CrossRiver**Rail**

2. Project Rationale

CROSS RIVER RAIL

CHAPTER 2
PROJECT RATIONALE

JULY 2011

Contents

2 Project rationale

2.1 Introduction

This chapter addresses Section 1.3 and Section 1.4 of the Terms of Reference as well as those parts of Section 1.5 relating to alternatives to the Project. Alternatives considered during the detailed feasibility phase in the development of the reference design are described in **Chapter 3 Project Development**.

South East Queensland is experiencing rapid population and employment growth, which is expected to continue. Brisbane's Central Business District (CBD) and inner city will remain the region's primary activity centre, complemented by a network of centres that focus on enterprise opportunities, innovation and technology. The CBD will continue to be an important focus for population and employment growth in coming years. This rapid growth will lead to increased rail passenger demand, particularly for trips into and through Brisbane's inner city.

The movement of freight through the region is also rapidly increasing and is forecast to more than double by 2031.

Previous rail capacity studies conducted by Transport and Main Roads have identified that the inner city rail network will be at capacity by 2016, constraining future growth in rail services across the region.

To deal with these growth pressures and improve the attractiveness and effectiveness of the public transport system, the Queensland Government is planning to transform the South East Queensland rail network, starting with Cross River Rail.

This chapter describes the rationale for Cross River Rail, including the strategic context and the future of South East Queensland's planning and transport without the Project. Alternatives to the Project are also described along with its relationship to other projects within South East Queensland.

2.2 Strategic policy context

This section provides an overview of the over-arching strategic planning framework, including both transport and land use planning, relevant to Cross River Rail. It provides an overview of how the Project aligns with the national, regional and local policies and strategic planning process along with a summary of current and future issues and constraints within the South East Queensland's transport network.

2.2.1 National policy context

At a national level, the Project is informed by the priorities established by Infrastructure Australia. These seek to ensure that the nation's infrastructure investment addresses current and future challenges for Australian communities to achieve sustainable economic growth and environmental sustainability, and improved quality of life and reduced social disadvantage.

Seven themes for action to meet these challenges were identified by Infrastructure Australia as the most important infrastructure objectives for the nation. Those relevant to the Project include:

- competitive international gateways; developing more effective ports and associated land transport systems to more efficiently cope with imports and exports
- a national freight network; development of our rail networks so that more freight can be moved by rail

- transforming our cities; increasing public transport capacity in our cities and making better use of existing transport infrastructure but also the need to develop coordinated long term integrated infrastructure plans, improved governance and stronger participation from industry and the community.

Infrastructure Australia identified that improving transport networks is crucial for economic growth and the liveability of our cities. In particular, inadequate transport networks and congestion of road and public transport networks threaten quality of life, damage the local and global environment and act as a significant brake on future economic growth.

Public transport in our cities is identified as a priority, with comprehensive public transport networks essential for the long-term liveability of Australia's cities. Infrastructure Australia considers that these networks should be planned alongside land use strategies, so that new residential and employment areas are well served by public transport.

Congestion and delays are currently being experienced on the land side of some of Australia's ports, impacting on the efficient movement of imports and exports. Infrastructure Australia identified that road and rail access needs to be sufficient to cater for the demand generated at ports, without excessive disruption to other road and rail users, notably passenger trains and private vehicles. The separation of urban passenger rail from the freight rail network was identified as a future concept for improved freight efficiency.

The draft National Ports Strategy developed by Infrastructure Australia seeks to improve the efficiency of port-related freight movements across infrastructure networks, minimise externalities associated with such freight movements and influence policy making in areas relevant to freight.

Cross River Rail addresses the challenges of population growth, urban congestion and climate change and aims to develop Brisbane into a more productive, sustainable and liveable city. It would provide the necessary infrastructure and change momentum to support the transformation of Brisbane into Australia's third internationally competitive city:

- providing essential capacity at the core of the region's rail network, allowing more people to travel more frequently, with greater reliability, with reduced journey times and with increased comfort (ie greatly reduced crowding in peak periods)
- improved accessibility to and within the Brisbane CBD, being the designated primary centre for South East Queensland, through relieved congestion in the key CBD station, ie Central Station, and providing a new station at Albert Street to support the major activity precincts (the Queen Street retail heart, the parliamentary and administrative precinct, the financial district and the education and learning precinct – QUT)
- contributing to a more sustainable city and region by providing a high quality passenger rail transport system to designated growth areas at Bowen Hills urban development area (RNA), Woolloongabba urban development area, Dutton Park (Boggo Road Urban Village) and Yeerongpilly transit oriented development
- rejuvenating Brisbane's inner city by creating opportunities for new public spaces, and retail and commercial opportunities, through development of four new inner city stations, each of which would be linked to major activity centres
- connecting to existing and new transport infrastructure including rail, bus and active transport facilities to make travelling throughout South East Queensland easier
- providing capacity in a heavily congested rail corridor to carry more freight on rail, particularly between Yeerongpilly and Park Road
- providing a dedicated standard gauge track from the Port of Brisbane to the key inland intermodal of Acacia Ridge and beyond for interstate freight traffic from Sydney and Melbourne
- improving connection between inter-modal and intra-state activity areas.

The Project is an enabler for South East Queensland's regional transport network – not just the rail network. Cross River Rail would relieve demand on the congested road network accessing the CBD, as well as supporting the bus mode share, particularly in peak periods. Congestion on the surface road network presents a constraint on both bus and private vehicle travel in peak periods.

Cross River Rail has been recognised by Infrastructure Australia as a project with "real potential" which clearly addresses a nationally significant issue or problem. In 2009, the Commonwealth Government committed $20 million toward the detailed feasibility phase for Cross River Rail.

2.2.2 State policy context

The Queensland Government has developed a number of overarching strategies and plans to manage growth and guide future development across the state and in South East Queensland. The following provides a summary of those strategies and plans relevant to Cross River Rail.

Toward Q2

Toward Q2: Tomorrow's Queensland (Towards Q2) sets the Queensland Government's vision for the state in 2020. This vision is framed around five key ambitions to address future challenges, being a Queensland that is strong, green, smart, healthy, and fair. The ambitions relevant to Cross River Rail include:

- "Strong" – a diverse economy powered by bright ideas
- "Green" – protecting our lifestyle and environment.

One of the targets for 2020 relating to a strong economy is for Queensland to be Australia's strongest economy, with infrastructure that anticipates growth. Congestion of the State's road and transport links is identified as one of the challenges to delivering this target. Continuing to plan for and invest in road, rail and public transport infrastructure to allow the economy to grow is a priority for the Queensland Government.

Cutting Queenslander's carbon footprint by one-third through reduced car and electricity use is identified in Toward Q2 as a target for a greener state. Community attitudes to public transport and demand and access to public transport are identified as key challenges to delivering this target. Continuing to fund more public transport services, to reduce dependence on cars, is a priority for the Queensland Government.

Cross River Rail supports the achievement of the "Strong" and "Green" targets by:

- supporting economic growth by developing the rail network and fast commuter links to ensure people and goods can move more reliably and efficiently
- supporting a reduction in Queenslander's carbon footprint through reduced motor vehicle use.

South East Queensland Regional Plan 2009-2031

The *South East Queensland Regional Plan 2009-2031* (SEQ Regional Plan) is the Queensland Government's long-term plan that will shape South East Queensland over the next 20 years.

The SEQ Regional Plan addresses emerging regional growth management issues – continued high population growth, housing affordability, transport congestion, climate change and employment generation and provides the framework for managing these issues.

South East Queensland has experienced substantial population growth over the past 30 years, with growth expected to continue to 2031 and beyond. The SEQ Regional Plan identifies sufficient land and density targets to accommodate a projected population of 4.4 million people and associated employment and economic development by 2031.

Brisbane will continue to support the largest proportion of the region's population, with planning looking to accommodate 1.27 million people by 2031. This population would require an additional 156,000 dwellings, of which at least 138,000 would be delivered through redevelopment and infill. Growth will predominantly be located in and around the Brisbane CBD, regional activity centres and growth corridors such as Brisbane –Yeerongpilly rail corridor and Brisbane – Albion rail corridor.

Brisbane will also continue to generate a high proportion of the region's employment growth by providing an attractive and competitive business environment that includes a highly skilled workforce, efficient and effective transport infrastructure, suitable serviced accommodation for businesses and industries and an attractive living environment. In particular, Brisbane's CBD and inner city will remain the region's primary activity centre, complemented by a network of centres that focus on enterprise opportunities, innovation and technology.

Of most relevance to the Project, the SEQ Regional Plan, through Desired Regional Outcome (DRO) 8 establishes "a clear policy and legislative platform to move to a more compact settlement pattern and a better mix of urban development that will support a greater use of public transport, walking and cycling". Fast passenger rail travel between all of the region's major urban centres is identified as the backbone of the public transport system.

Cross River Rail supports the SEQ Regional Plan vision for South East Queensland as a region of interconnected communities with excellent accessibility and an extensive system of efficient public transport that contributes to reducing greenhouse gas emissions.

South East Queensland Infrastructure Plan and Program 2010-2031

The *South East Queensland Infrastructure Plan and Program 2010-2031* (SEQIPP) is a supporting document to the SEQ Regional Plan. It establishes priorities for regionally significant infrastructure over the next four years and outlines the longer-term planning horizon to 2031.

The SEQIPP plans, coordinates and delivers infrastructure and services to achieve the vision of Toward Q2: Tomorrow's Queensland and the SEQ Regional Plan. SEQIPP has set infrastructure goals including:

- providing quality public transport infrastructure and services along key routes linking activity centres and the Brisbane CBD
- managing congestion and travel demand
- increasing public transport and road network capacity to cater for growth.

SEQIPP has identified Cross River Rail as one of the initiatives to achieve these goals. SEQIPP identifies the Project as a "key initiative in meeting future public transport needs" that will "help transform South East Queensland's rail system by providing more capacity for the region's rail services, meaning more people can move into and through the city more frequently". SEQIPP also identifies the Project as enabling "the rail network to expand to new areas and link people to key inner city places, jobs and education".

Draft Connecting SEQ 2031: An Integrated Regional Transport Plan for South East Queensland

The draft *Connecting SEQ 2031: an Integrated Regional Transport Plan for South East Queensland* (Connecting SEQ 2031) is the Queensland Government's long term transport plan to develop a sustainable transport system in South East Queensland. The plan was endorsed by State Cabinet and released for three months' consultation on 31 August 2010. It was developed as the guiding transport planning and policy document to support the desired regional outcomes of the SEQ Regional Plan.

This plan will endorse a new strategic framework for the future of the region's transport system. It has been informed by a number of studies, such as the Inner City Rail Capacity Study (ICRCS) 2008, Bus Access Capacity Inner City Study (BACICS) 2008, Rail Assessment of Capacity Alternatives Study (RACAS) 2009, Rail Network Strategy for South East Queensland, 2009 and the Integrated Transport

and Land Use Inner City Study (ITALICS) 2009, which have supported the need for improvements to the inner city public transport network, including:

- a large increase in cross-river mass transit capacity
- better mass transit coverage of the CBD and inner-city development precincts
- reduced reliance on arterial roads and city streets.

The Connecting SEQ 2031 transport vision for South East Queensland is for 'a transport system that supports the lifestyle enjoyed by residents and visitors, enhances the state's economic vitality and protects the environment'. It provides an integrated approach linking land use and transport planning that is needed to deliver the SEQ Regional Plan outcomes by supporting the delivery of well-designed and well-connected communities where people can work, attend schools, shop or recreate all within 15 minutes travel by using a sustainable transport mode.

