Northern Link

Environmental Impact Statement

TECHNICAL PAPER NO 1

TRAFFIC AND TRANSPORT

- September 2008

Contents

List of Figures

List of Tables

Executive Summary

The Project

This technical paper presents an assessment of the traffic and transport effects of the proposed Northern Link Project. Northern Link is predominantly an underground toll road proposed between the Western Freeway in Brisbane's western suburbs and the Inner City Bypass (ICB) at Kelvin Grove. Key traffic and transport features of the project include:

- the Project would incorporate a parallel two tunnel road system, these tunnels comprising approximately 5km of a total project length of 6km;
- the tunnels would be designed for two (2) lanes of traffic with a posted speed limit of 80km/h;
- there would be two main connections to the surface road network. Northern Link would connect with the Department of Main Roads (DMR) controlled Western Freeway at the western end of the Project and with the ICB at Kelvin Grove, a key link within the urban road network managed by the Brisbane City Council (BCC);
- there would be additional connections at Toowong and Kelvin Grove. At Toowong, the Project would connect with Milton Road and Croydon Street. At Kelvin Grove, the Project would connect with Kelvin Grove Road to the north of the Central City area;
- the Project would be operated as a toll road with an electronic system used for toll collection;
- a final decision on the tolls to be charged for use of Northern Link will be made by Council following assessment of the Business Case for the project. For this EIS assessment, the cost of the toll for cars has assumed to be $3.93 (expressed in $2008 including GST). Trucks would be charged a higher toll, and traffic modelling has assumed heavy commercial vehicles would be tolled at twice the car rate. This is within the toll range considered within the Business Case for the project; and
- if Northern Link is approved to proceed, construction would start in 2011 and it would be operational by 2014.

Project Objectives

The objectives of Northern Link have been developed, having regard to Council's Corporate Vision as expressed in Living in Brisbane 2026 and the State and local planning strategies for land use and infrastructure. The primary project objectives are to:

- provide an effective and convenient bypass of the Brisbane CBD for cross-city movement of people and freight;
- address, in part, deficiencies in the national freight network to improve freight distribution in and around Brisbane;
- improve safety and reliability of the regional road network and provide relief to congested roads in Brisbane's inner western suburbs;
- provide opportunities for additional public transport network capacity; and
- support the achievement of a sustainable urban environment for the inner western suburbs.

Northern Link is included in Council's Draft Transport Plan for Brisbane 2006-2026[1] and TransApex[2] initiative within an integrated transport plan for Brisbane. Northern Link, along with the other TransApex projects, forms a key response to the strategic objective of providing a safe and efficient road network within this integrated transport plan. It supports long-term regional and city wide transport planning objectives.

Northern Link is also identified in the South East Queensland Infrastructure Plan and Program (SEQIPP), developed to guide infrastructure planning and investment to support the preferred pattern of development in the South East Queensland Region. It is flagged as a transport infrastructure improvement that should be investigated to provide for future development of the Greater Brisbane area.

In 2007 the Federal Government released the AusLink Brisbane Urban Corridor Strategy[3]. This strategy recognised that the Brisbane Urban Corridor plays a critical role in supporting local, regional, interstate and international economic and industrial activity as well providing vital urban connectivity.

One of five strategic themes from the Brisbane Urban Corridor Strategy was identified as:

- East-west transport efficiency, safety and reliability (road and rail) across the broad corridor extending from the western growth area and Ipswich to the CBD, ATC and the Pacific Motorway.

An investigation of the transport network in Brisbane's Inner West area was identified in the Strategy to explore possible additional network links, including expansion of the Brisbane Urban Corridor to include the Centenary Highway and its' connections to the existing AusLink network (Northern Link, for example).

Purpose of this Technical Paper

This technical paper describes, and documents the finding of, the traffic and transport studies undertaken to assess the effects of the Project on the traffic and transport system. It addresses the relevant traffic and transport matters raised in the Northern Link Road Tunnel - Terms of Reference for an Environmental Impact Statement (April 2008) issued by the Co-ordinator General.

Study Approach

A consistent, clearly defined and well established process for assessment of the traffic and transport impacts of the Project was applied as follows:

- areas likely to be affected by traffic and transport aspects of the Project were defined;
- suitable data relevant for use in the study was collated;
- traffic and transport demand modelling and forecasting approaches were established, with model validation and sensitivity testing of the modelled results undertaken to ensure fitness for purpose;
- the existing status of the transport network was described;
- using the traffic model, forecast demands and conditions were derived for the transport network without, and with, the Project;
- the differences between the derived forecast conditions for scenarios without, and with, the Project were assessed;

[1] Brisbane City Council (2007) *Draft Brisbane Transport Plan 2006-2026*, Brisbane City Council, Brisbane.

[2] Brisbane City Council (March 2005) *TransApex Prefeasibility Report*, Brisbane City Council, Brisbane

[3] Australian Government, Department of Transport and Regional Services (2007) *AusLink Brisbane Urban Corridor Strategy*.

- the effects of the Project on traffic, public transport, cyclists and pedestrians were determined by examination of these differences; and
- the cumulative effects of the Project, in conjunction with known infrastructure projects in the north and western suburbs of Brisbane; and those emerging from contemporary transport plans, strategies and studies for SEQ were considered.

Modelling and Forecasting

Traffic and transport modelling was used to describe and assess the existing traffic flows and system performance, supplementing traffic counts and other observed data to generate estimates of existing conditions via modelled data. Modelling was also employed to forecast traffic conditions and network performance at specific years in the future.

The model used a range of inputs to predict transport and traffic demand including:

- land use descriptors - population, employment and education enrolments within small geographic areas termed traffic zones;
- travel characteristics - trip making rates and vehicle occupancy for different trip purposes, from a survey undertaken in 2003/04 in Brisbane of the travel behaviour of a sample of Brisbane households;
- user preference surveys - behaviour characteristics for potential toll road users from a survey of over 800 residents of the Brisbane Metropolitan area. The surveys were designed to obtain information to model the trade-off between the payment of a monetary toll and the benefit of a travel time saving and greater journey time reliability of the TransApex projects;
- road network changes - existing and planned or likely future road infrastructure, and road tolls, for the various forecasting years; and
- public transport - existing and planned or likely future public transport infrastructure and services for the various forecasting years.

The modelling of future transport networks, both without and with the Project, includes the following key future network projects currently under construction that are programmed for completion prior to Northern Link opening in 2014:

- the Clem Jones Tunnel (CLEM7), a major cross-river tolled tunnel linking the Pacific Motorway, Ipswich Road and Shafston Avenue in the south to the ICB, Lutwyche Road, and Airport Link at Bowen Hills in the north;
- Airport Link, a mainly underground toll road between Bowen Hills and Brisbane's northern suburbs and the Airport;
- the Northern Busway connecting the Inner Northern Busway to Kedron;
- the Airport Roundabout upgrade and Brisbane Airport Northern Access;
- the Gateway Upgrade Project (GUP) incorporating the duplication of the Gateway Bridge;
- Hale Street Link, a new 4 lane toll bridge connection from the intersection of Hale Street/Coronation Drive in Milton to South Brisbane; and
- The 6 lane upgrading of the Ipswich Motorway between Rocklea and Riverview.

The traffic modelling also assumes that the Centenary Highway and Western Freeway transit lane project identified within SEQIPP, and currently in planning phase is implemented by 2016. Based on advice from DMR, this network upgrade has been represented as an upgrading from 4 to 6 lanes inclusive of a single T2 lane each way between Toowong and Darra by 2016. No upgrading over the Centenary Bridge has been assumed.

Future traffic and transport conditions were modelled and assessed at two levels. Existing and future conditions for the Brisbane Metropolitan area were modelled at a strategic level to analyse the city-wide transport network implications of Northern Link. This strategic modelling also accounted for areas of influence outside the EIS study corridor, such as the Western Corridor, including Ipswich, Brisbane's CBD and the Australia TradeCoast area, which includes Brisbane Airport.

The strategic model used for the study was the Northern Link Traffic Model, based upon the Brisbane Strategic Transport Model (BSTM), with specific enhancements incorporated to enable more accurate forecasting of toll roads and intersection delays along surface routes. The BSTM provides average weekday travel demand forecasts for the Brisbane Metropolitan area up to and including the year 2026.

The structure of the Northern Link Traffic Model is similar to that used in recent years for the environmental impact assessment of other TransApex toll road projects including the Clem Jones Tunnel (CLEM7), Airport Link and Hale Street Link. Key model improvements include use of updated inputs such as the road network database for the Northern Link study corridor, descriptions and timing of future transport infrastructure projects, and demographic forecasts developed from the SEQ Economic and Employment Forecasting Study.

Modelling at a more detailed local level, covering Inner West Brisbane, addressed local traffic and transport effects of Northern Link within the suburbs of Milton, Paddington, Auchenflower, Bardon, Toowong, Taringa, Indooroopilly, St Lucia and parts of Kelvin Grove and Herston. At a local level, the effects of the Project on local intersection performance were examined using the SIDRA software with data extracted from the city-wide model.

Future traffic and transport conditions with the project, such as travel demand, travel times, travel speeds and the operating level of service of the road network and intersections, were forecast for 2014 (the year of project opening), 2016, 2021 and 2026 for scenarios without, and with, the project.

Existing Transport System Performance

Existing traffic levels, movement patterns, road network performance and intersection operating characteristics were determined from a range of observed and modelled data for the Brisbane Metropolitan Area and the Inner West area. **Table 1** presents a summary of current traffic flows and the percentage of commercial vehicles across the inner west Brisbane road network.

Table 1 Existing (2007) Traffic Volumes – Inner West Brisbane (two-way totals)

Road	Location	AWDT(1)	AADT(2)	% CV(4)
State Strategic				
Centenary Highway	Centenary Bridge	86,800[3]	80,600[3]	5.9%
Western Freeway	North of Moggill Rd Interchange, Indooroopilly	76,500	71,200	4.7%
Regional Radial				
Moggill Road	East of Russell Terrace, Indooroopilly	40,700	37,800	6.6%
Moggill Road	East of Brisbane Boys College Entrance	38,500	35,800	6.0%
High Street	West of Benson Street, Toowong	32,400	30,100	1.7%
Milton Road	East of Croydon Street, Toowong	52,900	49,200	5.9%
Coronation Drive	West of Land Street, Auchenflower	62,600	58,200	6.7%
Milton Road	East of Castlemaine Street, Milton	51,500	47,900	8.5%
Coronation Drive	East of Cribb Street, Milton	90,100	83,800	6.7%
Kelvin Grove Road	North of School Street, Kelvin Grove	50,500	47,000	5.1%
Musgrave Road	West of Cochrane Street, Paddington	31,400	29,200	2.7%
Regional Ring				
Inner City Bypass	Landbridge, Spring Hill	79,200	73,700	11.0%
Walter Taylor Bridge	Indooroopilly	32,500	30,200	4.6%
Miskin Street	North of Ascog Terrace, Toowong	10,500	9,700	3.8%
Frederick Street	South of Victoria Crescent, Toowong	33,500	31,100	3.9%
City Distributor				
Brisbane Street	North of Josling Street, Toowong	37,100	34,500	3.4%
Sylvan Road	East of Milton Road, Toowong	8,400	7,800	3.2%
Caxton Street	West of Hale Street, Paddington	22,900	21,300	6.0%
Jephson Street	North of Sherwood Road, Toowong	13,000	12,100	5.2%
Local Streets				
Eagle Terrace	West of Roy Street, Auchenflower	4,100	3,800	3.2%
Haig Road	West of Barona Road, Milton	6,500	6,100	5.0%
Park Road Mid-block	North of Gordon Street, Milton	12,147	11,300	7.6%
Morley Street	North of Milton Road, Toowong	3,900	3,600	1.7%

Table Notes:
Source: Northern Link Traffic Model and 2007 traffic counts.
(1) AWDT - Average of five (5) working days
(2) AADT – Average of the full seven (7) day week
(3) Modelled volume within 5 to 10% of DMR permanent count.
(4) Vehicle type has been based on AustRoads (2004) as follows: Cars and light vehicles – Classes 1and 2, Commercial Vehicles – Classes 3 to 12[4]

4

Class 3
Two Axle Truck

The term CV in the context of this report refers to medium and heavy commercial vehicles (commonly referred to as trucks) and is equivalent to AustRoads vehicle classes 3 to 12. The AustRoads classification system is based on number and spacing of axles. Class 3 is specifically designated by AustRoads as a two-axle truck (depicted to the left). Classes 1 and 2 are short vehicles (axle spacing <=3.1m eg: cars, 4WDs, standard utes etc with and without trailers). Classes 4 to 12 comprise multi-axle and articulated vehicles.

Key findings from the assessment were:

- the Western Freeway, a motorway standard regional route from the Centenary Highway, linking to the Ipswich Motorway, carries 76,500 vehicles per weekday west of Toowong. It connects via the heavily congested Toowong roundabout, which carries over 6,000 vehicles per hour during the evening peak, to the north-south arterial route termed MetRoad 5 (including Frederick Street, Boundary Street and Jubilee Terrace) and the east-west arterial of Milton Road;
- along the 3.2km Milton Road route between the Toowong roundabout and the CBD there are 12 signalised intersections and access to frontage properties is limited. The Moggill Road-Coronation Drive route between the Western Freeway at Indooroopilly and Milton has 25 signalised intersections along its 6.4km length. Coronation Drive operates under a tidal flow system that maintains two lanes in each direction and a third lane in the peak direction. Congested operating conditions are evident at a number of intersections during peak periods, and at many locations along both corridors there are turning restrictions imposed which effects accessibility to abutting land-uses;
- Moggill Road-Coronation Drive and Milton Road cater for the major proportion of the traffic task in inner west Brisbane. The typical traffic volumes on Moggill Road at Taringa are 40,000 vehicles per weekday; Coronation Drive are up to 90,000 vehicles per weekday and 55,000 vehicles per weekday on Milton Road and highly congested traffic conditions are evident during peak periods along each route;
- Frederick Street carries 33,500 vehicles per weekday and is one of Brisbane's most heavily trafficked, and congested, two lane roads;
- over the last 20 years the population in the Brisbane Metropolitan Area has increased by 60%, however traffic volumes using Coronation Drive and Milton Road have doubled (or increased by 100%), with a daily traffic increase on the Western Freeway during the same period of over 130%. Peak hour demands through the Toowong roundabout have increased by 30% in the morning peak and 60% in the evening peak over the same period, and high demands have spread through longer periods of the day;
- both Coronation Drive and Milton Road carry approximately 75% of vehicles making cross-city travel movements, that is travel between the western suburbs, Ipswich and beyond with northern suburbs, Australia TradeCoast area (including the Airport) and southside suburbs (via the Captain Cook and William Jolly Bridges). Only 25% of traffic on Milton Road and Coronation Drive relates to with central-city travel;
- Milton Road currently provides a freight route between the Western Freeway and the CBD, and areas served by the ICB. Commercial vehicles comprise between 6% and 8.5% of the traffic that use this congested road in the inner west area;
- travel speed on both Coronation Drive and Milton Road fluctuate along the corridor due to traffic congestion at numerous locations, often resulting in long delays and unreliable journey times during peak periods. Travel time unreliability on congested roads impacts on productivity for businesses and industry;
- congested traffic conditions on the arterial roads have created the pressure for through traffic use of some local streets, with consequential negative effects on the amenity of some residential areas in the inner west;
- the inner west suburbs are well served by public transport. Milton Road carries over 120 buses per day and Coronation Drive over 820 buses per day, serving commuters from both a local and wider catchment area in Brisbane. The Ipswich Rail carries about 136 passenger train services per weekday. Bus services in the inner west area are affected by congestion on the road system; and
- as the Western Freeway terminates at the Toowong roundabout and then connects to congested arterial roads, there is a major gap in the strategic road network that principally affects efficiency, safety and reliability of travel between the west and eastern and northern areas of the metropolitan region. A direct,

high quality connection that serves the desire line for cross-city travel between the west and the east, which includes the ATC, is missing from the current network structure.

Future Conditions Without the Project

Future traffic forecasts have been based on a medium series population outlook[5] for the Brisbane Metropolitan area. This provides a basis to examine the implications of a regionally significant road such as Northern Link.

Future conditions without the Project were found to include:

- a sustained growth in vehicle travel demand would occur both within the Brisbane Metropolitan area level and in the Inner West area, even with significant growth in public transport mode share and use (rising from 8% to 11% by 2026, with a doubling of public transport trips);
- overall traffic movements within the Inner West area would grow by approximately 25% for the period, even as congestion levels of the road network rise significantly;
- strong growth in trips generated to key land-uses in the west, east and north of Brisbane is forecast. This would increase the cross-city private vehicle and freight travel demand through the Inner West area. The Western Corridor has a forecast increase of almost 180% in vehicle demand from 2007 to 2026 due to significant population and employment growth as identified in the Regional Plan's Preferred Pattern of Development. To the north-east of the Inner West area vehicle demand is forecast to increase by over 120% at the Australia TradeCoast North;
- public transport would cater for the majority of growth in demand for travel to the Central City, however due to its significance as a Primary Activity Centre and a growth area for employment some growth in vehicle demand would also be evident. Travel demand to the Inner West area, which includes activity centres at Toowong, Indooroopilly and St Lucia is forecast to increase by 18% by 2026;
- a progressive increase in congestion on the road network and decline in peak period journey times is forecast due to increased travel demands, particularly on Coronation Drive and Milton Road. Intersections along both routes which provide key local traffic connectivity, such as Cribb Street, Park Road, Baroona Road and Croydon Street would operate with high delays; and
- much of the traffic congestion that would occur in the inner west Brisbane's road system would be caused by cross-city traffic being forced to use the roads through the suburbs. Commuters would seek to avoid the highly congested regional routes and divert to city distributors and local streets eroding amenity within the local urban area. Without the Project, examples of roads with high traffic growth include Caxton Street, +70% vehicles per day by 2026; Eagle Terrace and Haig Road, both +120%; and Morley Street + 200% traffic increase by 2026, compared to the current situation.

Traffic and Transport Need

South East Queensland (SEQ) is Australia's fastest-growing region, having attracted on average 55,000 new residents each year over the past two decades. The Brisbane Metropolitan area currently accounts for about two-thirds of the region's population with 1.88 million people. Brisbane City also dominates as the major employment centre for the region and currently has a population of about 1.0 million people.

In the future the region will continue to experience rapid population and employment growth. The population of the Brisbane Metropolitan area is forecast to be 2.53 million in 2026 and employment is forecast to increase by

[5] PIFU Medium Series from SEQ Economic and Forecasting Study (2007)

over half a million to almost 1.5 million in 2026. **Table 2** presents estimated population, employment and person trips for the Brisbane Metropolitan area for a medium series population scenario.

Table 2 Brisbane Metropolitan Area Population Forecasts

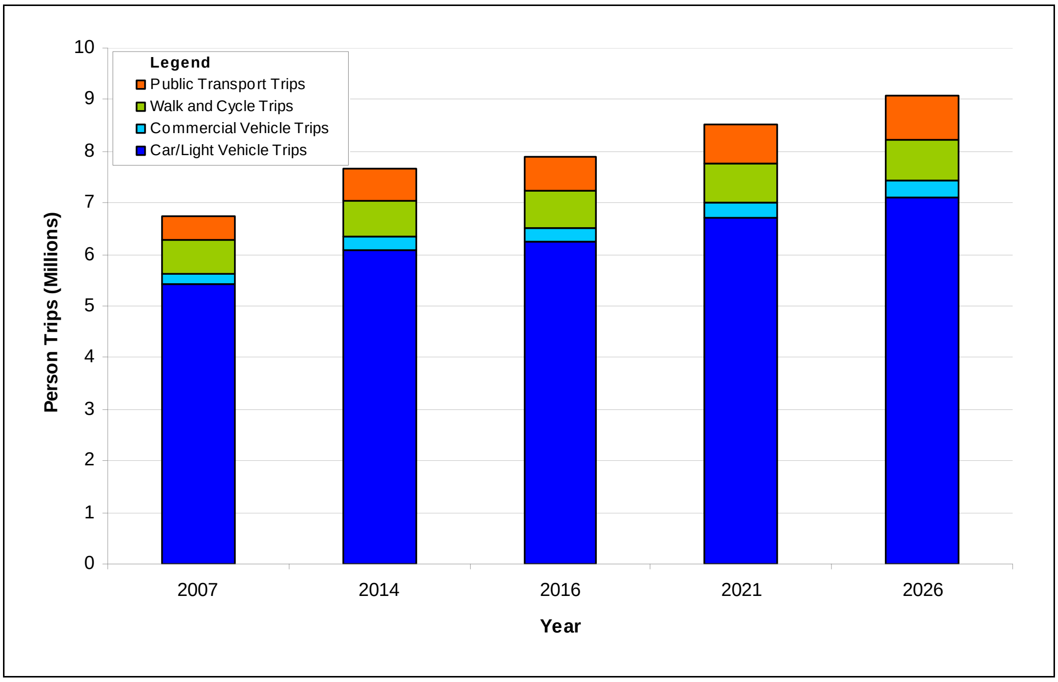
Year	Population(1)	Employment(2)	Total Person Trips(3) (average weekday)
2007	1,880,000	964,000	6,529,000
2014	2,126,000	1,185,000	7,400,000
2016	2,197,000	1,237,000	7,637,000
2021	2,370,000	1,373,000	8,228,000
2026	2,533,000	1,484,000	8,783,000

Table Notes:
(1) PIFU Medium Series from SEQ Economic and Forecasting Study (2007).
(2) NIEIR employment opportunities SEQ Economic and Forecasting Study (2007).
(3) Person trips by all modes including walk/cycle and excluding commercial vehicles.

The South East Queensland Regional Plan[6] provides a sustainable framework for managing this rapid growth and development in the SEQ region to the year 2026. The Regional Plan identifies a preferred pattern of development to cater for future population and employment growth that incorporates some significant and deliberate changes to the historic growth trends. It projects growth in the Western Corridor much higher than occurred in the past. In Ipswich, a more than doubling of population to 350,000 persons (+126%) is likely by 2026.

Under the pressure of population and employment growth, the estimated growth in the travel task (in terms of person trips) and vehicle travel demand in the network is significant. **Figure 1** summarises the estimated growth in the travel task (in terms of person trips) by the various travel modes – vehicle, public transport, and walk/cycle travel. This demonstrates how travel demand is forecast to grow across all modes.

Figure 1 Forecast Growth in Average Weekday Travel Demand Within Brisbane Metropolitan Area (Person Trips)



[6] Queensland Government Office of Urban Management (2005) *SEQ Regional Plan 2005 – 2026*, Brisbane

Table 3 summarises the growth in travel demand at the metropolitan level. Although public transport use is expected to grow substantially, vehicular trip demand is forecast to be 34% higher than current levels, reaching 5.5 million vehicle trips on an average weekday.

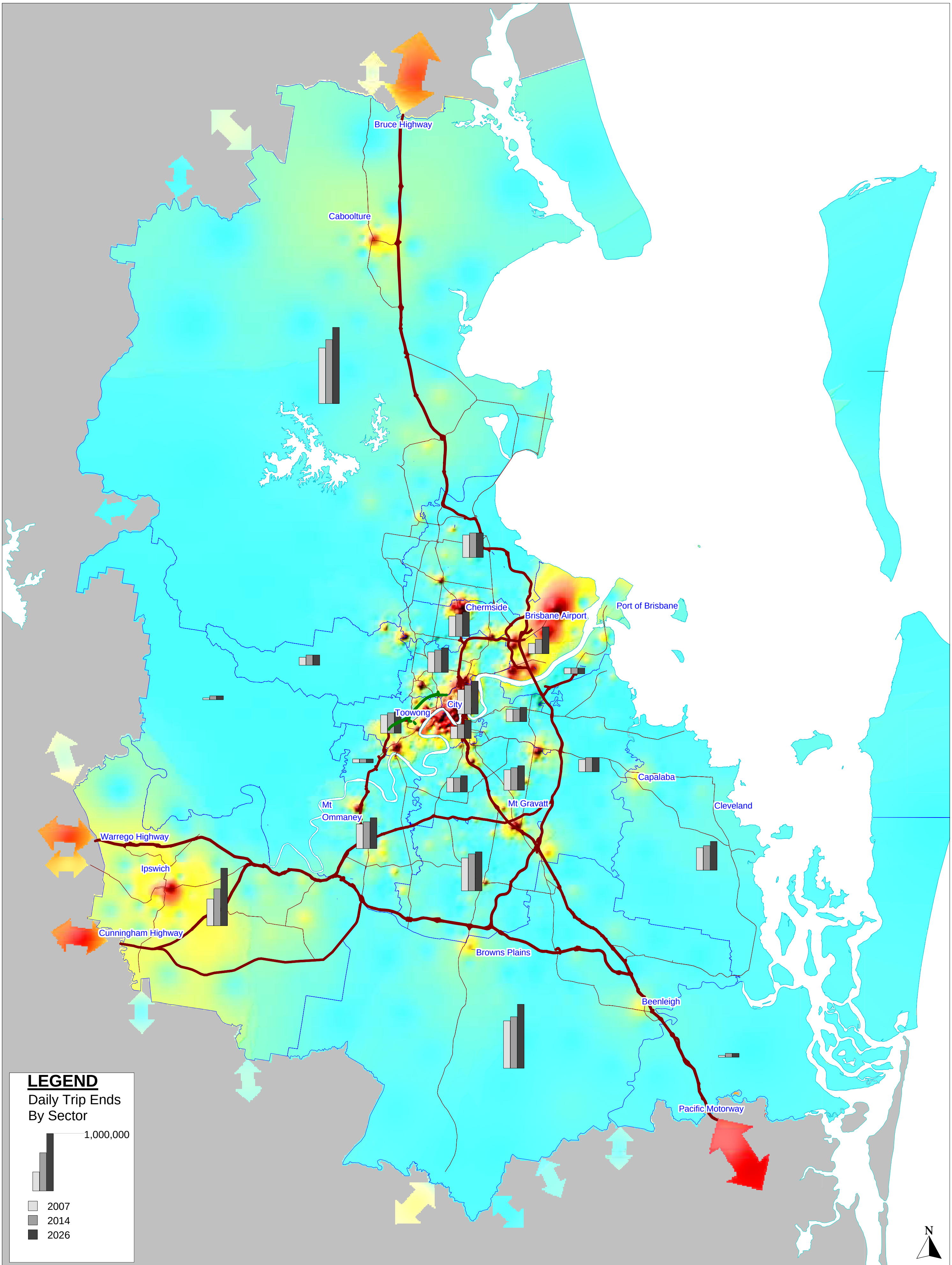
- **Table 3 Forecast Growth in Weekday Travel Demand in Metropolitan Area**

Parameter	2007	2014	2016	2021	2026
Person Trips by Motorised Travel Modes(1)	5,884,000	6,690,000	6,910,000	7,464,000	7,986,000
Public Transport Trips	464,000	599,000	670,000	742,000	866,000
% PT Trips	7.9%	9.0%	9.7%	9.9%	10.8%
Car/Light Vehicle Trips	3,879,000	4,385,000	4,498,000	4,855,000	5,150,000
Commercial Vehicle Trips	210,000	251,000	261,000	288,000	310,000
Total Vehicle Trips	4,089,000	4,636,000	4,759,000	5,144,000	5,460,000
% Growth in Vehicle Trips compared to 2007		**13%**	**16%**	**26%**	**34%**

Table Note:
Source: Northern Link Traffic Model
(1) Includes travel to and from locations outside the BSD.
(2) % Public Transport is expressed as a proportion of person trips by motorised modes.

As well as significant growth in travel demand there will also be changes to the distribution of travel generators. **Figure 2** depicts the change in trip ends forecast over the period between 2007 and 2026. This highlights the increased road travel demand associated with the Western Corridor, the ATC region that includes Brisbane Airport and the Port of Brisbane and activity centres such as the CBD, Toowong, Indooroopilly and the University of Queensland at St Lucia. The projected pattern of employment distribution for the metropolitan area and the Western Corridor is more decentralised than the current situation and the importance of a high-quality, efficient transport connections between these major economic drivers to the regional, State and national economies is evident.

The current national road network route and primary freight route between the Brisbane metropolitan region's western connections, the Cunningham and Warrego Highways, and the Gateway Motorway is the Brisbane Urban Corridor, a highly congested route south of the river including Granard Road, Riawena Road, Kessels Road and Mt-Gravatt Capalaba Road. The nature desire would be for a line of travel, on a shorter route north of the river from the western gateway to the Brisbane Airport and the ATC. A direct, high quality connection between the west and the east is missing from the current national network structure.



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 2

Forecast Trip End Growth: 2007 to 2026

Northern Link

SKM Connell Wagner JOINT VENTURE

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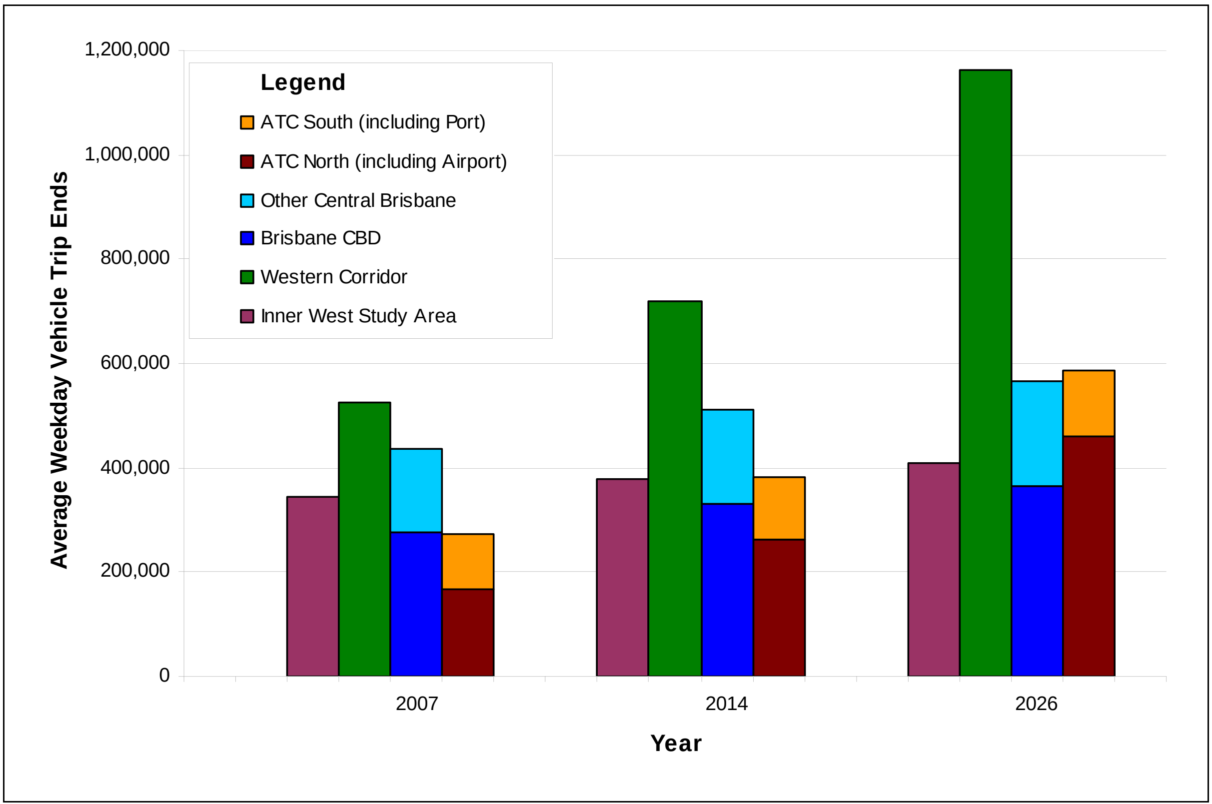
The forecast growth to key trip generators within the key catchments to the west, east and north that would be served by Northern Link is strong. In particular, high growth is anticipated in the ATC North region and the Western Corridor of 178% and 122% respectively. **Figure 3** clearly shows the future scale of travel to these regions relative to the Central City. Vehicle travel demand to the ATC north region will exceed current traffic levels to the CBD by 2026. Travel demand to the Inner West area that includes the activity centres of Toowong, Indooroopilly and the University of Queensland at St Lucia is forecast to be 18% higher than current levels by 2026.

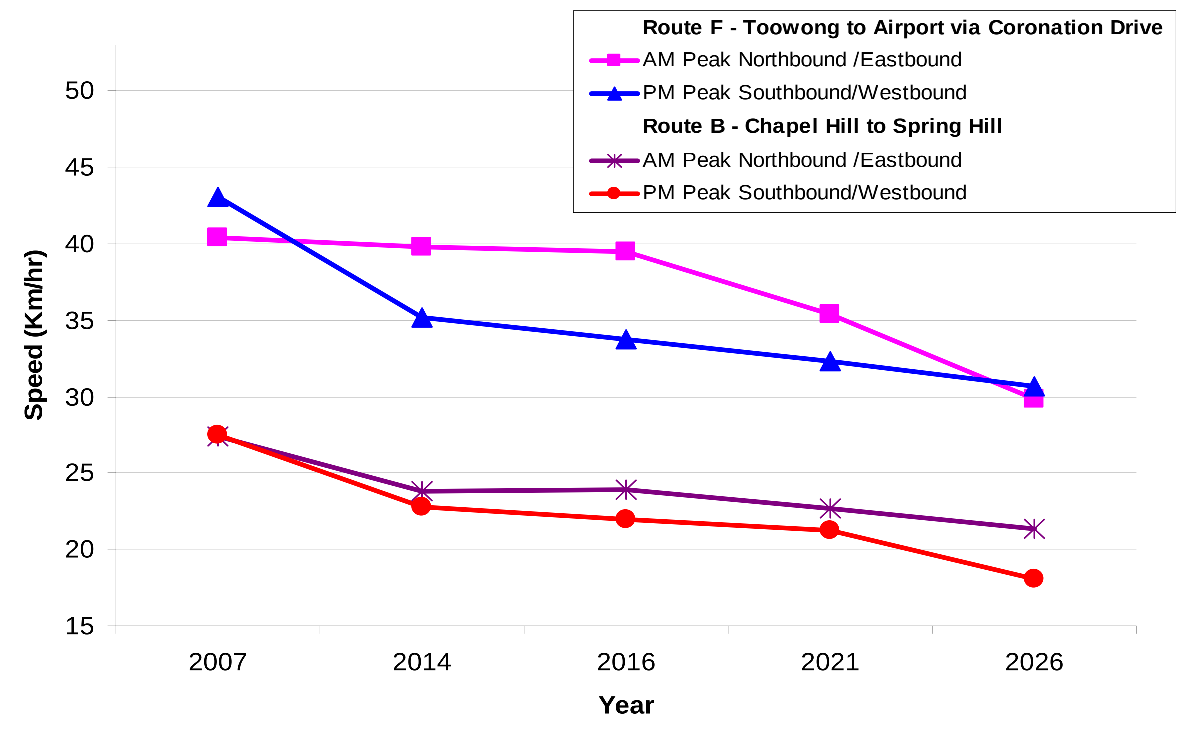
- **Figure 3 Forecast Growth in Vehicle Travel Demand to Northern Link Catchment Areas**



As both road and public transport networks face the pressure of accommodating increases in travel demand within and across the Brisbane Metropolitan area, journey times would increase.

Figure 4 illustrates that average peak period journey speeds would decrease progressively compared to current levels. By 2026 the average speed for a peak period trip for a typical trip between Chapel Hill and Spring Hill is forecast to decrease from a current average speed of 27km/h to 18 to 21km/h. Significant increases in travel time are also forecast for a regional cross city trip such as from Toowong to the Brisbane Airport. Average peak period speed for this journey would decrease from 40 to 43km/h to 30 to 31km/h in 2026.

- **Figure 4 Forecast Decline in travel speed on key routes without Northern Link**



Northern Link would address strategic needs by:

- supporting the preferred future development pattern, population and employment growth within the SEQ Regional Plan by improving connectivity and transport system capacity to cater for major growth areas (eg: Western Corridor) and economic activity centres (eg: CBD, ATC).
- reducing congestion and through-traffic in the inner west, supporting the growth of activity centres and improving local amenity and liveability;
- improving east-west transport efficiency by improving journey times and travel reliability from the Western Corridor and Western Suburbs to the ATC, the CBD and the regional roads in northern suburbs, by providing a motorway standard link between the Western Freeway and the ICB;
- support public transport by providing the opportunity for direct use by express bus services from the Western Corridor and the Western Suburbs to the CBD, and by relieving congestion on existing major bus routes such as Coronation Drive, Milton Road and Moggill Road so improving public transport efficiency; and
- providing opportunities to improve pedestrian and cycle environment in the inner west suburbs and reducing traffic levels on the surface network.

Operational Effects

Demand for Northern Link

Once operational, Northern Link would fulfil a traffic function of regional significance by providing a cross-city connection for trips between the western, eastern and northern areas of the Brisbane metropolitan area. Initial weekday traffic use would be 57,000 vehicles per day (following ramping up to full use) rising to 75,900 vehicles per day in 2026. The proportion of commercial vehicles forecast to use Northern Link in 2026 is 5.4%.

The traffic modelling indicates that in 2014 that approximately 32% of potential Northern Link users would not be prepared to pay the toll (and would choose to remain on surface roads), however as travel times on alternative routes increase by 2026 this would decline to 25%.

Use of the Northern Link mainline tunnel and its connections is summarised in **Table 4**. The Western Freeway connection would be the primary Western Connection, catering for 72% of traffic use, and the ICB would be the primary Eastern Connection, with a forecast use of 55% of traffic in 2026.

- **Table 4 Northern Link Traffic Use – Average Weekday Traffic Volumes(1)**

EIS Project Element	Daily Traffic 2014 - opening (vpd)	Daily Traffic 2014 (vpd)	Daily Traffic 2026 (vpd)	%
Western Connections				
Western Freeway	27,500	39,300	54,300	72%
Croydon Street	11,900	17,000	20,700[3]	27%
Other Toowong Approaches	500	700	940[2]	1%
Total	**39,900**	**57,000**	**75,900**	**100%**
Eastern Connections				
ICB	21,800	31,100	41,900	55%
Kelvin Grove Road (north-facing)	8,400	12,000	16,000	21%
Kelvin Grove Road/Musgrave Road (south-facing)	9,700	13,900	18,000	24%
Total	**39,900**	**57,000**	**75,900**	**100%**

Table Notes:

(1) EIS traffic forecast is based on a car toll of $3.93 (expressed in $2008 including GST).

(2) Forecast entry traffic to Northern Link in 2026 using east facing on-ramp of 940 vpd comprises 360 vpd approaching from Morley Street via right turn, with 580vpd from Milton Road east.

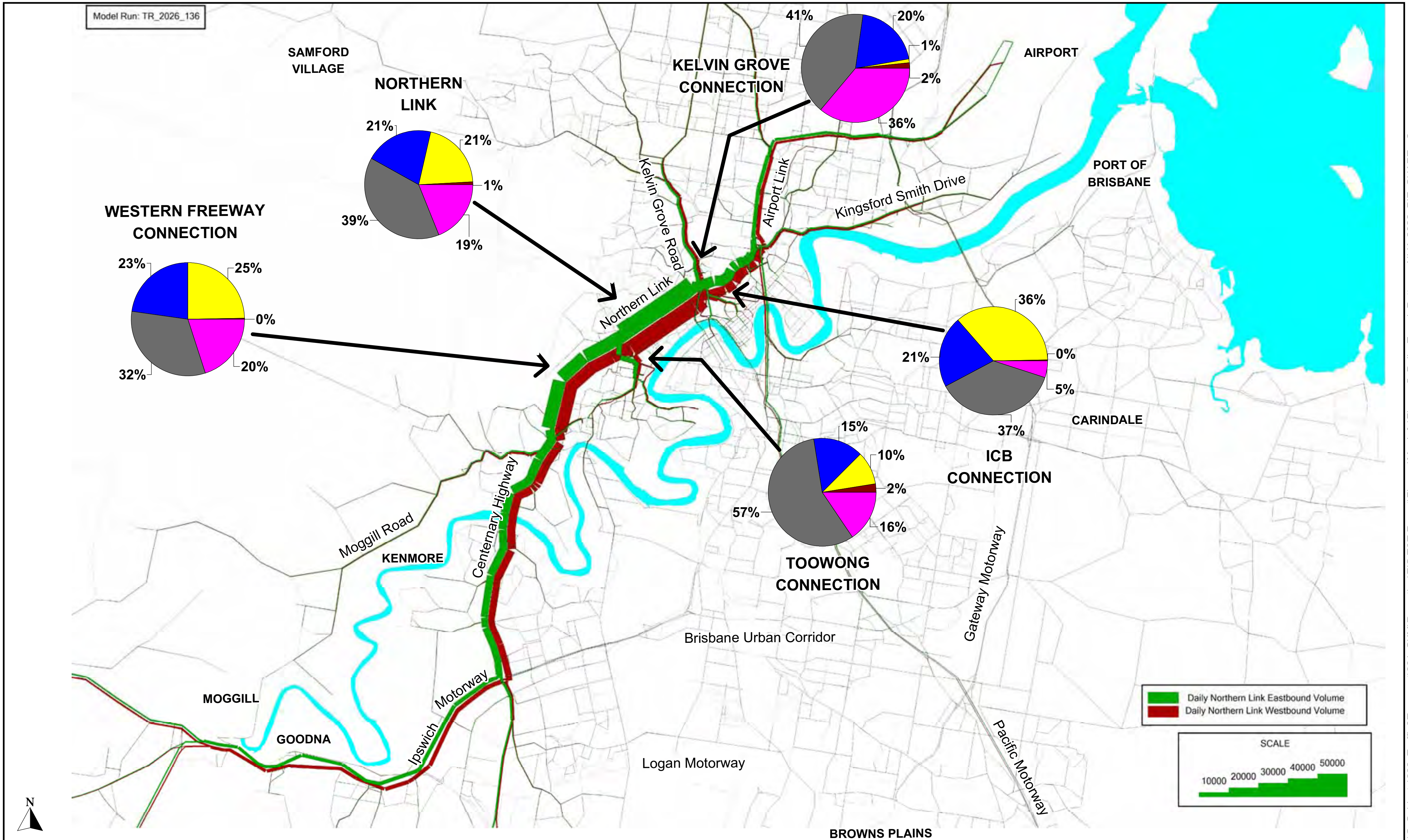
(3) Forecast exit traffic from Northern Link in 2026 to Croydon Street includes 140 vpd proceeding to Morley Street and 110 vpd proceeding to Milton Road east via indirect routes.

The forecast movement patterns of Northern Link users in 2026 are illustrated in **Figure 5**. Northern Link would predominantly carry cross city travel, representing over 81% of all trips, including 21% of trips associated with travel to the ATC. Radial travel would be a secondary function, accounting for 19% of all trips through Northern Link.

For commercial vehicles using Northern Link, one-third of trips would be ATC trips, from a total of 95% cross-city use.

Northern Link from the Western Freeway, ICB, Toowong and Kelvin Grove connections would have a predominant function of providing for cross-city travel. Characteristics of the connection use include:

- the Western Freeway would cater for over 70% of the traffic that enters Northern Link at its western connection. The Toowong Connection provides a secondary role;
- the straight through connection to and from the ICB would cater for over half of the traffic movement;
- use of the Kelvin Grove Connection would be distributed in similar proportions to the north and south;
- the Toowong Connection would play a significant role in catering for traffic between the activity centres in the Inner West area and the ICB and Kelvin Grove Road north;
- the Toowong Connection would be more strongly linked to travel between cross-city destinations via Airport Link, Kingsford Smith Drive and CLEM7, rather than central city related travel; and
- the majority of traffic using the Kelvin Grove Connection for Northern Link trips would travel west via the Western Freeway.



LEGEND

Pie charts show daily trip type for each connection

- Cross city travel to south of Brisbane River
- Cross city travel to/from north of Brisbane River
- Radial or CBD related travel
- Airport / ATC North travel
- Local travel

Northern Link
Environmental Impact Statement

Figure 5

2026 Daily Travel Patterns for Northern Link (select links)

Northern Link
SKM Connell Wagner JOINT VENTURE

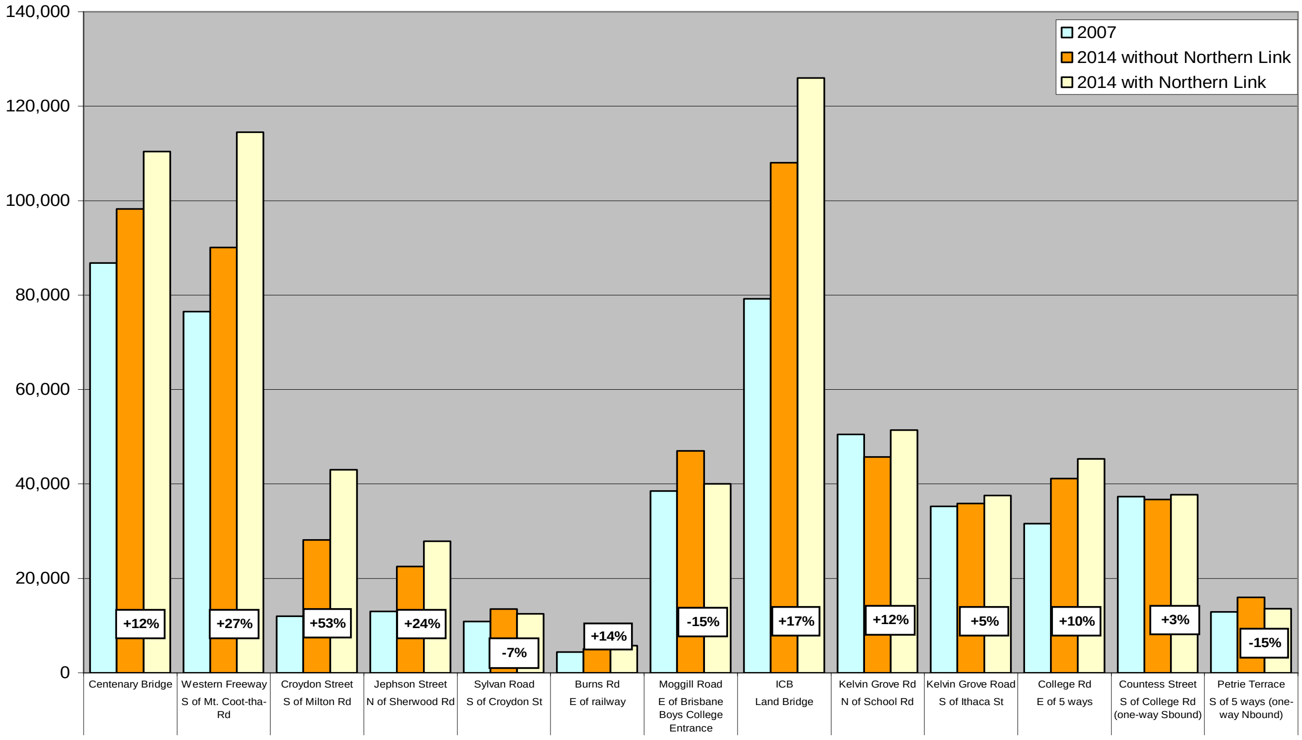
Traffic Volume Effects, Mitigations and Benefits

As Northern Link functions as a cross-city travel route, traffic volume effects are forecast beyond the corridor due to regional traffic re-distributing to alternative routes to access the facility, and in some cases these offer beneficial reductions in total traffic use of regional routes. Key findings include:

- traffic relief on several regionally important corridors, particularly by 2026 (when decreases in the range of 7% to 21% are forecast), including the Ipswich Motorway east of the Centenary Highway, Riverside Expressway, CLEM7, Ipswich Road and Fairfield Road;
- traffic reductions through the CBD, particularly on Ann and Turbot Streets;
- sound traffic reductions on the congested MetRoad 5 corridor, with a 14% traffic decrease forecast on Jubilee Terrace in 2026 and 11% on Frederick Street;
- negligible overall traffic changes within the Airport Link/Lutwyche Road corridor and on Kingsford Smith Drive;
- a small reduction in traffic use of Hale Street Link, with Northern Link reinforcing the use of the motorway standard ICB and the CLEM7 for longer distance cross-river travel; and
- negligible change in traffic volumes on the Walter Taylor Bridge in Indooroopilly, although some users will re-distribute to travel via Northern Link rather than via the Moggill Road – Coronation Drive corridor.

Figure 6 presents the average weekday traffic forecasts on the connecting routes to Northern Link for 2014 the scenario with and without the Project illustrating the immediate effects. The weekday traffic for 2007 is also presented for comparison.

- **Figure 6 Average Weekday Traffic on Connecting Routes**



The longer term effects of the Project on connecting routes include:

- at the four lane Centenary Bridge, average weekday traffic demands with the project of 110,400 in 2014 rising to 137,400 in 2026 are forecast. By 2026 peak period congestion is forecast at the Centenary Bridge either without or with Northern Link in the peak direction of travel. With peak spreading in the network over the next 20 years, it is considered not unreasonable to assume that a four lane cross-river facility could carry an AWDT of up to 140,000 vehicles per day;
- in 2014, average weekday traffic on the Western Freeway north of Moggill Road is forecast to reach 114,500 vehicles per day with Northern Link. This is similar to the traffic levels carried during 2007 on the four lane section of the Gateway Motorway north of Kingsford Smith Drive (112,000 AWDT). By 2026 forecast traffic increases by around 30% to 138,000 vehicles per day in 2026 compared to the scenario without the project, with overall demands within the anticipated traffic lane capacities at that time. SEQIPP incorporates upgrading for this route, anticipated as the addition of a transit (T2) lane in each direction by 2016;
- traffic increases of 60% on Croydon Street are forecast to 45,900 vehicles per day by 2026, accommodated by the widening of Croydon Street to a divided six lane road and intersection upgrades at Milton Road/Croydon Street/Morley Street and Jephson Street/Sylvan Road;
- along the four lane Jephson Street city distributor route, Council has been implementing set-backs as re-developments occur in order to improve the traffic capacity of this route progressively over time. The forecast traffic increases with the Project by 2026 would be 28% to 30,400 vehicles per day;
- the ICB would experience forecast increases in average weekday traffic in the order of 20% (compared to the without project scenario) resulting in 143,000 vpd by 2026. This is within the traffic carrying capacity of this six lane road link. Weaving movements can be accommodated satisfactorily with the proposed connection layout;
- Kelvin Grove Road to the immediate north of the project, is forecast to experience a 17% increase in daily traffic by 2026 with effects diminishing further north. Traffic increases can be satisfactorily managed with proposed project intersection works at the connection;
- traffic volumes on Kelvin Grove Road, Countess Street and Petrie Terrace south of the connection would experience little change, because although traffic from the south facing ramps from Northern Link would use these roads, some users that would have otherwise travelled via Countess Street or ICB to Milton Road or Coronation Drive would divert via the Kelvin Grove Road northern ramps to Northern Link;
- traffic increases of less than 15% are forecast on Musgrave Road, between College Road and Hale Street, and College Road. No significant effect on level of service during peaks is expected; and
- the Traffic Management Plan for the Project would address the need for signal co-ordination to accommodate increased traffic on connecting routes where multiple signalised intersections occur such as Croydon Street-Jephson Street and Kelvin Grove Road.

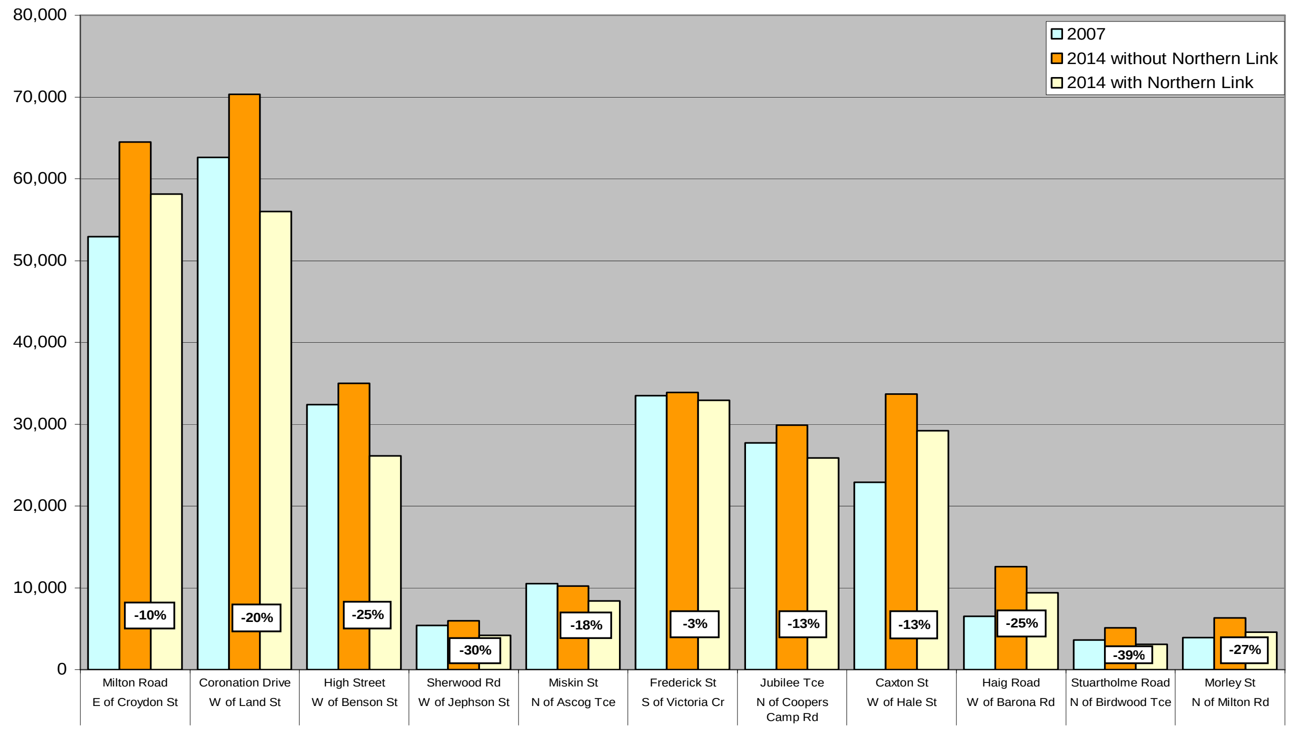
The effect of the project on traffic volumes within the residential precinct north of Milton Road in the vicinity of the Toowong connection has also been assessed taking into account the potential for use of the Gregory Street-Morley Street route for traffic seeking to access the Northern Link ramp connection. Key findings include:

- only traffic from the immediate local area (forecast as 360 vehicles per day by 2026) would find it beneficial to use Morley Street to access the Northern Link entry ramp via a right turn movement from Morley Street. Approximately 140 vehicles per day are forecast to use Morley Street as an exit route, with this traffic exiting to Croydon Street and then travelling via a circuitous route to access Morley Street;

- traffic reductions with Northern Link are forecast for the Gregory Street - Morley Street route compared to the situation without the project. This occurs due to congestion relief effects that Northern Link provides within the major road network and at the Toowong roundabout, reducing the pressure for through traffic intrusion (rat-running) into the precinct. The 2026 traffic volumes forecast on Morley Street of 5,000 vehicles per day however would be greater than existing levels due to general travel demand increases in the inner west, and exceed the typical level generally regarded as tolerable within a residential area (4,000 vehicles per day); and
- as this precinct will remain challenged over time by through traffic pressures, an expansion of the currently programmed local area traffic management (LATM) scheme for the area would be prudent to further protect the amenity of this residential area. As part of the Traffic Management Plan for the Project supplementary LATM initiatives should be considered for the precinct extending from Milton Road in the south to Birdwood Terrace in the north and from Frederick Street in the west to Wienholt Street in the east.

Improved amenity on many roads in the inner west suburbs would be likely, due to forecast traffic reductions with the Northern Link project. Short term effects are illustrated in **Figure 7**, which shows that the average weekday traffic for the 2014 scenarios with and without the Project. The weekday traffic for 2007 is also presented for comparison.

Figure 7 Average Weekday Traffic on Brisbane Inner West Roads



Examples of the longer term forecast effect of Northern Link in 2026 compared to the scenario without the project include:

- sound reduction in traffic on the Milton Road-Coronation Drive radial road corridors, and other roads used by east-west traffic. This includes traffic reductions of up to 22% on Coronation Drive and 9% on Milton Road;
- the Toowong activity centre would benefit from traffic reductions including a forecast decrease by 27% at High Street to 27,400 vehicles per day in 2026, lower than existing traffic levels;
- traffic on Moggill Road through Toowong would reduce by 13% and at Indooroopilly by 5%;

- significant daily traffic reductions on many City Distributors such as Sylvan Road south of Croydon Street (-23%), and Caxton Street (-19%) and Latrobe Terrace (-15%) improving amenity for these shopping and entertainment precincts; and
- reductions in daily traffic are forecast on many local streets throughout the inner west suburbs such as Eagle Terrace (-24%), Haig Road (-30%), Stuartholme Road (-22%), Rainworth Road (-43%), Sylvan Road east of Milton Road (-38%), Morley Street (-25%) and Birdwood Terrace (-38%).

Intersection Performance Effects

The effect of the Project on the performance of intersections within the network has been assessed. Findings include:

- the Projects' connections with the surface network have been designed to ensure traffic accessing or egressing the project can connect in an unimpeded manner to the connecting road network. Where possible, grade separations have been used. For locations where traffic exiting the tunnel will encounter a potential stop point, an analysis of the level of service and queuing at the exit has been undertaken. In all cases this was found to be able to be satisfactorily managed;
- as approximately 40% of the traffic using the Western Freeway would divert to Northern Link, there would be a substantial reduction in volume of Western Freeway traffic that would pass through the Mt Coot-tha and Toowong roundabouts, improving travel conditions for commuter and local traffic use and relieve pressure for use of local network for rat-running;
- an overall improvement in operating conditions at intersections along on Coronation Drive, Milton Road and Moggill Road is indicated with the Project due to traffic relief during peak periods;
- intersections along Jephson Street would experience some decrease in level of service associated with increased traffic due to the project, however as a significant upgrade to the intersection of Jephson Street/Croydon Street would occur, improved operations are forecast;
- in the Toowong area there would be a strong congestion relief at the busy High Street/Benson Street/Brisbane Street intersection near the Toowong railway station;
- at the intersection at the on ramp to the Western Freeway from Moggill Road, the level of service would decline with the project but remain satisfactory. At the intersection of the off ramp from the Western Freeway with Moggill Road, the level of service improves with the project due to traffic re-distribution effects; and
- although catering for access traffic to the Kelvin Grove south-facing ramps, there would be little change to the intersections on Musgrave Road, Countess Street and in the College Road corridor compared to the without project scenarios. This occurs because some existing cross-city traffic between Milton Road and Coronation Drive/Milton Road would transfer to use Northern Link instead of this part of the CBD network.

Network Performance Effects

The impact of the Northern Link project on the overall Brisbane Metropolitan area network performance in terms of overall vehicle kilometres and hours of travel are shown graphically in **Figure 8**. Key findings include:

- reduced travel on lower order roads in the network (local, district and suburban routes) with the Project and redistribution to Motorway routes. The arterial network is also benefited by travel distance and time reductions;
- a general lowering of congestion with an overall increase of average network speed;
- a very small (0.1%) increase in overall vehicle kilometres of travel, with an overall 1% reduction in the vehicle hours of travel within the network; and

- sound reductions in total vehicle hours of travel and vehicle kilometres of travel for commercial vehicles with a shift of use away from lower order roads and onto motorways. This would provide important benefits to industry through reduced operating costs and improved travel time reliability.

Figure 8 Changes in Overall Vehicle Kilometres and Vehicle Hours of Travel With Northern Link in 2026

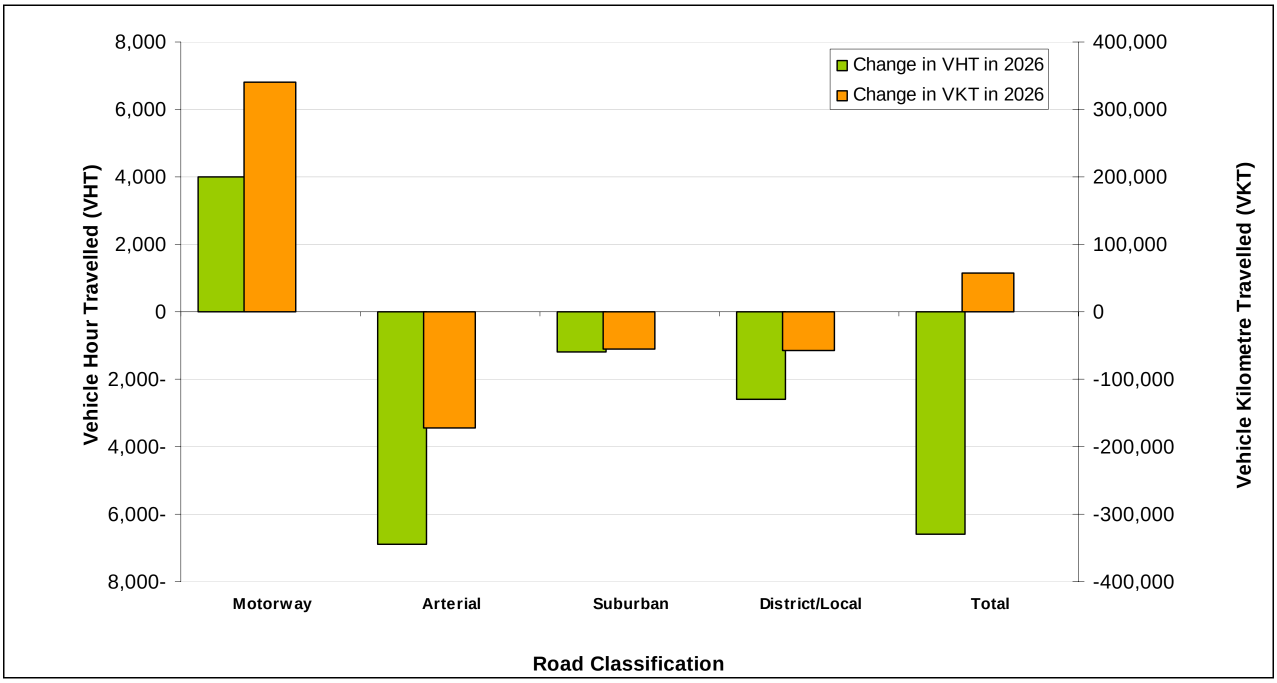


Table 5 Network Performance by Road Type without and With Northern Link

Road Type	Without Northern Link			With Northern Link			Difference		% Difference	
	VHT(1)	VKT(2)(4)	Speed km/h	VHT(1)	VKT(2)(4)	Speed Km/h	VHT	VKT	VHT	VKT
2014										
Motorway	297,100	24,677,400		301,100(3)	24,772,200(3)		4,000	279,300	1.3%	1.1%
Arterial	444,900	20,442,200		438,000	20,306,900		-6,900	-135,300	-1.6%	-0.7%
Suburban	167,600	8,147,700		166,400	8,121,500		-1,200	-26,200	-0.7%	-0.3%
District	106,300	3,505,100		102,400	3,465,100		-3,900	-40,000	-3.7%	-1.1%
Local	52,100	1,315,500		53,400	1,305,700		1,300	-9,800	2.5%	-0.7%
Total(4)	1,068,000	58,087,900	54.4	1,061,400	58,156,000	54.8	-6,600	68,100	-0.6%	0.1%
2026										
Motorway	412,800	32,754,100		415,400(3)	33,094,000(3)		2,600	339,900	0.6%	1.0%
Arterial	514,700	23,578,300		504,600	23,406,800		-10,100	-171,500	-2.0%	-0.7%
Suburban	200,900	9,624,600		199,100	9,570,000		-1,800	-54,600	-0.9%	-0.6%
District	136,400	4,057,600		133,500	4,013,600		-2,900	-44,000	-2.1%	-1.1%
Local	73,900	1,465,200		73,900	1,451,700		0	-13,500	0.0%	-0.9%
Total(4)	1,338,700	71,479,800	53.4	1,326,500	71,536,200	53.9	-12,200	56,400	-0.9%	0.1%

Table Notes:
(1) VHT - Vehicle Hours Travelled on Average Weekday
(2) VKT - Vehicle Kilometres Travelled on Average Weekday
(3) Includes NL Tunnel VHT and VKT
(4) Excludes travel on traffic zone centroid connectors within the model.

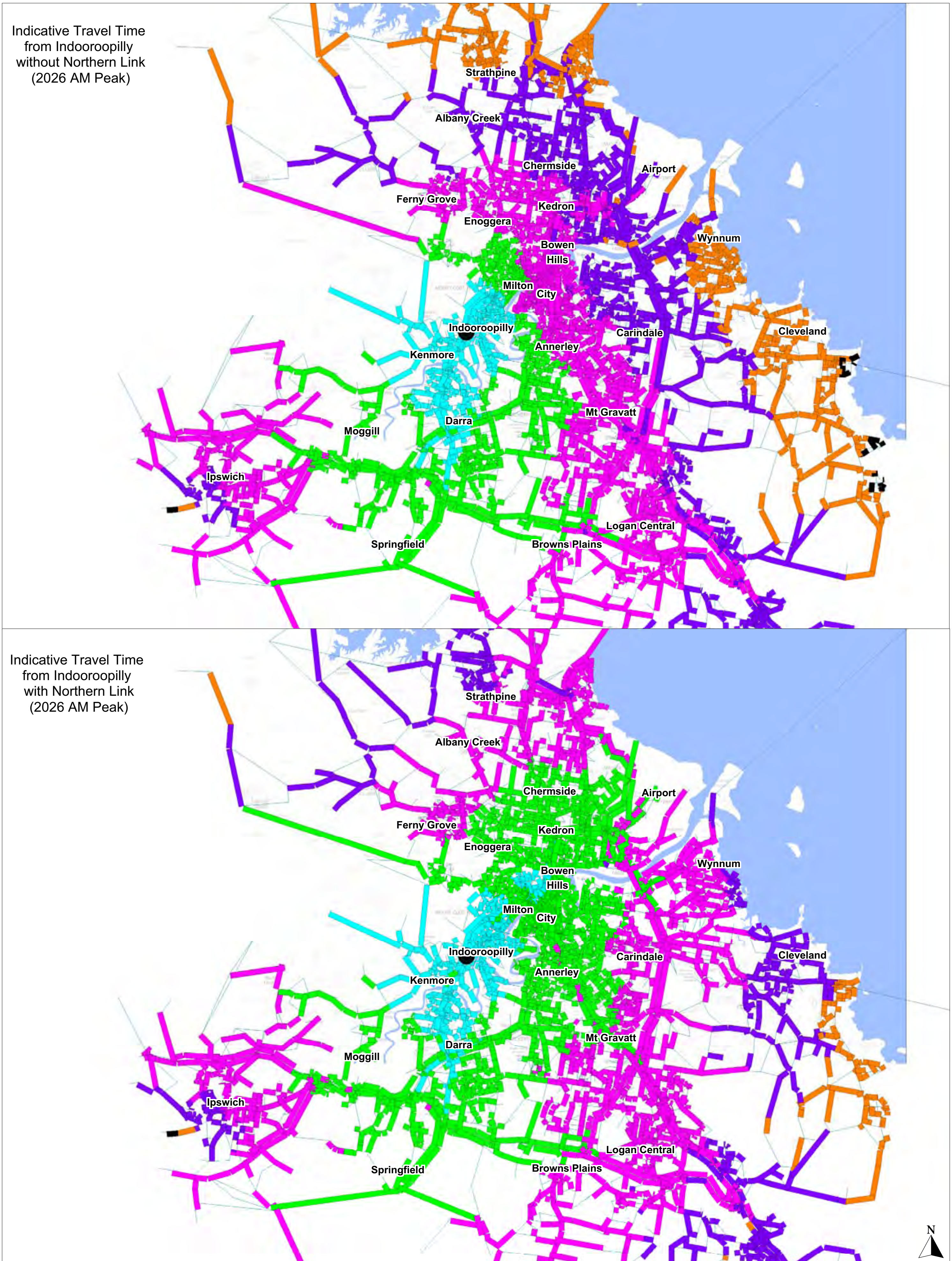
Travel Time Benefits

The travel time benefits offered by Northern Link are significant and some examples of these are illustrated in **Table 6**. An illustration of the extent of travel time savings is provided in **Figure 9,** showing the change in morning peak period travel times from Indooroopilly in 2026. Key examples of travel time benefits include:

- for travel from the Western Corridor to the ATC area including the Airport, travel time savings of 25%, or almost 20 minutes, would be experienced in both peaks;
- for travel to the Airport from the Inner West peak period travel time savings of 50%, or 20 minutes, would also occur in 2026. These time savings would enable residents of Toowong to access the Airport in about 15 minutes and residents of Indooroopilly would access the Airport in around 20 minutes;
- for routes between the Inner West and the Central City, such as Chapel Hill to Spring Hill, average time savings of approximately 50%, or 10 to 15 minutes, would be experienced in both the morning and evening peak periods in 2026;
- benefits, although lesser, are also forecast for traffic choosing to use the un-tolled surface routes instead of Northern Link. These travel time savings would be approximately 15% to 30% during the morning peak for routes between the Inner West and the Central City and between 5% and 20% in the evening peak period. This represents travel time savings of up to 9 minutes in the morning peak and 5 minutes in the morning peak; and
- for un-tolled surface routes between the Western Corridor and the ATC time savings would be around 5%.

- **Table 6 Effect of Northern Link on Travel Times (AM peak)**

Key Routes	Without Northern Link (min)	With Northern Link		Northern Link Time Benefits	
		On Surface (min)	Via NL (min)	On Surface (min)	Via NL (min)
2007					
Western Corridor to ATC/Airport	69	-	-	-	-
Indooroopilly to Chermside	34	-	-	-	-
Toowong to Airport	30	-	-	-	-
Centenary Bridge to Land Bridge	21	-	-	-	-
Chapel Hill to Spring Hill	19	-	-	-	-
Toowong to Newmarket	14	-	-	-	-
2014					
Western Corridor to ATC/Airport	58	57	46	-1	-12
Indooroopilly to Chermside	35	33	20	-2	-15
Toowong to Airport	29	27	14	-2	-15
Centenary Bridge to Land Bridge	24	23	12	-1	-12
Chapel Hill to Spring Hill	21	19	10	-2	-11
Toowong to Newmarket	16	15	9	-1	-7
2026					
Western Corridor to ATC/Airport	70	69	55	-1	-15
Indooroopilly to Chermside	42	34	20	-8	-22
Toowong to Airport	38	35	19	-3	-19
Centenary Bridge to Land Bridge	26	22	9	-4	-17
Chapel Hill to Spring Hill	24	20	9	-4	-15
Toowong to Newmarket	18	16	9	-3	-9



LEGEND

- Travel Time (mins) < 10
- 10 < Travel Time (mins) < 20
- 20 < Travel Time (mins) < 30
- 30 < Travel Time (mins) < 40
- 40 < Travel Time (mins) < 50
- 50 < Travel Time (mins)

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 9

Change in 2026 Morning Peak Travel Time From Indooroopilly with Northern Link

SKM Connell Wagner JOINT VENTURE

Local Traffic Effects

The project would also require changes to local traffic arrangements through access restrictions or changes that would generally be confined to the tunnel portal areas and immediate approaches. Local access effects can be summarised as:

- Western connections:
  - Western Freeway precinct – access to the area west of Frederick Street including the Mt Coot-tha Botanic Gardens, Anzac Park and the Toowong Cemetery not affected with benefits due to reduced traffic use of the Mt Coot-tha Roundabout;
  - Toowong north precinct (the area in Toowong north Milton Road and east of Frederick Street) - minimal effects of the project on local traffic access in this precinct. To assist in the management of extraneous through traffic pressures it is recommended that a local area traffic management scheme be implemented within the Toowong north precinct as described previously; and
  - Toowong south precinct (the area in Toowong south of Milton Road and east of Miskin Street) - moderate effects with the project design shaped to minimise adverse impact.
- Eastern connections:
  - ICB precinct – the effect of the project on local access would be minimal;
  - Kelvin Grove precinct (west of Kelvin Grove Road) - marginally increased journey times due to road changes however reduced traffic volumes on the local streets within this precinct; and
  - Kelvin Grove Urban Village (east of Kelvin Grove Road) – minimal effect on local access.

Access to hospitals, access for emergency services and access to rail infrastructure would not be affected by the Project.

Benefits for Bus Travel

Traffic reductions on the surface road network with the Project allow for the potential re-introduction of transit priority initiatives on Coronation Drive (which have been removed in recent years due to increasing traffic congestion), and this has been taken into account in the traffic modelling.

Specific benefits for bus travel would also include:

- the opportunity for Rocket bus services from the Brisbane western suburbs to use Northern Link as an express route from the Western Freeway to access the Inner Northern Busway stations in the CBD would be provided. Queensland Transport has identified that approximately 64 planned peak period Rocket bus services each morning and evening could be re-routed to travel via Northern Link in 2014 increasing to 92 services by 2026. Commuters using these buses travelling via Northern Link would benefit from daily savings in 2026 of 11 to 12 minutes each way, ie: 23 minutes per day. Patronage modelling indicates approximately 6,600 patrons would use these services daily by 2026;
- for bus services travelling along Milton Road and Coronation Drive travel time improvements would result due to reduced surface traffic levels, with time savings of approximately 25% forecast in the peak direction; and
- There will only be minor effects to existing bus stops due to the Project, all of which can be suitably accommodated within the design.

Effects on Active Transport

Compared to the scenario without Northern Link the Project would reduce traffic volumes and congestion on many surface roads in the study corridor, including Milton Road and Coronation Drive. This would enable improved access within the study corridor, through improved movement of traffic, including for pedestrians and cyclists.

Northern Link does not permit usage by pedestrians and cyclists. The Project's design has ensured that connectivity for pedestrian and cycle movements is maintained around the tunnel portals and their connections to the surface road network including:

- Western Freeway Connection - existing connectivity and function of the Western Freeway bikeway and the Toowong Cycle and Pedestrian Overpass, which currently being constructed, would be maintained;
- Toowong Connection – signalised pedestrian crossings would be maintained at intersection of Milton Road/Croydon Street/Morley Street on three of the four approaches. Pedestrian crossings of all approaches would be maintained at the Croydon Street/Jephson Street/Sylvan Road signalised intersection. Full pedestrian footpaths would be kept on both Croydon Street and Milton Road;

  The on-road bike paths on Sylvan Road and its connectivity with the Western Freeway and the Bicentennial bikeways would be maintained. Traffic reductions on Sylvan Road due to the elimination of the right turn from Milton Road would improve safety for cyclists.
- ICB Connection – No impact on the off-road bikeway adjacent to the southern side of the ICB or on the bikeway and pedestrian paths on the ICB Landbridge. The off-road bikeway on the northern side of the ICB between Kelvin Grove Road and the ICB Landbridge would be re-aligned. Its existing connectivity and functionality would be maintained; and
- Kelvin Grove Connection - Pedestrian facilities would maintain the current linkages between the Kelvin Grove Urban Village and the community and bus stops to the west of Kelvin Grove Road. New pedestrian footpaths would be provided on both sides of Lower Clifton Terrace so creating a good quality pedestrian connection between Kelvin Grove Road and Musgrave Road.

  Pedestrian crossing facilities at the Kelvin Grove Road/Musk Avenue/Northern Link ramps intersection would be provided with access from this intersection to Upper Clifton Terrace and Kelvin Grove Road north footpaths provided via a pedestrian route over the tunnel portal. Pedestrian footpaths would continue to be provided on both sides of Kelvin Grove Road between Musk Avenue and Blamey Street.

  Pedestrian crossings would continue to be accommodated at the signalised intersection of Kelvin Grove Road and Blamey Street, with the crossing of Kelvin Grove Road relocated to the southern approach to better serve bus stops in the area.

Road Safety

The effects of Northern Link on road safety have been assessed and an overall improvement is forecast due to the project. Key findings are:

- an overall reduction of forecast crashes on major routes in the inner west in 2014 and 2026 with Northern Link of 3.4% and 2.0% respectively;
- an overall reduction in forecast crashes on Coronation Drive (18%) and Milton Road (6.5%) in 2026;
- part of the MetRoad 5 north of the Toowong Roundabout up to and including Rouen Road experiences road safety benefits on average of 11%;
- the Western Freeway east of the Northern Link Western Freeway ramp connections would have an overall reduction in crashes would be expected (21%). To the west of the Northern Link ramps an increase in crashes (31%) in 2026 is forecast due to the increase in traffic volumes along this section of the Western Freeway. However, the combined overall increase in the number of crashes would be small; and

- traffic relief forecast on a range of other regional routes south of the Brisbane River (such as Ipswich Road and Fairfield Road) that are heavily used by freight, and these locations would also benefit from crash reductions.

Cumulative Effects of Northern Link with other projects

The cumulative traffic impacts of Northern Link with respect to the cumulative operational impacts with known infrastructure projects in the north and western suburbs of Brisbane including CLEM7, the Gateway Upgrade Project, Airport Link, Northern Busway (Windsor to Kedron), Airport Roundabout upgrade, Hale Street Link, Ipswich Motorway Upgrade and the Centenary Highway and Western Freeway transit lane project (identified within SEQIPP) have been incorporated within the traffic modelling scenarios.

Potential cumulative construction effects would arise from the overlap of haulage and delivery route traffic associated with Northern Link with similar activities on other known projects. The two proposed spoil haulage routes that have the potential to overlap with construction activities of other projects are summarised as follows:

- haul route to spoil placement site at Port of Brisbane - anticipated at 50 trucks per day to and from the Kelvin Grove Connection worksite/ICB workarea between July 2010 and February 2012; and
- haul route to spoil placement site at Swanbank – anticipated at 60 trucks per day to and from the Western Freeway and Toowong Connection worksites between April 2010 and June 2011.

Potential for cumulative construction effects based upon currently available information is as follows:

- CLEM7: No overlap in use of the common route for spoil haulage to the Port of Brisbane route is anticipated as activity from CLEM7 is expected to be complete prior to commencement of use of this route by Northern Link haul traffic in July 2010.
- Gateway Motorway Upgrade: If the Gateway Motorway Upgrade project haulage activities on the Western Freeway-Centenary Highway route to the western corridor continue beyond April 2010 there will be overlap with Northern Link spoil haulage, however it is noted that Northern Link haulage volumes would represent less than 0.2 % of traffic on this route, so cumulative effects would be minimal.
- Airport Link, Northern Busway and Airport Roundabout Upgrade Project: The potential common route for spoil haulage is the Port of Brisbane route from the ICB, Kingsford Smith Drive and Gateway Bridge from July 2010 onwards, where the Northern Link project would generate an anticipated 100 trucks per day. The anticipated use of this route by the Airport Link Changed Project would be up to 110 trucks per day, which is significantly lower than that initially envisaged for Airport Link construction due to the use of the spoil haulage conveyor from the northern worksite with the Airport Link Changed Project.

  The estimated peak combined haulage traffic associated with Airport Link and Northern Link (210 trucks per day) during 2010/11 would represent only 1.8% of the 2010 background truck traffic and approximately 0.3% of total traffic on this route. However, there are several intersections along Kingsford Smith Drive operating at close to nominal capacity during peak periods. The impact on performance of key intersections during peak periods would need to be examined during the preparation of the construction traffic management plans, and haulage operations managed accordingly (eg: being restricted to outside peak hours if necessary).
- Hale Street Link: The proposed haulage routes associated with Northern Link would not be likely to have any direct effects on the Hale Street Link construction activities. The construction program associated with the Hale Street Link project incorporates a number of traffic management and diversion measures within the eastern end of the Coronation Drive and Milton Road corridors to facilitate the connection of Hale Street Link to Hale Street. Early works to upgrade the Milton Road/Croydon Street intersection within the

Northern Link construction program could further assist in the management of traffic on diversion routes related to Hale Street Link construction.

- Ipswich Motorway Upgrade: The haul route to Swanbank, used by 60 trucks per day to and from the Western Freeway and Toowong connection worksites between April 2010 and June 2011, would pass through several construction projects planned on the Ipswich Motorway. Cumulative effects of overlapping haulage activities would be minimal as Northern Link haulage volumes would represent only 0.1% of traffic on the route.
- Centenary Highway and Western Freeway transit lane project (identified within SEQIPP): This project, assumed to be operational by 2016, is still in the planning phase by DMR so details of the proposed construction staging and timing are unknown. It is likely that use of the Centenary Highway and Western Freeway by Northern Link haulage vehicles will be finished prior to the start of substantial construction activities on this project.

Cumulative effects with projects emerging from contemporary studies have also been considered by considering the potential effect of a range of corridor options released for public comment in April 2008 from State Government's Western Brisbane Transport Network Investigation (WBTNI). In addition to Northern Link (WBTNI Tunnel Corridor Option 4), other WBTNI corridor options incorporated in cumulative effects traffic modelling for a 2026 time were Option 3: Toowong to Everton Park (New Road Corridor); Option 6: Everton Park to Kedron (Stafford Road corridor); Option 15: North West Transport Corridor (Everton Park to Carseldine – existing preserved corridor); and Option 5: TransApex East-West Link (Toowong to Buranda). These WBNTI links were tested as tolled links operational in 2026[7] and with the inclusion of several major tolled links branching from the Western Freeway (ie: Project 3, East-West Link and Northern Link) in 2026, it was assumed that the Western Freeway and Centenary Highway, including the Centenary Bridge, would operate as three general purpose lanes in each direction for this assessment.

Key findings for the cumulative effects assessment were:

- as there is some overlap of the cross-city (west-east, west-north and west-south) functions performed by the WBTNI options and Northern Link, a small reduction in traffic use of Northern Link is forecast. This preliminary modelling indicates that the average weekday traffic use of Northern Link volume would reduce by 12.4%, from 75,900 vehicles per day in 2026 to 66,500 vehicles per day;
- Northern Link would continue to cater for similar strong, east-west travel patterns between the Western Corridor and the ATC in the cumulative scenario. Overall the predominant cross-city function provided by Northern Link between the west, east and north would be maintained;
- traffic reductions in the cumulative scenario would result with key roads such as the ICB, Gympie Road, and Gateway Motorway north likely to benefit from congestion relief. Increased traffic volumes are forecast for the Western Freeway and Centenary Highway (in line with the capacity upgrades that would be implemented on these corridors to feed a combination of Northern Link and WBTNI option 3); and
- this preliminary testing of cumulative effects indicates minimal change to the local streets and city distributors in the Inner West with the combination of Northern Link and the WBTNI projects.

[7] Proposed toll rates for these other facilities have not been published to date, so preliminary assumptions only have been applied in traffic modelling.

Construction effects on traffic and transport

A review of mitigation measures that have been used on similar projects such as the CLEM7 tunnel and the ICB has been carried out so that such mitigation measures could be used to reduce the impact of the construction of Northern Link on traffic and transport. The mitigation measures that would be used and would significantly reduce the construction effects of Northern Link on traffic and transport are:

- the use of a conveyor system to take spoil to the Mt Coot-tha Quarry so significantly reducing the number of spoil trucks that would access the worksites;
- spoil haul routes via the regional road network and not via local streets and residential areas; and
- maintaining the existing road capacity and connectivity by staging the construction sequence such that it would be possible to maintain the existing number of traffic lanes and connections to the local road network.

Mitigation measures would be implemented during construction and to manage impacts in the area surrounding the four connection areas, due to physical changes or temporary traffic management, or more widely due to construction traffic on haulage and delivery routes. These would be detailed in Construction Traffic Management Plans (CTMPs) prepared for each work area to describe the management and mitigation measures to be adopted, for approval by the relevant authorities. Preparation of these Plans will include detailed analysis of operational effects along affected routes and at affected intersections. The CTMPs would consider the convenience and safety of all road users, including public transport, pedestrians and cyclists. During construction, conditions around the work sites and on the haulage routes would be monitored, and the CTMPs modified as necessary to address any issues which arise. Key features of construction traffic management would include:

- construction works would be located in four areas: the Western Freeway worksite; the Toowong Connection worksite; the Kelvin Grove Connection worksite; and the ICB workarea. Access to all of the worksites is available directly from the regional road network;
- the operations of access points would be examined in detail in the CTMPs for each site. Access points would provide adequate tapers where merge and diverge facilities are provided for the acceleration and deceleration of spoil trucks. Suitable queuing capacity would be provided within each worksite to prevent vehicle queues from affected the road network;
- over the 45 month construction period, an average total of 450 workers in all worksites and areas would be on site during the daytime shift. Surface works would generally be carried out between 6.30am and 6.30pm, Monday to Saturday. Where required by the relevant approval sections within Brisbane City Council or the Queensland Department of Main Roads, some works on major roads would need to be carried out outside these hours to minimise traffic and transport impacts. Underground work would continue 24 hours a day;
- the majority of the spoil would be taken by conveyor to the Mt Coot-tha Quarry so significantly reducing the amount of spoil to be transported by truck. For the remaining spoil three potential locations have been identified. A spoil site at Swanbank would be used for spoil from the Western Freeway and Toowong worksites. Sites at Port West Estate and Fisherman Islands at the Port of Brisbane would be used for spoil from the Kelvin Grove worksite and the ICB workarea;
- in order for spoil trucks and other heavy loads to avoid using the Mt Coot-tha or Toowong Roundabouts to turn in order to travel west from the Western Freeway worksite towards spoil sites a cross passage tunnel could be constructed when the worksite is established. This cross passage tunnel could also be used for spoil trucks to access the Western Freeway worksite from the Toowong Connection worksite;

- haulage is proposed to be carried out 24 hours a day for the five working days, and 12 hours on Saturday to 6.30pm, in order to minimise impact on traffic flows. With this arrangement the following number of average hourly loaded truck movements have been estimated to be generated from each worksite:
  - Western Freeway worksite – 3.5;
  - Toowong Connection worksite – 2.5;
  - Kelvin Grove Connection worksite – 2.7;
  - ICB workarea – 0.1.

  This level of traffic would be a very small compared to current traffic volumes, and is unlikely to significantly affect traffic flow on the haul routes. Delivery traffic is expected to be substantially lower than haulage volumes, and the delivery routes are, similarly, not expected to be adversely affected.

- staging of works at all sites would allow the existing number of through lanes to be provided past the sites at most times, though temporary alignment changes would be required. As a result, the level of through traffic intrusion into adjacent areas is expected to be small. Occasional short duration partial closures would be likely, for example for intersection works. These would be scheduled to minimise their impact;
- the identified workforce is expected to generate a parking demand of approximately 350 vehicles. The majority of workforce car parking would not be provided at the worksites but at convenient locations close by from where the workforce would be taken to the worksite by a shuttle bus. Workforce parking and associated management for surrounding residential or commercial areas, addressing issues such as safety, access and amenity, will need to be fully addressed in CTMP prepared by the construction contractor.

  Each worksite would also provide a small number of parking spaces for visitors and deliveries;

- bus routes and schedules would not be affected by construction. Bus stops at the Toowong Connection and Kelvin Grove Connection worksites would be affected by construction works and they would require temporary relocation during construction of Northern Link.

  Construction of Northern Link would not affect bus operations on the Inner Northern Busway;

- emergency service vehicle routes would not be affected by the construction of the project. This includes access to the Wesley Hospital in Auchenflower and the Royal Children’s Hospital and the Royal Brisbane and Women’s Hospital in Herston;
- pedestrian and cyclist access, including pedestrian crossings, would be maintained around all work areas, though some temporary diversions would be required and these should be detailed in the contractors CTMP.

  The Western Freeway bikeway and the Toowong Cycle and Pedestrian Overpass, which is currently being constructed, would remain operational during construction of Northern Link, with only occasional night time or some weekend closures required

  The bikeways on both the northern and southern side of the ICB would remain operational. Realignment of the bikeway on the southern side would be required. The bikeway on the northern side, in the vicinity of Victoria Park Road may need some temporary re-alignment and the occasional night time or weekend closure;

- the construction of Northern Link would not impact on rail infrastructure and operations, including access to QR property. Minor work at the QR access on the ICB in the vicinity of the Landbridge would be required. These works would not affect access to QR property;

Conclusion

It is evident that from a traffic and transport viewpoint Northern Link would fulfil a range of traffic and transport needs and support the Project objectives:

- Northern Link would provide a motorway standard link between the Western Freeway and the ICB that would remove the need to travel through the Brisbane CBD for cross-city movements between the west, north and east of Brisbane. Northern Link would predominantly cater for cross-city travel representing over 80% of all trips and 95% of commercial vehicles trips;
- Northern Link, in conjunction with the Centenary Highway, Western Freeway, ICB and Airport Link would provide a motorway standard corridor between the far south-west, the Western Corridor and the central city, the ATC, north Brisbane and the strategic road network to the north for long distance freight and regional freight distributors. This would provide an alternative freight route to the Brisbane Urban Corridor and the regional roads in the inner west and improve travel times and reliability for freight;
- by redistributing travel to motorway standard routes from the local road network Northern Link would reduce congestion and improve travel time reliability on the regional roads through the inner west. There would be an overall reduction in crashes on major roads in the inner west;
- Northern Link would relieve congestion on the existing major bus routes on Coronation Drive and Milton Road that would improve bus journey times and reliability and could assist in increasing public transport operations. Northern Link also provides the opportunity for express bus services from the Western Corridor and Brisbane’s western suburbs to be routed through it to access the Inner Northern Busway and the CBD; and
- connectivity to the activity centres within the inner western suburbs such as Toowong, Indooroopilly and the University of Queensland at St Lucia would be improved. Forecast traffic reductions on the surface road network in the inner western suburbs would provide the opportunity for improvements to the active transport and public transport networks within the inner western suburbs.

While some adverse effects have identified and assessed, the traffic and transport study shows clear support for the projects objectives and in particular for providing for cross-city movement of people and freight.

1. Introduction

This technical report presents an assessment of the traffic and transport effects of the proposed Northern Link Project. The project is predominantly an underground toll road proposed between Brisbane's western suburbs and Kelvin Grove.

