removal of four on street parking spaces adjacent to worksite driveway on Gregory Terrace will mean that right turning construction traffic would not block straight ahead traffic. Provision of 'Keep Clear' markings for northbound Gregory Terrace at worksite driveway entrance.

Impacts	Proposed remedial measures
Construction traffic using Gregory Terrace, Bowen Bridge Road and Herston Road. Temporary impacts to busway operations during construction.	Use of the Project busway infrastructure constructed at the start of the construction program as connection between the Northern worksites so removing some construction traffic activity from Herston Road, Gregory Terrace and Bowen Bridge Road.
Construction traffic to use a short section of the Northern Busway to access the ICB.	Consultation with TransLink on busway operations to develop a coordinated approach to the delivery of the busway infrastructure and to manage the mixing of haulage trucks with bus operations.

8.7 Construction workforce parking

This section provides a summary of workforce parking requirements.

The identified construction workforce is expected to generate a peak parking demand of approximately 800 vehicles across all construction worksites based on a conservative assumption that each member of the workforce would drive. A total of 700 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:
  - inappropriate and unnecessary on-street car parking should be controlled through the Workforce Code of Behaviour and the Construction Workforce Car Parking Plan (refer Chapter 18 – Draft Outline EMP).
  - no provision of car parking for construction workforce at Roma Street and George Street worksites due to public transport and commercial car park accessibility
  - encourage the workforce to car pool or catch public transport where possible, particularly to Roma Street and George Street construction worksites
  - 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 CTMPs prepared by the Proponent.

Overall car parking numbers are summarised in **Table 8-9**.

With the exception of the George Street Station construction worksite, each construction worksite car park would also provide a small number of parking space for visitors and deliveries.

Table 8-9 Construction workforce parking

Site	Peak workforce	Proposed workforce car parking	Surplus/ deficit
Southern Connection construction worksite	200	310	110 surplus Workforce parking provision well in excess of peak demands. Site could cater for overspill parking from other worksites as

Site	Peak workforce	Proposed workforce car parking	Surplus/ deficit
			required On street car parking discouraged due to Dutton Park traffic area Monday to Friday.
Woolloongabba Station	150	130	20 deficit Excess workforce would use car parks or carpool or public transport On-street car parking discouraged due to Gabba traffic area Monday to Friday (and on game days)
George Street Station	150	0	150 deficit Excess workforce to use off-street public car parks or carpool or public transport On street car parking discouraged through Brisbane Central traffic area Monday to Saturday
Roma Street Station	150	140	10 deficit Excess workforce to use off-street public car parks or carpool or public transport On street car parking discouraged through Brisbane Central traffic area Monday to Saturday
Northern Connection construction worksite	150	120	30 deficit Workforce parking provision matches demand.
Total	**800**	**700**	

Note: Assumes all workforce drives.

8.8 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.

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.

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 a combination of SIDRA single intersection and LinSig network modelling tools. 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.

8.8.1 Spoil placement sites and haulage routes

A number of spoil placement sites and associated haulage routes are considered. The location of the spoil placement site and the haulage route between worksites and the spoil placement site is a key input when assessing the impact of construction vehicles using the road network. The spoil placement site(s) to be used out of the potential five sites presented in this assessment is yet to be determined.

The Project proposes five spoil placement sites for which a quantitative assessment (intersection assessment completed) has been carried out on the first three and a qualitative assessment (no intersection assessment) has been completed on the two other sites.

- Brisbane Airport – quantitative assessment
- Swanbank (all times) – quantitative assessment
- Pine Mountain (day time) and Swanbank (evening and weekend) – quantitative assessment
- Larapinta – qualitative assessment
- Port of Brisbane – qualitative assessment.

8.8.2 Construction traffic generation

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 and intersection layouts resulting in changed traffic conditions/ detours or local diversions for general motorists.

Key intersections on the road network where the impact of spoil haulage and delivery vehicles is expected to be greatest have been assessed. For this worst case scenario assessment, the peak rate of generated haulage movements has been used, and all worksites have been assumed to be operating at full capacity concurrently.

This assessment provides forecasts of number of one way truck movements for each worksite per quarter. A summary is provided in **Table 8-10** of the number of spoil trucks at each worksite.

Table 8-10 Summary of truck generation at each construction worksite – one way

Site	Duration	Total trucks		Peak total (hourly)	
		Spoil	Delivery	Spoil	Delivery
S1A: Boggo Road	May 16 to May 20	10,100	2,300	9	3
S1B: PA Hospital	Jun 16 to Dec 19	76,200	22,600	9	3
Woolloongabba	May 16 to Nov 19	18,000	10,000	2	1
George Street	Jun 16 to May 20	21,800	8,800	4	1
Roma Street	Oct 16 to Aug 20	15,300	9,900	5	2
North Busway and rail connections	Jul 16 to Mar 20	600	1,100	1	1
Northern Connection	Jul 16 to Mar 20	5,000	3,200	2	1

8.8.3 Work site spoil operational hours

Table 8-11 provide a summary of the hours of spoil truck operation for each worksite and the total number of spoil truck hours per week.

Table 8-11 Construction worksite spoil hours

Worksite	Comments and restrictions	Spoil hours	Hours per week
S1A: Boggo Road	School restriction = 7.00am to 9.00am and 2.00pm to 4.00pm on school days No evening or night time spoil.	6.30am to 7.00am Monday to Friday 9.00am to 2.00pm Monday to Friday 4.00pm to 6.30pm Monday to Friday 6.30am to 6.30pm Saturday None – Sunday	49.5
S1B: PA Hospital	TBM spoil and no restrictions	24 hours. 7 days a week	168
Woolloongabba Station	Peak period restriction = 7.00am to 9.00am and 4.30pm to 6.30pm	24 hours. 7 days a week, except commuter peak hours 7.00am to 9.00am and 4.30pm to 6.30pm Monday to Friday	148
George Street Station	Peak period restriction = 7.00am to 9.00am and 4.30pm to 6.30pm No night time activity.	6.30am to 7.00am Monday to Friday 9.30am to 4.30pm Monday to Friday 6.30pm to 10.00pm Monday to Friday 6.30am to 6.30pm Saturday None – Sunday	69.5
Roma Street Station	Peak period restriction = 7.00am to 9.00am and 4.30pm to 6.30pm No night time activity.	6.30am to 7.00am Monday to Friday 9.30am to 4.30pm Monday to Friday 6.30pm to 10.00pm Monday to Friday 6.30am to 6.30pm Saturday None – Sunday	69.5

Worksite	Comments and restrictions	Spoil hours	Hours per week
Northern Busway & rail Connections and Northern Connection	Peak hour restriction = 7.30am to 8.30am and 4.30pm to 5.30pm. No night time activity.	6.30am to 7.30am Monday to Friday 9.00am to 4.30pm Monday to Friday 5.30am to 6.30pm Monday to Friday 6.30am to 6.30pm Saturday None – Sunday	62

8.8.4 Spoil site receiving hours

Table 8-12 presents the receiving hours assumed for each spoil dump site.

Table 8-12 Spoil site receiving hours

Spoil site	Receiving Hours
Brisbane Airport	24hrs/ 7 days
Swanbank	6.00am to 00.00 (midnight)/ 7 days
Pine Mountain, Mt Gravatt East	6.30am to 6.30pm Monday to Saturday
Larapinta	24hrs/ 7 days
Port of Brisbane	6.30am to 10.00pm/ 7 days

8.8.5 Spoil placement sites and haulage routes

This section provides an assessment of the routes to access the spoil placement sites from the Project's worksites. These routes are illustrated in **Figure 8-20** to **Figure 8-24**.

Brisbane Airport site (Sugarmill Road) and route

The proposed spoil truck routes to land to the east of Sugarmill Road at the Brisbane Airport precinct would be via CLEM7, Airport Link, East-West Arterial Road, Airport Drive, Lomandra Drive and Sugarmill Road.

Swanbank site and route

Spoil haulage from construction worksites to Swanbank would be primarily via Ipswich Road/ Ipswich Motorway or the ICB/ Legacy Way/ Centenary Motorway with both routes travelling along the Ipswich Motorway, Cunningham Highway and Swanbank Road to Swanbank.

A number of roads in the urban area would be used including the ICB, Ipswich Road, Annerley Road, Roma Street, George Street, Mary Street, Alice Street, Albert Street, Gregory Terrace and O'Connell Terrace.

At Swanbank, haulage trucks would leave the Cunningham Highway and follow Swanbank Road to access the spoil placement precinct. The haulage route has been selected to minimise the potential impact on residential land uses within the area.

Mount Gravatt East (Pine Mountain)

The Pine Mountain Quarry on Pine Mountain Road, Mount Gravatt East is a possible spoil placement site for the Project. Spoil haulage from the worksites to Mt Gravatt would be as follows:

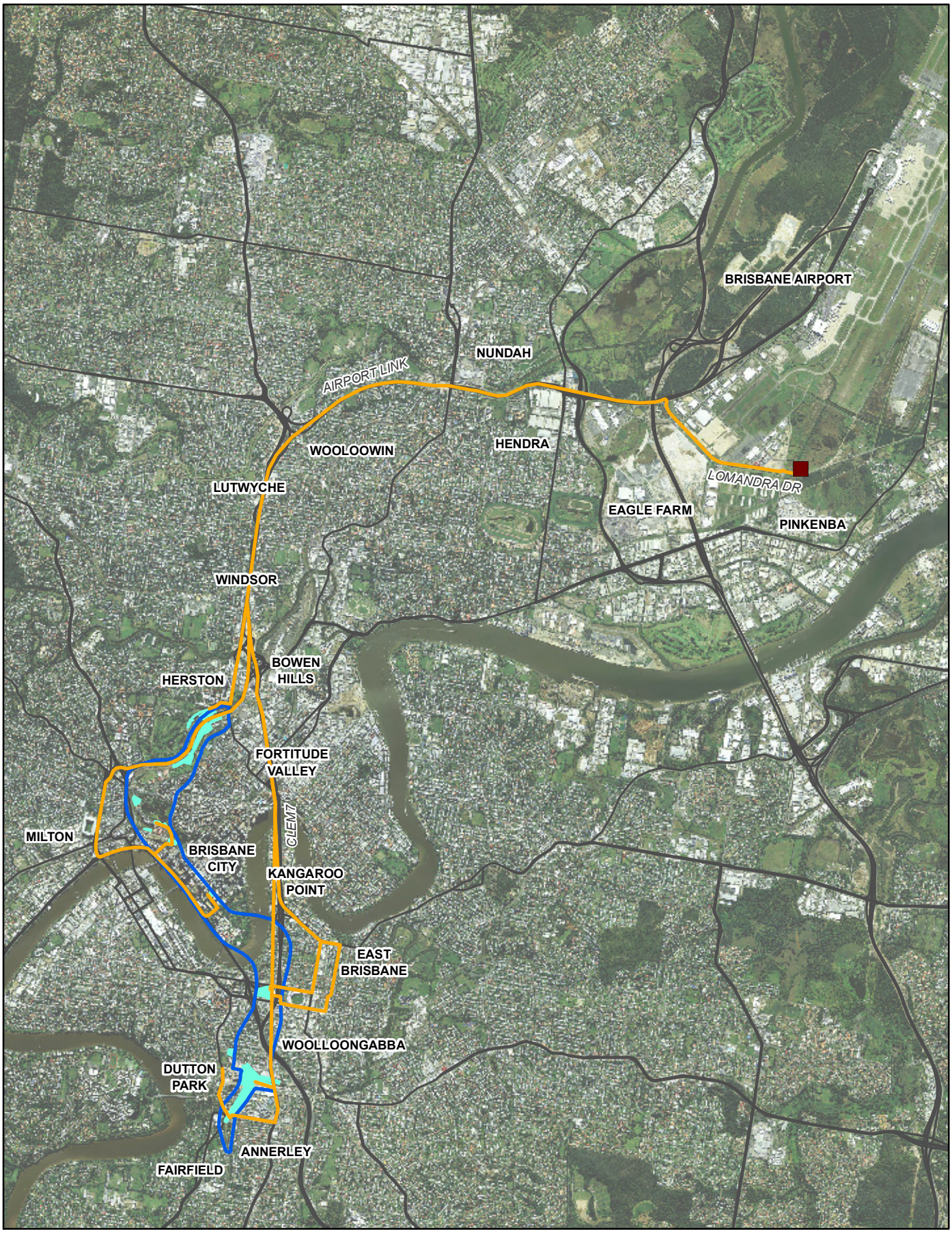
- Southern portal and Woolloongabba worksites: Ipswich Road, O'Keefe Street/ Old Cleveland Road, Creek Road, Pine Mountain Road
- CBD worksites: the Pacific Motorway, Vulture Street, Ipswich Road, O'Keefe Street/ Old Cleveland Road, Creek Road, Pine Mountain Road.