This is a vision underpinned by the notion of sustainable transport – a system that is resilient and capable of being continued over the longer term with minimal effect on the environment. To achieve this vision, the Connecting SEQ 2031 establishes nine key transport policy goals, all of which are relevant to Cross River Rail:

- protecting amenity and liveability
- ensuring equity and accessibility
- supporting economic prosperity and employment growth
- delivering transport efficiently
- managing congestion
- creating a low carbon and environmentally responsible transport system
- encouraging individual activity as a part of daily travel
- developing a resilient system that is not vulnerable to major incidents or reduced oil supply
- delivering safety and security.

Specific transport mode share targets have been set in the plan. By 2031, the aim is to:

- double the share of active transport trips, such as walking and cycling, from 10% to 20% of all trips
- double public transport mode share from 7% to 14%
- decrease the share of trips by private vehicle from 83% to 66%.

Rather than continue down a path of incremental change, the Connecting SEQ 2031 adopts a new strategy to provide for substantial growth on the rail network – the 'Rail Revolution'. This aims to boost the capability of the rail system to meet greatly increased passenger demands driven primarily by population growth and the large spatial spread of development in the South East Queensland region, and a growing CBD and fringe working population, with increased emphasis on public transport and no increase in road capacity into the Brisbane CBD. The Connecting SEQ 2031 proposes a major revolution of how public transport services operate, starting with the delivery of Cross River Rail, and including:

- UrbanLink, converting inner parts of the greater Brisbane rail network to high-frequency 'turn up and go', all-stops services using high capacity trains
- ExpressLink, all day express services connecting outer Brisbane suburbs to the rest of the region
- CoastLink, fast express services from the Gold and Sunshine coasts to Brisbane in about an hour.

Cross River Rail is the flagship initiative in the Connecting SEQ 2031 'Rail Revolution' and is identified as the enabler of long-term viability of the rail network.

Other State policies

Cross River Rail also supports a range of other State Government policies and strategies, including:

- *Draft South East Queensland Climate Change Management Plan 2009*, by achieving higher integration of transport and land use planning in South East Queensland to reduce greenhouse gas emissions
- *Transport Coordination Plan for Queensland 2008-2018*, by ensuring the transport system performs well and accommodates the changing travel patterns and requirements of society and industry
- *Rail Network Strategy 2009*, by connecting the community, supporting the freight transport needs of industry, enhancing economic performance and contributing to the preservation of the environment, community amenity and safety
- *South East Queensland Regional Freight Network Strategy 2007-2012*, by facilitating increased rail freight capacity to meet forecast freight movement demand.

2.2.3 Local policy context

Brisbane City Council has developed a number of overarching strategies and plans to manage growth and guide future development across the Brisbane local government area. The following provides a summary of those strategies and plans relevant to Cross River Rail.

Transport Plan for Brisbane 2008-2026

The *Transport Plan for Brisbane 2008–2026* (Transport Plan for Brisbane) sets out the actions which governments need to take to ensure that Brisbane can retain its unique lifestyle while providing the necessary transport infrastructure and services to encourage sustainable travel choices and accommodate expected growth.

The Transport Plan for Brisbane was developed as an Integrated Local Transport Plan (ILTP) to be consistent with the objectives of the SEQ Regional Plan and Connecting SEQ 2031. The Transport Plan for Brisbane was developed in consultation with the Queensland Government and shares similar objectives to Connecting SEQ 2031.

In the Transport Plan for Brisbane, Brisbane City Council states that in order to achieve the Project mode share target of 13% on weekdays in an earlier timeframe than 2026 a number of conditions are necessary, one of which is ‘a significant increase in rail capacity, making full use of rail corridors to move more than 30,000 passengers per hour, including serious consideration of an inner Brisbane metro system’.

The Transport Plan for Brisbane provides strong support for Cross River Rail as it identifies the need for ‘a second CBD crossing to increase cross-river capacity and rail catchment in the inner city beyond 2016’.

Local growth management strategy – draft CityShape Implementation Strategy 2007

The draft *CityShape Implementation Strategy 2007* (CityShape) was prepared by Brisbane City Council’s in response to the then regional plan. It outlines the preferred pattern of development for the Brisbane local government area to 2026.

CityShape identifies a range of strategies to address the challenges of population growth and changing demographics in Brisbane, including residential development, employment and economic development and integrated transport and infrastructure. Under the strategy it is intended that new homes and development would be built around Brisbane’s major shopping centres and/or along major growth corridors. Jobs would be located close to where people live and there would be a focus on provision of services and facilities locally.

The key growth areas identified in CityShape are focused in the Brisbane CBD and inner suburbs. The strategy identifies activity centres and growth corridors along high-frequency and high-capacity public transport routes, such as rail corridors and busways, and major renewal living areas, as a key focus for future growth and development. Bowen Hills, the RNA Showgrounds, Woolloongabba, Boggo Road Gaol, and Tennyson are identified as major renewal areas.

In relation to activity centres, CityShape reconfirms the regional activity centres identified in the SEQ Regional Plan and identifies a number of productive precincts as a focus for employment and economic development. These include the Brisbane CBD which will continue to be the primary activity centre for Brisbane and South East Queensland, and productive precincts at Boggo Road, University of Queensland, Queensland University of Technology, Herston medical precinct and the RNA Showgrounds.

Cross River Rail supports the CityShape by improving access to key inner city destinations and to these future development areas.

2.3 Existing transport and land use context

This section provides a summary of the existing transport and land use context within South East Queensland. It includes an overview of current and future issues and constraints associated with the region's transport network and land use pattern.

2.3.1 Public transport growth

For more than a decade there has been significant growth in public transport use, particularly for commuting trips to the Brisbane CBD. Commuting trips grew by around 4% per annum over the 10 years to 2006 (45% over ten years), with higher growth experienced in more recent years (around 7% per annum). This increase in the demand for travel has been driven by growth in employment of over 30% for the ten years to 2006.

By 2006 public transport had overtaken the car and become the major mode of transport for accessing employment in the Brisbane CBD. Growth in public transport trips to the Brisbane CBD in the peak periods for the period 2005 to 2009 was 34%, while growth in vehicle trips into the Brisbane CBD for the same period, was around 6%.

In 2009, over 540,000 trips were made by public transport on an average weekday. Rail users comprised approximately 45% of this total. Almost half of the demand for public transport and rail travel occurs during the morning and evening peak periods, which make up four hours of the day. It is during these peak periods that congestion is experienced on the rail and bus services for commuting trips to and from the Brisbane CBD.

2.3.2 Rail network constraints

The capacity of the South East Queensland rail network is highly constrained by the inner city rail network. This is mainly due to inbound routes to the CBD being limited to one line from Milton, servicing trains from the western line, and one line from Park Road across the Brisbane River, servicing passenger trains from Beenleigh, Gold Coast and Cleveland, in addition to freight trains. This results in trains from multiple lines needing to merge into two inbound lines in order to access the CBD. This limits the potential capacity of the western and southern lines.

Operation of rail freight during the passenger off-peak services is facilitated by the provision of 30 minute off-peak passenger frequencies on most lines, which places a constraint on the provision of increased off-peak passenger service frequencies.

Figure 2-1 provides an overview of the key capacity constraints in the inner city rail network including:

- single directional track on the Merivale Bridge across the Brisbane River, requiring inbound Gold Coast, Beenleigh and Cleveland trains to merge together at South Brisbane
- all Ipswich and southern lines each merge into single track on access to Roma Street Station
- congested junctions at Park Road and South Brisbane
- long waiting times at Central Station, limiting the number of trains that can move through the inner city
- single platforms and long dwell times in CBD stations, which do not allow large passenger numbers to be efficiently catered for, reducing the capacity of the network.

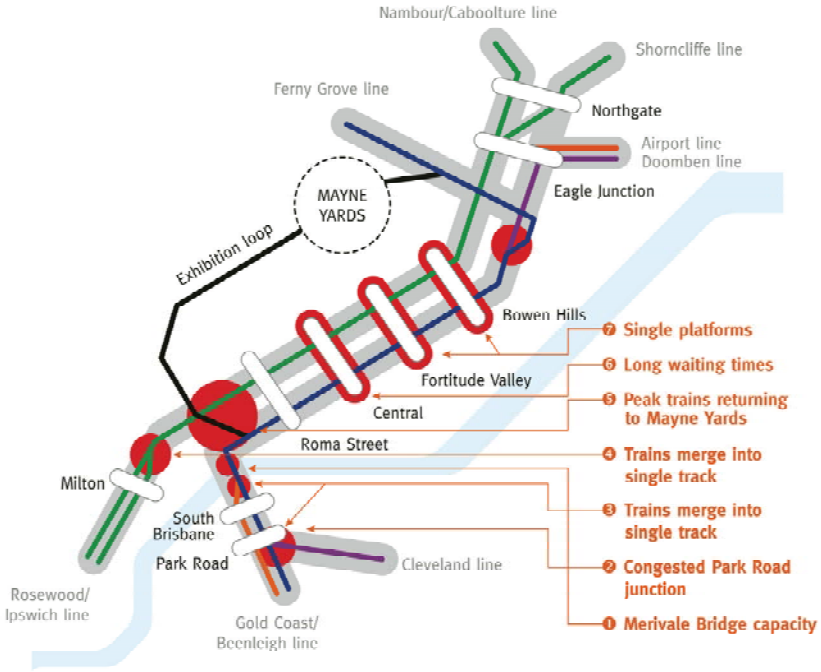

Figure 2-1 Capacity constraints in the inner-city rail network

2.3.3 Passenger rail network constraints

Passenger crowding

The demand for passenger arrivals in the Brisbane CBD would nearly double between 2009 and 2031. This increased demand would exceed the capacity of Central Station and would result in most services in the peak periods exceeding desirable crowding indicators on the approaches to the CBD.

Passenger loads on some services are generally heavier in the morning peak (in the peak direction) than the evening peak (in the peak direction) due to education and work-based trips coinciding in the morning peak period.

Particular crowding issues are experienced on the Gold Coast line where all four services in the morning peak hour exceed the design load for Queensland Rail rollingstock, ie more than 750 passengers at any point or passengers standing for more than 20 minutes. The Beenleigh line also has significant crowding issues where three out of seven peak hour services exceeding the design load.

In the morning two hour peak period trains from the Sunshine Coast, Caboolture, Airport, Doomben and Shorncliffe lines are operating at or above their full seated capacity, around 114% of seated capacity approaching Bowen Hills southbound. On the Caboolture line, eight out of ten services in the peak hour currently exceed the Queensland Rail design load.

Reliability of rail services

Queensland Rail currently adopts an on-time reliability benchmark that seeks to achieve 92.4% of trains operating within four minutes of the timetable. For inbound services arriving at Central Station from start of operation until 10.00 am during a normal weekday, the on-time reliability benchmark of four minutes is currently achieved on all lines, with the exception of the Nambour line. The Cleveland, Robina and Beenleigh lines just achieve the on time reliability benchmark.

Operational constraints

The lack of strict rail network sectorisation reduces schedule robustness, allows knock-on delays across lines and results in long distance rollingstock being used for short distance services and vice-versa. It reduces capacity on 'metro-style' CBD services and results in passengers on longer distance commutes not being guaranteed access to appropriate on-board facilities.

The current operation of rail service plans is complex such that passengers should have a detailed knowledge of the timetable for the most efficient travel around the network and discourages interchanges.

Dependence on Central Station

Central Station is the principal rail station for passengers travelling to and from the Brisbane CBD. Around 42,000 passengers board or alight at a CBD station during the morning peak period, with the majority of these passengers, over 30,000 passengers or 74% of the CBD total, alighting at Central Station.

This high demand for use of Central Station is putting pressure on the passenger infrastructure within the station and on the surrounding pedestrian network.