The primary objectives of Northern Link are:

- provide an effective and convenient bypass of the Brisbane CBD for cross-city movement of people and freight;
- address, in part, deficiencies in the national freight network to improve freight distribution in and around Brisbane;
- improve safety and reliability of the regional road network and provide relief to congested roads in Brisbane's inner western suburbs;
- provide opportunities for additional public transport network capacity; and
- support the achievement of a sustainable urban environment for the inner western suburbs.

Northern Link is part of TransApex, Brisbane City Council's proposed tri-axis based framework of strategic cross-river and orbital road links that would allow Brisbane's cross-city travel movements to bypass the Central Business District (CBD) and inner suburbs.

Northern Link is identified in the South East Queensland Infrastructure Plan and Program (SEQIPP), developed to guide infrastructure planning and investment to support the preferred pattern of development in the South East Queensland Region. It is flagged as a potential road infrastructure improvement that would provide relief to congested road links, connect activity centres and provide a sound basis for future traffic management within the Brisbane Metropolitan area (refer **Figure 1-1**).

The project, as shown in **Figure 1-2**, is planned to connect between the Western Freeway at Toowong and the ICB at Kelvin Grove. It is also planned to have a connection to the northern regional radial road of Kelvin Grove Road at Kelvin Grove and to provide a connection to activity centres in the inner western suburbs such as Toowong, Indooroopilly and the University of Queensland (UQ) in St Lucia.

The components of project TransApex are shown schematically in **Figure 1-3**. They were examined in detail in the TransApex Pre-Feasibility Report and are:

- Clem Jones Tunnel (CLEM7) – a cross-river tunnel linking the Pacific Motorway through to Lutwyche Road and the ICB. Construction of the CLEM7 is in progress and the facility is planned to be open for traffic use by 2010;
- Airport Link - a mainly underground link continuing northwards from the CLEM7 alignment and providing connectivity between the inner city, Brisbane's northern suburbs and Brisbane Airport. Construction is due to commence on Airport Link in the latter half of 2008, with the facility open for traffic use by 2011;
- a Hale Street-South Brisbane Link - a cross-river toll bridge between Milton and South Brisbane. Construction of this link commenced in 2008 with completion due by 2010;
- Northern Link – a cross-town tunnel linking the Western Freeway with the ICB. This project is the subject of this EIS investigation, and if approved to proceed, construction could commence in 2010 and could open to traffic by 2014; and
- East-West Link – a cross-river tunnel linking the Pacific Motorway and eastern suburbs to the Western Freeway and mid-west region. The timing of this proposal is still subject to further investigation.

Northern Link is proposed as a strategic solution that would provide:

- support for regional economic and population growth identified by the SEQ Regional Plan. The Regional Plan plans for increased growth in the Western Corridor, designated economic activity centres, industrial growth centres and inner west suburbs (infill development and Transit Orientated Developments);
- transport infrastructure improvements between Ipswich/Western Corridor and the CBD/Australia Trade Coast (ATC) to address congestion, travel time and network efficiency issues as well as growth in travel demand;
- improved distribution, connectivity and movement of passenger and freight transport within and around Brisbane to meet national, state and regional objectives as well as anticipated growth;
- support for improved public transport and pedestrian/cycle networks;
- support for local planning initiatives in relation to improvement of amenity, character, and community connectivity and economic and residential growth;
- support for the growth of activity centres as well the development of inner city suburbs; and
- a more efficient road network which appropriately manages congestion and ensures traffic appropriately utilises the road hierarchy.

This technical report addresses the relevant traffic and transport matters raised in the *Terms of Reference for an Environmental Impact Statement* issued by the Co-ordinator General in accordance with the Queensland *State Development and Public Works Organisation Act 1971*. Chapter 4 of those Terms of Reference deals specifically with traffic and transport matters and is reproduced in Appendix A.

Whilst a detailed description of the project is contained in other specialist studies within the EIS, key features from a traffic and transport perspective are:

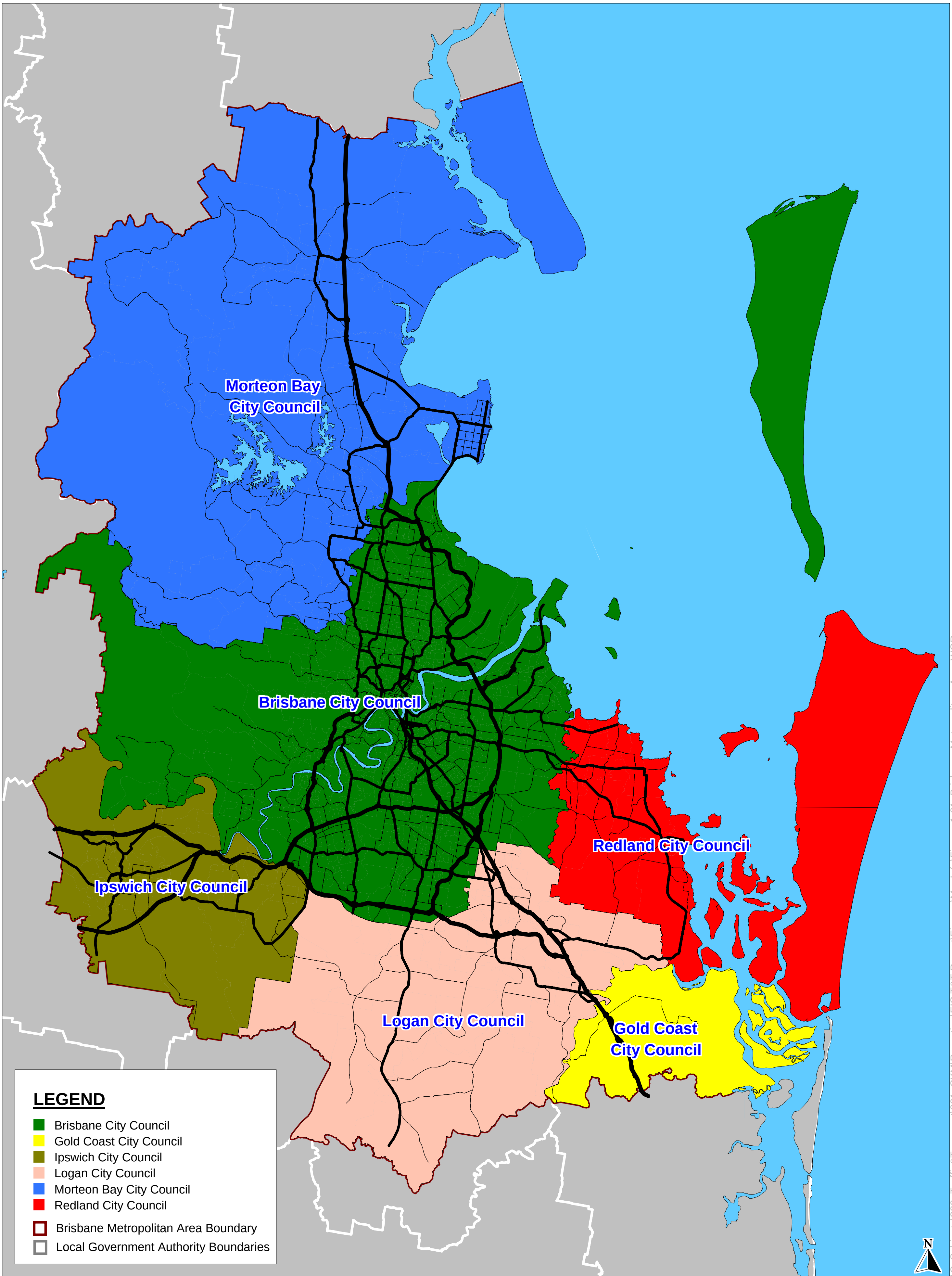
- the project would incorporate a parallel two tunnel road system, these tunnels comprising approximately 5 km of a total project length of 6km;
- the tunnels would be designed for two lanes of traffic with a posted speed limit of 80km/h;
- there would be two main connections to the surface road network – the Western Freeway connection at Toowong and the ICB connection at Kelvin Grove. There would also be additional connections at Toowong to connect traffic with Milton Road and Croydon Street, and a direct connection with Kelvin Grove Road at the eastern end. The project would provide connection between key elements of the urban road network managed by the Brisbane City Council (BCC) and the Department of Main Roads (DMR);
- the project would be operated as a toll road with an electronic system used for toll collection;
- for the EIS assessment, the cost of the toll has assumed to be $3.93 (expressed in $2008 including GST). This is within the toll range considered within the Business Case for the project; and
- if Northern Link is approved to proceed, construction would start in 2010 and finish by 2014.

Further information on the project features is contained in **Section 2**.

1.1 Limitations

The SKM-CW Joint Venture (JV) derived the data in this report primarily from inputs provided by Council. The passage of time, manifestation of latent conditions or impacts of future events may require further and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

The traffic model described here-in has been based on available information from a number of sources including investigations by others and, in some cases, for other projects. Reports prepared by other specialists (including those reports referred to in this report or specifically identified as having been used as input into the study) have not been subject to independent checking and may contain inaccuracies or be based on assumptions that are not applicable to Northern Link.



LEGEND

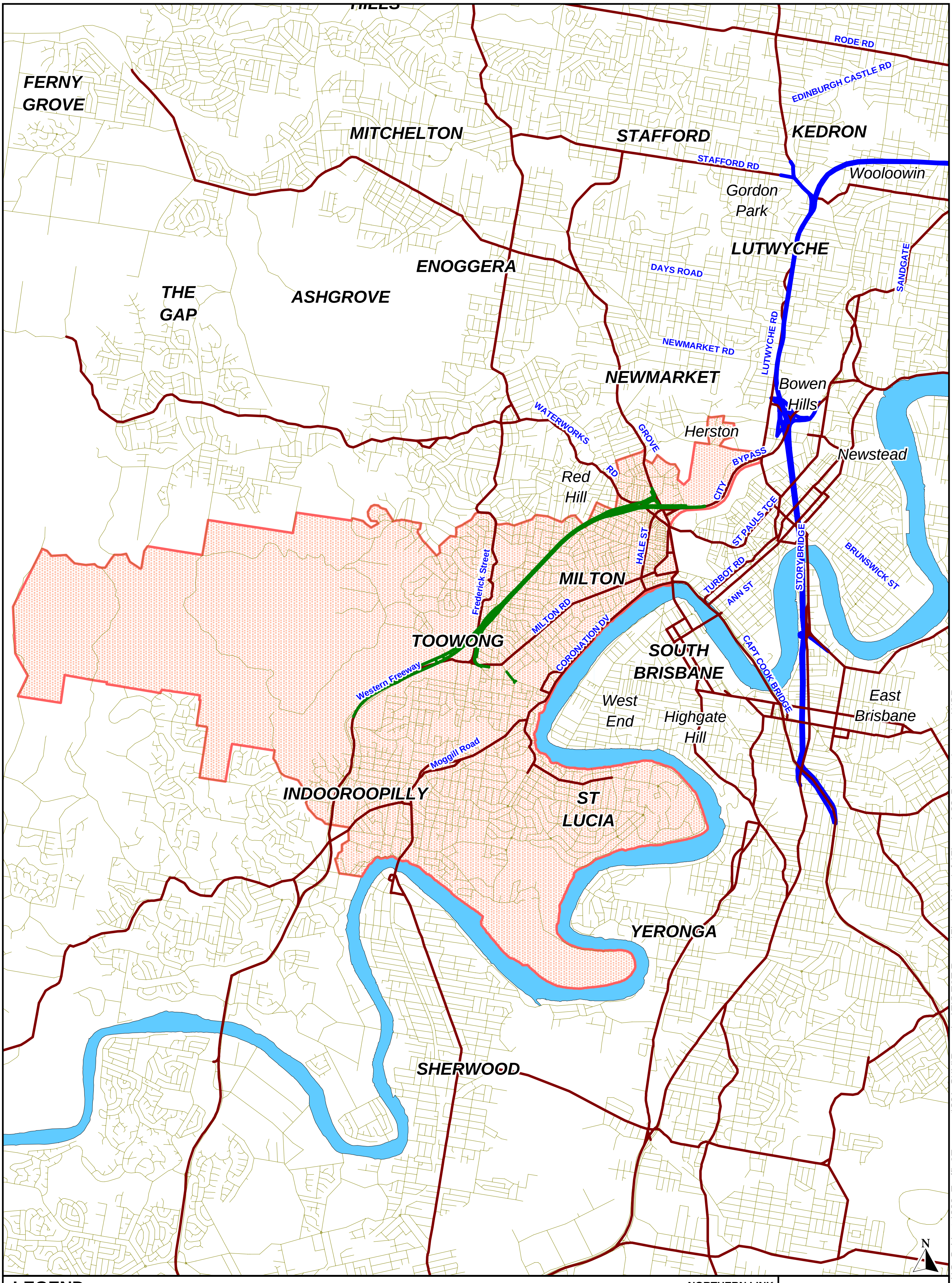
- State Strategic
- Regional Ring/Radial
- City Distributor

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 1-1

Brisbane Metropolitan Area

Northern Link
SKM Connell Wagner
JOINT VENTURE



LEGEND

- Northern Link
- Airport Link & North-South BypassTunnel
- Motorways and Arterial Routes
- Other Roads

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 1-2

Project Location

Northern Link
SKM Connell Wagner JOINT VENTURE

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TRANSAPEX LINKS

Indicative location of the TransApex links investigated during the prefeasibility study

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 1-3

TransApex Projects

2. Study Methodology

2.1 Technical Approach

A consistent and clearly defined approach was used to examine the traffic and transport effects of the project. The following tasks were undertaken:

- areas likely to be affected by traffic and transport aspects of the project were defined;
- data relevant for use in the study was collated (via identification of available data or new surveys), and the relevance and accuracy of that data critiqued for application in the assessment of existing conditions and the project effects;
- traffic and transport demand modelling and forecasting approaches were established (either undertaken as part of this assessment or adopted from previous studies considered reliable and relevant), including the processes of model validation and sensitivity testing of the modelled results to test their robustness;
- using the compiled information and the validated and tested transport models, existing and forecast conditions were analysed and documented for the transport network without and with the project; and
- the differences between the derived forecast conditions for scenarios without and with the project were assessed. These differences provided the measure of the effects of the project on traffic, public transport, cyclists and pedestrians.

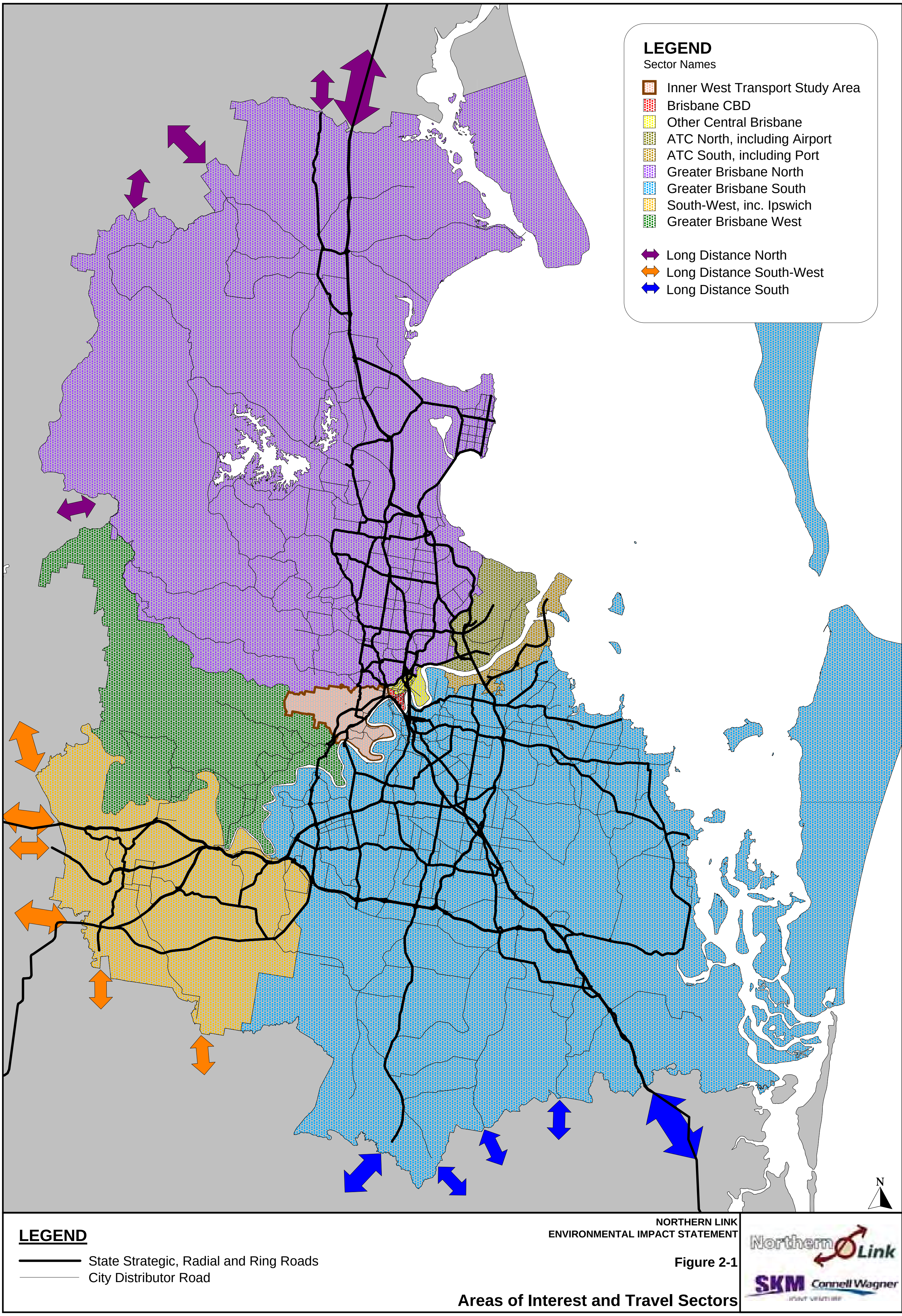
The approach to key tasks is further detailed in the following sub-sections.

2.2 Areas of Interest

A study corridor was defined for the project and has been used consistently in the other Environmental Impact Study (EIS) documents. This term has also been used generically in the report, however to enable an examination of the breadth of traffic and transport effects a range of areas of interest has been established.

The following areas are considered in this report as shown on **Figure 2-1** and **Figure 2-2**:

- *Central Brisbane* - the zone of extensive commercial and other activity in the centre of Brisbane, for this study designated as coinciding with City, Fortitude Valley, New Farm, Newstead, Spring Hill and Bowen Hills South Statistical Local Areas (SLAs). This area includes the CBD;
- *Inner West Transport Study Area* – an area defined initially for the purposes of examination of the localised effects on traffic and transport of the project. It encompasses suburban areas to the west of the CBD where local effects of the project require consideration and includes the suburbs of Milton, Paddington, Auchenflower, Bardon, Toowong, Taringa, Indooroopilly, St Lucia and parts of Kelvin Grove and Herston. The boundaries of this area have been selected to coincide with zones within the Brisbane Strategic Transport Model (BSTM) and it covers an area of 40km^2. This study area includes the Northern Link study corridor. Reference locations for reporting of traffic data in the Inner West Transport Study Area are shown in **Figure 2-3**; and
- The *Brisbane Metropolitan Area* or Brisbane Statistical Division (BSD) - the City of Brisbane and the surrounding area extending to Caboolture in the north, Beenleigh in the south, Ipswich to the west and Redland City Council to the east. This enables consideration of strategic transport network implications of the project as well as areas of influence outside the EIS study corridor, such as the CBD, the ATC, which includes Brisbane Airport and most of the Western Corridor including Ipswich. It covers an area of 4,600 km^2.



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 2-1

Areas of Interest and Travel Sectors

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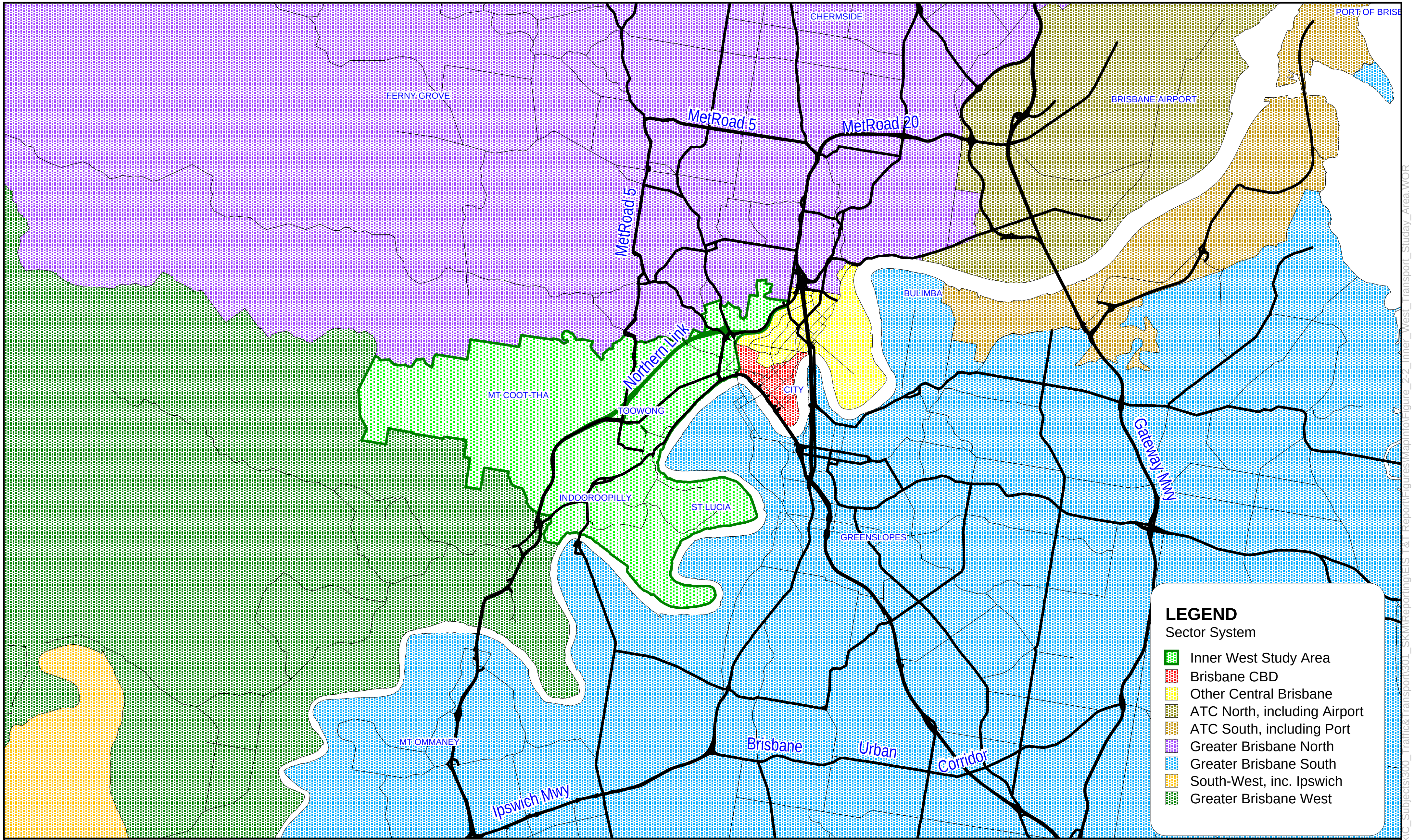


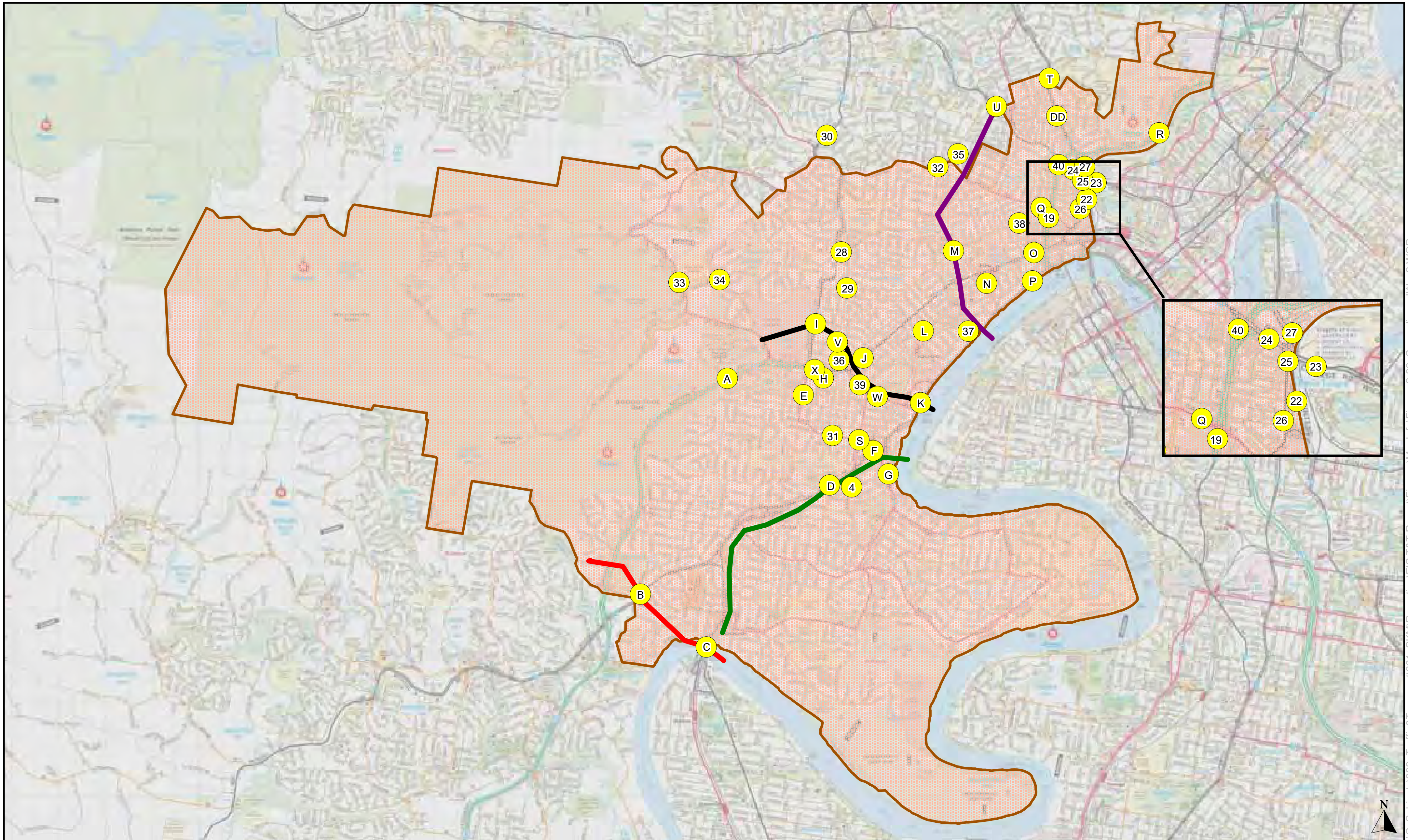
LEGEND

- Northern Link
- State Strategic, Regional and Ring Road
- City Distributor Road

Northern Link
Environmental Impact Statement

Figure 2-2

Inner West Transport Study Area



LEGEND

- Indooroopilly Screenline
- St Lucia & University Screenline
- Toowong Screenline
- Milton Screenline
- Reporting Points
- Inner West Transport Study Area

Northern Link
Environmental Impact Statement

Figure 2-3

Inner West Transport Study Area Reference Locations

Northern Link

SKM Connell Wagner JOINT VENTURE

The Brisbane Metropolitan area represents a standard defined geographic area used for examination of traffic and transport issues in the Brisbane context. The Central Brisbane area, as defined here, represents a grouping of key activity areas including the CBD, which enable the effects of the project, particularly at its eastern connection, to be identified.

The Inner West Transport Study Area, as defined for this study, represents a project specific traffic investigation footprint that enables the existing conditions, future base conditions and the potential effects of the project to be more satisfactorily described.

2.3 Data Collection

In order to describe existing traffic and transport conditions, develop and validate the traffic forecasting model and analyse local traffic effects, a range of observed traffic and transport data was collected. Data was used in various assessments covering all modes of travel within the transport network. These included car drivers and passengers, commercial vehicles, public transport, and pedestrians and cyclists, as described in subsequent sections of the report. Data included:

- Road Network Data: number of lanes and lane types (including short lanes, transit/bus lanes), intersection location and type, key intersection geometric layouts, signal and phase timing data, banned turns, signalised pedestrian crossing locations and phasing, aerial photographs and kerb lines.
- Public Transport Service Data: service routes, bus stops, infrastructure and operational frequencies for different time periods.
- Pedestrian and Cycle data: on and off road pedestrian facilities and observed count data at various locations.
- Traffic Counts: recent historical count data for intersections and mid-block counts (minimum of one week) sourced from Main Roads, Council's Brisbane Linked Integrated Signal System (BLISS) and project specific surveys conducted in October 2007.
- Journey Time Data: road travel journey time data collected in project specific surveys, conducted in October 2007, and bus travel times from BLISS for October 2007.
- Bus Patronage: ticketing information supplied by TransLink Transit Authority (TransLink) and patronage data sourced from previous studies.
- Road Accident Data: a five-year historical accident database (2001-2006) of the Brisbane local government area, supplied by BCC.
- Behavioural Driver Data: surveys, using both revealed and stated preference techniques, undertaken in recent years for other TransApex project studies (Airport Link, Hale Street Link, CLEM7) to obtain information on driver route choice and the effect of tolls.

2.4 Transport Modelling, Validation and Forecasting

The study has used models to assist with the technical assessment of traffic and transport effects of the project, for example by:

- supplementing observed data to describe existing traffic flows and traffic conditions, using information extracted from a validated base year model for which observed traffic volumes and travel speeds and public transport demands have been compared to modelled results;
- using a strategic transport model to forecast traffic conditions at specific years in the future, by modelling transport and traffic demand based on land use (in the form of demographic descriptors), travel

characteristics, road infrastructure, public transport services and road tolls. This model has been termed the Northern Link Traffic Model and is based on the Brisbane Strategic Transport Model (BSTM);

- predicting changes in travel demand, travel times, speeds and the operating level of the service of the road network with the project, and comparing differences without and with the project, using the strategic model; and
- undertaking local traffic modelling using the intersection analysis tool SIDRA with data extracted from the strategic transport model.

A detailed description of the traffic forecasting process is given in Section 6. Model validation details are provided in Appendix C Northern Link Traffic Model Development and Network Assumptions.

Forecasting of traffic demand has been carried out for the year of opening 2014 and for 2016, 2021 and 2026. Performance statistics are comprehensively reported for the year of opening 2014 and 2026.

3. Existing Transport System

3.1 Introduction

This chapter provides a description of the existing transport system with a focus on travel demand, the transport network and the transport services that are currently provided. Chapter 4 describes the performance of the existing transport system.

3.2 Travel Demand

Travel demand by mode is influenced by a range of factors such as the demographic characteristics of the region and Inner West Transport Study Area (**Figure 2-2**), land-use distribution and the transport system itself. These characteristics are discussed in the context of the project.

3.2.1 Population and Employment

In 2007, the Brisbane Metropolitan area had a population of 1.88 million persons. Population growth rates in the region have been strong, averaging 2.0% pa over the last 10 years.

An estimated 58,800 persons lived within the Inner West Transport Study Area (**Table 3-1**) in 2007, with an overall population density of 1,500 persons/km^2. This is a greater density than the Brisbane Metropolitan area average of 400 persons/km^2. The average household size of 2.1 persons in the Inner West Transport Study Area is lower than the metropolitan area average.

Employment in the area is summarised in **Table 3-1**. The Inner West Transport Study Area accounted for 6% of the region's employment in 2007 whereas Central Brisbane accounted for 15% of the 964,000 jobs within the Brisbane Metropolitan area. The ATC region is emerging as a significant future employment node for the region, particularly the ATC North precinct that includes Brisbane Airport.

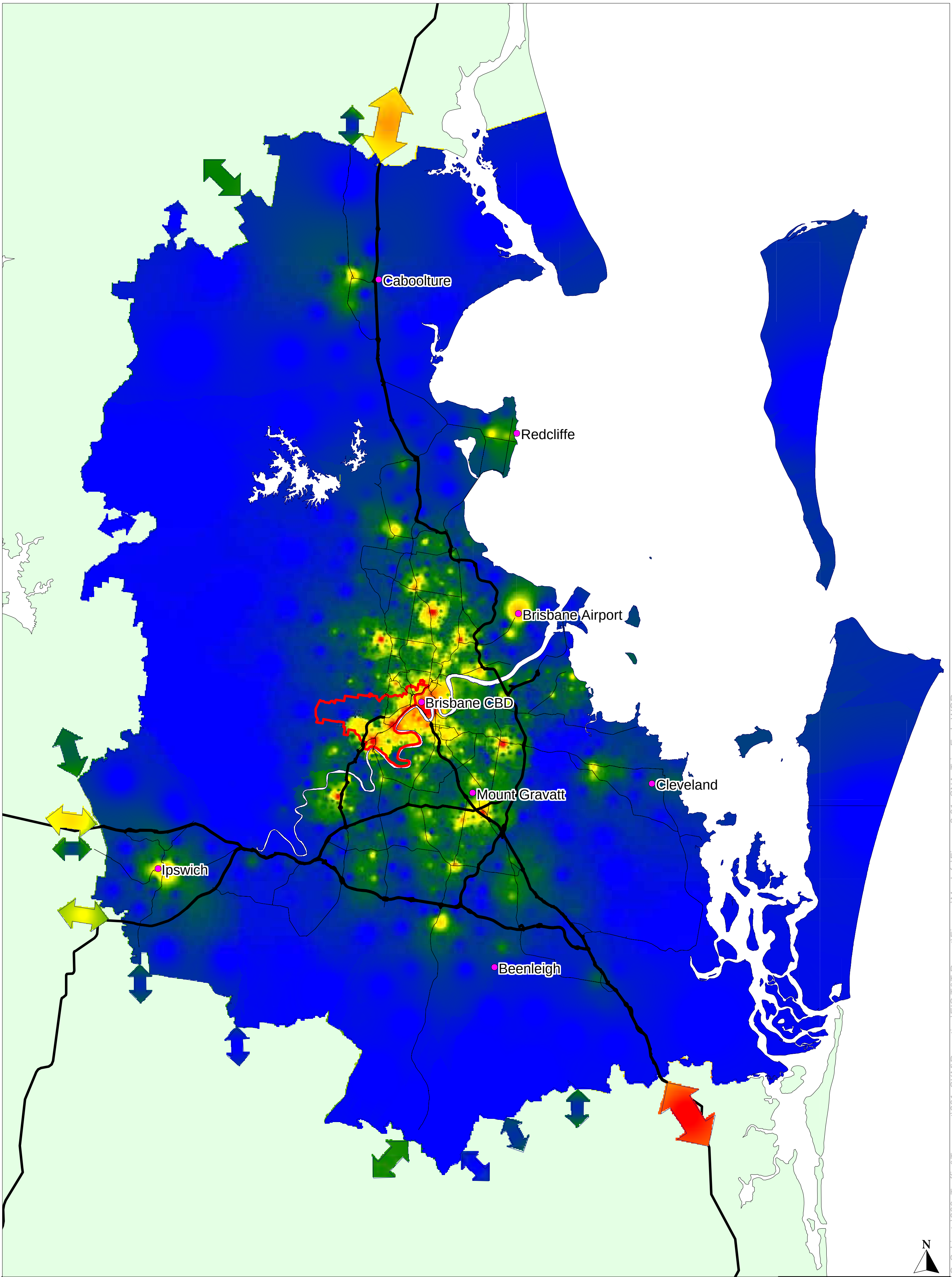
- **Table 3-1 Existing (2007) Population and Employment**

Parameter	Brisbane Metropolitan Area	Inner West Area
Total Persons	1,880,000	58,800
Area (km^2)	4,670	40
Density (persons/km^2)	400	1,500
Total Households	760,000	27,500
Person/Household	2.5	2.1
Total Employment	964,000	56,200
Central Brisbane Employment	146,000	N/a
ATC North Employment	33,600	N/a

Table Notes:
(1) PIFU Medium Series from SEQ Economic and Forecasting Study (2007).
(2) NIEIR employment opportunities SEQ Economic and Forecasting Study (2007).
(3) 2007 year data is interpolated.

3.2.2 Land Use and Trip Generators

A broad range of land uses within the local area and within the wider metropolitan area influence the demand for trip making in the Inner West Transport Study Area. Overall demands are illustrated in **Figure 3-1**.



LEGEND

Inner West Transport Study Area

State Strategic

Regional Ring/Radial

2007 Trip End Density

Trip Ends per square km

- 100,000
- 50,000
- 15,000
- 8,000
- 1,000

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 3-1

Existing Trip Generation

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Key land uses that generate travel demand within the Inner West Transport Study Area include:

- **residential land-uses** - the Inner West Transport Study Area is predominantly residential, varying widely in density and character with a good mix of more modern units and traditional "tin and timber" character housing. Higher density residential complexes occur along regional radial roads such as Coronation Drive and Milton Road as well as in the vicinity of the rail line and the Toowong centre. The Brisbane River forming the eastern part of the study area has high density living along its frontage stretching from Coronation Drive to St Lucia and the UQ. High density residential areas are also located along Swann Road and Sir Fred Schonell Drive in St Lucia. The area is dominated by the UQ but still maintains character housing in the southern part of the suburb with medium to low density housing in the northern reaches of St Lucia;
- **mixed land-uses:**
  - **Kelvin Grove Urban Village** is located immediately adjacent to the north east boundary of the Inner West Transport Study Area. The Kelvin Grove Urban Village is being developed by a partnership of the Queensland Department of Housing and the Queensland University of Technology (QUT) to transform an historic area of inner Brisbane into a vibrant new residential, educational and commercial precinct. The Urban Village is to be diverse city fringe community – a place where people connect, whether they come to live, work, study or visit.

    The Urban Village is bound by residential allotments to the south and north, by the QUT Kelvin Grove Campus and the Victoria Park Golf Course to the east and by Kelvin Grove Road to the west. Existing land uses with the Village include:

    - the recently completed Village Centre that includes a supermarket, specialty shops, cafes, restaurants and four residential towers;
    - Brisbane Housing Company housing lots;
    - QUT childcare centre;
    - QUT's Institute of Health and Biomedical Innovation, with inter-disciplinary research and development;
    - other QUT uses including the QUT creative industries facilities; and
    - La Boite Theatre Company.

    Full development of the Urban Village is expected to be reached by 2010.

    The Urban Village has identified a transport vision[8] as:

    "Ensure that people using the Urban Village can be less reliant on car borne transport solutions than the population of the inner Brisbane Suburbs. The preferred choice for travel to and from the Urban Village should be walking cycling or public transport."

    The Urban Village is located 2km from the Brisbane CBD and is conveniently located next to the Kelvin Grove QUT Busway Station and bus services that operate on Kelvin Grove Road. Main vehicular access points are from Kelvin Grove Road via Blamey Street and Musk Avenue and from the ICB via Victoria Park Road (left in and left out only). The Urban Village has just 2,000 existing or approved car parks and the QUT Kelvin Grove Campus has over 1,100 car parks.

[8] Cardno Eppell Olsen (2007) *Kelvin Grove Urban Village Transport Strategy*.

- **retail land-uses** such as:
  - **Toowong centre** is situated approximately 4 km west of the Brisbane CBD and is denoted as a Major Centre in the SEQ Regional Plan. The compact centre is primarily concentrated to the Lissner Street, High Street, Jephson Street and Sherwood Road blocks and is dominated by Toowong Village. Toowong rail station is located within Toowong Village. Bus stops are located on High Street, Benson Street and Sherwood Road.

    Toowong Village has a gross lettable area of 46,300 sqm and 1,650 car parks that are used by visitors to Toowong Village, and also includes a "park and ride" facility for rail commuters. Access to the Toowong Village car parks is constrained as it can only be accessed from either Sherwood Road or Lissner Street. The regional radial roads of Benson Street, High Street and Coronation Drive currently cater for traffic generated by Toowong Village and Toowong centre.
  - **Indooroopilly centre** is located 6km to the west of Brisbane CBD. Its immediate locality is west of Indooroopilly rail station and Coonan Street and south of Moggill Road. It is a Principal Activity Centre in the SEQ Regional Plan.

    The core of the town centre is primarily retail and is dominated by the Indooroopilly shopping centre. The shopping car parks can be accessed directly from Moggill Road, Station Road and Coonan Street via Belgrave Road. A bus interchange is located at the Station Road end of the Shopping Centre. Both the shopping centre and the bus interchange are separated from the rail station by a five minute walk.

    The Indooroopilly shopping centre is visited by some 13 million people per year and has a total retail area of 81,400 sqm and 3,700 car parks.[9] Indooroopilly shopping centre is therefore a significant generator of vehicular traffic during trading hours, with key traffic access routes via Moggill Road and Coonan Street.
  - **Park Road** entertainment precinct, linking Milton Road to Coronation Drive provides entertainment and dining locations that are highly used by the surrounding suburbs. Park Road is adjacent to Milton railway station and is easily accessible by public transport. Proposals currently exist for urban renewal of Milton Railway station, which include a transit orientated development over the station.
- **educational land-uses** such as:
  - **the University of Queensland** (UQ) at St Lucia is a major generator of private vehicle and public transport trips within the Brisbane region. In 2007 the St Lucia campus had 4,300 staff (full-time equivalent) and 34,500 students[10]. The campus provides 5,800 car parks controlled by permits issued to staff and students subject to availability.

    UQ has a broad student catchment throughout Brisbane with a particular concentration on the western side of the Brisbane River within close proximity of the campus. UQ is well served by buses that access UQ via St Lucia and from the Eleanor Schonell Bridge. The Eleanor Schonell Bridge was opened in 2007 and provides a bus connection to the eastern and southern sides of the Brisbane River that facilitates frequent bus service via the South East Busway to the CBD, Eight Miles Plains and Sunnybank Hills. A fourth route serves the eastern suburbs to Carindale.

    During term times, UQ generates a significant degree of counter-peak direction traffic demands on the bus, rail and road links from the CBD through the Inner West Transport Study Area.

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9 www.indooroopillyshopping.com.au 2007.

10 www.uq.edu.au 2007

- **Queensland University of Technology** (QUT) has a total population of over 40,000 students and 3,500 staff[11]. QUT has a major campus in Kelvin Grove and can be accessed from both Kelvin Grove Road (via Musk Avenue and Blamey Street) and the ICB (left in and left out only via Victoria Park Road).

  The campus is located adjacent to the QUT Kelvin Grove Busway station on the Inner Northern Busway and the campus can be also be accessed by bus routes that serve Kelvin Grove Road and Musgrave Road. There is also a frequent bus shuttle between the QUT Kelvin Grove campus and the Gardens Point campus. The campus is a 15-minute walk from the Roma Street Transit Centre. Car parking is limited with 1,100 spaces available. Staff parking spaces are allocated through a permit system with each faculty having a designated quota. Car park permits are not available for students. There are just over 800 public car parks available to students, visitors and staff that operate on an hourly or daily fee basis. The campus is part of the Brisbane Central Traffic Area that restricts on-street parking.

- there are many **schools and colleges** throughout the Inner West Transport Study Area that generate trips during term times, before and after school hours. In 2007 there were 4,200 primary enrolments and 4,400 secondary enrolments. The schools are located in the following suburbs:
  - Bardon - Rainworth Primary, Bardon Primary, Stuartholme College;
  - Milton - St Francis Theological College, Milton Primary, Marist College Rosalie;
  - Toowong - Brisbane Boys College, Toowong College, St. Ignatius Primary;
  - St Lucia - Ironside Primary; and
  - Indooroopilly - Indooroopilly Primary, Indooroopilly High, St Peter's Lutheran Primary, St Peter's Lutheran College.

- **industrial Land Uses** within the study area includes sites located to the east of the bus depot at Toowong. The Toowong-Indooroopilly local plan indicates that the small amount of industrial land along Milton road may not be the best use of the land and be redeveloped into low-medium density residential area in the future;
- **Castlemaine XXXX Brewery** located opposite the Milton Railway Station is of significant cultural and historical value in addition to generating freight and work trips;
- **the Wesley Hospital** is located on the corner of Coronation Drive and Chasely Street in Auchenflower and employs over 1,900 full and part-time staff and serves more than 75,000 patients a year. It has relatively direct access to the regional radial routes of Coronation Drive and Milton Road. Chasley Street provides the primary access to the hospital with another access being located via Patrick Lane.

  Recent studies[12] reported that the hospital has a provision for approximately 1,200 car parks and these operate at capacity between 11am and 3pm each day. Further, the hospital contributes to the high level of on-street parking in the catchment bordered by Patrick Lane/ Dixon Street, Coronation Drive, Park Road and Eagle Street.

  Public transport can be accessed through the adjacent Auchenflower rail station, the bus services on Coronation Drive and Milton Road and the Regatta CityCat ferry terminal located opposite Sylvan Road.

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[11] www.qut.edu.au 2008

[12] TTM Consulting (March 2006) *Proposed Car Park Expansion and Medical Suites, Wesley Hospital, Auchenflower, Traffic Engineering Report*

In January 2007, BCC approved Stage 1 of a five year master plan to expand and modify the function of the hospital. Stage 1 includes an additional 480 car parks through the expansion of the existing multi-level car park. The additional car parks will provide an increased parking supply rate and this may reduce local parking pressures.

- the **Suncorp Stadium** was redeveloped in 2003 and has an all seated capacity of 52,500. It is located in Milton, less than 2km from the CBD. As only 200 car parks are available patrons are encouraged to use public transport to access the stadium. Hence, a stadium Transport Management Plan (TMP) was developed to manage the additional pedestrian and general traffic in and around the stadium on event days. Key objectives of the TMP are to:
  - maximise public transport use for travel to and from the Stadium, while actively discouraging reliance on private car travel;
  - minimise the risk of local and regional traffic disturbance and public transport operations before, during and after events;
  - safeguard local residents and businesses from the effects of undesirable crowd and traffic intrusion before and after events; and
  - minimise the risk to public safety within the Stadium and on the plazas and walkways serving the Stadium.

  The re-development of the stadium was accompanied by pedestrian and public transport infrastructure upgrades within and around Milton. On event days a number of initiatives to facilitate the safe movement of pedestrians and to provide priority to buses whilst minimising the impact on other traffic are put in place. These include full and partial road closures, creation of alternative pedestrian routes, bus priority, intersection control and designated areas for coaches, limousines, taxis and disabled person parking.

  The TMP consistently achieves a public transport mode share of over 80% for trips to and from the stadium for most events; and
- various local parks, small urban commercial and shopping areas are scattered through the study area.

Key land uses that directly influence through traffic demands within the Inner West Transport Study Area include:

- Central Brisbane, including the CBD;
- the Brisbane Airport and ATC region to the north east, key travel generators that attract traffic from the wider region and interstate, including via routes from the Cunningham and Warrego Highways to the south-west;
- the Royal Brisbane and Women’s Hospital and Royal Children’s Hospital at Bowen Hills, and Chermside Regional Centre to the north;
- the western residential suburbs of Brisbane including Brookfield, Kenmore, Chapel Hill, Fig Tree Pocket, Jindalee, Mount Ommaney, Westlake, Middle Park, and Seventeen Mile Rocks; and
- the Western Corridor including Ipswich and Springfield to the south-west inclusive of large rapidly growing commercial, residential and industrial areas.

3.3 Brisbane Transport Network Overview

3.3.1 Transport Modes

The transport network in the Brisbane Metropolitan area comprises the following transport modes:

- road network;
- bus services, bus lanes, transit lanes and busways;
- rail network;
- ferry services;
- cycle facilities; and
- pedestrian facilities.

3.3.2 Road Network

The existing road hierarchy for Brisbane is shown in **Figure 3-2** and within the Inner West Transport Study Area in **Figure 3-3**. The system is characterised by a strong radial road network, with regional roads operating radially from the Central City area (including the CBD) to the outer Brisbane suburbs. The radial links also connect to the CBD river crossings and thus also cater for cross-city travel. Coronation Drive, Milton Road, Musgrave Road and Kelvin Grove Road are radial links that cater for a mix of commuter, cross-city and local traffic. The Queensland Department of Main Roads (DMR) controlled Metropolitan Road 5 (MetRoad 5) from Fredrick Street at the Toowong Roundabout to Stafford Road is a Regional Ring Road and is a secondary freight route that goes through and beyond the study area. The road network is discussed in more detail in **section 3.4**

3.3.3 Public Transport

The three main forms of public transport in Brisbane are bus, rail and ferry. All of these major forms of public transport exist within or close to the Inner West Transport Study Area. Bus routes, rail lines and stations and ferry terminals are shown in **Figure 3-4**.

North-south rail services operate close to the Milton Road, Coronation Drive corridor extending through Toowong and crossing the Brisbane River at the Walter Taylor Bridge, Indooroopilly. It is the only railway in the entire study area and continues to Ipswich in the South West. Bus services operate on Coronation Drive, Milton Road and Moggill Road, filling the major corridor gap between the single rail line. Bus services run at a high frequency to and from the CBD to destinations such as the UQ, Toowong and Indooroopilly and other western suburbs. Both Indooroopilly and Toowong act as hubs which serve feeder services from outlying suburbs, and the UQ towards the CBD.

Bus services operate on Kelvin Grove Road and Musgrave Road, generally providing radial services between the CBD and the northern suburbs. Buses that operate on Kelvin Grove Road are able to access the Inner Northern Busway at the Countess Street busway station via Ithaca Street.

CityCat ferry services also operate in the study area along the Brisbane River. The public transport network and services are discussed in more detail in **section 3.8**

Bus Network

The Brisbane bus network is mainly radial, consistent with the road network, although the expanding busway network and the use of integrated ticketing allows users to interchange between services to facilitate cross-city travel. Bus services utilise the regional radial routes as well as the Inner Northern Busway and South East Busway to reach the Brisbane CBD, with most services terminating in the Queen Street Bus Terminal or on Adelaide Street.

The Inner Northern Busway has recently been extended from its old access at the intersection of Countess Street and Roma Street to the Queen Street Bus Terminal. The extension opened in May 2008. The extension includes new busway stations at Roma Street Rail Station and King George Square. A new access to the Inner Northern Busway has also been provided as part of the extension on Upper Roma Street. This enables bus services from the west (Milton Road and Caxton Street) and the south via the Walter Taylor Bridge to access the Inner Northern Busway.

The extension to the Inner Northern Busway provides:

- improved travel times between the Queen Street Bus Station and Upper Roma Street - a reduction of up to nine minutes during normal traffic and up to 20 minutes in congested times;
- improved bus connections between the CBD, and the western, northern and southern suburbs;
- reduced inner city traffic congestion;
- improved consistency and reliability of bus services;
- features an underground turn facility, which will increase efficiency of bus operations;
- improved integration with the Transit Centre, the Roma Street Rail Station and bus services;
- features a modern underground station in King George Square; and
- increased capacity for growth of future bus services in the city centre.

A number of regional centres such as Garden City, Chermside, Indooroopilly and Toombul act as interchanging hubs for orbital, local and radial bus services.

The major bus corridors within the Inner West area are Coronation Drive and Milton Road with Moggill Road and the UQ feeding the two major routes. The Eleanor Schonell Bridge provides a direct bus link over the Brisbane River to the UQ from the eastern and southern suburbs. The bus network within the area is described in detail in Section **3.8.1**.

Construction of the Boggo Road Busway and the first section of the Eastern Busway have commenced and when completed in 2009 will link the Eleanor Schonell Bridge, and hence the UQ, to the South East Busway.

To the north east of the Inner West area Kelvin Grove Road and Musgrave Road are major bus corridors that serve northern suburbs.

Rail Network

A predominantly radial rail network serves Brisbane and its surrounding suburbs. All rail lines service the inner city stations of Roma Street, Central, Brunswick Street and Bowen Hills, which act as the four primary interchange points between services.

The Doomben, Airport and Shorncliffe lines service the northern suburbs, whilst the Caboolture line services the Sunshine Coast. The suburbs of Wilston and Windsor are serviced by the Ferny Grove rail line, which runs east – west through the southern section of the north of the City. South of the Brisbane CBD rail services operate to Cleveland (Eastern Suburbs), Beenleigh/Robina (Southern Suburbs and Gold Coast).

The Ipswich line, which connects Ipswich and the western suburbs to the CBD, is the only service to operate within the Inner West Transport Study area. Within the study area there are stations at Milton, Auchenflower, Toowong, Taringa and Indooroopilly station. More detail on rail services is given in section **3.8.2**

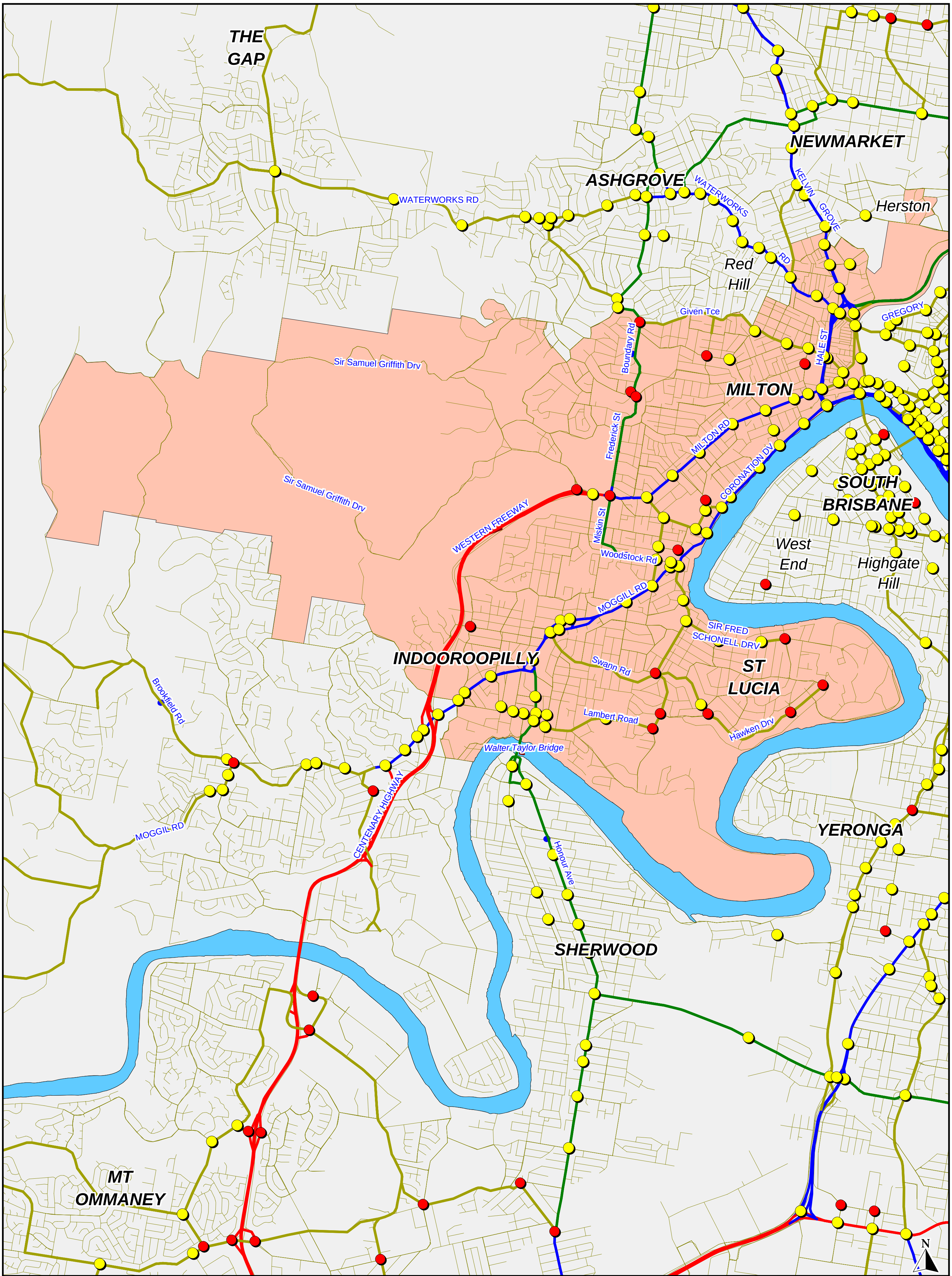
Ferry Network

The Brisbane CityCat catamaran ferry network operates between the CBD and the UQ campus at St Lucia with multiple stops along the way. These stops include the Regatta Ferry Terminal along Coronation Drive, Guyatt Park Ferry Terminal in St Lucia and the UQ Terminal along Sir William MacGregor Drive. More detail on the ferry network is provided in section **3.8.3**.

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 3-2

Existing Road Hierarchy



LEGEND

- Inner West Transport Study Area
- Signalised Intersection
- Roundabout
- City Distributor
- Regional Radial
- Regional Ring
- State Strategic

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 3-3

Inner West Transport Study Area Road Network

Northern Link
SKM Connell Wagner
JOINT VENTURE

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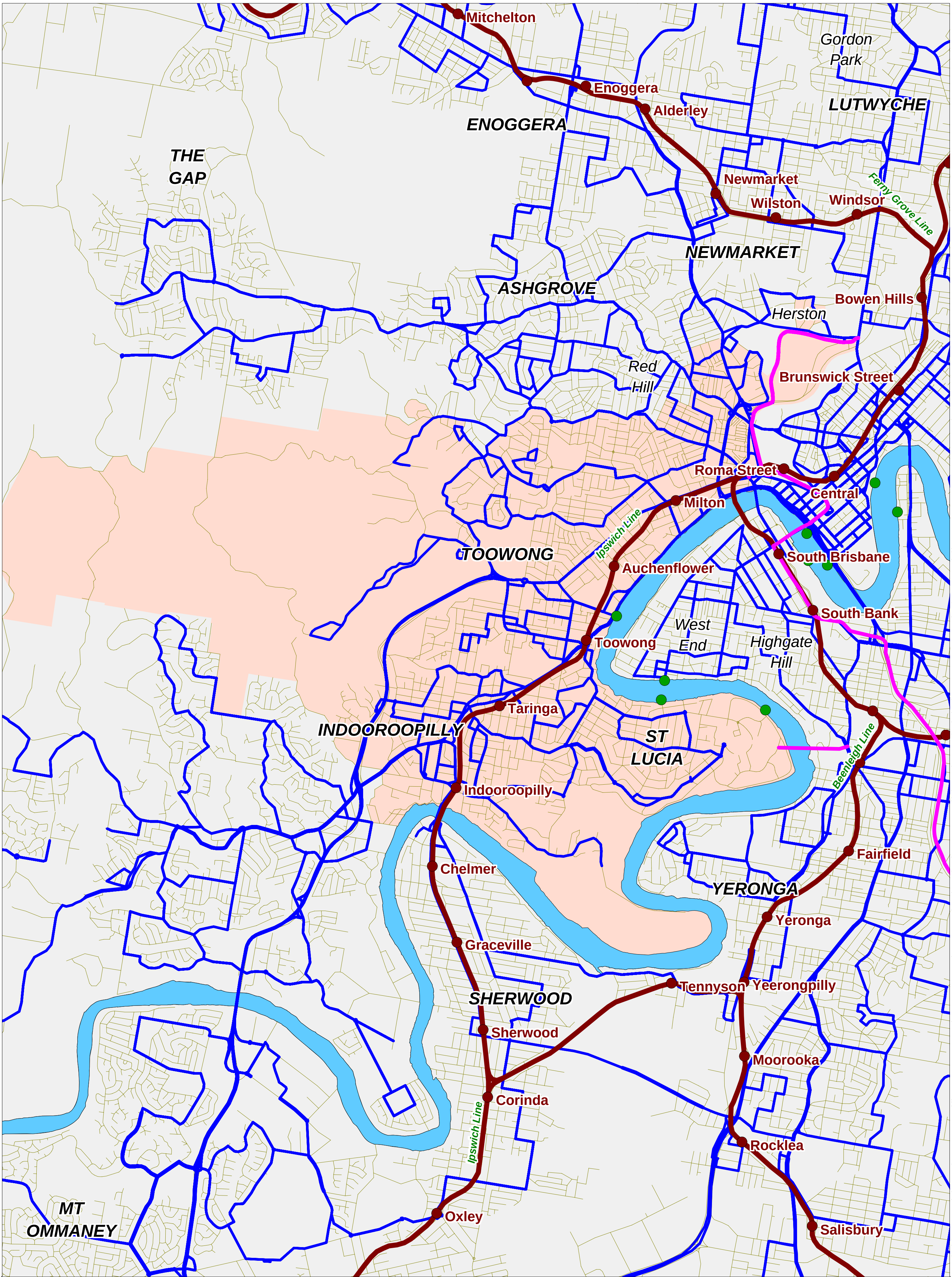

LEGEND

Inner West Transport Study Area
City Cat Jetties
Rail Stations
Rail Network
Bus Network
Busways

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 3-4

Existing (2007) Public Transport Network

Northern Link
SKM Connell Wagner JOINT VENTURE

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3.4 Road Network

The road network in the region that is within and affects the Inner West Transport Study area consists of national, regional, and local components.

3.4.1 National Transport Network

AusLink is an Australian Government initiative designed to achieve better national land transport planning, investment decision-making and funding. The AusLink Road network intends to provide for national and inter-regional trips for people and freight. The AusLink Transport Corridors in Brisbane are shown in **Figure 3-5** and are listed below:

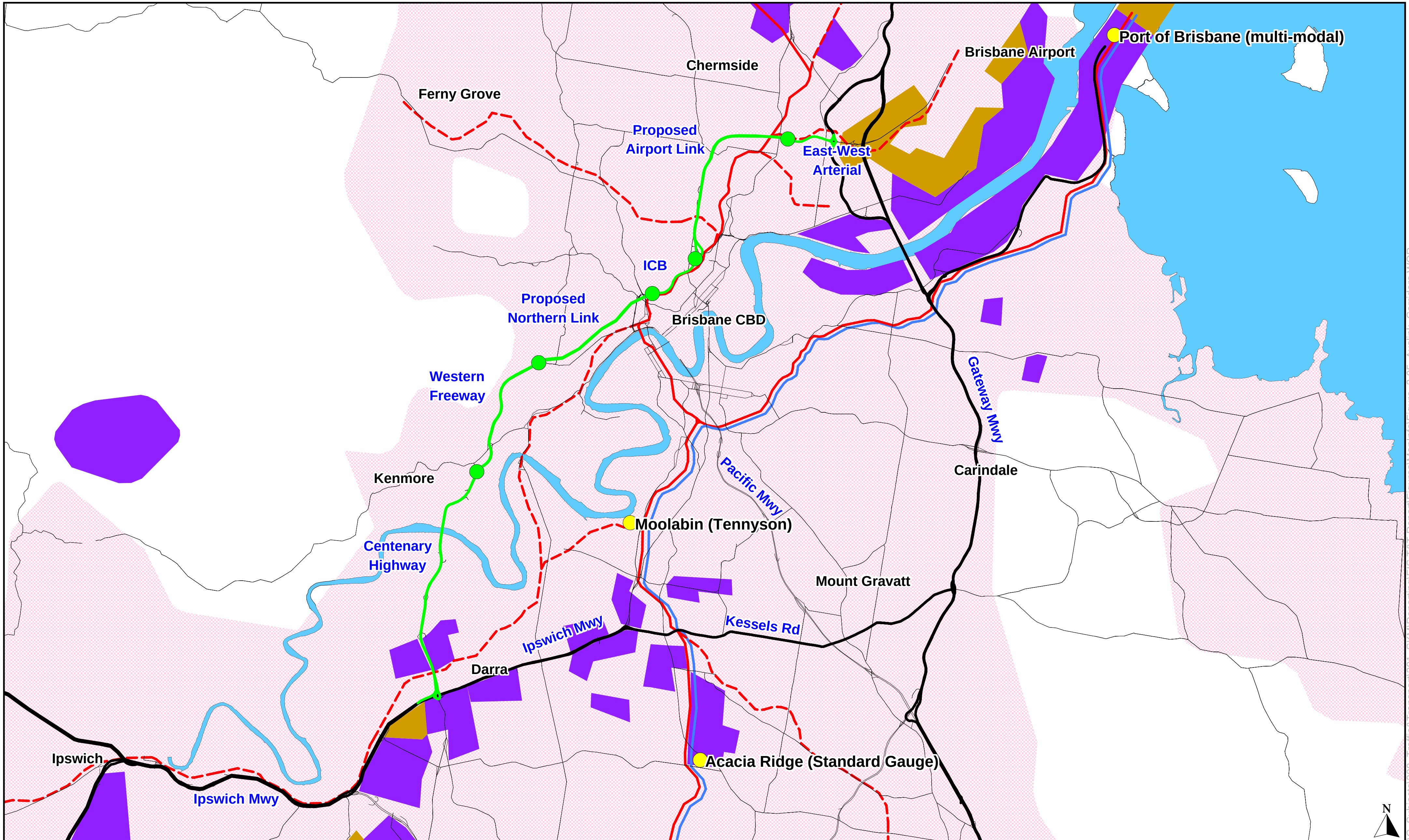
- Pacific Motorway - Logan Motorway to the Gateway Motorway;
- Gateway Motorway - Pacific Motorway to Gympie Arterial Road;
- Port of Brisbane Motorway - Gateway Motorway to Lytton Road to the Port;
- Ipswich Motorway - Cunningham Highway and Warrego Highway to Granard Road; and
- Granard Road, Riawena Road, Kessels Road, and Mt Gravatt-Capalaba Roads (commonly known as Brisbane Urban Corridor or BUC) to the Gateway Motorway.

The current national network route and primary freight route from the western gateway to the Gateway Motorway, known as the Brisbane Urban Corridor (BUC), is a highly congested route. BUC is comprised of a sequence of interrupted flow urban state strategic roads directly abutting and serving a range of local, urban land uses. These congested state strategic roads forming BUC include Granard Road, Riawena Road, Kessels Road, and Mt Gravatt-Capalaba Road.

Whilst the national route from the region's western gateway is via BUC, the natural desire would be for a line of travel, on a shorter route from the region's western gateway to Brisbane Airport and the ATC. In the inner west region this line is via the inner west suburbs and the urban regional radial roads of Milton Road and Coronation Drive.

The Western Freeway, Milton Road and MetRoad 5 are designated as secondary freight routes and Coronation Drive and Moggill Road are designated as tertiary freight routes.[13] There is a lack of high quality freight routes (primary freight routes) connecting the Western Corridor to the north, to the CBD or for cross-city freight. This results in freight using the secondary and tertiary freight routes that are located in the Inner West Transport Study Area.

[13]Brisbane City Council (March 2005) *TransApex Prefeasibility Report,* Brisbane City Council, Brisbane



LEGEND

Road Network
- AusLink Corridor
- Other Road
- Potential AusLink Brisbane North Urban Corridor

Rail Nework
- AusLink Rail Network - Standard Gauge
- AusLink Rail Network - Narrow Gauge
- Other Rail Line
- Freight Terminal

- Built up area
- Industrial Zoning, Feb 2006
- Future Industrial Land

Northern Link
Environmental Impact Statement

Figure 3-5

AusLink Transport Corridor in Brisbane

Northern Link
SKM Connell Wagner JOINT VENTURE

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3.4.2 Road Hierarchy and Function

The Draft Transport Plan for Brisbane 2006 – 2026 adopts a five-tier road hierarchy, as defined below. For cross-reference the earlier definition of road types included within the Transport Plan for Brisbane 2002 – 2016 is provided in brackets.

- State Strategic Road Network (Motorways) – these network elements provide connections for long distance travel between metropolitan areas and access to key activity centres, employment areas and principal terminals of non-road based modes. These roads essentially connect the Brisbane CBD, which provides the state's capital city and head office functions, with regional centres. They also allow regional manufacturing and export industries to access the ATC.
- Regional Radial (Arterial) – these links provide connections within the metropolitan area between the inner city, major residential communities and surrounding local authorities. They connect to the intra-state road network and reduce pressure from shorter distance trips. These links could also have a significant public transport line haul or freight function.
- Regional Ring (Arterial) – these elements of the network provide for movement in the metropolitan area that is not focussed on the CBD such as connections between surrounding local authorities and significant employment areas. These roads are likely to have significant freight function.
- City Distributor (Suburban) – these roads provide connections between communities and Major Centres. They also connect major land uses to the Regional network. These could also have a public transport priority function and freight function.
- Local Streets – in addition to providing private vehicle access, local streets have an open space function that residents use for other activities like walking, cycling or simply speaking neighbours.

The current road hierarchy for the Inner West Transport Study Area is shown in **Figure 3-3**.

The road network is characterised by a strong radial road network, connecting from the CBD area to the inner, middle and outer suburbs. The radial links also connect to the CBD river crossings and thus cater for cross-city travel. Coronation Drive and Milton Road within the inner west suburbs and Kelvin Grove Road and Musgrave Road to the north east of the Inner West Transport Study Area are key radial links that cater for a mix of commuter, cross-city and local traffic.

There are gaps in the motorway network serving the west, in particular, lack of high quality connectivity from the Western Freeway to the CBD, Pacific Motorway, regional routes to the north of Brisbane and the ATC.

MetRoad 5 runs from Springfield to Kedron to provide a notional western bypass route within Brisbane City to connect to the Gympie Arterial (connecting to the northern regional route) and the East-West Arterial (serving the Airport and ATC). MetRoad 5, which is under the control of the DMR, includes:

- a 9km Motorway section, the Centenary Highway, starting at Springfield, crossing the M6 Logan Motorway, and connecting to the Western Freeway at Indooroopilly. It includes eight interchanges, the major one being with the M2 Ipswich Motorway at Darra;
- a 5km Motorway standard section, the Western Freeway, extending between the Centenary Highway at Indooroopilly and Milton Road in Toowong. There is an interchange at Indooroopilly with Moggill Road; and
- a 13km section comprising various named urban roads of differing standards through Toowong, Bardon, Ashgrove, Everton Park, Stafford and Kedron. Roads include Frederick Street, Rouen Road, Boundary Street, Macgregor Terrace, Jubilee Terrace, Stewart Road, Wardell Street, South Pine Road and Stafford

Road. The route is characterised by numerous side road connections, frontage access (to both residential and commercial property) and many signalised intersections.

A range of movement types occurs on roads within the Inner West Transport Study Area consistent with the road hierarchy within the area. Examples of roads in each category are illustrated below and a more detailed description of key routes in the study area is given in the next section.

- The Centenary Highway and Western Freeway are State Strategic roads forming part of the Western Arterial Road, a state controlled (DMR) route between Springfield and Everton Park.
- Frederick Street, Rouen Road, Boundary Street, Macgregor Terrace, Jubilee Terrace forms part of a north-south regional radial road and part of the DMR controlled Western Arterial Road.
- Coronation Drive, Milton Road and Moggill Road are key east-west regional radial roads.
- Kelvin Grove Road and Musgrave Road are key regional radial roads between the CBD and northern suburbs.
- Sir Fred Schonell Drive is a city distributor that provides connectivity from Toowong to the UQ in St Lucia.
- City distributors provide a direct connection between the regional radial routes or act as major connection between regional radial roads and nearby residential areas. They include Sylvan Road and Croydon Street, Jephson Street, Gailey Road, Swann Road and Lambert Road.

There are some roads within the Inner West Transport Study Area such as Park Road, Baroona Road, Haig Road, Heussler Terrace and Castlemaine Street which were formerly classified as District Accesses (a category not formally recognised in the new road hierarchy). The roads provide a transitional function between the movement of people and goods and local access function. In particular they provide local connections from the regional radial road network to the suburbs of Milton, Paddington and Auchenflower.

3.4.3 Key Study Area Routes

This section provides a description of the key study area routes. The performance of these routes is presented in Chapter 4.

Western Freeway

The Western Freeway is a motorway standard route that runs from Mt Coot-tha Road/Toowong Roundabout in the north along a south-westerly alignment to Moggill Road. The Western Freeway comprises of a divided 4-lane carriageway, has shoulders for each direction and a posted speed limit of 90km/h. It effectively bypasses Taringa and Indooroopilly. Moggill Road has accesses to it from both the west (Kenmore) and the east (Indooroopilly) through the use of a left signalised dual lane movement and signalised priority right turn respectively. Off ramps to Moggill Road also give access to the east and west. The Western Freeway is currently designated as a secondary freight route because the freight route to the east of the Toowong Roundabout is via the undivided and interrupted road network in the urban area. The Western Freeway is a continuation of the Centenary Highway and provides connectivity from Toowong to Indooroopilly and Kenmore areas as well as suburbs to the south across the Brisbane River.

Bike paths exist along the length of the eastern side of the road on a grade separated and fenced off section of the corridor. At the eastern end of the Western Freeway the bikeway connects with the on-road bikeways on Sylvan Road.

Future upgrades to the area by DMR include the Western Freeway Roundabout Cycle and Pedestrian Bridge that will be located to the south of the Mt Coot-tha Road roundabout. The overpass will connect with the existing Western Freeway bikeway at Anzac Park and will cross over the Western Freeway before continuing along Mt Coot-tha Road. This is a DMR initiative and is expected to be complete in 2008/09.

Coronation Drive

Coronation Drive is an east-west regional radial connection that runs along the Brisbane River between the CBD to Toowong, UQ and the western suburbs. At the CBD, Coronation Drive connects to Hale Street, the Riverside Expressway, Roma Street and William Jolly Bridge. At Toowong, Coronation Drive connects to Moggill Road via High Street and to Sir Fred Schonell Drive and Gailey Road via Benson Street and Brisbane Road. A typical view of Coronation Drive is shown in **Figure 3-6**.

Coronation Drive has five traffic lanes that operate under a tidal flow system that maintains two lanes of traffic in each direction and a third lane in the peak direction. Indented bus bays are provided on both sides of the road. It is designated as a tertiary freight route in the BCC draft Transport Plan for Brisbane 2006 – 2026.

The Coronation Drive Tidal Flow system began operation in December 2002 with a peak direction bus lane. In March 2004 the peak direction bus lane was changed to a T3 lane, and more recently in March 2007 its operation has reverted to a general purpose lane due to the pressures of traffic congestion in the corridor.

At its connection with the Riverside Expressway, Coronation Drive lane configuration varies from between two and four lanes each way, on both divided and undivided road segments. The majority of its intersections are traffic signal controlled with a minor number of priority junctions that are restricted to left in/left out movements. Access to frontage properties from Coronation Drive is limited.

Benson Street and Brisbane Road form the western continuation of the Coronation Drive route from Toowong towards the suburbs of St Lucia and Taringa. They are divided regional radial roads with two traffic lanes in each direction and signalised intersections are generally provided.

Pedestrian and cyclists are catered for by the Bicentennial pedestrian and bikeway, grade separated and parallel to Coronation Drive. It provides safe off-road connectivity from St Lucia and Toowong to the CBD. Access points are spaced evenly for its duration with city access available at Queen Street and tunnels underneath Coronation Drive at the Oxley River Restaurant, Land Street and Cribb Street.

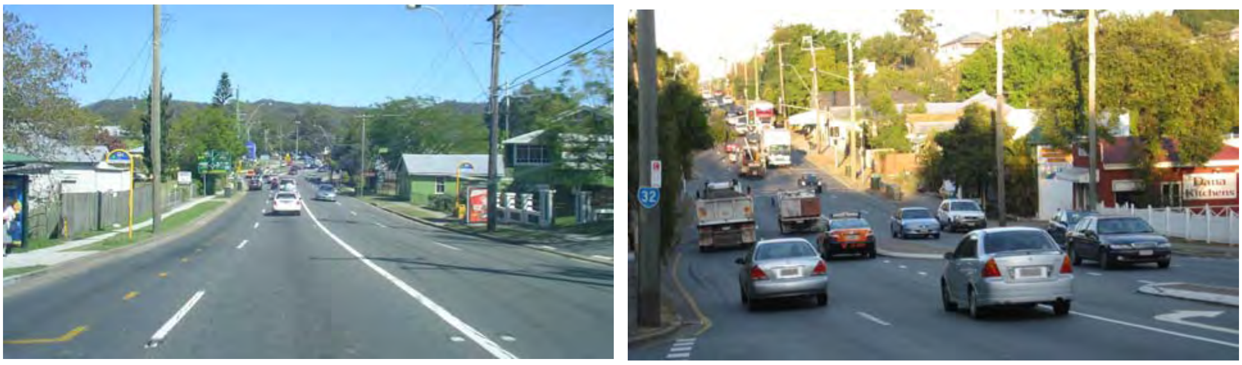
- **Figure 3-6 Coronation Drive North of Park Road**

Milton Road

Milton Road, shown in **Figure 3-7** is an east-west regional radial road connection between the CBD and the Toowong Roundabout and it runs generally parallel to Coronation Drive, along the northern side of the rail corridor. It is designated as a secondary freight route in the BCC future freight hierarchy. At the western end Milton Road connects to Hale Street for CBD bypass traffic via the ICB. The connections between Milton Road and the CBD road network are somewhat constrained, and less direct than that provided via Coronation Drive which distributes traffic via the Riverside Expressway. Inbound traffic must use a route via Petrie Terrace-Secombe Street and Countess Street to Roma Street. Outbound travel is more direct via Roma Street and Upper Roma Street. The Toowong Roundabout provides access to the Western Freeway, Frederick Street and Miskin Street. Milton Road also is a key route between the western suburbs and a variety of cross-city locations, as well as the CBD. It also provides access to Suncorp Stadium, which during events generates a high level of bus traffic and pedestrian movement.

Milton Road is undivided and has two lanes per direction. Along the length of Milton Road there are a number of priority and traffic signal controlled intersections. The movements that are permissible at a number of these intersections vary by time of day with a number of right turn movements banned during peak periods. Frontage access is provided to a number of residential, commercial and industrial properties along Milton Road. Between 7am and 7pm on weekdays Milton Road is a clearway. At other times on-street parking opportunities are limited despite the clearway not being in operation.

- **Figure 3-7 Milton Road approaching Croydon Street and Dixon Street**



Hale/Boomerang Street

Hale/Boomerang Street is a north-south regional ring road that has a dual function, acting both as an arterial route and as the continuation of the Pacific Motorway (Riverside Expressway) to the northern suburbs. Hale Street is designated as a primary freight route. It intersects with the eastern end of Coronation Drive at its southern end and with the ICB, Kelvin Grove Road and Musgrave Road at its northern end.

Hale Street is a divided dual carriageway that is a clearway and has two through lanes in both directions with a third lane (in both directions) facilitating merges and diverges. Grade separated interchanges are provided. The terminal intersection with Coronation Drive is signalised with a grade-separated overpass provided for right turn movements to the north on Hale Street from the Riverside Expressway.

Inner City Bypass

The ICB is an inner city regional ring road connecting a number of regional radial routes including Coronation Drive, Milton Road, Musgrave Road, Kelvin Grove Road, Lutwyche Road and Abbotsford Road. Connecting Hale Street at Milton to Kingsford Smith Drive at Breakfast Creek, the ICB is a six (6) lane divided arterial with speed limits varying between 60 and 80km/h. The ICB provides a high speed uninterrupted connection between the western and the north-eastern suburbs of Brisbane, bypassing the CBD.

Moggill Road

Moggill Road is an east-west regional radial road between Toowong and Moggill via Taringa and Indooroopilly. It is designated as a tertiary freight route in the BCC future freight hierarchy. Within the Inner West Moggill Road is generally undivided and has two lanes per direction. Moggill Road forms an interchange with the Western Freeway with both north and southbound ramps provided. Traffic movements on Moggill Road to and from side roads are a mix of traffic signal and priority control. Access is provided from Moggill Road to a number of residential, commercial and retail properties that include the Indooroopilly Shopping Centre.

Kelvin Grove Road

Kelvin Grove Road is a north-south regional radial road between Normanby Five Ways and Alderley passing through Kelvin Grove and Newmarket as part of State Route 77. At Newmarket Kelvin Grove Road becomes Enoggera Road. Kelvin Grove Road is a divided road with three lanes per direction that includes peak direction T3 lanes between Victoria Street and Windsor Road. It is designated as a secondary freight route in the BCC future freight hierarchy.

Due to the divided nature of Kelvin Grove Road movements to other roads are facilitated through signalised intersections, right turn pockets or restricted to left in and left out movements only. The movements that are permissible at a number of these intersections vary by time of day with a number of right turn movements banned during peak periods. Frontage access is provided to a number of residential, commercial and industrial properties along Kelvin Grove Road.

At the southern end of Kelvin Grove Road connectivity is provided with the ICB and Hale Street. For southbound traffic, towards the CBD, traffic continues to Countess Street via an underpass of the Normanby Five Ways intersection so bypassing the signalised intersection. Northbound traffic from the CBD accesses Kelvin Grove Road from Petrie Terrace at the Normanby Five Ways intersection.

Kelvin Grove Road is also a bus route and access to the Inner Northern Busway is possible at the Normanby Busway Station via Ithaca Street. There are a number of bus stops on Kelvin Grove Road of which most are in bus bays.

Musgrave Road

Musgrave Road is a regional radial road from Normanby Five Way and extends to become Waterworks Road as part of State Route 31 that serves the suburbs of Red Hill, Ashgrove and The Gap. It is generally undivided and has two lanes per direction. At the signalised intersection of Normanby Five Ways the CBD can be accessed via Countess Street or College Road. Ramps provide access with Hale Street and a connecting loop provides connectivity with Musgrave Road (northbound only) to the ICB (eastbound only) and Kelvin Grove Road (northbound only). This connection is used by traffic from College Road and Petrie Terrace for access the ICB in the eastbound direction. It is not possible to access Musgrave Road directly from the ICB (westbound).

Musgrave is designated as a tertiary freight route in the BCC future freight hierarchy. It is also a bus route however the Inner Northern Busway cannot be accessed from Musgrave Road.

High Street

High Street forms the link between the intersections of Moggill Road/Burns Road/Jephson Street and Benson Street at Toowong. High Street is a divided road with two lanes in each direction. Access to Toowong Village is provided via the signalised intersection with Sherwood Road. Frontage on High Street includes a number of commercial, retail, entertainment, restaurant and café/bar properties. Consequently, there are a number of conflicting pedestrian, bus, vehicular and parking activities occurring on High Street. These conflicting movement and modes can cause considerable congestion in peak periods and constrain future use of the corridor.

Petrie Terrace, Countess Street, Upper Roma Street

Petrie Terrace, Countess Street and Upper Roma Street are arterial roads that form a one-way system. They are designated as tertiary freight routes. They provide connectivity between the regional radial roads that feed into the eastern side of the CBD such as Milton Road, Musgrave, Road, Kelvin Grove Road and the ICB. Four traffic lanes are generally provided with clearway restrictions during peak periods. Signalised intersections are provided to control traffic movements. A contra flow bus lane has been provided between Caxton Street and Roma Street that can also be accessed by bus movements from Milton Road.

The William Jolly Bridge via Saul and Skew Streets that connect with Upper Roma Street facilitates cross-river connections.

Fredrick Street

Fredrick Street is part of the state controlled (DMR) MetRoad 5 and provides a north-south connection from the Toowong Roundabout to the north-west suburbs. It is designated as a secondary freight route. A one-lane flyover is provided for the Fredrick Street to Western Freeway movement. Fredrick Street is undivided and has one lane in each direction. Right turn movements to side roads are generally provided for through ghost islands. Access to residential properties and kerbside parking is provided along part of the eastern kerb.

Sir Fred Schonell Drive

Sir Fred Schonell Drive is city distributor that provides connectivity from Brisbane Road to the UQ and the suburb of St Lucia. It is an undivided four-lane road with on-street parking restrictions during peak periods. Intersections with side roads are a mix of traffic signal and priority control.

Coonan Street

Coonan Street is a north-south regional ring road that provides connectivity between Moggill Road at Indooroopilly and suburbs south of the Brisbane River. Connections from Coonan Street to Indooroopilly Shopping Centre and Railway Station are also provided. Two through traffic lanes are generally provided in each direction but there are some bottlenecks where only one traffic lane in each direction is provided such as the Walter Taylor Bridge.

Land Street

Land Street is a four lane divided carriageway that provides a short connection between Sylvan Road and Coronation Drive. Intersections with Sylvan Road, Patrick Lane and Coronation Drive are all signalised. The right turn movement from Land Street to Coronation Drive is not permitted. Frontage access on Land Street is minimal.

Park Road

Park Road provides a two-way connection between Milton Road and Coronation Drive. It has a four lane undivided carriageway, although on-street parking reduces this to one lane in each direction during off-peak periods. Park Road can be accessed from either direction from Coronation Drive but only from the outbound approach from Milton Road as there is right turn ban from Milton Road inbound. Right turns from Park Road into Coronation Drive and Milton Road are banned. It is generally a four-lane undivided road, however, on street parking in selected areas to serve abutting retail and commercial land-uses, effectively reducing operation to one lane in each direction.

Sylvan Road

Sylvan Road provides a two-way connection between Milton Road and Coronation Drive at Toowong. Sylvan Road is an undivided road with generally one lane in each direction and has on-road cycle lanes. On-street parking is provided along much of its length. Sylvan Road provides access to the Toowong Shopping Centre via Bennett Road.

The western section of Sylvan Road between Jephson Street and Milton Road has been traffic calmed and is more residential in nature. It is not possible to turn right into Sylvan Road from Coronation Drive but Land Street facilitates this movement. The right turn movement from Sylvan Road to Milton Road is also banned but this movement can be made via Croydon Street.

Jephson Street/Croydon Street

Jephson Street and Croydon Street are city distributors that provide a north-south connection between Moggill Road at Toowong and Milton Road. The frontages of these roads are generally a mix of low and medium density residential. Access to Toowong Centre is provided from Jephson Street via Sherwood Road and Lissner Street. Both Jephson Street and Croydon Street are generally undivided four-lane roads with limited provision for on-street parking. Brisbane City Council has been progressively implementing development set-backs along the corridor as property re-development occurs to allow potential future widening of this route.

Sherwood Road/Miskin Street

These are regional ring roads that provide a connection between Toowong Centre at High Street and the Toowong Roundabout. The section of Sherwood Road between High Street and Jephson Street provides direct access to the Toowong Village car parks and ground level car parking for a super market. Toowong Rail Station is located within Toowong Village and bus stops and taxi ranks are provided along this section of Sherwood Road. Frontage properties are retail and commercial. Due to the land use and public transport opportunities pedestrian activity is high.

The western section of Sherwood Road and Miskin Road are generally residential and provide access to the Toowong Roundabout and hence the Regional and State road network. They are undivided two-lane roads with on-street parking provision. The Toowong Bus depot is located on Miskin Road.

Gailey Road, Swann Road, Hawken Drive, Lambert Road

These are city distributors, which are generally undivided two-lane roads with on-street parking provisions. Intersection control is generally by priority control or roundabouts. These provide access to the suburbs of St Lucia and Taringa, and the educational facilities within them and connections to Indooroopilly and Toowong.

Mt Coot-tha Road, Sir Samuel Griffith Drive, Simpsons Road

These routes are generally undivided two-lane roads. They provide access from Toowong to Mt Coot-tha and Bardon. Generally there is no frontage activity along these roads with a minor number of side roads. The exception is Simpsons Road to the north of Bardon, which is residential in nature.

Latrobe Terrace, Given Terrace, Caxton Street

This east-west city distributor provides a radial connection from the intersection of Latrobe Terrace and Macgregor Terrace (MetRoad 5) in Bardon to the west of the CBD with a signalised intersection at Caxton Street and Petrie Terrace. Caxton Street has north facing ramps that connect to Hale Street. These city distributors are generally undivided two-lane roads that pass through the residential suburbs of Paddington and Red Hill. Much of the length of this route is fronted by retail properties and hence there is a significant provision for on-street parking, bus stops and pedestrian activity. Intersections with side roads are generally priority control with a greater degree of signalisation on Given Terrace and Caxton Street.

The Suncorp Stadium fronts onto Caxton Street resulting in significant pedestrian activity when events are held at the stadium (associated with both the stadium and nearby land-uses such as restaurants and bars). For major events the section of Caxton Street between Hale Street and Petrie Terrace is closed.

3.5 Travel Characteristics

Current household travel behaviour and historic trends have been examined by a comparative analysis of trip generation and modal use characteristics in the Inner West Transport Study Area using the results of the 1992 and the 2003/04 SEQ Travel Surveys. Results of the comparative analysis are shown in **Table 3-2.**

- **Table 3-2 Travel Behaviour Trends from SEQ Household Travel Survey 1992 and 2003/04**

Parameter	1992 SEQHTS			2003/04 SEQTS		
	Metro Region	BCC	Inner West Area	Metro Region	BCC	Inner West Area
General						
Total Persons	1.2 million	0.7 million	44,400	1.6 million	0.9 million	67,000(2)
Total Households	0.5 million	0.3 million	20,000	0.6 million	0.35 million	27,900(2)
Persons/Household	2.73	2.56	2.2	2.62	2.54	2.41(2)
Trips/HH	10.5	10.2	10.7	9.4	9.2	9.5
Trips/Person	3.85	4.00	4.83	3.61	3.61	3.97
Mode Choice						
Vehicle Driver	52%	51%	44%	56%	55%	48%
Vehicle Passenger	26%	24%	20%	24%	22%	17%
Walk	13%	14%	23%	11%	11%	17%
Cycle	2%	2%	4%	1%	1%	2%
Public Transport (1)	7%	9%	9%	8%	10%	15%
Vehicle Occupancy	1.50	1.47	1.45	1.42	1.40	1.35
Trip Purpose						
Home Based Work	15%	16%	17%	18%	19%	18%
Home Based Shopping	18%	18%	18%	19%	19%	21%
Home Based Education	14%	13%	10%	16%	14%	12%
Home Based Social	9%	10%	12%	13%	14%	18%
Home Based Other	11%	10%	8%	5%	5%	4%
Work Based Other	4%	4%	5%	11%	11%	13%
Work Based Shopping	5%	5%	8%	4%	4%	5%
Work Based Work	6%	6%	5%	4%	3%	2%
Non Home Based	18%	17%	18%	10%	9%	8%

Table Notes:
Source: SEQ Household Travel Survey 1992 and SEQ Travel Survey 2003/04
(1) Does not comprehensively cover public transport travel to external locations.
(2) Demographics estimated for travel survey at that time.