Other spoil placement sites

A number of other spoil placement sites have been identified that may be used in the event that the other sites are unavailable. These sites and the major roads that would be used for access are:

- Larapinta: primarily via Ipswich Road/ Ipswich Motorway, Centenary Highway and Logan Motorway
- Port of Brisbane: Ipswich Road, O'Keefe Street, Old Cleveland Road, Gateway Motorway, Port of Brisbane Motorway.

In the event that these sites are required for spoil disposal, access to them would be primarily by motorways and arterial roads and would have negligible impact on the local road networks.



LEGEND

- Spoil site
- Haulage route to spoil site
- Main road
- Study corridor
- Construction worksite

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-20

Combined haulage routes - Brisbane Airport (Sugarmill Road)

N

0 1 2
Kilometres
1:70,000 (at A4)
Projection: GDA 1994 MGA56

Aerial Photo: AusImage 2009

G:\QENV2\Projects\QE06863\SpatialVArcGIS\Figures\Final_EIS_Figures\04_Transport\Tech_Report\TranspTechRpt_Figure8-20_Combined_HaulageRoutes_BrisbaneAirport.mxd Date: 14/08/2014

LEGEND

- Spoil site
- Haulage route to spoil site
- Main road
- Study corridor
- Construction worksite

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-21

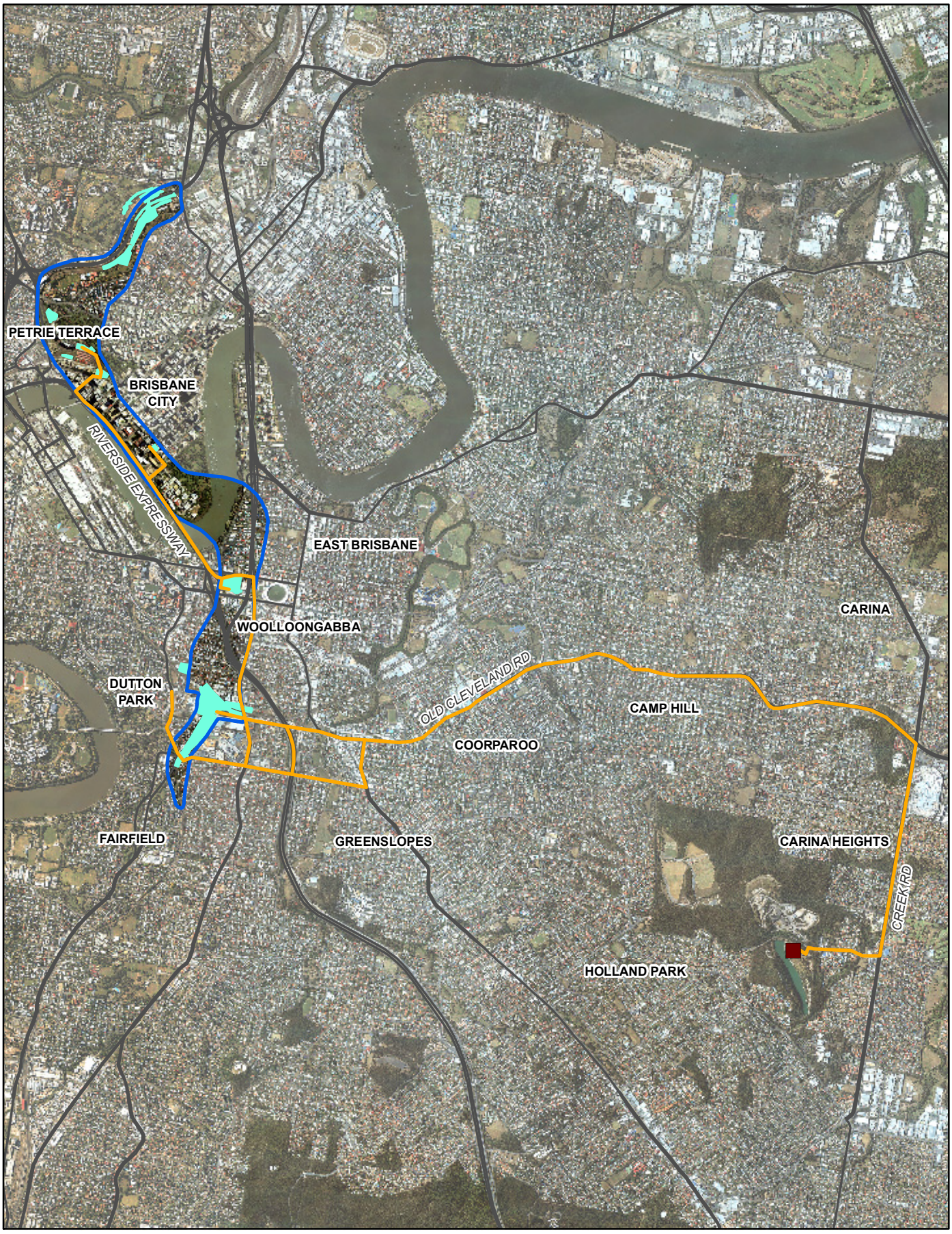
Combined haulage routes - Swanbank

N

0 1 2
Kilometres
1:80,000 (at A4)
Projection: GDA 1994 MGA56

Aerial Photo: AusImage 2009

G:\QENV2\Projects\QE06863\SpatialArcGIS\Figures\Final_EIS_Figures\04_Transport\Tech_Report\TranspTechRpt_Figure8-21_Combined_HaulageRoutes_Swanbank.mxd Date: 14/08/2014



LEGEND

- Spoil site
- Haulage route to spoil site
- Main road
- Study corridor
- Construction worksite

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-22

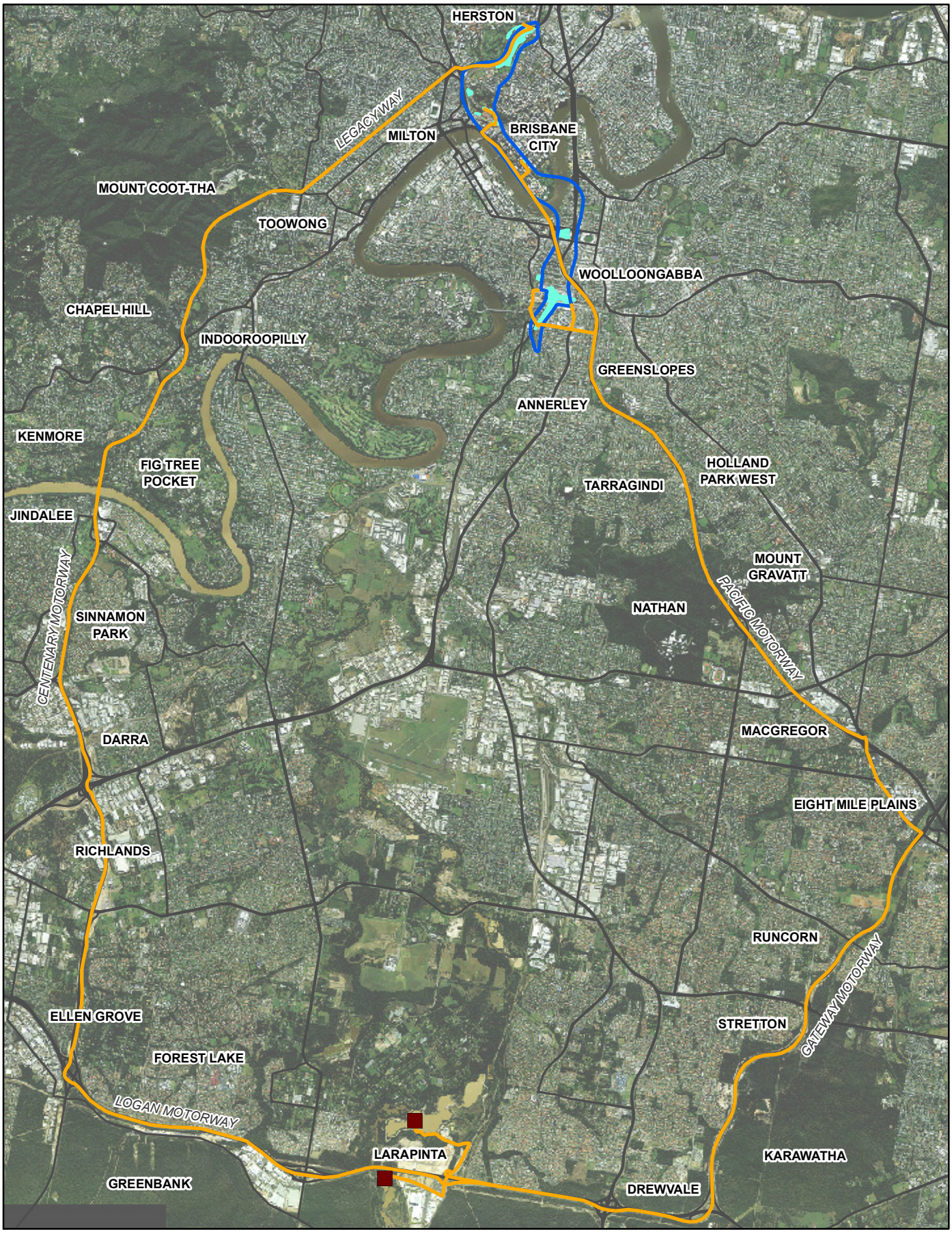
Combined haulage routes - Mount Gravatt East (Pine Mountain)

N

0 0.5 1
Kilometres
1:50,000 (at A4)
Projection: GDA 1994 MGA56

Aerial Photo: Brisbane City Council 2012

G:\QENV2\Projects\QE06863\SpatialArcGIS\Figures\Final_EIS_Figures\04_Transport\Tech_Report\TranspTechRpt_Figure8-22_Combined_HaulageRoutes_PineMountain.mxd Date: 14/08/2014



LEGEND

- Spoil site
- Haulage route to spoil site
- Main road
- Study corridor
- Construction worksite