Large parts of the Brisbane CBD, such the Government precinct around Margaret Street and Alice Street, parts of the financial precinct around Margaret Street and the Queensland University of Technology (QUT) campus at Gardens Point is more than a 15 minute walk from a rail station.

Freight rail network constraints

There are around 50 freight services per day travelling through the Brisbane rail network along narrow gauge or dual gauge lines. There is no dedicated rail freight network in South East Queensland. However, there are some corridors, such as Park Road to the Port of Brisbane and Acacia-Ridge to Melbourne/Sydney, that offer a dedicated track for freight.

A series of conflicts exist that affect the operational capacity of freight such that the demand for rail freight is not being fully met. The constraints are:

- peak freight – freight operational hours are currently restricted by a passenger-peak freight curfew, not allowing freight services access to the passenger network during the morning or evening peak hours, with restricted access during the shoulder period. This prevents freight operations for approximately four hours of the day.
- operations on the Merivale Bridge – passenger train operations have priority on the Merivale Bridge. This route is only used opportunistically when train paths are available for freight traffic. The primary route for all freight to and from Acacia Ridge from the North Coast is via Corinda.

- network constraints such as
  - freight services arriving from the North Coast must cross the path of passenger services heading to the north at Bowen Hills junction
  - non-freight services entering and exiting Mayne Rail Yard cause junction conflicts with the freight services on the Exhibition Loop tracks
  - the area around Normanby Rail Yard has many potential crossing and merging conflicts, especially with passenger services finishing at Roma Street and heading to Mayne Rail Yard
  - junction conflicts between freight and passenger services at the Milton and Roma Street Junction
  - passenger and freight trains sharing the single bi-directional dual gauge track between Salisbury and Park Road, on the Gold Coast and Beenleigh lines, preventing freight trains from operating on this part of the network in peak commuting hours, and limiting the number of both freight and express passenger services in the off peak to approximately current levels.

2.3.4 Bus network constraints

Buses currently carry approximately half of total public transport trips across the Brisbane metropolitan area. The Brisbane bus network is highly CBD-centred with more than 500 bus services per hour entering the CBD in the morning peak (BACICS, 2008).

About two-thirds of these buses access the Brisbane CBD via either the South East Busway or Inner Northern Busway. The South East Busway carries more than 250 buses per hour inbound at its busiest point at Woolloongabba while the Inner Northern Busway carries more than 90 buses per hour inbound at Roma Street in the morning peak.

Peak hour bus operations consist of a range of peak-only routes which supplement the standard timetable and offer single seat express journeys into the Brisbane CBD. From the south-east, most peak-only express services use the Captain Cook Bridge to enter the Brisbane CBD rather than the inner South East Busway route via the Victoria Bridge.

To support recent and continued growth of the CBD, significant bus network enhancements have been planned and implemented including the South East Busway, Inner Northern Busway, Eastern Busway, Northern Busway, Boggo Road Busway, King George Square Busway Station and Eleanor Schonell Bridge to the University of Queensland (UQ). There have been significant operational improvements including the introduction of the high frequency “BUZ” services and the modernisation of the bus fleet.

However, the bus network is reaching capacity. There are significant CBD bus access constraints, minimal opportunity for additional bus stops and layover spaces within and close to the CBD and limited capability to significantly improve bus infrastructure and services to the CBD beyond currently planned SEQIPP projects.

Use of the morning peak period bus services for trips to the inner city is high with crowding on buses being common that does result in full buses not being able to pick up additional passengers at some locations.

2.3.5 Road network constraints

The road network serving the city is primarily radial and directs private vehicle trips into and through inner Brisbane. More than 90% of available road capacity is used during peak periods, which generally causes unstable flows, congestion and delays.

Key routes with poor levels of service in the morning peak period include:

- Pacific Motorway (Riverside Expressway) (both directions)
- Pacific Motorway – on the approach and across the Captain Cook Bridge (inbound)
- Story Bridge (inbound)
- Coronation Drive (inbound)
- Sandgate Road/Abbotsford Road (inbound - north of the Inner City Bypass)
- Lutwyche Road/Bowen Bridge Road (inbound).

Increase in demand for inner city access over the last decade has contributed significantly to congestion, peak spreading, increase in demand for public transport services and other outcomes such as increased CBD parking fees.

Recent network upgrades, such as the Gateway Bridge duplication, Clem Jones Tunnel and Go Between Bridge and the Airport Link and Legacy Way (both currently under construction), have focused on improving the orbital network and removing the need of motorised transport to use the CBD for cross city trips.

Despite these upgrades many of the roads to the Brisbane CBD and inner city will continue to experience increasing levels of congestion and will not be able to provide appropriate accessibility to the CBD.

2.3.6 Growth and development

Employment growth in inner Brisbane

Population and employment are the most influential factors that drive the demand for travel.

The population of South East Queensland was 3.1 million people at June 2009. With the exception of Perth, South East Queensland's population has grown at a faster rate than all mainland capital city metropolitan areas in recent years.

In 2009, the Brisbane statistical division had an estimated resident population of about two million people, nearly two-thirds of South East Queensland's population. The populations of the Gold Coast and Sunshine Coast accounted for approximately 16.8 % and 10.5% respectively of the region's total population.

Strong population and employment growth is expected to continue in the region, with the population forecast to increase to 4.4 million people in 2031 and to six million people in 2056 (SEQ Regional Plan, 2009). Forecast increase in population and employment for Brisbane are shown in **Table 2-1**. Growth in employment with Inner Brisbane is expected to be significant at almost 60% from 2009 to 2031.

Table 2-1 Population and employment forecasts

Year	2009		2021		2031	
	Population	**Employment**	**Population**	**Employment**	**Population**	**Employment**
Inner Brisbane statistical local area	38,000	245,000	53,000	333,800	66,000	387,000
Brisbane metropolitan area	1,892,000	1,042,000	2,346,500	1,341,100	2,657,000	1,514,000

Source: Transport and Main Roads (Modelling and Data Analysis Centre), 2011

The continued importance of the Brisbane CBD as a major employment node and travel generator for South East Queensland is illustrated in the future regional employment distribution which is shown schematically in **Figure 2-2**.

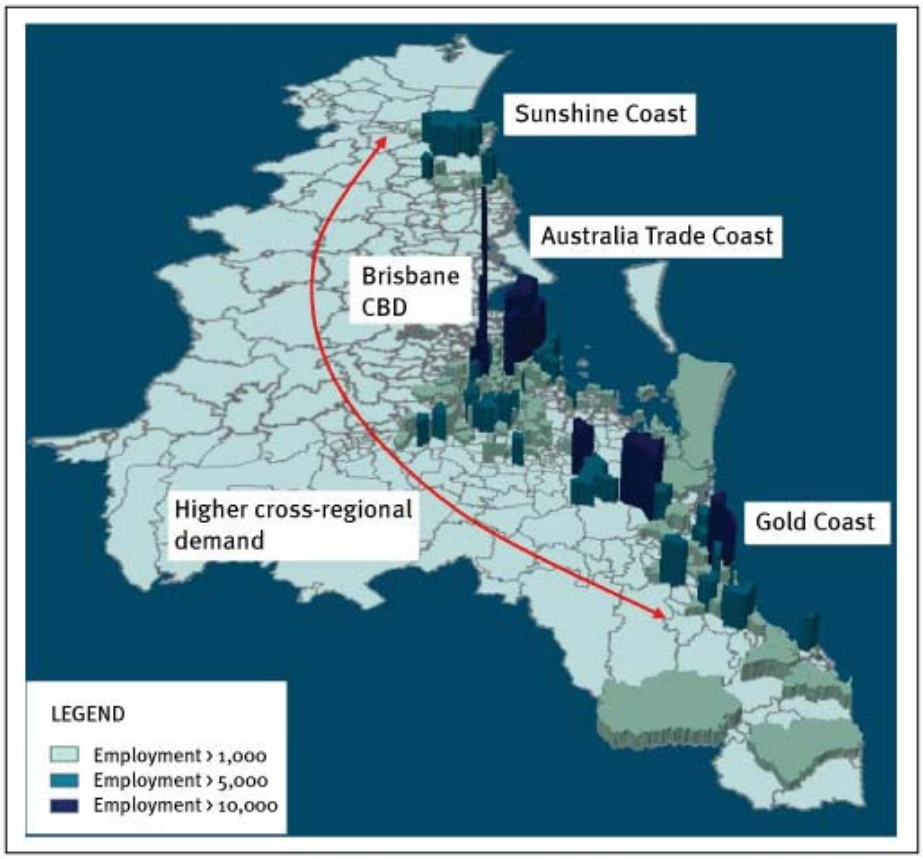

Figure 2-2 Forecast distribution of employment in South East Queensland by 2031

While growth in employment brings with it obvious economic benefits to the region, state and nation, it also brings challenges such as increased commuter trips to the Brisbane CBD, leading to greater demand for travel via the public transport and road networks. This is against a background of the significant growth in travel that has already occurred over the last decade.

Forecast growth in weekday travel demand across the Brisbane metropolitan area is shown **Table 2-2**. The highest percentage growth forecast is expected to occur in public transport trips, with almost double the trips forecast for 2031 compared to 2009. This is also true for rail trips with both total daily and peak period rail trips to the CBD also forecast to double. Vehicle trips are anticipated to grow at a slower rate, increasing by 47% between 2009 and 2031.

Table 2-2 Forecast growth in weekday travel demand in the Brisbane metropolitan area

Parameter	2009	2021	2031
Total person trips by all modes	6,700,600	8,283,800	9,259,900
Total person trips by car	5,533,200	7,009,800	7,771,700
Public transport person trips	546,000	824,200	1,074,000
Public transport mode share (of all person trips)	8.15%	9.95%	11.60%
Total rail patronage (24 hour)	243,200	421,900	529,500
Number of rail trips to CBD (morning peak period)	37,100	61,600	73,700
Total vehicle trips (1)	4,383,200	5,652,100	6,460,200

Note:
1. Includes commercial vehicle trips

Travel to the Brisbane CBD is expected to be increasingly met by public transport modes, with minimal growth in vehicle trips expected, as shown in **Figure 2-3**. Rail, bus and ferry are all expected to cater for a greater number of trips, as well as a greater proportion of all trips to the Brisbane CBD, by 2031 compared to 2009.

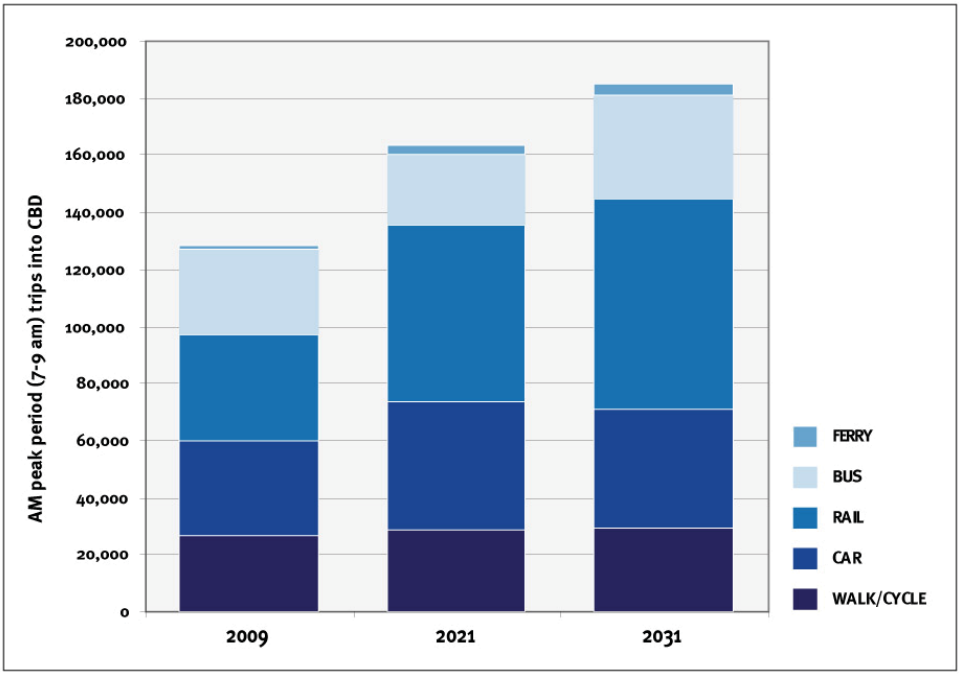

Figure 2-3 Forecast morning peak period travel demand (person trips) into the Brisbane CBD without the Project

The forecast growth in rail patronage for the Brisbane metropolitan area is shown in **Table 2-3**. Both peak period and daily rail trips are forecast to more than double between 2009 and 2031 on a rail network that is already experiencing capacity issues. By 2031, over half a million daily rail trips are expected in the Brisbane metropolitan area. The demand for passenger alightings in the CBD in the morning peak period is forecast to double from 37,000 in 2009 to almost 74,000 by 2031 passengers.