Key characteristics of travel behaviour and trends are:

- the trip rate per household is 9.5 trips per day and is similar to the metropolitan average;
- daily trip rates per household for the Inner West Area have reduced during the period 1992 to 2004. This is a similar trend to the metropolitan region;
- private vehicle usage accounts for 65% of trips. This is lower than the metropolitan average of 80%;

- the use of public transport within the Inner West Area is greater than the average for the metropolitan area. A 15% public transport mode share is estimated for the inner west compared to the metropolitan average of 8%; and
- walking and cycling is also proportionally higher in the Inner West Area compared to the metropolitan region (19% compared to 12%).

Over the period 1992 to 2004 key mode changes in the inner west are:

- car has remained constant;
- public transport growth from 9% to 15%;
- a decline in relative walk and cycle use from 27% to 19%; and
- the breakdown of trip purpose in the inner west is similar to the metropolitan region.

3.6 Road Traffic Flows

3.6.1 Daily Traffic Volumes

Daily traffic volumes for 2007 on key roads within the Inner West Transport Study Area are shown in **Table 3-3** and across four screen lines in **Table 3-4**. The location of the counts on the key roads and the screenlines are shown in **Figure 2-3**. The reported traffic volumes are from the Northern Link Traffic Model that has been validated against survey date collated from a number of sources including Brisbane City Council, DMR 2006 Census and various surveys commissioned for this study. Data from 2006 and 2007 has been used.

- **Table 3-3 Existing (2007) Traffic Volumes (Two-Way Totals)**

Hierarchy	Reporting Point(1)	Road	Location	AWDT	AADT
State Strategic					
	BB	Centenary Highway	Centenary Bridge	86,800[2]	76,300[2]
	A	Western Freeway	North of Moggill Rd Interchange, Indooroopilly	76,500	71,200
Regional Radial					
	B	Moggill Road	East of Russell Terrace, Indooroopilly	40,700	37,800
	D	Moggill Road	East of Brisbane Boys College Entrance, Toowong	38,500	35,800
	F	High Street	West of Benson Street, Toowong	32,400	30,100
	J	Milton Road	East of Croydon Street, Toowong	52,900	49,200
	X	Milton Road	West of Croydon Street, Toowong	54,900	51,300
	K	Coronation Drive	West of Land Street, Auchenflower	62,600	58,200
	O	Milton Road	East of Castlemaine St, Milton	51,500	47,900
	P	Coronation Drive	East of Cribb Street, Milton	90,100	83,800
	T	Kelvin Grove Road	North of School Street, Kelvin Grove	50,500	47,000
	U	Musgrave Road	West of Cochrane Street, Paddington	31,400	29,200
Regional Ring					
	R	Inner City Bypass	Landbridge, Spring Hill	79,200	73,700
	C	Walter Taylor Bridge	Indooroopilly	32,500	30,200
	E	Miskin Street	North of Ascog Terrace, Toowong	10,500	9,700
	19	Hale Street	South of Caxton Street	76,900	71,500
	I	Frederick Street	South of Victoria Crescent, Toowong	33,500	31,100
	30	Jubilee Terrace	North of Coopers Camp Road	27,700	25,800
	31	Sherwood Road	West of Jephson Street	5,400	5,000

City Distributor					
	G	Brisbane Street	North of Josling Street, Toowong	37,100	34,500
	H	Sylvan Road	East of Milton Road, Toowong	8,400	7,800
	Q	Caxton Street	West of Hale Street, Paddington	22,900	21,300
	S	Jephson Street	North of Sherwood Road, Toowong	13,000	12,100
	32	Latrobe Terrace	West of Enoggera Terrace	14,200	13,200
Local Streets					
	L	Eagle Terrace	West of Roy St., Auchenflower	4,100	3,800
	M	Haig Road	West of Barona Rd., Milton	6,500	6,000
	N	Park Road Mid-block	North of Gordon St., Milton	12,100	11,300
	33	Sir Samuel Griffith Drive	North of Birdwood Terrace	5,300	4,900
	34	Stuartholme Road	North of Birdwood Terrace	3,600	3,300
	35	Enoggera Terrace	North of Latrobe Terrace	5,100	4,700
	28	Rainworth Road	East of Rouen Road	4,300	4,000
	36	Morley Street	North of Milton Road	3,900	3,600
	37	Lang Parade	North of Coronation Drive	6,800	6,300
	29	Birdwood Terrace	East of Gregory Terrace	1,600	1,500
	38	Heussler Terrace	West of Castlemaine Street	8,000	7,400

Table Notes:
Source: 2007 Northern Link Traffic Model and October 2007 counts
(1) The Reporting Points and associated reference identifications are shown in Figure 2-3.
(2) Volumes from validated model. These are within 5-10% of DMR permanent count data.

Table 3-4 Existing (2007) Traffic Volumes across screenlines

Screenline(1)	East/Northbound (AWDT)	West/Southbound (AWDT)	Two way total (AWDT)
1 – Indooroopilly	80,000	82,400	162,400
2 – St Lucia and University	38,600	35,200	73,800
3 - Toowong	86,000	88,200	174,200
4 – Milton	99,800	105,700	205,500

Table Notes:
Source: 2007 Northern Link Traffic Model
(1) The Reporting Points and associated reference identifications are shown in Figure 2-3

The **Western Freeway**, which is a State Strategic road in the west of the study area, carries approximately 77,000 vehicles per weekday. The weekday peak hour flows on the Western Freeway are 3,000 vph in the eastbound direction in the morning and 3,500 vph westbound in the evening peak period. The variation of traffic flow by hour and direction on a weekday is shown in **Figure 3-8** and the variation by day throughout a week is shown in **Figure 3-9**.

The ICB is a Regional Ring Road to the east of the study area that carries approximately 80,000 vehicles each weekday. During the morning peak hour the ICB carries over 2,800 vph in the eastbound direction and over 3,200 vph in the westbound direction. In the evening peak it carries just less than 2,800 vph eastbound and less than 3,500 vph westbound.

Coronation Drive, east of Cribb Street, carries approximately 90,000 vehicles per weekday. Further west, in the vicinity of Land Street, Coronation Drive carries approximately 63,000 vehicles per weekday. The variation of traffic flow throughout a weekday is shown on **Figure 3-10**. Coronation Drive experiences peak periods in both directions during both the am and pm peak periods due to the major traffic generator of the UQ at St Lucia to the west of Coronation Drive and the Brisbane CBD to the east.

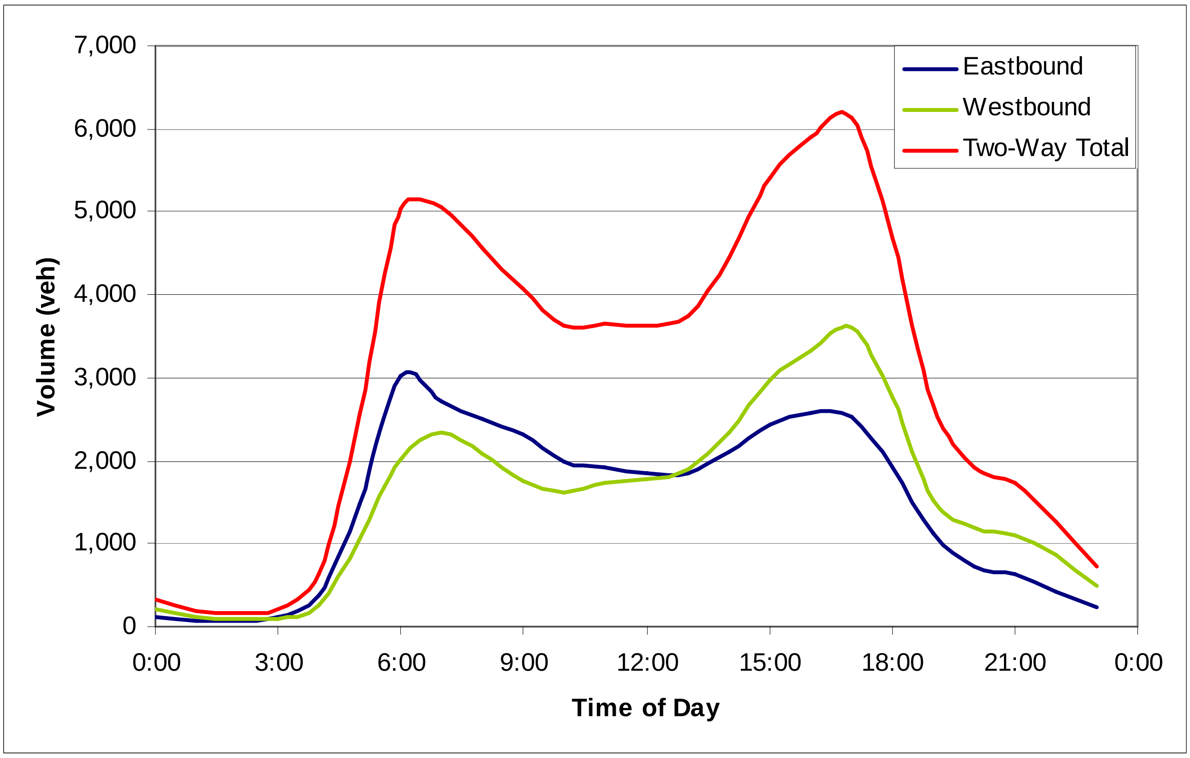
The variation of traffic flow throughout the week for Coronation Drive is shown in **Figure 3-11**. This figure shows that Fridays have the highest daily traffic volume whilst the Saturday daily traffic volume is 87% of the weekly daily traffic volume and the Sunday daily traffic volume is 74% of the weekly daily traffic volume. This indicates that recreational traffic use on the weekends is substantial.

Milton Road, east of Croydon Street, carries over 51,000 vehicles per weekday. It carries 2,000 vph in the eastbound direction in the morning peak and also carries 2,000 vph in the westbound direction in the evening peak period.

The typical weekday traffic flow profile and daily variation for **Moggill Road** are shown in **Figure 3-12** and **Figure 3-13** respectively. These shows traffic patterns more representative of an arterial road that is primarily used as commuter route with distinct commuter peaks in the eastbound direction in the am peak period and in the westbound direction in the pm peak period.

Kelvin Grove Road carries approximately 50,500 vehicles per weekday north of School Street and **Musgrave Road** carries approximately 30,700 vehicles per weekday west of Cochrane Street.

- **Figure 3-8 Western Freeway Weekday Temporal Traffic Profile**



- **Figure 3-9 Western Freeway Weekly Traffic Flow Profile**

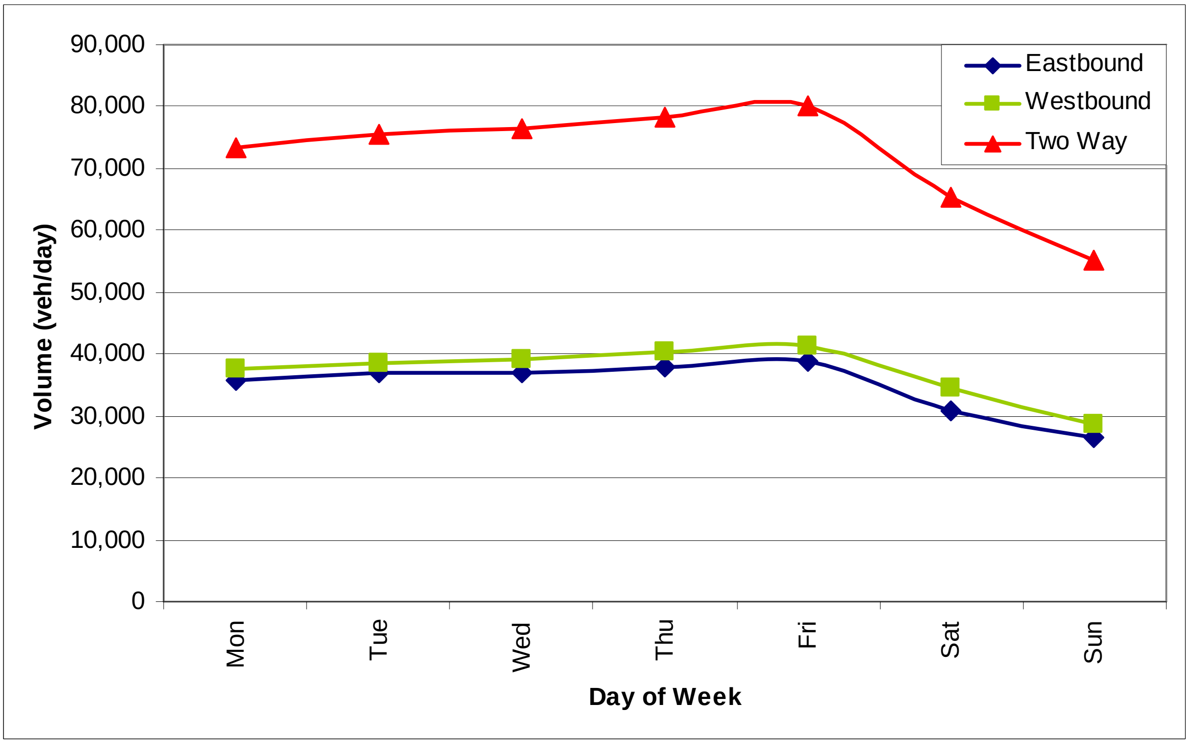


Figure 3-10 Coronation Drive Weekday Temporal Traffic Profile

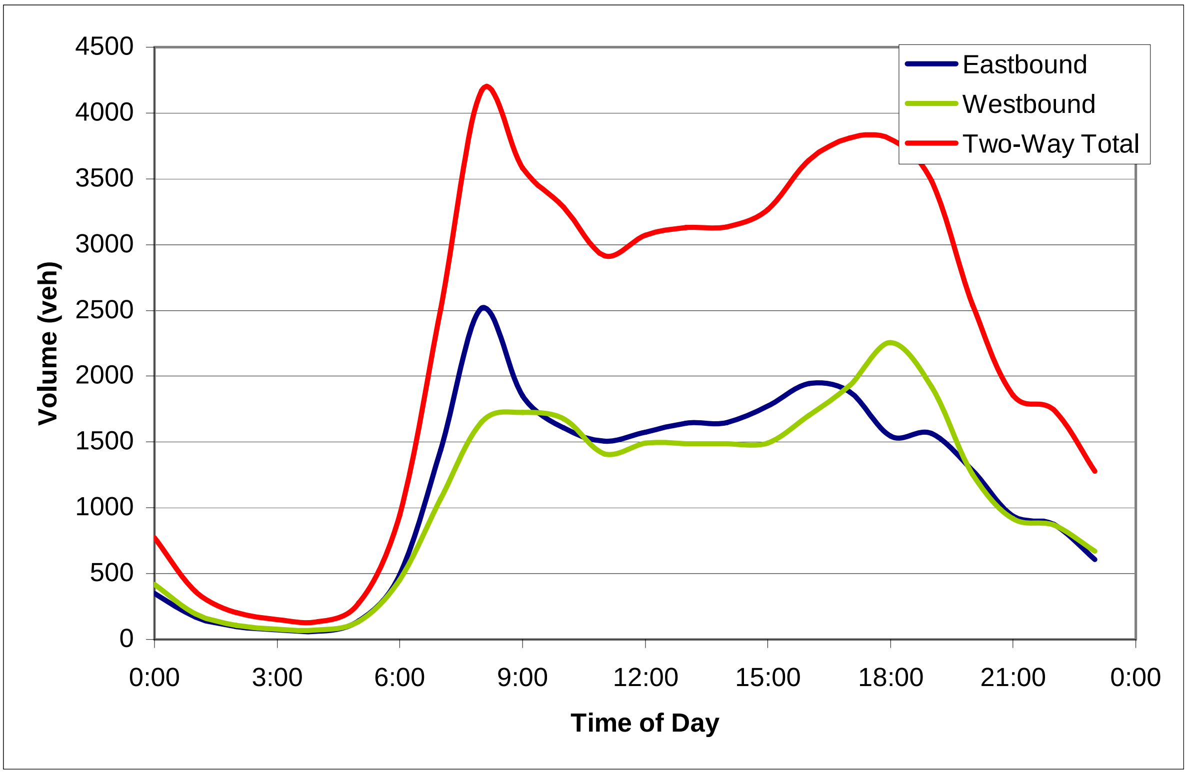
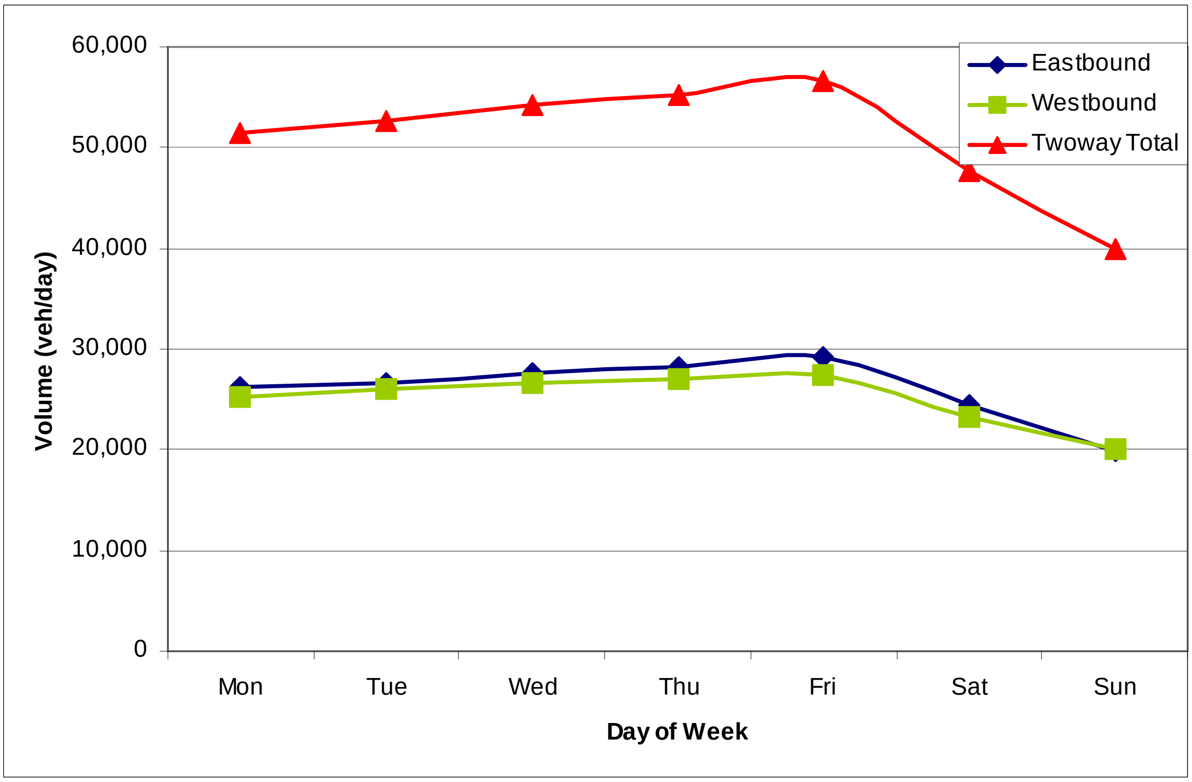
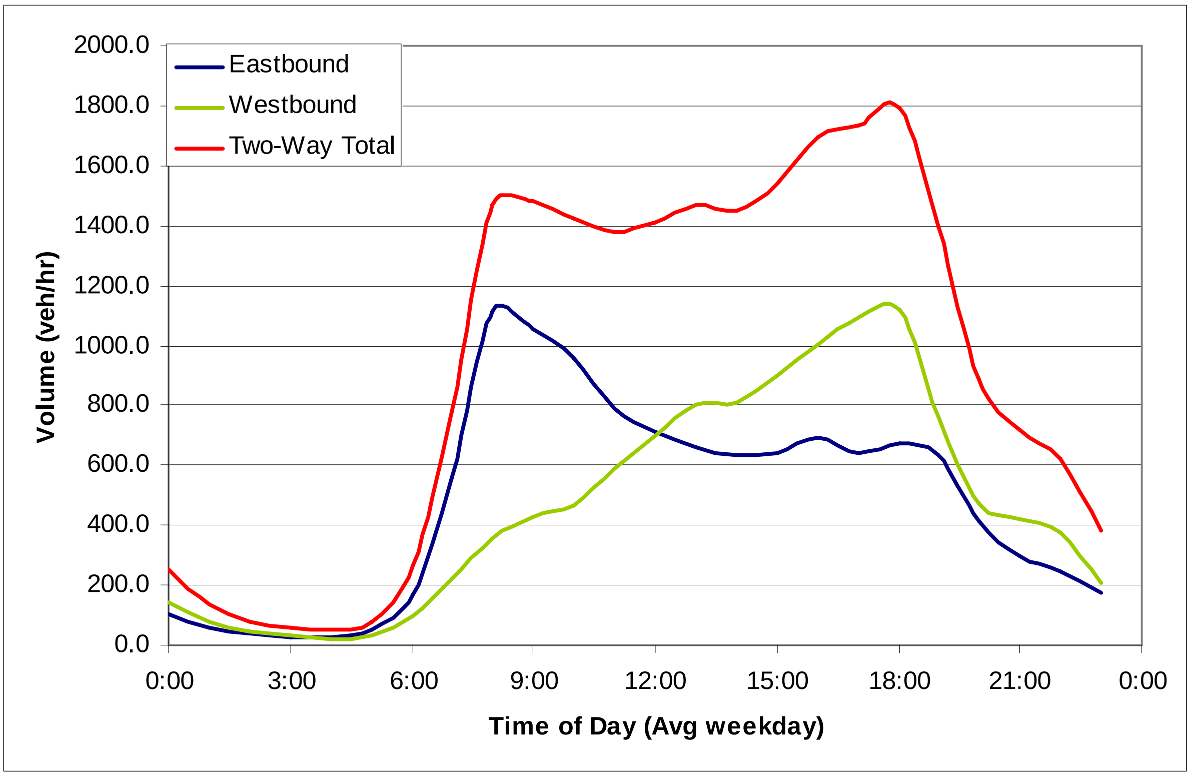


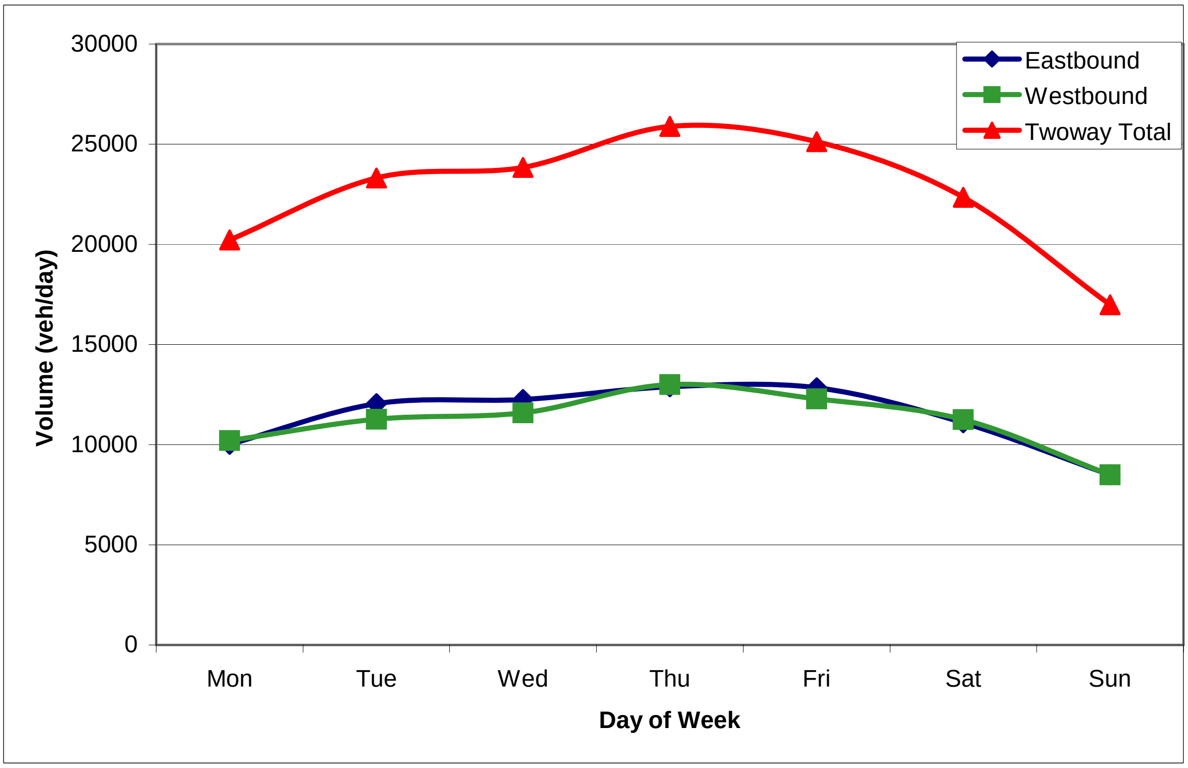
Figure 3-11 Coronation Drive Weekly Traffic Flow Profile



■ **Figure 3-12 Moggill Road Weekday Temporal Traffic Profile**



■ **Figure 3-13 Moggill Road Weekday Temporal Traffic Profile**



3.6.2 Peak Period Traffic Volumes

Existing peak period traffic volumes on major routes within the Inner West Transport Study Area are shown in **Table 3-5**. These volumes are primarily sourced from the validated 2007 Northern Link Traffic Model. Typically, the morning peak is found to be of a shorter time period whilst the evening peak is more extended. It can be seen that the two hour peak period traffic is typically around 15% of the total weekday traffic.

- **Table 3-5 Existing (2007) Peak Period Two-way Traffic Volumes**

Hierarchy	Reporting Point[(1)]	Road	Location	AM Peak 2 Hour	PM Peak 2 Hour
State Strategic					
	BB	Centenary Highway	Centenary Bridge	13,500 (15%)	14,100 (16%)
	A	Western Freeway	North of Moggill Rd Interchange, Indooroopilly	10,000(13%)	12,800(17%)
Regional Radial					
	B	Moggill Road	East of Russell Terrace, Indooroopilly	6,400(16%)	6,700(16%)
	D	Moggill Road	East of Brisbane Boys College Entrance, Toowong	5,800(15%)	5,600(15%)
	F	High Street	West of Benson Street, Toowong	4,300(13%)	4,100(13%)
	J	Milton Road	East of Croydon Street, Toowong	6,600(12%)	7,800(15%)
	X	Milton Road	West of Croydon Street, Toowong	6,500 (12%)	7,600 (14%)
	K	Coronation Drive	West of Land Street, Auchenflower	9,600(15%)	8,800(14%)
	O	Milton Road	East of Castlemaine Street, Milton	8,400(16%)	9,000(17%)
	P	Coronation Drive	East of Cribb Street, Milton	11,400(13%)	12,900(14%)
	T	Kelvin Grove Road	North of School Street, Kelvin Grove	6,200(12%)	7,100(14%)
	U	Musgrave Road	West of Cochrane Street, Paddington	5,200(17%)	6,300(20%)
Regional Ring					
	R	Inner City Bypass	Landbridge, Spring Hill	12,300(16%)	12,500(16%)
	C	Walter Taylor Bridge	Indooroopilly	5,000(15%)	5,100(16%)
	E	Miskin Street	North of Ascog Terrace, Toowong	1,900(18%)	1,600(15%)
	I	Frederick Street	South of Victoria Crescent, Toowong	4,500(13%)	4,700(14%)
	19	Hale Street	South of Caxton Street	10,200(13%)	10,400(14%)
	30	Jubilee Terrace	North of Coopers Camp Road	4,300(16%)	4,200(15%)
	31	Sherwood Road	West of Jephson Street	800(15%)	1,200(22%)
City Distributor					
	G	Brisbane Street	North of Josling Street, Toowong	6,100(16%)	6,000(16%)
	H	Sylvan Road	East of Milton Road, Toowong	1,000(12%)	1,400(17%)
	Q	Caxton Street	West of Hale Street, Paddington	3,600(16%)	4,100(18%)
	S	Jephson Street	North of Sherwood Road, Toowong	2,700(21%)	2,500(19%)
	32	Latrobe Terrace	West of Enoggera Terrace	2,700(19%)	2,300(16%)

Continued over

Hierarchy	Reporting Point[(1)]	Road	Location	AM Peak 2 Hour	PM Peak 2 Hour
Local Streets					
	L	Eagle Terrace	West of Roy St., Auchenflower	700(17%)	1,000(24%)
	M	Haig Road	West of Barona Rd., Milton	1,100(17%)	1,400(22%)
	N	Park Road Mid-block	North of Gordon St., Milton	2,000(17%)	1,400(12%)
	33	Sir Samuel Griffith Drive	North of Birdwood Terrace	1,600(30%)	2,800(53%)
	34	Stuartholme Road	North of Birdwood Terrace	700(19%)	400(11%)
	35	Enoggera Terrace	North of Latrobe Terrace	1,200(24%)	1,300(25%)
	28	Rainworth Road	East of Rouen Road	700(16%)	1,000(23%)
	36	Morley Street	North of Milton Road	600(15%)	700(18%)
	37	Lang Parade	North of Coronation Drive	1,300(19%)	1,400(21%)
	29	Birdwood Terrace	East of Gregory Terrace	300(19%)	300(19%)
	38	Heussler Terrace	West of Castlemaine Street	1,300(16%)	1,900(24%)

Table Notes:
Source - 2007 Northern Link Traffic Model and October 2007 counts
(1) The Reporting Points and associated reference identifications are shown in Figure 2-3.

3.6.3 Traffic Composition

The composition of traffic or vehicle mix (cars, buses, commercial vehicles) has an effect on the performance and characteristics of the road network. Motorways and arterial routes typically carry the higher proportions of commercial and/or industrial traffic, whereas suburban and district roads cater for lower truck volumes. The commercial vehicle percentages for a cross-section of roads within the Inner West Transport Study Area are tabulated in **Table 3-6**. This table shows the high proportion of commercial vehicles that use not only the State and Regional roads but also City Distributors and Local Streets.

- **Table 3-6 Existing (2007) Average Weekday Commercial Vehicle and Bus Percentages**

Hierarchy	Reporting Point[(1)]	Road	Location	%Bus	%CV
State Strategic					
	BB	Centenary Highway	Centenary Bridge	0.15%	5.9%
	A	Western Freeway	North of Moggill Rd Interchange, Indooroopilly	0.20%	4.7%
Regional Radial					
	B	Moggill Road	East of Russell Terrace, Indooroopilly	0.4%	1.7%
	D	Moggill Road	East of Brisbane Boys College Entrance, Toowong	1.4%	6.0%
	F	High Street	West of Benson Street, Toowong	2.0%	6.8%
	J	Milton Road	East of Croydon Street, Toowong	0.6%	6.6%
	X	Milton Road	West of Croydon Street, Toowong	0.2%	5.5%
	K	Coronation Drive	West of Land St., Auchenflower	1.3%	6.1%
	O	Milton Road	East of Castlemaine Street, Milton	1.1%	8.5%
	P	Coronation Drive	East of Cribb Street, Milton	1.0%	6.7%
	T	Kelvin Grove Road	North of School Street, Kelvin Grove	0.9%	5.1%
	U	Musgrave Road	West of Cochrane Street, Paddington	0.0%	2.9%

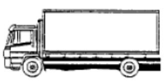
Continued over

Hierarchy	Reporting Point(1)	Road	Location	%Bus	%CV
Regional Ring					
	R	Inner City Bypass	Landbridge, Spring Hill	0.0%	11.0%
	C	Walter Taylor Bridge	Indooroopilly	0.3%	4.6%
	E	Miskin Street	North of Ascog Terrace, Toowong	0.1%	3.8%
	I	Frederick Street	South of Victoria Crescent, Toowong	0.0%	3.9%
	19	Hale Street	South of Caxton Street		8.6%
	30	Jubilee Terrace	North of Coopers Camp Road	0.0%	5.1%
	31	Sherwood Road	West of Jephson Street	1.9%	1.9%
City Distributor					
	G	Brisbane Street	North of Josling Street, Toowong	0.9%	3.5%
	H	Sylvan Road	East of Milton Road, Toowong	1.9%	3.6%
	Q	Caxton Street	West of Hale St., Paddington	1.4%	6.1%
	S	Jephson Street	North of Sherwood Road, Toowong	0.2%	5.4%
	32	Latrobe Terrace	West of Enoggera Terrace	1.1%	2.8%
Local Streets					
	L	Eagle Terrace	West of Roy St., Auchenflower	0.0%	2.4%
	M	Haig Road	West of Barona Rd., Milton	0.4%	4.6%
	N	Park Road Mid-block	North of Gordon St., Milton	0.2%	7.4%
	33	Sir Samuel Griffith Drive	North of Birdwood Terrace	1.0%	3.8%
	34	Stuartholme Road	North of Birdwood Terrace	0.0%	0.0%
	35	Enoggera Terrace	North of Latrobe Terrace	0.0%	2.0%
	28	Rainworth Road	East of Rouen Road	0.8%	2.3%
	36	Morley Street	North of Milton Road	0.0%	1.7%
	37	Lang Parade	North of Coronation Drive	0.0%	4.4%
	29	Birdwood Terrace	East of Gregory Terrace	0.9%	12.5%
	38	Heussler Terrace	West of Castlemaine Street	0.2%	10.0%

Table Notes:
Source: 2007 Northern Link Traffic Model
Vehicle type has been based on the AustRoads (2004) as follows: Cars and light vehicles – Classes 1and 2, Commercial Vehicles – Classes 3 to 12[14].

Figure 3-14 shows the weekday traffic flow by vehicle type on the Western Freeway and Coronation Drive. This shows a consistent profile of bus and commercial vehicle use throughout the day from 6am to 6pm.

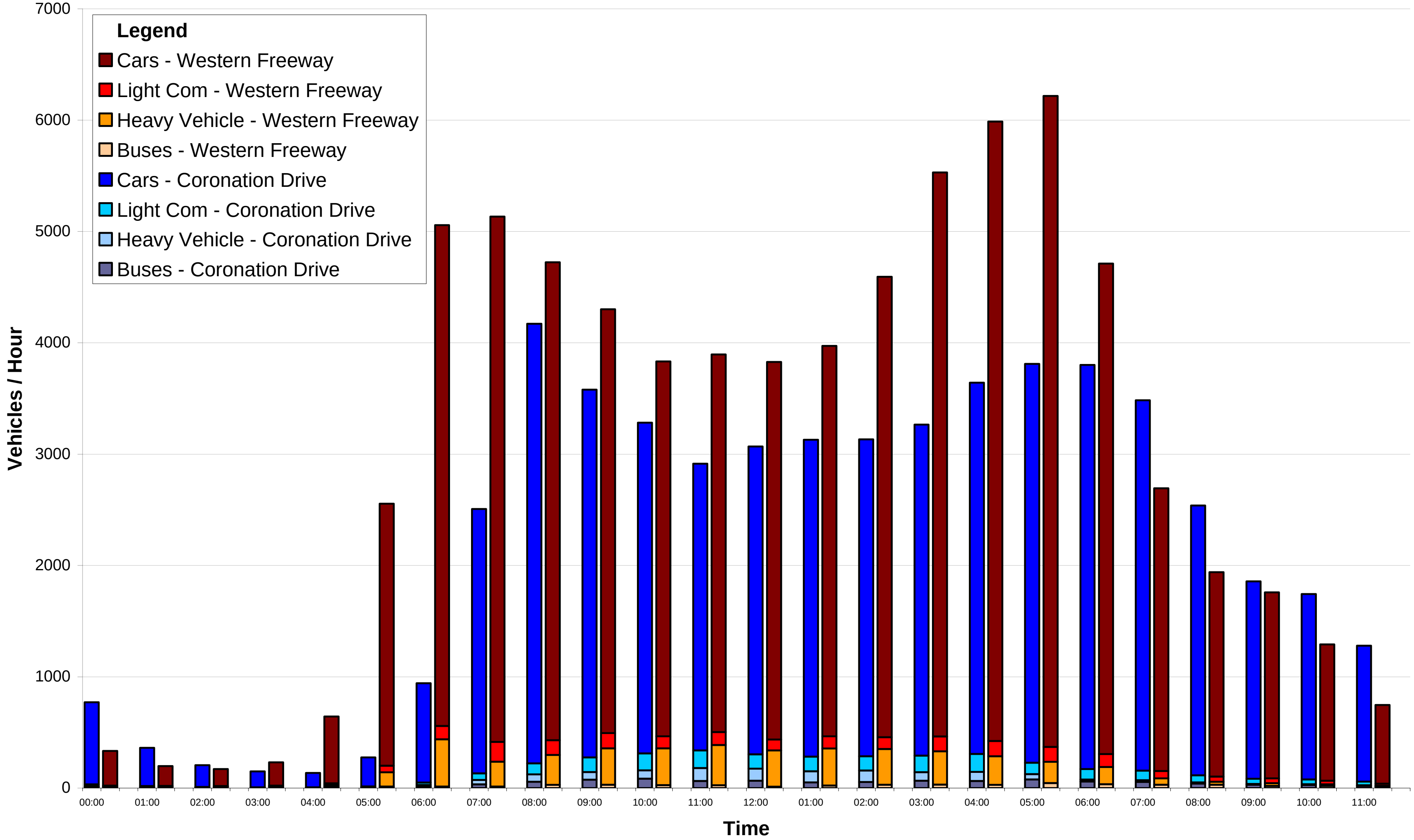
14



Class 3
Two Axle Truck

The term CV in the context of this report refers to medium and heavy commercial vehicles (commonly referred to as trucks) and is equivalent to AustRoads vehicle classes 3 to 12. The AustRoads classification system is based on number and spacing of axles. Class 3 is specifically designated by AustRoads as a two-axle truck (depicted to the left). Classes 1 and 2 are short vehicles (axle spacing <=3.1m eg: cars, 4WDs, standard utes etc with and without trailers). Classes 4 to 12 comprise multi-axle and articulated vehicles.

Figure 3-14 Existing (2007) Western Freeway and Coronation Drive Weekday Traffic Flow Profile by Vehicle Type



3.6.4 Traffic Growth

A review of historic transport planning studies has enabled comparison of historic traffic volumes on Milton Road, Coronation Drive and the Western Freeway. This is shown in **Table 3-7** for the years 1964, 1987 and 2007.

It should be noted that in 1964 the Western Freeway had not been constructed. However, it is appropriate to compare the total traffic flow on Coronation Drive and Milton Road. Between 1964 and 1987 the traffic using these roads increased by over 50%. Between 1987 and 2007 the traffic volume increased by over 90% which is equivalent to a growth rate of 3.3% per annum.

Between 1987 and 2007 the traffic volume using the Western Freeway increased by 133% or 4.3% per annum. This historic data illustrates the sustained strong growth in travel demand in the Inner West Transport Study Area over the past 40 years.

- **Table 3-7 Historic Traffic Volumes**

	1964[(1)]	% Growth per annum	1987[(2)]	% Growth per annum	2007[(3)]
Coronation Drive	30,000	1.6%	43,000	3.3%	82,000
Milton Road	17,200	2.3%	29,000	3.4%	57,000
Total on Coronation Drive and Milton Road	47,200	1.9%	72,000	3.3%	139,000
Western Freeway	n/a	n/a	33,000	4.3%	77,000

Notes:
[(1)] Average weekday traffic – Brisbane Transportation Study, Wilbur Smith and Associates (1965)
[(2)] Weekday traffic – Brisbane Traffic Study, Brisbane City Council, 1989
[(3)] Volumes surveyed in October 2007

Historic studies reported on traffic congestion levels in the network since at least 1964. The Brisbane Transportation Study[15] in 1965 reported that congestion was being experienced on both Coronation Drive and Milton Road during the pm peak hour in 1964. The Centenary Bridge was opened in 1964 and duplicated by 1986. The Western Freeway was completed by the 1970s, ending at the Toowong roundabout, so adding traffic pressures to the Milton Road and Coronation Drive routes. From 1985 to 2007 peak hour demands through the Toowong Roundabout have increased by 30% in the morning peak (to 5,500 vehicles per hour) and 60% in the evening peak (to 6,200 vehicles per hour) over the same period, and high demands have spread through longer periods of the day. Since that time, the only significant corridor capacity improvement has been the Coronation Drive tidal flow scheme implemented in 2002.

3.7 Parking

The demand for on-street parking in the Inner West Transport Study Area is increasing over time and the width and gradient of many local streets does not always facilitate kerb side parking on both sides of the carriageways. Increases in on-street parking demand have been generated by several factors that include:

- multiple car ownership at residential properties that do no not have sufficient capacity for off-road parking of all vehicles;
- increasing densification of residential areas leading to an increase in the number of vehicles owned within the area;
- office development within the Inner West Transport Study Area;
- parking demand associated with the QUT Kelvin Grove Campus that has been developed for public transport as the major mode of travel. There is limited off street parking at QUT with 1,100 spaces and no

[15] Wilbur Smith and Associates, 1965

specific allocation for students. The campus is part of the Brisbane Central Parking Area. The local streets to the immediate west and north of the campus, which are not in the Brisbane Central Parking Area, experience a significant demand for on-street parking associated with the campus. An additional 2,000 students and 160 staff will re-locate to the QUT Kelvin Grove Campus following the closure of the Carseldine Campus in December 2008, increasing travel pressures to the campus;

- car parking associated with the UQ at St Lucia;
- car parking associated with the Wesley Hospital; and
- commuters – due to the cost of car parking in central Brisbane (approximately $25.00 per day) and that the Brisbane Central Parking Area restricts on-street car parking to 2 hours (7am to 6pm Monday to Friday and 7am to 12noon Saturdays) there is a growing trend for commuters to drive and then park on-street close to public transport nodes within the study area before completing the commuting journey to the CBD by bus or rail.

3.7.1 Traffic Areas

Kerb side parking on the State Strategic and Regional Roads within the Inner West Transport Study Area is generally restricted through 24hour clearways. To control on-street car parking on other roads a number of traffic areas have been established that regulate on-street car parking during specified times. People that reside within a traffic area can obtain a permit from BCC to park on the street where they live. There are five traffic areas that impact on the Inner West Transport Study Area. They are the Brisbane Central Traffic Area, Lang Park Traffic Area, the St Lucia Traffic Area and the Auchenflower and Wesley Residential Parking Areas. These traffic areas are shown in **Figure 3-15** and are briefly described in the following sub sections.

Brisbane Central Traffic Area

This is a regulated parking area covering the CBD and nearby suburbs. The western border of the Brisbane Central Traffic Area extends to Kelvin Grove Road, Countess Street and the William Jolly Bridge. This traffic area incorporates the Kelvin Grove Urban Village. Signs for the Brisbane Central Traffic Area are located on the boundaries of the area. The objective of this traffic area is to restrict on-street commuter car parking in the CBD with on-street parking permitted for a maximum of two hours unless parking meters or traffic signs show otherwise. The two hour parking limit applies Monday to Friday 7am to 6pm and Saturday 7am to 12 noon.

Lang Park Traffic Area

During events at Suncorp Stadium, a 15 minute parking limit applies on all unsigned roads from 12 noon to 10pm. This traffic area includes the suburbs of Milton, Paddington and parts of Auchenflower and Red Hill. The objective of this traffic area is to encourage stadium patrons to use public transport to travel to Suncorp Stadium so limiting the amount of vehicular traffic generated by the stadium whilst maintaining on-street parking opportunities for residents and businesses.

St Lucia Traffic Area

A two hour parking limit applies on all unsigned roads Monday to Friday from 7am to 6pm, February to November. The objective of this traffic area is to control the impact of on-street car parking by people attending or visiting the UQ in the residential area of St Lucia that borders UQ.

Auchenflower and Wesley Residential Parking Areas

A resident parking area is in place, which restricts parking to two hours for vehicles without a resident parking permit in the Eagle Terrace and Lang Street precincts. The intention of the residential parking areas is to manage on-street parking demand generated by a number of land uses including the Wesley Hospital, Auchenflower rail station, commercial uses east of Lang Parade, local residents and local shops.

3.7.2 Major Commercial Centres

Major commercial centres within the Inner West Transport Study Area, and their associated parking provisions are shown in **Table 3-8**. While there are many smaller shopping centres Indooroopilly and Toowong Centres are the most dominant in the study area.

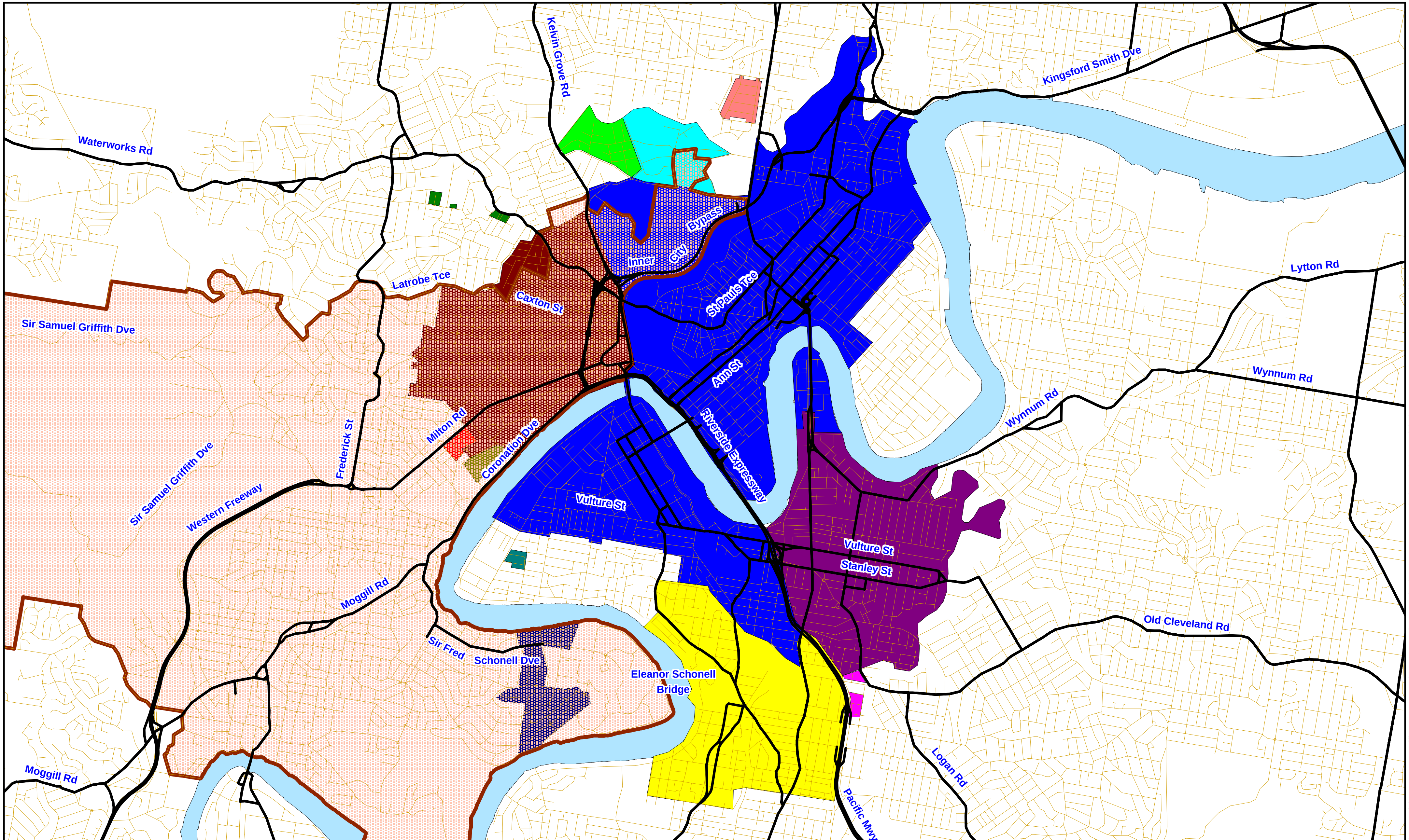
- **Table 3-8 Retail Centre Parking Provisions**

Centre	Retail Floor Space (m^2)	Office Floor Space (m^2)	Total Floor Space (m^2)	Parking Bays
Indooroopilly Centre	81,300	-	81,300	3,723
Toowong Centre	31,000	15,300	46,200	1,647

Table Note: Source: www.indooroopilly.com.au, www.retailfirst.com.au

University of Queensland

The UQ is the only major university in the Study Area. Located in St Lucia, UQ has 5,800 car parks that are controlled by permits issued to staff and students subject to availability.



LEGEND

- Auchenflower Residential Parking Area
- Ballymore Traffic Area
- Brisbane Central Traffic Area
- Buranda Residential Parking Area
- Dutton Park Residential Parking Area
- Herston Residential Parking Area
- Lang Park Traffic Area
- Red Hill Residential Parking Area
- St Lucia Traffic Area
- The Gabba Traffic Area
- Wesley Residential Parking Area
- West End Residential Parking Area
- Windsor Residential Parking Area
- Inner West Transport Study Area

Northern Link
Environmental Impact Statement

Figure 3-15

Traffic Areas

Northern Link
SKM Connell Wagner JOINT VENTURE

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3.7.3 Public Transport Parking

Demand for car parking at public transport nodes is increasing as the cost of car parking in the central city increases. The demand for increased car parking on public transport corridors within the Inner West Transport Study Area has increased over time.

Off street parking is provided at all rail stations within the Inner West Transport Study Area with the exception of Milton Station. A summary is given in **Table 3-15**.

A designated commuter car park for Toowong rail station is accessible from Benson Street (Coronation Drive). Commuter parking in the actual shopping centre is prohibited and warnings and fines are in place. The provision of off-street parking is inadequate for the current level of usage of the station and the overflow is accommodated by nearby streets such as Augustus Street.

Indooroopilly rail station has a limited number of off street parking available to commuters located adjacent to the station. Like Toowong rail station, commuters tend to park in local streets in the area before walking to the train station. Indooroopilly rail station is currently being upgraded. However, this upgrade will not provide for additional car parks. The ability to provide more designated spaces for commuters is limited by the proximity of the station to residential and commercial sites along with Coonan Street which connects all traffic coming from the North/East with the Walter Taylor Bridge.

Taringa and Toowong rail stations both have 61 designated parking bays.

The rail stations at Auchenflower and Taringa have limited off-street parking provision and Milton rail station has no off-street car parks. The lack of off-street parking at these stations results in on-street parking occurring on the adjacent local streets and the extent of this on-street parking has been increasing over time.

3.8 Public Transport Services and Infrastructure

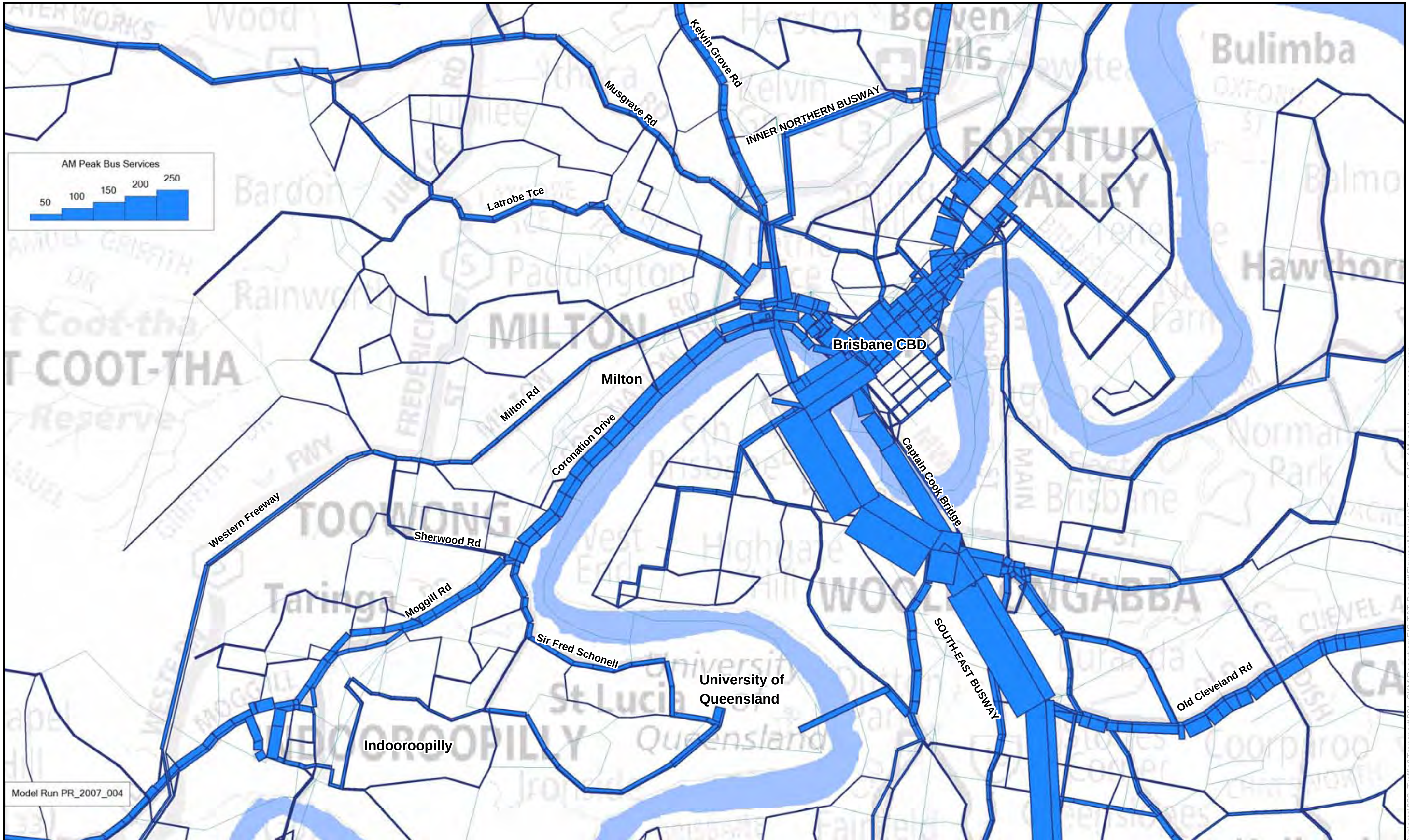
The three main forms of public transport in Brisbane are bus, rail and ferry. All these major forms of public transport exist within or close to the Inner West Transport Study Area. Bus routes, rail lines and stations and ferry terminals are shown in **Figure 3-4**.

3.8.1 Bus Services and Infrastructure

The Brisbane bus network is mainly radial, consistent with the road network, although the expanding busway network and the use of integrated ticketing allows users to interchange between services to facilitate cross-city travel. Bus services utilise major radial arterial routes as well as the Inner Northern busway and the South East Busway to reach the Brisbane CBD, with most services terminating in Queen Street Bus Terminal or on Adelaide Street. This is illustrated in **Figure 3-16** that shows the morning peak period number of bus services.

A number of regional centres such as Garden City, Chermside, Indooroopilly and Toombul act as interchange hubs for cross-city, local and radial bus services.

Most bus services within the Inner West Transport Study Area operate either in part or in full on the two major corridors of Coronation Drive and Milton Road before distributing out to Indooroopilly and St Lucia. There are a limited number of services operating in the northwest of the study area that do not use Coronation Drive or Milton Road.



Northern Link
Environmental Impact Statement

Figure 3-16

Existing (2007) Number of Bus Services

Northern Link

SKM Connell Wagner JOINT VENTURE

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Coronation Drive Bus Services

Coronation Drive is traversed by a number of BCC bus services including Buz (high frequency all day), Rocket (very limited stops), City Express (limited stops) and City Bus (all stops) services. The majority of bus routes service the entire corridor whilst some exit at Land Street and Park Road.

The major generators of public transport trips for Coronation Drive are the Toowong Centre shopping/commercial area and UQ. Trips to more regional centres like Indooroopilly are also quite significant due to the limited east/west movements (Coronation Drive and Milton Road) provided in the Study Area. Existing bus services on Coronation Drive west of Sylvan Road are summarised in **Table 3-9**.

During the two hour am peak period (7am to 9am), seventy-one (71) buses pass Sylvan Road towards the Brisbane CBD, an average of a bus every 1.7 minutes. The total number of buses using Coronation Drive is over 800 at Sylvan Road on a week day. Three of the bus services on Coronation Drive enter the Inner Northern Busway at its Upper Roma Street access.

- **Table 3-9 Existing (2008) Bus Services On Coronation Drive west of Sylvan Road**

Route	From	To	Service Type	AM peak freq (mins)	AM peak trips (2 h)	Daily Inbound	Daily Outbound	Daily 2way	Access INB
433	City	Kenmore South	All Stops	40	3	19	19	38	N
445	City	Fig Tree Pocket	All Stops	40	3	15	15	30	N
416	City	Duke Street	All Stops	30	4	5	2	7	N
454	City	Riverhills	Express	24	5	30	30	60	N
453	City	Mt Ommaney	Express	30	4	30	29	59	N
411	City	Uni of Qld	All Stops	20	6	38	39	77	N
415	City	Uni of Qld	All Stops	30	4	16	16	32	N
417	City	Long Pocket	All Stops	30	4	17	17	34	N
425	City	Chapel Hill	Express	40	3	27	27	54	N
430	City	Kenmore	Express	120	1	15	13	28	N
435	City	Brookfield	Express	40	3	14	15	29	✓
460	City	Forest Lakes	Express	30	4	29	27	56	N
412	City	Uni of Qld	Express	17	7	75	75	150	N
444	City	Moggill	BUZ	10	12	73	73	146	✓
443	City	Moggill	Rocket	30	4	8	6	14	✓
457	City	River Hills/Mt Ommaney	City Precincts	60	2	3	3	6	N
458	City	Mt Ommaney	City Precincts	120	1	2	1	3	N
459	City	River Hills	City	120	1	2	1	3	N
Total Bus Services					**71**	**418**	**408**	**826**	

Table Note:
Source: TransLink 2008
INB – Inner Northern Busway

Milton Road Bus Services

Eight bus routes utilise Milton Road to reach the CBD, of which six use the Western Freeway to navigate from south of the Brisbane River to Milton Road. Five of the Milton Road bus routes use the Inner Northern Busway from its access on Upper Roma Street. The Milton Road services are shown in **Table 3-10.** In the am two hour peak period, 18 buses uses Milton Road to reach the CBD or the equivalent of one bus every 2.4 minutes.

Table 3-10 Existing (2008) Bus Services on Milton Road east of Croydon Street

Route	From	To	Service Type	AM peak freq (mins)	AM peak trips (2 h)	Daily Inbound	Daily Outbound	Daily 2 way	Access INB
470	Tenerife Ferry	Toowong	All Stops	24	5	42	41	83	N
455	City	Riverhills	Rocket	30	4	7	7	14	N
426	City	Chapel Hill	Rocket	40	3	4	3	7	✓
431	City	Kenmore South	Rocket	60	2	3	3	6	✓
446	City	Fig Tree Pocket	Rocket	120	1	2	2	4	✓
436	City	Brookfield	Rocket	0	0	0	1	1	✓
461	City	Forest Lakes	Rocket	60	2	3	4	7	✓
456	City	Mt Ommaney	Rocket	120	1	2	2	4	N
Total Bus Services					**18**	**63**	**63**	**126**	

Table Note: Source: TransLink 2008

Kelvin Grove Road Bus Services

Currently 13 bus routes operate on Kelvin Grove Road that provides services between the CBD and the northern suburbs. The Kelvin Grove Road bus routes are shown in **Table 3-11.** Five of these routes utilise the Inner Northern Busway via the connection from Kelvin Grove Road to the Busway via Ithaca Street. In addition to the services shown in **Table 3-11** there are two QUT Campus shuttles that provide shuttle services for students and staff between the QUT Kelvin Grove Campus and the QUT campuses at Gardens Point and Carseldine.

The Kelvin Grove – Gardens Points shuttle (Route 391) operates on a 15 minute service frequency and enters the Kelvin Grove campus via the ICB at Victoria Park Road and leaves the campus via Kelvin Grove Road at Musk Avenue. For 2009 there are advanced plans to increase the frequency to a 10minute service and this will result in 136 buses entering the campus via Victoria Park Road and exiting via Musk Avenue.

The Kelvin Grove – Carseldine shuttle serves the Kelvin Grove Road Campus via the Busway Station and operates on an hourly frequency in both directions. This shuttle service will cease to operate in December 2008 with the closure of the Carseldine Campus that will result in 2000 students and 160 staff being relocated to the Kelvin Grove Campus.

- **Table 3-11 Existing (2008) Bus Services on Kelvin Grove Road north of Blamey Street**

Route	From	To	Service Type	AM peak freq (mins)	AM peak trips (2 h)	Daily Inbound	Daily Outbound	Daily 2way	Access INB
325	City	Boondall	Cityxpress	30	4	25	24	49	✓
344	City	Carseldine	City precincts	30	4	5	5	10	N
345	City	Aspley	Buz	7	17	82	77	159	✓
351	City	Bridgeman Downs	Rocket	30	4	7	6	13	✓
356	City	McDowall	Rocket	120	1	1	1	2	N
357	City	Brendale/Eatonvale	Cityxpress	40	3	9	8	17	✓
359	City	Albany Creek	Cityxpress	40	3	17	17	34	✓
360	City	Everton Park	All stops	30	4	20	18	48	N
361	City	Mitchelton	All stops	n/a	n/a	6	6	12	N
364	City	Kelvin Grove QUT	All stops	0	0	3	4	7	N
372	City	Ashgrove (Oakleigh)	All stops	20	6	11	11	22	N
390	City	Mitchelton	All stops	11	11	54	53	107	N
391	Kelvin Grove	Gardens Point QUT	Rocket	24	5	47	47	94	N
Total Bus Services					**62**	**287**	**277**	**574**	

Table Note: Source: TransLink 2008

Kelvin Grove QUT Busway Station

Table 3-11 shows the number of bus services that stop at the Kelvin Grove QUT Busway Station and illustrates the high level of bus connectivity that the Kelvin Grove QUT campus has.

- **Table 3-12 Existing (2008) Bus Services at Kelvin Grove QUT Busway Station**

Route	From	To	Service Type	AM peak freq (mins)	AM peak trips (2 h)	Daily Inbound	Daily Outbound	Daily 2way
330	City	Bracken Ridge	Cityxpress	17	7	38	41	79
333	City	Chermside	Buz	10	12	83	87	170
340	City	Carseldine	Cityxpress	120	1	28	26	54
376	City	Stafford	Cityxpress	40	3	3	3	6
393	Normanby	Tenerife Ferry	Link	20	6	42	42	84
Total Bus Services					**29**	**194**	**199**	**393**

Table Note: Source: TransLink 2008

Musgrave Road Bus Services

Over 210 bus services operate on Musgrave Road (south of Scott Street) with 22 services operating during the two hour morning peak period. Routes 350 and 352 access the Inner Northern Busway at Upper Roma Street.

- **Table 3-13 Existing (2008) Bus Services at Musgrave Road south of Scott Street**

Route	From	To	Service Type	AM peak freq (mins)	AM peak trips (2 h)	Daily Inbound	Daily Outbound	Daily 2way	Access INB
350	City	Bridgeman Downs	Cityxpress	40	3	29	32	61	✓
352	City	McDowall	Cityxpress	30	4	7	6	13	✓
380	City	The Gap	All stops	24	5	30	36	66	N
381	City	The Gap	All stops	24	5	31	35	66	N
384	City	The Gap	City precincts	24	5	6	5	11	N
Total Bus Services					**22**	**103**	**114**	**217**	

Table Note: Source: TransLink 2008

Major Bus Infrastructure

The key bus infrastructure in the inner west is:

- Eleanor Schonell Bridge – Provides a direct bus link from UQ to the eastern and southern suburbs giving passengers considerable time savings compared to previous bus routes via river crossing in the CBD or at Indooroopilly;
- The Inner Northern Busway – Runs along the eastern side the Inner West Transport Study Area and has recently been extended to provide a direct connection for buses from Herston to the heart of the CDB with busway stations at Kelvin Grove QUT, Normanby, Roma Street Rail Station, King George Square and connecting with the Queen Street Bus Terminal. The extension includes a new entry on Upper Roma Street which enables bus services from Milton Road, Caxton Street and the Walter Taylor Bridge to access the Inner Northern Busway.
- The Busway Stations that are provided at Normanby and QUT Kelvin Grove enables passengers in the Kelvin Grove and Red Hill suburbs to access Busway services. There is also a bus access point at the intersection of Kelvin Grove Road (northern approach) and Ithaca Street to the Inner Northern Busway at the Normanby Busway Station. This access enables bus services on Kelvin Grove Road to take advantage for the Inner Northern Busway for travel to the CBD.
- Upper Roma Street and Petrie Terrace contra-flow bus lanes – The contra-flow bus lanes allow city bound buses from Caxton Street and Milton road to avoid the Petrie Terrace/Countess Street one-way system; and
- Bus Interchanges at Indooroopilly, UQ and the Suncorp Stadium Bus Station (event only use).

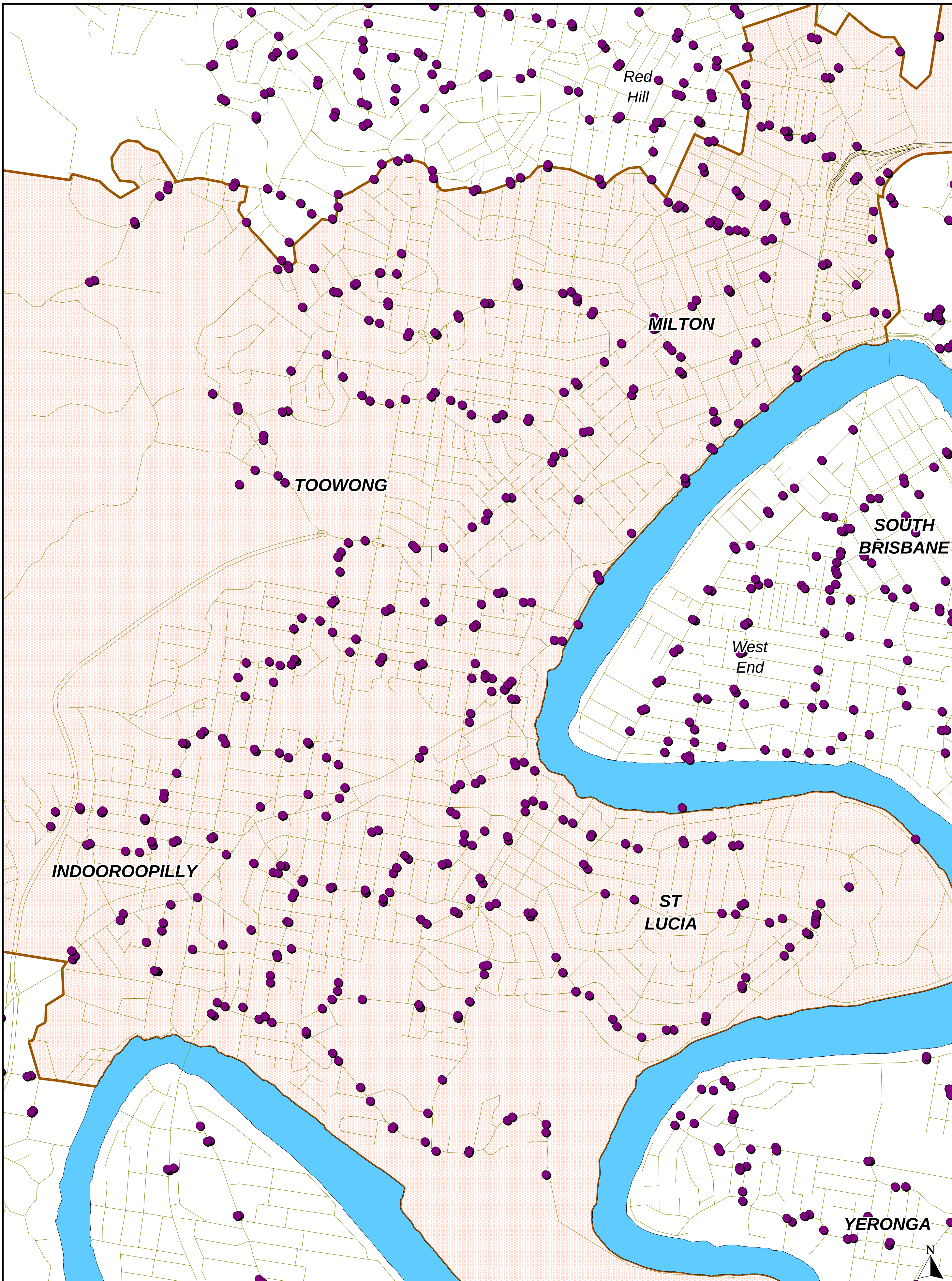
Indooroopilly Bus Interchange is located on the south west side of the Indooroopilly Shopping Centre at the intersection of Musgrave Road and Station Road. The bus interchange has the 3 distinct stopping bays each capable of holding up to three buses. There is additional layover space at the entrance to support approximately three more buses. Musgrave Road provides access to the interchange from the north with a bus priority signalised intersection at Station Road/Musgrave Road provided at the south for smooth exiting of buses.

In addition there are a number of indented bus bays along Milton Road, Coronation Drive, Kelvin Grove Road and Musgrave Road. **Figure 3-17** shows the location of bus stops in the Inner West Transport Study Area.

Bus Priority Measures

Bus priority measures are usually provided to improve travel times and/or increase reliability of travel times for bus services. T3 lanes are provided on Kelvin Grove Road north of Blamey Street that operate in the peak direction. As previously mentioned buses can access the Inner Northern Busway from Kelvin Grove Road at Ithaca Street and therefore bypass any traffic congestion to access the CBD.

Bus lanes or T3 lanes are not provided on Coronation Drive and Milton Road. Variable message signs (VMS) are provided at a large number of stops along major roads, the linkage into the BLISS and RAPID (Real Time Advanced Priority Information Delivery) has been removed and the system only displays hard coded timetable information.



LEGEND

- Bus Stops
- Inner West Tranposrt Study Area

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 3-17

Location of Bus Stops in the Study Area

SKM Connell Wagner JOINT VENTURE

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3.8.2 Rail Services and Infrastructure

Rail stations and rail lines within the Inner West Transport Study Area are shown in **Figure 3-4**. There are stations at Indooroopilly, Taringa, Toowong, Auchenflower and Milton. The Ipswich line serves these stations and there are a total of four tracks that are shared with freight services.

Existing weekday services for rail stations within the Inner West Transport Study Area are shown in **Table 3-14**.

- **Table 3-14 Existing (2007) Weekday Rail Services**

Station	Period	To City		From City	
		Rail Services	Peak Hour Service Headway (min)	Rail Services	Peak Hour Service Headway (min)
Indooroopilly	6-8AM	9	13.3	6	20
	4-6PM	8	15	14	8.5
	Daily	68		69	
Taringa	6-8AM	7	17.1	6	20
	4-6PM	8	15	13	9.2
	Daily	64		68	
Toowong	6-8AM	8	15	6	20
	4-6PM	8	15	13	9.2
	Daily	65		68	
Auchenflower	6-8AM	7	17.1	6	20
	4-6PM	8	15	13	9.2
	Daily	64		68	
Milton	6-8AM	8	15	6	20
	4-6PM	8	15	14	8.5
	Daily	67		69	

Table Note: Source: TransLink 2007

In the morning peak there are two express services. One stops at Indooroopilly and Toowong and the second stops at Indooroopilly and Milton rail stations. In the evening peak period there is one express service that only stops at Milton and Indooroopilly stations. During off-peak periods all services stop at each station shown in **Table 3-14**. Saturday services are generally one train every 30 minutes and Sunday services provide one train every hour for all rail stations.

Rail infrastructure includes rail, vehicular and pedestrian bridges, tunnels and rail stations. The layout and design of stations varies predominantly due to constraints associated with geographical location and infrastructure and land uses surrounding the rail station and the standards applicable in the period when they were built or upgraded. At all rail stations the four rail tracks are served by either one central island platform and two side platforms or two island platforms.

Only Toowong, Auchenflower and Milton provide wheel chair access to the station platforms by either ramps or lifts. Pay phones, toilets and help points are provided at all rail stations. Some distinguishing features between stations are listed in **Table 3-15**.

Table 3-15 Rail Station Infrastructure

Station	Weekday Office	Saturday Office	Sunday Office	Parking Bays	Secure Parking Bays	Visual Displays	Bike Lockers
Indooroopilly	Provided	Provided	Provided	16	-	-	Provided
Taringa	Provided	-	-	61	-	-	Provided
Toowong	Provided	Provided	Provided	61	Provided	Provided	Provided
Auchenflower	Provided	After Dark	After Dark	33	-	Provided	-
Milton	Provided	After Dark	Provided	-	-	Provided	-

Table Note: Source: Queensland Rail 2007

Indooroopilly Rail Station

This station does not have good pedestrian connectivity with the Indooroopilly shopping centre and bus interchange. These locations are a five-minute uphill walk from the station and pedestrians are required to use an underpass to cross Coonan Street.

Indooroopilly rail station is currently under going a significant upgrade that will transform the station into a more accessible, attractive, and safe destination. The works commenced in November 2007 and are due to be completed by December 2008.

Taringa Rail Station

The station infrastructure is old and lacks disabled access. The station is located to the south of the local convenience centre. The pedestrian paths to the station extend from the end of cul-de-sac streets that lack lighting or surveillance measures.

Toowong Rail Station

The rail station forms part of the Toowong Village building and multi-level car park. Pedestrian accessibility is through Toowong Village and can be confusing from the external road network or car park. Bus services stop on both High Street and Benson Street so integration of rail and bus services is not direct.

Auchenflower Rail Station

The rail station is located to the immediate north of Wesley Hospital and can be accessed from both the north and south of the rail line via Auchenflower Terrace and Lang Parade respectively. The station infrastructure is dated and disabled persons access to all platforms is by ramps from the pedestrian overpass of the railway tracks. Interchange with bus services is poor with the closest bus stops on Milton Road and Coronation Drive.

Milton Station

Milton rail station was subject to an upgrade that was completed in 2003 in conjunction with the redevelopment of Suncorp Stadium. Works included widening platforms and improving pedestrian linkages from the platforms to the stadium to cater for stadium crowds. However, pedestrian access from the northern side of Milton Road is problematic especially near the Baroona Road/Park Road intersection. The closest bus stops on Milton Road are to the west of Park Road.

3.8.3 Ferry Services

In the Inner West Transport Study Area there are fast ferry services (CityCat) that operate from pontoons at UQ, Guyatt Park (St Lucia) and Regatta (Toowong). The CityCat service provides a direct cross-river connection to West End from Guyatt Park and UQ. Services continue downstream to the City and onwards to Bretts Wharf (Hamilton). The first weekday service from UQ is at 5.57am and the last service is at 10:34pm. CityCat services generally operate at 20 minute headways during peak periods and 30 minute headways during off-peak periods.

The ferry service between UQ and Dutton Park ceased to operate following the completion of the Eleanor Schonell Bridge.

3.9 Cycle and Pedestrian Facilities

3.9.1 Origins and Destinations

The pedestrian and cycle networks within the Inner West Transport Study Area aim to provide connectivity between the origins and destinations within the area and beyond. The pedestrian network is characterised by footpaths adjacent to nearly all major roads whereas the cycle network is characterised by a combination of on and off road bike paths/lanes. The pedestrian network also makes use of some of the off road bike paths. The major origins and destinations are shown in **Figure 3-18** and are:

- CBD;
- University of Queensland;
- Toowong Shopping Centre;
- Indooroopilly Shopping Centre;
- Mt Coot-tha Botanical Gardens and Toowong Cemetery;
- Kelvin Grove QUT campus;
- Schools, rail stations;
- Office precincts, particularly along Coronation Drive, Milton Road and the Indooroopilly area; and
- Residential areas.

3.9.2 Cycle Network

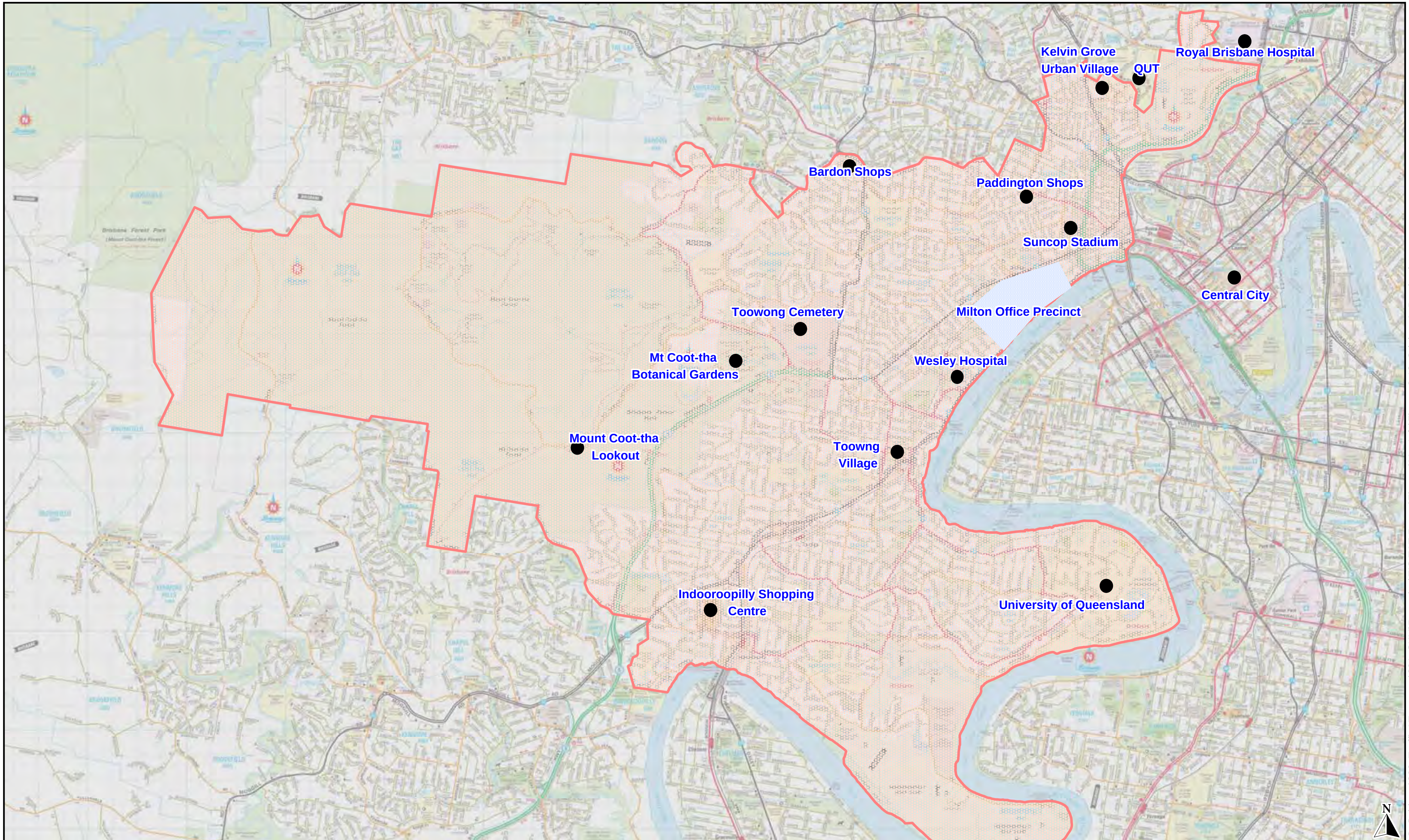
The cycle network is closely aligned to the road network and is radial in nature – the major links branching out from the CBD towards the outer suburbs. Thus, for the Inner West Transport Study Area it provides reasonable connectivity for those links connecting in the east - west direction. Connections in the north-south direction are more limited and this is one of the current shortcomings of the cycle network in this area. The on and off road cycle paths are detailed in **Figure 3-19**.

The major components comprising the off road cycle network are discussed below. They include the Bicentennial Bikeway and the recently opened Eleanor Schonell Bridge.

- *Bicentennial Bikeway* (**Figure 3-20**) - a pedestrian/cycle shared use off-road facility next to the Brisbane River from Toowong to the CBD. Access points are provided along Coronation Drive opposite Sylvan Road, Land Street (via subway), Lang Parade (via subway), Park Road and Cribb Street (via subway). On road bikeways connect the Bicentennial bikeway to UQ and the Western Freeway bikeway at the Toowong Roundabout;
- *Western Freeway/Centenary Highway Bikeway* – this is an off-road bikeway that runs parallel to the Western Freeway and Centenary Highway from the Toowong Roundabout to south of the Brisbane River via a bikeway at the Centenary Bridge. On road bikeways on Sylvan Road connect this facility to the Bicentennial Bikeway via an underpass of Coronation Drive that is accessed via Land Street;
- *Jack Pesch Bridge Pedestrian and Bike Bridge (Indooroopilly)* – this off-road facility is parallel to the Walter Taylor Bridge at Indooroopilly. On road bikeways provide connectivity to St Lucia and to suburbs south of the Brisbane River;
- *Eleanor Schonell Bridge* (**Figure 3-21**) - This facility provides a cross-river bus connection between UQ and Dutton Park as well as a segregated pedestrian and bikeway. This facility connects with off-road facilities in Dutton Park. The *Normanby Pedestrian and Cycle Link* (**Figure 3-22**) - opened in 2007 and

improves pedestrian and cycle access between Brisbane's CBD and the inner west and northern suburbs. This link connects the cycle and pedestrian network at Normanby Five-ways to the Roma Street Parkland, Albert Street in the city and the Inner Northern Bikeway. It provides a safe and accessible pathway through the heavily trafficked Normanby Fiveways intersection.

- A number of *cycle parking facilities* are located in Toowong, Paddington, Indooroopilly as well as a new "cycle pod" at the Guyatt Park CityCat terminal and cycle lockers at Indooroopilly, Taringa and Toowong rail stations.



LEGEND

- Major Origin/Destination
- Inner West Transport Study Area
- Office Precinct

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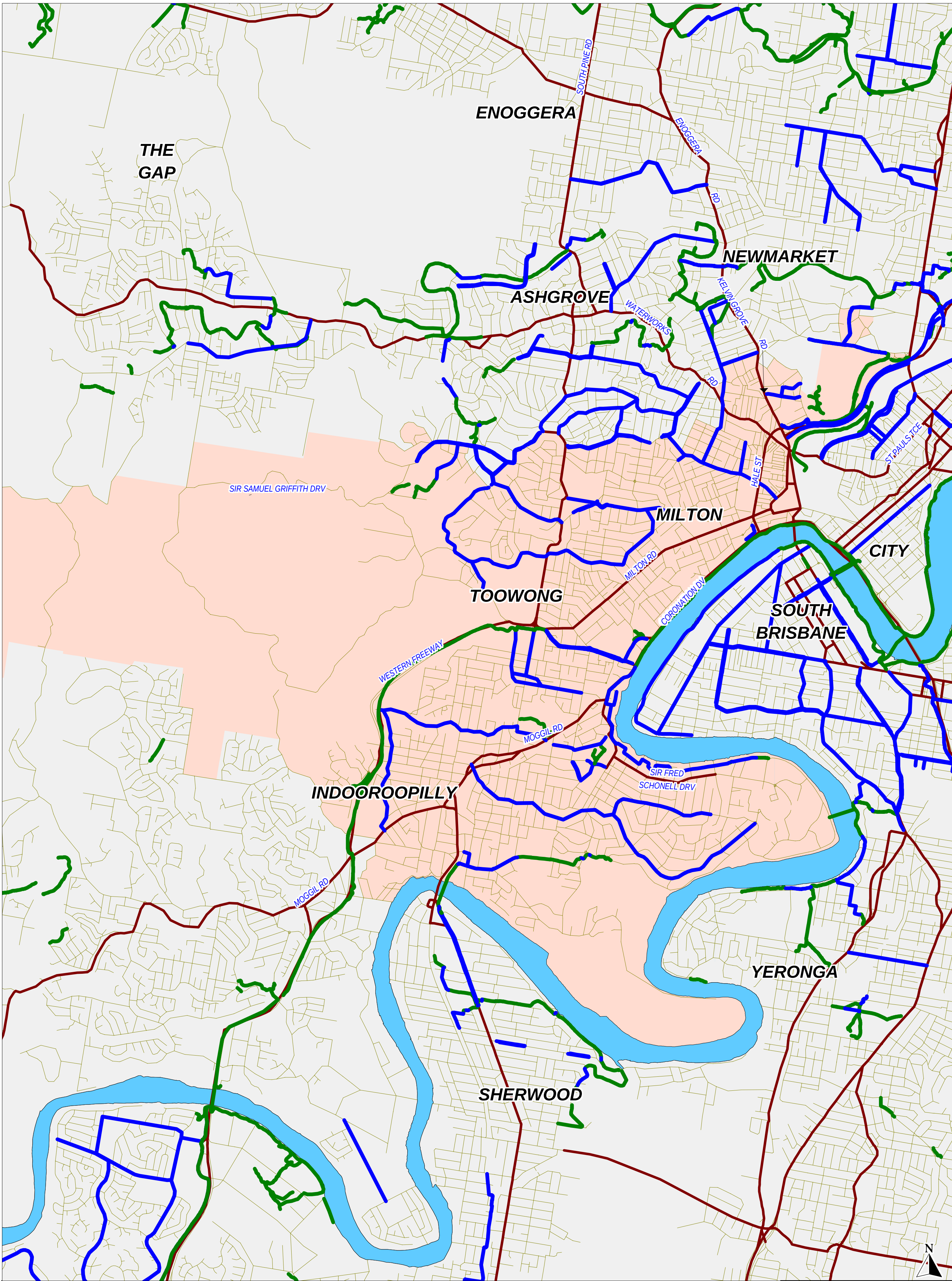
Figure 3-18

Major Origins and Destinations within the Inner West Transport Study Area



LEGEND

- Inner West Transport Study Area
- Motorways and Arterial Routes
- Other Roads
- Off Road Bikeway
- On Road Bikeway

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Figure 3-19

On and Off Road Cycle Paths within the Inner West Transport Study Area

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- **Figure 3-20 Bicentennial Bikeway at Park Road access, Milton**

- **Figure 3-21 Eleanor Schonell Bridge, St Lucia**

- **Figure 3-22 Normanby Pedestrian and Cycle Link, Kelvin Grove**

3.9.3 Pedestrian Network

The pedestrian network, like the cycle network, provides reasonable connectivity throughout the Inner West Transport Study Area. Locations of high pedestrian movements are concentrated around the major shopping and employment centres, universities, schools and public transport connections – these coinciding with the origins and destinations of the cycle network (**Figure 3-18**). Adjacent to nearly all major roads there are pedestrian paths and pedestrians are catered for at all signalised intersections. The pedestrian network utilises many of the cycle network's off road facilities providing additional connectivity. There are however some short shortcomings in this network which are discussed further in the following section.

3.9.4 Pedestrian and Cycle Network Deficiencies

Despite the quality of both on and off road facilities, there are a number of deficiencies in both the cycle and pedestrian networks. These deficiencies lessen the attractiveness of these networks deterring potential users. These key deficiencies are summarised below:

- segregation caused by high traffic flows, wide carriageway widths and limited crossing opportunities on Coronation Drive, Milton Road, Frederick Street, Moggill Road, Musgrave Road and Kelvin Grove Road so restricting pedestrian connections and access to bus stops, rail stations and other destinations;
- the Western Freeway forms a major barrier to pedestrian and cycle movement. Within the Inner West Transport Study Area pedestrian and cyclists can only cross the Western Freeway at the over bridge provided by Waverly Road (Taringa) and the under-bridges provided by Russell Terrace and Moggill Road (both at Indooroopilly);
- there are currently no formal pedestrian and cycle crossing opportunities between the end of the Western Freeway at Mt Coot-tha Road and the signalised intersection of Milton Road and Croydon Street;
- pedestrian and cycle connectivity from Kelvin Grove to the CBD is via the traffic dominated Normanby Five Ways intersection. This is due to the barrier to pedestrian and cycle movement caused by the ICB,

Inner Northern Busway and the railway such that there are no other pedestrian and cycle connections from Kelvin Grove to the CBD;

- breaks in connectivity in the pedestrian and cycle networks for example where cycle lanes end and do not connect onto additional cycles lanes/cycle paths;
- long traffic signal cycle times for pedestrians wishing to cross major arterial roads;
- limited crossing points at signalised intersections forcing pedestrians to use crossing points that may not be direct;
- limited use of grade separation throughout the Inner West Transport Study Area that could facilitate and enhance pedestrian and cyclist movements;
- poor provision of pedestrian routes and crossing locations at the Petrie Terrace, Countess Street, Upper Roma Street one-way system;
- unpleasant walking and cycling environment created by the high traffic volumes and number of commercial vehicles using the radial arterials of Coronation Drive, Milton Road, Moggill Road, Kelvin Grove Road and Musgrave Road;
- the hilly topography in the Inner West Transport Study area can discourage the take-up of walking and cycling; and
- usage of pedestrian and cycle network in hours of darkness may be limited due to a lack of lighting and personal safety concerns.