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-23

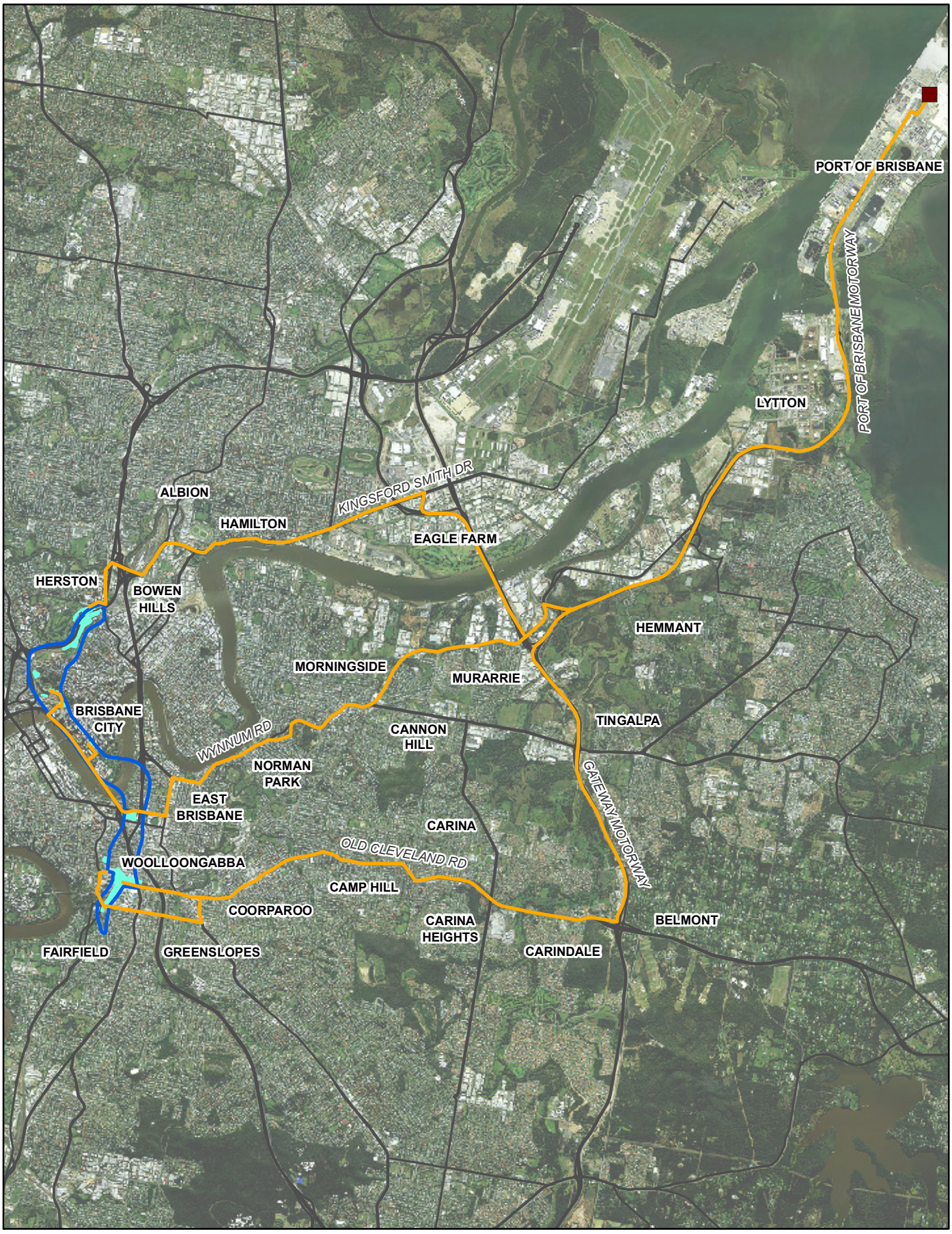
Combined haulage routes - Larapinta

N

0 1 2
Kilometres
1:95,000 (at A4)
Projection: GDA 1994 MGA56

Aerial Photo: AusImage 2009

G:\QENV2\Projects\QE06863\SpatialArcGIS\Figures\Final_EIS_Figures\04_Transport\Tech_Report\TranspTechRpt_Figure8-23_Combined_HaulageRoutes_Larapinta.mxd Date: 14/08/2014



LEGEND

- Spoil site
- Haulage route to spoil site
- Main road
- Study corridor
- Construction worksite

BUS AND TRAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 8-24

Combined haulage routes - Port of Brisbane

N

0 1 2
Kilometres
1:95,000 (at A4)
Projection: GDA 1994 MGA56

Aerial Photo: AusImage 2009

G:\QENV2\Projects\QE06863\SpatialArcGIS\Figures\Final_EIS_Figures\04_Transport\Tech_Report\TranspTechRpt_Figure8-24_Combined_HaulageRoutes_Port_of_Brisbane.mxd Date: 14/08/2014

8.9 Intersection analysis

8.9.1 Intersections – construction worksite precincts

Intersections in the vicinity of the worksite were examined to determine which of those were critical and warranted detailed SIDRA and LinSig analysis. For the purpose of determining the construction related impacts, the intersections assessed within each precinct are shown in **Table 8-13**. The intersections selected include key intersections on the proposed haulage routes adjacent to the worksites, and those within the George Street precinct which require geometric changes to accommodate the proposed haulage route from 2016 with peak haulage movements at the end of 2016.

For each intersection assessed, the 2014 Existing, the 2016 Do Nothing and the 2016 With Construction scenario results are provided for comparison. For the purpose of this assessment, both the future scenarios retain the existing cycle and average phase times to maintain wider network coordination, unless otherwise noted. The outcomes of intersection performance for at the worksite precincts for other spoil placement sites would be comparable.

Table 8-13 Key intersections modelled

Construction worksite precinct	Intersection modelled
Southern Connection	O'Keefe Street/ Ipswich Road (TCS 463) Cornwall Street/ Ipswich Road (TCS 695)
Woolloongabba Station	Ipswich Road/ Stanley Street (TCS 457) Leopard Street / Stanley Street (TCS 1512)
George Street Station	Alice Street/ William Street (TCS 1510); Alice Street/ George Street (TCS 47); Margaret Street/ George Street (TCS 48); Mary Street/ George Street (TCS 352); Charlotte Street/George Street (TCS 50); Elizabeth Street/ George Street (TCS 21); and Elizabeth Street/ William Street (TCS 1508).
Roma Street Station	Herschel Street/ North Quay (TCS 1506) George Street/ Roma Street/ Herschel Street (TCS 71) Parkland Boulevard/ Roma Street (TCS 8004) College Road/ Wickham Terrace/ Gregory Terrace (TCS 44)
Northern Connection	Gilchrist Avenue/ Northern Busway; and Gilchrist Avenue/ Herston Road.

To provide a worst case scenario the intersection assessment has been carried out for the morning and evening commuter peak periods. The PA Hospital worksite at the Southern Connection would be the only worksite that would have spoil and delivery trucks operating during the peak commuting periods. This worst case assessment is appropriate as:

- the other worksite would have spoil activity immediately before and after the peak periods when traffic conditions could be similar to the peak periods
- at the George Street construction worksite changes to the road layout would be in place permanently during the construction period
- the worst case assessment illustrates that there is flexibility in the operational hours of truck activity.

8.9.2 Southern Connection construction worksite

The following intersections have been assessed in determining the network operations and performance and the effects of construction traffic:

- O'Keefe Street/ Ipswich Road (TCS 463)
- Cornwall Street/ Ipswich Road (TCS 695)

The construction traffic impacts associated with the Southern Connection construction worksite account for peak spoil haulage and heavy vehicle demands. The primary access to the worksites is via O'Keefe and Cornwall Streets. The cumulative traffic from the George Street, Roma Street and Woolloongabba worksites via Ipswich Road were also considered in the O'Keefe Street/ Ipswich Road model.

Intersection model assumptions and inputs

In developing this model, the following assumptions and inputs have been made:

- the existing AM and PM peak hour traffic flows are based on the SCATS detector counts
- the signal phasings, saturation flows and intersection configurations are based on the provided SCATS data and TCS plots
- the future scenario models (2016 Do Nothing and Construction) model flows have been estimated using average growth rates from the Project strategic model for the 'without project' scenario run (released to EIS team in May 2014). The growth rate applied per year is 1.014 for AM peak and 1.029 for PM peak
- both the future scenarios retain the existing cycle and average phase times to maintain wider network coordination, unless otherwise noted
- construction vehicle numbers and routes are in accordance with the Pine Mountains Haulage Route.

The intersection performance results comparing the existing and future year scenarios for the AM and PM peak periods are shown in **Table 8-14** and **Table 8-15** respectively.

Table 8-14 AM peak hour intersection performance – Southern Connection worksites

Intersection/ scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Occurs on approach (movement)
Ipswich Road/ O'Keefe Street (TCS 463)						
2014 existing AM	5,279	28	C	0.91	220	Ipswich Road North-East
*2016 do nothing	5,428	28	C	0.93	230	Ipswich Road North-East Leg
*2016 construction	5,552	31	C	0.93	230	Ipswich Road North-East
Ipswich Road/ Cornwall Street (TCS 695)						
2014 existing AM	4,575	46	D	0.95	580	Ipswich Road South
*2016 do nothing	4,704	65	E	0.97	800	Ipswich Road South
*2016 construction	4,769	69	E	0.98	840	Ipswich Road South

** Denotes adjustment to existing phase times to accommodate the future demands.*

The AM modelling results indicates that the intersections operate at close to capacity under the existing situation.

The results of proposed construction scenarios demonstrate a slight decrease in performance with the additional haulage volumes; however they remain within the bounded LoS ranges of the Do Nothing scenario. The analysis suggests the intersection Ipswich Road and Cornwall Street will remain the worst performing intersection and operate at LoS E and DoS over 95 per cent. Under the forecast demand, the worst queues on the southern approach are expected to increase up to 800m. However, it is important to note the Ipswich Road corridor is heavily congested during the AM peak period, with DoS of the worst approach exceeding 95 per cent. The likelihood of the latent demand due to background growth arriving at the intersection stop line will be dependent on the capacity of the adjacent intersections. Should the latent background traffic growth along Ipswich Road not arrive at the Cornwall Street intersection, the extent of the queuing and average delay results illustrated above will be conservative.

Table 8-15 PM peak hour intersection performance – Southern Connection worksites

Intersection/ scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Occurs on approach (movement)
Ipswich Road/ O'Keefe Street (TCS 463)						
2014 existing PM	6,666	39	D	0.98	520	Ipswich Road North-East
*2016 do nothing	7,058	49	D	0.98	650	Ipswich Road North-East
*2016 construction	7,182	57	E	0.99	700	Ipswich Road North-East
Ipswich Road/ Cornwall Street (TCS 695)						
2014 existing PM	5,078	54	D	0.94	420	Ipswich Road South
*2016 do nothing	5,376	69	E	0.98	540	Ipswich Road South
*2016 construction	5,441	80	F	0.98	600	Ipswich Road South

** Denotes adjustment to existing phase times to accommodate the future demands.*

Similar to AM peak scenario, the PM modelling results indicates that the intersections operate at satisfactory conditions under the existing situation.

Like the previous AM peak construction scenario results, it demonstrates a slight decrease in performance with the addition of the haulage volumes. Under the construction scenario, the intersection at Ipswich Road/ Cornwall Street operates at capacity with LoS F and DoS over 95 per cent with anticipated queue lengths to exceed 500m on the southern approach. The intersection at Ipswich Road/ O'Keefe Street operates at LoS E under Construction scenario. The DoS is over 95 per cent and mean max queues over 500m in all the modelled scenarios.

As discussed above, the methodology of applying strategic model growth factors to the intersection demands is a conservative assessment. In practice, existing local network constraints may limit the potential for the forecast demand growth to arrive at the intersection.

8.9.3 Woolloongabba Station construction worksite

The construction impacts adjacent to the Woolloongabba precinct are limited to the Stanley Street intersections with Ipswich Road and Leopard Street. The primary worksite access inbound requires a left in from Main Street via the existing driveway and outbound haulage route via left out to Leopard Street.

The intersection performance results comparing the existing and future year scenarios for the AM and PM peak periods are shown in **Table 8-16** and **Table 8-17** respectively.

Table 8-16 AM Peak Hour Intersection Performance – Woolloongabba construction worksite

Intersection/ scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Queue occurs on approach
Ipswich Road/ Stanley Street (TCS 457)						
2014 existing AM	5624	56	E	0.99	234	Stanley Street east leg
2016 do nothing	5741	63	E	1.01	277	Stanley Street east leg
2016 construction	5761	63	E	1.01	277	Stanley Street east leg
Leopard Street/ Stanley Street (TCS 1512)						
2014 existing AM	3743	31	C	0.98	102	Leopard Street north leg
2016 do nothing	3819	34	C	1.00	106	Leopard Street north leg
2016 construction	3839	35	C	1.00	112	Leopard Street north leg

Table 8-17 PM Peak Hour Intersection Performance – Woolloongabba construction worksite

Intersection / scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Occurs on approach (movement)
Ipswich Road/ Stanley Street (TCS 457)						
2014 existing PM	5028	38	C	0.91	149	Main Street north leg
2016 do nothing	5128	40	C	0.94	153	Main Street north leg
2016 construction	5148	40	C	0.94	153	Main Street north leg
Leopard Street/ Stanley Street (TCS 1512)						
2014 existing PM	3088	22	B	0.70	68	Stanley Street east leg
2016 do nothing	3150	23	B	0.71	71	Stanley Street east leg
2016 construction	3170	23	B	0.72	71	Stanley Street east leg

The assessment of intersection performance at Woolloongabba suggests during construction the AM and PM intersection performance will largely remain unchanged with the addition of the haulage volumes. The haulage routes coincide with the major north south movements of the respective intersections, and have minimal impact to the level of overall intersection delay.