Table 2-3 Forecast growth in rail travel in the Brisbane metropolitan area

Time Period	2009	2021		2031	
	Rail users	Rail users	Growth	Rail users	Growth
Morning (AM) peak (7.00 am-9.00 am)	67,000	108,300	62%	141,900	112%
Evening (PM) peak (4.00 pm-6.00 pm)	58,400	104,400	79%	131,700	126%
Average weekday (24 hour)	243,200	421,900	73%	529,500	118%

Low density development

Between 1991 and 2006, South East Queensland's population increased by 47%, yet during the same period, its urban area increased by 64%. At June 2009, the population density of Brisbane was 8.9 people per hectare, which is very low compared to other international cities.

A preference for low-density suburban living combined with many people living in suburbs located at considerable distances from employment, schools, recreation and other activities, results in longer and multiple journeys and a high reliance on cars resulting in passenger vehicle kilometres travelled per capita growing faster than the population. In the Brisbane Statistical Division the estimated work commuting trip distance has increased by about 28% since 1992, from 13.5 km to 16.8 km (SEQ State of the Region Report, 2008).

The problems associated with South East Queensland's low density settlement have resulted in rising levels of congestion that exist across the road network. This in turn is impacting the regional economic performance through the loss of productivity due to time delays and increasing journey lengths to places of work and business. This effect is being realised both in the movement of people, but also for the movement of freight.

To overcome this legacy, the Queensland Government has taken a number of steps over the last 15 years to implement best-practice approaches to integrated land use and transport strategies by adopting smart land use growth policies, such as growth boundaries, increased densities, mixed use, transit oriented development (TOD) and activity centres and corridors; establishing statutory requirements for land use in South East Queensland, along with a prioritised and multi-modal approach to transport investment.

2.4 Transport network without Cross River Rail

This section provides an overview of the South East Queensland transport network in 2031 if Cross River Rail does not proceed.

2.4.1 Rail network without Cross River Rail

Passenger rail network

Ongoing capacity constraints on the rail network

Additional rail services that could be provided in 2031 on the current rail network would not be sufficient to meet the more than 100% increase in rail passengers. The lack of rail capacity to service the demand to travel would lead to worsening levels of service for rail passengers with respect to crowding and the reliability of services. If additional line capacity is not provided peak service performance will decline, leading to a greater dependence on other modes to access the CBD or peak spreading or both, which could slow the growth of the Brisbane CBD and affect the city's competitiveness.

Increased passenger crowding

During the current morning peak periods passenger crowding is already experienced on the approaches to the Brisbane CBD. In future years the degree of passenger crowding is forecast to significantly increase with each line becoming increasingly more crowded. **Figure 2-4** provides an overview of crowding increases in key segments of the network.

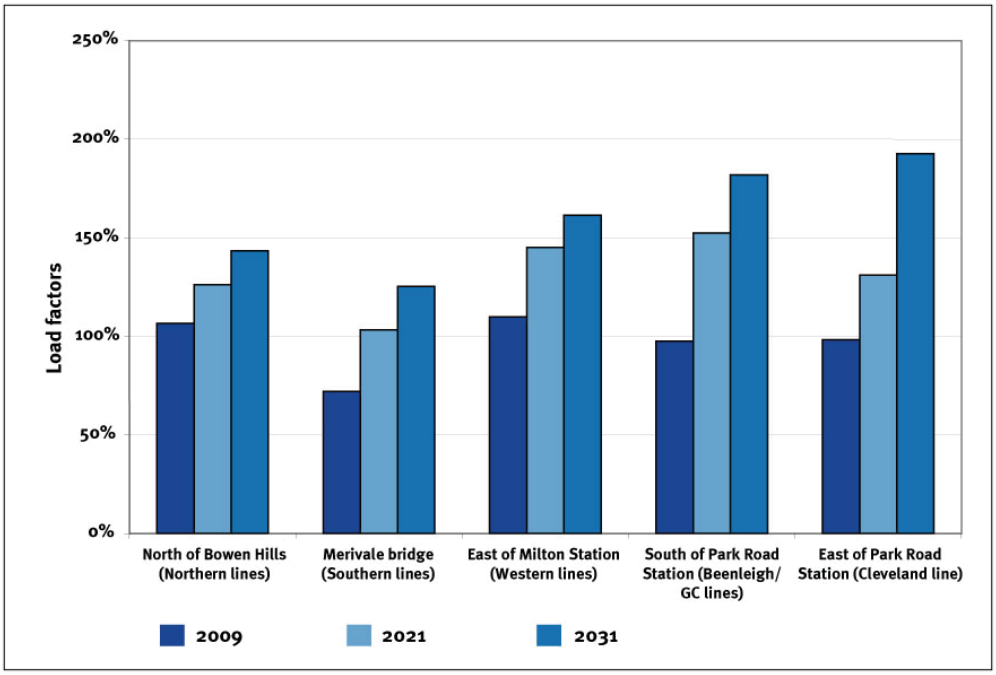

Figure 2-4 Increase in rail network crowding

By 2021 the number of standing passengers on all rail lines would increase. Those services most impacted by the inner city capacity constraints, the Beenleigh and Gold Coast lines are forecast to have 50% more passengers than the seated load capacity across the entire two hour morning peak period. All-stopping Kuraby services are forecast to be overcrowded while Gold Coast services would be catering for substantial numbers of passengers that would be standing for longer than 20 minutes.

By 2031, the forecast volume of passengers in excess of seated capacity will be critical. All lines approaching the CBD in the morning peak period would have passengers standing for more than 20 minutes and most lines would be carrying 50% more passengers than seats. Crowding on the southern lines inbound from Park Road would be extreme with trains carrying twice as many passengers than seats.

Such crowded conditions would result in extremely uncomfortable conditions for rail passengers such that they could be discouraged from using the rail system during peak periods.

Reduced rail network reliability

As more trains are put onto a congested rail network on-time reliability of services would deteriorate. On-time reliability across the network (weighted network average) would deteriorate to 80% in 2021 and to 65% in 2031. This compares to around 94% of trains in 2009 arriving within four minutes of the timetable. **Figure 2-5** provides an overview of decreased reliability of the rail network for 2031.

This forecasted poor reliability of rail services would result in passengers continuously experiencing unacceptably late trains across the network.

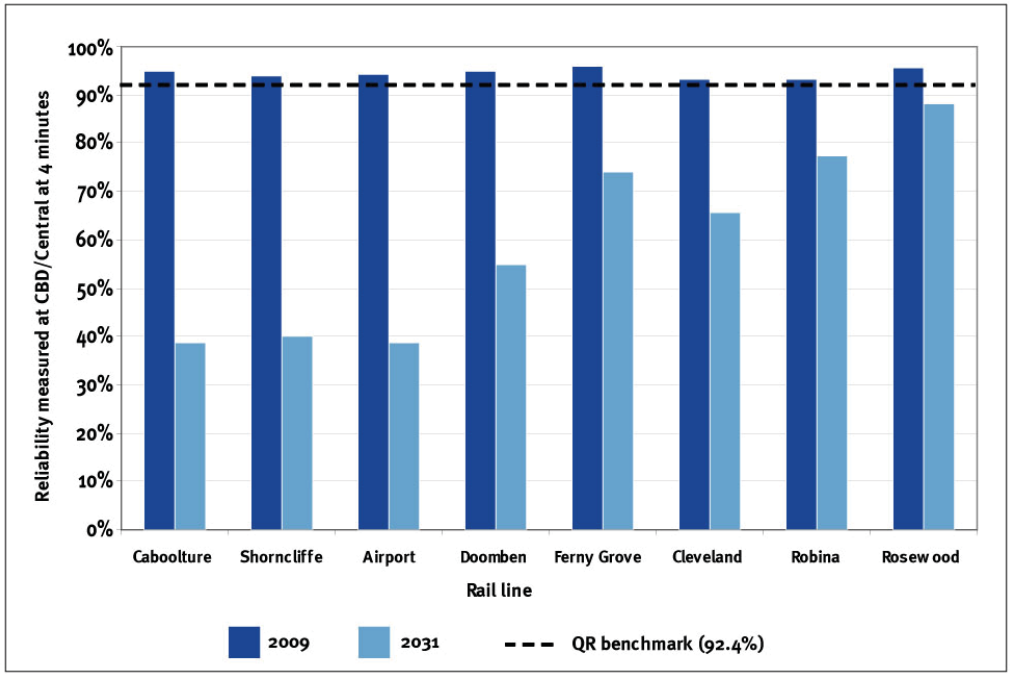

Figure 2-5 Decrease in reliability of the rail network

Source: Systemwide Pty Ltd, 2010

Ongoing dependence on Central Station

Without Cross River Rail, and the new station at Albert Street, Central Station would continue to be the principal rail station for passenger movements in the CBD, despite its capacity constraints. The existing arrangement of pedestrian infrastructure at Central Station would not have sufficient capacity to accommodate forecast passenger volumes without the Project, leading to further congestion and inefficiencies in the rail operating system.

As the Brisbane CBD grows, without the Project, the number of people living and working in the Brisbane CBD more than 400m from a rail station would increase. In 2009, approximately 20,000 people were living, working and studying in areas of the CBD more than 400m from Central Station, with this expected to increase to approximately 70,000 in 2031.

Rail freight network

With the increase in demand for passenger services and the provision of 15 minutes off peak frequencies that are expected in a metro rail network, there will be few paths available for freight services in the future without Cross River Rail.

As the demand for rail freight is unable to be met by the rail network, the excess demand would need to be accommodated by the road network resulting in a reduction in economic competitiveness and additional road congestion. **Table 2-4** provides an overview of the shortfall in rail freight capacity.

Table 2-4 Shortfall in rail freight capacity (weekly paths)

Line	2021			2031		
	Demand	Paths available	Shortfall	Demand	Paths available	Shortfall
North Coast	286	360	0	332	16	316
Salisbury – Tennyson	192	24	168	220	24	196
Tennyson – Port (Intermodal)	87	3	84	101	3	98
Tennyson – Port (Coal)	221	198	23	249	198	51
Tennyson to Port Total	308	201	107	350	201	149

Source: (Systemwide, 2010)

2.4.2 Bus network without Cross River Rail

With increasing demand for inner city accessibility and limited road and rail capacity, demand for the bus network would continue to grow. Consequently, there is a forecast large proportional increase in bus patronage from 2009 to 2031 of almost 100%. With around 550 buses per hour entering the CBD in the morning peak hour in 2009, such growth would require over 1,000 buses to enter the CBD by 2031.