Further detail on the performance of the pedestrian and cycle networks are detailed in **Section 4.9.**

3.9.5 Future Pedestrian and Cycle Schemes

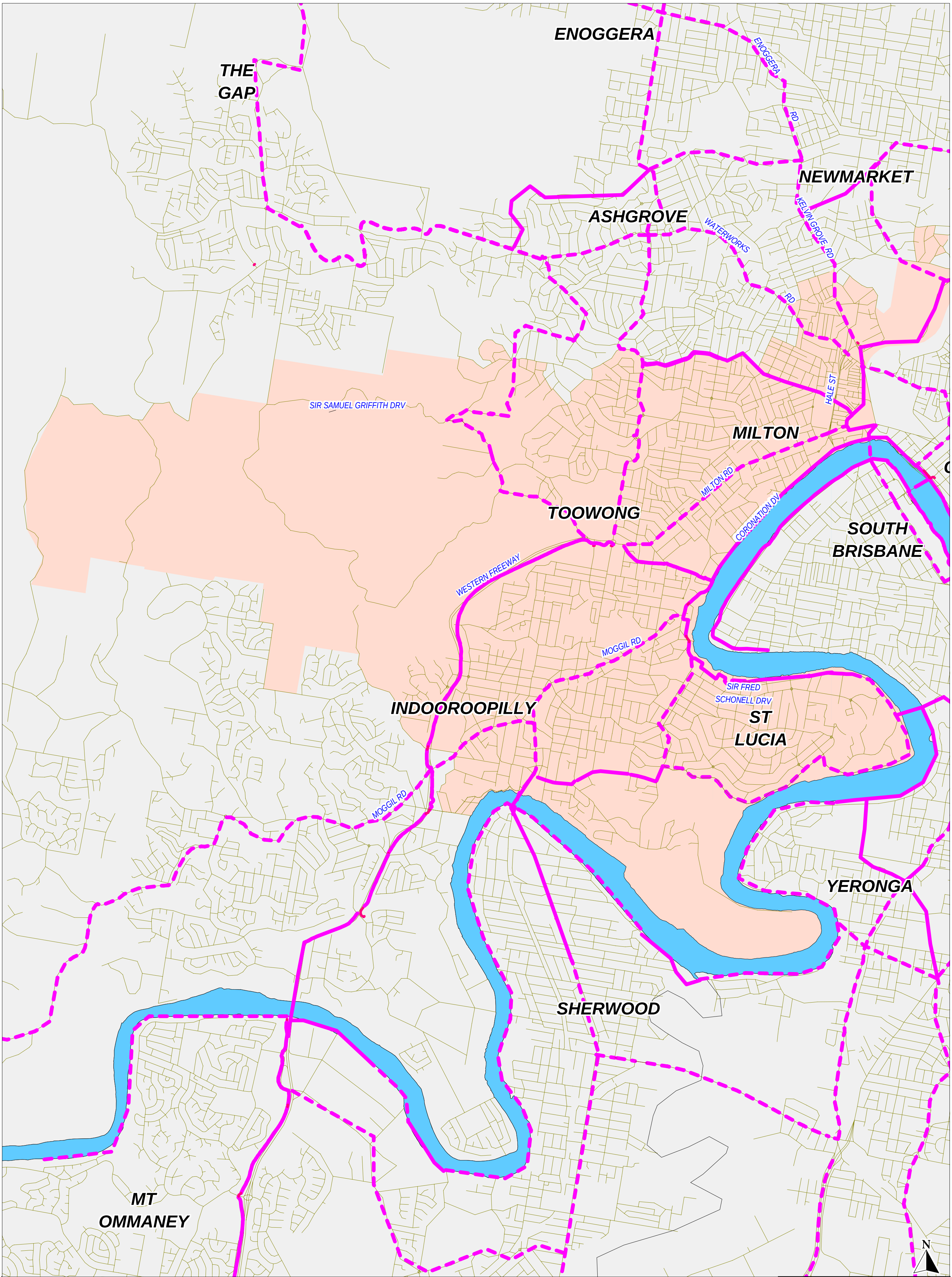
There are a number of committed pedestrian and cycle projects in the short to medium term. The major works are detailed below:

- work on a new bikeway in St Lucia along Hillside Terrace has commenced, with a three-meter wide pathway between Carawa Street and Tarcoola Street. Stage 2 of the bikeway will complete the link to University of Queensland;
- due to the high use of the *Bicentennial Bikeway* and concerns relating to pedestrian and cyclist safety BCC have recently carried out an investigation to widen and provide separation between bikes and pedestrians on the Bicentennial Bikeway. Implementation is scheduled as a staged construction commencing in the 2008/09 financial year. As an interim measure Council is undertaking a review of signage and pavement markings on the bikeway with the aim to increase the awareness of both pedestrians and cyclists and reinforce the shared pathway responsibilities of users. This review should lead to new signs and pavement treatments on the shared path section of the bikeway between William Jolly Bridge and Toowong. The review is currently being undertaken with signage and pavement markings to be installed by the end of the current financial year;
- the planned Hale Street Link will include a 3.6m wide cycleway on the western side of the bridge and a 3.6m wide pedestrian footpath on the eastern side of the bridge. This would provide a new cross river facility that would also link directly into the Bicentennial Bikeway;
- *City West* describes the western part of Brisbane's CBD. The City West Strategy addresses issues such as connectivity and the public domain. The City West Strategy includes safer, more direct and more frequent pedestrian crossings, including crossing on Upper Roma Street between Countess Street and Milton Road, North Quay/Saul Street between Roma Street and William Jolly Bridge, and a scramble crossing at Milton Road/Petrie Terrace/ Upper Roma Street intersection;

- the recently completed *Caxton – Roma Street pedestrian link* passes through the Police Barracks redevelopment at City West. The project will deliver a pedestrian link with the capacity to enable better management of the Suncorp Stadium post-event pedestrian traffic and improve pedestrian access between the Caxton Street precinct and the western fringe of the CBD to complement the vision of the City West Master Plan. This link will be operation when the Police Barracks redevelopment is completed towards the end of 2008; and
- the *Western Freeway Roundabout Cycle and Pedestrian Bridge* is a DMR scheme to build a safe north-south crossing for cyclists and pedestrians at the Toowong end of the Western Freeway. The new crossing will link the Western Freeway Bikeway at Toowong with the Botanic Gardens and Mt Coot-tha Road so making it safer and easier for people to access facilities in the adjoining area such as Mt Coot-tha Botanic Gardens, Anzac Park, the Western Freeway Bikeway and Toowong State School. The bridge is due to be completed in 2008/2009. Thus this infrastructure will greatly increase the connectivity of cyclists and pedestrians wishing to access Mt Coot-tha Road.

As discussed previously, a shortcoming of the cycle network is its radial pattern leading from the CBD to the outer suburbs. Queensland Transport has developed the SEQ Principal Cycle Network Plan. This report reviews the SEQ cycle network and identifies the key links that are lacking and so preventing a cohesive network. It presents a series of maps detailing both the existing and future principal cycle routes for the greater Brisbane area.

In the Inner West Transport study area is a future proposed north-south principal route along Frederick Street, Rouen Road and Boundary Roads. Milton Road and Moggill Road are future principal cycle routes. In the Kelvin Grove area there are proposed principal routes along Kelvin Grove Road and Musgrave Road. These strategies as well as the projects outlined above will go some way to address the issues outlined under previous section. The principal and future cycle routes can be seen in **Figure 3-23**.



LEGEND

Inner West Transport Study Area
Existing Principal Route
Future Principal Route
Other Roads

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Figure 3-23

Existing and Future Principal Cycle Routes - Inner West Transport Study Area

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3.10 Freight

Freight movements in the study area are limited to articulated vehicles and there are no B-Double routes. The Western Freeway, Milton Road and MetRoad 5 are designated as secondary freight routes and Coronation Drive and Moggill Road are designated as tertiary freight routes.[16] There is a lack of high quality freight routes (primary freight routes) connecting the Western Corridor to the north, to the CBD or for cross-city freight. This results in freight using the secondary and tertiary freight routes that are located in the Inner West Transport Study Area.

Local land uses that generate freight movements include:

- the Castlemaine XXXX brewery in Milton with freight vehicles using a route via Black Street and Castlemaine Street to access Milton Road; and
- the Mt Coot-tha Quarry predominantly uses a route to Eagle Farm via Milton Road, Hale Street and the ICB with a smaller proportion using the Western Freeway for trips to the west.

3.11 Emergency Services

Police stations within the study area are located at:

- 343 Moggill Road, Indooroopilly – left in left out only.

Fire services within the study area are located at:

- 26 Whitmore Street, Taringa

No ambulance stations are located within the study area. The Wesley Hospital operates a 24 hour emergency ward that accepts ambulances. To the immediate east of the Inner West Transport Study Area in Herston ambulance services operate to and from the Royal Brisbane Hospital complex.

[16] Brisbane City Council (March 2005) *TransApex Prefeasibility Report,* Brisbane City Council, Brisbane

4. Existing Network Performance

4.1 Introduction

The performance of the existing transport network is described in terms of:

- traffic demands and movement patterns;
- travel speeds and travel times;
- road capacity and level of service;
- intersection performance;
- local accessibility;
- toll routes;
- public transport performance;
- pedestrian and cyclist system performance; and
- road safety.

4.2 Traffic Demands and Movement Patterns

Figure 4-1 shows the distribution of all traffic and commercial vehicles using Coronation Drive and **Figure 4-2** shows traffic using Milton Road on an average weekday. Daily travel patterns are summarised in **Table 4-1** and **Table 4-2**. These graphics and sector travel analysis illustrate the wide catchments served by the Coronation Drive and Milton Road corridors.

- **Table 4-1 Coronation Drive Daily Traffic Patterns**

From \ To	Inner West	Central City	West Brisbane	Airport/ATC North/Eagle Farm	North Brisbane	South of Brisbane River	Total
Inner West	2% (1%)	8% (16%)	-	1% (4%)	10% (5%)	21% (18%)	43% (44%)
Central City	9% (16%)	-	1% (1%)	-	-	2% (1%)	12% (17%)
West Brisbane	-	2% (-)	-	-	-	3% (1%)	6% (1%)
Airport/ATC North/Eagle Farm	2% (4%)	-	-	-	-	1% (3%)	3% (7%)
North Brisbane	10% (5%)	-	-	-	-	2% (5%)	12% (10%)
South of Brisbane River	19% (16%)	2% (1%)	1% (1%)	- (2%)	1% (4%)	1% (-)	24% (23%)
Total	41% (41%)	12% (17%)	2% (2%)	2% (6%)	12% (9%)	30% (26%)	100%

Table Key:
- Radial or Central City related travel
- Cross-City travel
- Airport/ATC North travel
- Local travel

Table Notes
Source: 2007 Northern Link Traffic Model
(x%) - % commercial vehicles

The trips on Coronation Drive have been broken down into four trip types:

- local travel – 2% all traffic, 1% commercial vehicles;

- radial or Central City (including CBD) related travel – 24% all traffic, 33% commercial vehicles;
- cross city travel – 69% all traffic, 53% commercial vehicles; and
- ATC North/Airport travel – 5% all traffic, 13% commercial vehicles.

This shows that Coronation Drive has a minor role for local trips and for travel to and from the ATC North/Airport. Whilst daily travel demand to central Brisbane is reasonably significant travel patterns between the western suburbs to the north and southeast are high. This is supported by **Figure 4-1** that shows the main feeder roads to Coronation Drive are Moggill Road and Brisbane Street, which provide connectivity to the western suburbs and to Hale Street for northern trips and the Pacific Motorway for trips to the south east. This clearly illustrates that Coronation Drive, which is an inner urban arterial road, has a significant role for cross-city trips.

- **Table 4-2 Milton Road Daily Travel Patterns**

From \ To	Inner West	Central City	West Brisbane	Airport/ATC North/Eagle Farm	North Brisbane	South of Brisbane River	Total
Inner West	1% (2%)	3% (7%)	-	1% (3%)	6% (5%)	4% (8%)	14% (24%)
Central City	2% (7%)	-	4% (1%)	-	-	7% (1%)	13% (9%)
West Brisbane	-	3% (-)	-	2% (1%)	3% (2%)	3% (4%)	11% (7%)
Airport/ATC North/Eagle Farm	1% (2%)	-	1% (1%)	-	-	8% (6%)	10% (10%)
North Brisbane	3% (4%)	-	3% (2%)	-	-	8% (10%)	14% (16%)
South of Brisbane River	6% (10%)	6% (1%)	5% (4%)	9% (6%)	10% (11%)	3% (2%)	38% (34%)
Total	13% (25%)	11% (9%)	14% (8%)	11% (10%)	19% (17%)	32% (31%)	100%

Table Key:
Radial or Central City related travel
Cross-City travel
Airport/ATC North travel
Local travel
Table Notes
Source: 2007 Northern Link Traffic Model
(x%) - % commercial vehicles

The trips on Milton Road have also been broken down into four trip types:

- Local travel – 1% all traffic, 2% commercial vehicles;
- Radial or Central City (including CBD) related travel – 24% all traffic, 18% commercial vehicles;
- Cross city travel – 53% all traffic, 61% commercial vehicles; and
- ATC North/Airport travel – 22% all traffic, 19% commercial vehicles.

From **Figure 4-2** and **Table 4-2** it can be seen that Milton Road has a minor role for local trips. As with Coronation Drive, Milton Road has a significant role for cross-city and radial/CBD related travel. However, Milton Road also has a significant role for trips to and from the ATC North and Airport. Travel demand is strong between the western corridor, as opposed to the western suburbs of Brisbane, and the northeast. From **Figure 4-2** it can be seen that there is a strong pattern for trips from the Western Freeway to the ICB via Milton Road so highlighting the strategic role that this inner urban radial road has.

Overall network daily traffic demands shown on **Figure 4-3** illustrate the traffic volumes of over 60,000 vehicles per day on Coronation Drive and over 50,000 vehicles per day on Milton Road represent a major proportion of the traffic task within the network in Inner West Brisbane. This demonstrates their significance within the broader network of the metropolitan area.

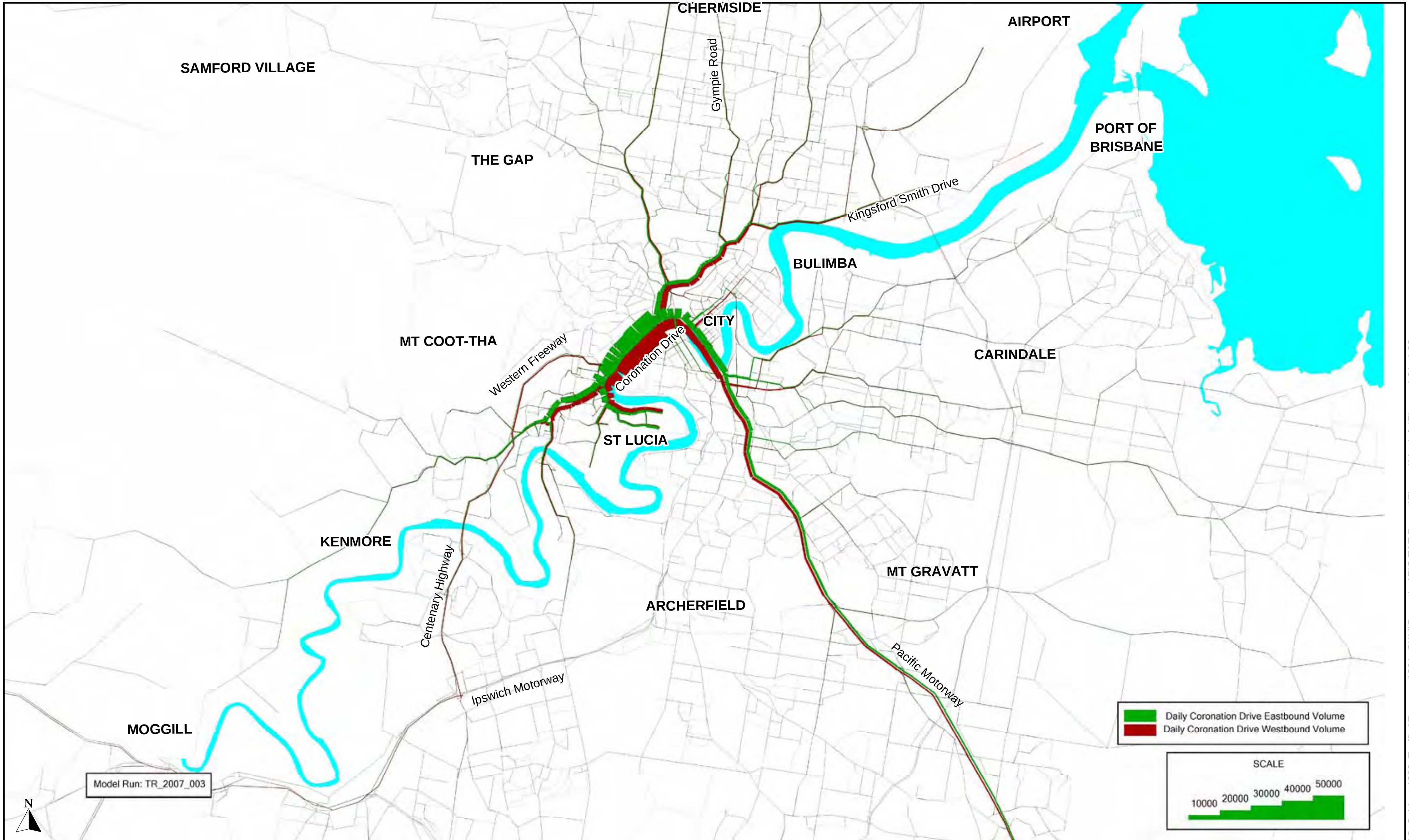

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Figure 4-1

Existing (2007) Daily Travel Patterns Coronation Drive

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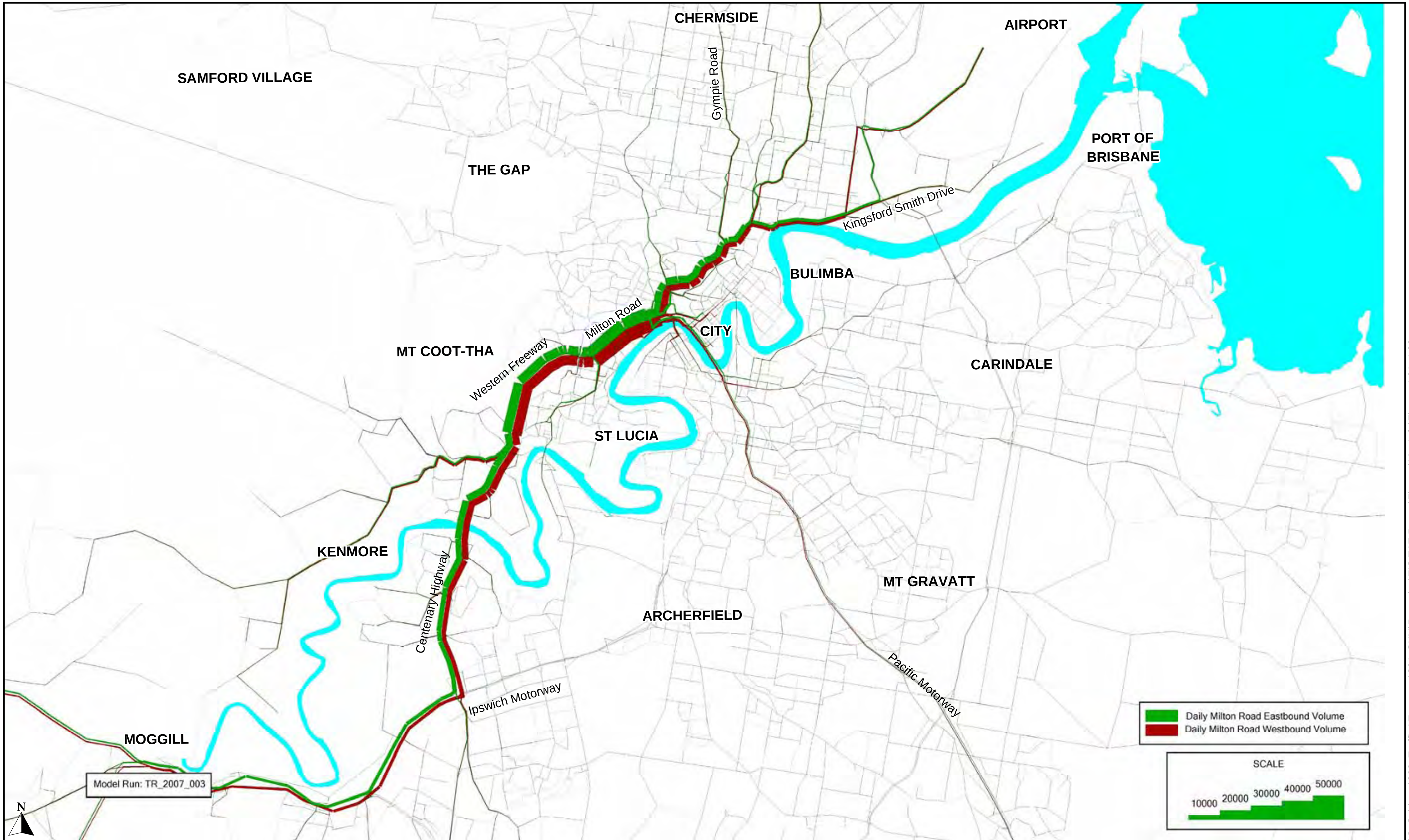

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Figure 4-2

Existing (2007) Daily Travel Patterns Milton Road

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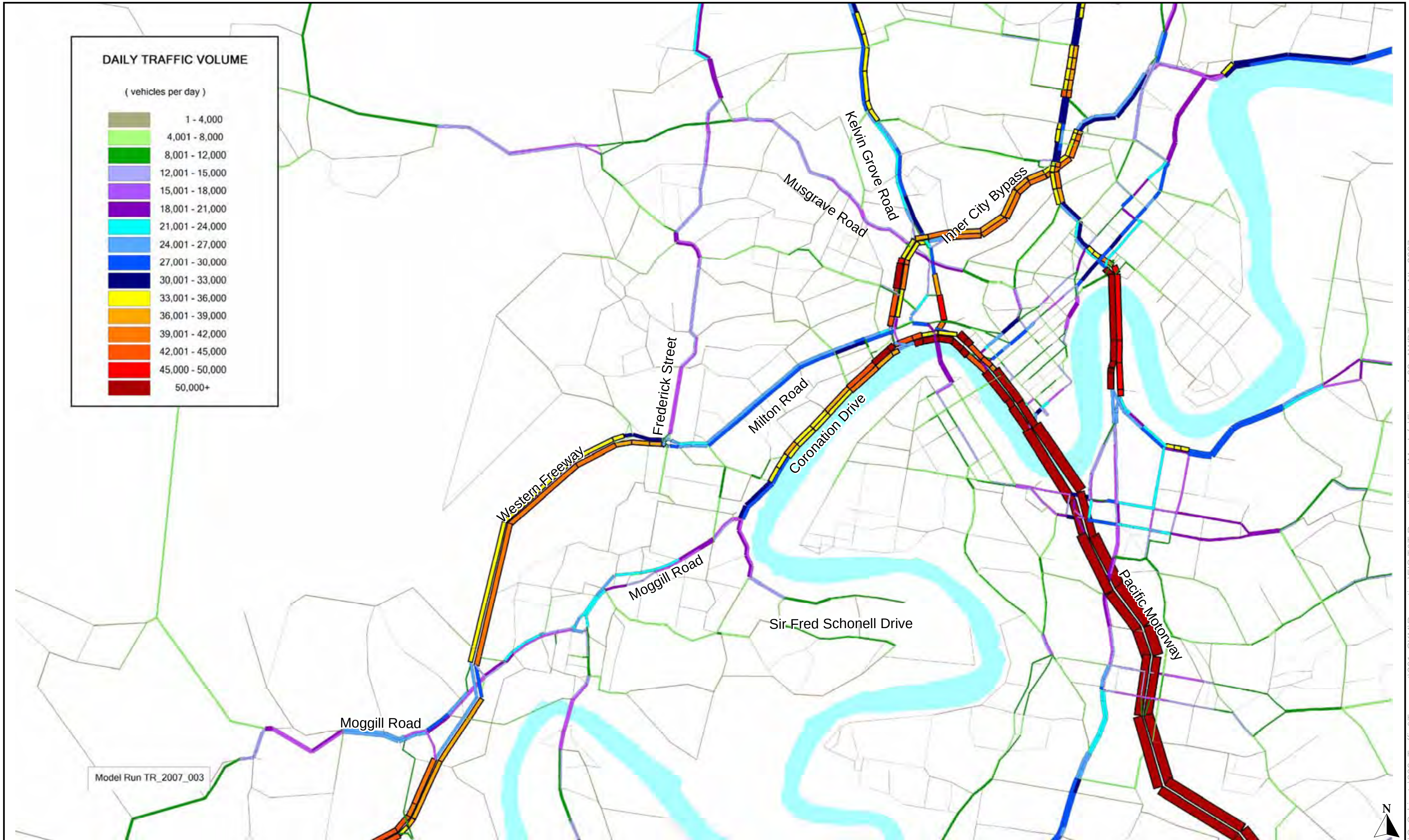

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Figure 4-3

Existing (2007) Average Weekday Traffic Volumes

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4.3 Travel Speeds and Travel Times

Travel time surveys conducted in October 2007 were used to extract average travel speed and time, as well as the variation of speed and time along Milton Road and Coronation Drive. Travel time and speed data was recorded through six-travel time runs conducted on a typical weekday in the am (7-9am) and pm (4-6pm) peak periods.

Coronation Drive is approximately two kilometres in length and connects Moggill Road in Toowong to the Riverside Expressway at Hale Street. Average travel time and speed data was assessed between Sylvan Road and Cribb Street.

Milton Road is in close proximity to Coronation Drive running roughly parallel to it in the east west direction. It is approximately 2.5 kilometres in length from the Frederick Street roundabout in Toowong to Petrie Terrace. For the purposes of extracting average travel time and speed the stretch of road between Morley Street/Croydon Street and Castlemaine Street was assessed. **Table 4-3** displays the average travel times and speed for Coronation Drive and Milton Road in the am and pm peak periods.

- **Table 4-3 Average 2007 Weekday Travel Times and Travel Speeds**

Parameter	Morning Peak (7-9am)				Evening Peak (4-6pm)			
	Coronation Drive		Milton Road		Coronation Drive		Milton Road	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Average Time (min)	8:42	2:54	5:00	7:00	3:48	2:42	5:18	6:42
Average Speed (km/h)	12.3	36.1	27.9	19.9	28.3	39.5	26.4	21.0

Table Note: Source: 2007 Travel Time Surveys

Table 4-3 shows that during the am and pm peak periods the traffic speed is significantly below the posted speed of 60km/h on both roads. This is due to delays caused at intersections. Some results differ from the typical result expected on a major arterial – Milton Road is slower in the outbound am peak rather than the pm peak and Coronation Drive faster in the outbound pm peak than am peak. These results could be attributed to differing road characteristics of the inbound and outbound directions and in the case of Coronation Drive, the tidal flow system allowing greater lane capacity for the peak flow direction and hence greater variability in travel time and speed. **Table 4-4** shows the variability in the time and speed ranges.

- **Table 4-4 Travel Times and Travel Speed Variability**

Parameter	Morning Peak (7-9am)				Evening Peak (4-6pm)			
	Coronation Drive		Milton Road		Coronation Drive		Milton Road	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Time Range (min)	2:12 – 16:24	2:36 – 3:24	4:12 – 6:12	4:30 – 17:54	2:06 – 5:24	2:30 – 3:06	4:18 – 5:48	3:06 – 10:30
Speed Range (km/h)	6.5 – 49.4	31.0 – 40.4	22.6 – 33.5	7.8 – 31.3	19.8 – 50.6	33.9 – 42.2	24.2 – 32.7	13.3 – 45.5

Table Note: Source: 2007 Travel Time Surveys

The above table shows both Coronation Drive and Milton Road to have significant fluctuations in travel times and speed within the peak periods. This is also a result of traffic delays at traffic signals along both stretches of road. Some vehicles would have a smooth progression through all of the intersections whilst others would be delayed at some or all intersections. The fluctuating travel times and speeds presented in **Table 4-4** are indicative of the unstable flow characteristics of both roads.

Figure 4-4 and **Figure 4-5** show the variation in the average travel speed along Coronation Drive in the inbound and outbound directions. Both the am and pm periods show a similar trend with the traffic flow slower towards Lang Parade and increasing to/from Patrick Lane. Overall the speed varies along the stretch of road - this is likely to be a result of intersection delay.

Figure 4-6 and **Figure 4-7** show the variation in the average travel speed along Milton Road. For the inbound direction traffic flow is close to the posted speed (60km/h) through Park Avenue and Weinholt Street gradually decreasing towards Cribb Street and Castlemaine Street. These delays would be partly due to traffic signals. The outbound direction in the am period follows a similar pattern to the inbound direction in the am peak period - that of the slowing of traffic flow around Cribb Street and freer flowing conditions towards Park Avenue. The pm peak displays the opposite, with more free flowing conditions towards Baroona Street and slower conditions towards Park Avenue.

In summary both Coronation Drive and Milton Road have travel speeds that are significantly lower than the signed speed limit of 60km/h and average travel times significantly fluctuate. This symptomatic of unstable flow characteristics on both roads.

Figure 4-4 Existing (2007) Coronation Drive inbound peak period and average travel speeds

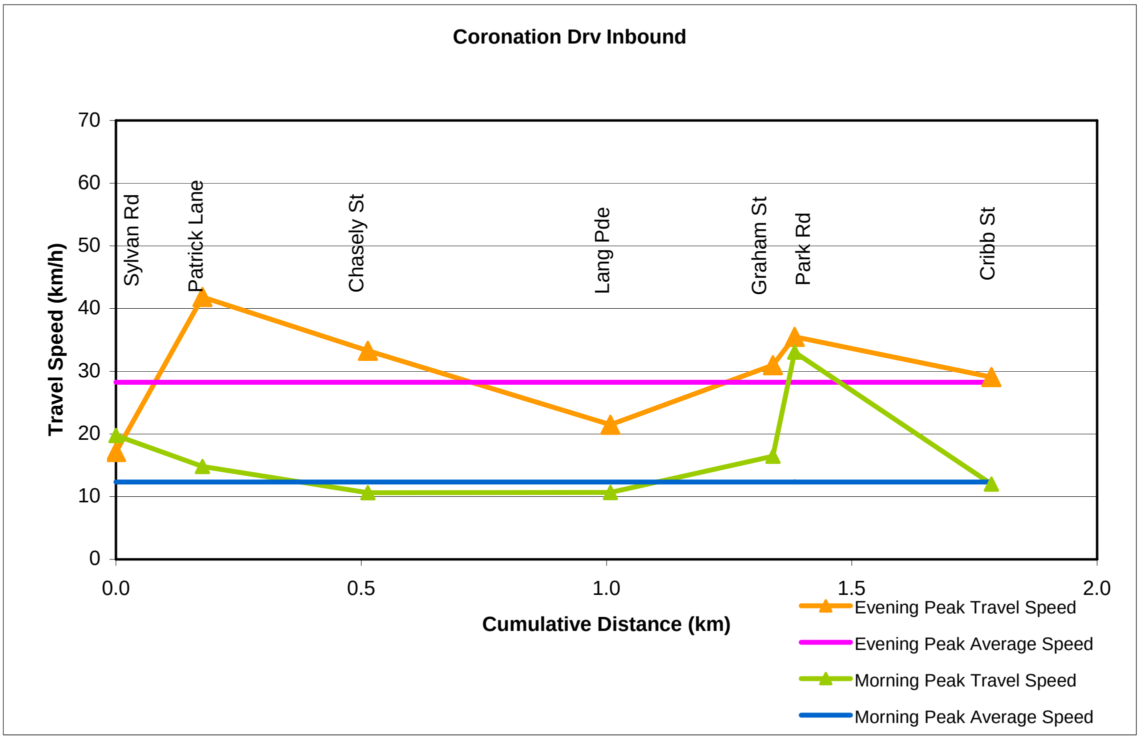
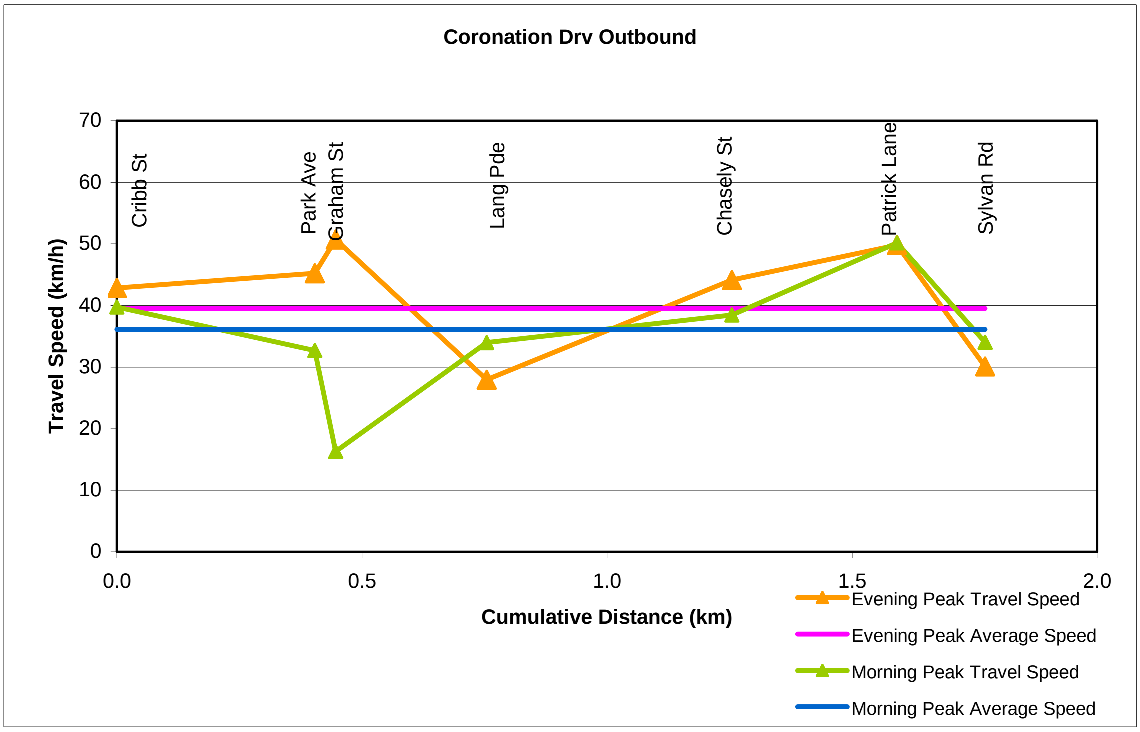
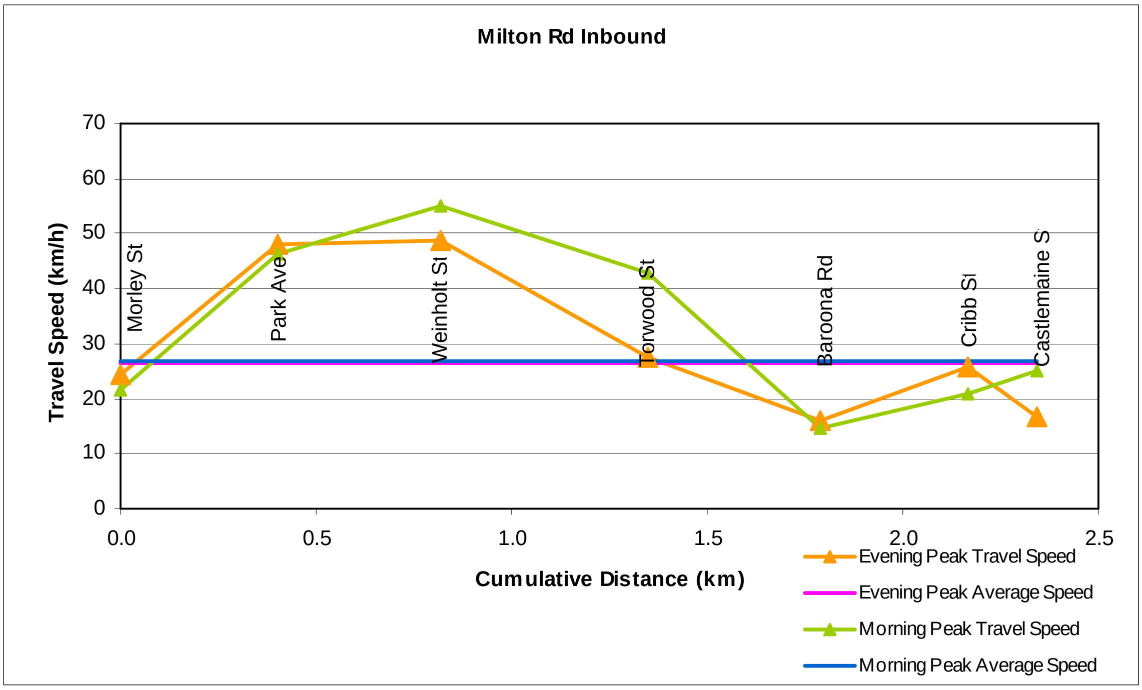


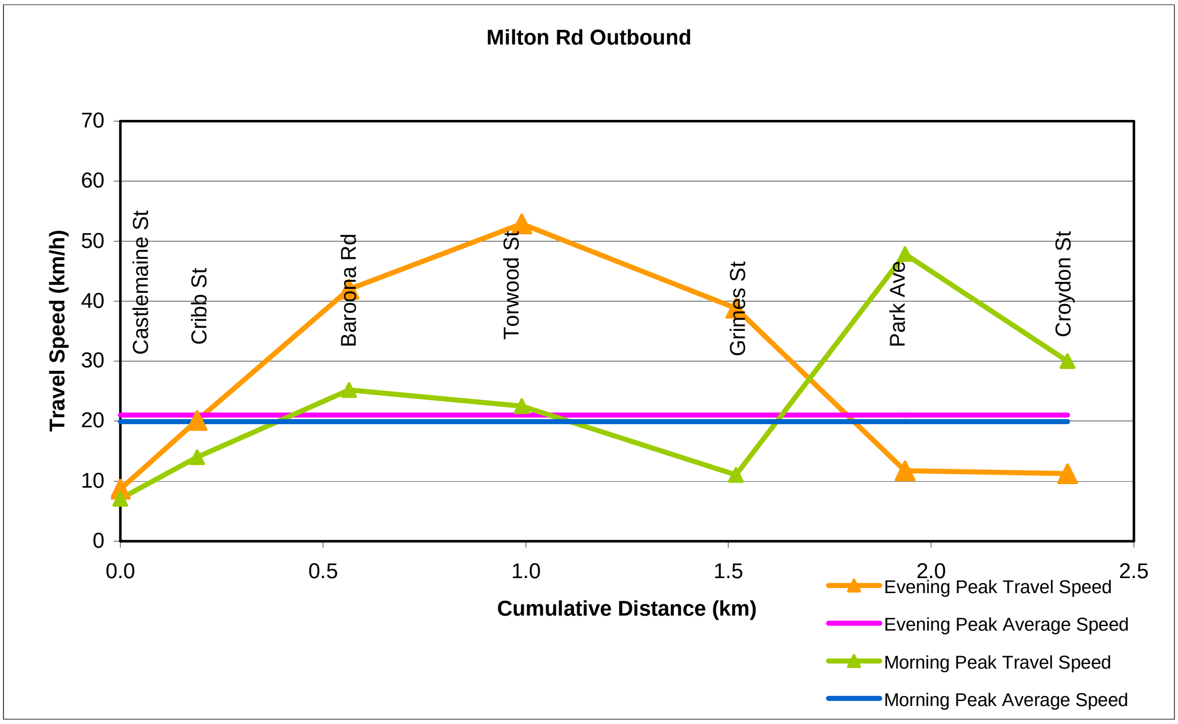
Figure 4-5 Existing (2007) Coronation Drive outbound peak period and average travel speeds



- **Figure 4-6 Existing (2007) Milton Road inbound peak period and average travel speeds**



- **Figure 4-7 Existing (2007) Milton Road inbound peak period and average travel speeds**



4.4 Road Capacity and Level of Service

4.4.1 Level of Service Definition

Level of Service (LOS) is a key measure of the performance of the road network. It can be measured at a mid-block point or at an intersection, and provides an assessment of the operation as performance of the road network in terms of conditions experienced by drivers.

The LOS for roads within the study area has been determined for existing conditions for the base year 2007. The assessment uses the criteria in the Austroads Guide to Traffic Engineering Practice Part 2 - Roadway Capacity (1998). These criteria use travel speed as the defining measure for urban arterial roads with interrupted flow. As travel speeds decrease from the optimum free-flow condition, the LOS to road users deteriorates. The LOS range is from A (very good) to F (congested). **Table 4-5** describes the characteristics of each category.

- **Table 4-5 Roadway Mid-Block Level of Service Criteria**

Level of Service	Criteria
Level of Service A	Generally free flow conditions with operating speeds usually about 90% of the free flow travel speed for the particular class of arterial. Vehicles are unhindered in manoeuvring in the traffic stream and stopped delay at junctions is minimal.
Level of Service B	Relatively unimpeded operation with average travel speeds about 70% of the free flow speed for the particular class. Manoeuvring in traffic stream is only slightly restricted and stopped delays are low.
Level of Service C	Stable operating conditions with manoeuvring becoming more restricted. Longer queues and/or adverse signal coordination may contribute to lower average travel speeds of about 50% of the free flow speed for that class.
Level of Service D	Conditions border on a range in which small increases in flow can significantly increase junction delay and reduce travel speed. Travel speeds are about 40% of the free flow speed.
Level of Service E	Conditions are characterised by significant junction delays and travel speeds of 33% of free flow speeds or lower. Contributing factors may be adverse signal progression, closely spaced signals and extensive queuing at critical junctions.
Level of Service F	Traffic flow at this level is very low speed for the road class, 25% to 33% of the free flow speed. Signalised junctions will be severely congested with extensive queuing and delay.

Table Note: Source: Austroads (1998) *Roadway Capacity*

4.4.2 Network Performance

The existing mid-block LOS for the study area road network during the am and pm peaks is shown in **Figure 4-8** and **Figure 4-9**.

Within the Inner West Transport Study Area during both the am and pm peak periods all of the regional roads (Moggill Road, Milton Road, Coronation Drive, Frederick Street, Musgrave Road, Kelvin Grove Road and Hale Street) have several mid-block segments in both directions that operate at LOS E or F. Lower order roads such as Park Road, Baroona Road, Sylvan Road, Sherwood Road and Coonan Street also have several mid-block segments in both directions during both peaks that operate at LOS E or F.

This information illustrates that road traffic throughout the Inner West Transport Study Area is congested with the critical period volume/capacity ratio being close to or over nominal capacity on many roads.

These levels of congestion not only result in delays and excessive journey time for local trips but also for the significant number of motorists that use the regional roads in the Inner West Transport Study Area for strategic trips.

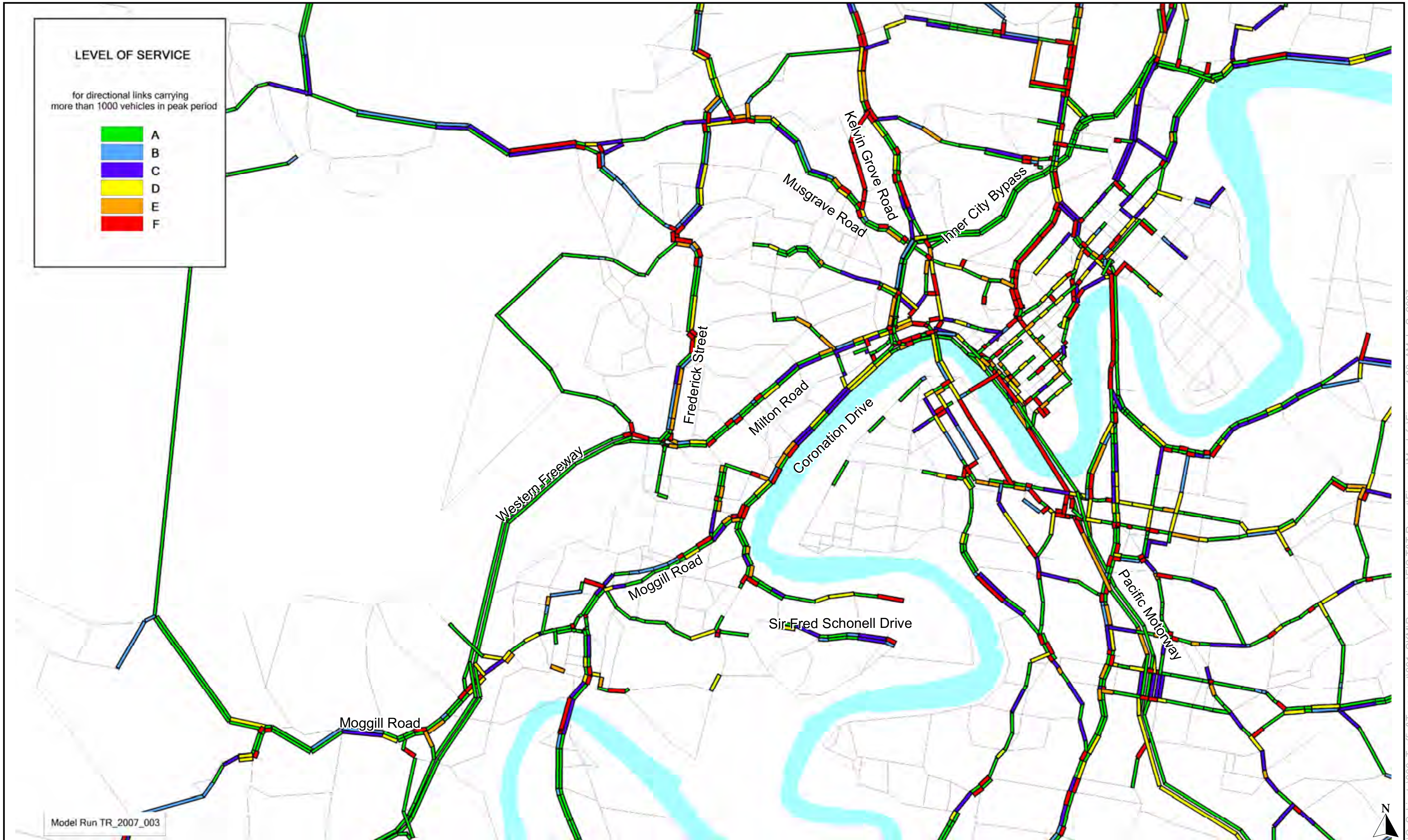


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Figure 4-8

Existing (2007) AM Peak Period Level of Service

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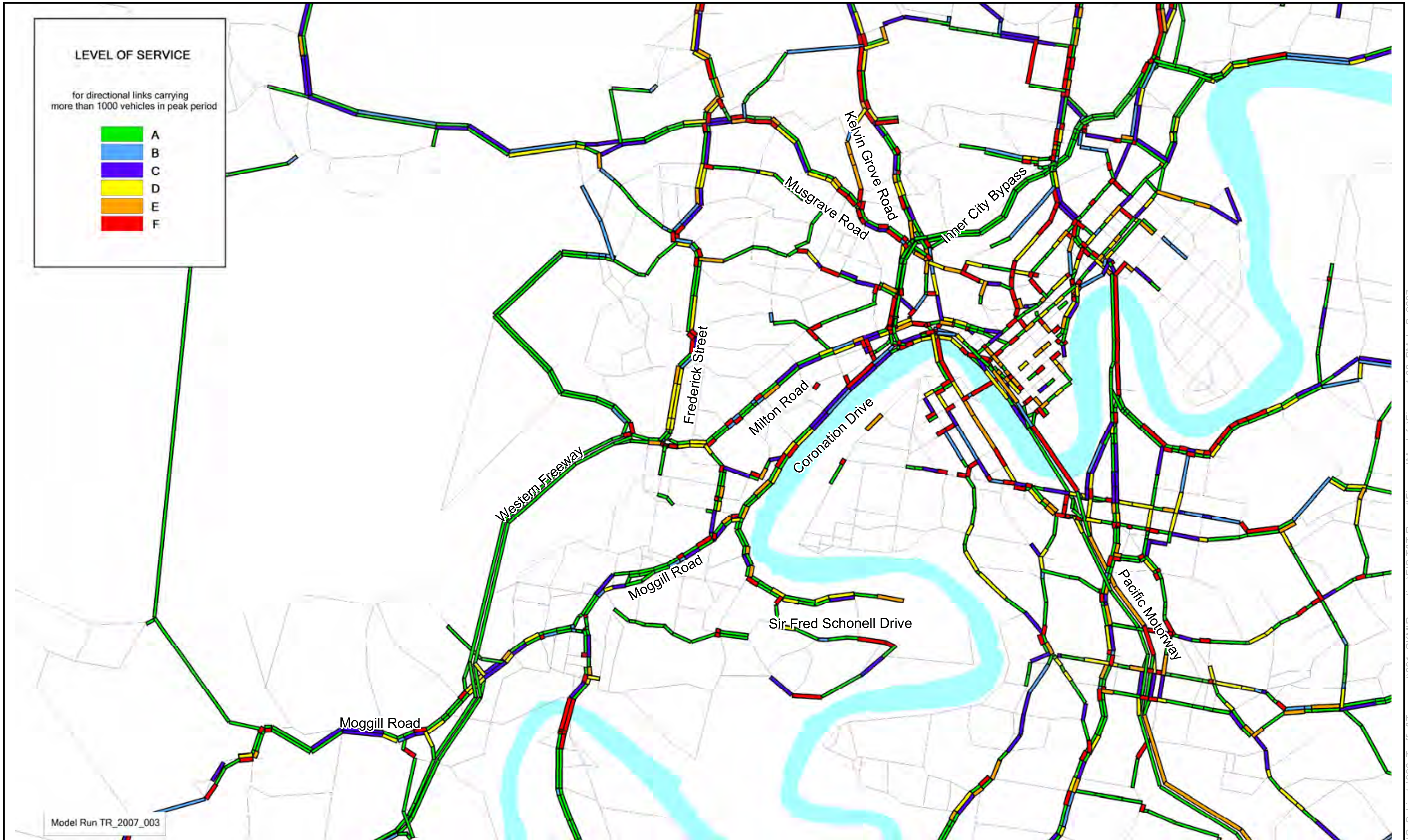

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Figure 4-9

Existing (2007) PM Peak Period Level of Service

4.5 Intersection Performance

4.5.1 Definitions

Within an urban road network, performance is strongly influenced by the operating conditions of intersections, which are generally more constrained from a capacity viewpoint than the mid-block sections of roadway. An intersection performance assessment considers the interaction of vehicle demands (turning movements), pedestrians, lane capacity, form of intersection control and traffic signal phasing and co-ordination.

Key measures of intersection operation include the LOS and the Degree of Saturation. The intersection LOS criteria is shown in **Table 4-6** and is based on average delays for all vehicles using an intersection over a given time period, typically a two hour peak period.

The Degree of Saturation (or X value) is the calculated ratio between the demand flow rate and the capacity for each movement. When the maximum X value for any movement in the intersection is above 95%, then the intersection is regarded as over-saturated or operating above its practical capacity. This means that it will take more than one cycle of the signals to progress through the intersection. X values above 1.0 typically indicate higher congestion and delays with conditions more sensitive to small changes in demand.

- **Table 4-6 Intersection Level of Service Criteria**

Level of Service (LOS)	Average Intersection Delay (seconds)
A	0-10
B	10-20
C	20-35
D	35-55
E	55-80
F	80+

Table Note: Source: TRB (2000) *Highway Capacity Manual*

The LOS and Degree of Saturation for key intersections within the Inner West Transport Study Area have been calculated using the intersection modelling package SIDRA. This was done either using 2007 traffic count data or traffic flows derived from the validated model.

4.5.2 Assessment

Within the Inner West Transport Study Area there are over 75 signalised intersections. Examples of routes where vehicles encounter a number of signalised intersections and can experience significant delay in congested conditions are:

- Russell Terrace (Indooroopilly) to William Jolly Bridge via Moggill Road and Coronation Drive - 23 signalised intersections; and
- from Toowong Roundabout to Roma Street via Milton Road - 12 signalised intersections.

The performance of a selection of the key intersections within the study area during peak periods is tabulated in **Table 4-7**.

Key findings include:

- over-saturated, congested traffic conditions occur during peak periods at several intersections along Coronation Drive, which is a regional radial road. Examples of intersections with a LOS greater than D, coupled with a very high degree of saturation include the intersections of Cribb Street, Land Street, and

Boomerang Street. As the traffic signals give priority to traffic on Coronation Drive delay to the side road traffic is very high;

- on the Milton Road corridor there are 9 signalised and 15 priority controlled intersections. Congestion occurs at several locations with LOS greater than D at the intersections at Cribb Street, Park Road, Croydon Street, and Eagle Terrace;
- the Toowong roundabout that forms a major connection with Milton Road, Frederick Street and Mt Coot-tha Road is operating at or over nominal capacity during both peak periods;
- the regional roads on the north east corner of the study area, Musgrave Road and Kelvin Grove Road, have a number of intersections that are over or close to capacity; and
- Brisbane City Council bus services use the regional roads so these are also subjected to the congested intersections on Coronation Drive, Milton Road and Kelvin Grove Road in particular. It should be noted that the Coronation Drive Tidal Flow T3 transit lane that operated in the peak direction was removed in March 2007. Consequently, buses are exposed to congested traffic flows and consequent delay.

Table 4-7 Existing Intersection Performance 2007

Intersection	Authority	Peak	Cycle Time	Max DOS (x)	LOS
Coronation Drive					
Coronation Drive/Cribb Street	BCC	AM	150	0.89	C
	BCC	PM	150	1.19	F
Coronation Drive/Park Road	BCC	AM	150	0.86	B
	BCC	PM	150	0.77	B
Coronation Drive/Land Street	BCC	AM	150	0.67	B
	BCC	PM	150	0.96	D
Coronation Drive/Boomerang (Hale Street)	BCC	AM	150	0.77	B
	BCC	PM	150	0.97	D
Coronation Drive/Sylvan Road	BCC	AM	150	0.82	B
	BCC	PM	150	0.61	B
Coronation Drive/Lang Parade	BCC	AM	150	0.92	C
	BCC	PM	150	0.88	C
Milton Road					
Milton Road/Cribb Street	BCC	AM	120	0.99	D
	BCC	PM	120	1.34	F
Milton Road/Park Road/Baroona Street	BCC	AM	120	1.06	F
	BCC	PM	120	0.99	D
Milton Road/Croydon Street	BCC	AM	120	0.83	C
	BCC	PM	120	0.91	D
Milton Road/Sylvan Road	BCC	AM	n/a	0.64	n/a
	BCC	PM	n/a	0.73	n/a
Milton Road /Eagle Terrace	BCC	AM	120	0.89	C
	BCC	PM	120	1.14	D
Milton Road/Grimes Street	BCC	AM	120	0.77	A
	BCC	PM	120	0.94	C
Milton Road/Park Avenue	BCC	AM	120	0.79	A
	BCC	PM	120	0.83	A
Moggill Road					
Moggill Road/Western Freeway on Ramp	DMR/BCC	AM	140	0.64	A
	DMR/BCC	PM	140	0.69	C
Moggill Road/Western Freeway off Ramp	DMR/BCC	AM	140	0.76	C
	DMR/BCC	PM	140	0.71	C
Moggill Road/Russell Terrace	BCC	AM	140	0.77	C
	BCC	PM	140	0.90	B
Moggill Road/High Street/Jephson Street	BCC	AM	120	1.00	C
	BCC	PM	150	1.00	C
Moggill Road/Station Road	BCC	AM	140	0.89	B
	BCC	PM	140	0.88	C

Continued over

Intersection	Authority	Peak	Cycle Time	Max DOS (x)	LOS
High Street					
High Street/Benson Street (Coronation Drive)	BCC	AM	150	0.88	C
	BCC	PM	150	0.88	D
Frederick Street					
Milton Road/Frederick Street roundabout	DMR/BCC	AM	n/a	0.83	F
	DMR/BCC	PM	n/a	0.80	E
Sylvan Road					
Sylvan Road/Bennett Street (Priority)	BCC	AM	n/a	1.24	n/a
	BCC	PM	n/a	2.36	n/a
Sylvan Road/Land Street	BCC	AM	75	0.57	C
	BCC	PM	75	0.43	C
Jephson Street					
Jephson Street/Sherwood Street	BCC	AM	120	0.45	C
	BCC	PM	120	0.62	D
Jephson Street/Lissner Street	BCC	AM	120	0.23	B
	BCC	PM	120	0.43	C
Jephson Street/Croydon Street	BCC	AM	120	0.80	D
	BCC	PM	120	0.91	D
Kelvin Grove Road					
Kelvin Grove Road/Herston Rd	BCC	AM	150	0.71	B
	BCC	PM	160	0.88	C
Kelvin Grove Road/Lorimer Terrace	BCC	AM	150	0.73	B
	BCC	PM	160	0.91	D
Kelvin Grove Rd/Prospect Terrace	BCC	AM	150	0.72	B
	BCC	PM	160	0.90	C
Kelvin Grove Road/Blamey Street	BCC	AM	150	0.75	B
	BCC	PM	160	0.62	A
Kelvin Grove Road/Lower Clifton Terrace	BCC	AM	140	0.56	B
	BCC	PM	160	0.59	B
Kelvin Grove Road/Ithaca Street	BCC	AM	120	0.69	C
	BCC	PM	120	0.74	C
Normanby 5 Ways	BCC	AM	120	0.96	D
	BCC	PM	120	0.92	D
Sir Fred Schonell Drive					
Sir Fred Schonell Drive/Gailey Road	BCC	AM	60	0.78	B
	BCC	PM	60	1.01	D
Musgrave Road					
Musgrave Road/Hale Street Off Ramp	BCC	AM	120	0.61	B
	BCC	PM	120	0.74	C

Continued over

Intersection	Authority	Peak	Cycle Time	Max DOS (x)	LOS
Musgrave Road/Hales Street On Ramp	BCC	AM	120	0.40	A
	BCC	PM	120	0.80	A
Musgrave Rd/Windsor Rd	BCC	AM	120	0.90	C
	BCC	PM	120	1.02	F
Countess Street					
Countess/Secombe	BCC	AM	130	0.87	C
	BCC	PM	120	0.62	B
Countess/Upper Roma	BCC	AM	120	1.00	C
	BCC	PM	120	1.34	F
Spring Hill					
College Rd/Gregory Terrace	BCC	AM	120	0.56	B
	BCC	PM	120	0.62	C
Leichardt Street/Upper Edward Street	BCC	AM	90	0.88	D
	BCC	PM	90	1.00	B
Wickham Tce/Leichardt Street	BCC	AM	120	1.00	B
	BCC	PM	120	0.49	B

Table note:
Traffic volumes extracted from 2007 Northern Link Traffic Model
Max DOS (x) - the reported maximum degree of saturation all approaches
LOS – Level of Service based on average delay for all vehicles at the intersection

4.6 Local Accessibility

The regional radial roads of Milton Road, Coronation Drive and Moggill Road provide accessibility between, through and to the suburbs of the Inner West Transport Study Area. Kelvin Grove Road and Musgrave Road provide access from the north east of the study area to northern and north west suburbs. The city distributors and other roads provide connectivity from the regional radial roads to the local catchments throughout the study area. The road hierarchy was shown in **Figure 3-2**.

A number of features of the regional road network have resulted in restrictions being placed on local traffic access at many priority (un-signalised) and signalised intersections. Typical restrictions include banned right turns to and from the regional roads. The restrictions could be permanent or in place during the peak periods. Features that have led to restrictions include:

- high traffic volumes on Milton Road, Coronation Drive, Benson Street, High Street, Moggill Road, Frederick Street, Kelvin Grove Road and Musgrave Road;
- central reserves on parts of these roads;
- the one-way networks at Petrie Terrace;
- no direct access from the ICB (westbound) to Musgrave Road;
- the gyratory systems on Moggill Road;
- the tidal flow system on Coronation Drive; and
- changing grades on Milton Road, Kelvin Grove Road and Musgrave Road.

The following discussion examines the traffic function of the Coronation Drive, Milton Road and Kelvin Grove Road corridors with respect to local accessibility.

- **Coronation Drive Corridor**

  The Coronation Drive tidal flow system and the high volume of traffic that uses it has led to some restrictions on priority movements on and off of Coronation Drive. Right turns to and from Coronation Drive are permitted only at signalised intersections with priority intersections limited to left in and left out movements only. However, due to road reserve measures and the tidal flow system, some signalised intersections have right turn movements banned. These banned movements restrict accessibility to and from Coronation Drive.

  Properties that have frontages on Coronation Drive are generally accessed from the local street network that is to the west of Coronation Drive. The few properties that do have driveway access directly to Coronation Drive are left in and left out access only. The spacing and number of signalised intersections facilitate the left-out merging of driveway traffic as the signals provide gaps in the traffic.

- **Milton Road Corridor**

  Milton Road has a mix of signalised (9) and priority controlled (15) intersections. A number of turn bans are in place in order to maintain the through traffic flow on Milton Road during peak periods. These bans are usually relaxed during off peak periods in order to provide higher levels of accessibility to the surrounding residential and commercial areas.

  The signalised intersections on Milton Road provide access to the suburbs of Milton, Auchenflower and Toowong. Streets that provide access are Morley Street, Croydon Street, Park Avenue, Grimes and Wienholt Street, Torwood Street and Eagle Terrace, Park Road and Baroona Road, Cribb Street and Castlemaine Street.

  There are a number of residential and office properties that have direct driveway access to Milton Road. The majority of these are restricted to left turn in and out only. However, due to the lack of central medians on Milton Road many of these restrictions are not self-enforcing.

  Whilst these restrictions optimise the performance of Milton Road as a regional radial road for commuters and through-traffic, local accessibility is severely compromised and the road network illegible to drivers who are not familiar with the area.

- **Kelvin Grove Road Corridor**

  The high traffic volumes, presence of a central median, the width of Kelvin Grove Road (three traffic lanes in each direction) and free flow merges with the ICB and Hale Street has led to restrictions to movement between Normanby Five Ways and Prospect Terrace in the northbound directions. All local streets and property accesses are left in and left out access only.

  There are competing needs for road space within the inner west that can add to congestion and restrict use of the surrounding land use. Examples include:

- High Street, Toowong – high levels of commuter and through-traffic that pass through a shopping area where demands are high for on-street loading and parking, bus stops, access to car parks, public transport and pedestrian activity;
- Sherwood Road, Toowong – a shopping street with competing needs for access to shops and commercial buildings, on-street parking and loading, pedestrian activity, bus stops, through trips between Toowong and Milton Road and access to residential areas;
- Moggill Road, Indooroopilly – provides an arterial function and access to the major regional traffic generator - Indooroopilly Shopping Centre;

- Park Road, Milton – demand for parking and street use of cafés, restaurants and shops compete with the linkage that Park Road provides between Coronation Drive and Milton Road;
- Kelvin Grove Road – a regional radial road that also provides access to the Kelvin Grove Urban Village and to cater for pedestrian, bus stops and cyclists; and
- Residential streets, Auchenflower – residential needs of these streets compete with parking and access demands to the Wesley Hospital.

4.6.1 Effect on Local Streets

The effect of existing congestion on the regional network and the associated low travel speeds on them encourages traffic to use the local street network for trips that do not have an origin or destination within or close to a defined local area. Such extraneous through trips are known colloquially as “rat-running” trips.

The environmental capacity of a local street is defined[17] as the capacity: a) considering the presence of parked vehicles and b) maintaining appropriate environmental standards; and it is generally recognised that flows of 3,000 vehicles per day or more may create environmental problems in residential streets. Most residents[18] would consider 4,000 vehicles per day as a traffic nuisance. Local streets that suffer from extraneous through traffic in the Inner West Transport Study Area have been identified and are shown in **Figure 4-11**. These streets have been identified by considering the road hierarchy, if the traffic volume on local streets exceeds 3,000 vehicles per day, and reviewing (through travel pattern analysis within the strategic model) through trip demands.

- **Toowong**

In the suburb of Toowong to the immediate north of Milton Road and east of Frederick Street there are a number of local streets, such as Morley Street, Gregory Street, Valentine Street and Musgrave Street that provide vehicular access to properties but also provide the opportunity for through traffic to bypass the Frederick Street roundabout and hence impact on the amenity of the area. The residential nature, gradients, carriageway width, occurrence of on-street parking and lack of pedestrian footpaths is such that these local streets are not suitable for excessive volumes of through traffic such that the total traffic volume exceeds the environmental capacity of the local street. **Figure 4-10** shows a view of Gregory Street.

- **Figure 4-10 Gregory Street, Toowong**

[17] National Association of Australian State Road Authorities; Guide to Traffic Engineering Practice TEC-10 (1982)

[18] National Association of Australian State Road Authorities; Guide to Traffic Engineering Practice TEC-10 (1982)

In response to community concerns, BCC have undertaken investigations and formulated a Local Area Traffic Management (LATM) Scheme for Gregory Street in order to address issues regarding excess traffic speed and volume. BCC carried out traffic surveys on Gregory Street in November 2005 which showed that:

- Two way average weekday traffic volume of just over 2,300 vehicles on Gregory Street between Morley Street and Musgrave Street.
- 95^{th} percentile speed of 49km/h northbound and 53km/h southbound at the above location.

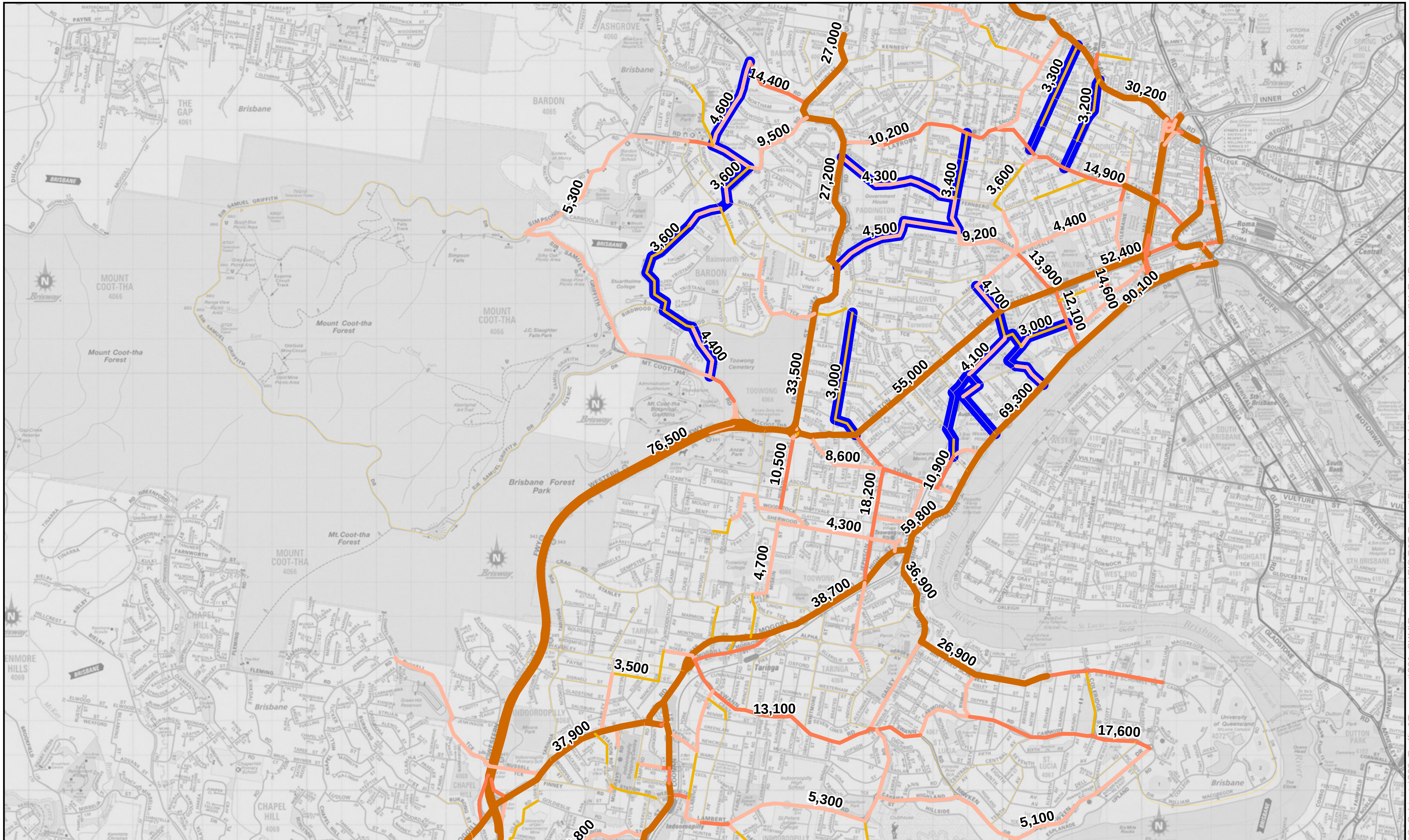
Following public consultation and detailed design the scheme has received funding approval for construction to be carried out during the 2008/09 financial year. This planned scheme incorporates three speed tables and entry treatments at the intersections of Gregory Street with Milton Road, Morley Street and Birdwood Terrace. Associated traffic signs and pavement markings are proposed, which includes signage informing drivers that there is no right turn from Gregory Street to Milton Road.

- **Kelvin Grove Road**

Key local access issues in Kelvin Grove are:

- there is no connection from the ICB (westbound) to Musgrave Road. Consequently, traffic accessing the suburb of Red Hill and Musgrave Road from the ICB must do so via Ithaca Street, Kelvin Grove Road and then Victoria Street;
- left in and left out access only is provided at Lower Clifton Terrace, Westbury Street (via Victoria Street), Victoria Street, Dalley Street and Lock Street is left in only. Upper Clifton Terrace is a cul-du-sac with access only from and to Musgrave Road; and
- Victoria Park Road provides a convenient left-in and left out access with the ICB for the residents of Normanby Terrace and the Kelvin Grove Urban Village.

Local access to the area bounded by Kelvin Grove Road, Musgrave Road and Prospect Terrace is exacerbated by the high level of on-street parking that occurs on the local streets. As discussed in S**ection 3.7** this is due to residential multiple car ownership and over-flow parking pressures from the Kelvin Grove Urban Village, which subject to on-street parking restrictions as part of the Brisbane Central Traffic Area. Due to narrow road widths car parking on both sides of the carriageways is not always possible.



LEGEND

2007 Weekday Daily Two Way Volumes (TR_2007_003)

- 20,001 to 90,200
- 20,000 to 100,000
- 4,001 to 10,000
- 3,001 to 4,000
- 0 to 3,000
- Local routes used by extraneous through traffic.

Northern Link
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Figure 4-11

Inner West Traffic Volumes

SKM Connell Wagner JOINT VENTURE

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4.7 Toll Routes

There are currently no toll routes located within the Inner West area. Within the Metropolitan area, the Gateway Motorway and Logan Motorway are the two main toll routes. A toll is also required to use the Moggill Ferry, which connects Brisbane's south western suburbs situated north of the Brisbane River with Ipswich. The toll values for private vehicle and commercial vehicle use are shown in **Table 4-8**.

▪ **Table 4-8 Existing Toll Locations and Values**

Toll Road (Location)	Cars and Light Vehicles	Commercial Vehicle (Classes 3 and above)
Gateway Bridge	$2.90	$7.20
Gateway (Kuraby)	$1.90	$4.50
Logan Motorway (Stapylton Road)	$2.00	$4.50
Logan Motorway (Loganlea Road)	$1.20	$3.20

Table Note: Toll values as of 1 July 2008, expressed in 2008 dollars including GST.
Source: www.qldmotorways.com.au

A number of toll roads are either currently under construction or due to commence construction in Brisbane. These projects include the duplicated Gateway Bridge as part of the Gateway Upgrade Program, the North South Bypass Tunnel, the Airport Link and the Hale Street Link. **Table 4-9** shows the expected first year of operation of these facilities and the associated toll value expressed in June 2008 dollars.

▪ **Table 4-9 Future Toll Roads and Values**

Toll Road (Location)	Year of opening	Cars and Light Vehicles	Commercial Vehicle (Classes 3 and above)
CLEM7	2011	$3.93	$10.41
Airport Link (NS)	2012	$4.24	$11.23
Airport Link (EW)	2012	$3.18	$8.42
Hale Street Link	2011	$2.40	$6.37

Table Note: Toll values expressed in 2008 dollars including GST.

4.8 Public Transport Performance

The SEQ Travel Survey in 2003/04 indicated that for the Brisbane Metropolitan Area:

- motorised trip making accounted for 80% of all travel internal to the Brisbane Metropolitan Area;
- public transport trip use accounted for further 8% of travel; and
- around 12% of travel demand was represented by walking and cycling.

As discussed in **Section 3.5** the Inner West Transport Study Area is well served by rail and bus routes. This is reflected in the mode share statistics for the Inner West Transport Study Area:

- motorised trip making accounts for 65% of all travel internal to the Inner West Transport Study Area;
- public transport trip use accounted for further 16% of travel; and
- around 19% of travel demand was represented by walking and cycling.

Figure 4-12 and **Figure 4-13** show the existing public transport demands, and illustrate the strong role of rail in servicing public transport demands in the Inner West Transport Study Area. The following patronage for 2007 is achieved in Milton:

- 37,000 daily rail passenger trips; and
- 25,100 daily bus passenger trips, which includes 16,100 trips on Coronation Drive and 1,800 trips on Milton Road.

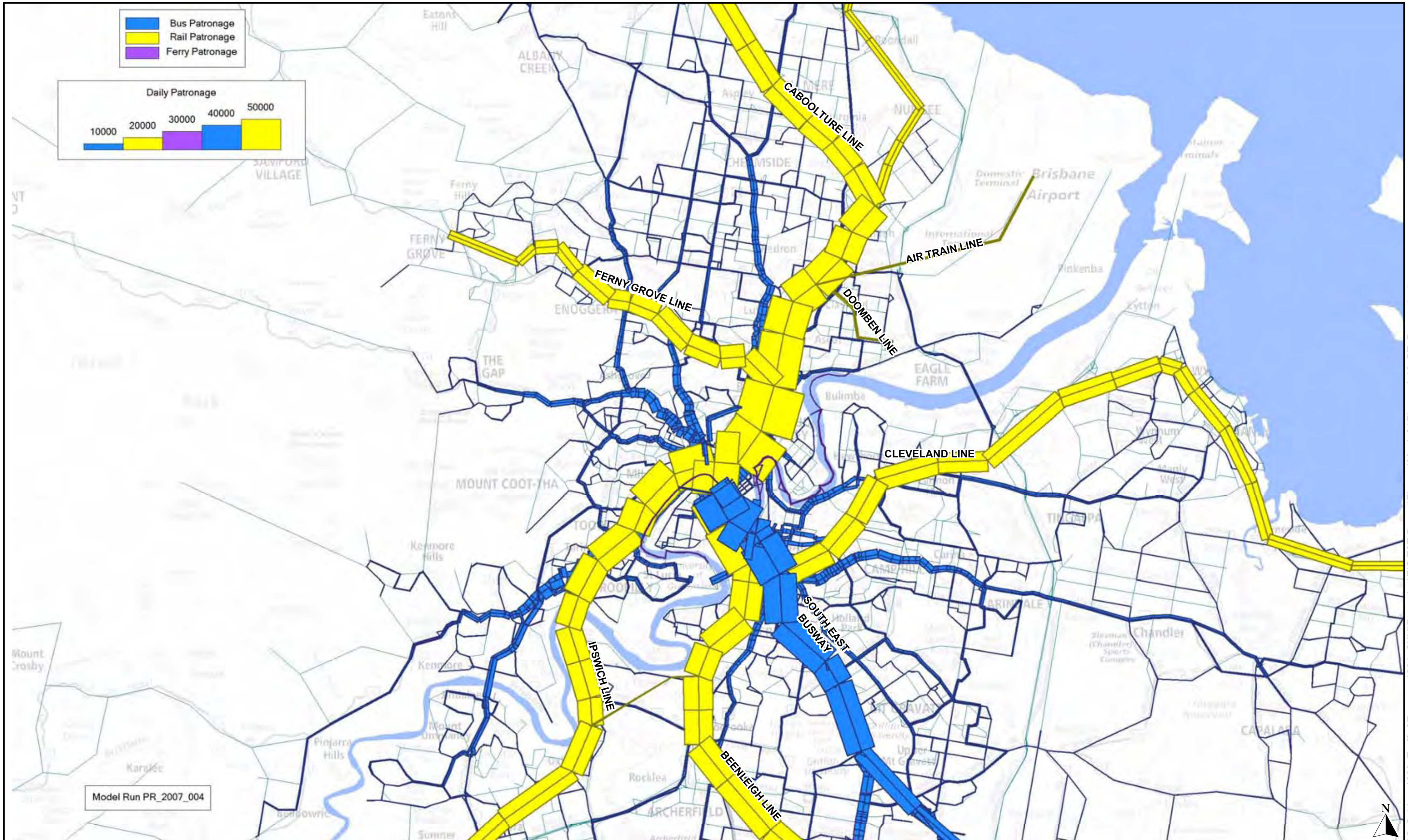

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Figure 4-12

Existing (2007) Average Weekday Public Transport Demands

SKM Connell Wagner JOINT VENTURE

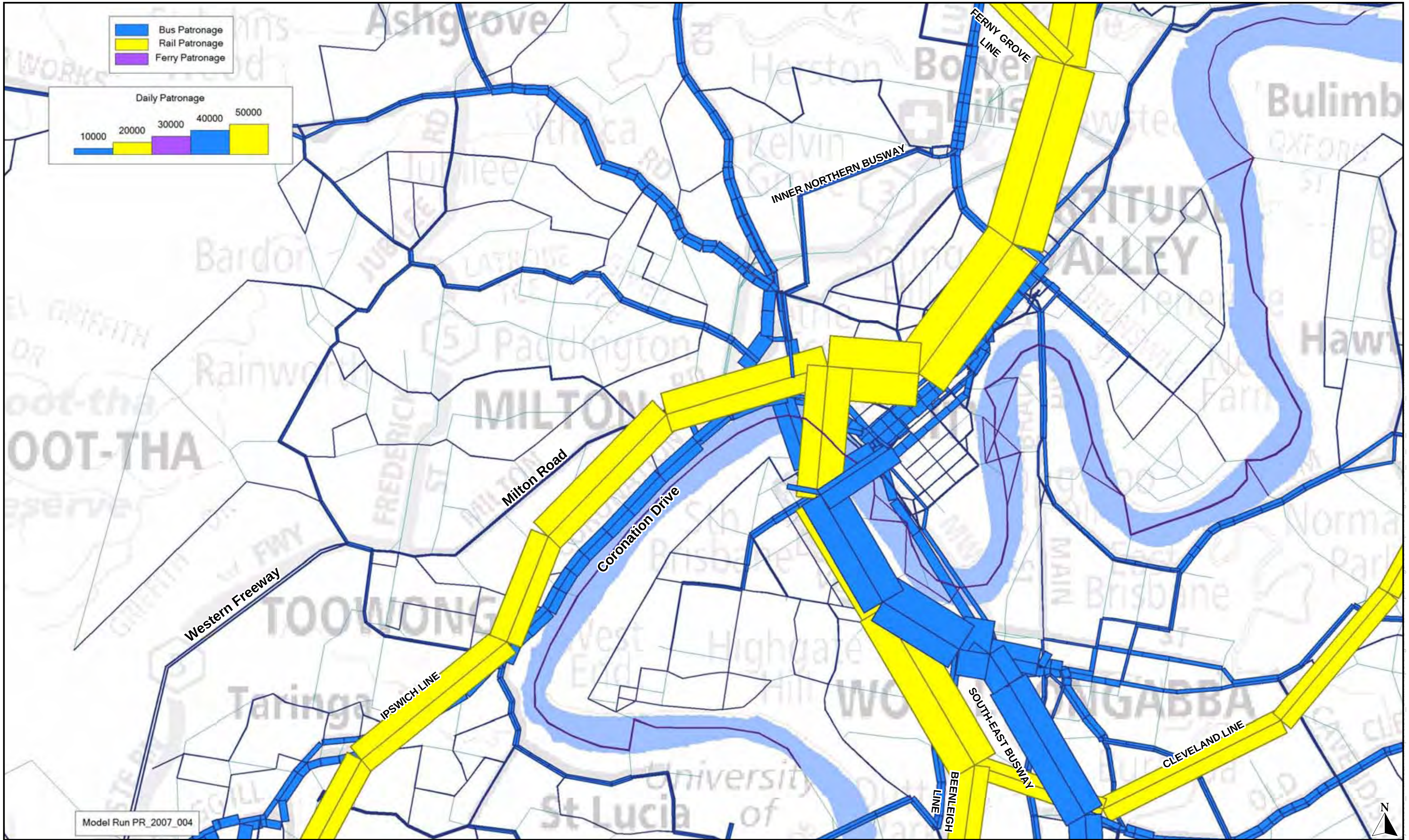

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Figure 4-13

Existing (2007) Average Weekday Inner West Transport Area Public Transport Demands

4.8.1 Rail System Performance

Daily station usage for the three major rail stations is shown in **Table 4-10**. Observed 2007 peak period patronage between Milton and Roma Street rail stations is shown in **Table 4-11**. Indicative peak period patronage on the segment between Milton and Roma Street is 12,400 passengers in the morning peak period and 9,700 in the evening peak period.

Average travel times between key stations and Central Rail Station are shown in **Table 4-12**. Travel times vary on average by 1 minute depending on peak period and trip direction. Occasional services to some stations can take approximately 5 minutes longer than the average travel time.

- **Table 4-10 Average Weekday Rail Station Usage**

Station	AM		PM	
	Boarding	Alighting	Boarding	Alighting
Indooroopilly Station	1,300	900	300	1,000
Taringa Station	600	200	100	500
Toowong Station	800	1,200	400	700
Auchenflower Station	600	300	200	400
Milton Station	500	1,300	400	300

Table Note: Source: Queensland Rail, 2007

- **Table 4-11 Peak Period Rail Patronage**

Station	To City	From City
Milton Station - Roma Street Station am	10,000	2,300
Milton Station - Roma Street Station pm	2,400	7,400
Total	12,400	9,700

Table Note: Source: Queensland Transport, 2007

- **Table 4-12 Peak Period Average Travel Time between Station and Central**

Station	Average Travel Time (minutes)
Indooroopilly Station	13
Taringa Station	12
Toowong Station	09
Auchenflower Station	07
Milton Station	05
Roma Street Station	02

Table Note: Source: TransLink, 2007

4.8.2 Bus System Performance

Bus travel demands are illustrated on **Figure 4-12**, and whilst not as high as rail, indicate a strong use of this mode of public transport with currently 16,100 daily bus passenger trips on Coronation Drive and 1,800 trips on Milton Road.

Coronation Drive services are predominant, serving the western suburbs and the centres of Toowong and Indooroopilly, however for these centres they compete for patronage with the parallel rail corridor. Bus services provide routes to areas such as St Lucia and Kenmore that are not served by the rail network with interchange possible at Toowong and Indooroopilly.

Corridor Bus Running Times

Table 4-13 and **Table 4-14** provide the average and variable bus travel times and speed for bus services along Coronation Drive and Milton Road for the peak direction. The data source was the Brisbane City Council (BCC) Brisbane Linked Intersection Signals System (BLISS). The bus data was retrieved for the same periods as the general travel time survey was conducted (October 2007).

The Coronation Drive corridor was analysed from Sylvan Road to Cribb Street while Milton Road was analysed from Croydon Street intersection to Castlemaine Street. This is so a direct comparison between travel times for cars (reported in **section 4.3**) and buses can be made.

The bus travel time data was retrieved for all services that run along these two corridors for the am and pm peak periods. Note that “rocket” services run on Milton Road in the peak direction and “limited stop” services only run along Coronation Drive. Both corridors have “all stops” services.

In general the Coronation Drive all stops and limited stop services operate at similar average speeds. This is due to the limited number of stops available between Sylvan Road and Cribb Street.

Conversely Milton Road all stops and rocket services have a greater difference of travel time between them. This is due to the section of Milton Road between Croydon Street and Castlemaine Street having several bus stops that are not used by the rocket services.

- **Table 4-13 Observed Average (2007) Travel Times and Travel Speeds for Bus Services**

	Morning Peak (7-9am) (Travelling Eastbound)					Evening Peak (4-6pm) (Travelling Westbound)				
	Coronation Drive			Milton Road		Coronation Drive			Milton Road	
Services	All Stops	Limited Stops	Rocket	All Stops	Rocket	All Stops	Limited Stops	Rocket	All Stops	Rocket
Average Time (min)	9:13	8:59	-	7:57	6:01	5:18	5:35	-	10:38	9:11
Average Speed (km/h)	11.6	11.9	-	17.4	22.9	20.1	19.1	-	13.0	15.0

Table Note: Source: BCC, 2007

- **Table 4-14 Minimum and Maximum Travel Speed Variability (2007) for Bus Services**

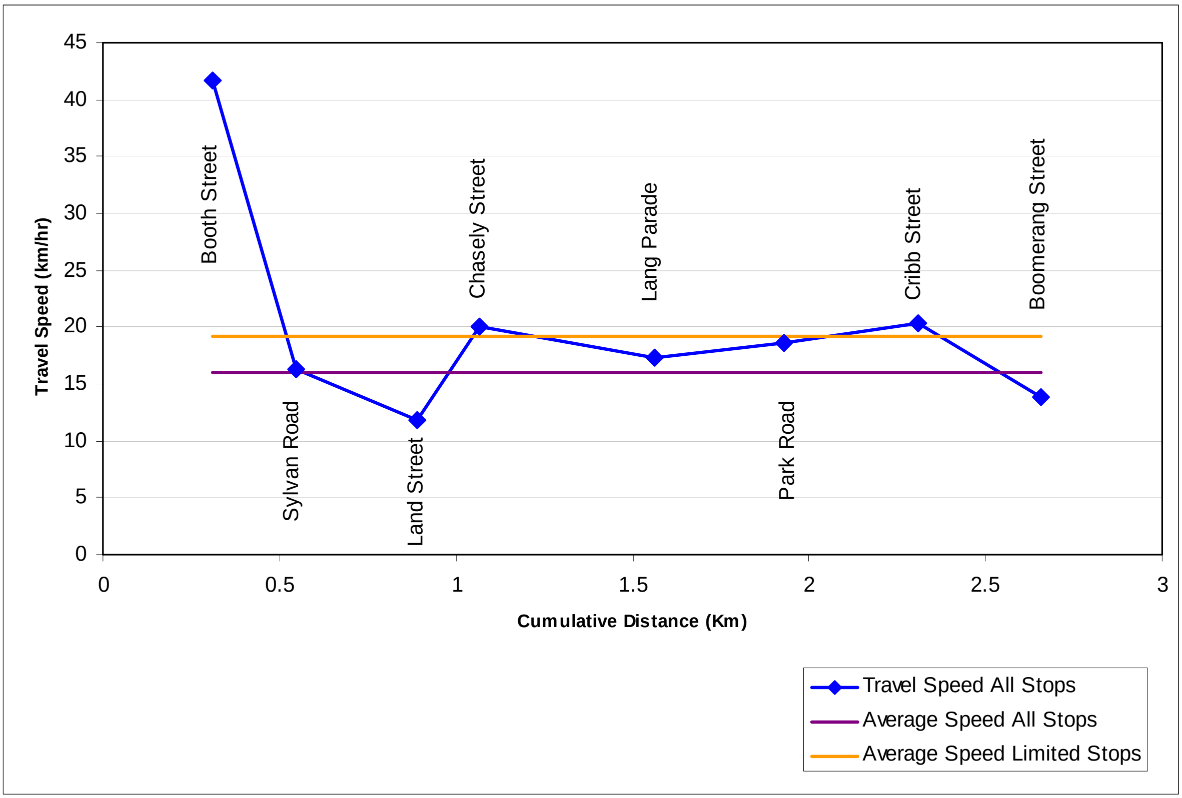
	Morning Peak (7-9am) (Travelling Eastbound)					Evening Peak (4-6pm) (Travelling Westbound)				
	Coronation Drive			Milton Road		Coronation Drive			Milton Road	
Services	All Stops	Limited Stops	Rocket	All Stops	Rocket	All Stops	Limited Stops	Rocket	All Stops	Limited Stops
Time Range (min)	3:29 - 10:06	4:29 - 12:14	-	5:23 - 11:03	4:48 - 6:45	4:43 - 5:45	5:18 - 5:58	-	6:54 - 12:54	6:21 - 11:31
Speed Range (km/h)	10.6 - 30.7	8.7 - 23.8	-	12.5 - 25.6	20.4 - 28.7	18.6 - 22.6	17.9 - 20.2	-	10.7 - 20.	12. - 21.7

Table Note: Source: BCC, 2007

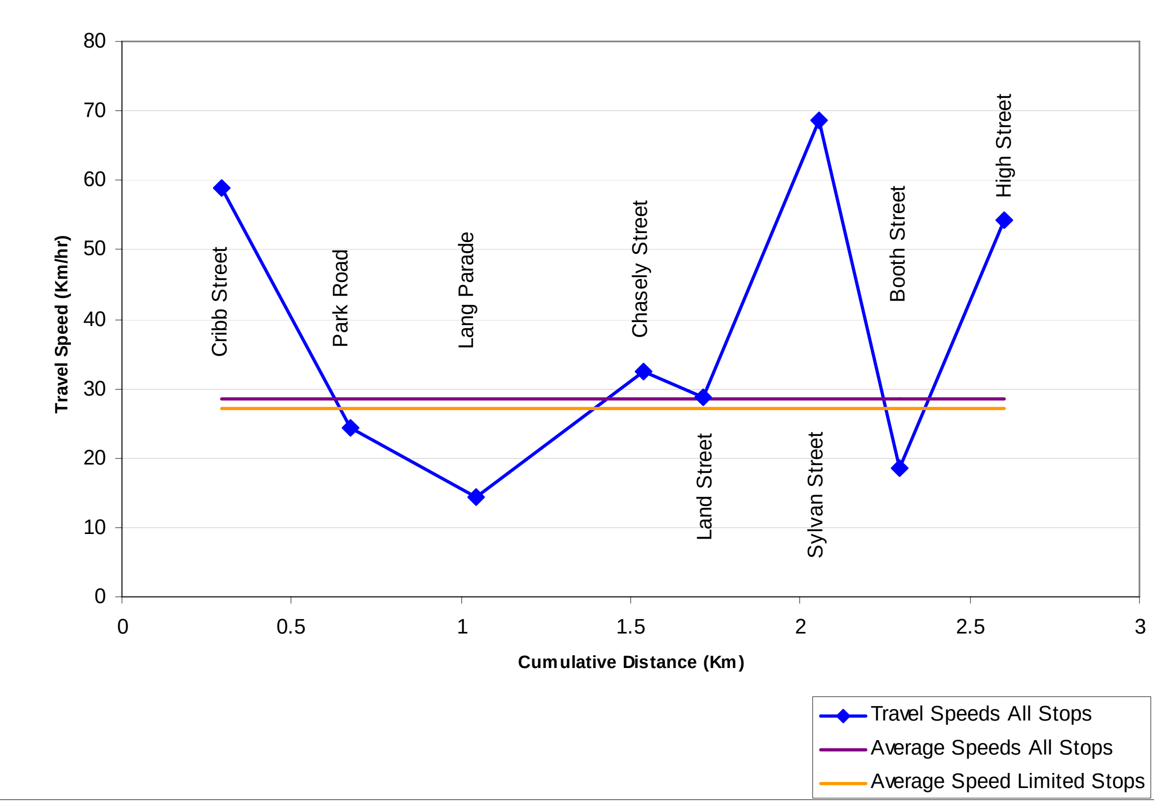
Figure 4-14 and **Figure 4-15** illustrate the section speeds for “all stops” bus services and the average speed for all three types of services along the Coronation Drive. The outbound pm “all stops” and “limited stops” services for Coronation Drive are almost identical, this is due to the relatively small number (three) of outbound stops being available. Located just before Cribb Street the first stop of the outbound leg shows a high through travel speed for "all stop" services indicating limited use and therefore a similar speed profile to the "limited stops" services.