8.9.4 George Street Station construction worksite

During construction the George Street road network will necessitate a number of changes to accommodate the proposed worksite and haulage routes. The key changes include:

- establishment of southbound connection on George Street between Elizabeth Street and Charlotte Street for construction vehicles only
- reduction in the number of northbound traffic lanes on George Street between Mary Street and Margaret Street and Charlotte Street and Elizabeth Street
- ban right and left turn movements from George Street into Mary Street.

Model assumptions and inputs

In developing this model, the following assumptions and inputs have been made:

- the existing AM and PM peak hour traffic flows are based on SCATS detector counts
- the signal phasings, saturation flows and intersection configurations are based on the provided SCATS data and TCS plots
- the future scenario models (2016 do nothing and construction) model flows have been estimated using average growth rates from the Project strategic model for the 'without project' scenario run (released to EIS team in April 2014). The growth rate applied per year is 1.016 for AM peak and 1.022 for PM peak
- the future scenarios retain the existing cycle and average phase times to maintain wider network coordination, unless otherwise noted.

Table 8-18 below indicates spoil/ delivery vehicle information for George Street Portal. 2 PCU is applied to the construction vehicles in the model. This value is consistent with Truck and Dog type of construction vehicle.

Table 8-18 Spoil /Delivery Vehicles – George Street construction worksite

Construction trucks/ hour (in PCU)	
Max spoil (in/ out)	Max delivery (in/ out)
8	2

Analysis

The intersection performance results comparing the existing and future year scenarios for the AM and PM peak periods are shown in **Table 8-19** and **Table 8-20** respectively.

Table 8-19 AM Peak Hour Intersection Performance – George Street construction worksite

Intersection/ scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Queue occurs on approach
Alice Street/ William Street (TCS 1510)						
2014 existing traffic	1723	17	B	0.58	42	William Street north west
2016 do nothing	1781	17	B	0.56	44	William Street north west
2016 construction	1821	17	B	0.60	44	William Street north west
Alice Street/ George Street (TCS 47)						

Intersection/ scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Queue occurs on approach
2014 existing traffic	1366	33	C	0.79	42	Alice Street north east
2016 do nothing	1413	34	C	0.83	43	Alice Street north east
2016 construction*	1453	46	D	0.92	59	George Street north west
Margaret Street/ George Street (TCS 48)						
2014 existing traffic	2312	11	A	0.61	43	Margaret Street south west
2016 do nothing	2391	11	A	0.62	46	Margaret Street south west
2016 construction	2431	13	A	0.65	25	George Street north west
Mary Street/ George Street (TCS 352)						
2014 existing traffic	900	46	D	0.94	42	Mary Street north east
2016 do nothing	933	51	D	0.97	49	Mary Street north east
2016 construction*	772	32	C	0.70	50	George Street south east
Charlotte Street /George Street (TCS 50)						
2014 existing traffic	843	392	C	0.77	47	George Street south east
2016 do nothing	874	41	C	0.82	52	George Street south east
2016 construction	878	41	C	0.82	52	George Street south east
Elizabeth Street/ George Street (TCS 21)						
2014 existing traffic	2366	41	C	0.97	84	George Street south east
2016 do nothing	2442	48	D	1.00	101	George Street south east
2016 construction*	2482	29	C	0.89	89	Elizabeth Street south west
Margaret Street/ William Street (TCS 1509)						
2014 existing traffic	2664	28	B	0.81	83	Margaret Street south west
2016 do nothing	2752	32	C	1.00	91	Margaret Street south west
2016 construction	2752	32	C	1.00	91	Margaret Street south west
Elizabeth Street/ William Street (TCS 1508)						
2014 existing traffic	2359	38	C	0.82	83	Elizabeth Street south west
2016 do nothing	2433	38	C	0.76	89	Elizabeth Street south west
2016 construction	2473	38	C	0.77	96	Elizabeth Street south west

** Denotes adjustment to existing phase times to accommodate the revised demand and/or geometry.*

The AM peak results demonstrate that under the existing conditions, the intersections are operating at LoS D or better. George Street/ Mary Street currently operate at beyond practical capacity with DoS over 90 per cent.

In the proposed construction scenario, George Street network will continue to operate at an acceptable LoS. The minor changes to average phase times at George Street intersections with Elizabeth Street and Alice Street lead to an improvement in intersection performance through a reallocation of the green time. The green time changes in AM peak included:

- Elizabeth Street/ George Street: Reallocation of green time from the south-western approach to the south-eastern approach to compensate for the reduction in stop line capacity (three lanes reduced to two).
- Alice Street/ George Street: Reallocation of green time from the north-western approach to the north-eastern approach.

Under Do Nothing scenario, the intersections at George Street/ Mary Street and George Street/ Elizabeth Street were identified as the worst performing intersections operating at capacity with a LoS D. During the construction scenario, the improvement at Elizabeth Street/ George Street and George Street/ Mary Street is due to the reallocation of green times at this intersection. During construction, the intersection at Mary Street/ George Street improves to LoS C with the banning of left turn and right turn movements from George Street into Mary Street.

The downstream exit blocking at Elizabeth Street/ George Street intersection will continue to impact the performance and queue length on the approaches. The current Elizabeth Street bus stops located east of George Street will continue to be a source of intermittent exit blocking under the Do Nothing and Construction scenarios. The existing average under-utilised green period for the Elizabeth Street through movement has been included within the calibration of the LinSig modelling based on site investigation. The modelling of the future year scenarios maintain the existing levels of downstream congestion, with no adjustment to account for revised signal timings or impacts of increased demand.

Overall, the intersections operate at satisfactory performance in all scenarios in AM peak hour.

Table 8-20 PM peak hour intersection performance - George Street construction worksite

Intersection / scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Occurs on approach (movement)
Alice Street/ William Street (TCS 1510)						
2014 existing traffic	3160	34	C	0.97	120	William St north-west
2016 do nothing	3305	51	D	1.01	185	William St north-west
2016 construction	3345	43	D	1.01	154	William Street north-west
Alice Street/ George Street (TCS 47)						
2014 existing traffic	2576	64	E	0.98	107	Alice Street north-east
2016 do nothing	2696	85	F	1.01	152	Alice Street north-east
2016 construction*	2736	89	F	0.98	149	Alice Street north-east

Intersection / scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Occurs on approach (movement)
Margaret Street/ George Street (TCS 48)						
2014 existing traffic	1562	15	B	0.57	38	Margaret Street south-west
2016 do nothing	1635	15	B	0.59	41	Margaret Street south-east
2016 construction	1675	16	B	0.63	61	George Street north-west
Mary Street/ George Street (TCS 352)						
2014 existing traffic	1080	39	C	0.89	52	Mary Street north-east
2016 do nothing	1129	44	D	0.93	60	Mary Street north-east
2016 construction	1123	46	D	0.93	61	George Street south-east
Charlotte Street/George Street (TCS 50)						
2014 existing traffic	1092	49	D	0.94	85	Charlotte Street north-east
2016 do nothing	1141	48	D	0.94	88	Charlotte Street north-east
2016 construction	1157	47	D	0.89	64	George Street south-east
Elizabeth Street/ George Street (TCS 21)						
2014 existing traffic	1520	19	B	0.53	40	Elizabeth Street south-west
2016 do nothing	1587	19	B	0.55	34	Elizabeth Street south-west
2016 construction*	1627	23	B	0.74	41	Elizabeth Street south-west
Margaret Street/ William Street (TCS 1509)						
2014 existing traffic	2020	27	B	0.72	56	Margaret Street south-west
2016 do nothing	2112	28	B	0.75	59	Margaret Street south-west
2016 construction	2112	28	B	0.75	60	Margaret Street south-west
Elizabeth Street/ William Street (TCS 1508)						
2014 existing traffic	1540	27	B	0.56	51	William Street south-west
2016 do nothing	1607	26	B	0.59	56	William Street south-west
2016 construction	1647	27	B	0.59	56	William Street south-west

** Denotes adjustment to existing phase times to accommodate the revised demand and/or geometry.*

The PM peak results demonstrate that under the existing conditions, the majority of intersections are operating with satisfactory conditions. Except, George Street/ Alice Street operates at capacity with DoS over 95 per cent and major queue occurs on Alice Street north-eastern approach.

The results of construction scenario demonstrate the George Street network will continue to operate at an acceptable LoS during the PM peak period. There are a number of intersections that experience a decrease in performance under the forecast background traffic growth alone. However with the

reduction in the number of lanes required during construction, in conjunction with the minor changes to average phase times at George Street intersections with Elizabeth Street and Alice Street, it leads to an improvement in performance through a reallocation of the green time. The green time changes in PM peak period included:

- Elizabeth Street/ George Street: Reallocation of green time from the south-western approach to the south-eastern approach to compensate for the reduction in stop line capacity (three lanes reduced to two)
- Alice Street/ George Street: Reallocation of green time from the north-western approach to the north-eastern approach.

The intersection analysis of the existing network suggests the George Street and Alice Street intersection is operating beyond practical capacity (DoS> 90d per cent with a LoS E. Under the proposed Do Nothing 2016 scenario in PM peak, the performance deteriorates to a LoS F, with the existing major queuing observed on Alice Street north-eastern approach increasing to approximate 150m.

The downstream exit blocking at Elizabeth Street/ George Street intersection will continue to impact the performance and queue length on the approaches. During the PM peak period, the queue extending back along George Street from Ann Street will continue to impact the green time utilisation of the through movement. The existing average under-utilised green period for the George Street through movement has been included within the calibration of the LinSig modelling based on site investigation. The Ann Street and George Street intersection is outside the extent of the current intersection modelling. As such, the analysis of the future year scenarios includes the existing levels of downstream congestion only, no adjustment to account for revised signal timings or impacts of increased demand.

8.9.5 Roma Street Station construction worksite

The construction impacts to intersection performance within the Roma Street Station precinct relate to two proposed changes which include:

- the construction volumes along the proposed haulage routes which connect the worksite with the Pacific Motorway via Herschel Street
- the revised layout at Gregory Terrace, College Road, Wickham Terrace and Parkland Boulevard intersection to enable vehicle access into the Parklands site.

The intersection performance results comparing the existing and future year scenarios for the AM and PM peak periods are shown in **Table 8-21** and **Table 8-22** respectively.

Table 8-21 AM peak hour intersection performance – Roma Street Station construction worksite

Intersection / scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Queue occurs on approach
Herschel Street/ North Quay (TCS 1506)						
2014 (existing traffic)	5096	18	B	0.90	264	Pacific Motorway west leg
2016 do nothing	5200	19	B	0.92	282	Pacific Motorway west leg
2016 construction	5232	19	B	0.92	282	Pacific Motorway west leg
George Street/ Roma Street/ Herschel Street (TCS 71)						
2014 (existing traffic)	2451	26	B	0.87	41	George Street east leg

Intersection / scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Queue occurs on approach
2016 do nothing	2497	26	B	0.88	42	George Street east leg
2016 construction	2561	29	C	0.95	51	George Street east leg
Parkland Boulevard/ Roma Street (TCS 8004)						
2014 (existing traffic)	1543	10	A	0.72	28	Parkland Boulevard north leg
2016 do nothing	1571	11	A	0.73	29	Parkland Boulevard north leg
2016 construction	1603	12	A	0.82	36	Parkland Boulevard north leg

The intersection performance results demonstrate the Roma Street precinct will continue to operate at an acceptable LoS during the AM peak period. The deterioration of the George Street/ Roma Street/ Herschel Street intersections should continue to operate as intended despite the decrease in LoSfrom B to C. The inherent coordination within the LinSig modelling of the precinct ensured the downstream merge would continue to operate with marginal increase in background demand.

Table 8-22 PM peak hour intersection performance – Roma Street construction worksite

Intersection / scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Queue occurs on approach
Herschel Street/ North Quay (TCS 1506)						
2014 existing PM	4340	9	A	0.79	175	Pacific Motorway west leg
2016 do nothing	4426	10	A	0.81	183	Pacific Motorway west leg
2016 construction	4458	10	A	0.81	183	Pacific Motorway west leg
George Street/ Roma Street/ Herschel Street (TCS 71)						
2014 existing PM	1811	25	B	0.75	26	George Street east leg
2016 do nothing	1846	25	B	0.77	27	George Street east leg
2016 construction	1910	28	B	0.84	28	Herschel Street south leg (south of George Street)
Parkland Boulevard/ Roma Street (TCS 8004)						
2014 existing PM	1110	12	A	0.56	19	Parkland Boulevard north leg
2016 do nothing	1132	12	A	0.56	19	Parkland Boulevard north leg
2016 construction	1164	13	A	0.65	24	Parkland Boulevard north leg

The intersection performance results demonstrate the Roma Street precinct will continue to operate at an acceptable LoS during the PM peak period. All intersections continue to operate within the LoS boundaries of both the Existing and Do Nothing scenarios.