The amount of new bus services able to access the inner city is restricted, as bus station and kerbside bus bays are currently nearing capacity and there is limited potential to increase the capacity of these key items of bus infrastructure. The inner city parts of the South East Busway would experience growing demand and worsening congestion. Current levels of bus passenger crowding would worsen by 2021 and would deteriorate further by 2031.

2.4.3 Road network without Cross River Rail

A 66% increase in the total vehicle kilometres travelled between 2009 and 2031 will place significant pressure on an already congested road network during peak periods.

There is very limited capacity on key routes to the inner city to support additional growth. With limited capacity on the road network and continued increase in demand for inner city accessibility, congestion will continue to grow, impacting on road travel times and trip time reliability.

2.4.4 Summary of transport network without Cross River Rail

Without Cross River Rail, the public transport network would not be able to meet increasing demand for transit services and access to the inner city. The transport network would experience a significant decline in level of service that would constrain the growth of the city.

Cross River Rail would provide significant improvements to the transport system and assist in achieving the strategic plans of all levels of government. It would allow for a fundamental change in the functionality of the transport network, from a predominantly car based system to a more integrated and functionally efficient transport system whereby the rail network provides a significant element of mass transit capacity, suitably augmented and supported by the bus network.

Table 2-5 summarises the transport problems and identifies the corresponding need for the Project to address these problems. Further information on the transport outcomes achieved by Cross River Rail is provided in **Chapter 5 Transport**.

Table 2-5 Transport problems and the need for the Project

Transport problems	Need for the Project
Inner city rail capacity from the south would be reached by 2016.	Provides a significant increase in cross river capacity to cater for the commuter demand to the inner city to 2031 and beyond.
Progressively poorer levels of rail service, including high levels of train crowding and reduced reliability, rail commuters will be forced to use alternative transport or change trip making decisions.	Provides improved capacity to manage future crowding on the public transport network, reduce wait times and improve reliability. Commuters would be encouraged to use rail.
Car dependency to access the inner city would increase.	Car dependency would not increase to access the inner city.
The bus network would experience increasing levels of congestion.	Allows rail to provide 55% of the total peak two hour period trips to the Brisbane CBD, reducing the need for the bus network to provide inner city access during peak periods.
Transport objectives such as public transport mode share would not be met.	The Project would facilitate significant gains in public transport mode share.
The attractiveness of the inner city as an economic and employment centre would decline and jobs growth and productivity would be constrained Inefficient inner city transport would lead to declining city life styles and liveability	Through providing significant increase in rail capacity to the inner city growth in jobs and productivity would not be constrained. Significantly improves accessibility to rail from within all parts of the CBD.
The demand for rail freight could not be met	Enables a significant increase in rail freight by allowing the provision of a dedicated freight line to the south such that the demand for rail freight could be met

2.5 Project objectives

The over-arching objectives of Cross River Rail addressing the three sustainable growth goals of economic, social and environment are:

Economic

- Freight and business traffic can move efficiently and effectively.
- Transport investment and land use patterns maximise the efficiency of the system, with a focus on getting the best out of the network.
- Travel times are reliable and the cost of congestion is not a significant impediment to economic prosperity.
- The transport system has alternative routes available when major incidents or events occur and the vulnerability to reduced supply of oil is minimised.

Social

- The transport system contributes to making the region a better place to be and enhances amenity in South East Queensland communities.
- People can easily access goods, services, facilities and jobs, with many residents having these available locally or able to easily access them without using a car.
- People feel safe and secure using the transport system and there is a steady reduction in the occurrence of crashes on the road and rail network.

Environmental

- Greenhouse gas and other environmental emissions are reduced by increasing public and active transport use, reducing overall transport demand, using transport more efficiently and increasing the proportion of fuel-efficient and alternative fuel vehicles in the fleet.

2.6 Benefits of Cross River Rail

This section provides an overview of the transport, land use and economic benefits of Cross River Rail.

2.6.1 Transport network benefits

The Project would provide much needed inner-city rail capacity improvements to accommodate future rail patronage to and from the Brisbane CBD. It would allow increased public transport accessibility to the CBD from new or improved railway stations. This improved transport accessibility would support planned CBD population and employment growth by providing more effective and efficient transport services compared with not investing in the Project. The Project would also free up capacity such that the rail freight demand could be met.

The forecasted transport benefits of the Project in 2031 are summarised below for the main beneficiaries:

- government, in terms of the project contributing to wider strategies and transport objectives
- transport users, for all modes of transport
- public transport operators namely, Queensland Rail, TransLink Transit Authority and Brisbane Transport.

The key transport benefits are savings in passenger journey times, reduced train crowding, reduced wait time and meeting rail freight demand.

The transport benefits of the Project are summarised in **Figure 2-6**.

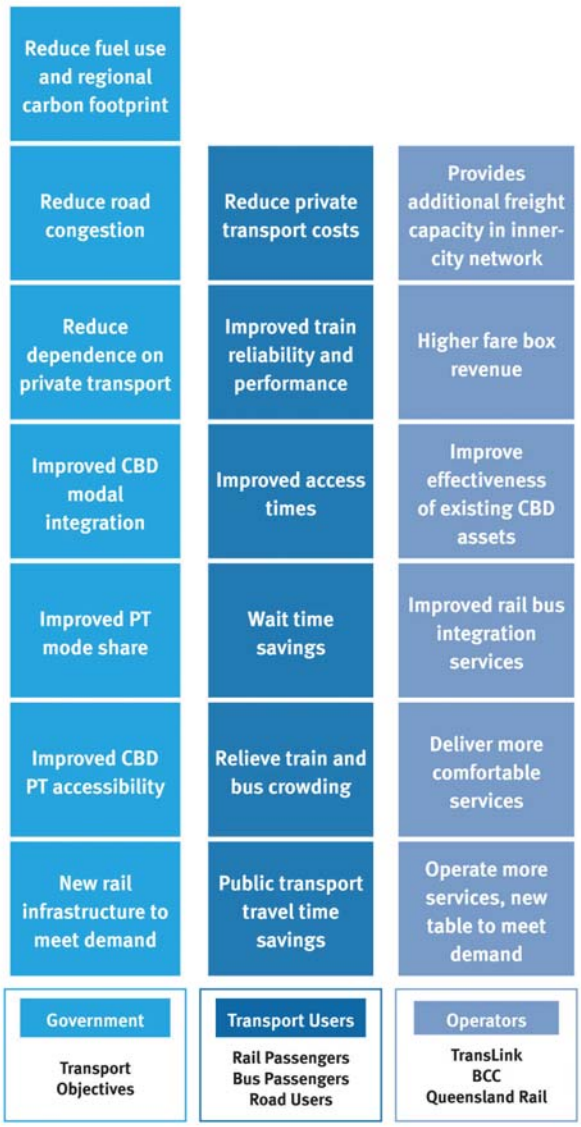

Figure 2-6 Transport benefits of Cross River Rail in 2031

Passenger rail network benefits

Increased rail use

Total rail patronage would be significantly higher with the Project. In 2021, an 8% increase to 454,200 rail trips per average weekday is forecast and by 2031 daily rail trips would reach 595,000, an increase of 12% compared to the scenario without the Project. By 2031, the total number of weekday rail trips would be over double current levels.

Figure 2-7 shows how Cross River Rail allows rail passenger volumes to more than double from 2009 to 2031. Cross River Rail would reduce the need for the bus network to provide inner city access during peak periods.

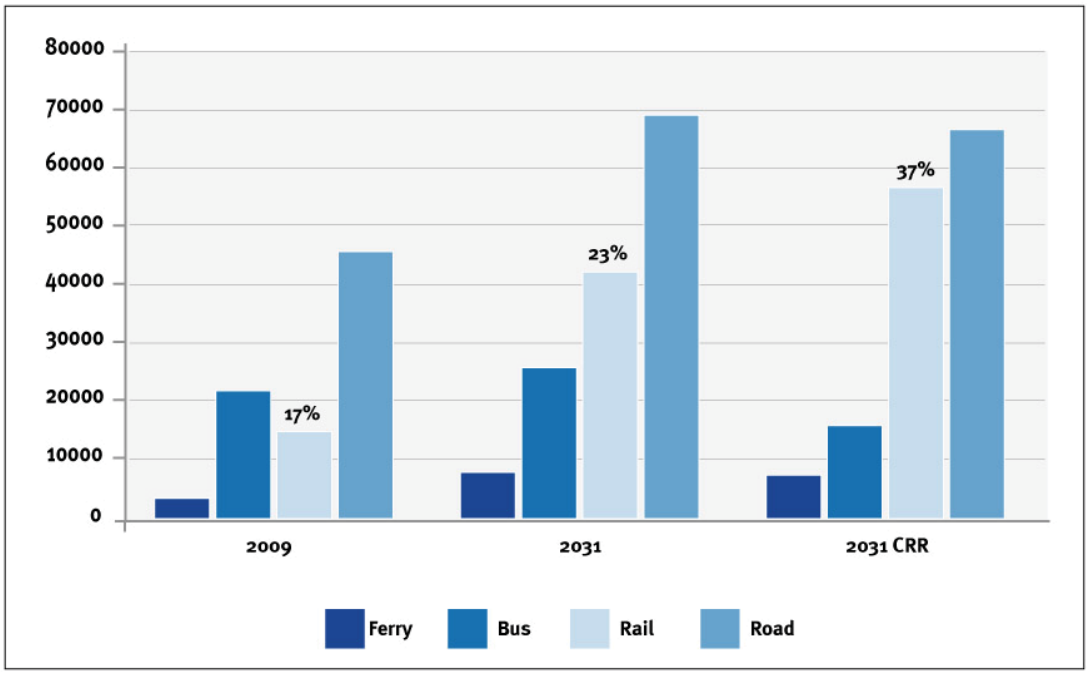

Figure 2-7 Morning peak two hour period trips into the CBD

The proportion of trips by public transport is higher with the Project in both 2021 and 2031. By 2031, with the Project, 12.1% of motorised trips are expected to be using public transport on an average weekday compared to 11.6% without Cross River Rail. This translates to a significant increase in the absolute number of trips by public transport.

Increase in rail capacity

The development of Cross River Rail allows for a fundamental transformation in rail capacity to and through the Brisbane CBD. The new Cross River Rail tunnels would allow up to an additional 48 trains per hour (two way) through the CBD, creating a combined total throughput of 132 trains per hour. With such a step change in capacity, the Project would free up surface rail paths at existing bottlenecks such as the existing single directional track across the Brisbane River at the Merivale Bridge, enabling additional passenger and freight services to be provided.

Key outcomes of this significant capacity enhancement for passenger rail include:

- with the Project in operation in 2031, an additional 28 trains per hour (two way) would be added to the Brisbane rail network during the morning peak, representing a 33% increase in capacity, and providing a combined total throughput of 112 trains per hour
- a significant increase in service provision along the Gold Coast/Beenleigh corridor
- more services would be added to the Brisbane rail network, especially from key regional centres such as Strathpine, Caloundra, Redcliffe from the north and Ripley, Flagstone Creek and Elanora from the south.

Travel time savings

The direct rail connection from the North Coast/Caboolture lines to the Gold Coast/Beenleigh lines provided by the Project, would give a ten minute journey time reduction to Roma Street from the south. Up to five minutes of journey time reduction to Roma Street from the north in 2021 would also be realised due to efficiencies with sectorisation and new express running patterns for some services.

Specific examples in estimated travel time savings during peak periods from key stations include:

- Helensvale and Beenleigh stations – about a ten minute travel time saving to the CBD
- Petrie and Caboolture stations – about a five minute travel time saving to the CBD, principally due to new express running patterns achievable with the Project.