Bus services run at a longer travel time and slower speed than general traffic particularly on Milton Road and Coronation Drive in the outbound direction during the evening peak period. Currently, neither Milton Road nor Coronation Drive provides transit lanes that could improve bus travel times.

- **Figure 4-14 Coronation Drive Eastbound Speeds for Bus Services (AM Peak)**



■ **Figure 4-15 Coronation Drive Westbound Speeds for Bus Services (PM Peak)**



4.9 Pedestrian and Cyclist System Performance

4.9.1 Usage of the Cycle Network

The existing on and off-road bikeways can be seen with reference to the existing road network in **Figure 3-23**. The majority of the off-road bikeways can also be used by pedestrians.

Pedestrian and cycle surveys were conducted in 2007 to assess the level of usage of the major bikeways in the Inner West Transport Study Area. The number of pedestrians and cyclists during the weekday morning peak period using the Bicentennial, Landbridge, the Western Freeway off-road bikeway and the William Jolly Bridge on road bikeways are in **Table 4-15**.

The surveys show that all connections are well used by pedestrian and cyclist commuters. The Coronation Drive Bikeway has a significantly higher level of usage then any other bikeway in the study area. Data collected in 2006[19] showed that while commuter traffic during the week is significant, recreational use of this route is greater. All routes surveyed (in 2006) showed stronger weekend use then weekday, showing the significant recreational use of pedestrian and cyclist facilities.

In general there are more cyclist than pedestrian users on all the paths, for both the average weekday and weekend.

[19] Data source - BCC 2006

Table 4-15 Pedestrian and Cyclist Activity – Morning Peak Period 2007

Locations	Morning Peak Period			
	Cyclist	Pedestrians	Total	Time
Bicentennial Bikeway	1083	460	1543	6:10-9:00
Eleanor Schonell Bridge	414	519	933	6:00-9:30
Landbridge	179	172	351	6:00-9:00
Jack Pesch Bridge Pedestrian and Bike Bridge (Indooroopilly) (1)	625	61	686	5:30-9:30
Western Freeway Bikeway(1)	286	n/a	286	6:00-9:00
William Jolly Bridge (Northbound)	217	184	401	5:45-9:30

Table Note: Source: Bicycle Queensland 2008.
(1) Data collected in 2006

The location of the Western Freeway Bikeway in relation to nearby suburbs and shopping centres and the distance between access points means that it has significantly lower levels of pedestrian traffic as compared to cyclist.

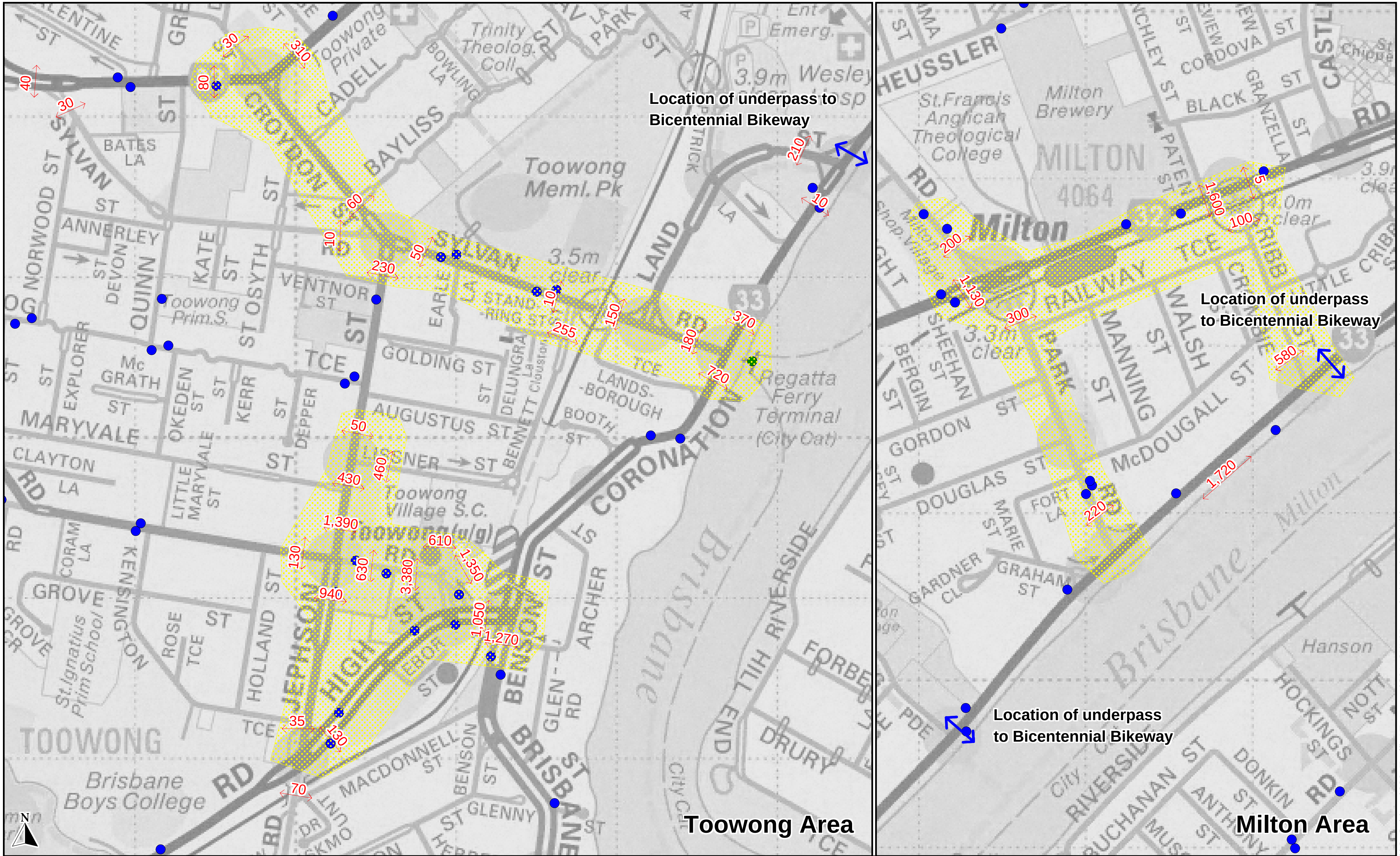
4.9.2 Usage of Pedestrian Crossings

Pedestrians using the crossing facilities at number of intersections were also surveyed on a typical weekday in October 2007. The number of pedestrians crossing at intersections in Toowong and Milton are shown in **Figure 4-16**. This shows a significant number of pedestrian crossings in the Toowong area, focused around the shopping centre and railway station, bus stops and the Regatta Ferry terminal. In Milton pedestrian activity is focused on the railway station and the commercial and retail areas as well as towards the Bicentennial Bikeway.

Examples of typical average weekday pedestrian flows at key locations are:

- on Milton Road approximately 1,100 pedestrians crossing at Park Road and 1,600 at Cribb Street;
- on Coronation Drive at Sylvan Road at the Regatta Ferry terminal approximately 1,000 pedestrian crossings.
- in the vicinity of Toowong Village approximately 1,300 pedestrian crossings of Benson Street, 1,000 of High Street and 3,400 of Sherwood Road;
- at the intersection with Sherwood Road over 2,000 pedestrians cross Jephson Street;
- approximately 400 pedestrians cross Milton Road at the signalised intersection of Milton Road/Morley Street/Croydon Street, with 80% of pedestrians using the eastern signalised crossing and 20% using the western crossing; and
- approximately 550 pedestrians cross Kelvin Grove Road at the intersection with Blamey Street on a typical weekday and with mid block crossings also typically observed south of Blamey Street.

This data shows that within the Inner West Transport Study Area there are strong pedestrian demands to cross the regional radial roads.



LEGEND

xxx — Typical 12 hour (2007) pedestrian weekday volume

Pedestrian / cycle underpass

Bus stop

CityCat Terminal

Key area of pedestrian activity

Northern Link
Environmental Impact Statement

Figure 4-16

Pedestrian Movements at Intersections

Northern Link
SKM Connell Wagner JOINT VENTURE

4.10 Road Safety

4.10.1 Introduction

A five-year crash history (June 2001-June 2006) for the Inner West Transport Study area has been reviewed. The crash history contains all accidents that required a police presence and includes location, date, weather conditions, accident type, and severity. Crash severity is measured on five levels of consequences:

1) Fatal;
2) Hospitalisation;
3) Medical Treatment;
4) Minor Injury; and
5) Property Damage.

Some of the key statistics from the analysis are:

- 2,573 crashes occurred over the five year period from 2001 to 2006 in the Inner West Transport Study Area;
- a total of eight fatal crashes occurred, of which four involved pedestrians and one cyclist;
- within the Inner West Transport Study Area 10% of the crashes occurred on Coronation Drive, 7% on Milton Road and 5% on Moggill Road. These three roads account for almost 25% of the total crashes within the Inner West Transport Study Area;
- the split between intersection and mid block crashes was 50%;
- 80% (1,969) of crashes within the area involved more than one vehicle; and
- within the Inner West Transport Study Area, 120 pedestrian related crashes have been recorded. This was 4.8% of the total number of crashes that occurred, which is similar to the Brisbane local government area average of 4.7%.

4.10.2 Intersection Crashes on Key Routes

The five-year crash history of intersections on the regional radial, regional ring and some of the city distributors within the Inner West Transport Study Area was carried out. Summary tables of the number, severity and major cause of the crashes occurring at intersections are contained in **Appendix B Crash Record Analysis**.

Coronation Drive

During the five year period from 2001 a total of 257 crashes occurred on Coronation Drive. Of these 257 crashes 101 occurred at intersections. No fatalities were recorded and the proportion of pedestrian crashes at intersections was 3%.

The signalised intersection with Cribb Street accounted for over 25% of the crashes that occurred at intersections on Coronation Drive with angle and rear-end crashes being the predominant crash type. The only other intersection that accounts for over 10% of the crashes occurring on Coronation Drive was the intersection with Lang Parade.

Milton Road

188 crashes occurred on Milton Road with 54 occurring at intersections (not including the Toowong Roundabout) during the five year period to 2006. Pedestrians were involved in 3% of accidents occurring at intersections and there were no fatalities.

Included in the analysis of crashes at intersections on Milton Road was the Toowong Roundabout at its western end that accounted for 27% of the crashes at intersection on Milton Road. The major cause of crashes at the Toowong roundabout was rear end and angle crashes.

The priority intersection with Sylvan Road had 12% of the intersection crashes on Milton Road. Over half of these involved vehicles turning right from Milton Road to Sylvan Road.

Moggill Road

The section of Moggill Road in the study area extends from High Street in Toowong to just north of the Western Freeway ramps at Indooroopilly. Between 2001 and 2006 126 crashes occurred on this stretch of Moggill Road with 67 occurring at intersections. Intersections that accounted for over 10% of the crashes were those with Russell Terrace, Whitmore Street and Woodville Street. These three intersections are all signalised. One pedestrian crash was recorded on the analysed section of Moggill Road.

Frederick Street, Rouen Road, Boundary Road

Within the Inner West Transport Study Area these roads form part of MetRoad 5. During the five year period there was only one crash at an intersection on Frederick Street (not including the Toowong Roundabout), one on Rouen Road and thirteen on intersections on Boundary Road. A crash with a fatality occurred at the intersection of Boundary Road and Hebe Street.

Toowong Roundabout

The Toowong Roundabout has approaches from Milton Road, Miskin Street, Mt Coot-tha Road and Frederick Street. During the five year period to 2006 there were 22 recorded crashes at the roundabout. 15 of them were associated with the Frederick Street approach and the major causes were sideswipe, angle and rear-end crashes. No pedestrian crashes have been recorded at the Toowong Roundabout during the five year period.

Sir Fred Schonell Drive

Of the 44 crashes that occurred on Sir Fred Schonell Drive, five occurred at intersections.

Coonan Street

Coonan Street is regional ring road and provides a connection from Moggill Road at Indooroopilly to suburbs south of the Brisbane River via the Walter Taylor Bridge. During the five year period to 2006, 97 crashes occurred on Coonan Street of which 74 occurred at intersections. 34 of these were at the gyratory system formed with Moggill Road and 25 occurred at the signalised intersection with Westminster Road.

4.10.3 Mid-block Crashes

The number of mid-block crashes, by severity, on major routes within the Inner West Transport Study area are shown below in **Table 4-16**.

- **Table 4-16 Mid-block Crashes on Major Routes in Inner West Transport Study Area June 2001 - June 2006**

Mid-block Accidents	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total
Western Freeway	0	13	16	6	12	47
Coronation Drive	0	45	78	45	89	257
Milton Road	0	24	66	42	56	188
Moggill Road	1	12	43	25	45	126
Frederick Street	0	1	3	1	2	7
Rouen Road	0	3	6	4	11	24
Boundary Road	0	1	7	3	9	20
Sir Fred Schonell Drive	1	8	8	5	17	39
Coonan Street	0	1	5	5	12	23

Table Note: Source: BCC, 2006.

During the five year period to 2006 a total of five fatal mid block crashes were recorded with two occurring on the major routes reported in **Table 4-16**. These two fatal crashes involved pedestrians. The first fatality occurred on Moggill Road west of Rockeby Street and involved a pedestrian in poor weather conditions.

The most frequent cause of a mid-block crashes was rear end collisions which, contributed to 40% and 60% of all mid-block accidents on the tabulated routes.

4.10.4 Crash Rates

Crash rates (vehicles per million kilometres travelled) for each of the major routes in the Inner West Transport Study Area are shown in **Table 4-17**. Coonan Street, Rouen Road and Boundary Road with VKT rates per million of 1.50, 0.98 and 0.82 respectively have the highest crash rates followed by Coronation Drive, Milton Road and Sir Fred Schonell Drive with 0.66, 0.69 and 0.72 crashes per million VKT respectively.

Assessment of the high crash rates on these routes indicates the following features.

- The majority of the crashes that occurred on Coonan Street were at the intersections of Westminster Road or Moggill Road. Rear end and angle crashes accounted for 46% and 30% respectively of the crashes that occurred on Coonan Street.
- Rouen Road and Boundary Road form part of the Metropolitan Route 5. Rear end crashes and hitting objects (no other car involved) were the main forms of crashes on these roads. Around 60% to 80% of all crashes were of these two types of crashes.
- On Coronation Drive rear end collisions were the predominant crash type (56%), followed by angle crashes (20%), mostly right turning vehicles colliding with through movements at intersections. While 60% of crashes were considered to be mid-block accidents it can be noted from their position that for the most part they are within 150m of an intersection.
- The major cause of crashes occurring on Milton Road was similar in nature to Coronation Drive with rear end accidents accounting for 52% of all crashes.

Table 4-17 Crash Rates for Major Routes Within the Inner West Transport Study Area 2001-2006

Route	Total Accidents	Distance (km)	Annual VKT	Crash Rate (Crashes per million VKT)
Western Freeway	47	3.7	92,942,000	0.10
Coronation Drive	257	3.1	77,441,000	0.66
Milton Road	188	3.2	54,187,000	0.69
Moggill Road	126	3.9	49,468,000	0.51
Frederick Street	24	0.8	8,662,000	0.55
Rouen Road	25	0.5	5,107,000	0.98
Boundary Road	34	0.9	8,293,000	0.82
Sir Fred Schonell Drive	44	1.8	12,211,000	0.72
Coonan Street	97	1.3	12,954,000	1.50

Table Note: Source: BCC 2006 (crash data), Northern Link Traffic Model (VKT, Distance)

4.10.5 Crashes Involving Pedestrians and Cyclists

Pedestrian and cyclist crashes account for 4.8% of the total accidents in the Inner West Transport Study Area. **Figure 4-17** displays the location of these crashes and shows that locations within Toowong, Petrie Terrace and Paddington have a concentration of crashes involving pedestrians and cyclists.

In the Toowong area there was a concentration of crashes in the vicinity of Toowong Village. Along Coronation Drive, between Booth Street and High Street, there were 9 cycle crashes during the five year period – with a range of contributing circumstances to these accidents.

The cluster of crashes at Petrie Terrace, Caxton Street and Given Terrace were generally associated with alcohol and the high degree of pedestrian activity, which is associated with the entertainment nature of these locations. In the Caxton Street precinct there were 12 pedestrian crashes and along Given Terrace near Guthrie Street there were five pedestrian crashes over the five year period.

Table 4-18 below details the severity of the crashes and **Table 4-19** shows the proportion of crashes by age group.

Table 4-18 Crashes Severity within the Inner Transport Study Area

Accident Severity	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage only	Total
Pedestrian	4	49	40	27	0	120
Cyclist	1	50	69	47	1	168

Table Note: Source: BCC, 2006.

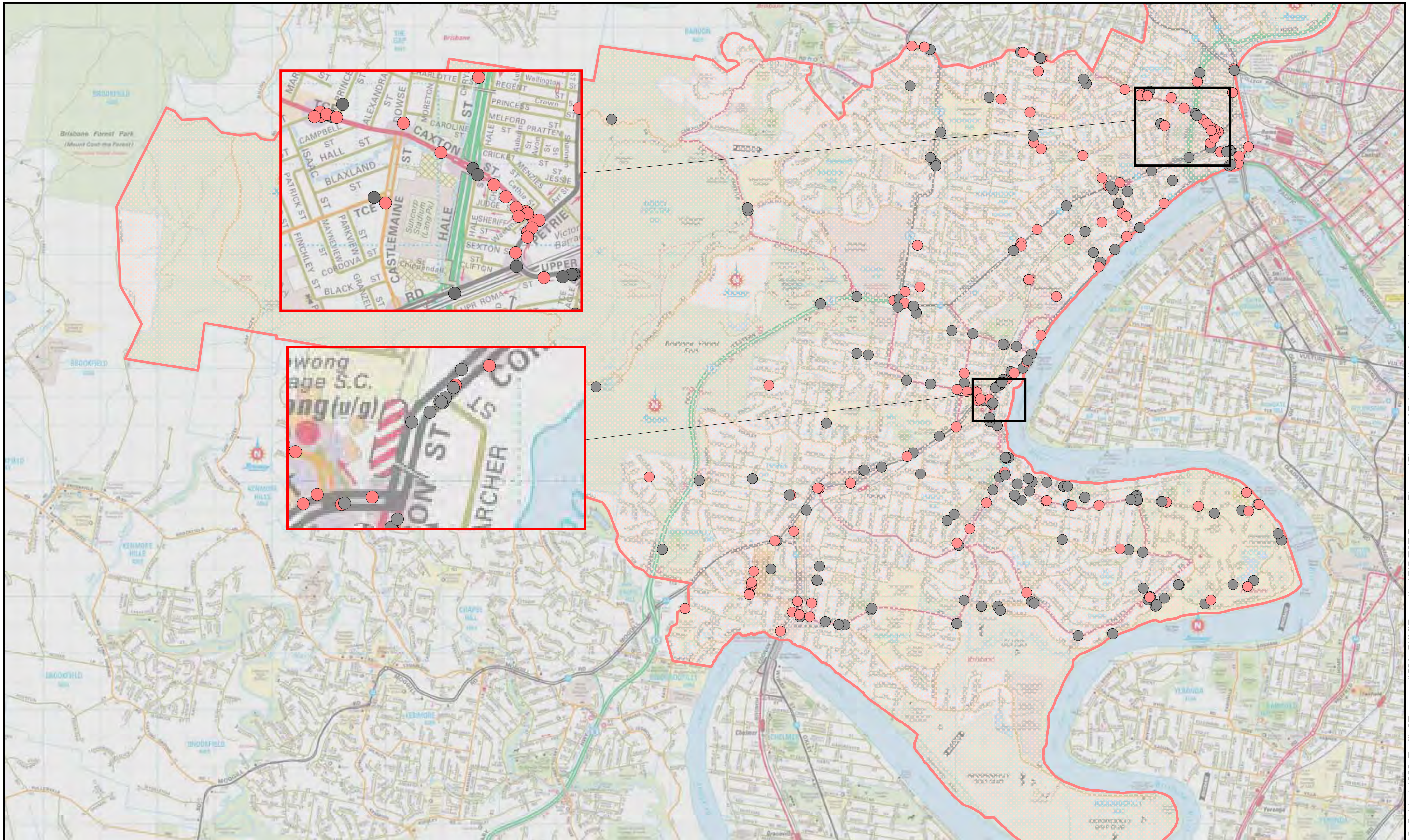
Table 4-19 Age Bracket of Crashes within the Inner West Transport Study Area

Age Bracket	0-16	17-24	25-29	30-39	40-49	50-59	60-74	75 and over	Total
Pedestrian	3	44	13	16	19	10	8	5	118
Cyclist	1	46	27	36	26	17	5	2	160

Table Note: Source: BCC, 2006.

Pedestrian and cyclist fatalities account for 5 of the 8 fatalities that occurred within the Inner West Transport Study Area during the 5 year period examined. Of these crashes, the majority were in the 17 – 24 age bracket.

Further data is included in **Appendix B Crash Record Analysis.**



LEGEND

- Pedestrian Crashes
- Cyclist Crashes
- Inner West Transport Study Area

Accident data collected from 2001 to 2006. Source BCC.

Northern Link
Environmental Impact Statement

Figure 4-17

Location of Pedestrian and Cyclist Accidents

Northern Link

SKM Connell Wagner
JOINT VENTURE

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5. Project Description

5.1 Introduction

This project description has been based on Chapter 4 of this EIS and summarises those elements relevant to traffic and transport.

The proposed Northern Link Project is a tunnel based toll road extending for approximately 5km in length and connects the Western Freeway near the Toowong roundabout with the ICB at Kelvin Grove Road. Northern Link also provides connections at the Toowong precinct at Milton Road/Croydon Street and to the Kelvin Grove precinct at Kelvin Grove Road.

5.2 Project Design and Operation

5.2.1 Design Standards and Criteria

The design objective for the tunnel is to achieve a 90km/h design speed for a signposted speed of 80km/h. This would be consistent with the rest of the Brisbane urban road network and is a speed that is commonly adopted for urban tunnels elsewhere in Australia and overseas. Slower design speeds have been adopted for connections to the local road network at each connection.

Desirable maximum vehicle grades of 5% up and 7% down were adopted for the concept design. Due to surface constraints it was necessary to exceed these values in certain areas of the ramps outside of tunnel areas. A minimum grade in each tunnel of 0.5% was adopted to ensure adequate performance of the longitudinal drainage system.

Dangerous Goods vehicles would be precluded (by regulation) from access to the tunnel.

5.2.2 Configuration

The project would provide for two separate parallel tunnels in the east-west direction. The northern tunnel would be dedicated to eastbound traffic and the southern tunnel would be for westbound traffic. The tunnels would be aligned next to each other, with a clear, minimum separation of approximately 10m between them. Both tunnels would have two running traffic lanes flanked by shoulders on each side. Dedicated break down bays are not provided as there would be sufficient room to pass a broken down vehicle safely at an appropriate speed within the proposed configuration. A posted height clearance of 4.6m would be provided but the trafficable enveloped would allow for a height of 4.9m.

For eastbound traffic, entry to the western end of the tunnel could be gained directly from the Western Freeway and from Milton Road, between Croydon Street and Frederick Street. The on-ramp on Milton Road would be accessed from both Milton Road and Croydon Street. Eastbound traffic could exit directly on to the ICB or onto Kelvin Grove Road. The off ramp to Kelvin Grove Road would allow traffic to go northbound on Kelvin Grove Road via a free flow slip or, via a signalised intersection southbound to Kelvin Grove Road or straight ahead to Musk Avenue.

For westbound traffic, entry to the eastern end of the tunnel would be provided directly from the ICB and from Kelvin Grove Road. The on ramp on Kelvin Grove Road would facilitate access from both the northbound and southbound directions of Kelvin Grove Road and from the existing ramp that would provide a connection from Musgrave Road (northbound) to Kelvin Grove Road. All connections for westbound Northern Link traffic would be via free flow ramps. Westbound traffic could exit directly to the Western Freeway or onto Milton Road for access to the Toowong precinct. The off ramp to Milton Road would be directly to the signalised intersection of Milton Road and Croydon Street. All traffic exiting from Northern Link would have to turn right to Croydon Street.

The project would be constructed in rock below the suburbs of Toowong, Auchenflower, Paddington, Red Hill and Kelvin Grove. To make the transition from tunnel to surface, cut and cover sections would be provided at the tunnel portals.

The transition to the Toowong precinct would involve cut and cover sections and an elevated structure that would not effect the existing alignment of Frederick Street or the Frederick Street/Milton Road roundabout.

5.3 Surface Road Works

5.3.1 Western Freeway Connection

This would provide for a seamless connection between the Western Freeway and Northern Link. The Western Freeway connection would be designed to take account of the future planning requirements of DMR for the Western Freeway and the Centenary Highway. The design of the Western Freeway connection would take account of the following:

- Western Freeway to ultimately have 3 lanes each way to the existing Mt Coot-tha Road roundabout. This would include two general purpose lanes and a transit lane (T2).
    - Northern Link ramps and portals to be on the outside of the Western Freeway with the HOV lane on the inside (median).
    - Maximise the length of the T2 lanes to Mt Coot-tha Road roundabout.
- Compatible with the East-West Link (TransApex project).

The Western Freeway connection would have the following general details:

- Provides a two lane on ramp from the Western Freeway to Northern Link through a left hand diverge from the Western Freeway.
- Provides a two lane off ramp from Northern Link that would connect with the Western Freeway through a left hand merge.
- No right hand diverges.
- No trapped lanes.
- The bikeway on the south-eastern side of the Western Freeway would be relocated to the outside of the ramp.

5.3.2 Toowong Connection

The Toowong connection would provide connection of Northern Link to the suburbs of Toowong, Auchenflower, St Lucia, Taringa and Indooroopilly. The connection would be via grade separated dual-lane east facing ramps that would connect with Milton Road and Croydon Street. Frederick Street, the Toowong Roundabout and the existing elevated ramp from Frederick Street to Mt Coot-tha Road would not be affected by the design.

Key details of the connections are:

- The entry to the mainline tunnel would be via a dual-lane east facing elevated ramp positioned on the outside of the Milton Road westbound carriageway. Access would be provided from Croydon Street via a dedicated left lane free flow slip at the intersection of Milton Road. Access would also be provided from Milton Road (east) downstream of the intersection with Croydon Street via a left hand diverge that could also be accessed by vehicles that turn right from Morley Street.

- The exit from the mainline tunnel would be via a dual-lane east facing elevated ramp connecting to the inside of the Milton Road eastbound carriageway. Both lanes would lead directly into Croydon Street. No direct access would be provided to Milton Road or Morley Street.
- The existing right turn pocket from Milton Road to Sylvan Road would be removed and replaced by a right turn lane to Croydon Street.
- The existing signalised intersection of Milton Road, Croydon Street and Morley Street would be upgraded to allow for:
  - Milton Road (east) – Widened to three traffic lanes approximately 200m upstream of the intersection to facilitate three straight ahead traffic lanes at the stop line and a left turn pocket and slip to Croydon Road.
  - Croydon Street (south) – Three traffic lanes at the stop line with two lanes for the right turn to Milton Road (east) and one lane to Milton Road (west) and Morley Street. A free flow left turn slip would be provided to the Northern Link on ramp.
  - Milton Road (west) – Five lanes at the stop line of which two are directly from the Northern Link off ramp and would provide for only the right turn to Croydon Street (south). The other three lanes would be for Milton Road traffic from the Toowong Roundabout. The outside lane would be for the right turn to Croydon Street and the remaining two lanes would be for the straight ahead movement to Milton Road (east). A left turn slip would be provided to Morley Street.
  - Morley Street (north) – Little change from the existing configuration with two lanes at the stop line. The inside line would be for the left and straight ahead movement and the outside lane would be for the right turn and straight ahead movements.
  - The existing pedestrian crossing on the Milton Road western approach would be removed.
- Croydon Street would be widened from two lanes to three lanes in each direction between Milton Road and the signalised intersection with Sylvan Road. The signalised intersection of Croydon Street, Sylvan Road and Jephson Street would be amended to suit.
- Milton Road through lanes would be realigned east of Frederick Street.
- The existing accesses of Valentine Street at Frederick Street, Gregory Street at Milton Road and Quinn Street at Milton Road would be severed so creating cul-du-sacs.

5.3.3 Eastern Connection

The ICB currently has three lanes in each direction. The lane configuration at the eastern connection would be two lanes each way for Northern Link and two lanes each way for the ICB.

- The outside lane of the Northern Link eastbound off ramp would merges into three lanes for the ICB prior to the ICB Land Bridge. East of the ICB Landbridge the ICB would have three lanes in each direction.
- The entry ramp from Kelvin Grove Road to the ICB currently becomes the third outside lane of the ICB. With the Project the entry ramp from Kelvin Grove Road would merge with the ICB to the east of Victoria Park Road to create two lanes that would merge with Northern Link between the Inner Northern Busway overbridge and the Landbridge.
- The Northern Link eastbound tunnel transition structure would allow for the left-in and left-out connection of the ICB to Victoria Park Road to be maintained.
- The westbound movement from the ICB to Hale Street would be facilitated through a lane drop and a diverge at the Land Bridge to create two lanes that would continue to Hale Street and two that would continue to Northern Link. The diverge to Ithaca Street would be maintained.
- Two westbound lanes of the ICB would continue to the Northern Link on ramp.

5.3.4 Kelvin Grove Connection

The design includes direct connections to Kelvin Grove Road and from the existing loop that connects Musgrave Road (northbound) to Kelvin Grove Road (northbound). Key details are:

- Two separate entry and exit ramps would provide a connection with Kelvin Grove Road, emerging on the western side of Kelvin Grove Road opposite Musk Avenue at a significantly upgraded signalised intersection.
- The off ramp from the Northern Link tunnel would consist of one traffic lane that would diverge from the Northern Link mainline tunnel. The off ramp widens to two traffic lanes approximately 700m from Kelvin Grove Road.
  - The left turn to Kelvin Grove Road (northbound) would be through a one lane free flow slip.
  - There would be two lanes at the stop line of the intersection with Kelvin Grove Road, one of which would be a short lane of 220m. Both lanes would allow for the right turn to Kelvin Grove Road (southbound) and the inside lane would also provide for the straight ahead movement to Musk Avenue.
- The on ramp from Kelvin Grove Road could be accessed from the north, south and from the existing loop that connects Musgrave Road with Kelvin Grove Road (northbound). These connecting ramps would narrow to one traffic lane approximately 300m from Kelvin Grove Road prior to a left hand merge with the main Northern Link tunnel.
  - An access to the on ramp from Kelvin Grove Road (southbound) would be provided through a diverge adjacent to the median of Kelvin Grove Road downstream of Blamey Street that would lead directly into the tunnel so avoiding the intersection of Kelvin Grove Road, Musk Avenue and Northern Link.
  - The Kelvin Grove Road (northbound) on ramp to Northern Link would be provided through a one lane diverge upstream of the intersection with Ithaca Street. This would lead to a cut and cover tunnel and a merge from the Musgrave Road loop so creating a two lane on ramp that would taper to one lane within the tunnel prior to merging with the on ramp from Kelvin Grove Road (southbound). This on ramp would also avoid the intersection of Kelvin Grove Road, Musk Avenue and Northern Link.
- Surface works on Kelvin Grove Road would extend from Ithaca Street to Blamey Street. The existing Kelvin Grove Road through lane capacity would be maintained. Some modifications of the Kelvin Grove Road/Blamey Street intersection would also be required.
- The tunnel transition structures would sever the connection of Lower Clifton Terrace with Kelvin Grove Road and the connection of Westbury Street and Victoria Street to Kelvin Grove Road.
  - A cul-de-sac is proposed at the end of Lower Clifton Terrace with access only to Musgrave Road.
  - Upper Clifton Terrace would remain as a cul-de-sac with access to Musgrave Road only but with a developed turning head.
  - Westbury Street would not connect directly to Kelvin Grove Road but would have access via a new service road to Victoria Street.
  - Victoria Street would no longer have direct access to Kelvin Grove Road but would have a roundabout at its eastern end retaining access to the service road adjacent to Kelvin Grove Road and Rusden Street.
- Existing connectivity at the Musk Avenue and Blamey Street intersections with Kelvin Grove Road would remain as at present with all turns available.

6. Transport and Traffic Demand Forecasting

Traffic demand forecasting was undertaken to quantify the effects on the transport network in terms of:

- changes in travel demand;
- changes in travel times, speeds and the operating level of the service of the road network; and
- impacts of road tolls on travel patterns.

The traffic forecasting model developed and applied in the study uses computer-based models to forecast road traffic demand based on land use (in the form of demographic descriptors), travel characteristics, road infrastructure, public transport services and road tolls.

The following years were modelled:

- 2014 – Northern Link opening year;
- 2016 and 2021 – interim years to assist in the assessment of demand trends; and
- 2026 – the forecast year for which key inputs were available.

6.1 Description of the Northern Link Traffic Model

The Northern Link Traffic Model is underpinned by the Brisbane Strategic Transport Model (BSTM) as updated in 2005, which is widely accepted as the most up to date traffic-forecasting model for Brisbane. The BSTM provides average weekday travel demand forecasts for the Brisbane Metropolitan Area (or the ABS Brisbane Statistical Division (BSD)) up to and including the year 2026.

The basic structure of the Northern Link Traffic Model is similar to that used in recent years for the environmental impact assessment of other TransApex toll road projects including CLEM7, Airport Link and Hale Street Link. The Airport Link Traffic Model has been extensively tested and reported, and has been made available to stakeholder agencies for ongoing use.

The Northern Link Traffic Model includes use of updated existing road network database for the Northern Link study corridor; updating of descriptions and timing of future road infrastructure projects in consultation with BCC, DMR and QT; and incorporation of updated future demographic forecasts developed from the SEQ Economic and Employment Forecasting Study (PIFU and NIEIR, 2007).

A representation of the major components of the Northern Link Traffic Model is given in **Figure 6-1**, showing the primary model inputs and outputs. The various components are briefly discussed below with a more detailed discussion of the Northern Link Traffic Model development in **Appendix C Northern Link Traffic Model Development and Network Assumptions**.

6.1.1 Demographic and Land Use Inputs

A key input to the Northern Link Traffic Model is base and forecast demographics for the entire modelled area at traffic zone level. The zonal information used by the model includes population, education enrolments, and employment.

Up to date demographic forecasts of population and employment within the area covered by the BSTM have been incorporated in the Northern Link Traffic Model. In 2007 the (then) Office of Urban Management, Queensland Government and the Council of Mayors (SEQ) commissioned the National Institute of Economic and Industry Research (NIEIR) to develop employment and economic projections for South East Queensland.

The state's Planning Information Forecasting Unit (PIFU) provided revised medium series population and housing estimates as input to NIEIR's work in 2007.

Using this updated data, medium and high series demographic data sets were established for use in the Northern Link model. The previous Brisbane Long Term Infrastructure Plan (BLTIP) demographic data set (prepared in 2005) was used to represent the low series demographic data set for sensitivity testing.

Table 6-1 gives the population and employment projections for the Brisbane Metropolitan area with the overall estimates of person trips for the medium series population scenario used as the basis for the EIS traffic modelling.

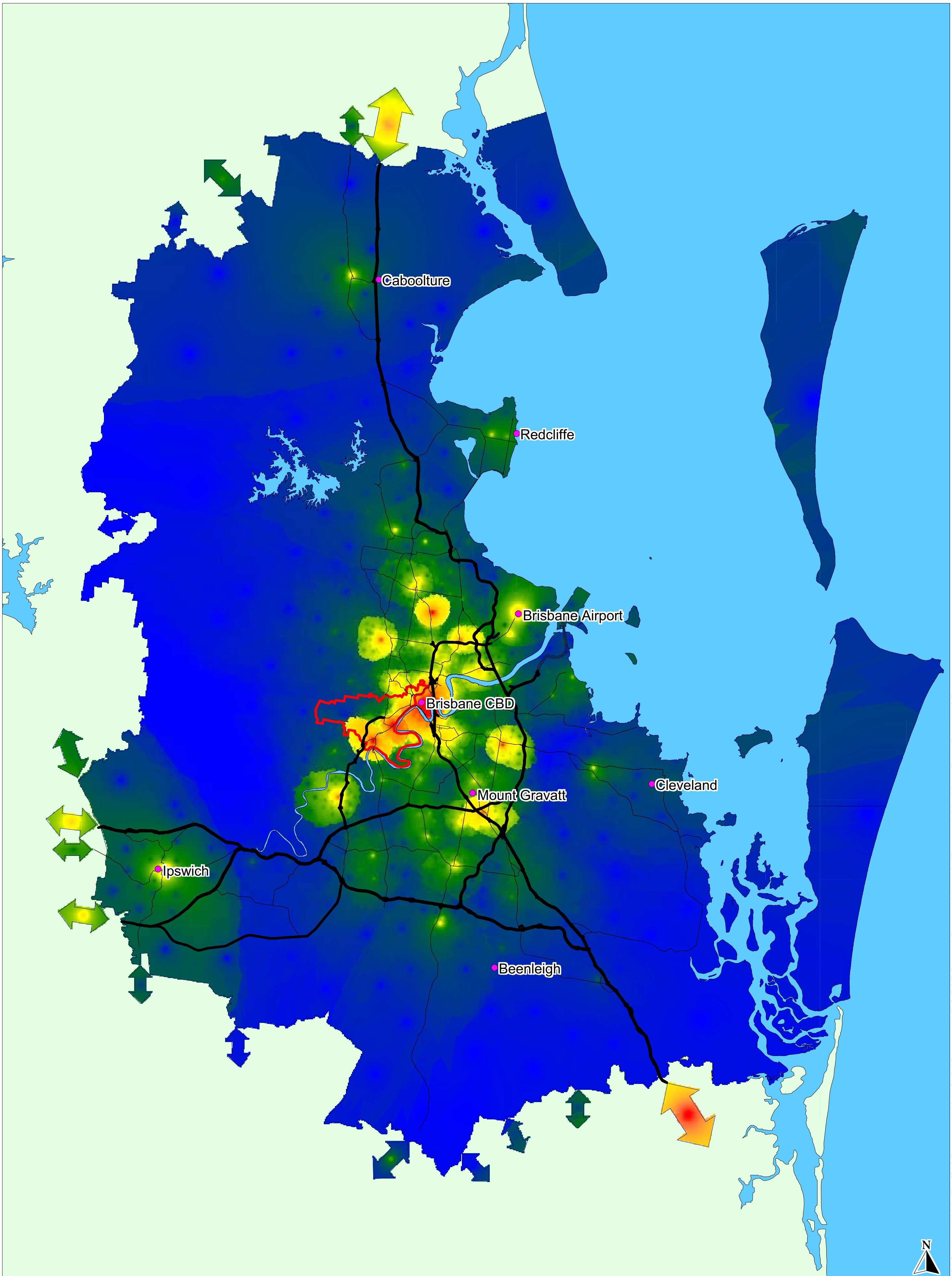
- **Table 6-1 Brisbane Metropolitan Area Population Forecasts**

Year	Population (1)	Employment (1)	Total Person Trips (2)
2007	1,879,800	963,800	6.5 million
2014	2,126,400	1,185,100	7.4 million
2016	2,196,900	1,236,600	7.6 million
2021	2,369,700	1,373,100	8.2 million
2026	2,533,400	1,484,100	8.8 million

Table Notes:
(1) Medium Series: PIFU and NIEIR forecasts – SEQ Economic and Employment Forecasting Study (2007/08).
(2) Person trips by all modes including walk/cycle and excluding commercial vehicles.

As land use and growth patterns vary across the Metropolitan Area, this will result in changes to travel demands. A representation of these changed travel demands as a result of land-use growth patterns is provided in **Figure 6-2** and shows clearly the distribution of land uses that will generate the greatest density of trip ends. To show the effects of forecast changes and growth in land use and travel demand generation, **Figure 6-3** depicts the change in trip ends forecast over the period between 2007 and 2026.

Figure 6-1
Northern Link Model Components



LEGEND

2014 Trip End Density
Trip Ends per square km

100,000	15,000	1,000
50,000	8,000	

Inner West Transport Study Area

State Strategic

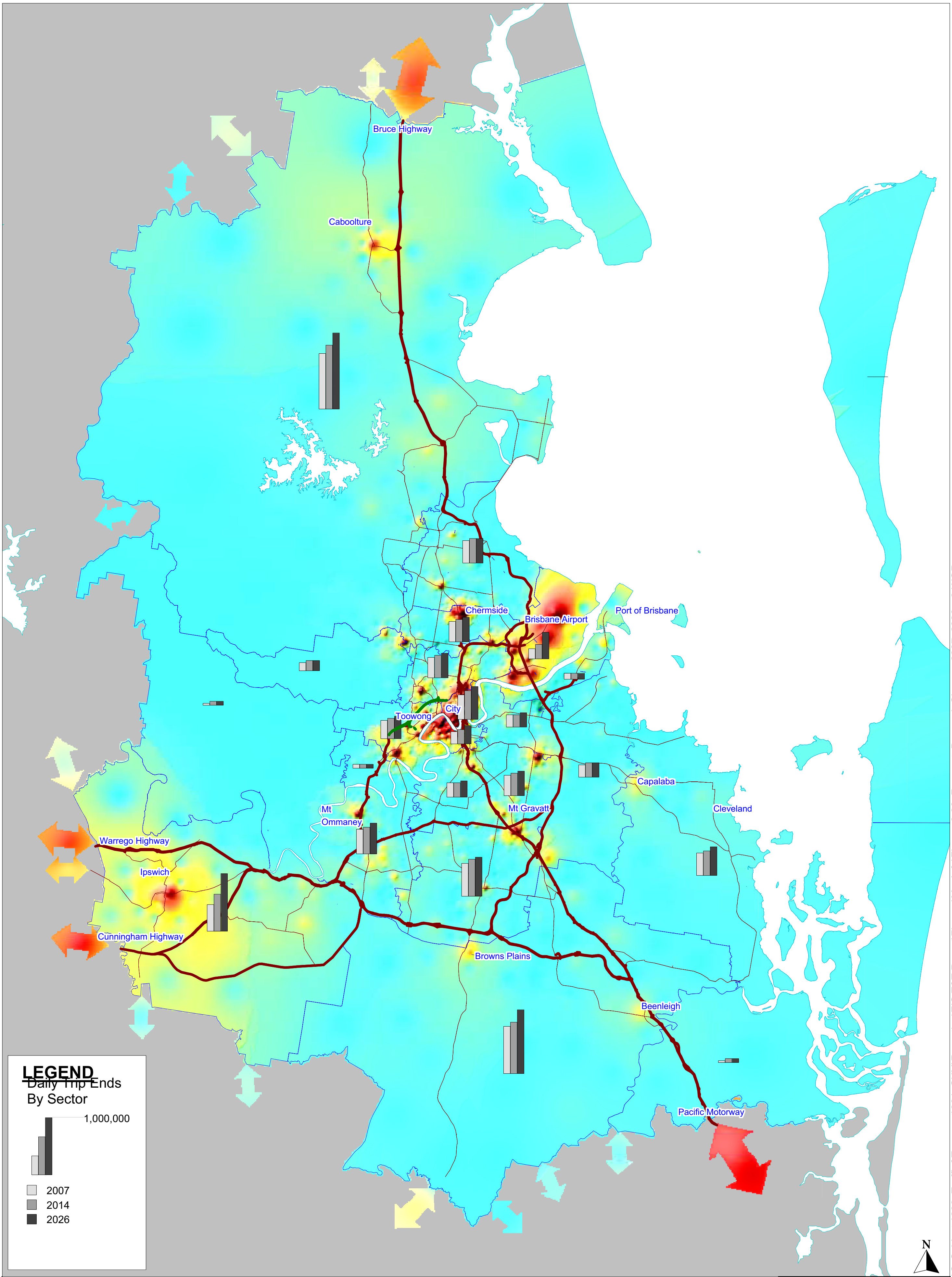
Regional Ring/Radial

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 6-2

2014 Daily Vehicle Trip End Density

Northern Link
SKM Connell Wagner JOINT VENTURE



LEGEND

Trip End Density Change
(2007 - 2026) Trip Ends per square km

25,000		5,000	
10,000		0	

Northern Link
State Strategic Road
Radial/Ring Road
Travel Sector Boundary

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 6-3

2007 to 2026 Daily Vehicle Trip End Changes

Northern Link
SKM Connell Wagner
JOINT VENTURE

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6.1.2 Trip Generation Model

The trip generation model estimates the quantum and nature of average weekday travel associated with land use throughout the Brisbane Metropolitan Area. A trip within the model refers to travel from one location to another and is estimated within the model by deriving the number of trips produced and attracted to traffic zones. Data on Brisbane travel behaviour have been used to develop relationships that calculate the number of trips to and from zones for various purposes (eg: shopping, work etc) based on zonal demographic descriptors.

Within the model, travel by all modes is calculated for an average weekday, including walk and cycle trips, public transport, private vehicle trips and commercial vehicle travel.

Some zones contain land uses that are focussed travel generators, examples being hospitals, shopping centres, universities and the Brisbane Airport. Forecast traffic demand for these special generators has been calculated outside the model from suitable data sources and applied as controls on the modelled trip generation for the relevant traffic zones.

6.1.3 Trip Distribution Model

The trip distribution model links the estimated trips produced at each traffic zone with trips attracted in other traffic zones, for a wide range of travel purposes (eg: home to work, home to shopping, business travel). The model considers the balance between the location of these trip ends and the cost of travel (in terms of time, distance, parking charges, and tolls) between them, for all locations within Brisbane. The gravity model is the most common form of trip distribution model and is used in the BSTM to estimate the distribution of trips internal to the strategic model boundary. The number of trips between two traffic zones is estimated to be directly proportional to the number of trip productions in the production zone and attractions in the attraction zone, and inversely proportional to the cost of travel between the zones. The output of the distribution model is a set of travel demand matrices that detail the number of trips from each traffic zone to all other traffic zones for various trip purposes.

Commercial vehicle (CV)[20] travel is treated separately to reflect the specific travel patterns exhibited by trucks. Observed data on commercial-vehicle origins and destinations (Queensland Transport, 2004) forms the basis of this part of the model, and is factored to represent future travel demands using relationships based on employment quantum and distribution.

Travel to and from the outer extremities of the modelled area is estimated to match vehicle totals calculated from traffic count records and trend projections. The trips are distributed amongst the internal traffic zones.

6.1.4 Time Period Model

Trip generation and distribution are used to forecast total daily travel on an average weekday; however, the transport system performs differently during the peak periods compared to the other times of the day. The time period model splits the total daily travel into separate am and pm peak periods and the off-peak period of the day. Time period proportions are based upon data from the 2003/04 SEQ Travel Survey and traffic counts.

Dividing the travel into these time periods allows more accurate estimation of travel behaviour changes throughout the day and the effects of traffic congestion during peak periods.

[20] CV refers to medium and heavy commercial vehicles as per the definition in **Section 3.6.3**.

6.1.5 Mode Choice Model

To enable assessment of the effects of planned public transport initiatives on travel behaviour within the Metropolitan Area, a mode choice modelling component was included within the Northern Link Traffic Model and integrated into the standard BSTM. A more detailed description of the Mode Choice Sub-Model is given in **Appendix C Northern Link Traffic Model Development and Network Assumptions**.

The model uses a current estimate of public transport travel and comparisons of road network performance and public transport service changes to estimate changes in public transport patronage. Future improvements in public transport infrastructure and services planned by TransLink (QT) have been explicitly modelled. Further information on the changes to public transport services advised by TransLink and adopted within this study is given in **Appendix C.9**.

Person trips by private transport are further factored by vehicle occupancy averages by trip purpose (observed in SEQ travel surveys) to convert the total person private travel into private vehicle trips.

6.1.6 Induced and Suppressed Demand Model

The opening of a major transport infrastructure facility such as Northern Link can produce several responses from the travelling public. The responses of the travelling public to improvements in network connectivity or reduction in congestion are referred to as induced traffic demand and can result in increased vehicle kilometres on the road network. The responses that occur are discussed below and are documented extensively elsewhere (Scottish Executive, 1997).

Responses directly catered for within the Northern Link Traffic Model include:

- changes in travel route – catered for in the trip assignment sub-model; and
- travel to new destinations for the same trip purpose - catered for in the trip distribution sub-model.

Other responses catered for by separate processes are:

- changes in journey start times – changes in travel start time to exploit improved peak travel times are separately accounted for within the induced demand sub-model;
- changes from other modes (public transport, cycling and walking) to private vehicle - addressed via use of a separate mode choice sub-model;
- changes in vehicle occupancy - changes in this characteristic are accounted for within the induced demand sub-model;
- changes in the frequency of some journeys and making entirely new journeys - these suppressed demand effects are catered for within the induced demand sub-model; and
- changes in the pattern of land use - land use patterns proposed by Brisbane City Council are used as fixed inputs, as these land use patterns reflect the desired vision for the City under the South East Queensland Regional Plan.

Many of these induced traffic effects are not catered for within standard strategic transport models. Research of techniques used in the UK and New Zealand was carried out to identify a suitable method to incorporate induced traffic effects within the Northern Link Traffic Model. The method selected as most appropriate for this project has utilised (with some customisation) techniques documented in the New Zealand Project Evaluation Manual. The methodology utilises an elasticity approach to estimate a new future travel private vehicle demand matrix using the following elasticity formula:

$$T_{ij}^{1} = T_{ij}^{F}\left(\frac{C_{ij}^{1}}{C_{ij}^{DM}}\right)^{E}$$

(Elasticity of demand, E, of -0.2 has been adopted based on the PEM and for consistency with the previous NSBT (now known as CLEM7) EIS.)

The induced demand model has been applied as a standard inclusion when applying the Traffic Model, to give a consistent upper estimate of travel expected for all forecasting years.

6.1.7 Induced Traffic Assessment

The induced demand model has been run for each time period and forecast year to provide revised demand matrices ready for use in the toll choice model time period assignments. **Table 6-2** gives estimates of the change in total average weekday vehicle demand.

- **Table 6-2 Daily Induced Private Vehicle Demands**

	Base Analysis without Induced Travel	Network with the Project
Year	Total Daily Demand Across Brisbane	Induced Demand Across Brisbane
2014	4,636,600	20,200 (0.44%)
2016	4,757,800	18,100 (0.38%)
2021	5,143,800	19,900 (0.39%)
2026	5,460,100	23,100 (0.42%)

Table Notes:
(1) Results are based on model runs using medium series demographic projections (SEQ Economic and Employment Forecasting Study 2007/08), and enhanced mode share.

The assessment demonstrates that low levels of induced demand across Brisbane in the order of 0.4% are forecast in a network that includes Northern Link.

Results from the induced demand assessment indicated that traffic increases vary across Brisbane, with a concentration where the project has the most direct effect on congestion levels.

Induced demands are also forecast to vary by time of day. The project provides most congestion relief within the peaks and, as such, the travel induced in these periods is greater than during off-peak periods. Overall induced demands within the Metropolitan Area in the am peak across the forecast years are in the range 0.5% to 0.6% of the base demand. Induced demand in the pm peak is in the range 0.6% to 0.8%, and the off-peak induced demand is in the range 0.2% to 0.5%.

6.1.8 Trip Assignment including Toll Route Choice

The preceding components of the model determine the amount of vehicle travel between traffic zones by time of day. The remaining step is the assignment of the demand onto particular routes between trip origins and destinations. To do this, driver route choice behaviour is simulated as a trade off between time, distance and toll for the route alternatives between the start and end locations for a trip. Trips from all trip origins and destinations are accumulated on the most attractive routes, such that the total represents forecast traffic on all road segments.

The presence of multiple toll routes within a network requires application of a complex methodology for assigning traffic on road networks. The approach used in the Northern Link Traffic Model gathers route cost information for the best tolled route and the best free alternative route, to allow a consumer choice comparison to be made.

A process has been developed to split traffic into toll users and non-toll users, taking into account travel distance, total time (including intersection delays) and the value of tolls along the route. The relationships applied are based on data obtained from a survey of the catchment areas where people make trips in the corridors that Northern Link is likely to serve. A cross-section of potential toll road users was surveyed, covering variations in home location, trip origin and destination, trip purpose, and whether tolls are regularly paid. The parameters applied in the model reflect average driver behaviour with respect to the willingness to pay a toll to improve travel time, avoid congestion and use higher quality roads during different periods of the day.

The total route costs on tolled and alternative routes are converted and aggregated into a total utility parameter. This process uses relative weights for each of the distance, time and toll components along the routes. A comparison is made between the best toll and best alternative routes for all trips that can potentially use the toll facilities. The demand between the relevant origin and destinations within Brisbane is split between toll users and non-toll users.

Both toll users and non-toll users are assigned to their identified best routes using the model in a process that balances demand with congestion delays. The resulting traffic estimates on the road network segments represent future traffic demands that can be critically compared on individual sections of the network or as a global total measure of network performance.

A more detailed description of the Toll Choice Assignment Model is given in **Appendix C Northern Link Traffic Model Development and Network Assumptions**.

6.1.9 Public Assignment Transport Model

The model produces estimates of public transport trips in addition to the road vehicle demands and assigns this demand to a representation of the public transport (rail, bus, ferry) services to produce public transport patronage estimates. In a similar manner to the road traffic assignment, detailed and network-wide statistics are produced for use in assessment of project effects.

6.1.10 Model Validation and Sensitivity Testing

For the Northern Link project, a base year (2007) model was validated within the Northern Link corridor against observed 2007 traffic count and journey time information. Results of the validation comparisons for the base year have been presented in **Appendix C Northern Link Traffic Model Development and Network Assumptions**.

In addition to the base year model validation, a range of sensitivity tests were undertaken to check the model’s predictive stability with respect to:

- changes in road network description including new roads and changes in link and intersection details;
- changes in public transport service provision and the effect on public transport patronage;
- changes in toll charges, both for private and commercial vehicles ;
- changes in toll and route choice behaviour parameters; and
- changes in demographics (land use).

Findings from the sensitivity testing are presented in Appendix C Northern Link Traffic Model Development and Network Assumptions.

The validation checks and sensitivity tests undertaken have verified that the model described above is capable of producing traffic estimates of sufficient accuracy and sensitivity for use in this study.

6.1.11 Model Outputs

Outputs from the traffic and transport modelling for use in the assessment of project effects have been prepared using the Northern Link Traffic Model for scenarios without and with the project. They include:

- estimates of future traffic volumes on individual roads within the network, for both untolled and tolled roads;
- traffic volumes (total and commercial vehicles) for peak periods, off-peak times and aggregated to average weekday volumes;
- intersection turning movements during peak periods for use in assessment of local traffic operations;
- travel times and operating LOS on routes within the network;
- additional specific traffic data requirements requested by the specialists preparing environmental assessments on air quality and noise. These included more detailed temporal traffic flow breakdowns, estimates of heavy vehicle proportions and bus estimates; and
- network wide statistics, disaggregated by road type and vehicle class, including vehicle–kilometres of travel, vehicle hours of travel and network speed, for use in economic assessments.

6.2 Alternative Future Scenarios for Strategic Modelling

6.2.1 Future Road Network Improvements

In order to forecast future conditions within the project, assumptions need to be made regarding the traffic and transport network at future critical dates. Details of planned or potential future projects and their timing were compiled from anticipated capital works programs (including SEQIPP), and an agreed list for network modelling developed in consultation with DMR and BCC.

The agreed list of Do Minimum network projects (or projects to be included in the network both without and with the project) for forecasting years 2014, 2016, 2021 and 2026 is summarised in **Appendix C.8**.

The major road transport projects relevant to the project at the time of the study were the CLEM7, Airport Link, Hale Street Link, Gateway Upgrade Project, Ipswich Motorway upgrade and the upgrading of the Centenary Highway/Western Freeway to include transit lanes between the Ipswich Motorway and Toowong. The incorporation of these projects within the traffic and transport analysis is described below. These projects were all included in both without, and with, the project traffic modelling.

Key base future network projects include:

- the CLEM7 has been coded to represent the River City Motorways (RCM) facility currently under construction. CLEM7 is assumed to be open and operating a toll road by 2011;
- the Gateway Upgrade Project (GUP) coding has been updated to reflect contemporary planning, inclusive of south facing ramps from Kingsford Smith Drive. The project is assumed to be in operation by 2011;
- Airport Link has been coded to match the project description within the Airport Link EIS (2006) assuming inclusion of the Northern Busway in interim form before 2026 and final form post 2026. Airport Link is assumed to be opened and operating as a toll road by 2012. Note that the Northern Link modelling for the EIS was undertaken prior to the announcement of the preferred Airport Link tender in late May 2008;
- the Airport Roundabout upgrade involving the replacement of the current grade separated roundabout with a new grade separated interchange, has been included in all networks post 2012. This was consistent with DMR planning investigations in progress at the time of the Northern Link modelling. It is noted that

implementation of this project has also been announced in conjunction with the preferred Airport Link tender;

- the Hale Street Link has been coded as a new 4 lane, 2 way bridge connection from the intersection of Hale Street/Coronation Drive in Milton to South Brisbane with configuration consistent with the Hale Street Link Modification Report (April 2008). Hale Street Link is assumed to open as a toll bridge by 2011;
- Ipswich Motorway Upgrade has been coded as a 6 lane upgrade between Rocklea and Riverview to be in place by 2012; and
- a preliminary planning study is in progress by DMR for the proposed Centenary Highway and Western Freeway transit lane project identified within SEQIPP. Although this investigation has not been finalised, based upon advice provided by DMR, for the purposes of modelling within the EIS this project has been coded as an upgrading from 4 to 6 lanes inclusive of a single T2 lane each way between Mount Coot-tha Road and approximately at Warrender Street. No upgrading over the Centenary Bridge has been assumed. Implementation in 2016 has been assumed.

6.2.2 Public Transport Services

Improvements in public transport services for each of the forecasting years 2014, 2016, 2021 and 2026 have been incorporated into the Northern Link future scenarios. This was done based on advice from TransLink using their detailed forward planning being undertaken consistent with the TransLink Network Plan and SEQIPP initiatives.

Key service planning assumptions incorporated in the incremental mode choice model to establish the enhanced mode share scenario are as follows:

- general improvement to bus frequencies for existing bus services are forecast to increase by 6% up to 2016 and by 4.4% from 2016 to 2026;
- inclusion of the Northern Busway service patterns and frequencies, with interim busway data up to 2021 and full busway for 2026;
- inclusion of the Eastern Busway service patterns and frequencies from 2016. Existing services with increased frequencies were assumed prior to 2016;
- other new future year bus services data, as provided by TransLink was included (eg: Eleanor Schonell Bridge services); and
- Queensland Rail future service patterns and frequencies were revised in line with TransLink's Rail Services and Infrastructure Requirements Study (2007), including Springfield rail services.

6.2.3 Toll Value Assumptions

Toll values have been included in the road network description as a monetary charge on particular road segments representing existing or proposed toll collection points. The value of tolls on Northern Link and other TransApex toll facilities at the proposed year of opening, 2014, were modelled as:

- Northern Link tolls (2008 dollars including GST):
  - $3.93 for light vehicles, $7.86 for commercial vehicles.
- Airport Link tolls (2008 dollars including GST):
  - full (north-south) journey – $4.24 for light vehicles, $11.23 for commercial vehicles; and
  - partial (east-west) journey – $3.18 for light vehicles, $8.42 for commercial vehicles.
- CLEM7 toll (2008 dollars including GST):
  - $3.93 for light vehicles, $10.41 for commercial vehicles.

- Hale Street Link (2008 dollars including GST):
  - $2.40 for light vehicles, $6.37 for commercial vehicles.

A common basic perceived toll dollar value has been calculated for each year for use in the model. This calculated value takes into account the assumption that tolls will rise with CPI, and increases in average wages (spending power) slightly higher than CPI.

7. Future Scenario Without Northern Link

7.1 Introduction

The forecast traffic demands and performance of the transport network on the basis that the proposed Northern Link is not constructed are described in this chapter.

7.2 Demand for Travel

The future demand for travel, which incorporates public transport trips and the effects of significant enhancements to the public transport network, has been forecast for the Brisbane Metropolitan Area for the years 2014, 2016, 2021 and 2026. The travel demand in 2007 has also been identified so to allow comparison. **Table 7-1** summarises the growth in travel demand at the metropolitan level.

- **Table 7-1 Forecast Growth in Weekday Travel Demand in Metropolitan Area**

Parameter	2007	2014	2016	2021	2026
Person Trips by Motorised Travel Modes(1)	5,884,000	6,690,000	6,910,000	7,464,000	7,986,000
Public Transport Trips	464,000	599,000	670,000	742,000	866,000
% PT Trips	7.9%	9.0%	9.7%	9.9%	10.8%
Car/Light Vehicle Trips	3,879,000	4,385,000	4,498,000	4,855,000	5,150,000
Commercial Vehicle Trips	210,000	251,000	261,000	288,000	310,000
Total Vehicle Trips	4,089,000	4,636,000	4,759,000	5,144,000	5,460,000
% Growth in Vehicle Trips compared to 2007		**13%**	**16%**	**26%**	**34%**

Table Note:
Source: Northern Link Traffic Model
(1) Includes travel to and from locations outside the BSD.
(2) % Public Transport is expressed as a proportion of person trips by motorised modes.

These forecasts show that even with significant growth in public transport mode share from a current level of 7.9% to 10.8% of motorised travel in 2026 a sustained growth in vehicle travel demand is forecast at the Brisbane Metropolitan Area level. It is expected that by 2026 there would be 34% more vehicle trips even with the number of public transport trips almost doubling during the same period. The number of commercial vehicle trips is forecast to increase by 48% to 2026.

With respect to the Inner West Transport Study Area east-west traffic movements at its southern gateways are forecast to increase by over 18% between 2007 and 2026, a sustained growth rate of over 1.0% per annum. Traffic movements within the study area are forecast to grow by almost 25% for the same period, which is a growth rate of 1.5% per annum. This illustrates the significant forecast increase for vehicle trips throughout the Inner West Transport Study Area for the future scenario without the Northern Link project.

These growth rates are similar for commercial vehicle movement, indicating that the adverse effects of truck travel through the surface network in the Inner West Transport Study Area for access to commercial and industrial precinct will become even more significant over time.

Further detail of the forecast traffic volumes and growth at the key screenlines in the Inner West Transport Study Area for all vehicles and commercial vehicles are shown in **Table 7-2**. The location of the screenlines is shown in **Figure 2-3**. Across all screenlines there is forecast to be sustained growth to 2026 for all vehicle types of between 16% for the St Lucia and University screenline and 25% for the Toowong and Milton screenlines. Growth in commercial vehicles to 2026 is forecast to be 18% at Indooroopilly screenline and rising to 35% at the St Lucia and University screenline.

Table 7-2 Forecast Growth in Traffic Volumes at Screenlines

Average Weekday Traffic Without Northern Link									
Screenline	2007	2014	% Growth(1)	2016	% Growth(1)	2021	% Growth(1)	2026	% Growth(1)
Indooroopilly	162,400	178,400	9.0%	187,400	13.3%	191,600	15.2%	198,900	18.4%
St Lucia and University	73,800	81,600	9.6%	83,500	11.6%	85,100	13.3%	88,100	16.2%
Toowong	174,200	210,400	17.2%	219,400	20.6%	224,400	22.4%	230,900	24.6%
Milton	205,500	244,900	16.1%	255,200	19.5%	263,000	21.9%	269,700	23.8%
Commercial Vehicle Weekday Traffic Without Northern Link									
Screenline	2007	2014	% Growth(1)	2016	% Growth(1)	2021	% Growth(1)	2026	% Growth(1)
Indooroopilly	6,200	6,200	0%	6,500	4.6%	7,000	11.4%	7,600	18.4%
St Lucia and University	2,600	3,200	18.8%	3,300	21.2%	3,600	27.8%	4,000	35.0%
Toowong	10,100	11,100	9.0%	11,400	11.4%	12,200	17.2%	12,900	21.7%
Milton	10,900	12,300	11.4%	12,900	15.5%	14,000	22.1%	14,800	26.4%

Table Notes
Source: Northern Link Traffic Model
(1) Percentage growth compared to 2007

7.3 Strategic Traffic Network Performance

Average weekday traffic volumes have been forecast for roads in the Brisbane Metropolitan Area for the years 2014, 2016, 2021 and 2026 for a road network that does not incorporate the proposed Northern Link. Estimated average weekday daily traffic volumes for 2007 have also been evaluated in order to allow comparison.

Figure 7-1, Figure 7-2, Figure 7-3, and **Figure 7-4** show the forecast volumes on the road network without Northern Link for 2014, 2016, 2021 and 2026 due to growth in the demand for key travel movements. Forecast traffic volumes and growth without Northern Link at key locations are show in **Table 7-3**.

The LOS for the road network without Northern Link has been examined for roads within the Brisbane Metropolitan Area for the years 2014 and 2026 for both the am and pm peak periods. **Figure 7-5**, **Figure 7-6**, **Figure 7-7** and **Figure 7-8** detail the LOS for the road system in the western suburbs and central city areas for the two-hour peak periods in the morning and evening.

Traffic growth and network performance characteristics that are evident from these forecasts include:

- due to increased demand on the road network, there is a general decrease in LOS across the years on the road network. This reflects a decrease in travel speeds due to increased congestion;
- within the Inner West Transport Study Areas significant sections of most arterial roads are forecast to operate with a poor LOS in both the am and pm peak periods by 2014. The LOS is typically forecast to deteriorate over time indicating an increasing capacity deficiency;
- significant growth in demand is forecast on the major east-west arterials through the Inner West Transport Study Area without the project;
- traffic on the Western Freeway is forecast to grow by almost 30% from 76,500 vehicles per day currently to 105,200 vehicles per day by 2026. It is noted that with the future upgrading of the Western Freeway currently under investigation by Main Roads as a SEQIPP initiative (assumed within the modelling from 2016 onwards as an additional lane in each direction operating as a T2 transit lane), the Western Freeway is forecast to maintain a good LOS and have suitable capacity west of the Mt Coot-tha roundabout. At the Mt Coot-tha roundabout (without upgrading) the LOS would deteriorate to F and this would be accompanied

by extensive queuing and delay. The congestion experienced at the Frederick Street roundabout would also worsen in the absence of major intersection upgrading;

- Milton Road would experience traffic growth of almost 30% from 51,500 vehicles per day in 2007 to 72,500 vehicles per day in 2026. The LOS would deteriorate to F (very congested conditions) on many sections of Milton Road is forecast in both directions during both peak periods in 2026;
- Coronation Drive is also forecast to experience very congested conditions on the majority of its length during both peak periods and in both directions by 2026. The amount of traffic is forecast to increase from 90,100 vehicles per day to 96,400 vehicles per day by 2026 (north of Cribb Street). The small increase of 7% reflects that Coronation Drive is already operating close to capacity;
- major traffic growth is forecast on Moggill Road at Toowong. Moggill Road is a regional radial road, which links the western suburbs to Toowong and onto the CBD via Coronation Drive. Traffic growth of up to 23% is forecast. Traffic growth on Moggill Road at Indooroopilly, to the west of the study area is lower and by 2014 growth, compared to 2007, is only 4%; and
- traffic growth on the ICB is forecast to be 32% with a traffic volume of 117,000 vehicles per day by 2026. A good LOS is forecast to continue on ICB. It is noted that by 2014 the CLEM7 and the Airport Link projects would be operational and these projects will have free flow connectivity with the ICB. The LOS on Hale Street is forecast to deteriorate to F along much of its length by 2026, and the associated queues and delays may then have an impact on traffic on the abutting ICB.

Significant growth in demand is forecast on the east-west regional radial roads through the Inner West Transport Study Area without the project. Examples include:

- Fredrick Street is a regional ring road that provides a strategic connection from the Toowong Roundabout to the northern suburbs and is part of the Met Road 5. Traffic on Frederick Street is forecast to grow by 10% to 37,400 vehicles per day by 2026. Between Rainworth Road and Milton Road the level of serve on Frederick Street is expected to deteriorate to F (very congested conditions) during the am peak in the northbound direction and in the southbound direction during the pm peak period.
- Kelvin Grove Road and Musgrave Roads are both regional radial roads that provide connectivity from the central city area to the Brisbane northern suburbs. Traffic reductions of 11% and 2% respectively are forecast for 2014. This is due to the traffic redistribution effect of the opening of major road infrastructure such as CLEM7 and Airport Link projects prior to 2014 on north-south movements in the corridor. These projects provide alternative routes for traffic that currently uses Kelvin Grove Road and Musgrave Road. By 2026 the quantum of traffic forecast to use Kelvin Grove Road is 51,400 vehicles per day only a 2% increase on current levels. The amount of traffic forecast to use Musgrave Road in 2026 is slightly lower than the current volume of 31,400 vehicles per day. The LOS in 2026 of both roads is thus forecast to be similar to current levels during both the am and pm peak periods.
- On city distributors and local streets throughout the Inner West Study Area significant increases in traffic are forecast and this increase in traffic would lead to deterioration in the LOS on these roads. Examples of forecast traffic increases include:
  - Caxton Street - a growth of 70% or 16,000 vehicles per day to 38,900 vehicles per day by 2026
  - Jephson Street - a growth of 82% or 10,700 vehicles per day to 23,700 vehicles per day
  - Eagle Terrace and Haig Road both have increases of over 120% from current traffic volumes of around 5,000 vehicles per day by 2026.
  - Park Road - a growth of 57% or from a current level of 12,100 vehicles per day to 19,000 vehicles per day by 2026.

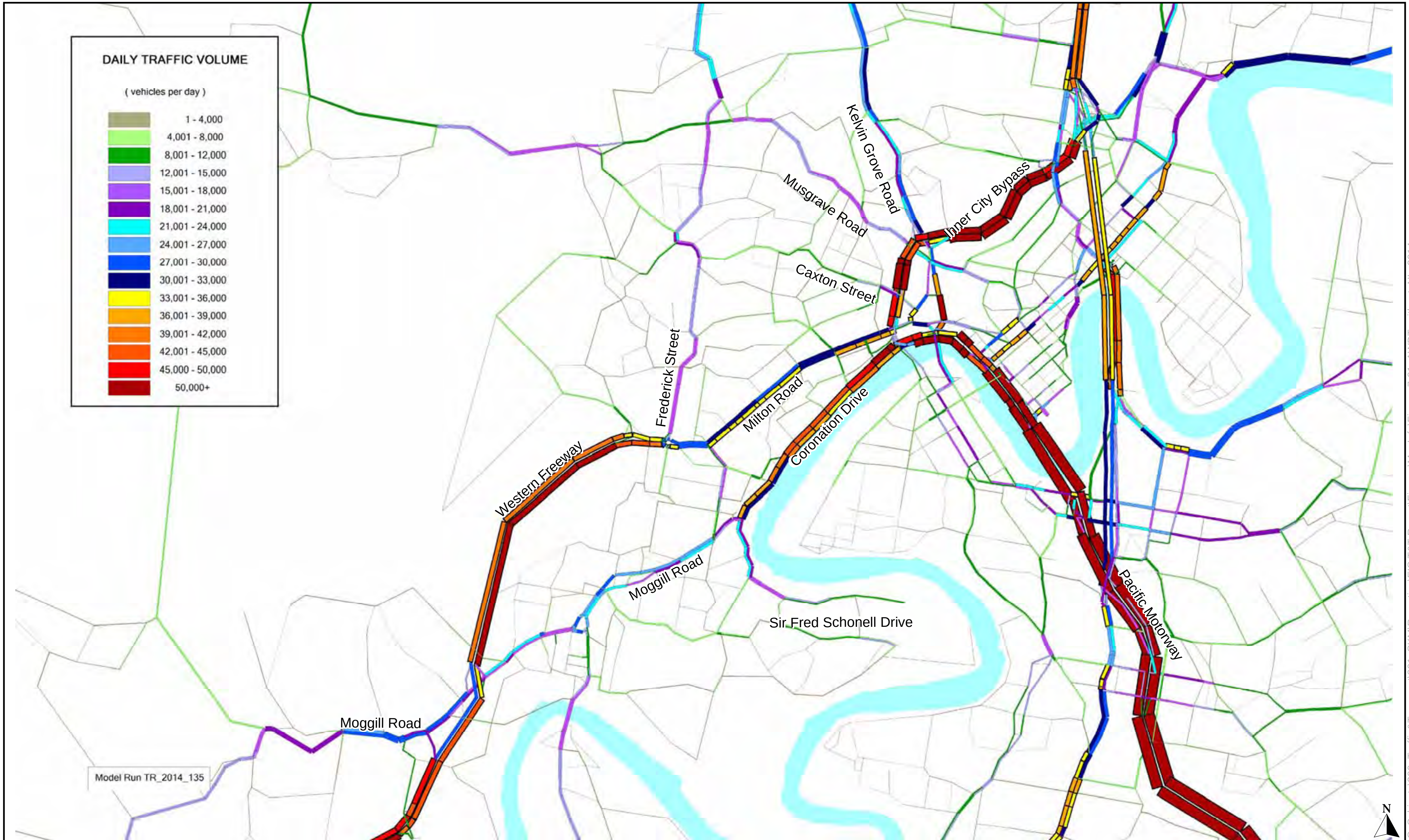

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Figure 7-1

2014 Average Weekday Traffic Volumes Without Northern Link

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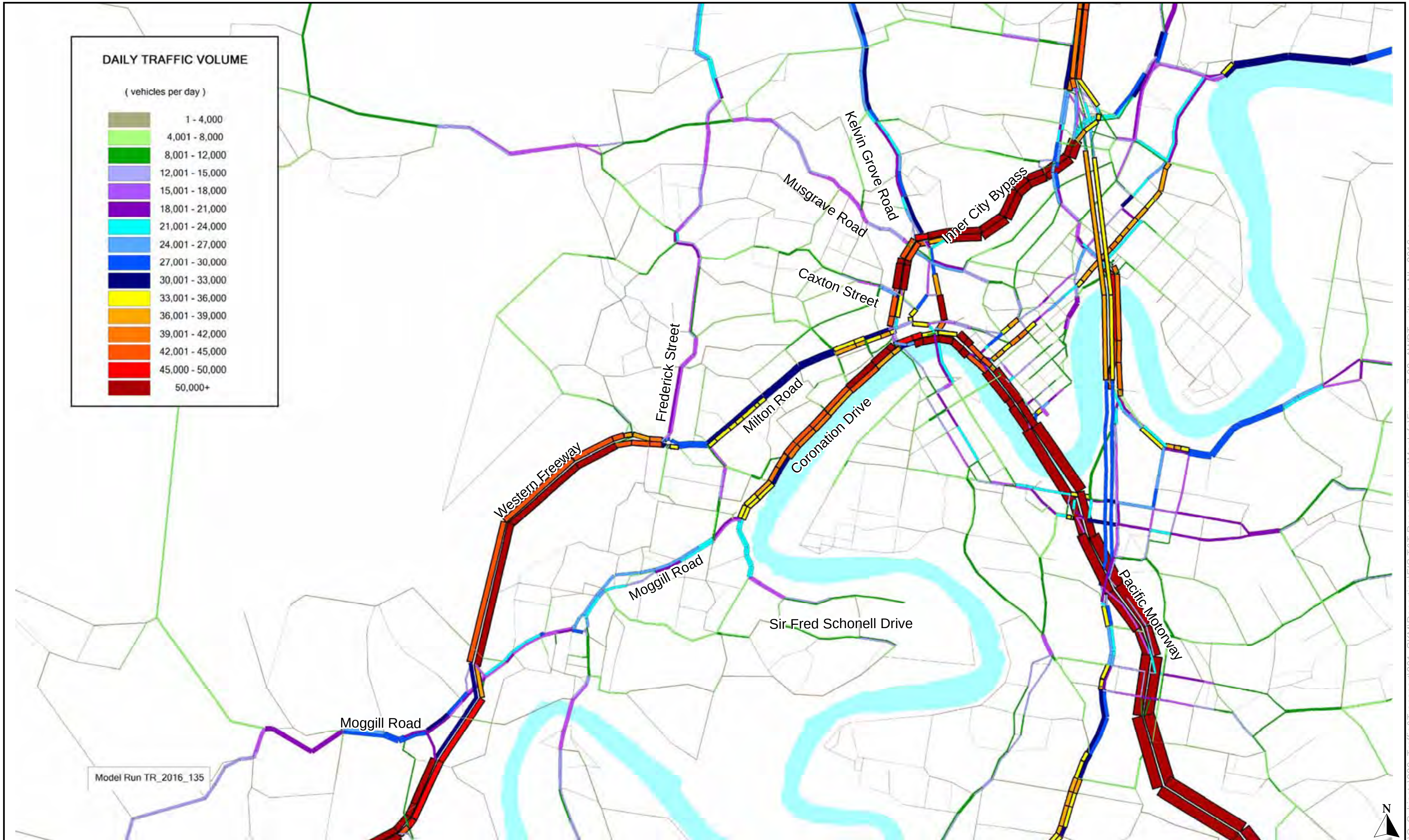

Northern Link
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Figure 7-2

2016 Average Weekday Traffic Volumes Without Northern Link

SKM Connell Wagner JOINT VENTURE

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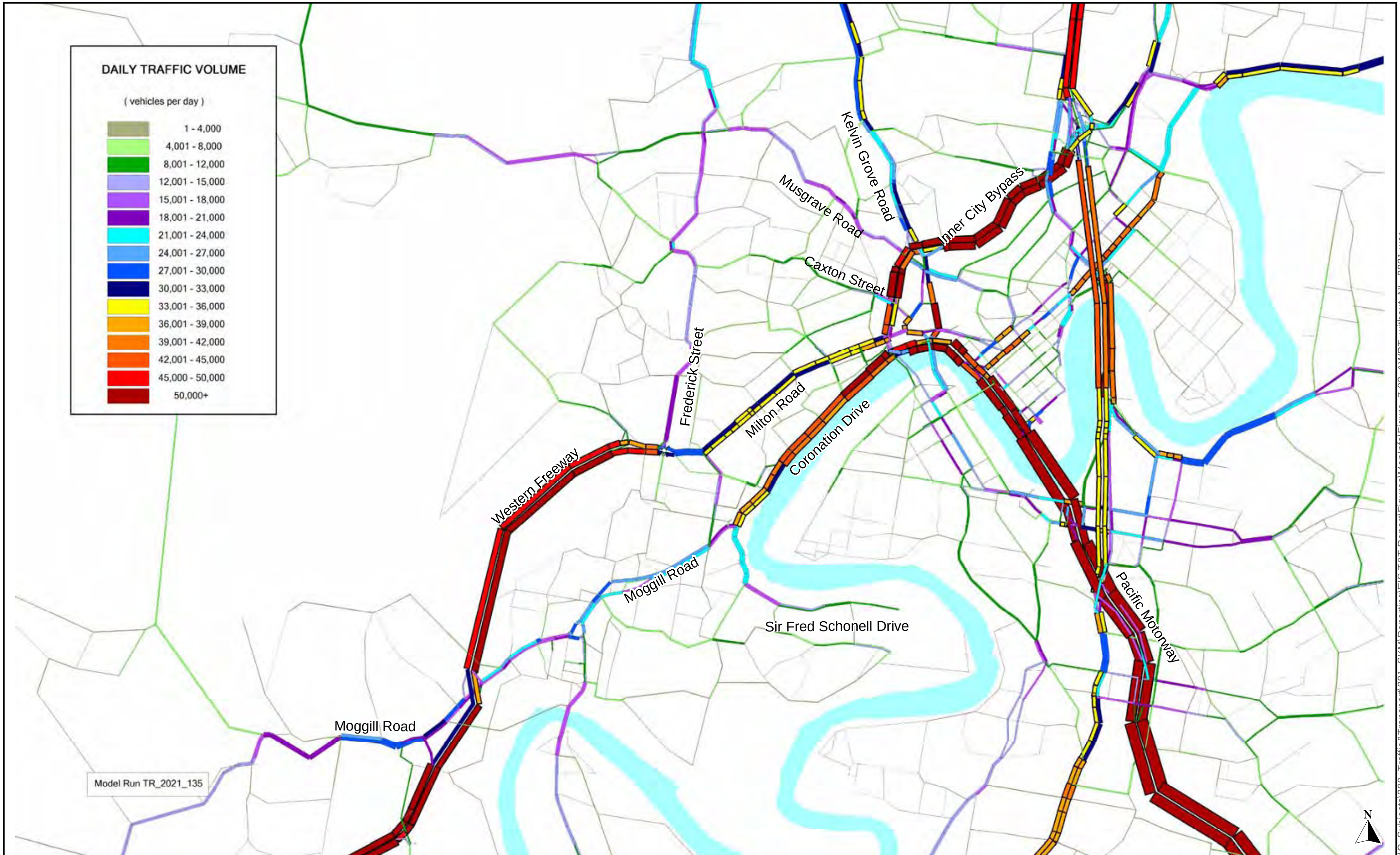

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Figure 7-3

2021 Average Weekday Traffic Volumes Without Northern Link

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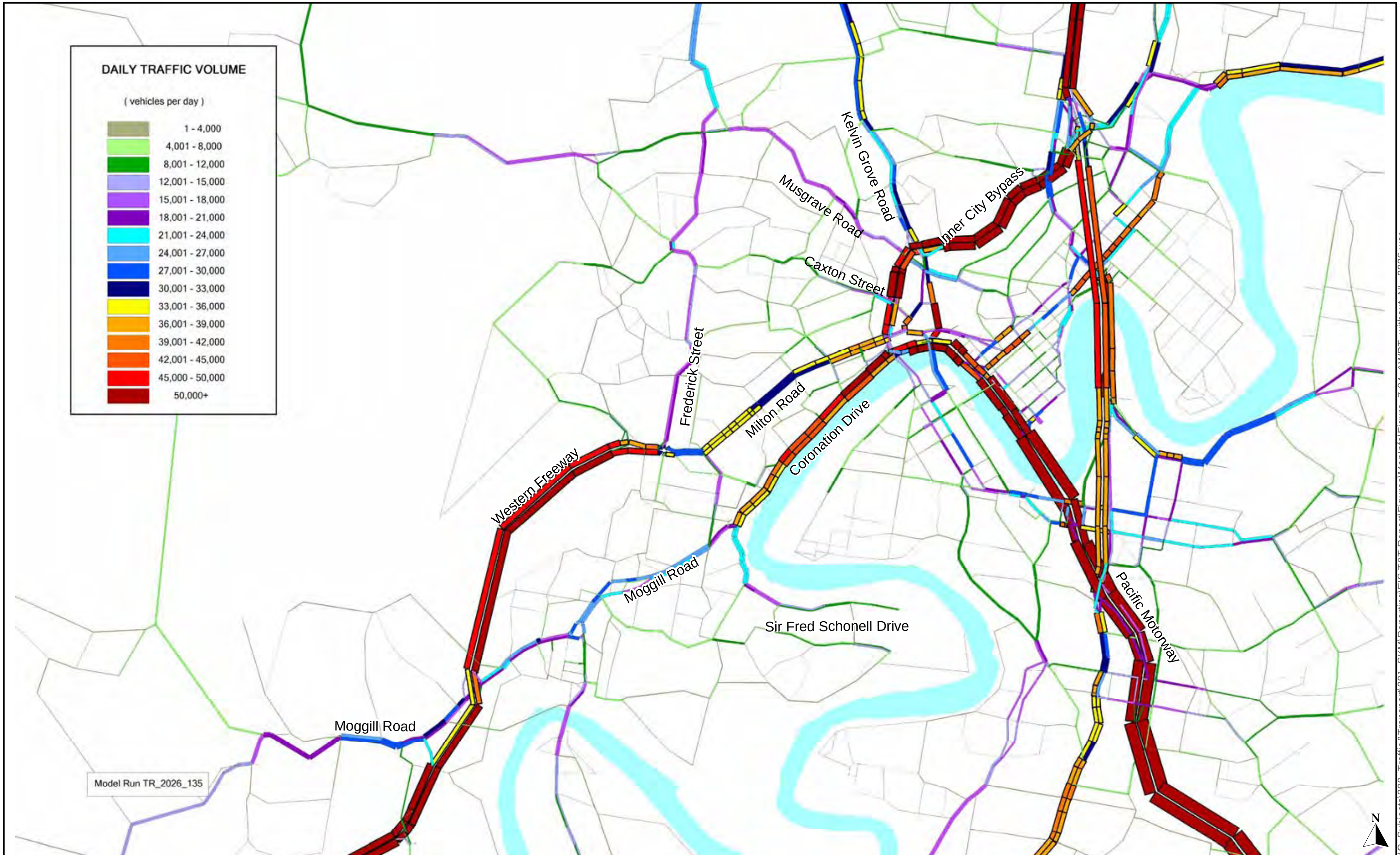

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Figure 7-4

2026 Average Weekday Traffic Volumes Without Northern Link

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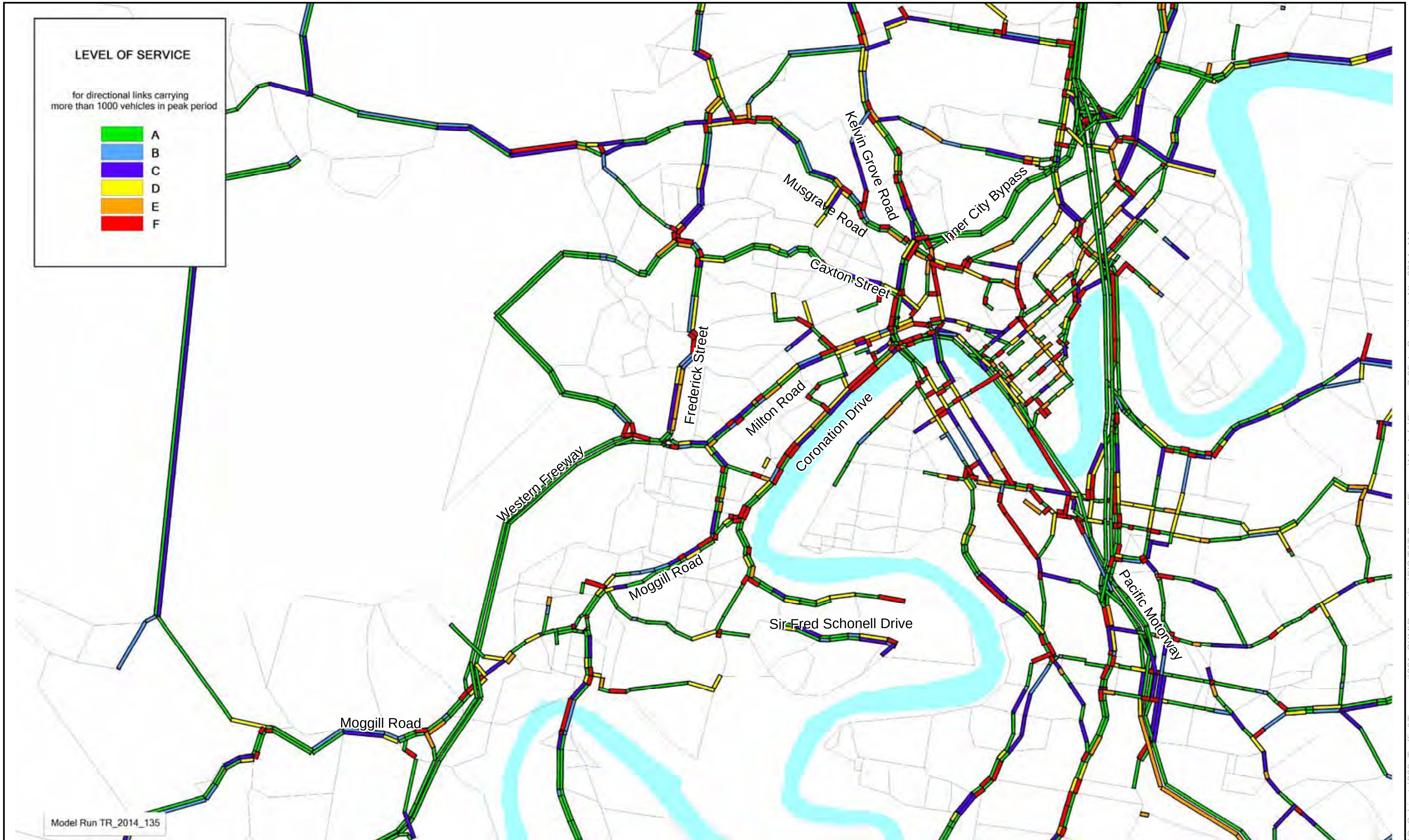
Table 7-3 Forecast Traffic Growth on Key Roads Without Northern Link