8.9.6 Northern Connection construction worksite

Following the early works which includes the construction of the link from the Northern Busway to the ICB, the construction impacts to the Northern Connection construction worksite are limited to the Gilchrist Avenue/ Herston Road/ Northern Busway intersection. The intersection demands are predominately from the ICB to Herston Road via the single through lane at the signals, with the movement receiving the majority of the green time. The intersection performance results comparing the existing and future year scenarios for the AM and PM peak periods are shown in **Table 8-23** and **Table 8-24** respectively.

Table 8-23 AM peak hour intersection performance – Northern Connection worksite

Intersection / scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Occurs on approach (movement)
Gilchrist Avenue/ Herston Road (TCS 369)						
2014 existing AM	1213	25	B	0.91	147	Herston Road east leg
2016 do nothing	1241	28	B	0.93	166	Herston Road east leg
2016 construction	1261	28	C	0.93	166	Herston Road east leg

The intersection performance results demonstrate the Northern Connection precinct continues to operate at an acceptable LoS of no worse than D during the AM peak. The high degree of saturation and queuing on the eastern leg is the result of the unconstrained demand from the ICB off-ramp arriving at the single lane stop line. Whilst the approach receives the majority of green time, the approach is operating beyond practical capacity, degree of saturation above 90 per cent, in all scenarios assessed.

Table 8-24 PM Peak Hour Intersection Performance - Northern Connection worksite

Intersection/ scenario	Vehicles	Average delay (sec)	LoS	DoS	Mean max queue (m)	Occurs on approach (movement)
Gilchrist Avenue/ Herston Road (TCS 369)						
2014 existing PM	1313	35	C	0.95	171	Herston Road east leg
2016 do nothing	1336	40	C	0.97	189	Herston Road east leg
2016 construction	1356	40	C	0.97	189	Herston Road east leg

The intersection performance results for the PM peak are consistent with the AM peak. The significant demand from the ICB continues to operate at close to capacity under all PM peak scenarios. However the overall LoS remains acceptable.

8.9.7 Summary of intersection performance at each construction worksite

Table 8-25 provides a summary of the intersection performance at each worksite.

Table 8-25 Summary of intersection performance at worksites due to haulage activity

Site	Intersection	Change in average intersection delay (SIDRA/ LinSig calculated) in Seconds		Conclusion
		AM peak	PM peak	
Southern Connection	Ipswich Road/ O'Keefe Street	3	8	Minor change in delay due to additional construction activities demand. Intersection would operate with a LoS of D and E in the 2016 without Project scenario in the morning and evening peak respectively.
	Ipswich Road/ Cornwall Street	4	11	Increase in delay due to additional construction activities demand at this intersection. Would operate at capacity in both the morning and evening peaks without project scenario.
Woolloongabba Station	Ipswich Road/ Stanley Street	No change	No change	Negligible change in delay due to additional demand from construction activities.
	Leopard Street/ Stanley Street	1	No change	Negligible change in delay due to additional demand from construction activities.
George Street Station	Alice Street/ William Street	No change	-8	Minor improvements in delay in evening peak and performance of intersection is similar to the without construction scenario.
	Alice Street/ George Street	12	4	Whilst increase in delay of 12 seconds in morning peak the intersection would operate with LoS D during operation.
	Margaret Street/ George Street	2	1	Minor increase in delay due to additional construction activities demand.
	Mary Street/ George Street	-19	2	Improvements in delay in morning peak due to removal of left turn and right turn into Mary Street.
	Charlotte Street/ George Street	No change	-1	Negligible change in delay due to additional construction activities demand.
	Elizabeth Street/ George Street	-19	4	Improvements in morning Peak delay due to adjustments to signal timing. Minor increase in delay in evening Peak due to reduction in stop line capacity on George Street.
	Margaret Street/ William Street	No change	No change	Negligible change in delay due to additional construction activities demand.
	Elizabeth Street/ William Street	No change	1	Negligible change in delay due to additional construction activities demand.

Site	Intersection	Change in average intersection delay (SIDRA/ LinSig calculated) in Seconds		Conclusion
		AM peak	PM peak	
Roma Street Station	Herschel Street/ North Quay	No change	No change	Negligible change in delay due to additional construction activities demand.
	George Street/ Roma Street/ Herschel Street	3	3	Minor increase in delay due to additional construction activities demand.
	Parkland Boulevard/ Roma Street	1	1	Minor increase in delay due to additional construction activities demand.
Northern Connection	Gilchrist Avenue/ Herston Road	No change	No change	Negligible change in delay due to additional construction activities demand.

8.10 Cumulative construction vehicle trips

In consideration of the worst case scenario, cumulative construction vehicle trips have been considered from multiple worksites across the study corridor to the possible spoil placement sites of Brisbane Airport, Swanbank and Mount Gravatt (Pine Mountain). The assessment is based on the peak hour rates of the combined spoil and delivery heavy vehicle trips. It should be noted that due to the diverse range of origin and destination of delivery truck movements, the majority of intersections have components of delivery traffic from all worksites incorporated into the worst case scenario construction traffic loading as well.

To assess the cumulative impact of construction traffic associated with peak spoil haulage and heavy vehicle demands on the road network in Brisbane, intersection models were built using the software tool, SIDRA.

To provide a worst case scenario the intersection assessment has been carried out for the morning and evening commuter peak periods. It should be noted that only the PA Hospital construction worksite at the Southern Connection would have spoil and delivery trucks operating during these peak periods.

The network has been tested for 3 scenarios as listed below:

- 2014 AM and PM existing
- 2016 AM and PM do nothing
- 2016 AM and PM construction

8.10.1 Intersections assessed

The following intersections have been assessed in determining the network operations and performance under the cumulative construction volumes:

- George Street/ Ann Street (TCS 2)
- Roma Street/ Ann Street (TCS 3)
- Airport Drive/ Lomandra Drive (Site 1001)

- Bowen Bridge Road/ Butterfield Street/ Campbell Street (TCS 83)
- Annerley Road/ Cornwall St (TCS 512)
- Annerley Road/ Gladstone Road (TCS 511)
- Creek Road/ Winstanley Street (TCS 598)
- Creek Road/ Pine Mountain Road (TCS 599)
- Old Cleveland Road/ Montague Street / Logan Road (TCS 653)
- Old Cleveland Road/ Boundary Road (TCS 680)
- Old Cleveland Road/ Cavendish Road (TCS 681)
- Old Cleveland Road/ Creek Road (TCS 682)
- Ipswich Road/ Beaudesert Road (TCS 667)
- Ipswich Road/ Cracknell Road (TCS 668)
- Ipswich Road/ Annerley Road (TCS 693)
- Annerley Road/ Peter Doherty Street (TCS 893)
- Upper Roma Street/ Countess Street/ Soul Street (TCS 40)
- Upper Roma Street/ Skew St (TCS 213)

8.10.2 Model assumptions and inputs

In developing this model, the following assumptions and inputs have been made:

- The existing AM and PM peak hour traffic flows are based on the SCATS detector counts;
- The signal phasings, saturation flows and intersection configurations are based on the provided SCATS data and TCS plots
- Both the future 2016 scenarios retain the existing cycle and average phase times to maintain wider network coordination, unless otherwise noted;
- The future scenario models (2016 do nothing and construction) model flows have been estimated using average growth rates extracted from the Project strategic model (Without Project scenarios – dated May 2014) which provided local network growth rates for Airport, Pine Mountain and Swanbank haulage routes. The growth rate applied per year is indicated in **Table 8-26** below:

Table 8-26 Spoil / Delivery Vehicles for haulage routes

Route	Average growth/ year	
	AM	PM
Airport	2%	2.4%
Pine Mountain	1.6%	2.3%
Swanbank	2%	2.4%

The key intersections assessed along the propose spoil / delivery routes for each of the proposed spoil sites (Airport, Pine Mountain and Swanbank) with the respective cumulative volumes are outlined in **Table 8-27**, **Table 8-28** and **Table 8-29** below. These routes were previously shown in **Figure 8-20** to **Figure 8-22**. For the purpose of intersection analysis, a two Passenger Car Equivalent (PCU) value was applied all construction volumes. This value is consistent with Truck and Dog type of construction vehicle.

Table 8-27 Key intersections and cumulative haulage volumes accessing the Airport spoil placement site

Site- Airport	Construction trucks/ hour (in PCU)	
Intersection	**Max spoil (in/ out)**	**Max delivery (in/ out)**
George Street/ Ann Street	10	4
Roma Street/ Ann Street	10	4
Airport Drive/ Lomandra Drive	34	10
Bowen Bridge Road/ Butterfield Street/ Campbell Street	4	2

Table 8-28 Key intersections and cumulative haulage volumes accessing the Pine Mountain spoil placement site

Site- Pine Mountain	Construction trucks/ hour (in PCU)	
Intersection	**Max spoil (in/ out)**	**Max delivery (in/ out)**
Annerley Road/ Cornwall St	22	4
Annerley Road/ Gladstone Road	22	4
Creek Road/ Winstanley Street	22	10
Creek Road/ Pine Mountain Road	22	10
Old Cleveland Road/ Montague Stree / Logan Road*	22	10
Old Cleveland Road/ Boundary Road	22	10
Old Cleveland Road/ Cavendish Road	22	10
Old Cleveland Road/ Creek Road	22	10

**This site also include the cumulative construction traffic travelling along Old Cleveland Road*

Table 8-29 Key intersections and cumulative haulage volumes accessing the Swanbank spoil placement site

Site- Swanbank	Construction trucks/ hour (in PCU)	
Intersection	**Max spoil (in/ out)**	**Max delivery (in/ out)**
Ipswich Road/ Beaudesert Road	26	6
Ipswich Road/ Cracknell Road	26	6
Ipswich Road/ Annerley Road	26	6
Annerley Road/ Peter Doherty Street	22	4
Upper Roma Street/ Countess Street/ Soul Street	10	4
Upper Roma Street/ Skew Street	10	4

8.10.3 Results – Airport spoil haulage route

The intersection performance results comparing the existing and future year scenarios for the AM and PM peak periods for the proposed Airport haulage route are shown in **Table 8-30** and **Table 8-31** respectively.

Table 8-30 AM peak hour intersection performance- Airport spoil haulage route

Intersection/ scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
George Street/ Ann Street TCS 2						
2014 existing	2271	19.6	B	0.536	110	Ann Street north
2016 do nothing	2363	19.8	B	0.557	110	Ann Street north
2016 construction	2377	19.8	B	0.563	110	Ann Street north
Roma Street/ Ann Street TCS 3						
2014 existing PM	2165	23.8	B	0.602	100	Ann Street north
2016 do nothing	2253	24.1	B	0.627	110	Ann Street north
2016 construction	2267	24.3	B	0.656	110	Ann Street north
Bowen Bridge Road/ Butterfield Street/ Campbell Street TCS 83						
2014 existing	5734	10.45	B	0.720	170	Bowen Bridge Road north
2016 do nothing	5966	10.85	B	0.750	180	Bowen Bridge Road north
2016 construction	5978	10.85	B	0.750	190	Bowen Bridge Road north
Airport Drive/ Lomandra Drive						
2014 existing	2880	38.7	C	0.865	240	Airport Drive west
2016 do nothing	2995	41.2	C	0.900	260	Airport Drive west
2016 construction	3083	44.6	D	0.934	300	Airport Drive west

Table 8-31 : PM Peak Hour Intersection Performance- Airport spoil haulage route

Intersection/ scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
George Street/ Ann Street						
2014 Existing	3080	21.9	B	0.700	150	Ann Street north
2016 do nothing	3230	22.0	B	0.734	160	Ann Street north
2016 construction	3244	22.3	B	0.740	160	Ann Street north
Roma Street/ Ann Street TCS 3						
2014 existing	2324	22.6	B	0.660	110	Ann Street north
2016 do nothing	2437	23	B	0.693	120	Ann Street north
2016 construction	2451	23.2	B	0.726	120	Ann Street north
Bowen Bridge Road/ Butterfield Street/ Campbell Street TCS 83						
2014 existing	5752	6.35	A	0.757	170	Butterfiled Street west

Intersection/ scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
2016 do nothing	6031	6.55	A	0.795	180	Butterfiled Street west
2016 construction	6043	6.60	A	0.795	180	Butterfiled Street west
Airport Drive/ Lomandra Drive						
2014 existing	2907	24.5	B	0.700	130	Lomandra Drive south
2016 do nothing	3048	25.1	B	0.734	140	Lomandra Drive south
2016 construction	3136	25.8	B	0.762	150	Lomandra Drive south

The results of the above intersection analysis suggest that whilst the key intersections along the proposed Airport haulage routes experience moderate congestion during the peak periods, they continue to operate at an acceptable LoS D or higher under the 2016 Do Nothing scenario. With the addition of construction vehicles the average intersection delays remain largely constant, with only the Airport Drive/ Lomandra Drive intersection observing an increased delay of 3.4 seconds per vehicle which results in a deterioration to LoS D. It is noted, the methodology of applying a strategic model growth factors to the intersection demands is a conservative assessment. In practice, existing local network constraints may limit the potential for the forecast demand growth to arrive at the intersection.