With Cross River Rail, a trip by train from the Gabba Station to the CBD and from Ekka Station to Roma Street Station would be each only a two minute journey. A trip from Yeerongpilly Station to the CBD would take about ten minutes, which is approximately half the existing journey time.

Reduced passenger crowding

The introduction of Cross River Rail is forecast to reduce passenger crowding on numerous lines during peak periods providing significantly improved capacity to manage future growth in public transport demand. With the introduction of the Project in 2021, crowding would decrease significantly on the Beenleigh and Gold Coast, Ipswich and Cleveland lines as well as providing crowding relief on the northern lines between Northgate and Albion.

With the introduction of the Project, significant crowding relief to a large portion of the network is provided, including the Beenleigh and Gold Coast lines, the Ferny Grove line, the North Coast line through Wooloowin and Albion, the Cleveland line and on the Merivale Bridge. Significant crowding inbound from Park Road and Bowen Hills during the morning peak would be eliminated.

Increased service reliability

When Cross River Rail is operational in 2021 it would bring punctuality improvements for rail to the Brisbane CBD during the morning peak period. A 10% to 12% improvement of on time reliability is estimated. In 2031, the Project would bring significant reliability benefits (39% to 57% improvement) for northern services (Caboolture, Redcliffe, Nambour and Kawana). In 2031 reliability improvements are also forecast for the Hillcrest, Gold Coast, Ferny Grove and Strathpine services during the morning peak period. **Figure 2-8** provides a summary of reliability improvements due to the Project.

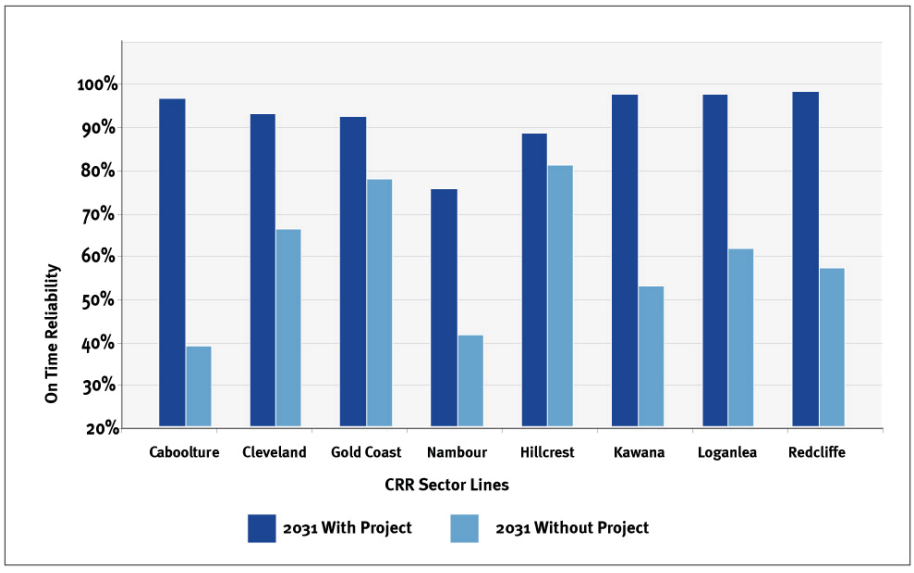

Figure 2-8 Comparison of on time reliability at CBD with and without the Project in 2031

Source: Systemwide, 2010

Improved inner city station capacity

Cross River Rail significantly increases inner city station capacity and accessibility by providing three new stations at Albert Street, Woolloongabba and Bowen Hills.

By developing Albert Street Station, boarding and alightings would be more evenly spread across the three CBD stations as illustrated in **Figure 2-9**. This significantly decreases cross town pedestrian movements and reduces pressure on Central Station by evenly distributing rail passengers in the CBD between Roma Street, Central Station and Albert Street. It also provides a high level of system resilience by increasing the number of stations in the CBD and providing an alternative route through the CBD.

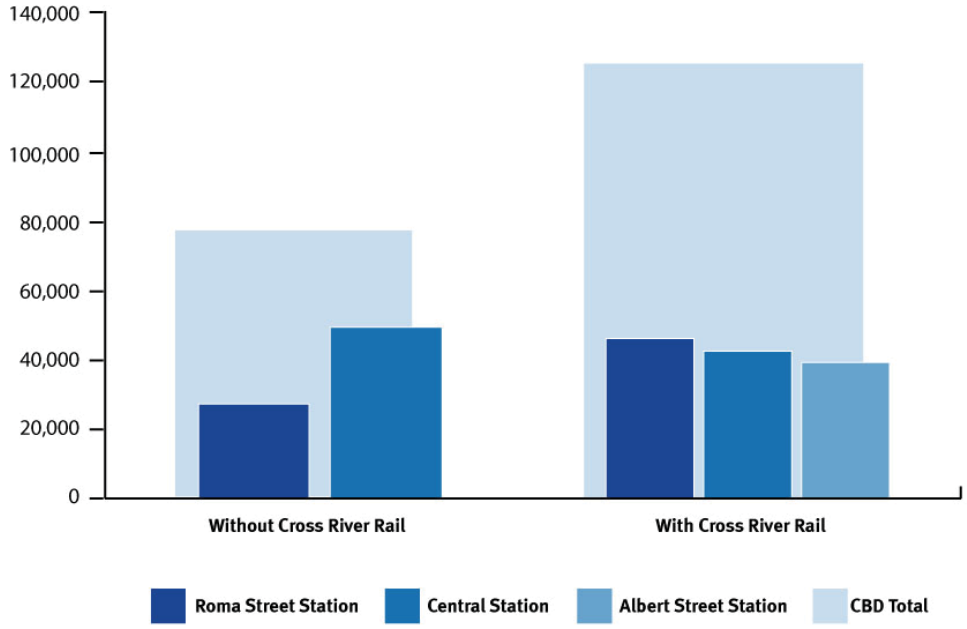

Figure 2-9 CBD rail station patronage in 2031

Freight rail network benefits

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

Bus network benefits

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

Road network benefits

The Project provides a level of congestion relief with travel time savings for private and commercial vehicle users due to higher levels of public transport patronage providing additional road space.

While only small percentage changes in road network volumes and performance on a typical weekday with the Project in operation are forecast for the wider Brisbane metropolitan area, overall cumulative benefits are significant. By 2031, the reduction in private vehicle use associated with the Project (compared to without the Project) is forecast to reach 275 million vehicle kilometres per annum.

The Project would therefore result in a small reduction in traffic volumes on individual links within the study corridor as well as across the regional network.

2.6.2 Land use benefits

Cross River Rail would support the future growth and development of South East Queensland proposed under the SEQ Regional Plan, by providing improved public transport access to areas of future population and employment growth. The following provides an overview of the land use benefits of the Project.

Regional population and employment growth

The SEQ Regional Plan identifies a preferred settlement pattern for South East Queensland. The preferred settlement pattern seeks to support growth in established urban areas and redevelopment in and around existing urban centres and along high-frequency transport corridors.

The SEQ Regional Plan identifies the Brisbane CBD as the primary activity centre, supported by a number of principal regional activity centres that provide a focus for business, employment and residential development. Cross River Rail supports the development of the principal regional activity centres by providing the capacity to allow the regional rail network to link the regional activity centres with the Brisbane CBD, so these centres can act as vital nodes in the rail network. Without Cross River Rail, the ability to connect the principal regional activity centres to the Brisbane CBD by high quality, rapid transit links would be compromised. This would inevitably lead to the inability of these centres to reach a critical mass, more dispersed regional activities and a more car dependent region.

The SEQ Regional Plan also promotes the development of a number of strategic regional development areas, in particular Caloundra South, Flagstone, Fitzgibbon, Coomera and Yarrabilba. Each of these locations lies within the northern and southern catchments of the regional rail network supported by the capacity provided by Cross River Rail. Sufficient transit access is required in these areas to allow them to develop as self sustaining communities with regional public transport connectivity to major employment and education centres.

The efficient and sustainable development of these communities is dependent on additional rail capacity provided by Cross River Rail. Without the regional rail network capacity provided by Cross River Rail, the ability to connect these regional development areas to activity centres by high quality transport would be compromised, resulting in increased car dependency and continued growth in demand for road space.

Inner city population and employment growth

The SEQ Regional Plan seeks to facilitate a more sustainable and compact settlement pattern with reduced reliance on private car use, by accommodating a higher proportion of growth through infill development in inner Brisbane and areas close to transport corridors. Inner Brisbane is also identified as a focus for future employment growth, with more than 567,000 jobs expected to be provided in inner Brisbane by 2031.

Cross River Rail would enhance the existing rail network such, supporting the preferred land use patterns and efficient and sustainable development activity. Without Cross River Rail, the transport capacity provided by the rail network would be constrained, limiting the ability for the passenger rail network to support the urban development densities envisaged in the SEQ Regional Plan.

The location of Cross River Rail stations would also provide rapid, high frequency connections between primary destinations and activity areas in inner Brisbane. Albert Street Station would support

the ongoing development of the Brisbane CBD and a vibrant mixed use residential, employment and retail precinct adjoining the City Botanic Gardens. It also provides direct access to the financial district, the government precinct at lower George Street and QUT Gardens Point.

Roma Street Station would support continued development of commercial and mixed use activities in the city's north quarter and preserve long term city expansion opportunities associated with the Transit Centre and Roma Street Rail Yard. It would also provide direct access over the Kurilpa Bridge to the planned CBD expansion areas at the northern extent of the West End peninsula.

The Ekka Station would support regeneration of the Bowen Hills UDA core and the planned RNA Showgrounds redevelopment, as well as the ongoing renewal of the Fortitude Valley urban core and employment growth at Herston associated with the Royal Brisbane and Women's Hospital.

Gabba Station would support the planned renewal of Woolloongabba Central, Kangaroo Point South and the Woolloongabba UDA, while Boggo Road Station would support redevelopment of the Boggo Road Urban Village, planned growth at Buranda, ongoing growth of the University of Queensland at St. Lucia and the Princess Alexandra Hospital and associated health, medical and eco-science activities.

2.6.3 Economic benefit of Cross River Rail

An economic assessment has been carried of the Cross River Rail. A benefit-cost analysis (BCA) approach has been used to estimate the economic worth of the Project. Full details of this assessment are provided in **Chapter 21 Economic assessment**.

Project economic benefits

The largest component of benefit identified for the Project is that of perceived benefits to public transport users (time savings and improved amenity from reduced train and bus crowding) which accounts for 39% of benefits. The next largest components are travel time and cost savings to private transport users who gain from the reduction in road congestion leading to higher vehicle speeds and reduced operating costs (*Technical Report No. 10 – Economic Assessment*). In addition to passenger related travel benefits, Cross River Rail also results in benefits to rail freight as a result of providing dedicated rail freight paths to the port as well as to Acacia Ridge. This allows more intermodal freight to be transported by rail rather than by road in the "with Project" case which results in operating cost, externality, crash cost and road decongestion benefits.

Key findings for the Project are a projected Benefit Cost Ratio of 1.42 (1.63 inclusive of the wider economic impacts), and a Net Present Value of $2,345 million ($3.5 billion inclusive of the wider economic benefits). Under the assumptions adopted, the Project is assessed as economically viable (*Technical Report No. 10 – Economic Assessment*).

Wider economic benefits

Transport improvements have the potential to impact the economy through a number of different mechanisms, including changes in prices, economic output, labour supply, imports and exports. Changes to the features of an urban economy such as Brisbane may result in wider economic impacts, with direct gains attributable to the Project magnified as they pass through the broader economy (*Technical Report No. 10 – Economic Assessment*). These possible changes and impacts include:

- agglomeration effects may be the result of transport bringing activities and people closer together and effectively raising the density of economic activity. This can result in more efficient labour markets.
- imperfect competition effects, where companies that benefit from transport improvements would experience lower costs, which in turn can be converted to increased turnover. These effects tend to be more important for improvements that deliver significant time and cost savings to travellers in the course of work.