Hierarchy	Reporting Point	Road	Location	2007	Average Weekday Traffic			
					2014		2026	
					Forecast Volume	% Growth (1)	Forecast Volume	% Growth (1)
State Strategic								
	A	Western Freeway	North of Moggill Rd Interchange, Indooroopilly	76,500	90,100	18%	105,200	38%
Regional Radial								
	B	Moggill Road	East of Russell Terrace, Indooroopilly	40,700	42,200	4%	47,000	15%
	D	Moggill Road	East of Brisbane Boys College Entrance, Toowong	38,500	47,000	22%	50,100	30%
	F	High Street	West of Benson Street, Toowong	32,400	35,000	8%	37,300	15%
	J	Milton Road	East of Croydon Street, Toowong	52,900	64,500	22%	68,200	29%
	X	Milton Road	West of Croydon Street, Toowong	54,900	61,400	12%	63,900	16%
	K	Coronation Drive	West of Land Street, Auchenflower	62,600	70,300	12%	74,000	18%
	O	Milton Road	East of Castlemaine Street, Milton	51,500	68,200	32%	72,500	41%
	P	Coronation Drive	East of Cribb Street, Milton	90,100	92,100	2%	96,400	7%
	T	Kelvin Grove Road	North of School Street, Kelvin Grove	50,500	45,700	-10%	51,400	2%
	U	Musgrave Road	West of Hale Street	31,400	30,000	-4%	31,200	-1%
Regional Ring								
	R	Inner City Bypass	Landbridge, Spring Hill	79,200	108,000	36%	116,900	48%
	C	Walter Taylor Bridge	Indooroopilly	32,500	33,800	4%	33,800	4%
	E	Miskin Street	North of Ascog Terrace, Toowong	10,500	10,200	-3%	10,800	3%
	I	Frederick Street	South of Victoria Crescent, Toowong	33,500	33,900	1%	37,400	12%
	19	Hale Street	South of Caxton Street	76,900	84,100	9.4%	83,500	8.6%
	30	Jubilee Terrace	North of Coopers Camp Road	27,700	29,900	8%	32,600	18%
	31	Sherwood Road	West of Jephson Street	5,400	6,000	11%	7,900	46%

Continued over

Hierarchy	Reporting Point	Road	Location	2007	Average Weekday Traffic			
					2014		2026	
					Forecast Volume	% Growth (1)	Forecast Volume	% Growth (1)
City Distributor								
	G	Brisbane Street	North of Josling Street, Toowong	37,100	43,100	16%	45,900	24%
	H	Sylvan Road(2)	East of Milton Road, Toowong	8,400	5,500	-35%	6,300	-25%
	Q	Caxton Street	West of Hale Street, Paddington	22,900	33,700	47%	38,900	70%
	S	Jephson Street	North of Sherwood Road, Toowong	13,000	22,500	73%	23,700	82%
	32	Latrobe Terrace	West of Enoggera Terrace	14,200	18,200	28%	21,400	51%
Local Streets								
	L	Eagle Terrace	West of Roy St., Auchenflower	4,100	6,600	61%	9,100	122%
	M	Haig Road	West of Barona Rd., Milton	6,500	12,600	94%	14,500	123%
	N	Park Road Mid-block	North of Gordon Street, Milton	12,100	15,000	24%	19,000	57%
	33	Sir Samuel Griffith Drive	North of Birdwood Terrace	5,300	9,900	87%	13,900	162%
	34	Stuartholme Road	North of Birdwood Terrace	3,600	5,100	42%	5,100	42%
	35	Enoggera Terrace	North of Latrobe Terrace	5,100	7,700	51%	10,400	104%
	28	Rainworth Road	East of Rouen Road	4,300	7,000	63%	10,000	133%
	36	Morley Street	North of Milton Road	3,900(3)	6,300	62%	6,700	72%
	37	Lang Parade	North of Coronation Drive	6,800	11,300	66%	12,600	85%
	29	Birdwood Terrace	East of Gregory Terrace	1,600	3,900	144%	4,500	181%
	38	Heussler Terrace	West of Castlemaine Street	8,000	13,500	69%	14,800	85%

Table Notes
Source: Northern Link Traffic Model except (3) October 2007 count
(1) Percentage growth compared to 2007
(2) Decrease in traffic volume on Sylvan Road from 2007 to 2014 is due to closure of the right turn from Milton Road to Sylvan Road



Northern Link
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Figure 7-5

2014 AM Peak Level of Service Without Northern Link

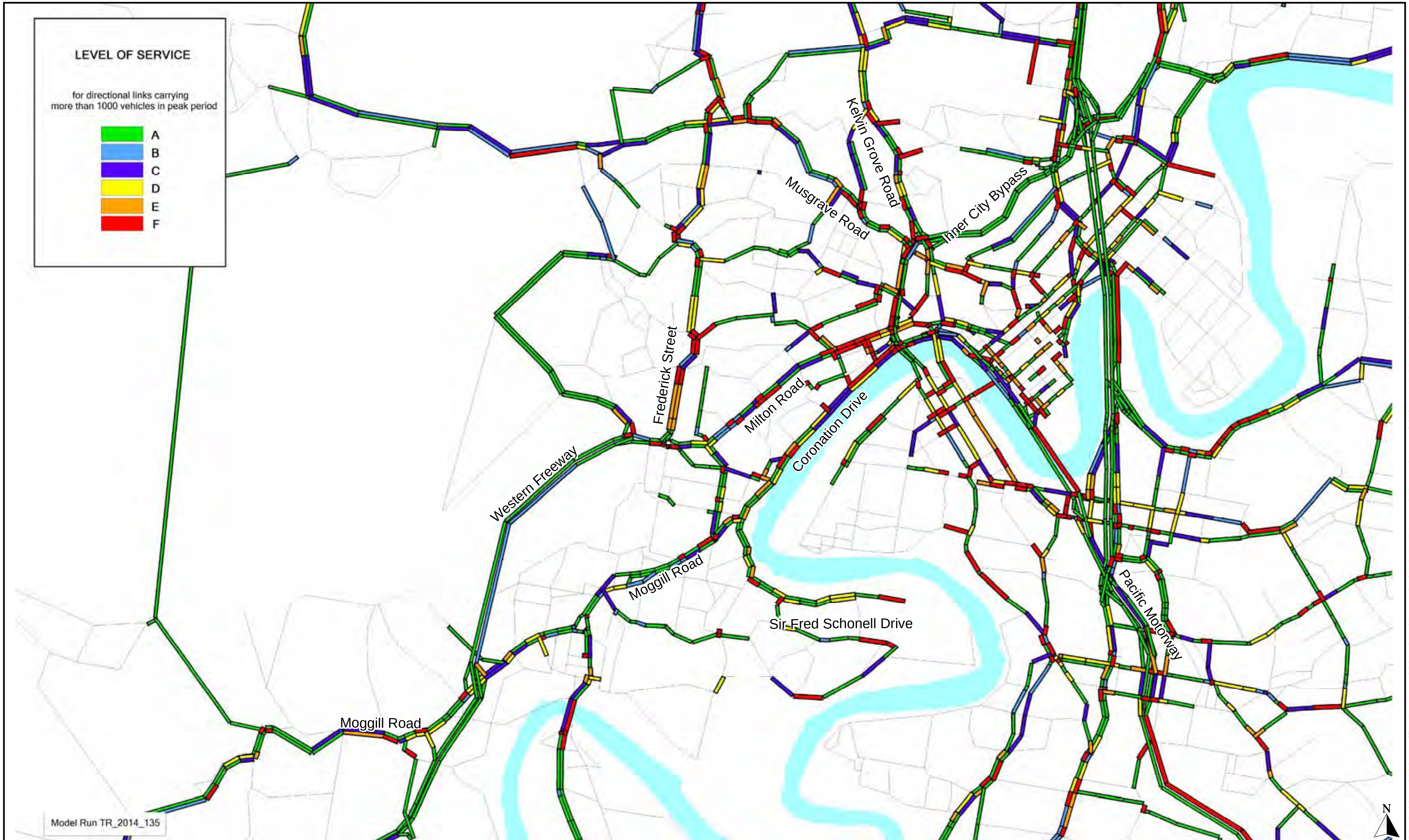

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Figure 7-6

2014 PM Peak Level of Service Without Northern Link

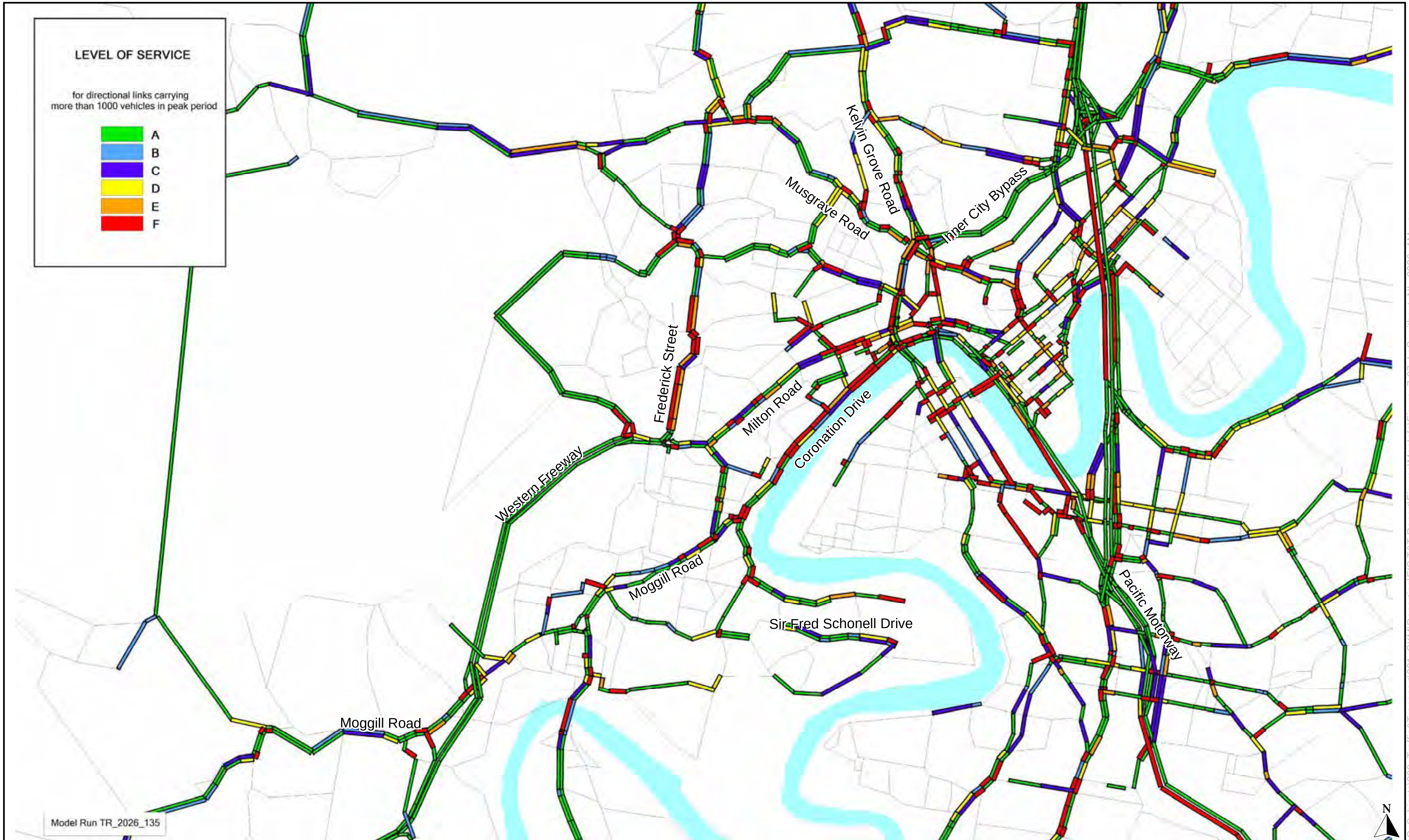

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Figure 7-7

2026 AM Peak Level of Service Without Northern Link

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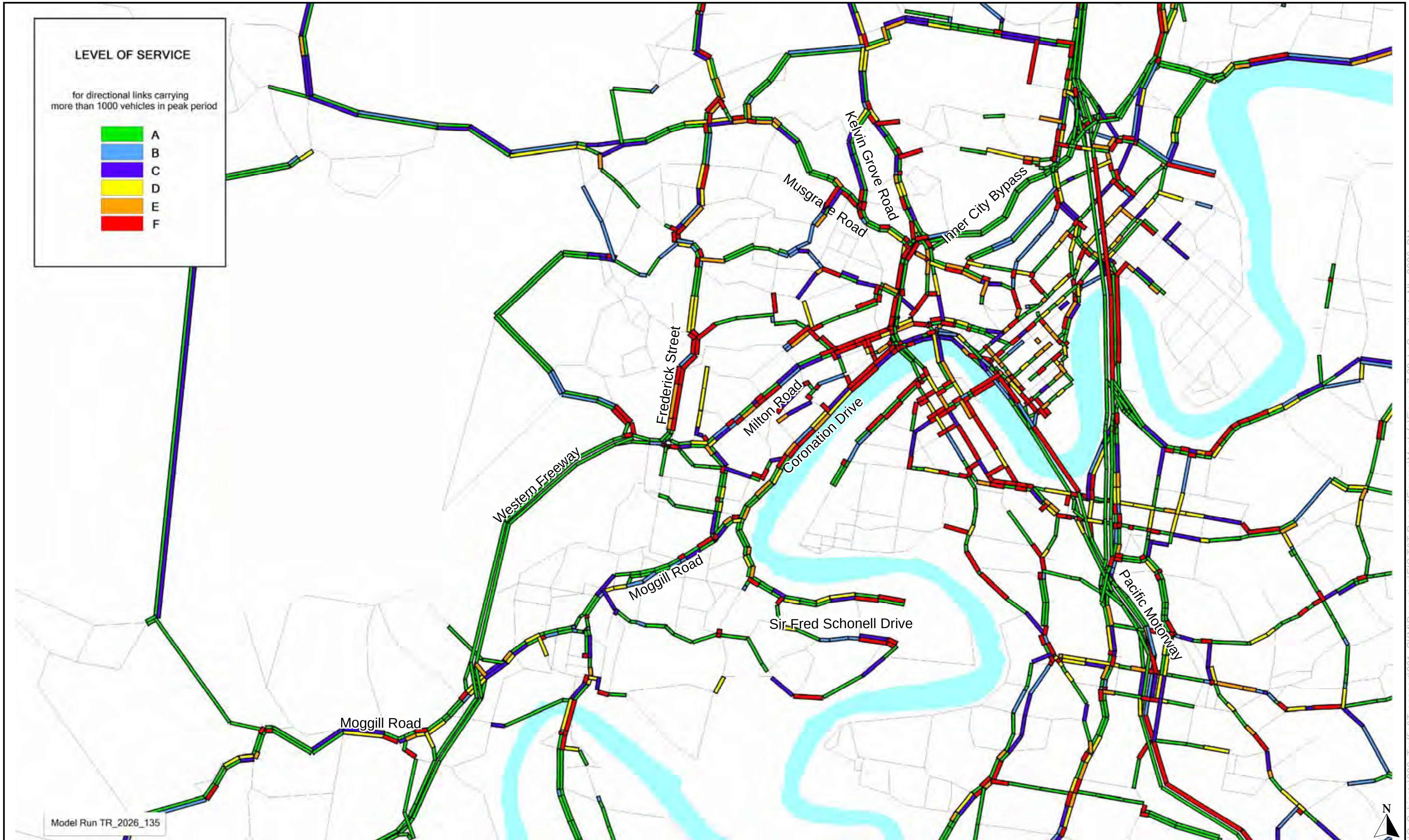

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Figure 7-8

2026 PM Peak Level of Service without Northern Link

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Travel times on key strategic routes are shown in **Table 7-4** for regional and cross city routes and in **Table 7-5** for Inner West and central city routes for both the am and pm peak periods. The travel time routes are shown in **Figure 7-9.**

The travel time analysis shows that in the future both regional cross city trips and trips between the inner west suburbs and the central city will deteriorate as increases in travel demand lead to worsening levels of congestion. Some regional cross city trips are able to benefit in early years from other future infrastructure projects such as GUP, CLEM7 and Airport Link, which are all due to be operational prior to 2014. However in the absence of other major works, these benefits are forecast to be eroded over time.

In the case of a journey between the Western Corridor and the ATC/Airport (Route D) travel time savings compared to the current situation are evident in both the am and pm peak periods in 2014. By 2026, the trend of decreasing travel times is reversed as the additional capacity that the other projects supply is increasingly utilised by increased travel due to population and employment growth patterns. The evening peak in 2026 is shown to be equal to the evening peak in 2007 with travel times of 70 minutes between the Western Corridor and the ATC/Airport.

Indooroopilly to Chermside (Route E) in the morning peak shows similar travel times for 2007 and 2014, showing the benefits of other future year infrastructure implementations on the surface road network. Evening peak periods show less of a benefit when comparing 2007 to 2014 with a travel time increase of 3 minutes from 34 minutes to 37 minutes. Between 2014 and 2026 travel times on this route are forecast to increase to 42 minutes in the am peak and 44 minutes in the pm peak from 28 minutes and 34 minutes respectively in 2007.

Travel time routes from Toowong to the Airport/ATC north area (Route F) have the option of taking two routes through the Inner West Transport Study Area, Coronation Drive and Milton Road, prior to accessing the Airport via the toll free route of Kingsford Smith Drive (ie: not via Airport Link). The peak period travel times show little change from 2007 to 2014, again showing the improvements in travel time due to the effect of other infrastructure projects for cross city trips to the airport on the surface road network. The section of the travel time routes on Milton Road and Coronation Drive show an increase in travel time during this period. Beyond 2014 a decline in travel speeds and increase in travel times is forecast for this route with increases in travel time of 5 to 9 minutes being forecast for these routes.

Route A from the Centenary Bridge to the Landbridge on the ICB has increasing travel times and decreasing speeds for both Coronation Drive and Milton Road from 2007 to 2026. The morning peak periods for Milton Road and Coronation Drive have very similar travel times of 28 minutes and 26 minutes respectively in 2026 and increased from 21 minutes and 20 minutes in 2007. The forecast travel time for the evening peak periods shows Milton Road to the Airport has a travel time of 20 minutes compared to 28 minutes on Coronation Drive in 2026 which is an increase of 2 minutes and 11 minutes respectively from 2007.

Central City trips from Chapel Hill to Spring Hill (Route B) show an increase in travel times to 2026. The travel time for this route via Milton Road or Coronation Drive is similar. In 2026 am peak period travel time of around 25 minutes have been forecast which is an increase of up to 8 minutes compared to 2007. Increases in travel time are also forecast for the pm peak period. Similar increases in travel time for trips between Toowong to Newmarket (Route C) are also forecast.

Table 7-4 Travel Times and Speeds for Regional and Cross City Routes

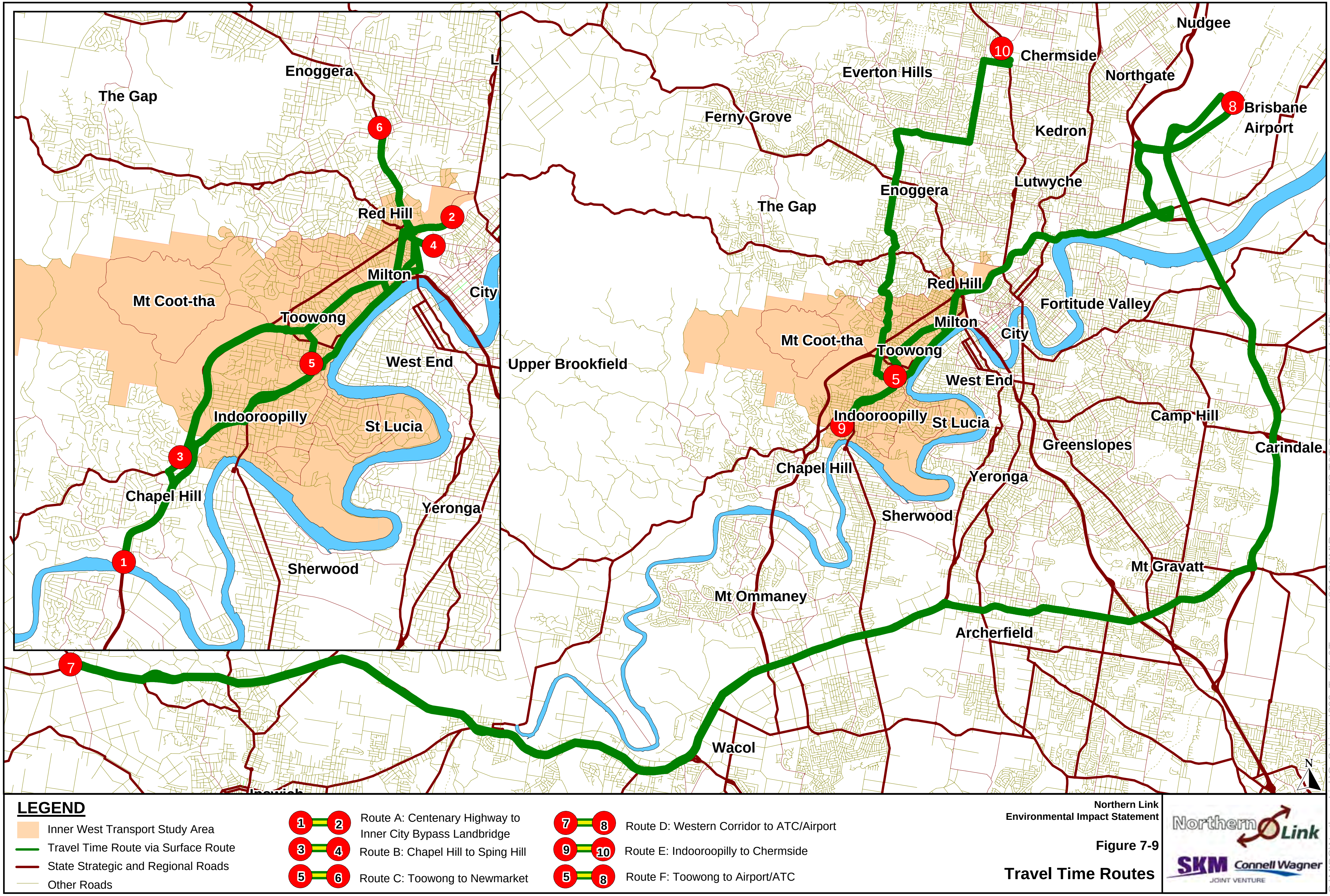
Travel Time Routes (refer to Figure 7-9 for travel time routes)		Direction	2007 (min)	2007 (km/h)	2014 (min)	2014 (km/h)	2026 (min)	2026 (km/h)
AM Peak Hour								
D	Western Corridor to Airport	Eastbound	69	59	58	67	70	55
E	Indooroopilly to Chermside	Eastbound	34	35	35	33	42	28
F	Toowong to Airport - Milton Road	Eastbound	29	42	28	41	40	28
F	Toowong to Airport - Coronation Drive	Eastbound	30	40	29	40	38	30
PM Peak Hour								
D	Western Corridor to Airport	Westbound	71	57	59	66	70	55
E	Indooroopilly to Chermside	Westbound	34	34	37	32	44	26
F	Toowong to Airport - Milton Road	Westbound	29	49	32	38	34	36
F	Toowong to Airport - Coronation Drive	Westbound	30	43	34	35	39	31

Table Notes
Source: Northern Link Traffic Model

Table 7-5 Travel Times and Speeds for Inner West and Central City Routes

Travel Time Routes (refer to Figure 7-9 for travel time routes)		Direction	2007				2014				2026			
			via Coronation Drive		via Milton Road		via Coronation Drive		via Milton Road		via Coronation Drive		via Milton Road	
			(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)
AM Peak Hour														
A	Centenary Bridge to Land Bridge	Eastbound	21	34	20	38	24	30	23	33	26	27	28	27
B	Chapel Hill to Spring Hill	Eastbound	19	27	18	30	21	24	20	26	24	21	26	20
C	Toowong to Newmarket	Eastbound	14	28	14	30	16	25	16	26	18	22	21	20
PM Peak Hour														
A	Centenary Bridge to Land Bridge	Westbound	20	36	18	42	24	31	20	37	28	26	20	38
B	Chapel Hill to Spring Hill	Westbound	19	27	17	31	22	23	20	28	28	18	21	26
C	Toowong to Newmarket	Westbound	16	27	15	28	19	23	16	26	23	19	17	25

Table Notes
Source: Northern Link Traffic Model



Northern Link
Environmental Impact Statement

Figure 7-9

Travel Time Routes

7.4 Local Traffic Network Performance

Traffic volumes on major roads within the Inner West Transport Study Area and surrounds, during peak periods without the project, have been forecast for 2014 and 2026. To estimate the performance of intersections, SIDRA models were constructed. Turning movements at each intersection, extracted from the strategic model, are inputs to these models. The strategic model does not contain a detailed representation of intersection operations, although it does incorporate a representation of intersection delays to enable a more accurate assignment of traffic to alternative routes. Some minor roads are not explicitly modelled in the strategic model; hence some adjustments to the strategic model volumes were required to create turning volume estimates that more accurately represented the observed turning pattern at each intersection approach. The traffic volumes from the strategic model represent demand for travel during the peak two hour period, but in some locations upstream intersection constraints may mean that the strategic model volumes cannot actually arrive at the downstream intersection in the modelled time period.

An assessment of the traffic performance of 40 locations within the network has been carried out. The assessment includes eight signalised intersections on the Coronation Drive-High Street-Brisbane Road corridor; six signalised intersections, one roundabout on the Milton Road corridor; five signalised intersections on Moggill Road; one signalised and one priority intersection on Sylvan Road and three on Jephson Street. Towards the eastern section of the project the assessment includes nine signalised intersections on Kelvin Grove Road and Countess Street corridor; three signalised intersections on the Musgrave Road corridor; and three on the College Road-Wickham Terrace-Leichardt Street corridor.

The intersection Degree of Saturation and LOS is provided in **Table 7-6**. Examples of highly congested intersections in the network include:

- the performance of the intersections on the Coronation Drive corridor is forecast to deteriorate from congested base conditions over time. The Coronation Drive intersections with Cribb Street and Lang Parade and the intersection of Brisbane Road with Sir Fred Schonell Drive are forecast to have highly congested conditions during both peak periods. Forecast increases in traffic demand to the counter peak direction will present challenges to the capacity of the counter peak direction of the Coronation Drive Tidal Flow system. To effectively manage queuing, signal settings are likely to need to be adjusted to allow priority for the major through movements on the Coronation Drive corridor. This would cause additional delay to local traffic movement;
- as with the Coronation Drive corridor the performance of the Milton Road corridor will worsen over time due to the increase in demand for east-west travel from the Western Freeway. Significant levels of congestion are forecast to be experienced at the intersections of Cribb Street, Park Road, Eagle Terrace and Croydon Street during both the morning and evening peak periods;
- the LOS for the signalised intersections is generally forecast to deteriorate over time along Moggill Road;
- the intersections on Jephson Street that provide connectivity with Sherwood Street and Croydon Street are forecast to be operating over capacity by 2026 with the intersection with Croydon Street having exceeded capacity by 2014; and
- little change is forecast for the LOS of the signalised intersections on the Kelvin Grove Road, Musgrave Road and Spring Hill corridors. As identified previously, forecast increases in traffic along these corridors from 2007 to 2026 are very minor as traffic re-distributions that relieve north-south surface traffic in these corridors are forecast with the implementation of Airport Link.

Table 7-6 Intersection Performance without Northern Link – 2014 and 2026

Intersection	Peak	2007 LOS	2014		2026	
			Max DOS (X)	LOS	Max DOS (X)	LOS
Coronation Drive – High Street – Brisbane Road						
Coronation Drive/Cribb Street	AM	C	0.92	C	1.04	F
	PM	F	1.21	F	1.24	F
Coronation Drive/Park Road	AM	B	0.89	C	0.88	C
	PM	B	0.81	B	0.83	B
Coronation Drive/Land Street	AM	B	0.71	B	0.75	B
	PM	C	0.94	D	1.00	D
Coronation Drive/Boomerang (Hale Street)/Hale Street Link(1)	AM	B	1.30	F	1.51	F
	PM	D	1.38	F	1.52	F
Coronation Drive/Sylvan Road	AM	B	0.66	B	0.63	A
	PM	B	0.67	B	0.72	B
Coronation Drive/Lang Parade	AM	C	1.06	F	1.14	F
	PM	C	1.07	F	1.10	F
High Street/Benson Street (Coronation Drive)	AM	C	0.88	C	0.93	C
	PM	D	0.89	D	0.91	D
Sir Fred Schonell Drive/Gailey Road	AM	B	0.89	C	0.96	C
	PM	D	1.05	D	1.09	F
Milton Road						
Milton Road/Cribb Street	AM	D	1.06	F	1.09	F
	PM	F	1.11	F	1.11	F
Milton Road/Park Road/Baroona Street	AM	F	1.07	F	1.07	F
	PM	D	0.99	D	1.01	E
Milton Road/Croydon Street	AM	C	0.94	D	1.02	E
	PM	D	1.00	E	0.99	E
Milton Road /Eagle Terrace	AM	C	0.95	D	0.99	E
	PM	D	0.95	D	1.02	E
Milton Road/Grimes Street	AM	A	0.82	B	0.82	B
	PM	C	0.96	D	0.99	D
Milton Road/Park Avenue	AM	A	0.90	B	0.91	B
	PM	A	0.85	A	0.85	A
Frederick Street/Roundabout	AM	F	0.78	E	0.79	C
	PM	E	1.14	D	1.09	D
Moggill Road						
Moggill Road/Western Freeway on Ramp	AM	A	0.58	A	0.61	A
	PM	C	0.77	C	0.80	C
Moggill Road/Western Freeway off Ramp	AM	C	0.73	C	1.04	D
	PM	C	0.89	C	1.19	F

Continued over

Intersection	Peak	2007 LOS	2014		2026	
			Max DOS (X)	LOS	Max DOS (X)	LOS
Moggill Road/Russell Terrace	AM	C	0.73	C	0.73	C
	PM	B	1.00	A	1.00	A
Moggill Road/High Street/Jephson Street	AM	C	1.01	F	1.06	F
	PM	C	1.00	D	1.00	D
Moggill Road/Station Road	AM	B	0.83	B	0.84	B
	PM	C	0.95	D	0.98	E
Sylvan Road						
Sylvan Road/Bennett Street priority intersection)	AM	n/a	1.31	n/a	1.57	n/a
	PM	n/a	2.69	n/a	4.27	n/a
Sylvan Road/Land Street	AM	C	0.78	C	1.00	C
	PM	C	0.52	C	0.51	C
Jephson Street						
Jephson Street/Sherwood Street	AM	C	0.95	E	1.03	F
	PM	D	0.97	E	1.19	F
Jephson Street/Lissner Street	AM	B	0.59	B	0.63	B
	PM	C	0.74	C	0.72	C
Jephson Street/Croydon Street	AM	D	3.27	F	3.56	F
	PM	D	1.19	F	1.41	F
Kelvin Grove Road						
Kelvin Grove Road/Herston Road	AM	B	0.66	B	0.65	B
	PM	C	0.82	C	0.81	C
Kelvin Grove Road/Lorimer Terrace	AM	B	0.77	C	0.89	C
	PM	D	0.87	D	0.91	D
Kelvin Grove Rd/Prospect Terrace	AM	B	0.81	C	0.80	C
	PM	C	1.00	E	1.03	F
Kelvin Grove Road/Blamey Street	AM	B	1.00	E	1.00	E
	PM	A	0.68	B	0.68	B
Kelvin Grove Road/Lower Clifton Terrace	AM	B	0.68	B	0.63	B
	PM	B	0.53	B	0.69	B
Kelvin Grove Road/Ithaca Street	AM	C	0.87	D	0.77	C
	PM	C	0.73	C	0.89	D
Normanby 5 Ways	AM	D	1.14	F	1.16	F
	PM	D	1.01	F	0.99	E
Musgrave Road						
Musgrave Road/Hale Street Off Ramp	AM	B	0.57	B	0.58	B
	PM	C	0.63	C	0.62	C
Musgrave Road/Hales Street On Ramp	AM	A	0.97	C	1.00	C
	PM	A	1.16	F	1.13	F

Continued over

Intersection	Peak	2007 LOS	2014		2026	
			Max DOS (X)	LOS	Max DOS (X)	LOS
Musgrave Road/Windsor Road	AM	C	1.03	F	1.04	F
	PM	F	1.01	E	1.00	E
Countess St						
Countess Street/Secombe Street	AM	C	0.86	C	0.87	C
	PM	B	0.49	B	0.52	B
Countess Street /Upper Roma Street	AM	C	1.00	C	1.00	D
	PM	F	1.31	F	1.21	F
Spring Hill						
College Road/Gregory Terrace	AM	B	0.69	B	0.77	C
	PM	C	0.67	C	0.66	C
Leichardt Street/Upper Edward Street	AM	B	0.87	D	0.88	D
	PM	B	1.00	B	1.00	B
Wickham Terrace/Leichardt Street	AM	D	1.00	B	1.00	B
	PM	B	0.47	B	0.71	C

Table notes:

Traffic volumes extracted from Northern Link Traffic Model

(1) Intersection layout modelled as per Hale Street Link Modification Report (April 2008)

7.5 Public Transport Network Performance

The travel demand forecasts for the Brisbane Metropolitan Area show significant growth in the public transport mode share from a current level of 7.9% to almost 11% of motorised travel in 2026 as reported in **Table 7-1**. Growth in public transport trips is forecast to almost double from 464,000 trips in 2007 to 866,000 in 2026.

Figure 7-10 and **Figure 7-11** show the forecast public transport demands for 2026 for Metropolitan Area and the Inner West Transport Study Area respectively. Compared to the existing situation it can be seen that the pattern of public transport trips in 2026 is similar to 2007 (**Figure 4-12** and **Figure 4-13**) but the quantum of public transport travel is much greater. Key differences to note are a significant increase in bus trips in the northern and eastern corridors, which are due to the proposed Northern and Eastern Busways.

As discussed in **Section 4.7** the Inner West Transport Study Area is currently well served by rail and bus routes and this is reflected in the mode share and patronage statistics. **Table 7-7** reports the forecast bus passenger and rail passenger trips in 2014 and 2026 along with 2007 trips for comparative reasons. This shows that bus passenger trips are forecast to grow by 66% and rail passenger trips by 71%. This increases total public transport trips by 69% to 104,500 in 2026. This is equivalent to an annual growth rate of 2.8%. This growth rate is significantly greater than the annual growth rate of 1.5% forecast for private vehicle trips in the Inner West Transport Study Area.

The growth in public transport trips of 69% by 2026 within the Inner West Transport Study Area is less than that forecast of 86% for the Brisbane Metropolitan Area. This is because public transport usage within the Study Area is already strong, and whilst service improvements are proposed there are no major public transport infrastructure initiatives currently programmed for implementation within the rail or bus network within the study area.

- **Table 7-7 Future average weekday public transport usage at Milton**

Location	2007	2014 forecast trips	% Growth(1)	2026 forecast trips	% Growth(1)
Coronation Drive bus passenger trips	16,100	26,300	63%	27,600	71%
Total bus passenger trips(2)	25,100	37,700	50%	41,600	66%
Rail trips	36,700	45,300	23%	62,900	71%
Total	**61,800**	**83,000**	**34%**	**104,500**	**69%**

Table Notes
Source: Northern Link Traffic Model
(1) Percentage growth compared to 2007
(2) Includes patronage of bus services using Milton Road and Given Terrace

Bus travel times on the regional roads in the Inner West Transport Study area are forecast to increase over time as buses are delayed by general traffic and significant bus priority measures are not programmed for implementation. Bus travel times on the Kelvin Grove Road corridor are forecast to be similar to existing travel times as peak period transit lanes are already incorporated within this corridor and general traffic congestion is not forecast to significantly increase, as previously reported in **Section 7.3**, due to the relief effect on surface traffic of Airport Link.

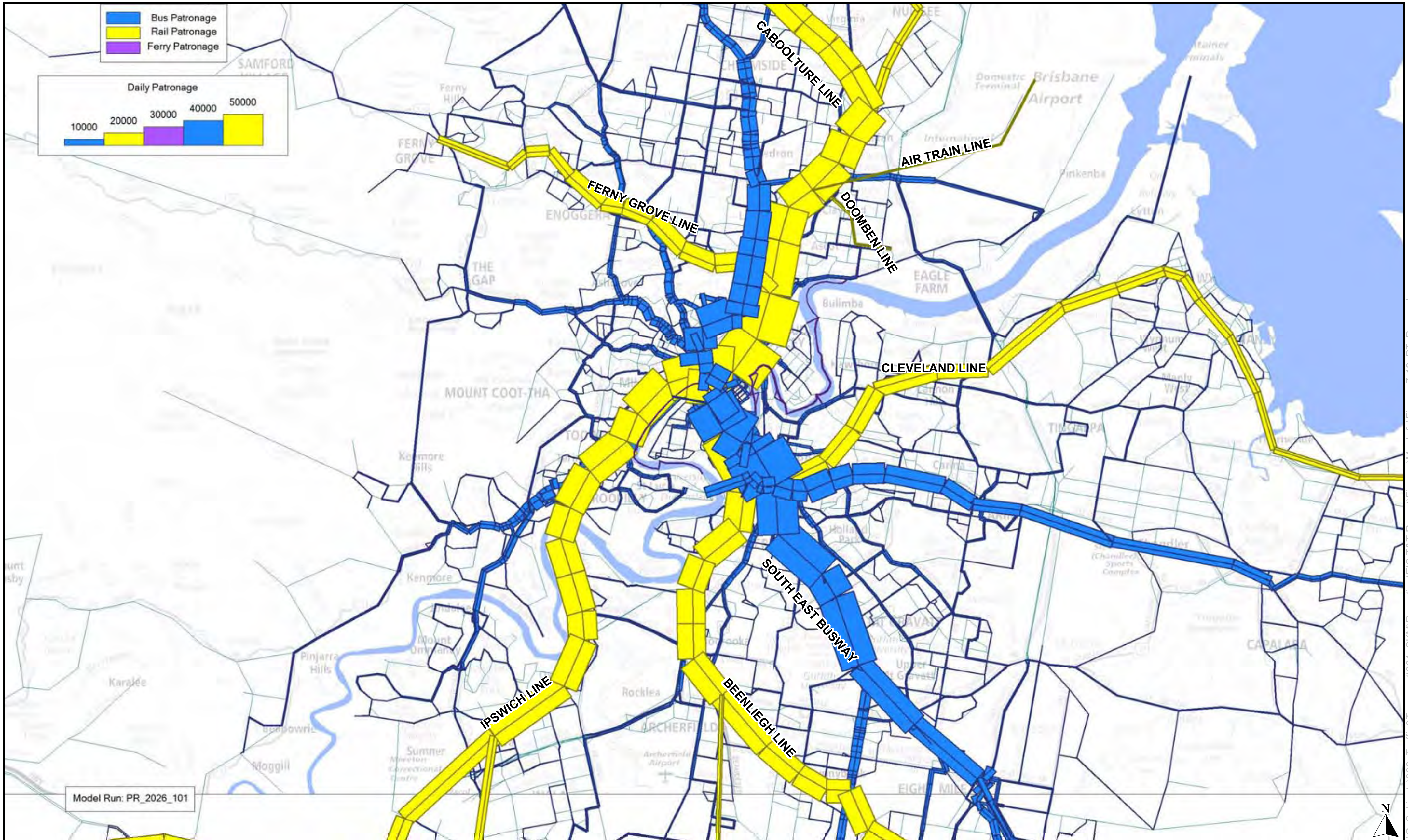


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Figure 7-10

2026 Average Weekday Public Transport Travel Demand

SKM Connell Wagner JOINT VENTURE

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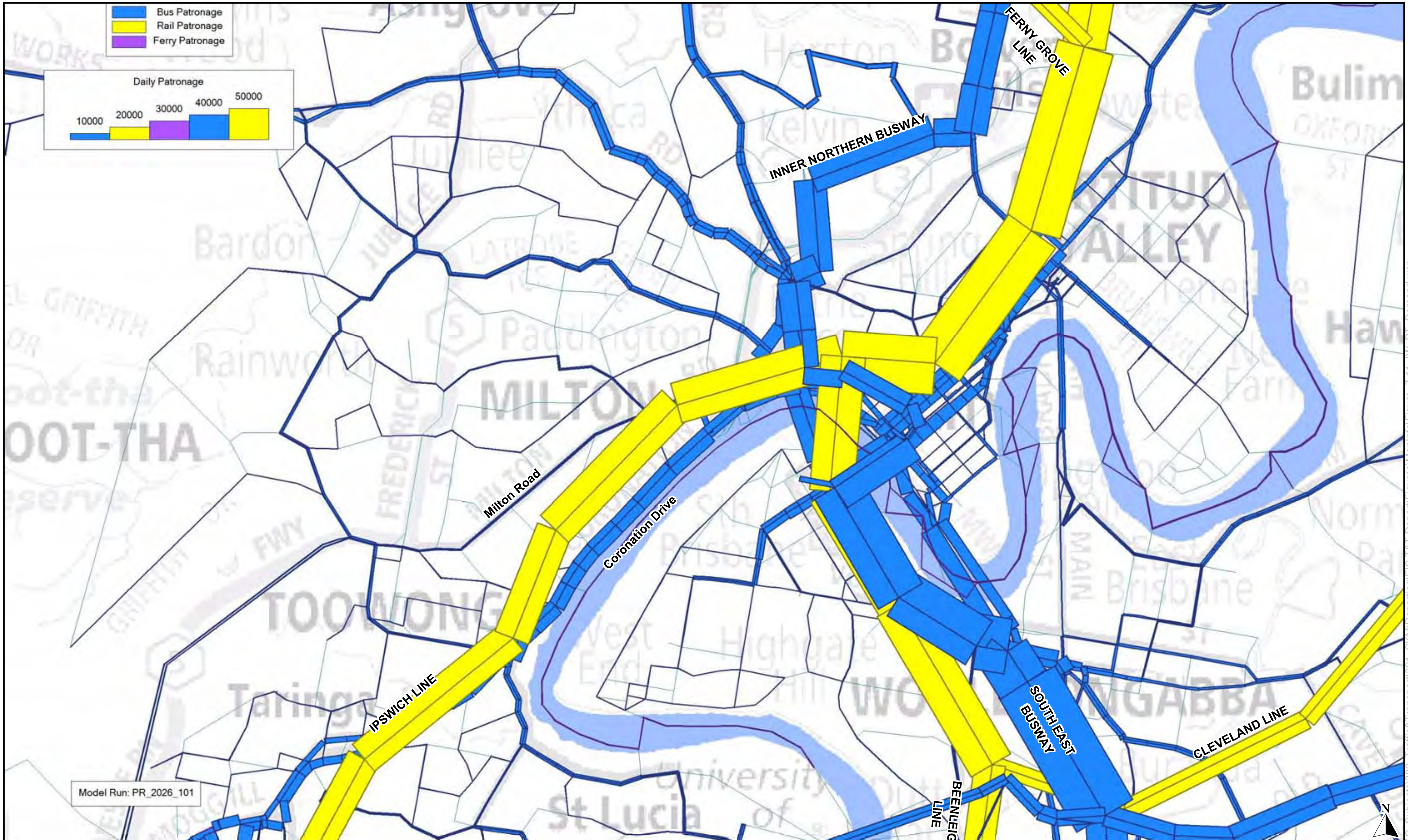

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Figure 7-11

2026 Inner West Average Weekday Public Transport Demand

SKM Connell Wagner JOINT VENTURE

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7.6 Road User Safety Performance

Increased traffic levels on the road network in the future will lead to an increase in the number of crashes on roads within the Inner North area which will affect all types of road users – motorists, bus users, pedestrians and cyclists. The forecast deterioration in road user safety without the project has been assessed by calculation of the forecast number of road crashes on key routes. These values are tabulated in **Table 9-19**. By 2014 an increase of annual crashes on key routes by 7% is forecast, an increase from 178 crashes in 2007 to 190 crashes in 2014. In 2026, the crash total would be over 11% greater than the current level.

8. Traffic and Transport Need

8.1 Introduction

Brisbane City Council and the Queensland Government, represented by the DMR and Queensland Transport (QT) have examined both transport policy and the need for improvements in transport infrastructure for all travel modes, over many years, within the overall Metropolitan area and also specifically within the western suburbs of Brisbane.

Northern Link has been identified by the Brisbane City Council as an initiative as part of its approach to addressing the city's transport needs. Northern Link is included in Council's *Draft Transport Plan for Brisbane*[21] and *TransApex*[22] initiative and is hence a component of an integrated transport plan for Brisbane. Northern Link is a key component in an overall strategy to improve the efficiency of Brisbane's road network, consistent with long-term regional and city wide transport planning objectives. In the Queensland Governments *South East Queensland Infrastructure Plan and Program*[23] (SEQIPP) Northern Link is seen as having potential to ease traffic congestion on the western city corridors of Coronation Drive and Milton Road.

Northern Link forms part of Project TransApex, Brisbane City Council's proposed tri-axis based framework of strategic road connections that would allow Brisbane's cross-city travel movements to bypass the CBD and inner suburbs using a high quality toll-road alternative to the surface road system. The first component of TransApex is the CLEM7 that is currently being constructed and is due to open in 2010/11. The second component is Airport Link. BrisConnections were announced as the preferred bidder for Airport Link in May 2008 with construction due to commence in late 2008. Airport Link is due to be operational during 2012. Northern Link is the third component of TransApex and is the subject of this EIS. Northern Link could be operational by 2014.

The primary objectives of Northern Link are:

- provide an effective and convenient bypass of the Brisbane CBD for cross-city movement of people and freight;
- address, in part, deficiencies in the national freight network to improve freight distribution in and around Brisbane;
- improve safety and reliability of the regional road network and provide relief to congested roads in Brisbane's inner western suburbs;
- provide opportunities for additional public transport network capacity; and
- support the achievement of a sustainable urban environment for the inner western suburbs.

This section reviews these objectives and the ability of Northern Link to meet these needs, using the findings of previous chapters and is based upon:

- a review of the effect of changes in travel demand due to population, economic and land-use characteristics in the Brisbane Metropolitan Area and the Western Corridor;

[21] Brisbane City Council (2007) *Draft Brisbane Transport Plan 2006-2026*, Brisbane City Council, Brisbane.

[22] Brisbane City Council (March 2005) *TransApex Prefeasibility Report*, Brisbane City Council, Brisbane

[23] Office of Urban Management (June 2008) *South East Queensland Infrastructure Plan and Program*, the State of Queensland (The Co-ordinator General), Brisbane.

- an assessment of the road network structure in terms of capacity, connectivity and performance for both now and the future to adequately serve communities and industry; and
- The context for the need for Northern Link in relation to Council and State integrated transport planning to cater for growth.

8.2 Travel Demand

South East Queensland (SEQ) is Australia's fastest-growing region, having attracted on average 55,000 new residents each year over the past two decades. The Brisbane Metropolitan Area currently accounts for about two-thirds of the region's population and Brisbane City's population share of the region is currently 35% of the total. Brisbane City also dominates as the major employment centre for the region.

The predicted population figures for the region and both the Brisbane City Council and Ipswich City Council areas are shown in **Table 8-1.** The region will continue to experience rapid employment growth with Brisbane City dominating as the major employment centre for the region.

- **Table 8-1 Predicted Population for Brisbane and Ipswich to 2026**

Area	2007	2014	2016	2021	2026	% Change 2007 - 2026
Brisbane	996,000	1,076,000	1,097,000	1,136,000	1,164,000	17%
Ipswich	154,000	210,000	229,000	286,000	348,000	126%
SEQ	2,840,000	3,255,000	3,377,000	3,677,000	3,960,000	39%

Table Notes:
(1) PIFU Medium Series from SEQ Economic and Forecasting Study (2007).

The South East Queensland Regional Plan[24] provides a sustainable framework for managing this rapid growth and development in the SEQ region to the year 2026. The Regional Plan identities a Preferred Pattern of Development (PPOD) to cater for future population and employment growth which incorporates some significant and deliberate changes to the current growth trend. It projects growth in the Western Corridor much higher than occurred in the past which is illustrated in **Table 8-1** through significant population growth in Ipswich. The plan also relies on infill development within Brisbane City, with much of the growth to be centred on public transport infrastructure.

Table 8-2 shows the population and employment projections for the Brisbane Metropolitan Area and indicates overall estimates of person trips for a medium population scenario. Employment is forecast to increase by over half a million in the Brisbane Metropolitan Area between 2007 and 2026. Such significant growth in population and employment would lead to a sustained growth rate in trip making at an average of 1.6% per annum is forecast to 2026, which is an increase in over two million total weekday person trips compared to 2007.

Whilst there is forecast to be a significant growth in travel demand there will also be changes to the distribution of trip ends. **Figure 8-1** depicts the change in trip ends forecast over the period between 2007 and 2026. These figures clearly depict the significant growth in travel demand forecast within the inner west suburbs of Brisbane. There is also a clear focus for increased road travel demand associated with the Western Corridor, ATC region that includes Brisbane Airport and the Port of Brisbane and activity centres such as the CBD, Toowong and Indooroopilly. The resultant pattern of employment distribution for the metropolitan area and the Western Corridor will be more decentralised than the current situation and the importance of a high-quality, high-speed transport connections between these major economic drivers to the regional, State and national economies is evident.

[24] Queensland Government (2005), *South East Queensland Regional Plan 2005 – 2026*, Brisbane

Table 8-2 Brisbane Metropolitan Area Population Forecasts

Year	Population [1]	Employment [2]	Total Person Trips [3] (average weekday)
2007	1,880,000	964,000	6,529,000
2014	2,126,000	1,185,000	7,400,000
2016	2,197,000	1,237,000	7,637,000
2021	2,370,000	1,373,000	8,228,000
2026	2,533,000	1,484,000	8,783,000

Table Notes:
(1) PIFU Medium Series from SEQ Economic and Forecasting Study (2007).
(2) NIEIR employment opportunities SEQ Economic and Forecasting Study (2007).
(3) Person trips by all modes including walk/cycle and excluding commercial vehicles.

Growth in travel demand does not have to be accommodated by vehicle travel alone. The importance of sustainable transport planning, including increasing the number of trips made by walk/cycle and public transport modes, has been recognised by the State Government and Brisbane City Council in their transport policy, transport infrastructure and investment programs. The South East Queensland Infrastructure Plan and Program, Council's draft Transport Plan for Brisbane 2006-2026 and the TransLink Network Plan all incorporate a significant emphasis on promoting public transport use and active transport as core strategies catering for travel demand within a connected and accessible region.

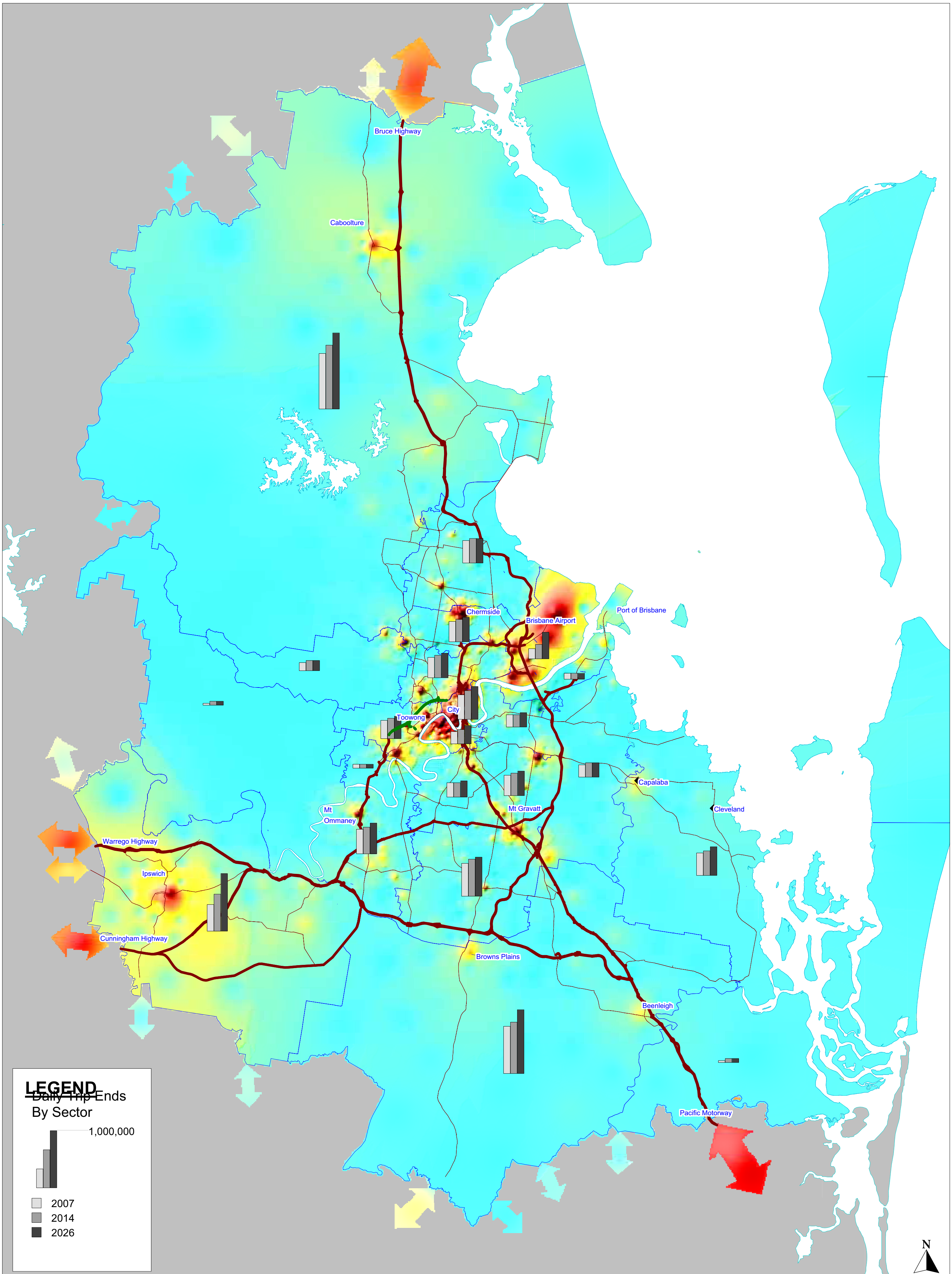
Over the last 15 years there has been a concerted effort to significantly increase use of public and active transport and the current rate of patronage growth for weekday trips in the region is around 7.7% per annum[25]. Despite this substantial growth in public transport usage the majority of trips in the Brisbane Metropolitan Area are made by private and commercial vehicles.

As discussed in **Chapter 6**, in forecasting future travel demand the effect of proposed public transport initiatives, either planned or under consideration by Council and State, has been incorporated in the estimation of future travel demand, as transport planning needs to encourage less reliance on private vehicle travel. The alternative approach, to assume a continuation of current trend of public transport use, was examined as a sensitivity test. By 2026 the increased public transport patronage associated with an enhanced mode share scenario, would represent a doubling of current levels to over 860,000 public transport trips per weekday. The reduction in vehicle trips in the network with enhanced public transport is estimated as 3% compared to a trend public transport situation (where public transport would account for approximately 8% of travel demand).

Figure 8-2 summarises the estimated growth in the travel task (in terms of person trips) by the various travel modes – vehicle, public transport, and walk/cycle travel. It also includes commercial vehicle travel. This demonstrates how travel demand is forecast to grow in a sustained manner across all modes.

The estimated growth in the travel task is illustrated through the forecast future motorised travel demand in the network in **Table 8-3**. This information shows that despite forecast gains in the public transport mode share there will be significant growth in vehicular trips that will need to be catered for within the Brisbane Metropolitan Area from just over 4 million weekday vehicle trips in 2007 to almost 5.5 million in 2026. This forecast increase is equivalent to growth in vehicular trips of 34% from 2007 to 2026, which is equivalent to per annum growth of 1.5%. Over the same period growth in commercial vehicle trips is forecasted to increase by 48% or 2.1% per annum.

[25] TransLink (2007) *TransLink Network Plan*, Brisbane.



LEGEND

Trip End Density Change
(2007 - 2026) Trip Ends per square km

25,000
10,000
5,000
0

Northern Link
State Strategic Road
Radial/Ring Road
Travel Sector Boundary

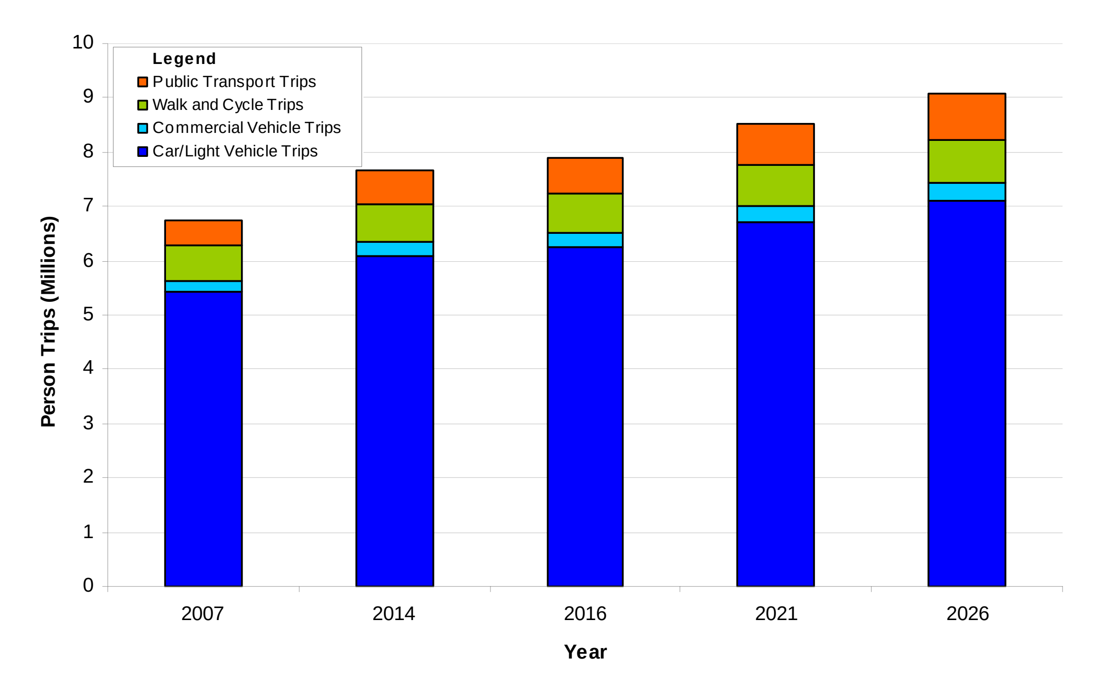
NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-1

Forecast Trip End Growth: 2007 to 2026

Northern Link
SKM Connell Wagner JOINT VENTURE

- **Figure 8-2 Forecast Growth in Average Weekday Travel Demand Within Brisbane Metropolitan Area (Person Trips)**



- **Table 8-3 – Forecast Growth in Weekday Travel Demand in Metropolitan Area**

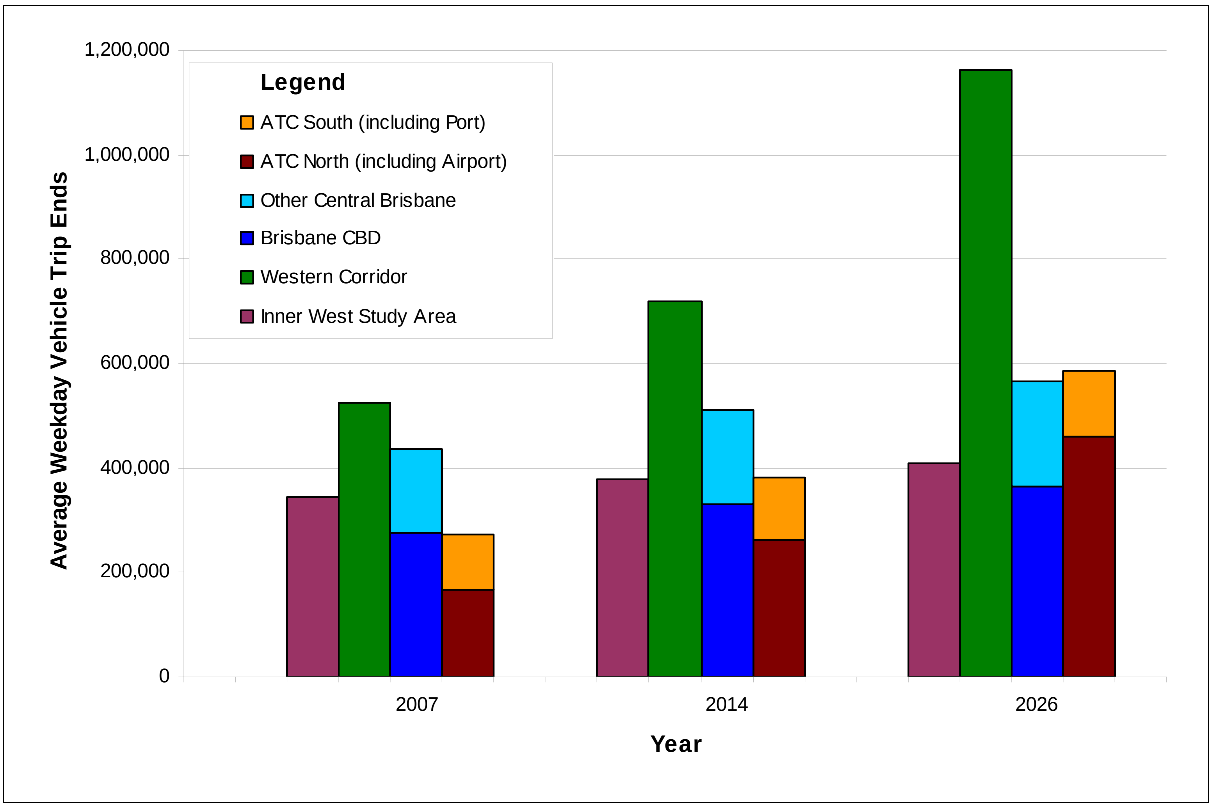
Parameter	2007	2014	2016	2021	2026
Person Trips by Motorised Travel Modes(1)	5,884,000	6,690,000	6,910,000	7,464,000	7,986,000
Public Transport Trips	464,000	599,000	670,000	742,000	866,000
% PT Trips	7.9%	9.0%	9.7%	9.9%	10.8%
Car/Light Vehicle Trips	3,879,000	4,385,000	4,498,000	4,855,000	5,150,000
Commercial Vehicle Trips	210,000	251,000	261,000	288,000	310,000
Total Vehicle Trips	4,089,000	4,636,000	4,759,000	5,144,000	5,460,000
% Growth in Vehicle Trips compared to 2007		**13%**	**16%**	**26%**	**34%**

Table Note:
Source: Northern Link Traffic Model
(1) Includes travel to and from locations outside the BSD.
(2) % Public Transport is expressed as a proportion of person trips by motorised modes.

Whilst the assessment provides a perspective on the significance of the increased quantum of vehicular travel demand to be catered for within the overall Brisbane Metropolitan area, a specific assessment has also been carried out of the forecast growth in travel demand to key travel generators that could benefit from Northern Link. **Figure 8-3** illustrates the growth in vehicle travel demand to Northern Link catchment areas. Growth in vehicle travel demand from 2007 to 2026 is expected to be:

- Inner West Transport Study Area – 18%:
- Central City – 30%:
- Australia Trade Coast North– 178%: and
- Western Corridor – 122%.

Figure 8-3 Forecast growth in vehicle travel demand to Northern Link catchment areas



In summary, significant growth in travel demand is forecast that is fuelled by continued year on year increases in the population and industry of the region. The distribution of growth is such that the demand for trips through the Inner West Transport Study Area will be great. Although the State and City Council have implemented measures to increase the use of public transport and active transport trips in the recent past, and have strong policies to continue to increase the use of these modes, the scale of the growth in travel demand associated with demographic trends is such that vehicular trips will continue to increase, placing increased pressure on travel corridors between key population growth areas, activity centres and employment nodes.

8.3 Road Network

The current road network structure and its current performance were reported in **sections 3.4** and **chapter 4**. The key deficiencies of the current road network are related to gaps in the strategic network, system performance, the ability to cater for growth in travel, low and unreliable travel times and a lack of route choice and flexibility.

Transport Network Gaps

There are gaps in the strategic transport network that principally affect east-west transport efficiency, safety and reliability. From a National Road Network view there are network gaps such as between the western and northern approaches to Brisbane. A direct, high quality connection between the west and the ATC north region, which includes Brisbane Airport, is missing from the current network structure.

In relation to the regional network, the Western Freeway terminates at Toowong. This results in congested urban arterial roads being used to complete journeys from the west to the CBD, to connect with the ICB, Riverside Expressway, northern suburbs and beyond to the Gateway Motorway and ATC. This is of particularly relevance to freight traffic from the growing industries of the Western Corridor and long distance freight from west of Ipswich. Provision of an alternative route to key road links that have a significant freight transport role and have major future deficiencies such as:

- Milton Road that currently provides a freight route from the Western Freeway to the CBD, ICB and Riverside Expressway;
- MetRoad 5 that currently provides a freight route to the northern suburbs and beyond; and
- the Brisbane Urban Corridor (formed by Granard Road, Riawena Road, Kessels Road, and Mt Gravatt-Capalaba Roads) that is the primary freight route from the western corridor to the Gateway Motorway. BUC is a highly congested route. It is comprised of a sequence of interrupted flow urban arterial roads directly abutting and serving a range of local, urban land-uses.

The strategic gap in the network from the Western Corridor and western suburbs for cross-city trips currently affects a significant proportion of trips through the Inner West Transport Study Area. In **section 4.2** it was reported that the demand for cross-city trips on the inner west regional radial roads currently accounts for about 75% of traffic. This means that the majority of the traffic using the regional radial roads in the inner west is going elsewhere but is forced to use these roads through the inner urban area due to a lack of feasible alternatives.

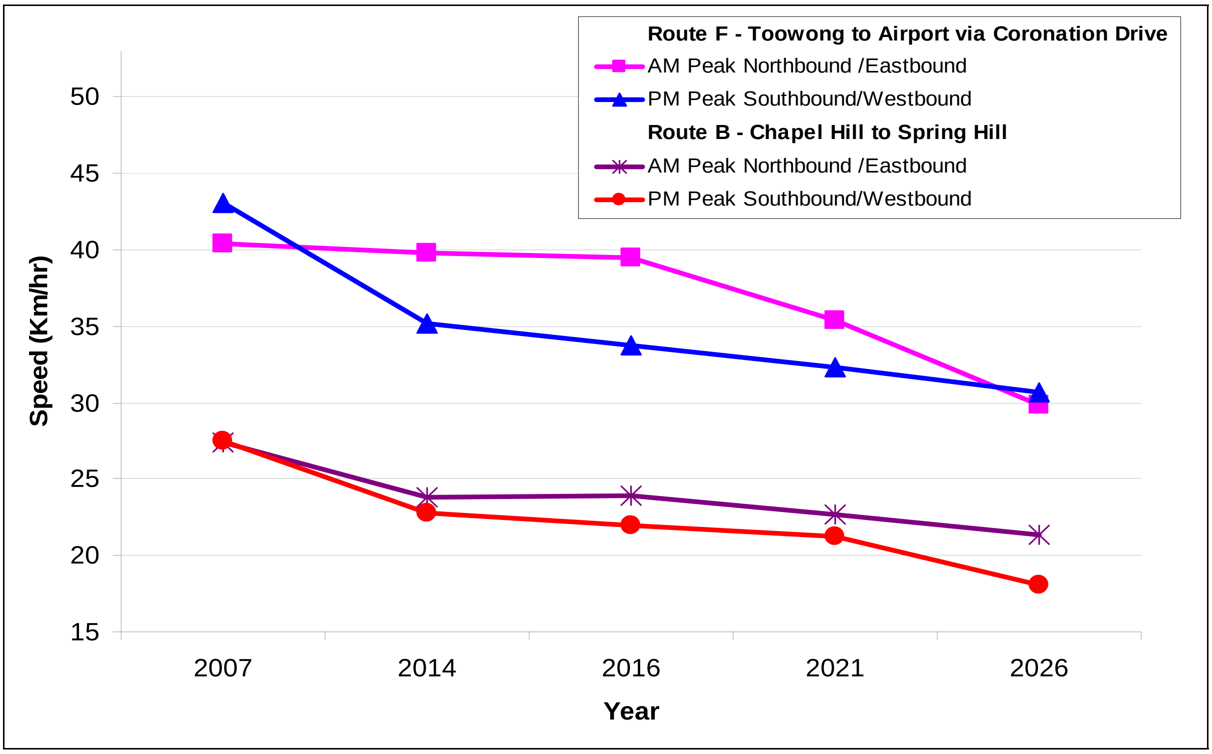
Improving System Performance

Congestion is currently experienced on the transport network within and through the Inner West Transport Study Area despite significant increases in the use of public transport over recent years. **Section 4** of this report illustrated that the regional radial and ring roads in the Inner West Transport Study Area currently experience congestion. This congestion, that is forecast to worsen over time, results in longer travel times, diversion of strategic and through traffic to lower order roads and low travel time reliability. Bus services are also delayed by peak period traffic congestion.

These impacts are particularly experienced for trips from the south-west access corridors to the region, Western Corridor, western suburbs of Brisbane to the Gateway Motorway north of the river, Brisbane Airport, the CBD, northern suburbs and beyond.

Figure 8-4 provides examples of the forecast decline in travel speed for examples of typical journeys through the Inner West Transport Study Area.

▪ **Figure 8-4 Forecast Decline in travel speed on key routes without Northern Link**



This shows that by 2026 the average speed for a peak period trip for a typical trip between Chapel Hill and Spring Hill will decrease from a current average speed of 27km/h to 21km/h in the morning peak period and from 27km/h to 18km/h in the evening peak period for the return journey.

Significant reductions in travel time are also forecast for a regional cross city trip such as from Toowong to the Brisbane Airport. In the morning peak period the average speed is forecast to decrease from 40km/h to 30km/h in 2026. Reductions in average speed are forecast for the evening peak period with a current speed of 43km/h for the return journey decreasing to 31km/h.

Route Choice and Flexibility

There are a lack of routes that provide a choice and a degree of flexibility for trips between the western suburbs and the CBD, cross-city and cross-river locations. A degree of network choice and flexibility can provide alternative routes in the event of a major incident or event occurring on or close to a key arterial or motorway route.

Strategic routes with a lack of choice and flexibility include:

- the strategic road network to the CBD, Brisbane Airport and the northern access corridors independent from BUC, Gateway Motorway and the inner city cross-river links; and
- the inner urban arterials of Milton Road, Coronation Drive and MetRoad 5 for trips from the Western Freeway at Toowong to the CBD, northern suburbs and beyond.

Traffic Growth

The increased travel demands in the future years that were presented in **Section 8.2** will create significant additional pressure to the metropolitan area network. The consequences of the network deficiencies will worsen such that peak period journey travel times are forecast to increase compared to the current level.

For example, without the project, even with enhanced mode share to public transport, traffic conditions on the Milton Road, Coronation Drive and Moggill Road corridors are forecast to deteriorate over time. Traffic volume growth to 2026 is forecast to be almost 30% on Milton Road and 15% on Coronation Drive.

In summary, the traffic congestion that currently exists on the road network is forecast to deteriorate further over time. This will have a range of consequences such as:

Key base future network projects include:

- congested arterial roads resulting in excessive and unreliable travel times;
- increased and unreliable bus journey times;
- increased time for the road network to recover from an incident;
- traffic management to cater for regional radial traffic resulting in accessibility issues such as banned turns and one-way systems that create local network legibility and access problems;
- the creation of segregation due to road infrastructure and high traffic volumes;
- the diversion of trips to the local road network;
- inappropriate vehicles types (freight) using inner urban roads;
- a lack of road space for local functions such as parking, loading, public transport; and
- the high number of necessary signalised intersections can result in significant delay during congested times, in particularly for local traffic.

8.4 Development of Northern Link as a Response

Much of Brisbane's major road network structure was shaped during the 1960s, and until the 1970s focus was on increasing road capacity and adding network flexibility to cater for the increases in population and car ownership, and significant consequential increases in vehicular travel demand. However, many of the recommended network schemes from the early planning that shaped the structure of Brisbane's transport network, and influenced growth patterns, were not completed. Strong community opposition to major surface road schemes also resulted in infrastructure improvements being shelved from the 1970s.

During the 1980s and 1990s, the transport planning focus evolved towards incrementally managing increases of traffic on the existing network, filling in selected missing surface network links (wherever possible within funding and community acceptance constraints) and improving public transport, walking and cycling so as to encourage greater use of non-motorised travel modes.

Significant road network improvement schemes that were identified as having merit in various past studies to cater for (then) existing and (then) forecast future growth, were not implemented, creating strategic gaps in the network. These deficiencies have been further exacerbated in recent years by the strong growth in population and economic activity in the SEQ region.

Strategic gaps in the western suburbs, as identified in past studies, and continuing to require attention:

- a deficient middle orbital (or bypass) route for south-west to north-east transport movement, principally because a major upgrade of the former Route 20 was shelved in the early 1990s and an alternative corridor has not been identified;
- discontinuity between the Western Freeway (completed only to Toowong) and not connected by a high quality route to the eastern network elements such as the ICB or Riverside Expressway; and
- lack of direct cross-river connectivity to the eastern and southern suburbs as a number of recommended vehicular river crossings to the west of William Jolly Bridge have not been constructed. The exception has been the Eleanor Schonell Bridge between Dutton Park and the UQ at St Lucia, which has improved accessibility for buses, cyclists and pedestrians only.

In recent years integrated transport planning investigations have acknowledged that key strategic roads within the Brisbane network are required, in conjunction with continuing major public transport enhancements and other sustainable travel initiatives, to cater for growth in travel whilst maintaining acceptable levels of amenity.

The challenges in implementing strategic infrastructure within urban areas, due to community and environmental concerns, have also been accepted.

This has shaped proposals for mainly underground (tunnel) solutions to provide for city bypasses and cross-river connections to complete and enhance Brisbane's strategic road network. Although expensive to construct, these types of infrastructure solutions can offer significant benefits without the same degree of adverse impacts created by surface level routes, whilst also creating opportunities for public transport and urban improvements in inner urban areas due to the reduction of surface traffic.

The role and context of Northern Link has been recognised by all three levels of Government within recent strategic transport planning investigations as summarised below.

Brisbane City Council

Brisbane City Council's Transport Plan for Brisbane 2002-2016 (BCC, 2003) examined the challenges facing Council in keeping their transport network operating effectively into the future, and supporting the Vision of Living in Brisbane in 2010. From this comprehensive strategic analysis of the transport system, the importance of addressing gaps in the strategic road network and strengthening the structure by creating an orbital road system in Brisbane (including additional cross river road capacity) emerged. Providing a safe and efficient road network was one strategic objective within the integrated plan. The Transport Plan 2002-2016 also included strategic improvements to public transport (bus and rail) and pedestrian/cycle initiatives to achieve desired outcomes, including greater public transport mode share, under the pressure of population growth in the metropolitan area.

Project TransApex, released by BCC in 2005, then further developed Council's aspiration of an enhanced road network structure for Brisbane to support economic and liveability outcomes. They were examined in detail in the TransApex Pre-Feasibility Study (Brisbane City Council, 2005) and are:

- CLEM7 Tunnel – Construction is due to commence on the CLEM7 in the latter half of 2006. The facility is expected to be open for traffic use by 2010/11;
- Airport Link – Connects to the northern end of the CLEM7, and provides connectivity to Brisbane Airport. In June 2007 the Queensland Government approved the Environmental Impact Statement (EIS) for Airport Link and the Coordinator-General recommended Airport Link proceed, subject to conditions. BrisConnections was announced as the preferred bidder in May 2008 with construction due to commence in late 2008. Airport Link is due to be operational during 2012.
- Northern Link – a cross-town tunnel linking the Western Freeway with the ICB. This project is the subject of this EIS investigation and could open in 2014.
- East-West Link – a cross-river tunnel linking the Pacific Motorway and eastern suburbs to the Western Freeway and mid-west region. The timing of this proposal is subject to further investigation; and
- a Hale Street–South Brisbane Link - a cross-river connection between Milton and South Brisbane. This project was approved by Brisbane City Council in 2006 and is currently expected to be operational during 2010.

Council's Transport Plan has been updated as a draft plan for the period 2006 – 2026 and this incorporates the TransApex initiatives and re-iterates that significant action is needed at all levels of government to provide the transport infrastructure that is required to support the significant forecast of increased travel demand in the region.

Queensland Government

The State Governments SEQIPP acknowledges the potential role of TransApex in supporting objectives of the SEQ Regional Plan, with recognition of the potential for Northern Link to ease traffic congestion of the western city transport corridors.

Recently, the State Government has released road corridor options from the Western Brisbane Transport Network Investigation. These possible options include Northern Link as a new road tunnel corridor option between Toowong and Kelvin Grove with an indicative timeframe based on demand of within 15 years.

Federal Government

The National Land Transport (AusLink) Network is a single integrated network of land transport linkages of strategic national importance that is funded by Federal, State and Territory Governments. The AusLink Network is based on national and inter-regional transport corridors including connections through urban areas, links to ports and airports, rail, road and intermodal connections that together are of critical importance to national and regional economic growth development and connectivity. Consequently, AusLink assists national and regional economic and social development by the provision of funding aimed at improving the performance of land transport infrastructure.

AusLink is an Australian Government initiative designed to achieve better national land transport planning, investment decision-making and funding. To ensure a strong and transparent focus for future national land transport investment, objectives have been developed.

In 2007 the AusLink Brisbane Urban Corridor Strategy[26] was released. This report recognised that the Brisbane Urban Corridor plays a critical role in supporting local, regional, interstate and international economic and industrial activity as well providing vital urban connectivity. The Brisbane Urban Corridor is shown in **Figure 8-5**.

The Strategy recognises that increasing congestion on the AusLink network and related performance issues have encouraged traffic diversion onto alternative routes and adding to congestion elsewhere on the network and that congestion related problems will increase over the next 20-25 years as the population and commercial activity increases in the region. The Strategy states that the ability of the metropolitan road network to meet growing demand for cross-town movement of freight, commercial and commuter traffic is critical to Brisbane's long-term development.

One of five strategic themes from the Brisbane Urban Corridor Strategy was identified as:

- East-west transport efficiency, safety and reliability (road and rail) across the broad corridor extending from the Ipswich and western growth area to the CBD, ATC and Pacific Motorway.

Short term responses of the Strategy identified that could address the key challenges of the strategic theme were:

- Increase the capacity of the east-west rail and road corridors to address existing congestion and provide for new residential and freight growth (with high priority to the Ipswich Motorway corridor).
- Investigate the transport network in Brisbane's inner west to explore possible additional network links, including expansion of the Brisbane Urban Corridor to include the Centenary Highway and its' connections to the existing AusLink network (Northern Link, for example).

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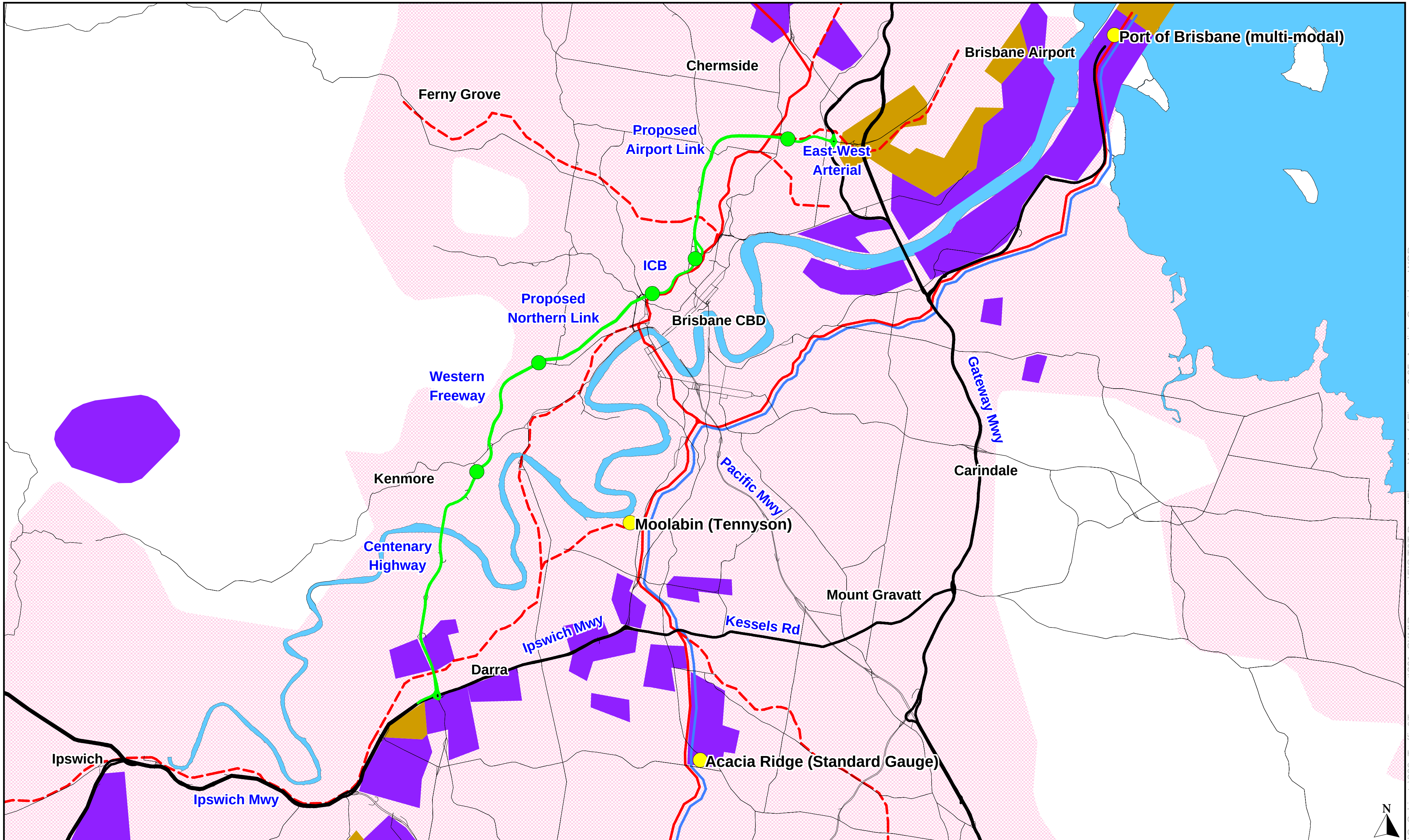
[26] Australian Government, Department of Transport and Regional Services (2007) *AusLink Brisbane Urban Corridor Strategy*.



LEGEND

Road Network
AusLink Corridor
Other Road
Potential AusLink Brisbane North Urban Corridor

Rail Nework
AusLink Rail Network - Standard Gauge
AusLink Rail Network - Narrow Gauge
Other Rail Line
Freight Terminal

Built up area
Industrial Zoning, Feb 2006
Future Industrial Land

Northern Link
Environmental Impact Statement

Figure 8-5

AusLink Transport Corridor in Brisbane

Northern Link
SKM Connell Wagner JOINT VENTURE

G:\MIPO\Northern Link\C_Subjects\300_Traffic&Transport\301_SKM\Reporting\EIS T&T Report\Figures\MapInfo\Figure_8-05_Auslink_Corridors.WOR

8.5 Strategic Need for Northern Link

The proposed Northern Link Project addresses the regional transport strategic needs for the study area by:

Supporting the preferred future development pattern, population and employment growth of SEQ in accordance with the SEQ Regional Plan by:

- improving connectivity and transport system capacity to cater for major growth areas (eg: Western Corridor) and economic activity centres (eg: CBD, ATC). Section 8.2 stressed that significant travel demand will be experienced in the Western Corridor. To accommodate this travel demand the State Government has commenced substantial road infrastructure schemes in the Western Corridor. This includes major capacity upgrades to the Ipswich Motorway and capacity enhancements and extension of the Centenary Highway that would go some way to addressing issues relating to growth in travel demand generated by the Western Corridor. The impacts of the previously discussed transport network gaps in the Inner West Transport Area would be exasperated by infrastructure improvements in the Western Corridor that are not matched by improvements in the Inner West Transport Study Area;
- reducing congestion and through-traffic which could support the growth of activity centres in the inner city areas by improving local amenity and liveability; and
- providing opportunities for improved bus transit services in the corridor.

Improving east-west transport efficiency eg: Western Corridor and Western Suburbs to ATC, the CBD and the regional roads in northern suburbs, by:

- enhancing east-west regional road network and catering for future growth by providing a motorway standard link between the Western Freeway and the ICB;
- relieving forecast future capacity deficiency, reduces congestion and improving travel time reliability on regional routes;
- redistributing travel to motorway standard routes and reducing travel on the local road system; and
- providing an alternative route in event of a major incident.

Improving freight distribution by:

- completing a motorway standard corridor for long distance freight from the south-west to the CBD, ATC and north Brisbane;
- providing for motorway standard distribution between freight generators (Western Corridor, CBD and ATC);
- relieving freight travel pressures on the Brisbane Urban Corridor (Granard, Riawena and Kessels Roads);
- improving connectivity to proposed inter-modal terminals (eg: Ebenezer) and supporting new Western Corridor industrial development;
- providing congestion relief and improved travel times and reliability for freight (improved productivity via reduced transport costs); and
- relieving traffic flow on (existing) secondary freight routes in inner west.

Providing additional public transport capacity:

- providing opportunities for express bus services from the Western Corridor to the CBD and other growth areas; and
- relieving congestion on existing major bus routes ie: Coronation Drive, Milton Road and Moggill Road.

The proposed Northern Link Project addresses the local strategic needs for the study area by:

Supporting public transport and passenger travel needs by:

- providing a high quality route for western suburbs to CBD for express bus service use;
- improving public transport efficiency on major surface bus routes; and
- providing opportunities to improve pedestrian and cycle environment in inner west suburbs and reducing existing barriers to pedestrian and cycle movements.

Providing an efficient road network by:

- removing through-traffic from Coronation Drive, Milton Road and Moggill Road which pass through major commercial and residential areas;
- relieving rat-running pressures from local roads from reduced congestion; and
- improving journey time and reliability by improved traffic flows.

Improving freight movements through the local areas by:

- providing a new higher order freight route to inappropriate routes through local areas;
- removing freight movements from surface traffic routes; and
- providing congestion relief for light freight carrying distribution and delivery tasks.

9. Operational Effects of Northern Link

9.1 Introduction

This chapter describes the traffic conditions likely to occur in the future with the project. The changes to traffic conditions in the transport network are assessed for the Brisbane Metropolitan Area and the Inner West Transport Study Area.

Traffic forecasts both without and with the project were prepared for the years 2014 (opening year), 2016, 2021, and 2026 using the traffic models described in **Section 6**.

The project and its connections, described in detail in **Section 2**, were included in the Northern Link Traffic Model. Key elements of the project modelling include:

A two lane northeast-southwest tunnel for each direction of travel between the Western Freeway at Toowong and the ICB at Kelvin Grove.

At the Western Connection:

- Two lane ramps connections with the Western Freeway in each direction. These would be located to the west of the Mt Coot-tha Roundabout.
- Two lane east facing ramps for each direction that provide on and off access with Milton Road between Croydon Street and the Toowong Roundabout. The intersections of Milton Road/Croydon Street/Morley Street and Croydon Street/Jephson Street/Sylvan Road would be upgraded. Milton Road, between Croydon Street and the Toowong Roundabout, would be widened as well as Croydon Street between Jephson Street and Milton Road. These upgrades would facilitate traffic movement to the Northern Link on ramp from Milton Road (westbound), Croydon Street (northbound) and Morley Street (southbound). Traffic movement from the off ramp would only be to Croydon Street (southbound). The existing right turn from Milton Road to Sylvan Road would be accommodated via the Milton Road/Croydon Street/Morley Street intersection.

At the Eastern Connection:

- two lane ramps connecting with the ICB in each direction to the east of Kelvin Grove Road;
- a one lane off ramp from the eastbound mainline tunnel that would widen to two (2) lanes plus a left turn lane prior to an intersection with Kelvin Grove Road. The left turn lane would merge with Kelvin Grove Road (northbound). The two other lanes would connect with Kelvin Grove Road via a signalised intersection that also incorporates Musk Avenue. The intersection would facilitate straight ahead movement to Musk Avenue for access to Kelvin Grove Urban Village and right turn movement to Kelvin Grove Road (southbound) for access to the central city;
- a one lane on ramp to the westbound mainline tunnel from Kelvin Grove Road. Access to this on ramp would be possible from both the northbound and southbound directions of Kelvin Grove Road and from Musgrave Road via the existing loop that provides a connection between the northbound direction of Musgrave Road and Kelvin Grove Road;
- Kelvin Grove Road would be widened between Normanby Five-ways and the Kelvin Grove Road /Blamey Street intersection. Upgrades would be provided to the intersections of Kelvin Grove Road with Blamey Street and Musk Avenue and the connecting loops to Kelvin Grove Road from both Musgrave Road and Hale Street.

With the Project, reductions in surface road demands through the inner west area would create the opportunity to provide for improved bus priority initiatives. Reductions in demand on the Coronation Drive corridor could allow for reallocation of lane designations to improve public transport operations. For example, tidal flow bus lane or T3 lane (ie: inbound in the am peak and outbound in the pm peak) could be re-introduced, or alternatively a continuous inbound T3 lane could be designated Toowong to Milton, west of Hale Street, with two through lanes of traffic operating in each direction during all time periods.