8.10.4 Results – Pine Mountain spoil haulage route

The intersection performance results comparing the existing and future year scenarios for the AM and PM peak periods for Pine Mountain haulage route are shown in **Table 8-32** and **Table 8-33** respectively.

Table 8-32 AM Peak Hour Intersection Performance- Pine Mountain spoil haulage route

Intersection/ scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
Annerly Road/ Cornwall St TCS 512						
2014 existing	4711	42.4	C	0.924	250	Annerley Road south
2016 do nothing	4958	47.8	D	0.967	300	Annerley Road south
2016 construction	5010	50.2	D	0.982	320	Annerley Road south
Annerley Road/ Gladstone Road 511						
2014 existing	4190	27.0	B	0.848	290	Annerley Road south
2016 do nothing	4325	28.4	B	0.876	320	Annerley Road south
2016 construction	4377	28.8	C	0.876	320	Annerley Road south
Creek Road/ Winstanley Street 598						
2014 existing	3093	46.1	D	0.929	220	Winstanley Street east
2016 do nothing	3238	48.8	D	0.973	260	Winstanley Street east

Intersection/ scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
2016 construction	3302	48.8	D	0.973	260	Winstanley Street east
Creek Road/ Pine Mountain Road TCS 599						
2014 existing	3106	40.7	C	0.978	180	Pine Mountain Road east
2016 do nothing	3209	43.7	D	1.023	210	Pine Mountain Road east
2016 construction	3274	43.7	D	1.023	210	Pine Mountain Road east
Old Cleveland Road/ Montague Street/ Logan Road TCS 653						
2014 existing	2690	44.9	D	0.995	260	Montague Street south
*2016 do nothing	2814	44	D	0.972	260	Montague Street south
*2016 construction	2877	46.7	D	0.998	290	Montague Street south
Old Cleveland Road/ Boundary Road TCS 680						
2014 existing	3483	70.5	E	0.965	520	Old Cleveland Road east
*2016 do nothing	3594	135.8	F	1.115	800	Old Cleveland Road east
*2016 construction	3658	139.3	F	1.128	820	Old Cleveland Road east
Old Cleveland Road/ Cavendish Road TCS 681						
2014 existing	3935	31.7	C	0.89	300	Old Cleveland Road east
2016 do nothing	4063	33.4	C	0.921	320	Old Cleveland Road east
2016 construction	4128	33.3	C	0.921	320	Old Cleveland Road east
Old Cleveland Road/ Creek Road TCS 682						
2014 existing	5492	48.7	D	0.936	280	Old Cleveland Road east
2016 do nothing	5753	52.7	D	0.98	310	Old Cleveland Road east
2016 construction	5817	53.1	D	0.987	310	Old Cleveland Road east

** Denotes adjustment to existing phase times to accommodate the future demand.*

Table 8-33 PM Peak Hour Intersection Performance- Pine Mountain spoil haulage route

Intersection / scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
Annerley Road/ Cornwall St TCS 512						
2014 existing	4444	40.3	C	0.988	470	Annerley Road north
2016 do nothing	4679	48.7	D	1.054	610	Annerley Road north
2016 construction	4731	48.9	D	1.054	610	Annerley Road north
Annerley Road/ Gladstone Road 511						

Intersection / scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
2014 existing	3820	37.5	C	0.930	310	Gladstone Road north
2016 do nothing	3997	44	D	0.974	380	Gladstone Road north
2016 construction	4050	47	D	0.992	400	Gladstone Road north
Creek Road/ Winstanley Street 598						
2014 existing	3406	44	D	0.986	190	Winstanley Street west
2016 do nothing	3563	45.9	D	1.00	220	Winstanley Street west
2016 construction	3627	46	D	1.00	220	Winstanley Street west
Creek Road/ Pine Mountain Road TCS 599						
2014 existing	3223	40.5	C	0.995	130	Creek Road south
2016 do nothing	3404	48	D	1.123	190	Creek Road south
2016 construction	3468	48	D	1.123	190	Creek Road south
Old Cleveland Road/ Montague Street/ Logan Road TCS 653						
2014 existing	3063	54.2	D	0.975	290	Montague Street south
2016 do nothing	3204	56.2	D	0.988	310	Montague Street south
*2016 construction	3268	60.7	E	0.956	300	Montague Street south
Old Cleveland Road/ Boundary Road TCS 680						
2014 existing	3792	58.7	E	0.984	460	Old Cleveland Road west
*2016 do nothing	3967	128	F	1.11	770	Old Cleveland Road west
*016 construction	4031	127	F	1.11	760	Old Cleveland Road west
Old Cleveland Road/ Cavendish Road TCS 681						
2014 existing	4118	34.8	C	0.973	290	Old Cleveland Road west
2016 do nothing	4310	38.1	C	1.018	310	Old Cleveland Road west
2016 construction	4374	38	C	1.018	320	Old Cleveland Road west
Old Cleveland Road/ Creek Road TCS 682						
2014 existing	5999	58.9	E	0.962	300	Old Cleveland Road west
2016 do nothing	6279	68.3	E	1.007	360	Old Cleveland Road west
2016 construction	6344	68.2	E	1.007	360	Old Cleveland Road west

** Denotes adjustment to existing phase times to accommodate the future demand.*

The results of the above intersection analysis suggest that a number of key intersections along Old Cleveland Road are approaching capacity under existing traffic demand. The practical capacity of an intersection is reached when DoS exceeds 90 per cent (0.90); as a result a minor increase in traffic demand can lead to a significant increase in average vehicle delay. The 2016 Do Nothing scenario

results illustrate the impact of background traffic growth on the intersection performance, with a number of intersections experiencing a spike in average vehicle delay. To improve the performance of intersections where background traffic had led to deterioration in performance, the average signal timings were optimised using SIDRA to reflect the updated demands. The changes to signal timing were relatively minor (up to 3 seconds), with the cycle time retained to ensure wider network coordination.

As discussed above, the conservative approach which applies the strategic network forecast growth rates directly to the local intersections represents a worst case scenario. It is likely that existing network constraints at adjacent intersections would prevent the total background traffic forecast demand reaching the intersection. In addition the assessment presented for the proposed Pine Mountain haulage route includes cumulative volumes from work sites at Roma Street, George Street, and Woolloongabba, however these are unlikely to operate construction traffic during the peak periods.

8.10.5 Results – Swanbank spoil haulage route

The intersection performance results comparing the existing and future year scenarios for the AM and PM peak periods for Swanbank routes are shown in **Table 8-34** and **Table 8-35** respectively.

Table 8-34 : AM Peak Hour Intersection Performance- Swanbank spoil haulage route

Intersection / scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
Ipswich Road/ Beaudesert Road TCS 667						
2014 existing	4489	23	B	0.838	240	Ipswich Road south
2016 do nothing	4670	24	B	0.872	260	Ipswich Road south
2016 construction	4735	24	B	0.872	270	Ipswich Road south
Ipswich Road/ Cracknell Road TCS 668						
2014 existing pm	4952	32.1	C	0.851	400	Ipswich Road north
2016 do nothing	5151	34.9	C	0.885	460	Ipswich Road north
2016 construction	5214	36.1	C	0.899	490	Ipswich Road north
Ipswich Road/ Annerley Road TCS 693						
2014 existing pm	4706	13.5	A	0.635	190	Ipswich Road south
2016 do nothing	4858	13.7	A	0.655	200	Ipswich Road south
2016 construction	4923	13.7	A	0.655	210	Ipswich Road south
Annerley Road/ Peter Doherty Street TCS 893						
2014 existing	1859	4	A	0.407	90	Annerley Road south
2016 do nothing	1934	4	A	0.420	100	Annerley Road south
2016 construction	1986	4	A	0.430	100	Annerley Road south

continued

Intersection / scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
Upper Roma Street/ Countess Street/ Soul Street TCS 40						
2014 existing pm	5132	35	C	0.902	490	Countess Street north
2016 do nothing	5382	46	D	0.946	620	Countess Street north
2016 construction	5410	47	D	0.946	620	Countess Street north
Upper Roma Street/ Skew St TCS 213						
2014 existing pm	2330	41.8	C	0.836	290	Skew Street south
2016 do nothing	2419	43.2	D	0.872	330	Skew Street south
2016 construction	2447	43.1	D	0.872	330	Skew Street south

Table 8-35 : PM peak hour intersection performance- Swanbank spoil haulage route

Intersection/ scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
Ipswich Road/ Beaudesert Rd TCS 667						
2014 existing	4452	19	B	0.666	240	Ipswich Road south
2016 do nothing	4669	19	B	0.698	260	Ipswich Road south
2016 construction	4734	19	B	0.698	260	Ipswich Road south
Ipswich Road/ Cracknell Road TCS 668						
2014 existing PM	4817	31.7	C	0.884	470	Ipswich Road north
2016 do nothing	5051	37	C	0.927	570	Ipswich Road north
2016 construction	5115	39.1	C	0.941	600	Ipswich Road north
Ipswich Road/ Annerley Road TCS 693						
2014 existing PM	4842	21	B	0.754	260	Ipswich Road south
2016 do nothing	5066	22	B	0.789	280	Ipswich Road south
2016 construction	5130	22	B	0.789	290	Ipswich Road south
Annerley Road/ Peter Doherty Street TCS 893						
2014 existing	1836	6	A	0.400	88	Annerley Road north
2016 do nothing	1925	6	A	0.420	90	Annerley Road north
2016 construction	1977	6	A	0.430	100	Annerley Road north
Upper Roma Street/ Countess Street/ Soul Street TCS 40						
2014 existing PM	4054	33	C	0.774	260	Countess Street north

Intersection/ scenario	Light vehicles+ heavy vehicles	Average delay (sec)	LoS	DoS	95% queue (m)	Occurs on approach
2016 do nothing	4252	35	C	0.806	280	Countess Street north
2016 construction	4280	35	C	0.816	280	Countess Street north
Upper Roma Street/ Skew St TCS 213						
2014 existing PM	2304	38.6	C	0.760	220	Skew Street south
2016 do nothing	2414	40.0	C	0.796	240	Skew Street south
2016 construction	2442	39.9	C	0.796	240	Skew Street south

The results of the above intersection analysis suggest that whilst the key intersections along the proposed Swanbank haulage routes experience moderate congestion during the peak periods, they continue to operate at an acceptable LoS (LoS D or higher) under the 2016 Do Nothing scenario. Major arterial routes including Ipswich Road observe significant queuing during the peak periods; however using the existing average SCATS signal timings the intersections continue to maintain an acceptable LoS with average delays of less than 40 seconds.

The impact to intersection performance associated with the construction haulage routes is limited, and in some instances the overall average intersection delay has reduced. The reductions in average delay are likely due to the haulage route to Swanbank being coordinated with the major traffic movements which receive lower average delay.

8.10.6 Summary of the intersection performance due to the cumulative haulage activity

A summary of the intersection performance due to cumulative haulage activity is provided in **Table 8-36**.