- additional labour supply, as the result of improved time and reduced cost in getting to a place of work, as an incentive to work. By reducing the cost of accessing jobs, improved accessibility can encourage non-participants, typical potential second-earners or family members with child care responsibilities, to take up employment.
- more productive jobs, with better access to city centres and growth in employment in highly productive location.

The most important wider economic impact of Cross River Rail is agglomeration benefits. Agglomeration adds about $52 million to user benefits in 2021, rising to $209 million in 2031 (*Technical Report No. 10 – Economic Assessment*).

Labour supply benefits add almost 5% to the user benefits identified above, partly because travel to work is one of the main benefits from Cross River Rail. Overall, wider economic impacts add $265 million to the benefits of Cross River Rail by 2031, adding 22% to the perceived user benefits in that year (*Technical Report No. 10 – Economic Assessment*).

2.7 Alternatives to the Project

In defining Cross River Rail and it's key elements, an extensive series of integrated transport planning analysis both at a strategic and detailed level has been undertaken. This has included analysis of reform options which encompasses regulatory, legislative and governance options, as well as investment options which can be categorised as capacity enhancements.

Options have been considered and progressively refined at the following three broad levels:

- Strategic transport options analysis – assessment of the strategic transport need and options to meet this need including prioritised investment in the road network over the public transport network, and strategic public transport options including an enhanced bus investment program, light rail and "metro" rail options.
- Strategic heavy rail options analysis – includes numerous heavy rail options predominantly derived from investigations during the ICRCS and the early detailed feasibility work undertaken for Cross River Rail, including the duplication of Merivale Bridge.
- Detailed heavy rail options analysis – that is the detailed feasibility study to determine the reference design including the preferred north-south tunnel solution that is Cross River Rail, along with two potential alternative solutions for comparison and benchmarking purposes including a minimal enhancement option, predominantly operational initiatives, and a lower cost alternative tunnel option (refer to **Chapter 3 Project Development**).

Figure 2-6 provides an overview the strategic transport options analysis process undertaken to identify the study corridor. Further information on the development of the study corridor, Project definition and reference design is provided in **Chapter 3 Project Development**.

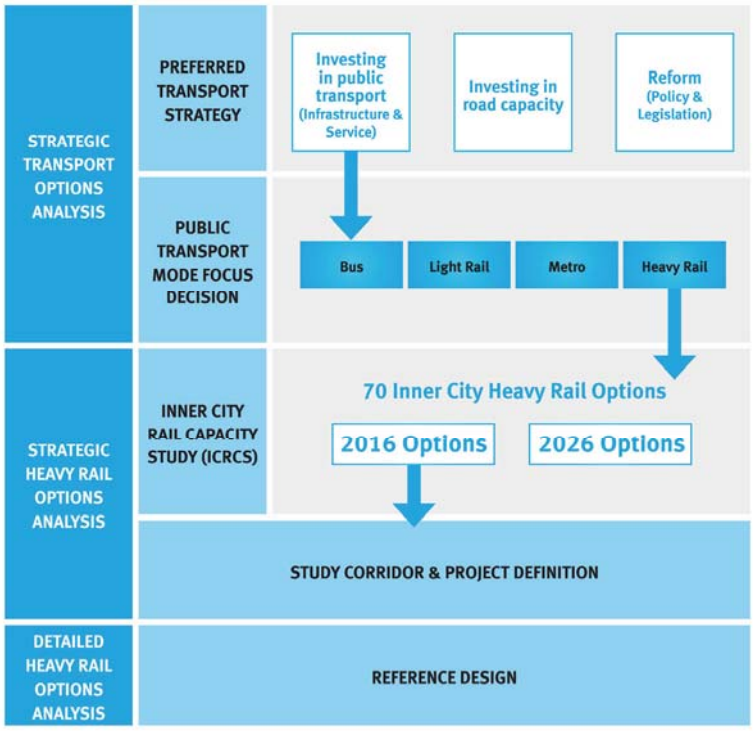

Figure 2-10 Strategic options analysis

2.7.1 Strategic transport options analysis – preferred transport strategy

To assess and determine the policy and investment options best able to effectively tackle the transport challenges in South East Queensland, a range of hypothetical strategy options were tested. Strategic options assessed were:

- road traffic focus – based on catering for growth in general motor traffic
- public transport focus – concentrated investment in enhanced public transport infrastructure and services
- building blocks – a pragmatic approach to road and public transport investment with increasingly high proportion of investment allocated to public transport by 2031
- comprehensive – assumed the maximum range of investment and policy initiatives were used to shift people and goods to sustainable modes (public transport, active transport and more freight on rail) from the early years of the plan
- staged – based on the building blocks investment in the first ten years, moving towards comprehensive by 2021.

Following the evaluation of the strategic transport options, a preferred strategy was developed that combined elements from across the strategies initially tested as well as giving consideration to feedback from consultation with key stakeholders and local governments. The preferred strategy includes a multi-modal investment program to guide investment in transport infrastructure and services across South East Queensland and policy measures and programs to encourage more sustainable transport. The multi-modal investment program includes the principle of a progressive shift to rail as the backbone of the region's passenger transport system.

The preferred transport strategy therefore has significant investment in rail capacity at its core and is not an alternative to the Project but rather is dependent on the Project.

2.7.2 Strategic transport options analysis – public transport options

Four integrated public transport options were developed and assessed against the goals and objectives for Cross River Rail. These were:

- Option 1 – Heavy rail enhancement
- Option 2 – Enhanced bus network
- Option 3 – Light rail
- Option 4 – Metro.

Apart from heavy rail enhancement, each of the other modal transport options would require trains to be turned back at the perimeter of the inner city and transferring commuters to another mode in order to cater for the significant increase in future demand for travel to the inner city and across the Brisbane River. This is due to the inability of bus, light rail or metro to independently accommodate the inter city function and also the constraints of the inner city rail network in accommodating additional rail services such as only one inbound rail track across the Brisbane River.

Options 2, 3 and 4 do not meet the Project objectives as:

- Additional rail infrastructure such as crossovers, signalling modifications, additional tracks and upgraded stations and platforms would be required to accommodate the turn back needs that would be used by 50,000 to 60,000 passengers by 2031.
- The need for passengers to transfer to another mode, such as bus or light rail, is likely to discourage commuters from using the system.
- Relying primarily on buses to meet the inner city passenger transport task would require many streets in the inner city to be turned over to bus priority. Major upgrades of facilities would be required to meet bus passenger demand such as new bus stations, bus lanes and layover space.
- The development of a full grade separated inner city light rail system that would be required to meet the demand would require significant capital investment. The demand for light rail for transferring rail passengers is likely to approach the capacity of a single line light rail system. Major community disruption during its construction and significant property acquisition would be required.
- A light rail system offers little opportunity for growth in demand in the central core area beyond 2031.
- A metro (subway) option is identified in the draft Connecting SEQ 2031 as a future project for delivery by 2031. While a subway option would have the passenger capacity and frequency necessary to meet the Project objectives, it would only support the expected growth and expansion of the inner city only. A subway option would lack the function and ‘reach’ to support the planned urban growth centres beyond the inner city.

  The subway option is not aimed specifically at intercepting rail passengers at the perimeter of the city core, though it does aim to provide transfer options to improve coverage of the expanded city core. This forced transfer would be inefficient and expensive to provide, particularly for the large numbers requiring transfer.
- An important advantage of a subway system over either bus or light rail is that it allows on-going growth of demand for travel within the core of Brisbane. However, additional options would be needed for accommodating turn back of more southside trains beyond 2031.

The assessment of alternate project options indicate that public transport options which do not include an improvement to the inner city rail network perform relatively poorly from a financial and economic perspective and in their ability to achieve the identified Project objectives.

2.7.3 Heavy rail options analysis

The strategic heavy rail options analysis included numerous heavy rail options predominantly derived from investigations during the ICRCS and the early detailed feasibility work undertaken for Cross River Rail.

The ICRCS is considered to be the prefeasibility work leading to development of the Cross River Rail detailed feasibility phase. During this study, 70 possible network concepts were identified and evaluated. The ICRCS broadly included the rail network triangle between Bowen Hills, Park Road and Milton stations. In the earlier phases of the detail feasibility study for Cross River Rail, additional network concepts were also identified and evaluated.

Together these stages examined more than 100 heavy rail alternatives which were reviewed and shortlisted to provide a project definition and corridor that would be developed into the reference design for Cross River Rail. These options consisted of a variety of through-running and alternative heavy rail options.

Options were assessed on their capacity to meet a number of key criteria and their indicative costs. Capital costs for each of the options were determined based on a consistent cost methodology. The costs were based on the methodology utilised in the ICRCS which was updated in July 2009. The eight preferred options from the different investigation streams were evaluated in a weighted multi-criteria analysis. The criteria categories were based on objectives of serviceability, accessibility and sustainability, along with consideration of affordability and constructability.

This led to a shortlist of potential options for further consideration in the Detail Heavy Rail Options Analysis:

- Minimal Enhancement Option – this option, examined in detail non-assets alternatives along with some network infrastructure improvements to improve system performance. Effectively this option is about making better use of the existing rail infrastructure.
- Alternative Option – this option is regarded as a 'lower cost' alternative to the North-South Option that seeks to improve inner city rail capacity by alleviating pressure on key network choke points.
- North-South Option – this is Cross River Rail, which is a proposed north-south rail line in Brisbane's inner city, including a new tunnel under the Brisbane River and new underground inner city rail stations.

In order to assess the relative merits of these heavy rail options in both qualitative and quantitative terms, a multi-criteria analysis (MCA) and rapid appraisal was undertaken.

For the result of the rapid economic appraisal outcomes of the options, refer to **Table 2–6** that demonstrated the clear benefits of the North-South Option.

Table 2-6 Rapid appraisal summary of the Public Transport Options

Heavy rail option	Present value of capital cost ($M 2010)	Present value of operating cost ($M 2010)	Present value of benefit ($M 2010)	Benefit cost ratio
Minimal enhancement	Minimal - less than 1% of North-South Option as most elements do not require significant budget to implement		n/a	n/a – as unable to model benefits
Alternative option	5,597	461	3,928	0.65
North-south Option	5,552	724	7,908	1.26

Source: *Technical Report No. 10 – Economic Assessment*

Duplication of the Merivale Bridge across the Brisbane River

The ICRCS also considered the duplication of the Merivale Bridge as an option for increasing rail capacity across the Brisbane River and into the CBD. The option considered would follow the existing rail corridor from the south, passing through the existing stations at Park Road, South Bank and South Brisbane. After crossing the river, the proposal was to dive to a new underground station at Roma Street. Each of Park Road, South Bank and South Brisbane stations would require upgrading to provide four platforms

A duplication of the Merivale Bridge would increase rail network capacity across the Brisbane River. This option would have significant cost and would not resolve many of the existing network problems. The following key issues resulted in this option being discounted:

Passenger rail services

The duplication path follows the existing rail corridor from the south, and would not deliver savings in either journey time or distance over the services on the existing lines. Furthermore, the use of the existing corridor ties this option to existing stations and existing service technology, such as signalling, which would constrain the extent of travel benefits.

In comparison, Cross River Rail allows for the use of a range of advanced service technologies, including signalling, to optimise capacity on the new lines.

Opportunities to interchange with other modes

Use of the existing rail corridor from the south would also limit the opportunities for interchanging with other modes of public transport. At present, bus-rail interchanges are possible only at Roma Street and Boggo Road/Dutton Park. The existing land use pattern, combined with the existing transport infrastructure north of Dutton Park constrain the opportunities for establishing additional bus-rail interchanges at South Bank or South Brisbane.