Apart from this opportunity to re-introduce bus priority improvements on Coronation Drive, no changes to the alternative surface road network to Northern Link have been assumed in the traffic modelling reported in this Chapter. For clarity the number of lanes along the key surface roads are summarised in **Table 9-1**.

- **Table 9-1 Northern Link surface road network assumptions**

Surface Road Segment	Number of lanes[1]
Centenary Highway/Western Freeway (Northbound – between Warrender Street and Mt Coot-tha Road)	2 lanes +T2
Centenary Highway/Western Freeway (Southbound – between Warrender Street and Mt Coot-tha Road)	2 lanes +T2
Coronation Drive (Eastbound)	2 lanes + bus lane[2]
Coronation Drive (Westbound)	2 lanes + bus lane[2]
Inner City Bypass at Landbridge (Eastbound)	3 lanes
Inner City Bypass at Landbridge (Westbound)	3 lanes
Frederick Street (Northbound)	1 lane
Frederick Street (Southbound)	1 lane
Milton Road (Eastbound)	2 lanes
Milton Road (Westbound)	2 lanes
Kelvin Grove Road (Northbound – from north of Blamey Street)	2 lanes +T3[3]
Kelvin Grove Road (Southbound – to north of Blamey Street)	2 lanes +T3[3]
Milton Road (Eastbound)	2 lanes
Milton Road (Westbound)	2 lanes
Musgrave Road (Northbound)	2 lanes
Musgrave Road (Southbound)	2 lanes
Jephson Street (Eastbound)	2 lanes
Jephson Street (Westbound)	2 lanes
Moggill Road (Eastbound)	2 lanes
Moggill Road (Westbound)	2 lanes

Table Notes:
(1) The lane numbers listed above are typical general traffic through lanes for each road segment. The number of lanes does not include ancillary lanes at intersections (for example, turn pockets).
(2) Coronation Drive has a total of 5 traffic lanes and operates on a tidal flow basis with 3 traffic lanes in the peak direction. Within the traffic modelling for the EIS, the tidal flow lane has been designated as a bus lane with the Project. Model sensitivity testing indicates that similar strategic traffic impacts with the Project would be expected if Coronation Drive were to operate with a continuous inbound T3 lane and 2 traffic lanes in each direction.
(3) T3 lanes on Kelvin Grove Road assumed to operate in the peak direction as per current arrangements.

A final decision of the tolls to be charged for use of Northern Link will be made by the State Government and Council following assessment of the Business Case for the project. For this EIS study, Northern Link traffic forecasts have been prepared assuming a toll of $3.93 (expressed in 2008 dollars including GST). This toll level is within the range under consideration within the Business Case.

An enhanced mode share effect for public transport (of 10.8% of motorised trips by 2026) in the Brisbane Metropolitan area, consistent with the implementation of a range of public transport initiatives as described in **Section 6.2.2** has been incorporated in the traffic forecasting.

9.2 Demand for Northern Link

Table 9-2 summarises the forecast Northern Link traffic use. Average weekday traffic flows of 57,000 vehicles per day in 2014 and 75,900 vehicles per day in 2026 in the Northern Link mainline tunnel are forecast.

- **Table 9-2 Northern Link Overall Traffic Use Summary – Average Weekday**

Project Element	2014 Daily(1) (2)	2026 Daily(1)	2026 am Peak vph	2026 pm Peak vph	2026 % CV(3)
Eastbound tunnel	29,900	39,200	3,200	3,000	5.0%
Westbound tunnel	27,100	36,700	2,300	3,000	5.9%
Total Northern Link	57,000 (39,900)	75,900	5,500	6,000	5.4%

Table Notes:
Source: Northern Link Traffic Model
(1) Average Weekday Traffic Volumes.
(2) 2014 model volumes exclude adjustment for ramp-up effects. At opening, volumes would be typically 70% of the traffic model forecast and these adjusted volumes are indicated in brackets below the modelled volume. Ramping up to the modelled 2014 volumes would typically occur over an 18 month to 2 year period.
(3) CV = medium and heavy commercial vehicles as per AustRoads Class 3 and above.
(4) Forecast based on toll of $3.93 expressed in $2008 including GST.

The overall forecast network daily traffic demand for Northern Link in 2014 and 2026 is displayed in **Figure 9-1** and **Figure 9-2** respectively. Both of these figures display the significant volume of traffic that Northern Link would carry in relation to other major roads and in a regional context.

To examine the traffic function of Northern Link, an analysis of the forecast travel patterns and geographic distribution of travellers has been undertaken. **Figure 9-3** shows the traffic routes for vehicles that would use the Northern Link tunnel. **Figure 9-4** and **Figure 9-5** illustrate the geographic distribution of travellers that would use the facility, clearly showing the wide catchment area of Northern Link spread over the Metropolitan Area.

To the west of the project there are number of significant locations within the catchment area. These would include the growth area of the Western Corridor and locations further west that are accessed via the Cunningham and Warrego Highways. The significance of the project for travel to the ATC precinct that includes Brisbane Airport is clearly shown as are locations in the northern suburbs such as Chermside and Stafford.

There are a number of key local travel generators that would be important origins and destinations for the project. These include Indooroopilly, Toowong, St Lucia (UQ), Kelvin Grove and the central city area.

The forecast daily travel patterns are summarised in **Table 9-3** based on travel sectors illustrated previously in **Figure 2-1**. The select link and catchment area plots, in combination with the sector travel analysis presented in the tables highlight the function and major travel demands that would be served by the project.

Using this data the forecast daily traffic use of Northern Link in 2026 can be summarised into four trip types:

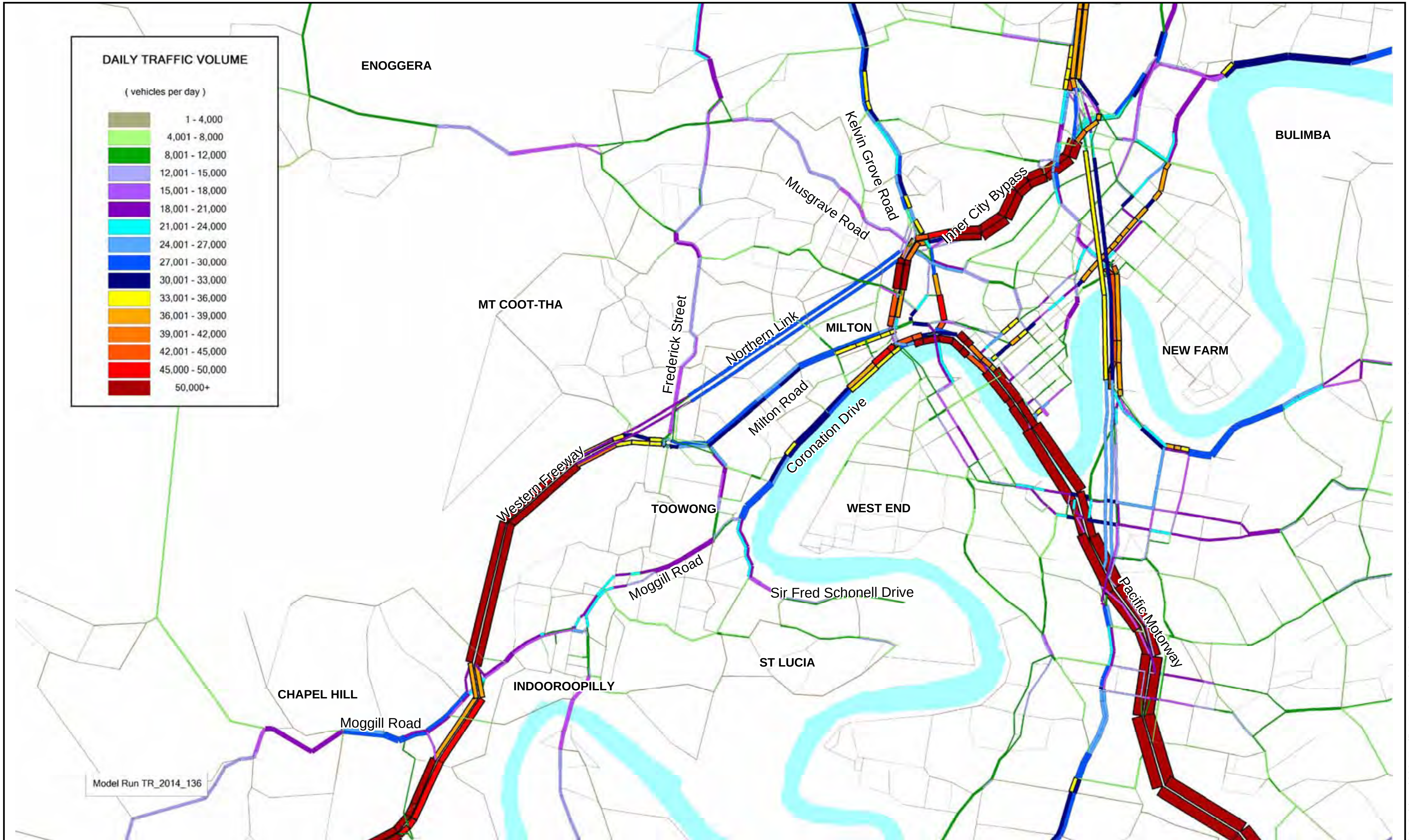
- Local travel – 1% all traffic, <1% commercial vehicles;
- Radial or Central City (including CBD) related travel – 19% all traffic, 5% commercial vehicles;
- Cross city travel – 60% all traffic, 63% commercial vehicles; and
- ATC North/Airport travel – 21% all traffic, 32% commercial vehicles.

This analysis shows that the Northern Link tunnel would predominantly carry cross city travel, representing 60% of all trips, with a further 21% of trips associated with travel to the ATC. This breakdown illustrates that Northern Link would fulfil an important function as part of a network of cross-city connections between the western suburbs and Western Corridor to the northern and eastern suburbs of Brisbane that includes the major economic activity centre of the ATC North precinct. Radial travel would be a secondary function, accounting for less than 20% of all trips through Northern Link. Northern Link would provide a network option for trips to the central city area from the western suburbs and the Western Corridor, relieving some commuter traffic demands of the arterial routes carrying bus services and would allow the potential for bus priority measures to be re-instated on Coronation Drive.

- **Table 9-3 Daily Travel Patterns for Northern Link Traffic (2026)**

From \ To	Inner West	Central City	West Brisbane	Airport/ATC North/Eagle Farm	North Brisbane	South of Brisbane River	Total
Inner West	- (-)	3% (1%)	- (-)	1% (4%)	8% (3%)	5% (1%)	18% (9%)
Central City	1% (1%)	- (-)	2% (-)	- (-)	- (-)	5% (1%)	9% (2%)
West Brisbane	- (-)	2% (-)	- (-)	1% (2%)	3% (2%)	2% (1%)	9% (5%)
Airport/ATC North/Eagle Farm	2% (6%)	- (-)	1% (2%)	- (-)	- (-)	8% (9%)	11% (18%)
North Brisbane	8% (5%)	- (-)	3% (2%)	- (-)	- (-)	10% (23%)	21% (30%)
South of Brisbane River	4% (2%)	5% (2%)	2% (1%)	8% (8%)	11% (22%)	3% (1%)	33% (36%)
Total	16% (15%)	10% (3%)	8% (6%)	10% (14%)	22% (27%)	33% (36%)	100%

Table Key:
Radial or CBD related travel
Cross-City travel
Airport/ATC North travel
Local travel
(x%) - % commercial vehicles
Table Notes:
Source: Northern Link Traffic Model



Northern Link
Environmental Impact Statement

Figure 9-1

2014 Average Weekday Traffic Volume with Northern Link

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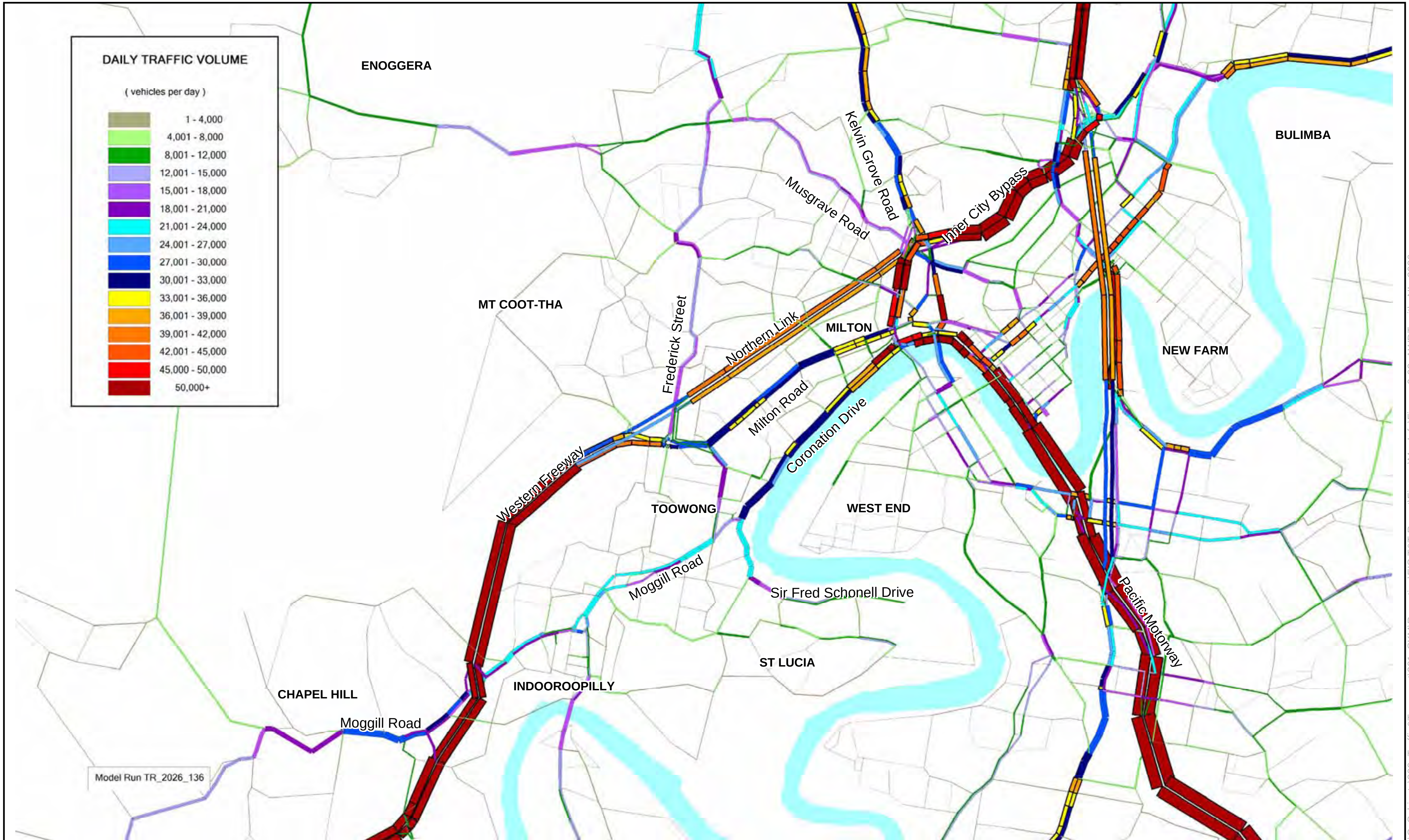

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Figure 9-2

2026 Average Weekday Traffic Volumes with Northern Link

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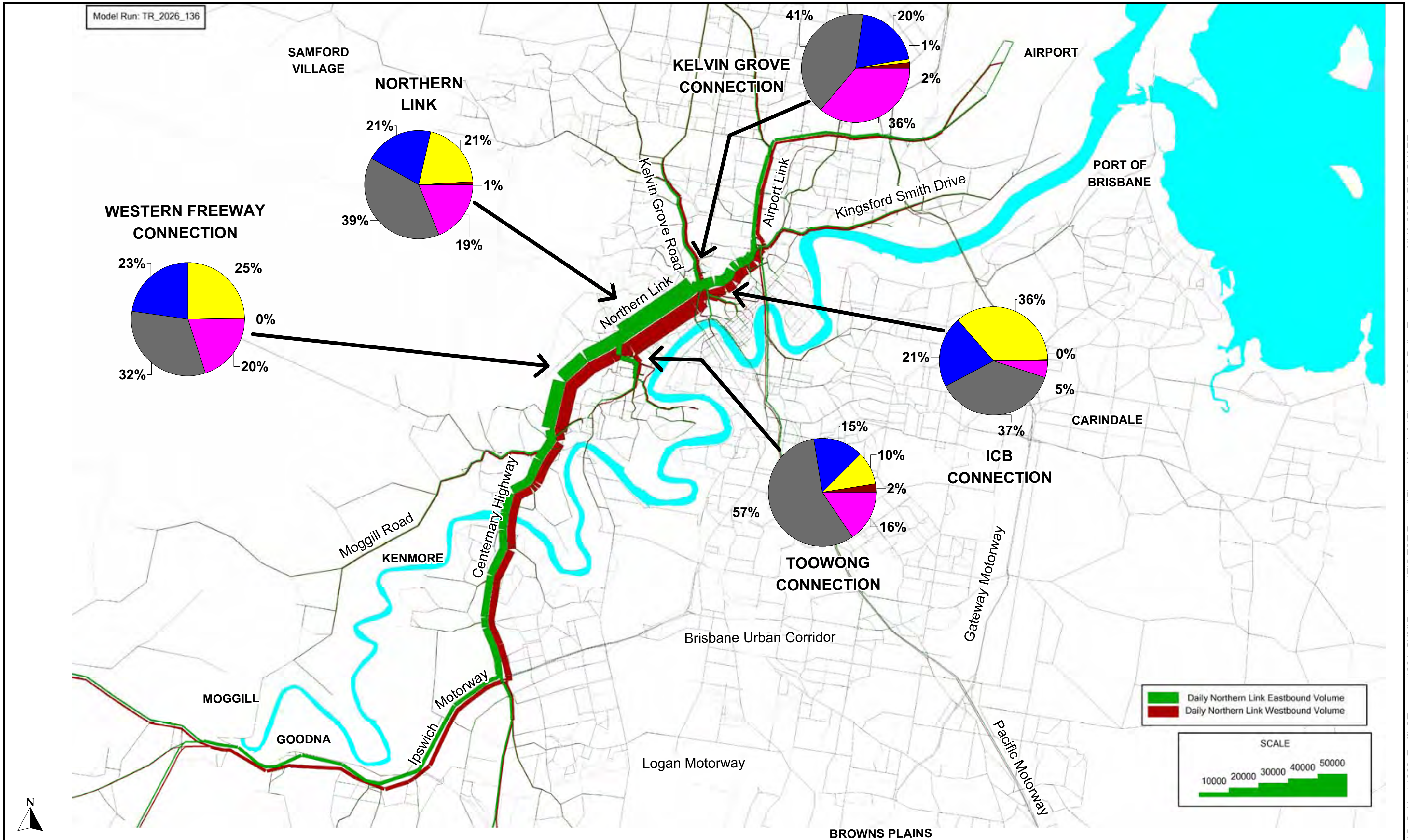

LEGEND

Pie charts show daily trip type for each connection

- Cross city travel to south of Brisbane River
- Cross city travel to/from north of Brisbane River
- Radial or CBD related travel
- Airport / ATC North travel
- Local travel

Northern Link
Environmental Impact Statement

Figure 9-3

2026 Daily Travel Patterns for Northern Link (select links)

Northern Link
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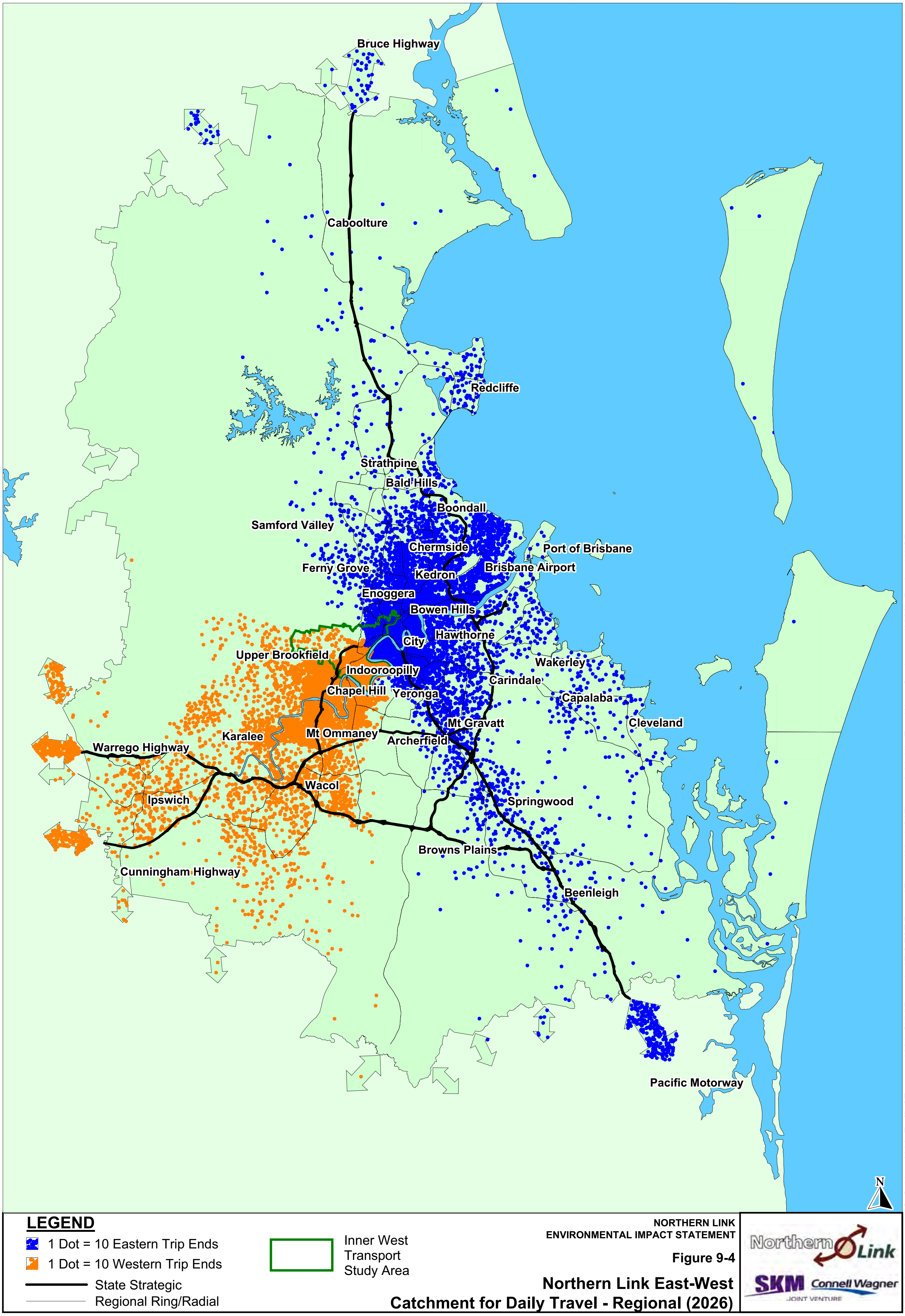

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 9-4

Northern Link East-West Catchment for Daily Travel - Regional (2026)

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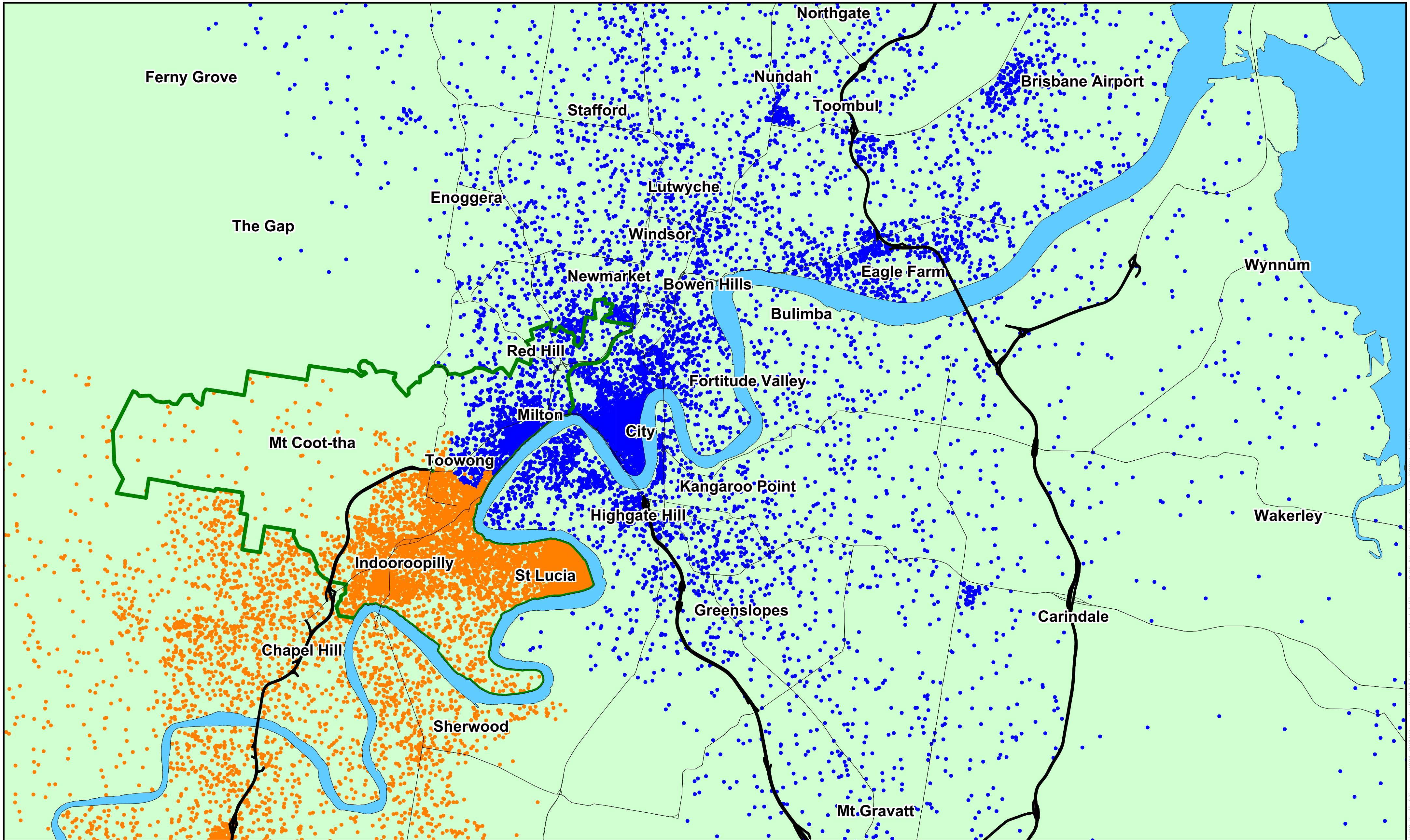

LEGEND

1 Dot = 10 Western Trip Ends
1 Dot = 10 Eastern Trip Ends

Inner West Transport Study Area

State Strategic
Regional Ring/Radial

Northern Link
Environmental Impact Statement

Figure 9-5

Northern Link East-West Catchment for Daily Travel - Brisbane (2026)

Northern Link
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G:\MPO\Northern Link\C_Subjects\300_Traffic&Transport\301_SKM\Reporting\EIS T&T Report\Figures\MapInfo\Figure_9-05_NL_East-West_Catchment_(2026)_v1.WOR

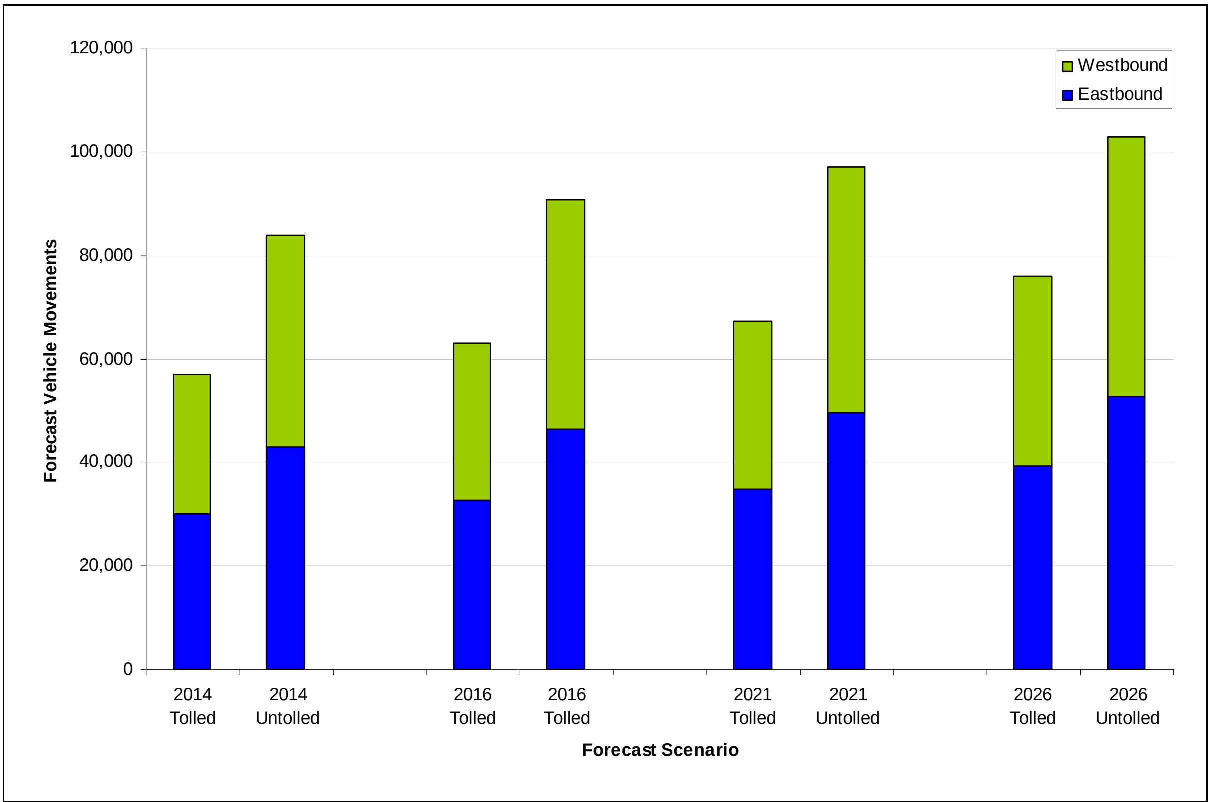
9.2.1 Effect of Toll on Demand for Northern Link

The implementation of a toll on Northern Link would discourage some potential users who judge that the travel time savings and other benefits provided by the facility would not equal or exceed the cost of the toll. The extent of toll avoidance would be directly related to the importance of reliability of an individual journey together with the cost and attractiveness of alternate routes.

Figure 9-6 illustrates the effects of toll at four future years, 2014, 2016, 2021 and 2026 on forecast average weekday travel use of Northern Link. A toll value of $3.93 (including GST) in 2008 dollars has been used for this assessment, with future year tolls indexed to rise in line with the Consumer Price Index. Comparing the diversion (ie: the proportion of users not prepared to pay a toll) between 2014 and 2026 indicates that this decreases over time, as users perceive greater benefits in travel time savings can be realised by using the toll road facility as the overall road network becomes more congested over time.

Modelling indicates that in 2014, approximately 32% of potential Northern Link users would not be prepared to pay the toll (and would choose to remain on surface roads). In 2026 this proportion reduces to 25%.

- **Figure 9-6 Effect of Toll on Northern Link Traffic compared to No Toll**



9.3 Function of the Northern Link connections

The forecast overall distribution of Northern Link users across the key connecting routes in 2026 would be:

Western Connections:

- Western Freeway – 72%
- Milton Road – 1%
- Croydon Street – 27%

Eastern Connections:

- ICB – 55%

- Kelvin Grove Road – 45%

Table 9-4 details the overall forecast daily and peak hour traffic use of the Northern Link connections, and separately reports the forecast use of the on and off ramps at the eastern and western connections.

The western connections would consist of ramps to and from the Western Freeway, Milton Road and Croydon Street. The Western Freeway would cater for 71% of the traffic that enters Northern Link at its western connection with 27% accessing from Croydon Street. Only 2% of entry traffic at the western connection would enter from Milton Road (including traffic from the residential precinct north of Milton Road, which would be able to enter Northern Link from Morley Street).

The eastern connections would consist of the ICB, Kelvin Grove Road and the on ramp from Musgrave Road. The straight through connection to and from the ICB would cater for over half of the traffic movement at the eastern connection. Movements to and from the south, which would include central city area users, as well as traffic to other destinations including South Brisbane, would account for approximately 24% of Northern Link traffic at the eastern connection. To and from Kelvin Grove Road Grove north would account for 21% of Northern Link use.

- **Table 9-4 Northern Link Connections Traffic Summary – 2026 Average Weekday**

Project Element	Daily Traffic 2026	%	AM Peak vph	PM Peak vph
Western Connections (on-ramps)				
Western Freeway (west facing on-ramp)	27,800	71%	2,300	1,900
Milton Road (east facing on-ramp)	940[1]	2%	100	100
Croydon Street (east facing on-ramp)	10,500	27%	800	1,000
Total Western Connection Traffic (on ramps)	**39,200**	**100%**	**3,200**	**3,000**
Western Connections (off-ramps)				
Western Freeway (west facing off-ramp)	26,500	72%	1,500	2,000
Croydon Street (east facing off-ramp)	10,200[2]	28%	800	1,000
Total Western Connection Traffic (off-ramps)	**36,700**	**100%**	**2,300**	**3,000**
Eastern Connection (on-ramps)				
ICB (east facing on-ramp)	19,400	53%	1,500	1,500
Kelvin Grove Road (north facing on-ramp)	8,000	22%	500	600
Kelvin Grove Road (south facing on-ramp)	2,500	7%	100	300
Musgrave Road (south facing on-ramp)	6,800	18%	200	600
Total Eastern Connection Traffic (on-ramps)	**36,700**	**100%**	**2,300**	**3,000**
Eastern Connection (off-ramps)				
ICB (east facing off-ramp)	22,500	57%	1,700	1,900
Kelvin Grove Road (north facing off -ramp)	8,000	21%	600	600
Kelvin Grove Road (south facing off -ramp)	8,700	22%	900	500
Total Eastern Connection Traffic (off-ramps)	**39,200**	**100%**	**3,200**	**3,000**

Table Notes:
Source: Northern Link Traffic Model
Forecast based on full journey toll of $3.93 and expressed in $2008 including GST.
(1) Forecast entry traffic to Northern Link using east facing on-ramp of 940 vpd in 2026 comprises 360 vpd approaching from Morley Street via right turn, with 580 vpd from Milton Road east.
(2) Forecast exit traffic from Northern Link to Croydon Street includes 140 vpd proceeding to Morley Street and 110 vpd proceeding to Milton Road east via indirect routes.

The indicative travel patterns for traffic accessing Northern Link from the Western Freeway, ICB, Toowong and Kelvin Grove connections are shown in **Figure 9-7** to **Figure 9-10** respectively. All of the Northern Link connections would have a predominant function of providing for cross-city travel.

The forecast traffic volumes associated with the connections are presented in **section 9.4**.

Figure 9-7 and **Figure 9-8** show that users of Northern Link from the Western Freeway and the ICB would be predominantly cross-city travellers. For example:

- most traffic from the Western Freeway using Northern Link would also use the ICB (55%). A further 15% would travel on Kelvin Grove Road to access the Brisbane northern suburbs, and the remaining 30% would use the south-facing ramps. Over half of the Western Freeway users of Northern Link would have travelled from the Western Corridor via the Ipswich Motorway or Centenary Highway; and
- over 90% of Northern Link users travelling via the ICB would be for cross-city travellers proceeding to use Airport Link/Lutwyche Road, Kingsford Smith Drive or crossing to the south of the river via routes such as CLEM7. Approximately 40% of these travellers would be associated with the Western Corridor or regional locations, travelling via the Ipswich Motorway or Centenary Highway.

Figure 9-9 illustrates the indicative travel patterns for traffic that would use the Toowong ramps for Northern Link trips. This illustrates that:

- the key travel movement for these ramps would be between the major activity centre at Toowong (40%), with most users proceeding to the ICB and Kelvin Grove Road north:
- traffic use from the St Lucia area would account for about 30% of the Toowong ramp use;
- 20 to 25% of traffic would be associated with local users from the Taringa area;
- approximately 7% of users would be from suburbs immediately south of the Walter Taylor Bridge;
- the Toowong ramps are not strongly used by central city traffic, but are more strongly linked to travel between cross-city destinations via Airport Link, Kingsford Smith Drive and CLEM7; and
- there would be minimal use of Milton Road or the adjacent local network to the north for travel access to Northern Link, less than 1,000 vpd and 300 vpd for entry traffic and exit traffic respectively.

Figure 9-10 illustrates the indicative travel patterns for traffic using the Kelvin Grove ramps for Northern Link trips. A balanced distribution between the north and south facing ramps is forecast. Over 70% of users of these ramps would travel west via the Western Freeway.

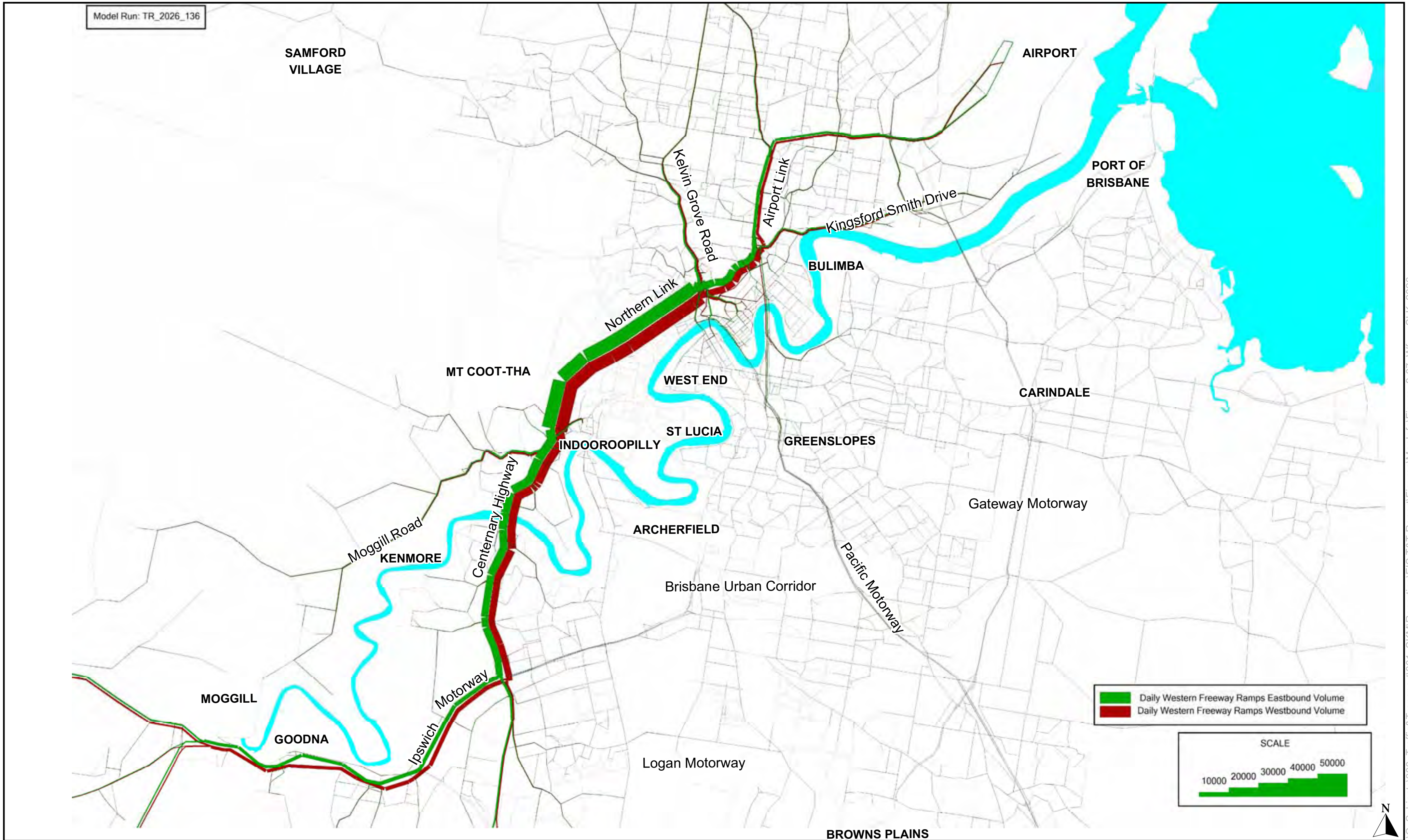


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Figure 9-7

Northern Link Daily Travel Pattern for the Western Freeway Connection

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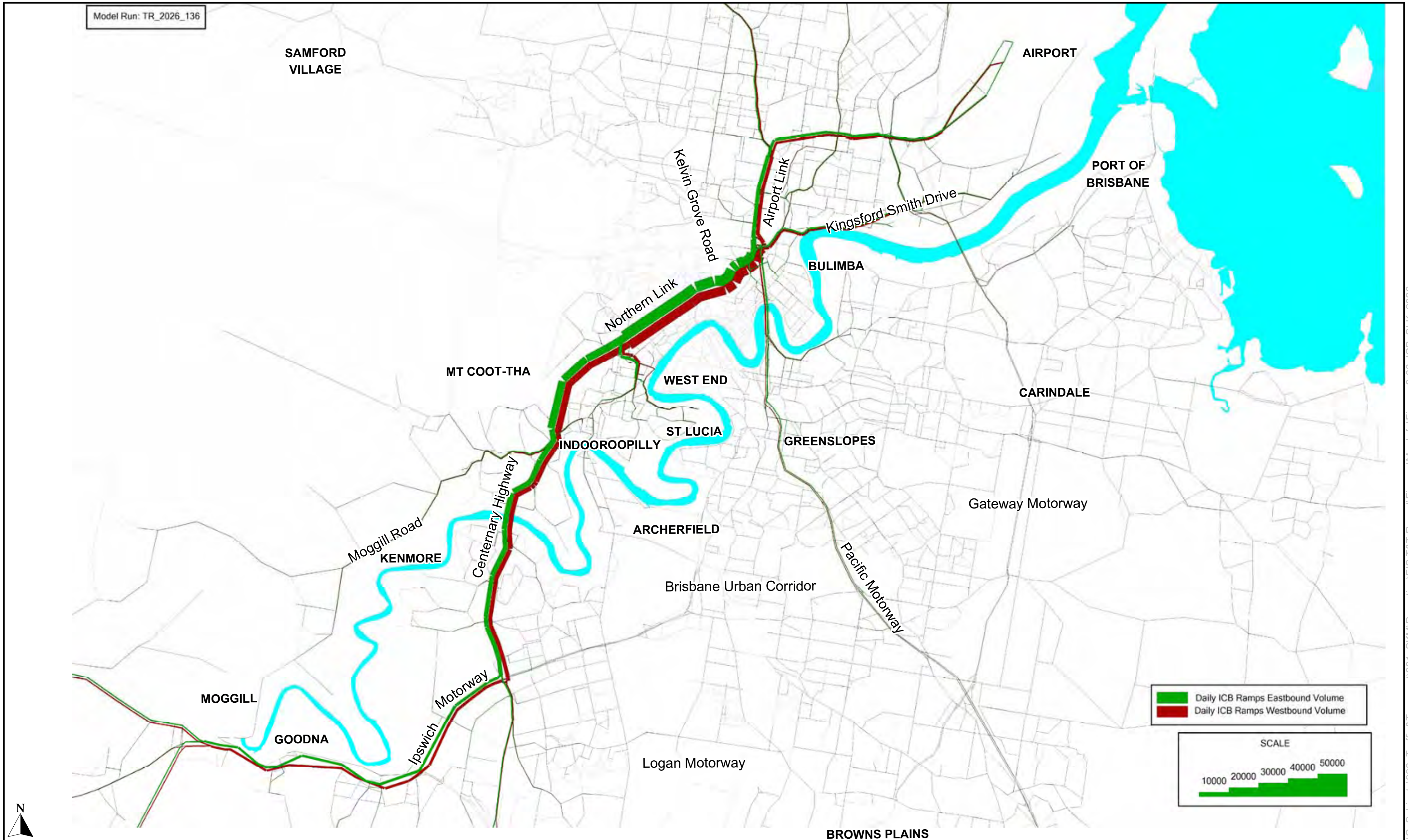

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Figure 9-8

Northern Link Daily Travel Pattern for the Inner City Bypass

Northern Link
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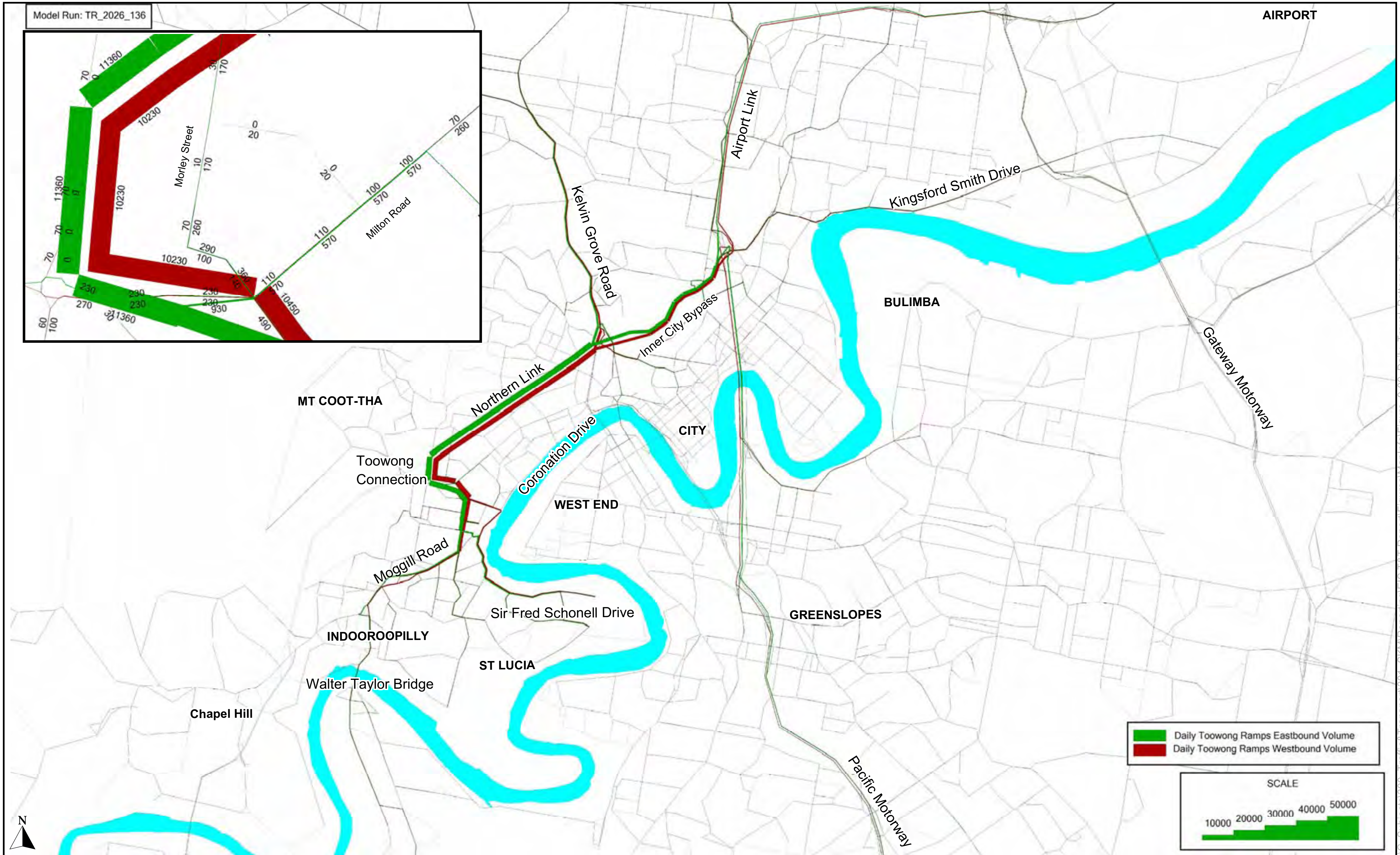

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Figure 9-9

Northern Link Daily Travel Pattern for the Toowong Connection

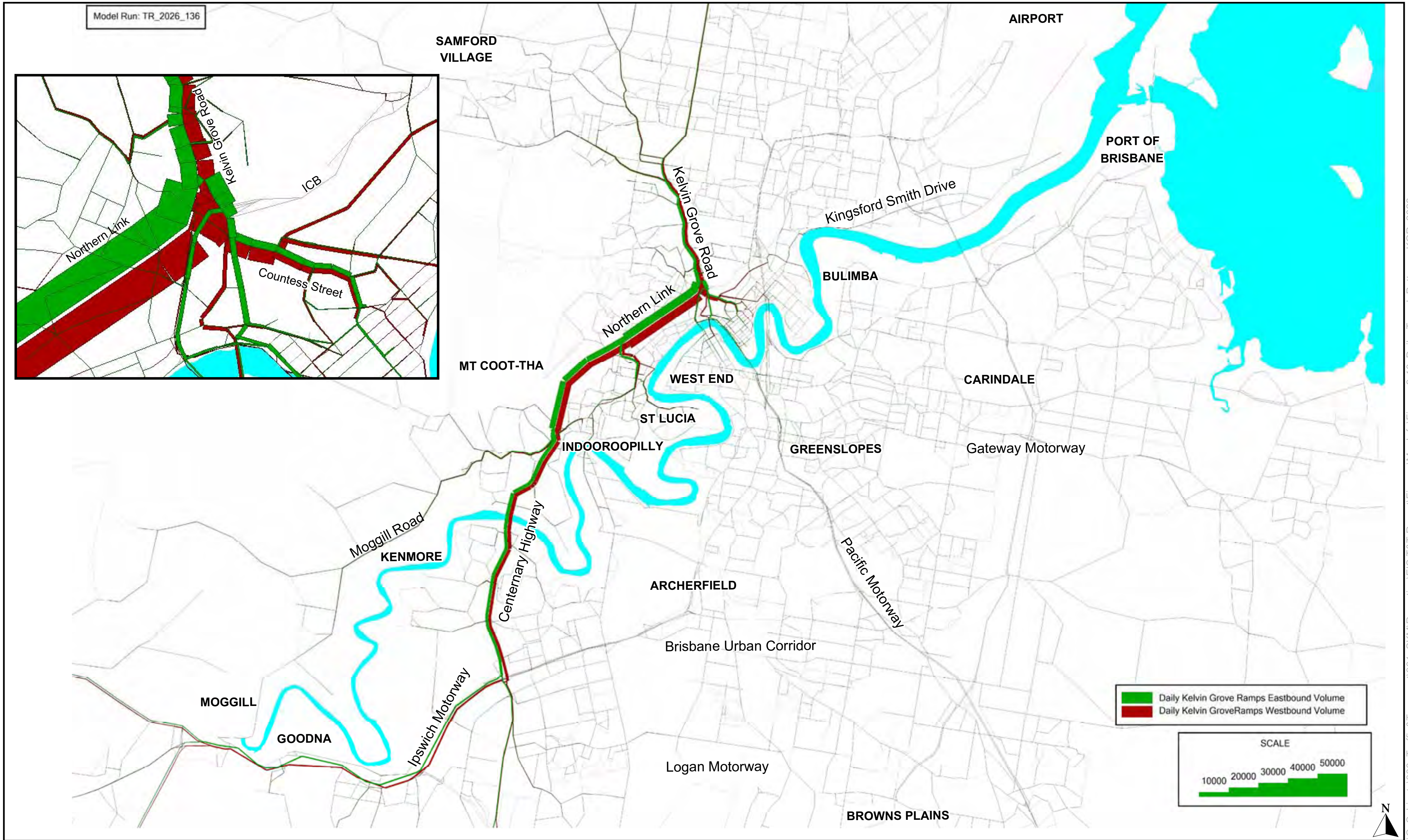

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Figure 9-10

Northern Link Daily Travel Patterns for the Kelvin Grove Connection

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9.4 Regional Traffic Volume and Flow Effects of Northern Link

Forecast changes in weekday traffic volumes on the regional road network are presented in **Table 9-5** and illustrated in **Figure 9-11**. This supports the travel pattern assessment and again illustrates that the major component of the traffic function of Northern Link would be associated with strategic and intra regional travel. Traffic volume effects are forecast beyond the corridor due to regional traffic re-distributing to alternative routes to access the facility, and in some case these offer beneficial reductions in total traffic use of regional routes.

Table 9-5 also identifies the forecast traffic volume impacts on other elements of the Brisbane toll road network, namely Gateway Bridge, Logan Motorway, CLEM7, Airport Link and Hale Street Link.

Traffic flow with the Project is illustrated in **Figure 9-14** to **Figure 9-17**. These figures show the forecast Level of Service (LOS) in 2014 and 2026 during the peak periods, providing an assessment of traffic flow conditions as perceived by drivers.

Key findings include:

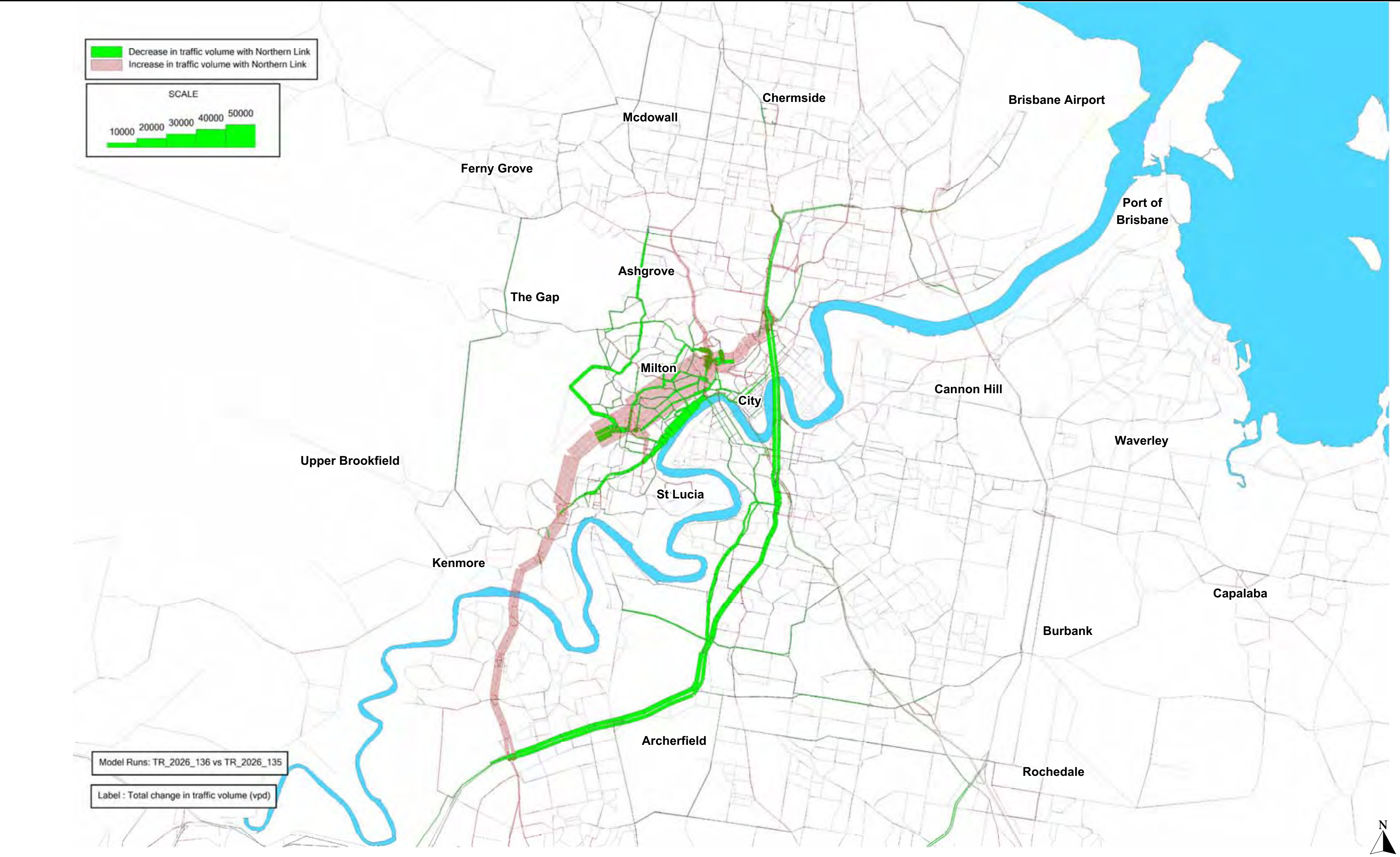
- beyond the immediate area of the Project, few key routes experience significant traffic increases;
- the highest increase is on the Western Freeway-Centenary Highway corridor, where a moderate increase of 12% in 2014 and 16% in 2026 is forecast at the Centenary Bridge. At the four lane Centenary Bridge average weekday traffic demands with the Project are forecast to rise to 137,400 in 2026. Increases of this magnitude would be within the anticipated traffic lane capacities along this route (as discussed further in **Section 9.5.1**). By 2026, the traffic flow conditions on the Western Freeway are forecast as LOS C;
- the ICB would experience increases in average weekday traffic in the order of 20% (compared to the without project scenario) resulting in 143,000 vehicles per average weekday by 2026. This is within the traffic carrying capacity of this 6-lane road link. Traffic flow conditions of LOS A are forecast;
- the strategic model indicates negligible overall traffic change within the Airport Link/Lutwyche Road corridor although a small redistribution in demand (4% to 5% in 2014) between relative demands on Lutwyche Road and Airport Link is forecast. This is likely to be influenced by the balance of flows through the Airport Link/ICB/ CLEM7/Lutwyche Road interchange at Bowen Hills. It should be noted that the traffic modelling preceded the finalisation of the Airport Link tender process and the Airport Link Changed Project may re-dress this issue;
- a small reduction in traffic use of Hale Street Link is forecast with the project, with Northern Link reinforcing the use of the motorway standard links using ICB and CLEM7 for longer distance cross-river travel;
- traffic volumes on the Walter Taylor Bridge in Indooroopilly are not changed by Northern Link, although some users of this link will re-distribute to travel via Northern Link rather than the Moggill Road corridor;
- sound traffic relief would be expected on several regionally important corridors, particularly by 2026 (when decreases of 7% to 21% are forecast), including the Ipswich Motorway east of the Centenary Highway, Riverside Expressway, CLEM7, Ipswich Road and Fairfield Road. The relief offered to the Riverside Expressway, as well, flows on into traffic reductions through the CBD, particularly Ann and Turbot Streets; and
- sound traffic reductions are forecast on the congested MetRoad 5 corridor, with a decrease of 14% traffic forecast on Jubilee Terrace in 2026 and -11% on Frederick Street due to increased connectivity for cross-city travel.

In summary, the assessment indicates that no specific broader road network upgrades to mitigate congestion points with the project operational are triggered, although it is noted that an underlying assumption incorporated with the traffic modelling is that implementation of the Western Freeway-Centenary Highway transit lane project identified within SEQIPP occurs, and that this is operational by around 2016.

Table 9-5 Volumes on Key Surface Roads in the Regional Network

Road	Location	Average Weekday Traffic						
		2007	2014			2026		
			Without NL	With NL	% Difference	Without NL	With NL	% Difference
State Strategic Roads								
Centenary Highway	Centenary Bridge	86,800[1]	98,300	110,400	12%	118,500	137,400	16%
Western Freeway	South of Mt Coot-tha-Rd	76,500	90,100	114,500	27%	105,200	137,800	31%
Ipswich Motorway	at Oxley Creek, Oxley	93,700	122,700	110,800	-10%	143,000	125,200	-12%
Logan Motorway	at Oxley Creek, Larapinta	23,500	46,500	45,500	-2%	77,100	75,300	-2%
Kessels Road	E of Lowndes Street, Coopers Plains	62,300	68,700	67,000	-2%	68,300	66,500	-3%
Gateway Motorway	at Gateway Bridge	105,800	170,000	170,500	0%	238,300	239,100	0%
Airport Link	in Mainline Tunnel	X	80,800	77,500	-4%	102,600	97,900	-5%
East-West Arterial	E of Widdop Street	28,800	95,600	94,400	0%	129,300	128,700	0%
Regional Radial Roads								
Pacific Motorway	at Captain Cook Bridge	164,000	166,500	166,700	0%	169,400	168,200	-1%
Riverside Expressway	at Merivale Bridge	96,000	102,800	97,500	-5%	103,400	101,900	-2%
Kelliher Road	S of Ipswich Mwy, Darra	36,200	38,300	38,800	1%	89,300	92,600	4%
CLEM7	at Brisbane River	X	71,700	66,800	-7%	92,100	79,100	-14%
ICB	Land Bridge	79,200	108,000	126,000	17%	116,900	143,100	22%
Hale Street Link	at Brisbane River	X	20,900	19,200	-8%	27,600	25,000	-9%
Gympie Road	N of Broughton Road, Kedron	63,400	93,600	94,900	1%	103,000	103,400	0%
Lutwyche Road	N of Stoneleigh Street, Lutwyche	60,600	46,500	49,600	7%	47,100	50,100	6%
Kingsford Smith Drive	E of Cooksley Street, Hamilton	62,400	62,200	62,900	1%	70,800	71,200	1%
Regional Ring Roads								
Stafford Road	E of Beaconsfield Terrace, Kedron	19,200	37,300	37,500	1%	41,900	41,900	0%
Coonan Street	at Walter Taylor Bridge	32,500	33,800	33,800	0%	33,800	33,900	0%
Ipswich Road	N of Gainsborough Street, Moorooka	31,800	47,700	37,500	-21%	56,100	44,500	-21%
Jubilee Terrace	N of Coopers Camp Road, Ashgrove	27,700	29,900	25,900	-13%	32,600	27,900	-14%
City Distributor Roads								
Fairfield Road	N of Sherwood Road, Yeerongpilly	17,400	22,500	20,500	-9%	31,000	23,900	-23%

Table note: Source: Northern Link Traffic Model.
(1) Volume from validated model. These are within 5-10% of DMR permanent count data.



Northern Link
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Figure 9-11

2026 Regional Traffic Volume Changes with Northern Link

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9.5 Local Traffic Volume and Flow Effects of Northern Link

A detailed assessment of the forecast effects of the project on traffic changes on the corridor, connecting routes and local network has been undertaken.

The forecast effect of the project on traffic volumes on connecting (or feeder) roads is summarised in **Table 9-6** for average weekday daily traffic for the years 2014, 2016, 2021 and 2026 without and with the project and for 2007 for comparison purposes. **Table 9-7** reports the forecast peak period traffic for 2026 with and without the project on these connecting routes.

Forecast effects on local roads and in the corridor are shown in **Table 9-8** and **Table 9-9** and graphically in **Figure 9-12** and **Figure 9-13**.

Traffic flow with the Project is illustrated in **Figure 9-14** to **Figure 9-17.** These figures show the forecast Level of Service (LOS) in 2014 and 2026 during the peak periods, providing an assessment of traffic flow conditions as perceived by drivers.

Table 9-6 Volumes on Key Connecting Roads to the Project - Comparison without and with the Project

Reporting Point	Road	Location	2007	Average Weekday Traffic											
				2014			2016			2021			2026		
				Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
Western Connection															
A	Western Freeway	South of Mt Coot-tha-Rd	76,500	90,100	114,500	27%	98,800	124,500	26%	100,900	130,700	30%	105,200	137,800	31%
BB	Centenary Highway	Centenary Bridge	86,800	98,300	110,400	12%	108,100	120,800	12%	110,700	127,400	15%	118,500	137,400	16%
39	Croydon Street	South of Milton Road	12,000	28,100	43,000	53%	28,800	42,600	48%	28,400	43,600	54%	28,700	45,900	60%
36	Morley Street	North of Milton Road	3,900	6,300	4,600	-27%	6,600	4,700	-29%	6,400	4,600	-28%	6,700	5,000	-25%
S	Jephson Street	North of Sherwood Road	13,000	22,500	27,900	24%	22,700	27,700	22%	23,300	28,900	24%	23,700	30,400	28%
W	Sylvan Road	South of Croydon Street	10,900	13,500	12,500	-7%	14,500	12,000	-17%	15,000	12,000	-20%	15,500	12,000	-23%
4	Burns Road	East of railway	4,400	5,100	5,800	14%	5,300	6,200	17%	5,300	6,200	17%	5,500	6,200	13%
Eastern Connection															
R	ICB	Land Bridge	79,200	108,000	126,000	17%	111,300	129,200	16%	113,800	135,400	19%	116,900	143,100	22%
DD	Kelvin Grove Road	South of Blamey Street[1]	53,000	50,800	59,300	17%	52,500	59,900	14%	56,300	67,700	20%	57,700	67,400	17%
T	Kelvin Grove Road	North of School Road	50,500	45,700	51,400	12%	46,800	51,800	11%	50,100	59,300	18%	51,400	58,600	14%
27	Kelvin Grove Road	South of Ithaca Street	35,300	35,900	37,600	5%	37,200	38,600	4%	40,600	39,500	-3%	40,400	40,500	0%
25	Kelvin Grove Road	off ramp to College Road	5,000	7,400	9,000	22%	7,500	9,300	24%	9,000	10,500	17%	9,300	11,800	27%
23	College Road	East of 5 ways	31,600	41,100	45,300	10%	43,900	47,300	8%	47,300	51,400	9%	48,600	54,700	13%
24	Musgrave Road	West of 5 ways	32,900	34,100	37,100	9%	36,300	39,300	8%	36,400	41,200	13%	35,900	41,600	16%
26	Petrie Terrace	South of 5 ways (one-way northbound)	12,900	16,000	13,600	-15%	17,000	16,100	-5%	18,000	17,800	-1%	20,200	18,500	-8%
22	Countess Street	South of College Road (one-way southbound)	37,300	36,700	37,700	3%	38,400	37,800	-2%	41,400	38,100	-8%	40,800	39,300	-4%
40	Musgrave Road loop to NL, KGR and ICB	West of Hale Street (one-way from Musgrave Road)	5,000	6,700	9,700	45%	6,800	10,700	57%	6,800	12,900	90%	7,300	13,400	84%

Table Notes:
Source: Northern Link Traffic Model
1 Volumes reported for this link are based on model run with left-in left-out from Victoria Park Road to ICB retained.

■ **Table 9-7 2026 Peak Period Volumes on Key Connecting Roads to the Project - Comparison without and with the Project**

Reporting Point	Road	Location	2 hour average weekday morning peak period volumes						2 hour average weekday evening peak period volumes					
			Eastbound			Westbound			Eastbound			Westbound		
			Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
Western Connection														
A	Western Freeway	South of Mt Coot-tha-Rd	7,000	10,600	51%	6,300	8,000	27%	6,300	9,100	44%	9,900	10,900	10%
BB	Centenary Highway	Centenary Bridge	8,900	10,000	12%	7,400	8,400	14%	6,800	8,700	28%	10,300	10,700	4%
39	Croydon Street	South of Milton Road	2,700	3,800	41%	2,700	3,000	11%	2,800	4,200	50%	2,200	3,300	50%
36	Morley Street	North of Milton Road	200	200	0%	900	700	-22%	200	100	-50%	1,200	900	-25%
S	Jephson Street	North of Sherwood Road	3,300	3,100	-6%	1,900	2,100	11%	1,800	2,300	28%	2,600	3,200	23%
W	Sylvan Road	South of Croydon Street	1,800	1,400	-22%	400	400	0%	800	600	-25%	1,900	1,200	-37%
D	Moggill Road	South of Jephson Street	4,500	3,400	-24%	2,000	2,000	0%	2,300	2,200	-4%	4,300	4,500	5%
4	Burns Road	East of railway	600	500	-17%	800	600	-25%	500	500	0%	400	500	25%
Eastern Connection														
R	ICB	Land Bridge	7,000	9,400	34%	9,700	11,300	16%	8,700	11,300	30%	8,100	9,800	21%
DD	Kelvin Grove Road	South of Blamey Street[(1)]	2,600	3,800	46%	4,600	4,800	4%	4,700	5,400	15%	3,700	4,300	16%
T	Kelvin Grove Road	North of School Road	2,100	3,200	52%	4,200	4,200	0%	4,600	4,700	2%	2,800	3,200	14%
25	Kelvin Grove Road	off ramp to College Road	-	-	-	2,600	2,600	0%	-	-	-	400	600	50%
27	Kelvin Grove Road	South of Ithaca Street	500	800	60%	4,300	4,200	-2%	2,300	2,500	9%	3,800	3,900	3%
23	College Road	East of 5 ways	5,000	5,000	0%	2,300	2,600	13%	1,700	1,900	12%	5,600	5,800	4%
24	Musgrave Road	West of 5 ways	2,800	2,900	4%	2,200	2,400	9%	800	1,000	25%	5,800	6,100	5%
26	Petrie Terrace	South of 5 ways (one-way northbound)	2,000	1,900	-5%	-	-	-	3,600	3,400	-6%	-	-	-
22	Countess Street	South of College Road (one-way southbound)	-	-	-	6,100	6,000	-2%	-	-	-	4,300	4,400	2%
40	Musgrave Road loop to NL, KGR and ICB	West of Hale Street (one-way from Musgrave Road)	700	1,000	43%	-	-	-	1,900	2,300	21%	-	-	-

Table Notes: Source: Northern Link Traffic Model
(1) Volumes reported for this link are based on model run with left-in left-out to Victoria Park Road from ICB retained.

Table 9-8 Volumes on Surface Roads within the Inner West Transport Study Area - Comparison without and with the Project

Hierarchy	Reporting Point	Road	Location	2007	Average Weekday Traffic											
					2014			2016			2021			2026		
					Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
Regional Radial																
	B	Moggill Road	East of Russell Terrace, Indooroopilly	40,700	42,200	40,400	-4%	43,000	41,500	-3%	44,300	43,000	-3%	47,000	44,800	-5%
	D	Moggill Road	East of Brisbane Boys College Entrance, Toowong	38,500	47,000	40,000	-15%	46,800	40,000	-15%	48,600	42,000	-16%	50,100	43,400	-13%
	F	High Street	West of Benson Street, Toowong	32,400	35,000	26,100	-25%	35,300	26,500	-25%	36,100	27,300	-32%	37,300	27,400	-27%
	X	Milton Road	West of Croydon Street, Toowong	54,900	61,400	58,300	-5%	61,400	58,300	-5%	63,000	60,600	-4%	63,000	60,600	-4%
	J	Milton Road	East of Croydon Street, Toowong	52,900	64,500	58,100	-10%	65,000	60,200	-7%	66,300	62,700	-6%	68,200	63,500	-7%
	O	Milton Road	East of Castlemaine Street, Milton	51,500	68,200	61,100	-10%	67,800	60,900	-10%	70,600	63,900	-10%	72,500	65,900	-9%
	K	Coronation Drive	West of Land Street, Auchenflower	62,600	70,300	56,000	-20%	71,400	56,500	-21%	72,900	58,200	-25%	74,000	57,900	-22%
	P	Coronation Drive	East of Cribb St, Milton	90,100	92,100	80,900	-12%	94,100	82,000	-13%	97,000	83,900	-16%	96,400	83,800	-13%
Regional Ring																
	C	Walter Taylor Bridge	Indooroopilly	32,500	33,800	33,800	0%	33,400	33,400	0%	34,000	34,100	0%	33,800	33,900	0%
	E	Miskin Street	North of Ascog Terrace, Toowong	10,500	10,200	8,400	-18%	9,700	8,700	-10%	10,500	9,300	-13%	10,800	9,500	-12%
	I	Frederick Street	South of Victoria Crescent, Toowong	33,500	33,900	32,900	-3%	36,700	33,500	-9%	37,200	34,200	-9%	37,400	33,200	-11%
	19	Hale Street	South of Caxton Street	76,900	84,100	81,600	-3%	80,700	81,600	1%	80,400	86,200	7%	83,500	86,800	4%
	30	Jubilee Terrace	North of Coopers Camp Road	27,700	29,900	25,900	-13%	30,400	26,700	-12%	31,500	27,000	-17%	32,600	27,900	-14%
	31	Sherwood Road	West of Jephson Street	5,400	6,000	4,200	-30%	6,600	5,100	-23%	7,300	5,800	-26%	7,900	6,000	-24%

Continued over

Hierarchy	Reporting Point	Road	Location	2007	Average Weekday Traffic											
					2014			2016			2021			2026		
					Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
City Distributor																
	G	Brisbane Street	North of Josling Street, Toowong	37,100	43,100	42,200	-2%	43,900	42,900	-2%	44,700	43,600	-3%	45,900	45,000	-2%
	W	Sylvan Road	South of Croydon Street, Toowong	10,900	13,500	12,500	-7%	14,500	12,000	-17%	15,000	12,000	-20%	15,500	12,000	-23%
	Q	Caxton Street	West of Hale Street, Paddington	22,900	33,700	29,200	-13%	39,600	31,300	-21%	38,500	32,900	-17%	38,900	31,600	-19%
	32	Latrobe Terrace	West of Enoggera Terrace	14,200	18,200	16,700	-8%	19,600	17,000	-13%	20,500	17,600	-16%	21,400	18,200	-15%
Local Streets																
	L	Eagle Terrace	West of Roy Street, Auchenflower	4,100	6,600	6,000	-9%	7,200	6,100	-15%	7,100	6,400	-11%	9,100	6,900	-24%
	M	Haig Road	West of Barona Road., Milton	6,500	12,600	9,400	-25%	16,900	10,900	-36%	16,200	9,700	-67%	14,500	10,200	-30%
	N	Park Road Mid-block	North of Gordon Street, Milton	12,100	15,000	13,400	-11%	16,200	13,400	-17%	16,300	14,100	-16%	19,000	14,800	-22%
	33	Sir Samuel Griffith Drive	North of Birdwood Terrace	5,300	9,900	4,900	-51%	11,500	5,500	-52%	11,900	5,700	-109%	13,900	6,500	-53%
	34	Stuartholme Road	North of Birdwood Terrace	3,600	5,100	3,100	-39%	5,400	3,000	-44%	4,500	3,900	-15%	5,100	4,000	-22%
	35	Enoggera Terrace	North of Latrobe Terrace	5,100	7,700	5,800	-25%	8,700	6,100	-30%	9,500	6,800	-40%	10,400	7,300	-30%
	28	Rainworth Road	East of Rouen Road	4,300	7,000	4,200	-40%	9,500	4,600	-52%	8,400	5,400	-56%	10,000	5,700	-43%
	36	Morley Street	North of Milton Road	2,200	6,300	4,600	-27%	6,600	4,700	-29%	6,400	4,600	-39%	6,700	5,000	-25%
	37	Lang Parade	North of Coronation Drive	6,800	11,300	9,000	-20%	12,000	9,400	-22%	11,600	9,600	-21%	12,600	10,000	-21%
	29	Birdwood Terrace	East of Gregory Terrace	1,600	3,900	3,000	-23%	4,500	3,000	-33%	4,700	3,000	-57%	4,500	2,800	-38%
	38	Heussler Terrace	West of Castlemaine Street	8,000	13,500	11,200	-17%	16,800	11,200	-33%	16,700	11,200	-49%	14,800	11,200	-24%
	H	Sylvan Road	East of Milton Road, Toowong	8,400	5,500	4,500	-18%	6,000	4,400	-27%	6,100	4,600	-33%	6,300	3,900	-38%

Table Note: Source: Northern Link Traffic Model

Table 9-9 Surface Traffic Changes within the Inner West Transport Study Area - Comparison without and with the Project

Screenline[1]	2007	Average Weekday Traffic											
		2014			2016			2021			2026		
		Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
1 – Indooroopilly	162,400	178,400	201,400	11%	187,400	208,400	10%	191,600	220,600	13%	198,900	229,600	13%
2- St Lucia and University	73,800	81,600	81,300	-0.4%	83,500	82,300	-1%	85,100	84,700	-0.5%	88,100	87,700	-0.5%
3 – Toowong	174,200	210,400	174,700	-20%	219,400	174,100	-26%	224,400	185,200	-21%	230,900	186,900	-24%
4 - Milton	205,500	244,900	210,600	-16%	255,200	208,100	-23%	263,000	222,400	-18%	269,700	226,300	-19%
Screenline[1]	2007	Commercial Vehicle Weekday Traffic											
		2014			2016			2021			2026		
		Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
1 – Indooroopilly	6,300	6,200	6,900	10%	6,500	7,200	10%	7,000	8,100	14%	7,600	9,000	16%
2- St Lucia and University	2,600	3,200	3,100	-3%	3,300	3,300	0%	3,600	3,600	0%	4,000	3,900	-3%
3 – Toowong	10,200	11,100	9,400	-18%	11,400	9,200	-24%	12,200	10,000	-22%	12,900	9,900	-30%
4 – Milton	11,100	12,300	10,600	-16%	12,900	10,700	-21%	14,000	11,700	-20%	14,800	11,900	-24%

Table Note:
Source: Northern Link Traffic Model
(1) A Screenline is a notional boundary across roads within the inner west suburbs in the vicinity of the project across which traffic demands can be compared. Screenline locations are shown on Figure 2-3.