Table 8-36 Summary of intersection performance due to cumulative haulage activity

Spoil placement site	Intersection	Change in average intersection delay (SIDRA calculated) in Seconds		Conclusion
		AM peak	PM peak	
Brisbane Airport (Sugarmill Road)	George Street/ Ann Street	No change	No change	Negligible change in delay due to additional construction activities demand.
	Roma Street/ Ann Street	No change	No change	Negligible change in delay due to additional construction activities demand.
	Bowen Bridge Road/ Butterfield Street/ Campbell Street	No change	No change	Negligible change in delay due to additional construction activities demand.
	Airport Drive/ Lomandra Drive	3	1	Minor increase in delay due to additional construction activities demand.
Swanbank	Ipswich Road/ Beaudesert Road	No change	No change	Negligible change in delay due to additional construction activities demand.

Spoil placement site	Intersection	Change in average intersection delay (SIDRA calculated) in Seconds		Conclusion
		AM peak	PM peak	
	Ipswich Road/ Cracknell Road	1	2	Minor increase in delay due to additional construction activities demand.
	Ipswich Road/ Annerley Road	No change	No change	Negligible change in delay due to additional construction activities demand.
	Upper Roma Street/ Countess Street/ Soul Street	1	No change	Minor increase in delay due to additional construction activities demand.
	Upper Roma Street/ Skew Street	No change	No change	Negligible change in delay due to additional construction activities demand.
Mount Gravatt East (Pine Mountain)	Annerley Road/ Cornwall Street	2	No change	Minor increase in delay due to additional construction activities demand.
	Annerley Road/ Gladstone Road	No change	5	Minor increase in delay due to additional construction activities demand.
	Creek Road/ Winstanley Street	No change	No change	Negligible change in delay due to additional construction activities demand.
	Creek Road/ Pine Mountain Road	No change	No change	Negligible change in delay due to additional construction activities demand.
	Old Cleveland Road/ Montague Street/ Logan Road	3	4	Minor increase in delay due to additional construction activities demand.
	Old Cleveland Road/ Boundary Road	4	No change	Minor increase in delay due to additional construction activities demand.
	Old Cleveland Road/ Cavendish Road	No change	No change	Negligible change in delay due to additional construction activities demand.
	Old Cleveland Road/ Creek Road	No change	No change	Negligible change in delay due to additional construction activities demand.

8.11 Commentary on the overall intersection assessment

Peak hour intersection modelling for both the worksite precincts and the wider extent of the cumulative routes to the spoil placement locations revealed minor increases in queuing and delay at most of the critical network intersections modelled.

With respect to the intersections of Ipswich Road/ Cornwall Street and Ipswich Road/ O'Keefe Street the 2016 without Project scenario shows these intersections operating at capacity with a DoS of over

95 per cent and anticipated queue lengths to exceed 500m on Ipswich Road. The small increase in traffic due to the construction of the Project marginally worsens the DoS and queue lengths.

Despite a relatively minor increase in peak period delays and queuing at the intersections modelled, suspension of peak period trucking activity should be considered during the development of detailed CTMPs. This would be due to the current level of congestion and delays within the inner city area. The suggested worksite hours (refer to **Table 8-11**) would not permit construction truck activity at all worksites except the PA Hospital worksite at the Southern Connection during the commuter peak periods.

8.12 Pavement assessment

Assessment has been undertaken to analyse the pavement impacts of the heavy vehicle movements to and from the worksites at Pine Mountain and Swanbank for the scenarios of:

1) Pine Mountain (day time) and Swanbank (evening and weekend)

2) Swanbank (all times)

The route to a spoil placement site at the Brisbane Airport precinct has not been assessed for pavement impacts as the majority of the routes are on the recently completed motorway standard roads of CLEM7 and AirportLink whilst the impacts on the roads close to the worksite would be comparable to those reported for Pine Mountain and Swanbank.

This assessment has been conducted in accordance with TMR's Guidelines for Assessment of Road Impacts of Development.

8.12.1 Method and assumptions

The worksites identified in **Section 8.6** 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 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.

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. The most intensive construction activity from a heavy vehicle trip generation perspective is during the period of tunnel and station excavation.

The following assumptions have been made in order to calculate the total generated construction vehicle volumes:

- based on the Project's construction programme
- spoil removal by Truck and Dog (T&D) , max 19m^3 (11BCM) or 29t
- concrete delivery by concrete mixer (CM) , max 6m^3
- cement delivery by cement bowser (CB) , max 12m^3 / 20t

- all other deliveries by semi-trailer (Semi) or smaller rigid , max 20t.

The existing traffic load for each of the sections has generally been determined with reference to TMR and Brisbane City Council traffic data and where this has not been available by reference to the traffic volumes in the Project demand forecast model. Volumes are expressed as Equivalent Standard Axles (ESA) and Annual Average Daily Traffic (AADT).

Based on TMRs 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 occurs in the period 2016 – 2018 so this is a worst case assessment). A compounding growth rate of 2.0 per cent 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 calculated noting that:

- The calculation of the annual ESAs without development and percentage increase in ESAs due to the additional heavy vehicle movements have been calculated as follows:
- 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)
- assume commercial vehicle ESA factor of 2.5 for base annual ESA calculation
- total additional truck movements evenly spread out over 4.5 years program duration
- delivery movements occur as per the construction programme schedule
- A dog and truck has been assumed to 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 the percentage increase)
- given the commercial vehicle growth for each link has not been separately determined in this assessment, the forecast growth rate of 2.0 per cent has been applied, therefore growth of commercial vehicles to the design horizon 2016 has the same growth as general traffic.

8.12.2 Spoil placement at Pine Mountain (day time) and Swanbank (evening and weekend) – pavement assessment

The operating times of the Pine Mountain spoil placement site are 06:30 to 18:30 Monday to Saturday. When worksite spoil and delivery times are outside those hours spoil would be placed at Swanbank. Under this scenario the following truck movements would be generated to each soil placement site throughout the duration of the construction programme. The predicted heavy vehicle trip generation for each worksite to Pine Mountain and Swanbank, is shown in **Table 8-37**.

Table 8-37 Heavy vehicle trip generation - Pine Mountain and Swanbank

Worksite	Pine Mountain		Swanbank	
	Spoil movements required	Delivery movements required	Spoil movements required	Delivery movements required
Northern Connection - North Busway & rail connections	0	0	600	1,100
Northern Connection – Dive structure	0	0	5,000	3,200
Roma Street	12,300	7,900	3,000	1,900
George Street	17,600	7,100	4,300	1,700
Woolloongabba	7,700	4,300	10,300	5,700
Southern Connection – Boggo Road	10,100	2,300	0	0
Southern Connection – PA Hospital Site	32,700	9,700	43,500	12,900

Note: one way truck movements

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 8-38**.

Table 8-38 Percentage increase in ESA of construction vehicles – Spoil placement at Pine Mountain and Swanbank

Segment	Horizon 2016 AADT	CV%	ESA without Project for construction period	Total additional trucks	Total additional ESA	% increase in ESA
Segments to Pine Mountain (some are common to Swanbank)						
George Street (west of Alice)	9,000	5%	1,800,000	31,000	169,000	9%
Parklands Boulevard	4,000	5%	815,000	27,000	150,000	18%
Herschell Street	9,000	5%	1,804,000	22,000	123,000	7%
Captain Cook Bridge	153,000	5%	28,664,000	45,000	248,000	1%
Leopard Street (north bound)	22,000	9%	8,011,000	28,000	155,000	2%
Vulture Street (east of Main Street)	35,000	9%	13,057,000	73,000	403,000	3%
Main Street (south of Vulture Street)	38,000	9%	14,109,000	73,000	403,000	3%
Ipswich Road at South East Freeway	57,000	9%	21,095,000	73,000	403,000	2%
Peter Doherty Street/ Boggo Road	400	5%	90,000	12,000	69,000	76%
Annerley Road	22,000	5%	4,649,000	12,000	69,000	1%
Cornwall Street (east of SE Freeway)	13,000	5%	2,657,000	12,000	69,000	3%

Segment	Horizon 2016 AADT	CV%	ESA without Project for construction period	Total additional trucks	Total additional ESA	% increase in ESA
O'Keefe Street (west of Ipswich Rd)	2,000	9%	816,000	42,000	234,000	29%
O'Keefe Street (east of Ipswich Rd)	16,000	9%	5,984,000	99,000	549,000	9%
Logan Road (east of O'keefe Street)	27,000	5%	5,553,000	99,000	549,000	10%
Old Cleveland Road (west of Creek Road)	43,000	7%	11,527,000	112,000	617,000	5%
Creek Road (south of Old Cleveland Road)	27,000	7%	7,213,000	112,000	617,000	9%
Pine Mountain Road (west of Creek Road)	14,000	5%	2,854,000	112,000	617,000	22%
Segments to Swanbank spoil placement site (excluding those common to Pine Mountain)						
ICB	120,000	3%	14,735,000	10,000	55,000	0%
Milton Road	61,000	6%	16,086,000	11,000	60,000	0%
Centenary Highway (Brisbane River)	94,000	6%	24,379,000	21,000	115,000	0%
Ipswich Road (North of Waterton Street)	70,000	10%	28,565,000	72,000	400,000	1%
Ipswich Road (Rocklea)	68,000	13%	36,131,000	72,000	400,000	1%
Ipswich Motorway (Oxley)	100,000	12%	50,194,000	72,000	400,000	1%
Ipswich Motorway (Goodna)	92,000	14%	52,883,000	93,000	515,000	1%
Cunningham Highway (Ebbw Vale)	27,000	20%	21,975,000	93,000	515,000	2%
Swanbank Road	2,000	52%	3,956,000	93,000	515,000	13%

8.12.3 Spoil placement at Swanbank only – pavement assessment

The predicted heavy vehicle trip generation for each worksite placing spoil only at Swanbank is shown in **Table 8-39**.

Table 8-39 heavy vehicle trip generation – spoil placement at Swanbank only

Worksite	Swanbank	
	Spoil movements required	Delivery movements required
Northern Connection - Busway and rail connections	600	1,100
Northern Connection – Dive structure	5,000	3,200
Roma Street	15,300	9,900
George Street	21,800	8,800
Woolloongabba	18,000	10,000

Worksite	Swanbank	
	Spoil movements required	Delivery movements required
Southern Connection – Boggo Road	10,100	2,300
Southern Connection – PA Hospital Site	76,200	22,600

Note: one way truck movements

The calculation of the annual ESAs without development and percentage increase in ESAs due to the additional heavy vehicle movements related to placing spoil only at Swanbank is shown in **Table 8-40**.

Table 8-40 Percentage increase in ESA of construction vehicles – spoil placement at Swanbank

Segment	Horizon 2016 AADT	CV%	ESA without Project for construction period	Total additional trucks	Total additional ESA	% increase in ESA
ICB	120,000	3%	14,735,000	10,000	55,000	0%
Parkland Boulevard	4,000	5%	815,000	25,000	139,000	17%
George Street (west of Alice)	9,000	5%	1,800,000	31,000	169,000	9%
Milton Road	61,000	6%	16,086,000	56,000	309,000	2%
Peter Doherty Street/ Boggo Road	400	5%	90,000	12,000	69,000	76%
Annerley Road	22,000	5%	4,649,000	12,000	69,000	1%
Cornwall Street (west of Ipswich Road)	13,000	5%	2,657,000	12,000	69,000	3%
O'Keefe Street (west of Ipswich Rd)	2,000	9%	816,000	99,000	546,000	67%
Leopard Street (north bound)	22,000	9%	8,011,000	28,000	155,000	2%
Vulture Street (east of Main Street)	35,000	9%	13,057,000	28,000	155,000	1%
Main Street (south of Vulture Street)	38,000	9%	14,109,000	28,000	155,000	1%
Ipswich Road at South East Freeway	57,000	9%	21,095,000	28,000	155,000	1%
Ipswich Road (North of Waterton Street)	70,000	10%	28,565,000	139,000	769,000	3%
Ipswich Road (Rocklea)	68,000	13%	36,131,000	139,000	769,000	2%
Ipswich Motorway (Oxley)	100,000	12%	50,194,000	139,000	769,000	2%
Ipswich Motorway (Goodna)	92,000	14%	52,883,000	193,000	1,064,000	2%
Cunningham Highway (Ebbw Vale)	27,000	20%	21,975,000	193,000	1,064,000	5%
Swanbank Road	2,000	52%	3,956,000	193,000	1,064,000	27%

8.12.4 Commentary on the pavement assessment

For both spoil placement scenarios the results indicate most of the road links would lead to an increase of ESA of less than 5 per cent which is a general threshold below which changes are considered negligible (as this is generally within normal day to day variances in traffic volumes).