Cross River Rail would provide a high quality bus-rail interchanges at Woolloongabba and supplement the interchange capacity at Roma Street and Boggo Road. The provision of high frequency passenger rail services at the new Ekka Station would complement the Northern Busway at the Royal Brisbane and Women's Hospital on Bowen Bridge Road. Further opportunities for public transport interchanges could be developed at Yeerongpilly as a separate planning investigation.

Freight rail services

This option would require additional passenger trains to pass along the existing rail lines at South Brisbane, taking up the space capacity presently used for freight rail services. The additional track capacity would also be required to address forecast demand for passenger rail services.

This option does not compare well with Cross River Rail, which frees up the surface rail infrastructure for freight rail services so that demand for freight access to the Port of Brisbane out to 2031 could be met.

City building and land use integration

Duplication of the Merivale Bridge would confine any land use benefits to the existing rail corridor. The Boggo Road Urban Village and the Bowen Hills UDA are the other planned growth areas along the corridor north of Park Road Station. With this option, there would little if any opportunity to deliver substantial additional benefits in terms of urban efficiencies, through land use changes, that are not already available from the existing rail corridor.

In comparison, Cross River Rail would support planned urban growth areas in Bowen Hills (RNA), Woolloongabba and Boggo Road far more effectively.

Environmental and community impacts

In its construction the duplication option would involve the acquisition of a considerable number of properties beside the rail corridor through South Brisbane and possibly further to the south. The river crossing itself would be constrained by its proximity to the existing Merivale Bridge, the Go Between Bridge, the Brisbane Convention and Exhibition Centre, the South Bank TAFE, South Brisbane Station and properties south of Vulture Street.

North of the river crossing, there are a number of existing buildings and infrastructure elements that would require acquisition and relocation to make way for the duplication corridor. Some of the infrastructure includes the feeder station adjacent to the Roma Street fire station, while community attributes that would be affected include the Victoria Barracks. The Victoria Barracks is listed as a matter of national environment significance by the Commonwealth Government.

Further, substantial impacts would accrue on the Inner Northern Busway, the Brisbane Transit Centre and properties in Upper Roma Street and Coronation Drive.

Construction of the duplication option in a heavily-constrained live rail corridor would be challenging and likely to present a range of construction and delivery risks that would not arise with Cross River Rail.

Commercial considerations

From a commercial perspective, the duplication option would present a high risk profile with respect to costs and the complexity of design required to ensure integration with stages along the corridor. Furthermore, this option is not readily staged in its implementation.

Overall, the evaluation of the duplication option found that the environmental, community, construction and commercial impacts and risks could not be justified when the transport benefits were found to be marginal for passenger rail services and negative for freight rail services.

2.7.4 Minimal enhancement option

A range of lower cost operational or infrastructure measures were also considered to ensure maximum utilisation of the existing rail network capacity, in order to defer the timeframe for major enhancement of rail network capacity.

Measures identified and assessed as part of this “minimal enhancement option” include:

- rail operation reform initiatives (from RACAS) – including Mayne Rail Yard stabling moves, dwell time management, express passenger train paths, headway optimisation
- improved timetabling and service planning
- increased shoulder peak services to encourage peak-spreading.

Individually, or in combination, these initiatives could supply significant levels of additional passenger carrying capacity. However, these initiatives are not likely to receive acceptance from passengers due to:

- supply of this capacity may not align with when passengers wish to travel, where future demand is greatest, or the alternative services offered through peak spreading may not meet their lifestyle or work needs resulting in continued overcrowding in the one hour peak
- decreased passenger comfort levels due to reduced seating and increased standing times
- reduced accessibility to key inner city destinations.

The viability of these initiatives is also dependent on an effective implementation strategy supported by operators, which require holistic consideration of passenger incentives (fares), additional subsidy, marketing and education, capital investment in stations and rolling-stock, and increased operational cost.

Initiatives to maximise the existing rail network capacity and supporting investments are consistent with the long term vision for the rail network identified in the Connecting SEQ 2031.

While these minimal enhancements would not be a long-term viable option to achieving the Project objectives, they could be considered as a means to defer necessary rail network improvements until a preferred solution can be developed, funded and constructed.

2.7.5 Alternative "lower cost" option

The Alternative Option is regarded as a "lower cost" option as it seeks to improve inner city rail capacity by alleviating pressure on the key network choke points being the:

- Merivale Bridge – all services from the south currently merge together between Park Road and South Brisbane to operate as one corridor across the Merivale Bridge, restricting peak growth in this corridor
- Merivale Junction – all western corridor services currently merge together at this junction to operate on a single corridor through the inner city, restricting peak growth in this corridor
- existing inner city stations – the capacity of existing inner city stations is limited and is expected to start impacting on service growth by the time service levels reach 23 trains per hour in either direction on the suburban lines, or 19 trains per hour in either direction on the main lines.

Rail operations analysis also identified some limitations on the capacity of the western corridor and the Tennyson Loop to cater for additional services from the Gold Coast. These limitations of external track elements could be resolved with upgrades such as additional track, grade separations at Corinda and Yeerongpilly, and operational infrastructure such as signalling. These works are included in the Alternative Option.

The Alternative Option capital costs total $7.39 billion (nominal) for both the inner city section between Milton and the Exhibition Loop, the infrastructure components required for grade separations at Corinda and Yeerongpilly, additional tracks on Tennyson Loop, Victoria Park to North Mayne, and Salisbury to Yeerongpilly. As well as stabling facilities at Clapham Rail Yard and a new surface station at Ekka Station.

Analysis of the Alternative Option highlighted a number of significant issues including:

- limited ability to enhance access to trip attractors or generators within the inner city that are currently not serviced by rail, in particular the lack of a new station in the heart of the Brisbane CBD
- limited ability to provide an adequate catalyst for redevelopment within the inner city
- inability to provide the service capability of Cross River Rail
- limit future growth capability
- operational complexity (increased crossing conflicts which lead to unreliability, delays and reduced line capacity)
- potential constructability and property resumption issues
- significant costs relative to service requirement satisfaction.

In addition to these issues, the economic evaluation results show that the Alternative Option produces a negative economic return with a Net Present Value of - $2.1 billion and a Benefit Cost Ratio of 0.65 (*Technical Report No. 10 – Economic Assessment*).

2.8 Relationship to other infrastructure and urban development projects

This section provides an overview of the relationship of Cross River Rail to other infrastructure and urban development projects that have been, are being, or that have been approved in or near to the study corridor. An assessment of potential cumulative impacts of these projects with Cross River Rail is provided in **Chapter 23 Cumulative Impacts**.

2.8.1 Urban development projects

A range of urban development projects are planned within Brisbane's inner suburbs near to Cross River Rail. These areas will be a focus of future population and employment growth in inner Brisbane. The future land use and development intent for each of these areas is summarised as follows. Further information on each of these urban development projects is provided in **Chapter 9 Land Use and Tenure**.

Cross River Rail supports the redevelopment of these growth areas through improved public transport accessibility and will act as a catalyst for urban renewal and regeneration of the surrounding catchment areas.

Bowen Hills Urban Development Area

The Bowen Hills urban development area (UDA) has been identified as an inner city TOD. The development scheme provides for a range and mix of uses, including residential, commercial, retail and community/recreational uses. Development within the UDA is proposed to range in height from four storeys within the northern precinct to 30 storeys within the 'heart'.

The Bowen Hills Station is the 'heart' of the UDA, and a focus for high intensity mixed use development. Mixed use precincts are also proposed adjacent to O'Connell Terrace and Bowen Bridge Road and within the RNA Showgrounds. Redevelopment of the RNA Showgrounds is proposed to commence in 2011 and be undertaken in stages over the next 15 years.

A new Ekka Station within the RNA Showgrounds is proposed as part of Cross River Rail which will provide full service to support the Bowen Hills UDA and redevelopment of the RNA show grounds. This will improve accessibility for local residents between the UDA and the Brisbane CBD as well as for visitors to the UDA and RNA show grounds.

Woolloongabba Urban Development Area

The Woolloongabba UDA has been identified as a TOD, containing a range and mix of residential, community, recreation and commercial uses. The draft structure plan identifies development ranging from 20 storeys to 40 storeys across the UDA. Redevelopment of the UDA is proposed to occur over a 10 to 15 year development horizon. Planning for Cross River Rail has considered the future development needs of the Woolloongabba UDA in relation to building heights and site layout.

The new Cross River Rail Gabba Station has been located within the UDA and will support the future development of this area by improving accessibility for residents and visitors between the UDA and the Brisbane CBD.

Boggo Road Urban Village

The Boggo Road Urban Village will comprise a mix of residential, retail, commercial, environmental research and recreational facilities. The Ecosciences Precinct was completed in 2010. The building is expected to accommodate up to 1,000 staff from the Department of Environment and Resource Management, Department of Employment, Economic Development Innovation and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). A new station at the Boggo Road Urban Village would support the future development of this area through by improving accessibility for residents and workers.

Yeerongpilly Transit Oriented Development

The Yeerongpilly TOD is located on land currently used by the Animal Research Institute adjacent to the Brisbane River, Queensland Tennis Centre and Tennyson Reach development at Yeerongpilly.

The first release of land has been released to the market for development and development applications lodged with Brisbane City Council for several sites. However, the effects of the January 2011 flooding in the Brisbane River have caused the development scope and program to be revised.

Initial development will include development of sites between King Arthur Terrace and Ortive Streets for low-rise residential apartments and a land parcel next to Fairfield Road for office accommodation. Construction was completed in December 2010 on a new pedestrian overpass of Fairfield Road which connects the TOD to the existing Yeerongpilly Station and residential areas east of the railway line.

The development of new station at Yeerongpilly that would be used by Cross River Rail services would support the development of the Yeerongpilly TOD by improving accessibility for residents and visitors through improved frequency of rail services and reduced travel times between Yeerongpilly, the Brisbane CBD and other destinations.

2.8.2 Transport projects

The Connecting SEQ 2031 is the guiding transport planning and policy document to support the desired outcomes of the SEQ Regional Plan.

Rail is a key element of the Connecting SEQ 2031 and is identified as the backbone of the region's transport network. Cross River Rail is identified as a key feature of the rail strategy proposed by the Connecting SEQ 2031, and is identified as a catalyst for the transformation of the South East Queensland rail network. In addition to Cross River Rail, the Connecting SEQ 2031 identifies a number of rail projects including:

- high frequency UrbanLink rail services, with higher capacity trains operating inbound from Redbank, Strathpine, Loganlea, Ferny Grove, Manly, Springfield, Shorncliffe and the Airport
- ExpressLink services from Ipswich, Cleveland, Beenleigh and Caboolture
- CoastLink services from Brisbane to the Gold Coast and Sunshine Coast
- North-west rail line, which includes additional rail from Strathpine to Alderley to service Brisbane's north west suburbs
- Brisbane subway, which connects Toowong to Newstead and provides a high capacity, high-frequency, distributor system connecting central Brisbane destinations and distributing passengers from the bus and rail network across the intensely developed core of inner Brisbane
- Petrie to Kippa-Ring (Moreton Bay Rail Link), which connects Petrie and Kippa-Ring via Kallangur, Murrumba Downs, Mango Hill, Kinsellas Road and Rothwell.

Connecting SEQ 2031 identifies that Cross River Rail makes possible the operation of future UrbanLink, ExpressLink and CoastLink services by addressing capacity constraints in the inner city rail network and allowing improved rail sectorisation to improve capacity and reliability of the rail network. The reference design for the underground northern portal structure at Spring Hill does not compromise a possible future north-west rail corridor connection, which would be delivered as a separate project.