Some links, such as George Street, Herschel Street, O'Keefe Street (east of Ipswich Road), Logan Road and Creek Road, show a slightly higher increase of between 5 per cent and 10 per cent (considered minor). Roads that form the immediate access to the worksites and soil placement sites have considerable greater increases of ESAs. These include:

- Parklands Boulevard
- Peter Doherty Street/ Boggo Road
- O'Keefe Street (west of Ipswich Road)
- Pine Mountain Road
- Swanbank Road

Therefore, with the exception of these links, 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.

8.13 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.

8.13.1 Whole of project safety considerations

Project control documentation

Project documents such as the CTMP, as well as general plans such as Project Safety Plans would be developed by the Proponent 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 an 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 George Street worksites to fully illustrate that the use of truck and dog combinations for the haulage of spoil material can be safely accommodated on the CBD streets through comprehensive checks of turning circles, amending the street alignment to suit truck and dog operation, the banning of truck operation during the two hour morning and evening commuter peaks and the provision of any other necessary safety measure.

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 should 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 the Project 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	The Project 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.

Over-dimension vehicles

Over-dimension vehicle movements would be controlled in accordance with processes managed by TMR and Brisbane City Council. The CTMP developed for the Project would outline the systems and processes to be followed by all over mass or over dimension vehicles accessing project worksites.

8.13.2 Mitigation measures

This section provides information on mitigation measures proposed at the whole of Project level.

Mitigation measures for construction works within the rail corridor

Construction works in the rail corridors would need to be staged into manageable, safe and reliable increments acceptable to Queensland Rail. Therefore Queensland Rail will be consulted as 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 and should use existing planned shutdowns where possible.
- early and on-going notification is to be provided to Queensland Rail, TransLink, 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 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) 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.
- 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 access and car parking, toilets and baggage handling facility at Roma Street (Platform 10) where disrupted during construction works.

Mitigation measures for construction works within the busway corridor

Construction works in the rail and busway corridors would need to be staged into manageable, safe and reliable increments acceptable to TransLink and TransLink must be part of the process to plan and agree the many operational interfaces between the new and existing busway infrastructure during the planning, demolition and construction phases. Much of the works to existing busways would be carried out during organised busway shutdowns.

Specific busway operational mitigations measures would include:

- busway shutdowns to be coordinated with TransLink.
- where busway shutdowns are required during operational hours, TransLink will be consulted in advance to enable alternate routes and stops to be established.
- early and on-going notification is to be provided to TransLink, busway passengers and local communities of the timing and duration of shutdowns, likely disruptions to services and alternative arrangements to be implemented.
- disruption to busway services is to be avoided to the extent reasonable and practicable during major events, such as the Ekka (Northern Busway) and the Gabba (Eastern Busway). Where disruptions are unavoidable, services are provided on the local road network between appropriate stations to the major event venues, or to bypass the disrupted section in the network.

Mitigation measures for construction works on the road network

Each construction worksite would have a CTMP prepared to implement measures that avoid where practicable, or minimise and mitigate, traffic problems arising during the construction phase. Prior to implementation of the CTMPs they would be subject to a review by the relevant agencies (Brisbane City Council, TMR, Queensland Police, Employment Services Queensland, Queensland Ambulance

Service and Queensland Fire and Rescue Service) and finally approved by the Chief Executive of the Department of Transport and Main Roads.

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 (such as 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 and documented in traffic management plans.
- 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.
- access for emergency services vehicles is to be maintained for the duration of construction works to:
    a) RBWH via O'Connell Terrace
    a) PA Hospital, via Cornwall Street
    b) Mater Hospital, via Stanley Street.
- As far as practicable, major haulage tasks for worksites are avoided during the following scheduled major events:
    a) at the Gabba stadium (crowds greater than 25,000) – for the Woolloongabba Station construction worksite
    b) at Roma Street Parkland (crowds greater than 5,000) – for the Roma Street Station construction worksite
    c) at Suncorp Stadium (crowds greater than 25,000) – for the Roma Street Station construction worksite
    d) the Ekka and other events at the RNA Showgrounds (daily crowds greater than 25,000) – for the Northern Connection construction worksite.
- to the extent reasonable and practicable, haulage activities are managed and coordinated with other major construction works near to construction activities so to minimise the disruption to local traffic, including at:
    a) Woolloongabba Priority Development Area
    b) Queen's Wharf Brisbane
    c) RNA Showgrounds and Bowen Hills Priority Development Area

A Construction Vehicle Management Plan will be prepared and implemented prior to the commencement of construction works. This plan will provide measures to manage the operation of the construction truck fleet, including, but not limited to:

- real-time monitoring, via GPS tracking, of spoil haulage truck position, speed, route and performance in relation of traffic conditions and schedule requirements

- managing truck speed and position to avoid queuing near construction worksites, sensitive community facilities and residential neighbourhoods
- managing traffic signals on nominated spoil haulage routes in night-time hours to achieve optimum performance of the truck fleet and to minimise impacts on communities along the designated routes
- maintaining all haulage vehicles to Australian Design Rule 28/01 in relation to noise emissions, exhaust emissions, traffic safety and operational safety
- ensuring all vehicles leaving a construction worksite pass over or through devices that removes loose spoil and other debris before entering a public road
- establishing a Driver Code of Conduct.

Impacts from construction workforce car parking will be mitigated through the preparation and implementation of a Construction Workforce Car Parking Plan. This plan will be prepared in consultation with relevant local communities and stakeholders. It will be prepared and implemented prior to the commencement of construction works and updated as necessary to reflect the needs of the Project during peak construction workforce periods. As a minimum, the plans will:

- outline parking and travel arrangements for the construction workforce
- identify measures to avoid worker car parking and access in local streets near construction worksites
- address safety, access and amenity for both workers and the local community
- describe any proposals to shuttle workers to or from other worksites
- identify any restricted areas or times where different worker procedures apply
- identify parking control arrangements agreed with Brisbane City Council
- address changing worksite demands during the construction program
- be provided to Brisbane City Council prior to commencement of construction at a worksite
- address the Transport, Access, Parking and Servicing Planning Scheme Policy in the Brisbane City Plan 2014.

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.
- bus replacement services are to be provided when passenger rail operations are interrupted, eg during rail network shutdown periods or temporary closures of 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 areas of high pedestrian and cycle activity such as Roma Street and George Street worksites, 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 should consider the safe operation of dog trailers.
- the design of driveways for Project worksites 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:
    a) the bikeway in Victoria Park
    b) the bikeway through Roma Street Parkland
    c) the bikeway along Kent Street, Dutton Park and the PA Hospital bikeway.
- 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.

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.

Brisbane Statistical Division: Covers an area of approximately 4,700km² and comprises the Brisbane Local Government Area (LGA) and the surrounding area to Caboolture in the north, Beenleigh in the south, Ipswich in the west and Redlands in the east. The Brisbane Statistical Division broadly represents the area cover by the Brisbane Strategic Transport Model (BSTM) and the BaT Project Model.

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 George Street railway stations.

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.

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.

GEH Statistic is a formula used in traffic engineering, traffic forecasting, and traffic modelling to compare two sets of traffic volumes

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

Integrated ticketing: One ticket than can be used on multiple public transport modes.

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. Also used as a key performance measure for pedestrian congestion.

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

LinSig: LinSig is a powerful network based traffic model that is designed to understand road capacities for a series of linked intersection (networks). LinSig has the ability to assess lane by lane movements, pedestrian impacts on traffic, and optimal phase times and offsets.

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.

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

SIDRA: A computer analysis package that is a widely accepted tool for specifically assessing the operation of individual 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 that includes Dutton Park, PA Hospital, Boggo Road, Park Road, Woolloongabba and Roma Street. Busway and rail stations outside of the study corridor that have been considered include Central Station, Fortitude Valley, Cultural Centre, South Brisbane, South Bank, Mater Hill and RBWH.

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.

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: A division of the Department of Transport and Main Roads 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

VISSIM Verkehr In Städten - SIMulationsmodell" (German for "Traffic in cities - simulation model") is a microscopic multi-modal traffic flow simulation software package developed by PTV Planung Transport Verkehr AG in Karlsruhe, Germany

VISWALK software used to assess the potential impacts of the forecast pedestrian demands

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

BLTIP Brisbane Long Term Infrastructure Plan

BSD Brisbane Statistical Division

BSTM-MM Brisbane Strategic Transport Model – Multi Modal version

BUG Brisbane Urban Growth model

CAGR Compounding annual growth rates

CBD Central Business District

CCTV Closed Circuit Television

CLEM7 Clem Jones Tunnel (previously known as the North-South Bypass Tunnel)

CPI Consumer Price Index

CRR Cross River Rail

CTMP Construction Traffic Management Plan

CV Commercial Vehicle

DOS Degree of Saturation

DTMR Queensland Department of Transport and Main Roads

E/B Eastbound

EMU Electric Multiple Unit (Type of rail passenger rolling stock)

GEH Geoffrey E. Havers formula

GST Goods and Services Tax

HV Heavy Vehicles

ICB Inner City Bypass

INB Inner Northern Busway

JV Joint Venture

Km/h Kilometres per hour

LOS Level of Service

MTPA Million Tonnes Per Annum

N/B Northbound

NB Northern Busway

NGR New Generation Rollingstock

OTR On Time Reliability

PM After noon

PT Public Transport

SA Statistical area

S/B South bound

SEQ South East Queensland

SIDRA Signalised and un-signalised Intersection Design and Research Aid

T2 or T3 Transit Lane

TBM Tunnel Boring Machine

TMP Traffic Management Plan

VHT Vehicle hours travelled

VISSIM Verkehr In Städten - SIMulationsmodell" (German for "Traffic in cities - simulation model")

VISVAP traffic signal control software associated with VISSIM

VISWALK pedestrian simulation software

VKT Vehicle kilometres travelled

VOC Vehicle operating costs

V/C Volume over Capacity

VPH Vehicles per hour

W/B West Bound

Appendix C – Extract of the Terms of Reference

This transport technical report addresses the following items in the Terms of Reference.

The 8th and 15th dot points in the following:

Proposed construction and operations

9.12 Describe the following information about the proposal:

- existing infrastructure and easements on the potentially affected land
- the proposed extractive and processing methods, associated equipment and techniques
- hours of operation for proposed construction works, including night time works
- the sequencing and staging of activities
- any activity that is a prescribed ERA
- the capacity of high-impact plant and equipment, their chemical and physical processes, and chemicals or hazardous materials to be used
- the known locations of new or altered works and structures and infrastructure necessary for the project at all stages of its development
- the proposed spoil transport routes, receiving methods and locations
- location of quarry operations the project may source materials from
- the range of land uses and site layout
- built form and design specifics
- operation detail (e.g. hours of operation for project components)
- the commissioning process including landscaping and the rehabilitation of affected areas after construction
- management/ownership structure of final development (e.g. body corporate)
- location and scale of parking requirements.

And the transport items copied on the next page

Transport

Objectives

The construction and operation of the project should aim to:

(a) maintain the safety and efficiency of all affected transport modes for the project workforce and other transport system users

(b) avoid or mitigate impacts on the condition of transport infrastructure

(c) ensure any required works are compatible with existing infrastructure and future transport corridors.

Information requirements

10.32 The EIS should include a clear summary of the total transport task for the project, including workforce, inputs and outputs during the construction and operational phases.

10.33 Present the transport assessment in separate sections for each project-affected mode (road, rail, air, sea, walking and cycling) as appropriate for each phase of the project.

10.34 Provide sufficient information to allow an independent assessment of how existing transport infrastructure and services will be affected by the project at the local and regional level (for example, rail services, local roads and state-controlled roads), recognising relevant transport plans (for example Passenger Transport Network Plan and Park and Ride Strategy).

10.35 Include details of the adopted assessment methodology for impacts on roads within the road impact assessment report, in accordance with the *Guidelines for Assessment of Road Impacts of Development.*

10.36 Discuss and recommend how identified impacts will be mitigated. Mitigation strategies are to be prepared in close consultation with relevant transport authorities and service providers (including Local Government).

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