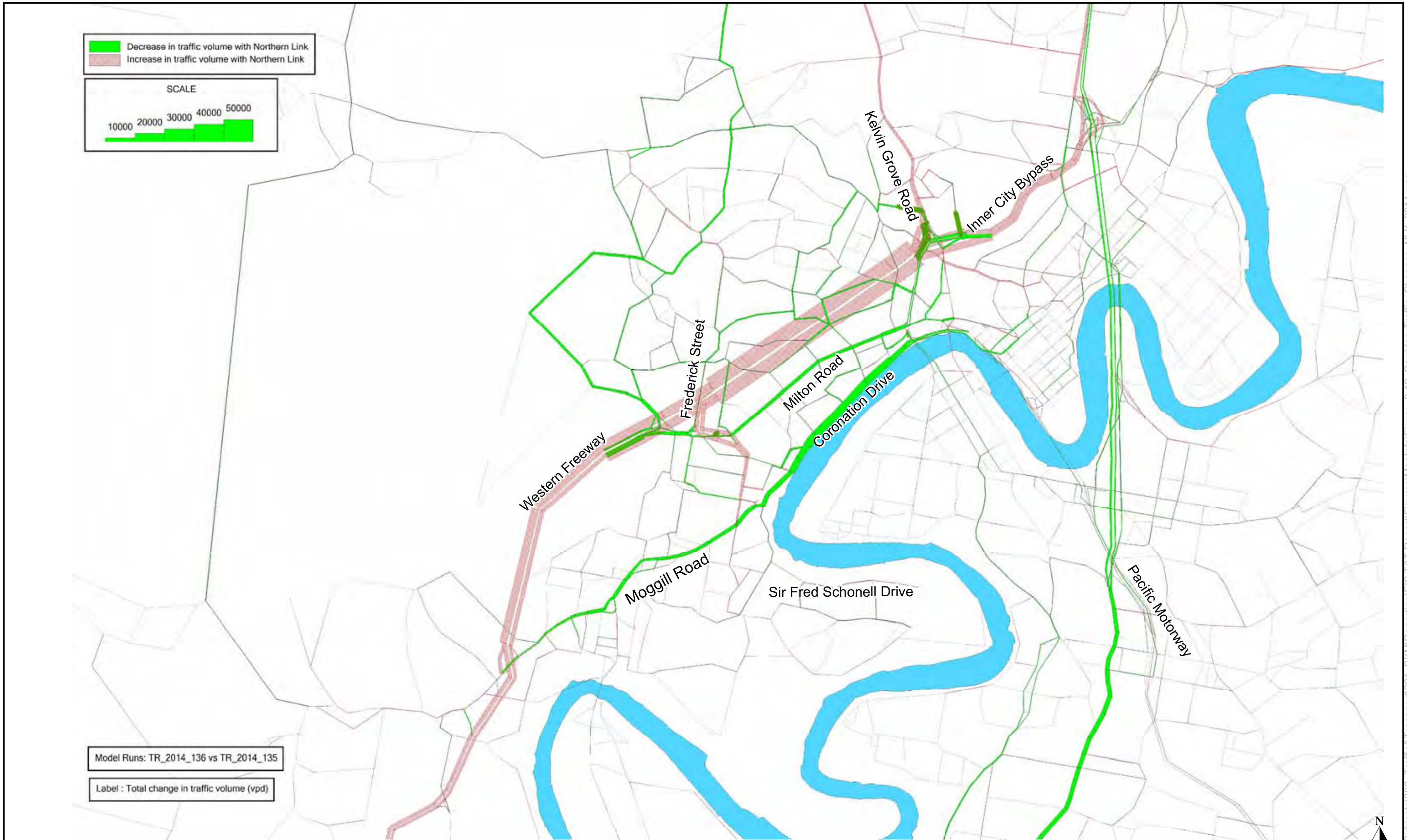

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Figure 9-12

2014 Corridor Traffic Changes with Northern Link

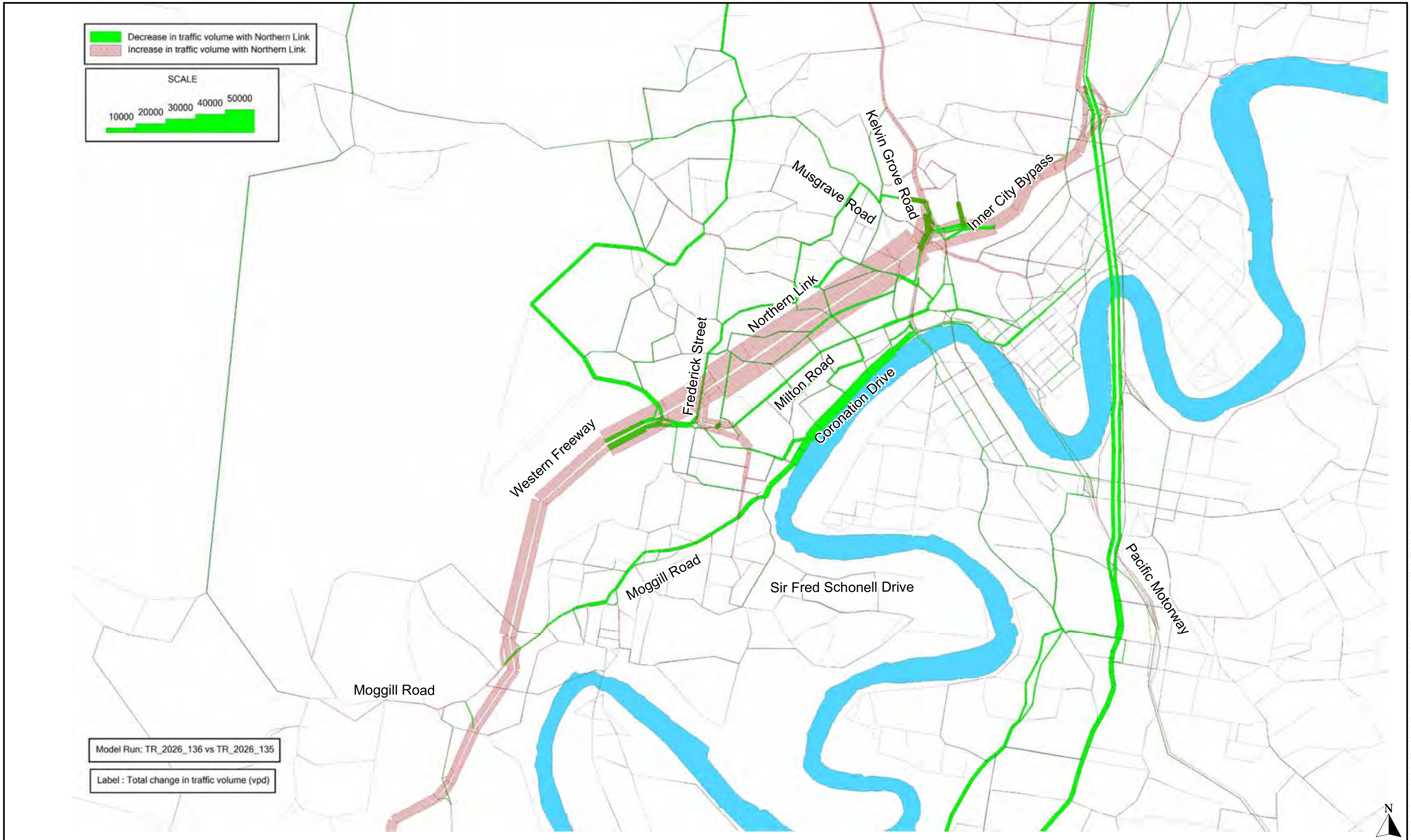

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Figure 9-13

2026 Corridor Traffic Volume Changes with Northen Link

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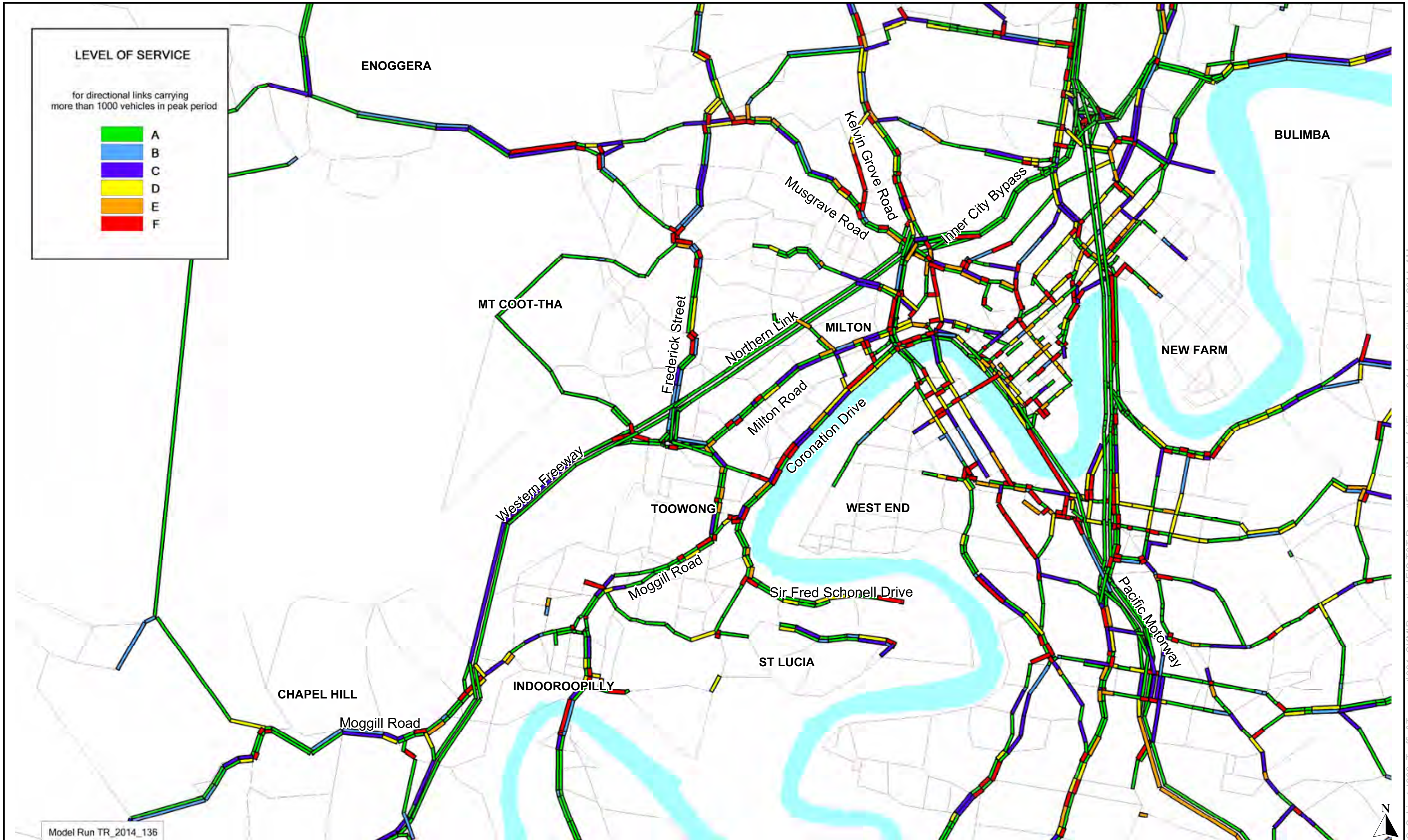

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Figure 9-14

2014 AM Peak Level of Service with Northern Link

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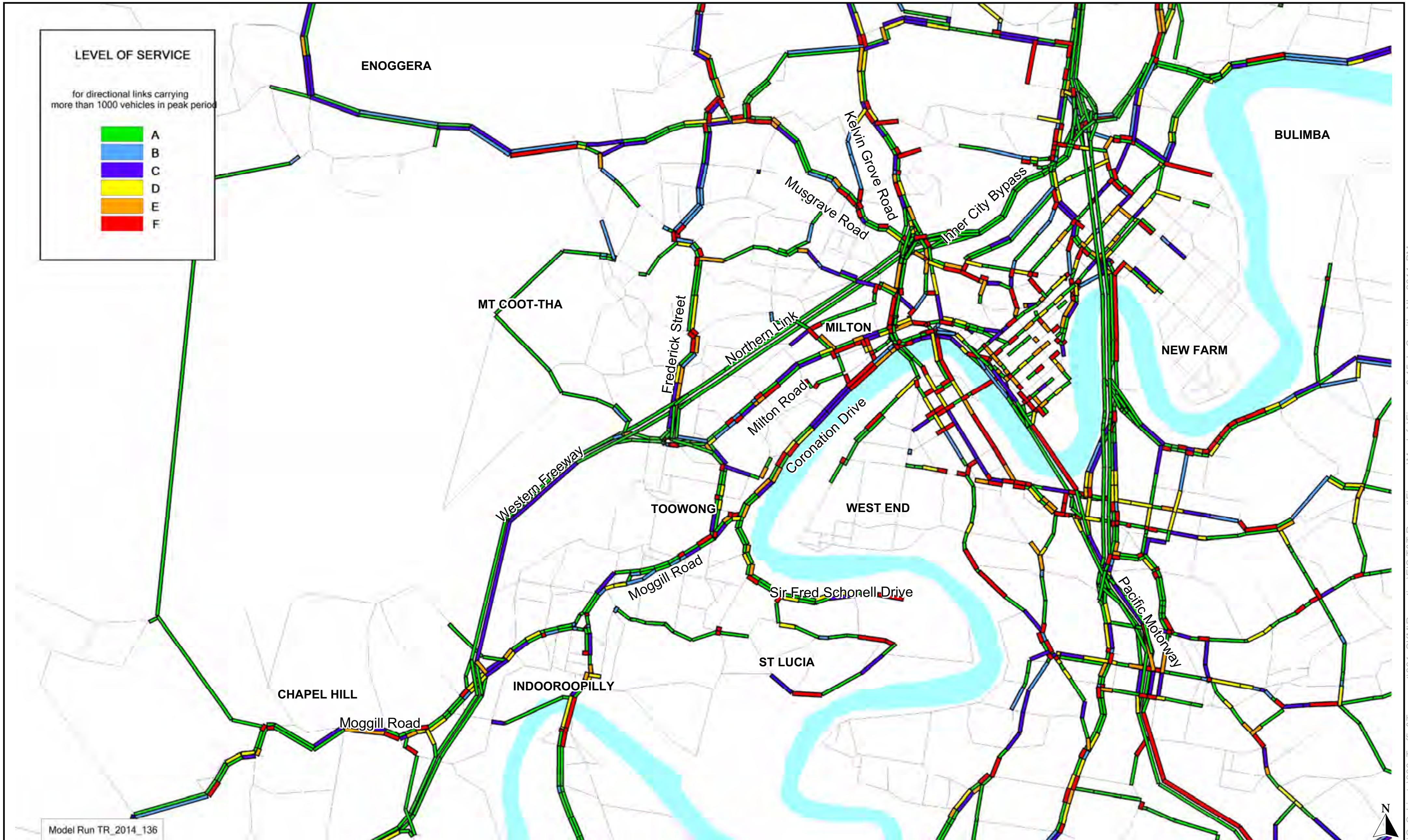

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Figure 9-15

2014 PM Peak Level of Service with Northern Link

Northern Link

SKM Connell Wagner JOINT VENTURE

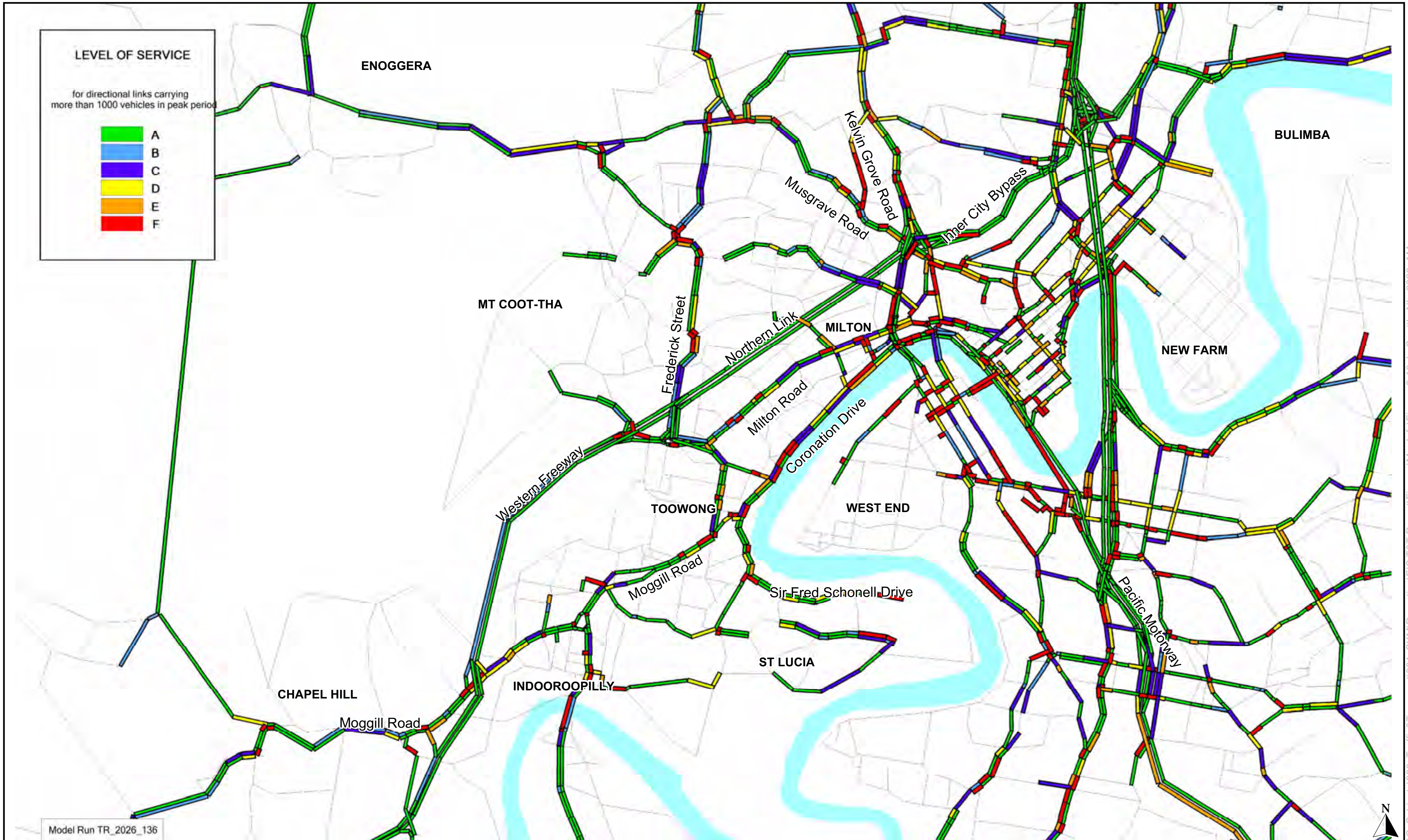

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Figure 9-16

2026 AM Peak Level of Service with Northern Link

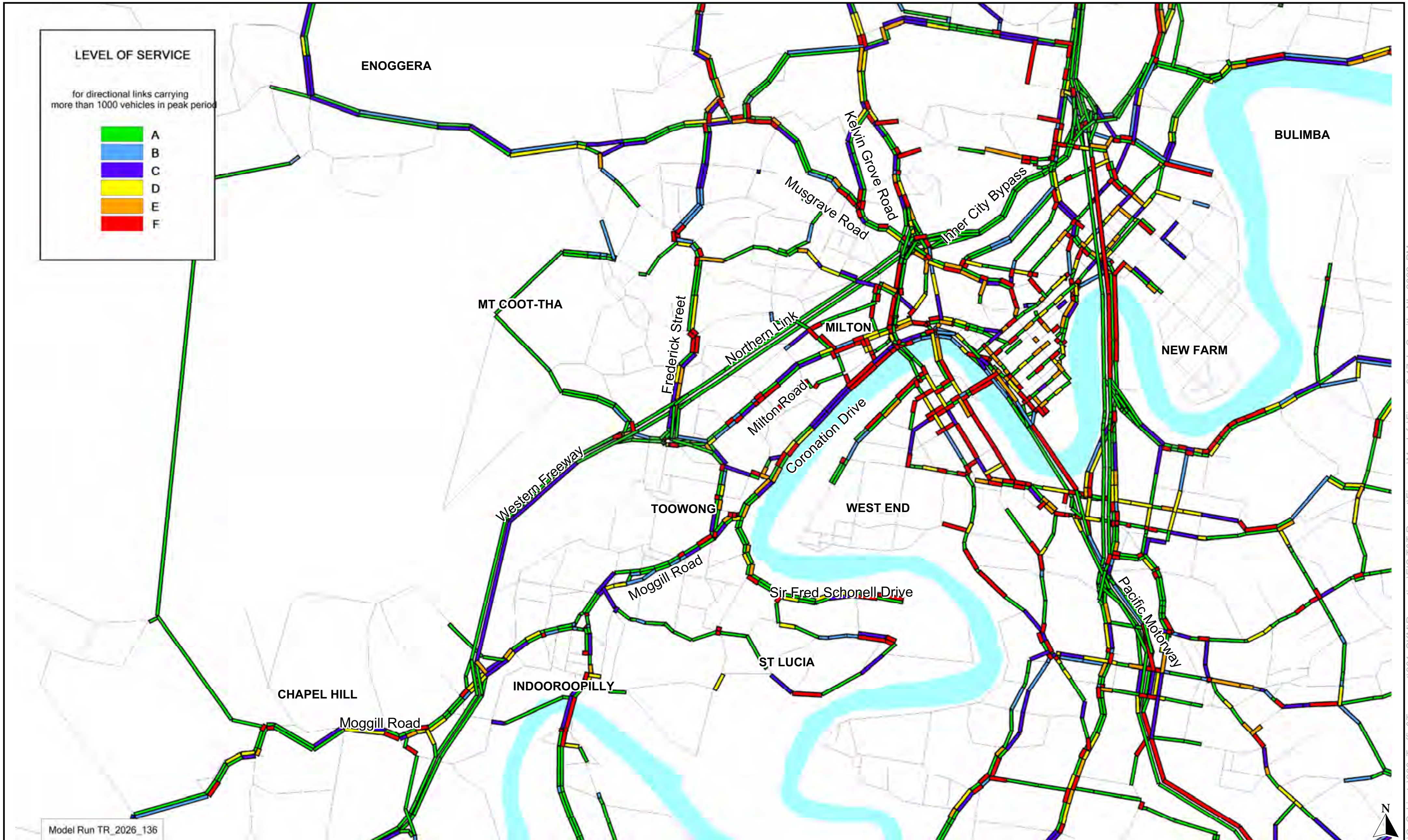

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Figure 9-17

2026 PM Peak Level of Service with Northern Link

SKM Connell Wagner JOINT VENTURE

9.5.1 Effects of Connecting Roads

The key traffic effects on feeder roads at the western end of the project are:

- the main feeder route at the western end of the project would be the Western Freeway. In 2014, average weekday traffic on the Western Freeway north of Moggill Road is forecast to reach 114,500 vpd with Northern Link. This is similar to the traffic levels carried during 2007 on the four lane section of the Gateway Motorway north of Kingsford Smith Drive (112,000 AWDT) . By 2026, an increase in traffic to 138,000 vehicles per day is forecast, representing a 31% change compared to the without project scenario. By this time horizon, the forecast increased peak period demands would contribute to a decline in the LOS in the peak direction. However, overall demands are within the anticipated traffic lane capacities along this route which, as per SEQIPP, has been assumed to be upgraded by 2016 to add a T2 lane in addition to existing 2 lanes in each direction;
- at the four lane Centenary Bridge, average weekday traffic demands with the project of 110,400 in 2014 rising to 137,400 in 2026 are forecast. By 2026 peak period congestion is forecast at the Centenary Bridge either without or with Northern Link in the peak direction of travel. This is because whilst corridor upgrading in the form of the Western Freeway-Centenary Highway Transit Lane project (identified in SEQIPP) has been included in the base future networks from 2016, widening of the bridge has been excluded. It is not uncommon to tolerate a lower level of service on a specific cross-river link if feeder road capacity is available due to the high expense associated with capacity increases on such facilities. With peak spreading in the network over the next 20 years, it is considered not unreasonable to assume that a four lane cross-river facility could carry an AWDT of up to 140,000 vehicles per day;
- approximately 40% of the traffic using the Western Freeway would be associated with Northern Link and hence would not pass through the Mt Coot-tha and Toowong roundabouts. Compared to the without project scenario in 2026, there would be a substantial reduction in volume of Western Freeway traffic that would pass through the Mt Coot-tha and Toowong roundabouts. This would generally improve travel conditions for commuter and local traffic use of this part of the network, and relieve pressure for use of local network for rat-running;
- Croydon Street and Jephson Street are forecast to experience increases in average weekday traffic in 2026 compared to the without project scenario. Increases range from 60% on Croydon Street to 28% on Jephson Street. To facilitate these increases in traffic volume widening of Croydon Street from an undivided four lane road to a divided six lane road has been incorporated with upgrades to the intersections of Milton Road/ Croydon Street/ Morley Street and Croydon Street/Jephson Street/ Sylvan Road. The effect of these intersection upgrades are discussed in **Section 9.6**. Jephson Street is a four-lane City Distributor and Council has been actively preserving set-backs along this corridor over a number of years as re-developments occur in order to improve the traffic capacity of this route progressively over time;
- forecast traffic reductions with the project compared to without the project scenario would be experienced on Sylvan Road (between Coronation Drive and Croydon Street) in 2026 in the order of 23%; and
- Morley Street is forecast to experience traffic reductions with the project, when compared to the scenario without the project, in the order of 25% in 2026, although traffic levels are forecast to increase in the future due to growth in population and activity. This issue is discussed further in **Section 9.5.3**. It can be seen from **Figure 9-13** that a similar reduction is forecast for Gregory Street. This is due to the relief of traffic pressures on major routes in the area such as Frederick Street and at the roundabout. **Figure 9-13** illustrates the decreases in traffic volume on the Frederick Street corridor extending north along the MetRoad 5.

The key traffic effects on feeder roads at the eastern end of the project are:

- the ICB would be a key feeder route with forecast increases in average weekday traffic in the order of 20% (compared to the without project scenario) resulting in 143,000 vehicles per average weekday by 2026. This is within the traffic carrying capacity of this 6-lane road link. Peak direction increases of traffic are forecast of the order of 30% for the section of the ICB immediately east of the project connection, however no significant effect on the mid-block level of service is forecast. Weaving movements can be accommodated satisfactorily with the proposed connection layout;
- at the Kelvin Grove Road connection, Kelvin Grove Road immediately north is forecast to experience a 17% increase in daily traffic by 2026. It is noted that this route will experience some relief of traffic growth effects due to the introduction of Airport Link into the network in 2012. The impacts of peak period traffic increases can be managed with the proposed project connection works at Kelvin Grove Road. Intersection performance is described further in **Section 9.6**. Traffic changes on Kelvin Grove Road diminish rapidly to the north of the study area;
- Kelvin Grove Road south of the connection would experience little change in forecast traffic demand. This would occur because whilst some traffic is added to the network at this point associated with the Kelvin Grove south facing ramps from Northern Link, there would be compensating reduction in traffic achieved via westbound traffic use of the north facing ramps. This traffic would otherwise travel via Countess Street or ICB to Milton Road or Coronation Drive;
- Musgrave Road, between College Road and Hale Street is forecast to experience a 13% increase in average weekday traffic by 2026. West of Hale Street, Musgrave Road is forecast to experience traffic reductions as the increase in traffic is associated with the loop that would connect Musgrave Road with Hale Street, Kelvin Grove Road and Northern Link. There would be no significant effect on level of service;
- average weekday traffic increases of less than 15% are forecast for College Road by 2026. The off ramp from Kelvin Grove Road (southbound) to College Road is forecast to experience traffic increases, with manageable peak period changes; and
- the forecast effects of the project diminish quite rapidly to the south with minimal (5% or less) weekday traffic changes (either increases or reductions in traffic) on Countess Street and Petrie Terrace due to overall traffic re-rerouting effects.

Based on the assessment described above, the following modifications would be needed on access and link roads to the project to ensure its effective operation:

- Widening of Croydon Street from an undivided four lane road to a divided six lane road with upgrades to the intersections of Milton Road/ Croydon Street/ Morley Street and Croydon Street/ Jephson Street/ Sylvan Road.
- Implementation of the proposed Project connection works at Kelvin Grove Road including modification of the signalised intersection of Kelvin Grove Road/Musk Avenue and Kelvin Grove Road/Blamey Street.

In conjunction with these modifications, the Traffic Management Plan for the Project would address the need for signal co-ordination to accommodate increased traffic on connecting routes where multiple signalised intersections occur such as Croydon Street-Jephson Street, Kelvin Grove Road and Musgrave Road.

9.5.2 Traffic Effects in Inner West Suburbs

Improved amenity on many roads in the inner west suburbs would be likely, due to forecast traffic reductions with the Northern Link project. Examples of the forecast effect of Northern Link in 2026 compared to the scenario without the project include:

- sound reduction in traffic on the Milton Road-Coronation Drive radial road corridors, and other roads used by east-west traffic, with a 19% to 24% reduction by 2026 in the network across the Toowong and Milton screenlines respectively. This includes traffic reductions of up to 22% on Coronation Drive and 9% on

Milton Road. These routes represent the untolled alternative routes to Northern Link within the inner west area;

- High Street in Toowong is forecast to experience a reduction of 27%, with resultant traffic levels in 2026 lower than existing;
- traffic on Moggill Road through Toowong would reduce by 13%, and at Indooroopilly by 5%;
- as the project would have a wider effect on route choice within the network, a range of heavily trafficked regional ring roads in the broader Western Brisbane area are forecast to experience traffic reductions and improved operation. Examples at 2026 include Frederick Street (-11%) and Jubilee Terrace (-14%), which are components of MetRoad 5, and Miskin Street (-12%) and Sherwood Road (-24%) to the west of Jephson Street;
- significant daily traffic reductions on many City Distributors such as Sylvan Road south of Croydon Street (-23%), Caxton Street (-19%) and Latrobe Terrace (-15%). The traffic reductions on these streets should lead to improved amenity particularly as these streets typically provide a function for active transport and public transport trips, access to properties and local streets. Caxton Street and Latrobe Terrace pass through shopping and entertainment precincts so improved amenity would be enjoyed by the many visitors to those streets; and
- reductions in daily traffic are forecast on many local streets throughout the inner west suburbs such as Eagle Terrace (-24%), Haig Road (-30%), Stuartholme Road (-22%), Rainworth Road (-43%), Sylvan Road east of Milton Road (-38%), Morley Street (-25%) and Birdwood Terrace (-38%)

Figure 9-13 clearly illustrates the significant reduction not only on the arterial routes such as Coronation Drive and Milton Road but throughout the Inner West Transport Study Area. This is particularly pertinent when compared to the local streets identified in **Figure 4-11** that are used by extraneous through traffic. The implementation of Northern Link has the potential to help alleviate some of these routes. Examples of daily traffic reductions that could lead to noticeable traffic relief on local streets through residential areas between Toowong and Milton are:

- Heussler Terrace (-27%), Birdwood Terrace (-38%), Morley Street (-25%), Park Road (-22%), Rainworth Road (-43%), Stuartholme Road (-22%), and Lang Parade (-21%).

To identify the changes to the categories of vehicles using the surface road system with the Project, **Table 9-9** provides a comparison of forecast overall traffic levels as well as the number of commercial vehicles on surface streets within the inner west suburbs when compared to a situation without the Project. Forecasts for the Toowong screenline in 2026 (location shown in **Figure 2-3**) shows reductions of 24% of total daily traffic and 30% of commercial vehicles would be removed from roads from Mt Coot-tha Road across to Coronation Drive. The Milton screenline (location shown in **Figure 2-3**) also shows significant forecast reductions with 19% of total daily vehicle traffic and 24% of commercial vehicle traffic being removed from the surface network routes from Coronation Drive through Milton to Musgrave Road in 2026.

The Project is forecast to result in some increase in traffic flow through the western section of the study area (the Indooroopilly screenline) although it is noted some double counting occurs in the tabulation as traffic from within the study area in the vicinity of Indooroopilly uses Moggill Road and the Western Freeway to reach Northern Link. This can be seen in **Figure 9-7**. Overall traffic increases and commercial vehicle traffic are confined to the higher order roads such as the Western Freeway-Centenary Highway which are designated freight routes. There would be reduction in general and freight traffic on Moggill Road ,and negligible impact on the Walter Taylor Bridge.

9.5.3 Traffic Effects in Toowong North of Milton Road

The effect of the project on traffic volumes within the residential precinct north of Milton Road in the vicinity of the Toowong connection has also been modelled. This assessment has taken into account the potential for use of the Gregory Street - Morley Street route for traffic seeking to access the Northern Link ramp connection. Key findings from this assessment are as follows:

- modelling shows that only traffic from the immediate local area (forecast as 360 vpd) would find it beneficial to use Morley Street to access the Northern Link entry ramp via a right turn movement from Morley Street. Approximately 140 vpd are forecast to use Morley Street as an exit route, with this traffic exiting to Croydon Street and then travelling via a circuitous route to access Morley Street These travel patterns have been illustrated in **Figure 9-9** and connection use forecasts are tabulated in **Table 9-4;**
- **Figure 9-13** illustrates that traffic reductions, compared to the without project scenario are forecast for the Gregory Street - Morley Street route. This occurs due to congestion relief effects that Northern Link provides within the wider network;
- resultant traffic volumes forecast on Morley Street by 2026 (as shown in **Table 9-6**) of 5,000 vehicles per average weekday would be greater than existing levels (less than 4,000 vpd) to due to the general pressure of increase travel demand in the inner west associated with growth in population and economic activity;
- without the project, and in the absence of improvements to the adjacent arterial road links such as Frederick Street and Milton Road, traffic demands of up to 6.700 vpd are forecast within this precinct, significantly above the typical level generally regarded as tolerable within a residential area (4,000 vpd). The traffic relief provided by Northern Link on the arterial links and at the Milton Road/Frederick Street roundabout and the upgrading of the Milton Road/Croydon Street intersection would clearly assist in reducing the pressure for through traffic intrusion (rat-running) into the precinct, As indicated in **Table 9-6,** a 25% reduction with Northern Link is forecast for 2026 however this would not solve the on-going issues forecast for this precinct; and
- as this precinct will remain challenged over time by through traffic pressures, an expansion of the currently planned local area traffic management (LATM) measures would be prudent to further protect the amenity of this residential area. Due to the proximity of the project to this on-going problem, it has been identified that it would be beneficial to investigate further local area traffic management (LATM) measures as part of the Traffic Management Plan. It is recommended that potential supplementary initiatives be considered for the precinct extending from Milton Road in the south to Birdwood Terrace in the north and from Frederick Street in the west to Wienholt Street in the east. The expanded LATM scheme would need to establish in consultation with local community. The scheme objectives would be to minimise the potential use of the local streets in this precinct by extraneous though traffic generally, whilst still allowing access to local residents and businesses.

9.6 Intersection Performance

The effect of the project on the performance of intersections within the network has been assessed. Locations have been selected to cover key signalised intersections on feeder routes to the facility, as well as intersections along the surface road network that would benefit due to diversion of traffic due to Northern Link. Intersections examined include:

- key intersections in the Coronation Drive and Milton Road corridors;
- intersections along Kelvin Grove Road corridor, including the Normanby Five-Ways intersection;
- locations along Musgrave Road including off ramps from Hale Street;
- key intersection along the Moggill Road corridor, inclusive of the Western Freeway on and off ramps;

- locations around the Toowong shopping precinct in particular, High Street, Jephson Street and intersecting local streets; and
- Sir Fred Schonell Drive and Brisbane Road.

Intersection assessment has been carried out using modelled volumes for the two hour peak period in the morning, and assuming that half of these volumes occur in a one-hour time period within the peak. In practice, however, as travel demand builds-up over the entire network in Brisbane, peak spreading would be likely to occur. This means that the peak period in the morning would begin to spread over a longer period than two hours, for example between 6.45am and 9.15am, or 3.30pm and 6.00pm for the evening peak period, consistent with an urban area with a larger population base. As transport demands increase as the population grows, some commuters who chose to travel to work by private vehicle, would be likely to adjust their time of trip-making within the peak period so as to avoid heavy congestion. Assuming all peak traffic occurs in the modelled two hour period is therefore conservative.

The intersection analysis provides an assessment of the relative forecast effects of the project compared to the without project scenario using this conservative assumption in both cases. The intersection Degree of Saturation (DoS) and Level of Service (LOS) is provided in **Table 9-10** for both year of opening 2014 and the future year of 2026 (10+ years from opening). This is the standard practice for traffic impact assessments for intersection effects.

Key effects on intersection performance and LOS are:

- significant benefits to the operation of the Mt Coot-tha Roundabout are indicated. In the future scenarios without Northern Link this roundabout, located where the Western Freeway intersects with Mt Coot-tha Road, is forecast to operate significantly above practical capacity. With Northern Link operational, significant traffic relief would occur and improved operations (LOS B) during both the morning and evening peak periods is forecast;
- a sound improvement in the operation of the Toowong Roundabout would occur, particularly during evening peak period;
- an overall improvement in operating conditions on Coronation Drive is indicated with the project. Intersections such as Cribb Street and Lang Parade would particularly benefit from traffic reductions. It should be noted that intersection operation assessment with the project has incorporated the re-introduction of tidal flow bus lane on Coronation Drive (as a maximum impact on general traffic performance), and slightly better overall performance would be likely at most locations with a permanent inbound T3 arrangement;
- Milton Road would show significant improvement with the project in 2026 with most intersections benefiting from the improved operating conditions associated with traffic relief during peak periods;
- Jephson Street would experience some decrease in LOS associated with increased traffic due to the project. Intersections that would be most heavily challenged by traffic increases are those with Sherwood Road and Lissner Street, although there is a re-distribution of movements forecast. The Lissner Street intersection with the project would still operate satisfactorily in the morning peak period and would continue to operate under a DOS of 1.00 during evening peak period in 2026. The Sherwood Road/Jephson Street intersection, both with and without the project has a forecast LOS F by 2026, and improvements would be desirable. Council has been actively pursuing set-backs along the Jephson Street corridor to facilitate future capacity improvements;
- the project incorporates a significant upgrade to the intersection of Jephson Street with Croydon Street and improved traffic operations are forecast;

- other intersections in the Toowong area such as High Street/Benson Street/Brisbane Street and the priority intersection of Bennett Street with Sylvan Road would show an overall improvement in the DOS;
- along Moggill Road the DOS and the LOS would at most locations improve for signalised intersections, due to decreased traffic volumes during both the morning and evening peak periods as evidenced by the results for the sample of intersections assessed in detail;
- at the intersection at the on ramp to the Western Freeway from Moggill Road, the LOS declines with the project, however remains satisfactory, at LOS D or better until 2026. At the intersection of the off ramp from the Western Freeway with Moggill Road, the LOS improves with the project due to traffic re-distribution effects; and
- here is little change in forecast operations of the intersections on Musgrave Road, Countess Street and in the College Road corridor compared to the without project scenarios, again influenced by the forecast re-distribution of traffic in this part of the network.

Where possible, grade separation has been incorporated within the project to ensure that traffic accessing or egressing the project tunnels would connect in an unimpeded manner to the connecting road network and not encounter a signalised intersection for a considerable distance. For exit traffic, this means that the potential for traffic exiting the tunnel to queue back from the first potential stop point upon egress would be minimised. The design of the project has been shaped so that this would occur are for the following major movements:

- exiting from the Western Connection to the Western Freeway;
- exiting from the Eastern Connection to ICB;
- Kelvin Grove Road North Facing on ramp; and
- Kelvin Grove South Facing on ramp from Kelvin Grove Road and Musgrave Road loop.

For other locations, where traffic exiting the tunnel would encounter a potential stop point, an analysis of the LOS and queuing at the exit has been undertaken as is provided in **Table 9-11**.

Measures used were:

- DOS: the ratio of the flow to the capacity of the movement; and
- queue: the maximum queue length relative to the stop line, below which a nominated percentage of all queue lengths fall. The desirable standard is 95% with 90% an absolute minimum.

Checks undertaken on key Northern Link movements found that:

- the Kelvin Grove off ramp to the southbound direction of Kelvin Grove Road would operate in 2026 with a LOS of D and a maximum queue length of 213m, demonstrating that the queue would not affect traffic on the off ramp that would go northbound on Kelvin Grove Road;
- the Musgrave Road loop to Kelvin Grove Road and Hale Street off ramp connection to Kelvin Grove Road/Musk Avenue intersection would operate with a LOS C and a maximum queue of 146m in 2026 meaning that the queue would not extend to the diverge of the Musgrave Road loop to the ICB; and
- the east facing off ramp to Milton Road/Croydon Street would operate with a maximum queue of 456m by 2026. This is within the 480m space available from the tunnel portal.

If excessive queuing were to develop, the operational measure to be implemented to manage queues associated with traffic flows into and out of the tunnel system would be identified within the Traffic Management Plan (Operations) for the facility.

A range of traffic movements would continue to need to be catered for at the surface road intersections in the vicinity of the access points to the project which are also catering for significant commuter traffic demands on the arterial network linking to the CBD at the eastern and western connections. Consequently at the Milton Road/Croydon Street intersection and the Kelvin Grove Road intersections the LOS would remain reasonably congested.

The Milton Road/Croydon Street/Morley Street intersection (with upgrading to cater for increased project traffic) would have a marginally improved LOS for all years with the project, except the pm peak period in 2026 with the project, where a decline is forecast. This intersection would however be accommodating a more direct, safer right turn from the western approach on Milton Road into Croydon Street for general traffic, replacing the current problematic routing of this traffic via Sylvan Road that occurs immediately upon exit from the roundabout.

The signalised intersection of Croydon Street/Sylvan Road/Jephson Street is forecast to experience improvements to the performance of the intersection with the project which can be attributed to the project upgrading incorporated at this location to manage traffic.

To manage these impacts, traffic signal co-ordination could be implemented through the Traffic Management Plan (Operations) for the facility to ensure that key movement streams using the surface road routes would not be unduly delayed. It is noted that traffic making east to west or northeast to southwest movements along Sylvan Road and Milton Road corridors through the western connection intersections, would find intersections further along their route less congested with an overall reduction in travel time. This is discussed further in S**ection 9.8**.

In the Kelvin Grove Road corridor intersection performance is similar to the without project scenario with the exception of the intersections with Blamey Street and Musk Avenue/Northern Link. These two intersections are both upgraded as part of the project and the degree of saturation in 2026 during the peak periods does not exceed 0.90. It is noted that the Normanby Five-Ways intersection is forecast to experience an improvement in its operation due to the re-rerouting of cross-city traffic away from this part of the CBD access network to use Northern Link for travel between the Kelvin Grove Road corridor and western suburbs.

Operation further along the Musgrave Road arterial route at the Hale Street on and off ramps would be congested in future years with variations between the peak evident, however there little overall difference forecast between the with and without project cases.

Many of the intersections in **Table 9-10** are forecast to be congested without the project in the future, and in peak periods have a high proportion of use associated with commuter traffic. As Brisbane grows, peak spreading will become more of an influence in the management of intersection throughput on these commuter routes.

Table 9-10 Intersection Performance without and with Northern Link – 2014 and 2026

Intersection	Peak	2007 LOS	2014				2026			
			Without NL		With NL		Without NL		With NL	
			Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS
Coronation Drive										
Coronation Drive/Cribb Street	AM	C	0.92	C	1.00	D	1.04	F	1.00	D
	PM	F	1.21	F	1.17	F	1.24	F	1.20	F
Coronation Drive/Park Road	AM	B	0.89	C	1.02	E	0.88	C	1.02	E
	PM	B	0.81	B	0.74	B	0.83	B	0.75	B
Coronation Drive/Land Street	AM	B	0.71	B	0.75	B	0.75	B	0.77	C
	PM	C	0.94	D	1.00	D	1.00	D	1.05	E
Coronation Drive/Boomerang (Hale Street)/Hale Street Link	AM	B	1.30	F	0.95	D	1.51	F	1.21	F
	PM	D	1.38	F	0.16	F	1.52	F	1.32	F
Coronation Drive/Sylvan Road	AM	B	0.66	B	1.00	E	0.63	A	0.95	D
	PM	B	0.67	B	0.83	B	0.72	B	0.84	B
Coronation Drive/Lang Parade	AM	C	1.06	F	1.03	F	1.14	F	1.06	F
	PM	C	1.07	F	0.92	C	1.10	F	0.92	C
Milton Road										
Milton Road/Cribb Street	AM	D	1.06	F	1.04	E	1.09	F	1.05	E
	PM	F	1.11	F	1.09	F	1.11	F	1.14	F
Milton Road/Park Road/Baroona Street	AM	F	1.07	F	1.05	F	1.07	F	1.08	F
	PM	D	0.99	D	0.89	C	1.01	E	0.94	D
Milton Road/Croydon Street	AM	C	0.94	D	0.88	D	1.02	E	0.92	D
	PM	D	1.00	E	0.96	E	0.99	E	1.07	F
Milton Road /Eagle Terrace	AM	C	0.95	D	0.84	C	0.99	E	0.90	C
	PM	D	0.95	D	0.92	C	1.02	E	1.03	C
Milton Road/Grimes Street	AM	A	0.82	B	0.73	B	0.82	B	0.74	A
	PM	C	0.96	D	0.99	E	0.99	D	0.99	D
Milton Road/Park Avenue	AM	A	0.90	B	0.82	A	0.91	B	0.84	A
	PM	A	0.85	A	0.77	A	0.85	A	0.78	A
Moggill Road										
Moggill Road/Western Freeway on Ramp	AM	A	0.58	A	0.61	A	0.61	A	0.76	B
	PM	C	0.77	C	1.00	D	0.80	C	1.00	D
Moggill Road/Western Freeway off Ramp	AM	C	0.73	C	0.65	C	1.04	D	0.63	C
	PM	C	0.89	C	0.88	C	1.19	F	1.00	C
Moggill Road/Russell Terrace	AM	C	0.73	C	0.59	B	0.73	C	0.57	B
	PM	B	1.00	A	1.00	A	1.00	A	1.00	A
Moggill Road/High Street/Jephson Street	AM	C	1.01	F	1.00	D	1.06	F	1.00	D
	PM	C	1.00	D	1.00	E	1.00	D	1.00	E
Moggill Road/Station Road	AM	B	0.83	B	0.64	A	0.84	B	0.61	A
	PM	C	0.95	D	0.93	D	0.98	E	0.97	D

Continued over

Intersection	Peak	2007 LOS	2014				2026			
			Without NL		With NL		Without NL		With NL	
			Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS
High Street										
High Street/Benson Street (Coronation Drive)	AM	C	0.88	C	0.76	C	0.93	C	0.77	C
	PM	D	0.89	D	0.83	C	0.91	D	0.83	C
Mt Coot-tha Roundabout										
Western Freeway/Mt Coot-tha Rd.	AM	A	1.21	E	0.78	B	2.52	F	0.80	A
	PM	B	1.21	E	0.73	A	2.02	F	0.76	B
Toowong Roundabout										
Frederick Street/Milton Road/Miskin Street	AM	F	0.78	E	0.86[1]	B	0.79	C	0.86[1]	B
	PM	E	1.14	D	0.87	B	1.09	D	0.91	B
Sylvan Road										
Sylvan Road/Bennett Street (Priority)	AM	n/a	1.31	n/a	1.32	n/a	1.57	n/a	1.30	n/a
	PM	n/a	2.69	n/a	1.28	n/a	4.27	n/a	1.52	n/a
Sylvan Road/Land Street	AM	C	0.78	C	0.44	C	1.00	C	0.54	C
	PM	C	0.52	C	0.36	C	0.51	C	0.41	C
Jephson Street										
Jephson Street/Sherwood Street	AM	C	0.95	E	0.98	E	1.03	F	1.08	F
	PM	D	0.97	E	1.14	F	1.19	F	1.39	F
Jephson Street/Lissner Street	AM	B	0.59	B	0.64	B	0.63	B	0.69	C
	PM	C	0.74	C	0.92	D	0.72	C	0.98	E
Jephson Street/Croydon Street	AM	D	3.27	F	0.80	C	3.56	F	0.83	C
	PM	D	1.19	F	0.95	C	1.41	F	0.95	D
Kelvin Grove Road										
Kelvin Grove Road/Herston Road	AM	B	0.66	B	0.68	B	0.65	B	0.68	B
	PM	C	0.82	C	0.84	C	0.81	C	0.83	C
Kelvin Grove Road/Lorimer Terrace	AM	B	0.77	C	0.77	C	0.89	C	0.85	C
	PM	D	0.87	D	0.87	D	0.91	D	0.99	F
Kelvin Grove Road/Prospect Terrace	AM	B	0.81	C	0.79	C	0.80	C	0.84	C
	PM	C	1.00	E	1.13	F	1.03	F	1.04	F
Kelvin Grove Road/Blamey Street [2]	*AM*	*B*	*1.00*	*E*	*0.85*	*C*	*1.00*	*E*	*0.89*	*C*
	PM	*A*	*0.68*	*B*	*0.76*	*C*	*0.68*	*B*	*0.82*	*C*
Kelvin Grove Road/Musk Avenue/Northern Link (with project) [2]	*AM*	*B*	*0.53*	*B*	*0.72*	*C*	*0.63*	*B*	*0.74*	*D*
	PM	*B*	*0.68*	*B*	*0.61*	*C*	*0.69*	*B*	*0.64*	*C*
Kelvin Grove Road/Ithaca Street	AM	C	0.87	D	0.85	C	0.99	E	0.92	D
	PM	C	0.73	C	0.70	B	0.74	C	0.69	B
Normanby 5 Ways	AM	D	1.14	F	0.83	D	1.16	F	0.85	D
	PM	D	1.01	F	1.00	F	0.99	E	0.94	E
Sir Fred Schonell Drive										
Sir Fred Schonell Drive/Gailey Road	AM	B	0.89	C	0.90	C	0.96	C	0.99	C
	PM	D	1.05	D	1.07	E	1.09	F	1.11	E

Continued over

Intersection	Peak	2007 LOS	2014				2026			
			Without NL		With NL		Without NL		With NL	
			Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS
Musgrave Road										
Musgrave Road/Hale Street Off Ramp	AM	B	0.57	B	0.73	B	0.58	B	0.72	B
	PM	C	0.63	C	0.64	B	0.62	C	0.74	B
Musgrave Road/Hale Street On Ramp	AM	A	0.97	C	1.00	D	1.00	C	1.02	D
	PM	A	1.16	F	1.07	E	1.13	F	1.11	F
Musgrave Road/Windsor Road	AM	C	1.03	F	0.94	D	1.04	F	0.98	E
	PM	F	1.01	E	1.00	E	1.00	E	1.00	E
Countess Street										
Countess Street/Secombe Street	AM	C	0.86	C	0.84	C	0.87	C	0.83	C
	PM	B	0.49	B	0.50	B	0.52	B	0.52	B
Countess Street/Upper Roma Street	AM	C	1.00	C	1.00	D	1.00	D	1.07	F
	PM	F	1.31	F	1.28	F	1.21	F	1.13	F
Spring Hill										
College Road/Gregory Terrace	AM	B	0.69	B	0.65	B	0.77	C	0.83	C
	PM	C	0.67	C	0.70	C	0.66	C	0.71	C
Wickham Terrace/ Leichardt Street	AM	B	1.00	B	1.00	C	1.00	B	1.00	B
	PM	B	0.47	B	0.48	B	0.71	C	0.53	B
Leichardt Street/Upper Edward Street	AM	D	0.87	D	0.81	D	0.88	D	0.89	D
	PM	B	1.00	B	1.00	B	1.00	B	1.00	B

Table Notes:
Level of Service (LoS),
Degree of Saturation (DOS X)
(1) – Does not include morning peak period traffic light on Miskin Street approach.
(2) – It is noted that strategic traffic modelling was undertaken for an initial concept displayed in the EIS consultation that truncated Victoria Park Road. Supplementary modelling was undertaken for the final EIS concept design that mains the existing left in and left out access at Victoria Park Road. Intersection volumes for this supplementary model runs have been used for SIDRA analysis.

Table 9-11 Traffic Performance of Intersections at Surface Connections

Surface Connection Intersection and Distance to Tunnel Portal or Conflict Zone (where applicable)		AM PEAK					PM PEAK				
		2007	2014 Without NL	2014 With NL	2026 Without NL	2026 With NL	2007	2014 Without NL	2014 With NL	2026 Without NL	2026 With NL
Toowong Connection											
Milton Road/Croydon Street/Morley Street	LOS[1]	C	D	D	E	D	D	E	E	E	F
	DOS(X)[2]	0.83	0.94	0.88	1.02	0.92	0.91	1.00	0.96	0.99	1.07
Northern Link East Facing Off Ramp - 480 metres to tunnel portal	LOS	-	-	E	-	E	-	-	F	-	F
	DOS (X)	-	-	0.87	-	0.92	-	-	0.93	-	1.03
	Queue[3]	-	-	158	-	225	-	-	231	-	456
Croydon Street/Sylvan Road/Jephson Street	LOS	D	F	C	F	B	D	F	C	F	D
	DOS (X)	0.80	3.27	0.80	3.56	0.83	0.90	1.19	0.95	1.41	0.95
Kelvin Grove Road Connection											
Kelvin Grove Road/Musk Avenue	LOS	B	B	C	B	D	B	B	C	B	C
	DOS(X)	0.56	0.53	0.72	0.63	0.74	0.60	0.68	0.61	0.69	0.64
Eastbound off ramp at Kelvin Grove Road - 10 metres to tunnel portal	LOS	-	-	D	-	D	-	-	C	-	C
	DOS(X)	-	-	0.72	-	0.74	-	-	0.61	-	0.64
	Queue[3]	-	-	196	-	213	-	-	159	-	191
Musgrave Road on ramp to Kelvin Grove Road and Hale Street off ramp to Kelvin Grove Road.	LOS	-	-	C	-	C	-	-	C	-	C
	DOS(X)	-	-	0.34	-	0.47	-	-	0.49	-	0.47
	Queue[3]	-	-	112	-	159	-	-	134	-	146
Kelvin Grove Road/Ithaca Street	LOS	C	D	C	E	D	C	C	B	C	B
	DOS (X)	0.69	0.87	0.85	0.99	0.92	0.75	0.73	0.70	0.74	0.69
Normanby Five Ways	LOS	D	F	D	F	D	D	F	F	E	E
	DOS (X)	0.96	1.14	0.83	1.16	0.85	0.92	1.01	1.00	0.99	0.94
Kelvin Grove Road/Blamey Street	LOS	B	E	C	E	C	A	B	C	B	C
	DOS (X)	0.71	1.00	0.85	1.00	0.89	0.62	0.68	0.76	0.68	0.82

Table Notes:
(1) Level of Service (LoS)
(2) Degree of Saturation (DOS X)
(3) 95% queue on Northern Link ramp

9.7 Effect on Network Performance

The forecast impact of the Northern Link project on the overall Metropolitan Area network performance is summarised in **Table 9-12**. This shows that the lower order roads would gain a positive effect from the implementation of Northern Link with an overall decrease in VKT or amount of travel on these roads. The increase in VKT on Motorways shows the redistribution of traffic from these lower order roads to Northern Link. There would be a very slight increase in overall vehicle kilometres travelled on the network of less then 0.15% in 2026. These forecast effects are shown graphically in **Figure 9-18**.

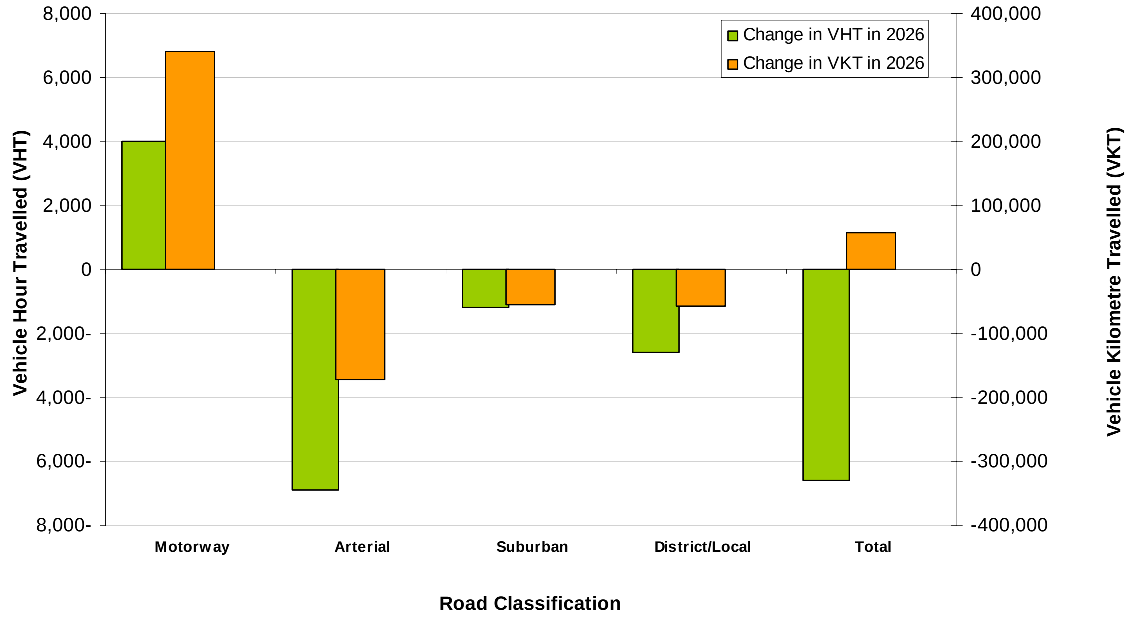
- **Table 9-12 Network Performance by Road Type without and With Northern Link**

Road Type	Without Northern Link			With Northern Link			Difference		% Difference	
	VHT(1)	VKT(2)(4)	Speed km/h	VHT(1)	VKT(2)(4)	Speed Km/h	VHT	VKT	VHT	VKT
2014										
Motorway	297,100	24,677,400		301,100(3)	24,956,700(3)		4,000	279,300	1.3%	1.1%
Arterial	444,900	20,442,200		438,000	20,306,900		-6,900	-135,300	-1.6%	-0.7%
Suburban	167,600	8,147,700		166,400	8,121,500		-1,200	-26,200	-0.7%	-0.3%
District	106,300	3,505,100		102,400	3,465,100		-3,900	-40,000	-3.7%	-1.1%
Local	52,100	1,315,500		53,400	1,305,700		1,300	-9,800	2.5%	-0.7%
Total	1,068,000	58,087,900	54.4	1,061,400	58,156,000	54.8	-6,600	68,100	-0.6%	0.1%
2021										
Motorway	361,100	29,431,800		365,000(3)	29,747,000(3)		3,900	315,200	1.1%	1.1%
Arterial	484,200	22,559,000		476,800	22,397,800		-7,400	-161,200	-1.5%	-0.7%
Suburban	185,500	9,059,800		184,400	9,016,500		-1,100	-43,300	-0.6%	-0.5%
District	120,300	3,833,500		119,900	3,791,200		-400	-42,300	-0.3%	-1.1%
Local	66,200	1,399,700		62,400	1,372,100		-3,800	-27,600	-5.7%	-2.0%
Total	1,217,300	66,283,800	54.5	1,208,500	66,324,600	54.9	-8,800	40,800	-0.7%	0.1%
2026										
Motorway	412,800	32,754,100		415,400(3)	33,094,000(3)		2,600	339,900	0.6%	1.0%
Arterial	514,700	23,578,300		504,600	23,406,800		-10,100	-171,500	-2.0%	-0.7%
Suburban	200,900	9,624,600		199,100	9,570,000		-1,800	-54,600	-0.9%	-0.6%
District	136,400	4,057,600		133,500	4,013,600		-2,900	-44,000	-2.1%	-1.1%
Local	73,900	1,465,200		73,900	1,451,700		0	-13,500	0.0%	-0.9%
Total	1,338,700	71,479,800	53.4	1,326,500	71,536,200	53.9	-12,200	56,400	-0.9%	0.1%

Table Notes:
Source: Northern Link Traffic Model
(1) VHT - Vehicle Hours Travelled on Average Weekday
(2) VKT - Vehicle Kilometres Travelled on Average Weekday
(3) Includes NL Tunnel VHT and VKT
(4) Excludes travel on traffic zone centroid connectors within the model.

The overall forecast reduction of less then 1% of vehicle hours travelled (VHT) along with the general increase in average network speed indicates a general lowering of congestion on the road network.

▪ **Figure 9-18 Changes in Overall Vehicle Kilometres and Vehicle Hours of Travel With Northern Link**



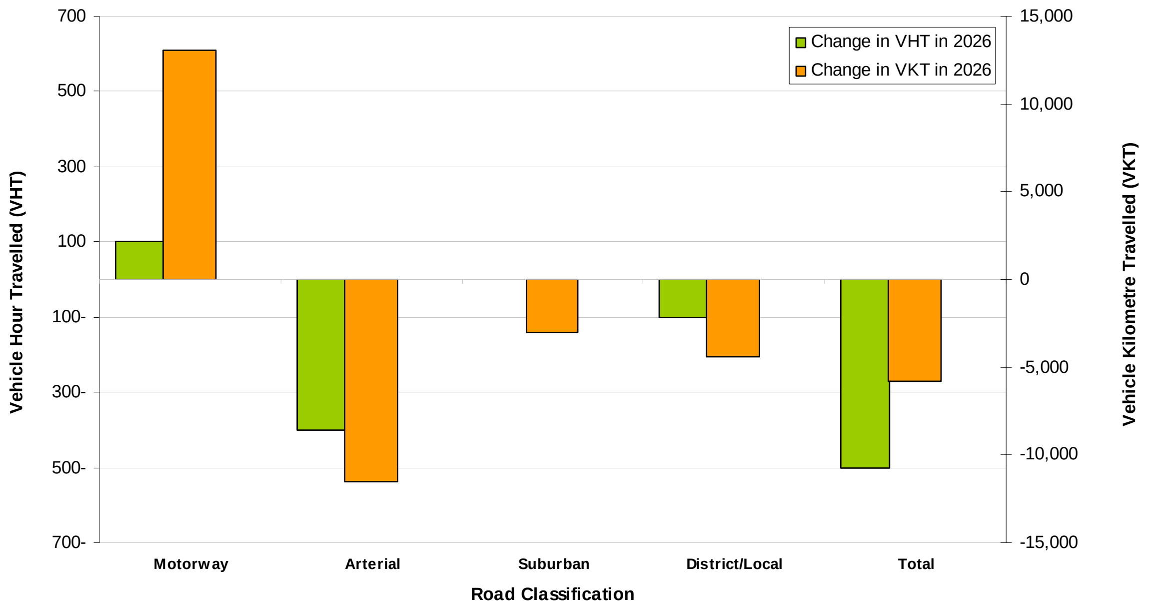
The forecast effect on network performance for commercial vehicle travel is provided in **Table 9-13** and is illustrated in **Figure 9-19**. There is an overall reduction of commercial vehicle kilometres travelled on suburban, district and local streets, with a corresponding redistribution and increase of travel on motorways (Northern Link is classified as a motorway). This is mirrored by the vehicle kilometres travelled and shows the truck usage shifting away from lower order roads onto motorways. This will provide important benefits to industry by reducing operating cost through increased travel speeds on the network and would improve amenity within residential areas by reducing the vehicle hours travelled by commercial vehicles on suburban, district and local roads.

- **Table 9-13 Commercial Vehicles Network Performance by Road Type without and With Northern Link**

Road Type	Without Northern Link			With Northern Link			Difference		% Difference	
	VHT(1)	VKT(2)(4)	Speed Km/h	VHT(1)	VKT(2)(4)	Speed Km/h	VHT	VKT	VHT	VKT
2014										
Motorway	21,400	1,853,000		21,500(3)	1,859,600(3)		100	6,600	0.5%	0.4%
Arterial	29,300	1,379,400		28,900	1,372,700		-400	-6,700	-1.4%	-0.5%
Suburban	9,000	436,600		9,000	435,300		0	-1,300	0.0%	-0.3%
District	5,100	190,400		5,000	189,500		-100	-900	-2.0%	-0.5%
Local	3,000	72,400		3,000	72,000		0	-400	0.0%	-0.6%
Total	67,800	3,931,800	58.0	67,300	3,929,100	58.4	-500	-2,700	-0.7%	-0.1%
2021										
Motorway	25,300	2,128,500		25,400(3)	2,137,400(3)		100	8,900	0.4%	0.4%
Arterial	32,000	1,521,400		31,600	1,511,400		-400	-10,000	-1.3%	-0.7%
Suburban	10,300	500,000		10,300	499,200		0	-800	0.0%	-0.2%
District	6,000	214,500		5,900	213,200		-100	-1,300	-1.7%	-0.6%
Local	4,100	82,700		4,100	82,000		0	-700	0.0%	-0.8%
Total	77,800	4,447,100	57.2	77,300	4,443,100	57.5	-500	-4,000	-0.6%	-0.1%
2026										
Motorway	27,900	2,291,500		28,000(3)	2,304,600(3)		100	13,100	0.4%	0.6%
Arterial	34,100	1,602,300		33,500	1,590,800		-600	-11,500	-1.8%	-0.7%
Suburban	11,300	540,800		11,200	537,800		-100	-3,000	-0.9%	-0.6%
District	7,000	235,200		6,900	232,300		-100	-2,900	-1.4%	-1.2%
Local	4,800	89,100		4,800	87,600		0	-1,500	0.0%	-1.7%
Total	85,100	4,758,800	55.9	84,200	4,753,000	56.4	-900	-5,800	-1.1%	-0.1%

Table Notes:
Source: Northern Link Traffic Model
(1) VHT - Vehicle Hours Travelled on Average Weekday
(2) VKT - Vehicle Kilometres Travelled on Average Weekday
(3) Includes NL Tunnel VHT and VKT
(4) Excludes travel on traffic zone centroid connectors within the model.

- **Figure 9-19 Changes in Commercial Vehicle Kilometres and Commercial Vehicle Hours of Travel With Northern Link**



9.8 Travel Time Benefits

An assessment of the effect of the project on travel times has been undertaken by comparing estimates of peak period travel times without the project to travel times, both on surface road routes and via Northern Link itself, once the project is operational.

Estimated travel times for key routes during peak periods without and with Northern Link have been extracted from the strategic model. **Table 9-14** provides a summary of forecast travel times for regional and cross city routes. **Table 9-15** summaries forecast travel times for central city and inner west trips. The travel time routes are displayed in **Figure 9-20**. These routes have been selected to show key travel movements within the study area and the greater metropolitan area such as:

- Central city travel (Route B: Chapel Hill to Spring Hill)
- Cross-city travel (Route C: Toowong to Newmarket, Route E: Indooroopilly to Chermside)
- Regional cross-city trips to the ATC/Airport from the Western Corridor (Route D) and Toowong (Route F)

Direct comparison with surface routes such as Milton Road and Coronation Drive have been summarised to show the forecast travel time savings associated with and without the project. Where appropriate the forecast travel time benefits associated with Northern Link have been based on the best performing surface route of either the Coronation Drive or Milton Road corridors in order to give the most conservative travel time saving (ie: quickest surface route verses the project route).

The travel times listed provide a reasonable guide to the relative forecast change in travel times that would be expected to occur due to the project. Although they include indicative intersection delays, forecast by the strategic model, each intersection is operationally unique and the forecast delays will not fully reflect the complexities of all of the intersections involved. It should be noted that improvements in travel time forecast in the strategic model generally result from lower congestion levels, and reflect a more stable road network in terms of journey time variability. Associated with any forecast reductions in travel times there would also be reliability improvements in travel time provided by the project.

As expected, over time, increased vehicle demand and congestion on the network would increase the forecast travel times with and without the project, with peak period speeds and journey times declining and increasing respectively. This is usual for most routes except for those that would benefit from travel time savings associated with other major infrastructure projects such as the Airport Link and the CLEM7 between 2007 and 2014. The pattern of declining travel speeds and increasing travel times would resume between 2014 and 2026.

The forecast travel time benefit for regional and ATC/Airport related travel using Northern Link (Routes D, E and F) is significant with Indooroopilly to Chermside (Route E) routes showing 53% savings in the morning peak and 54% in the evening peak. This is a forecast saving of 22 minutes and 24 minutes respectively compared to the scenario without the project. Large benefits are also seen for airports trips from both the western corridor (Route D) and trips originating in the study area (Route F). For Route D, savings of 23% or 16 minutes in the morning would be expected in 2026 with a 25% or 18 minute saving in the evening. Toowong to the Airport (Route F) in 2026 is on average 50% quicker than without the project with savings in the morning peak of around 13-14 minutes compared to either Coronation Drive or Milton Road. The evening peak period savings are slightly higher with a comparison to Coronation Drive against the project showing 62% decreases in travel time or 23 minute savings. Milton Road to the Airport compared to using Northern Link shows a 55% reduction in travel time or a 20 minutes saving.

Regional trips choosing to use the surface network with the project in place would also receive benefits to travel time, though to a lesser extent. Indooroopilly to Chermside (Route D) shows the greatest forecast trip saving benefits to the surface network with 20% savings in the morning peak and 18% in evening peak. Airport trips have varying degrees of benefit with an average saving of around 8% in the morning and 3% in the evening peak. When viewing these results it should be noted that the routes from Toowong to the Airport via Northern Link (Route F) use the Airport Link facility. The surface routes that have been analysed for both the with and without project scenarios are completely toll free routes and access the Airport via Kingsford Smith Drive and do not use Airport Link.

Central City trips travelling on Northern Link to reach the city (Route B) would receive benefits compared to the without project case where the radial network consisting of Coronation Drive and Milton Road are used. With the project, morning peak savings of around 61% on Northern Link compared to the without project case can be expected, while the alternative routes would also benefit with morning peak savings of 36% on Milton Road and 16% on Coronation Drive. Evening peak travel times via Northern Link are forecast to reduce by 46% compared to the surface network without the project. With the project in place time savings of 19% on Coronation Drive and 6% on Milton Road are forecast to be experienced by trips that do not use Northern Link.

Cross City routes such as Centenary Bridge to the ICB Land Bridge (Route A) and Toowong to Newmarket (Route C) have been analysed and show trip savings of greater then 50% in the morning peak when using Northern Link and average of 48% saving in the evening peak. The is equivalent to trip savings of greater then 10 minutes in the morning and 8 minutes in the evening peak. Similar trips using the surface network of Coronation Drive and Milton Road also gain benefits from the project to a lesser degree. Average savings of 32% are seen in the morning peak on Milton Road and 15% on Coronation Drive in 2026. Travel time savings in the evening peak for the route via Milton Road are forecast to provide a 3% benefit compared to the scenario without the project. Travel time savings for the surface route via Coronation Drive are forecast to experience an average travel time saving of 15%.

Figure 9-21 and **Figure 9-22** illustrate the forecast change in peak period travel times that would be experienced in 2026 for Northern Link users compared to the scenario without the project. **Figure 9-21** and

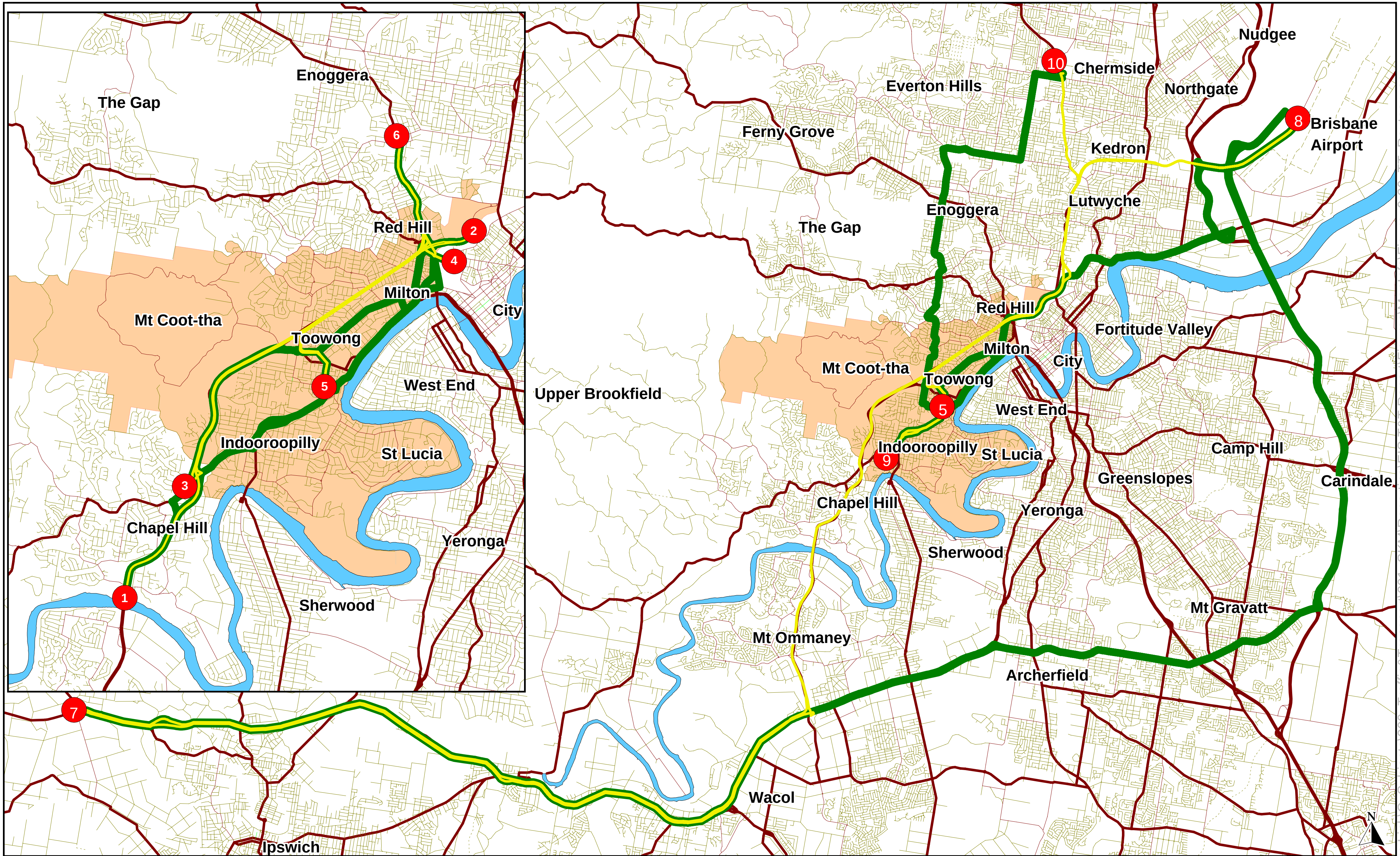
Figure 9-22 illustrate change in morning peak travel time from Toowong and Indooroopilly, and **Figure 9-23** compares evening peak travel times from Kelvin Grove. These figures clearly illustrate the travel time benefits provided by Northern Link for cross-city trips extend over a wide reach, and clearly improve the convenience of travel between the major growth area of the Western Corridor and western suburbs of Brisbane, and the regional road network to the north of Brisbane and the major growth area of the Australia Trade Coast.

■ **Table 9-14 Effects of Northern Link on Travel Times and Speeds for Key Routes – Regional and ATC/Airport Travel**

Route (refer to Figure 9-20 for travel time routes)	Direction	Without NL		With NL				NL Time Benefits			
				On Surface		Via NL		On Surface		Via NL	
		(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(%)	(min)	(%)
AM Peak Hour											
2007											
D - Western Corridor to Airport	E/B – N/B	69	59	-	-	-	-	-	-	-	-
E - Indooroopilly to Chermside	E/B – N/B	34	35	-	-	-	-	-	-	-	-
F - Toowong to Airport - Milton Road	E/B – N/B	29	42	-	-	-	-	-	-	-	-
F - Toowong to Airport - Coronation Drive	E/B – N/B	30	40	-	-	-	-	-	-	-	-
2014											
D - Western Corridor to Airport	E/B – N/B	58	67	58	68	46	75	-0.4	-1%	-12	-20%
E - Indooroopilly to Chermside	E/B – N/B	35	33	33	35	20	53	-1.9	-5%	-15	-43%
F - Toowong to Airport - Milton Road	E/B – N/B	28	41	25	45	14	80	-2.4	-9%	-13	-49%
F - Toowong to Airport - Coronation Drive	E/B – N/B	29	40	27	42	14	80	-1.3	-5%	-14	-50%
2026											
D - Western Corridor to Airport	E/B – N/B	70	55	69	56	55	64	-1.3	-2%	-16	-23%
E - Indooroopilly to Chermside	E/B – N/B	42	28	34	35	20	52	-9	-20%	-22	-53%
F - Toowong to Airport - Milton Road	E/B – N/B	40	28	33	34	19	59	-6.9	-17%	-21	-52%
F - Toowong to Airport - Coronation Drive	E/B – N/B	38	30	35	32	19	59	-2.8	-7%	-19	-49%
PM Peak Hour											
2007											
D - Western Corridor to Airport	W/B – S/B	71	57	-	-	-	-	-	-	-	-
E - Indooroopilly to Chermside	W/B – S/B	34	34	-	-	-	-	-	-	-	-
F - Toowong to Airport - Milton Road	W/B – S/B	29	44	-	-	-	-	-	-	-	-
F - Toowong to Airport - Coronation Drive	W/B – S/B	30	43	-	-	-	-	-	-	-	-
2014											
D - Western Corridor to Airport	W/B – S/B	59	66	58	67	47	75	-0.4	-1%	-12	-20%
E - Indooroopilly to Chermside	W/B – S/B	37	32	35	33	20	51	-1.3	-4%	-17	-45%
F - Toowong to Airport - Milton Road	W/B – S/B	32	38	31	39	14	81	-1	-3%	-18	-56%
F - Toowong to Airport - Coronation Drive	W/B – S/B	34	35	34	35	14	81	0.1	0%	-20	-59%
2026											
D - Western Corridor to Airport	W/B – S/B	70	55	67	58	53	67	-3.8	-5%	-18	-25%
E - Indooroopilly to Chermside	W/B – S/B	44	26	36	32	21	51	-8	-18%	-24	-54%
F - Toowong to Airport - Milton Road	W/B – S/B	34	36	34	36	14	81	0	0%	-20	-58%
F - Toowong to Airport - Coronation Drive	W/B – S/B	39	31	37	33	14	81	-2.2	-6%	-25	-64%

Table 9-15 Effects of Northern Link on Travel Times and Speeds for Key Routes – Central City and Inner West Travel

Route (refer to Figure 9-20 for travel time routes)	Direction	Without NL				With NL						NL time Benefit					
		via Coronation Drive		via Milton Road		Coronation Drive		Milton Road		via Northern Link		via Coronation Drive		via Milton Road		via Northern Link	
		(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(%)	(min)	(%)	(min)	(%)
AM Peak Hour																	
2007																	
A - Centenary Br. to Land Br.	E/B – N/B	21	34	20	38												
B - Chapel Hill to Spring Hill	E/B – N/B	19	27	18	30												
C - Toowong to Newmarket	E/B – N/B	14	28	14	30												
2014																	
A - Centenary Br. to Land Br.	E/B – N/B	24	30	23	33	23	32	19	39	12	62	-1	-5%	-4	-17%	-12	-50%
B - Chapel Hill to Spring Hill	E/B – N/B	21	24	20	26	19	27	16	34	10	54	-2	-10%	-5	-24%	-11	-51%
C - Toowong to Newmarket	E/B – N/B	16	25	16	26	15	27	13	32	9	50	-1	-9%	-3	-17%	-7	-43%
2026																	
A - Centenary Br. to Land Br.	E/B – N/B	26	27	28	27	22	32	19	41	9	79	-4	-16%	-9	-33%	-17	-66%
B - Chapel Hill to Spring Hill	E/B – N/B	24	21	26	20	20	25	16	32	9	57	-4	-16%	-9	-36%	-15	-61%
C - Toowong to Newmarket	E/B – N/B	18	22	21	20	16	25	14	29	9	50	-3	-14%	-7	-32%	-10	-52%
PM Peak Hour																	
2007																	
A - Centenary Br. to Land Br.	W/B – S/B	20	36	18	42												
B - Chapel Hill to Spring Hill	W/B – S/B	19	27	17	31												
C - Toowong to Newmarket	W/B – S/B	16	27	15	28												
2014																	
A - Centenary Br. to Land Br.	W/B – S/B	24	31	20	37	24	31	20	38	11	63	0.1	0.4%	-0.5	-3%	-9	-43%
B - Chapel Hill to Spring Hill	W/B – S/B	22	23	20	28	22	23	19	29	11	48	-0.2	-0.9%	-0.6	-3%	-8	-42%
C - Toowong to Newmarket	W/B – S/B	19	23	16	26	19	23	15	28	9	50	-0.2	-1.1%	-1.3	-8%	-8	-47%
2026																	
A - Centenary Br. to Land Br.	W/B – S/B	28	26	20	38	23	31	19	39	10	70	-5	-16%	-0.4	-2%	-9	-48%
B - Chapel Hill to Spring Hill	W/B – S/B	28	18	21	26	23	22	20	28	11	49	-5	-19%	-1.2	-6%	-10	-46%
C - Toowong to Newmarket	W/B – S/B	23	19	17	25	19	22	16	27	9	48	-3	-14%	-0.9	-5%	-8	-46%



LEGEND

- Inner West Transport Study Area
- Travel Time Route via Northern Link
- Travel Time Route via Surface Route
- State Strategic and Regional Roads
- Other Roads

1 – 2 Route A: Centenary Highway to Inner City Bypass Landbridge
3 – 4 Route B: Chapel Hill to Sping Hill
5 – 6 Route C: Toowong to Newmarket
7 – 8 Route D: Western Corridor to ATC/Airport
9 – 10 Route E: Indooroopilly to Chermside
5 – 8 Route F: Toowong to Airport/ATC

Northern Link
Environmental Impact Statement

Figure 9-20

Travel Time Comparison Routes

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LEGEND

- Travel Time (mins) < 10
- 10 < Travel Time (mins) < 20
- 20 < Travel Time (mins) < 30
- 30 < Travel Time (mins) < 40
- 40 < Travel Time (mins) < 50
- 50 < Travel Time (mins)

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 9-21

Change in 2026 Morning Peak Travel Time from Toowong with Northern Link

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LEGEND

- Travel Time (mins) < 10
- 10 < Travel Time (mins) < 20
- 20 < Travel Time (mins) < 30
- 30 < Travel Time (mins) < 40
- 40 < Travel Time (mins) < 50
- 50 < Travel Time (mins)

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 9-22

Change in 2026 Morning Peak Travel Time From Indooroopilly with Northern Link

Northern Link

SKM Connell Wagner JOINT VENTURE

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LEGEND

- Travel Time (mins) < 10
- 10 < Travel Time (mins) < 20
- 20 < Travel Time (mins) < 30
- 30 < Travel Time (mins) < 40
- 40 < Travel Time (mins) < 50
- 50 < Travel Time (mins)

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 9-23

Change in 2026 Evening Peak Travel Time from Kelvin Grove with Northern Link

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9.9 Local Access Effects

The main traffic impacts caused by the implementation of Northern Link would generally be confined to the tunnel portal areas and immediate approaches. Other effects would however extend for the entire route due to changes in traffic flows as a result of the project and these have been discussed previously in this Chapter.

The key local effects have been considered in the following areas:

Western connections:

- Western Freeway precinct (the area west of Frederick Street and including the Mt Coot-tha Botanic Gardens, Anzac Park and the Toowong Cemetery);
- Toowong north precinct (the area in Toowong north Milton Road and east of Frederick Street); and
- Toowong south precinct (the area in Toowong south of Milton Road and east of Miskin Street.

Eastern connection:

- ICB precinct;
- Kelvin Grove precinct (west of Kelvin Grove Road); and
- Kelvin Grove Urban Village (east of Kelvin Grove Road).

9.9.1 Western Freeway Precinct

The existing arrangements from the eastern end of the Western Freeway at the Mt Coot-tha Roundabout to, and including, the Toowong Roundabout are proposed to remain. Consequently, the existing access to Mt Coot-tha Road, Dean Street, Miskin Street and Frederick Street would not alter and so access to the Mt Coot-tha Botanic Gardens, Anzac Park and the Toowong Cemetery are proposed to be unaltered.

In addition the effects of reduced traffic volumes east of the Western Freeway ramps and on Mt Coot-tha Road due to changed traffic patterns due to Northern Link (as described in **Section 9.2**) would benefit traffic operations in this precinct.

In summary, the project would have an overall beneficial effect on local traffic access to the Western Freeway precinct.

9.9.2 Toowong North Precinct

The existing operation and local access from Frederick Street is proposed to remain unchanged with the exception of the left-in and left-out access from Valentine Street that would be closed so creating a cul-du-sac. With the project both Valentine Street and Gregory Street would no longer have direct access with Milton Road. Convenient access to both Valentine Street and Gregory Street would be available via Morley Street.

The project design would allow for local access from Morley Street to the eastbound Northern Link on ramp, which would be located on Milton Road, via a right turn movement at the signalised intersection of Morley Street and Milton Road.

As discussed previously in **Section 9.2.1**, demand for use of Northern Link via Morley Street is forecast to be minimal and would be confined to only local precinct traffic. The demand for Northern Link use from the suburbs north of Milton Road (Auchenflower, Paddington, Bardon, Ashgrove) would be minimal, as is illustrated in **Figure 9-5**. Improved accessibility to these suburbs directly via Northern Link in not part of the project's function and the ramp arrangements incorporated within the concept design do not therefore facilitate a convenient, direct route from these suburbs to the east. It is noted that forecast traffic reductions on Latrobe Terrace and Given Terrace (for example), will provide for improved travel conditions via the surface network for trips from these suburbs to destinations in the east such as the Central City, ICB, the Airport, and the regional road network to the north. The potential for traffic access from the north via the precinct would be further mitigated by an expanded local traffic management scheme for the precinct, as discussed previously in **Section 9.2.1.**

The properties on the northern kerb of Milton Road between Gregory Street and Morley Street and further eastwards on Milton Road through to Penrose Street would continue to be accessed through existing access points through left in and left out movements.

In summary, there are minimal effects of the project on local traffic access in the Toowong precinct north of Milton Road. Where current access arrangements would be altered, suitable alternative arrangements have been incorporated into the project design so that both Valentine Street and Gregory Terrace can be accessed from Milton Road via Morley Street. To mitigate against extraneous through traffic it is recommended that a LATM measure be implemented within the Toowong north precinct.

9.9.3 Toowong South Precinct

Access to Miskin Street from the Toowong roundabout would not be altered with the project.

Local access to the residential precinct to the south of Milton Road and east of Miskin Street, which includes a school, would alter with the project. This is as the westbound Northern Link off ramp would connect with Milton Road in the median and the eastbound on ramp would exit Milton Road from the southern kerb. The structures associated with these ramps would require the removal of the existing priority right turn from Milton Road to Sylvan Road (located in very proximity to the roundabout exit) and the closure of the current access to Quinn Street from Milton Road. Access to Sylvan Road would be facilitated within the design through the provision of a right turn movement at the signalised intersection of Milton Road and Croydon Road (a movement which is currently not able to be provided for at this location due to intersection capacity constraints). Access to Sylvan Road and Quinn Street would be completed through the right turn from Croydon Street to Sylvan Road. Alternatively, Sylvan Road and Quinn Street would be accessible from Ascog Terrace via Miskin Street. These proposed revised access arrangements are considered to be reasonable, provide for safer traffic operations on Sylvan Road for cyclists due to the removal of through traffic on Sylvan Road in the eastbound direction between Milton Road and Croydon Street.

The proposed surface works on Croydon Street include a central median and the removal of the existing properties on the western kerb between Milton Road and Jephson Street. The central median would include a break at Cadell Street to facilitate right turn movements from Croydon Street and the right turn out of Cadell Street to Croydon Street would be prevented on safety grounds. Access to properties on the eastern kerb of Croydon Street and to Bayliss Street would be left in and left out only. Convenient access would remain to Bayliss Street via Park Avenue for trips from the north and south and from Cadell Street for trips from the west. As the right turn from Bayliss Street and Cadell Street would be banned trips to Milton Road and Frederick Street could be via Park Avenue or Sylvan Road. Trips to the Toowong north precinct, accessed at Morley Street, would be via Sylvan Road, St Osyth Road and Croydon Street.

The proposed surface works maintain the existing unnamed laneway between Croydon Street and St. Osyth Street for vehicular access to the rear of properties on Sylvan Road.

With the project, significant changes are proposed to the signalised intersection of Croydon Street, Jephson Street and Sylvan Road. This would include the removal of the right turn from Jephson Street to Sylvan Road. Appropriate local access would be available for this movement via Lissner Street and Bennett Street. The removal of this right turn, traffic reduction and redistribution of trips due to the Northern Link project would result in trips originating from West Toowong using the regional road network (Miskin Street, Sherwood Road, Moggill Road and High Street) for trips to the east rather than local streets.

During peak traffic periods, on-street parking would not be possible on both sides of Croydon Street between Jephson Street and Milton Road. The proposed surface works on Croydon Street would result in the removal of all existing properties on the western side of Croydon Street and future re-development would need to ensure that suitable off-street parking provision was incorporated.

Although Croydon Street would experience significantly increased traffic flow with the project the proposed surface works and intersection improvements would result in improved intersection operations (as reported in **Section 9.6**).

In summary, there would be moderate effects of the project on local traffic access in the Toowong south precinct. However, suitable alternative access arrangements have been incorporated into the project design to minimise adverse impacts.

9.9.4 Inner City Bypass

The proposed connection of Northern Link with the ICB would be located to the east of Kelvin Grove Road and maintains the existing connectivity of the ICB with Hale Street, Ithaca Street and Kelvin Grove Road. Similarly, the existing connectivity of Hale Street with Musgrave Road and Kelvin Grove would remain unaltered.

The proposed connection of Northern Link with the ICB would be located to the east of Kelvin Grove Road and would maintain the existing connectivity of the ICB with Hale Street, Ithaca Street, Victoria Park Road and Kelvin Grove Road. Similarly, the existing connectivity of Hale Street with Musgrave Road and Kelvin Grove would remain unaltered. The effect of the project on local access would be minimal.

9.9.5 Kelvin Grove Precinct

On the western side of Kelvin Grove Road between the ICB and Victoria Street the proposed local access changes that would be required to facilitate the Northern Link connection with Kelvin Grove Road are summarised in **Table 9-16** along with an assessment of the effect of the proposed change.

Table 9-16 Proposed local access changes in the Kelvin Grove precinct

Street	Current access	Proposed access	Alternative Route	Effect
Lower Clifton Terrace	One way north bound - left in from Musgrave Road and left out to Kelvin Grove Road	Two way street and closed at Kelvin Grove Road. Left in and left out with Musgrave Road	Trips to Kelvin Grove Road via left out to Musgrave Road and left turn at signalised intersection from Musgrave Road to Kelvin Grove Road.	Marginally increased travel time for low number of people for trips to Kelvin Grove Road Reduced traffic volume.
Upper Clifton Terrace	All movements with Musgrave Road. No access to Kelvin Grove Road	No change	No change	No change
Westbury Street	Left in from Kelvin Grove Road and left and right to Victoria Street for access to Kelvin Grove Road (left out) and Windsor Road and Musgrave Road	Access with Kelvin Grove Road closed	Access to Kelvin Grove Road via Victoria Street and Windsor Road or Prospect Terrace.	Marginally increased travel time for low number of people for trips to Kelvin Grove Road
Victoria Street	Left in and left out with Kelvin Grove Road and all movements with Windsor Road and other local streets in the network for access to Musgrave Road and Prospect Terrace.	Access with Kelvin Grove Road closed	Access to Kelvin Grove Road via Victoria Street and Windsor Road or Prospect Terrace.	Marginally increased travel time for low number of people for trips to Kelvin Grove Road. Reduced traffic volume.
Prospect Terrace	All movements at Kelvin Grove Road (signalised intersection)	Currently it is not possible to access Musgrave Road from the ICB (westbound). The route of ICB – Ithaca Street, Kelvin Grove Road, Victoria Street is currently used as an alternative.	Musgrave Road accessed from ICB (westbound) via Ithaca Street, Kelvin Grove Road, Prospect Terrace.	Increased travel time. Increased traffic volume.

The proposed Northern Link connection with Kelvin Grove Road provides for additional road capacity at the signalised intersections of Kelvin Grove Road with Musk Avenue and Blamey Street. This would result in marginally increased journey times of just over 10% (approximately 30 seconds) in 2026 (compared to the without project scenario) from the Ithaca Street off ramp of the ICB to the intersection of Windsor Road and Prospect Terrace during the morning peak period and just over 15% (over 30 seconds) during the evening peak period.

The proposals would also result in reduced traffic volumes on the local streets within this precinct, for example on Lower Clifton Terrace and Victoria Street.

In summary, the proposed changes to the local road network adjacent to Kelvin Grove Road that have been presented above would result in marginally increased journey times and reduced traffic volumes on the local streets within the precinct to the west of Kelvin Grove Road.

9.9.6 Hospitals

Hospitals within or close to the study area include the Wesley Hospital in Auchenflower, Toowong Private Hospital and the Royal Brisbane Hospital in Herston.

The project would not affect access arrangements to the Wesley Hospital in Auchenflower or the Toowong Private Hospital, which is located on the southern kerb of Milton Road between Park Avenue and Croydon Street. The Toowong Private Hospital would continue to be accessed from both Milton Road and Cadell Street. Reduction in traffic volumes are forecast on Milton Road, Coronation Drive and local streets within the vicinity of these hospitals would however improve travel times for both routine and emergency access. Overall regional accessibility to these facilities would be improved, with significant travel time benefits for travel to these hospitals via Northern Link from suburbs to the east and north.

Similarly, the project would not affect access to the Royal Brisbane Hospital in Herston. Northern Link tunnel would provide significant travel time savings for trips from the west to the Royal Brisbane Hospital for ambulance and emergency trips.

9.9.7 Emergency Services Vehicles

The project would not alter existing access to Police Stations, Queensland Fire and Rescue Service stations or ambulance stations that are located within or close to the Inner West Transport Study Area. Forecast traffic reductions within the study area on regional roads and local streets would reduce response times, and emergency vehicles would experience the travel time benefits facilitated by direct use of the project.

9.10 Rail Services and Infrastructure

The Northern Link project would not have an effect on rail services or access to QR infrastructure.

9.11 Bus Travel Effects

Effects on bus travel due to the project would include:

- changes in travel time and travel time reliability due to changed traffic conditions or traffic volumes on the road network;
- potential for bus services to utilise Northern Link when operational; and
- changes to the location of bus stops.

The effects on bus operations during construction are discussed specifically in **Section 11**.

9.11.1 Corridor Effects

Traffic reductions compared to the without project scenario are forecast on a number of road corridors in the Inner West Transport Study Area that cater for bus routes. Reduced traffic would improve travel times and travel time reliability, compared to the scenario without the project. In some instances on feeder routes such as the Western Freeway and Kelvin Grove Road the project would result in increased forecast traffic volumes so the resultant effect on bus travel times in these areas has been examined.

The major bus corridors are Milton Road, Coronation Drive, Moggill Road, Kelvin Grove Road and Musgrave Road. To assess the effects on bus travel on these corridors due to changes in traffic conditions with the project, an assessment of peak hour travel times along major bus routes on the surface road system, once the project is operational, has been undertaken. Estimated change in overall traffic volumes, the change in travel speed in the peak direction, and the forecast bus use for key routes during peak periods are summarised in **Table 9-17**. These have been extracted from the strategic model. The travel time comparison routes are shown in **Figure 9-24**.

Key findings from the assessment are:

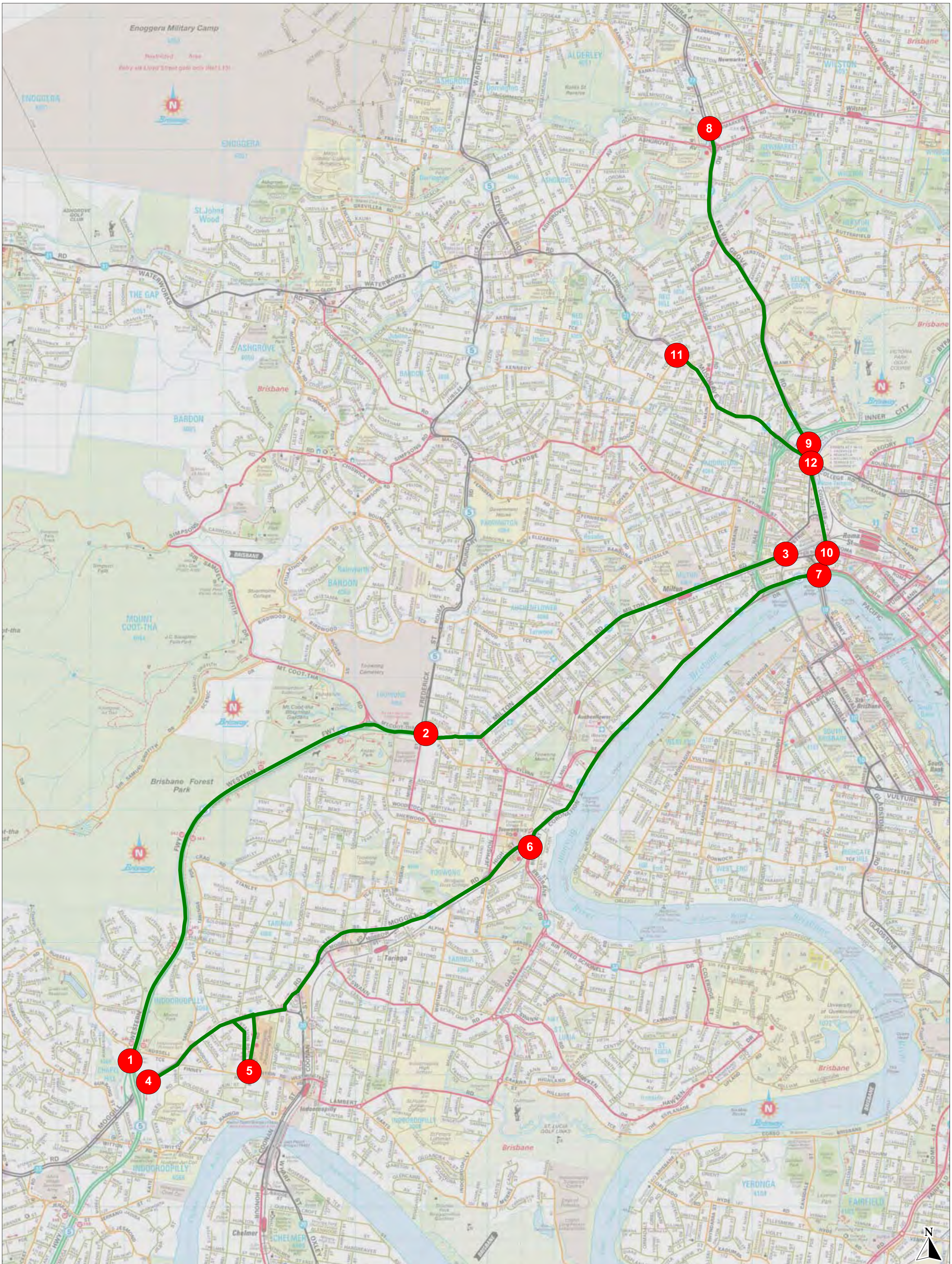
- During peak hours Coronation Drive would have significant traffic reductions and increased travel speeds. Coronation Drive is the highest utilised corridor for bus services in the Inner West Transport Study Area. The project is forecast to yield travel time savings of over 3 minutes in the morning peak period and 2.5 minutes in the evening peak period for commuter trip to the CBD along Coronation Drive compared to the scenario without Northern Link. These estimated travel times (extracted from strategic model comparisons of general traffic lane travel times during the peak period) are conservative they do not specifically measure the additional benefits that would be offered by implementation of a bus priority initiative such as a tidal flow bus lane or inbound T3 lane on Coronation Drive. An overall speed improvement of around 25% in the peak periods is forecast for Coronation Drive in 2026 compared to the scenario without Northern Link, and this would improve travel time reliability for bus passengers.
- For the counter commuter peak direction on Coronation Drive (for example outbound in the morning peak) the forecast traffic reductions would lead to travel time reductions for bus passengers travelling to the University of Queensland.
- Milton Road would also experience reductions in traffic volumes that would lead to increased travel speeds for all vehicles including buses. Improvement in bus travel speeds of over 30% in the morning peak direction and 20% in the evening peak direction are forecast for 2026 compared to the scenario without the project.
- Traffic on the Western Freeway approach to Northern Link is forecast to increase. Bus services that use the Western Freeway are predominantly rocket services that also use Milton Road to access the CBD. **Table 9-17** shows that the effect of the traffic reductions on Milton Road would provide an overall benefit for CBD destined bus services, even taking into account the effects of increased traffic on the Western Freeway.
- Marginal travel time savings are forecast for bus services that use Moggill Road corridor between the Western Freeway and Benson Street in Toowong.
- At the eastern connection of the project on Kelvin Grove Road increases in traffic volume are forecast. Due to proposed upgrades of key intersections the effect on peak period bus services would be limited to a 15% increase in travel time for the peak direction between Newmarket Road and Ithaca Street. This would be equivalent to an increase of less than one minute in 2026 compared to the scenario without Northern Link. Marginal travel improvements are forecast for the component of a CBD based bus trip between Ithaca Street and Roma Street that would reduce the impact of the travel time increases.
- The access route for buses to and from the Inner Northern Busway at Normanby would not be affected by Northern Link.
- On Musgrave Road minimal changes in traffic volume and travel time are forecast so the forecast effect of Northern Link on bus services that use Musgrave Road is minimal.

The project includes retention of the existing left in and left out access of Victoria Park Road with the ICB. Consequently, there would be no changes to the route of the QUT Kelvin Grove Campus – Gardens Point Campus shuttle bus.

Table 9-17 Effect of Northern Link on Bus Routes in 2026

Travel Time Route	Route	Start of Route	End of route	AM Peak Hour Inbound: Bus Volume (veh)	AM Peak Hour Inbound: % Change Total Traffic	AM Peak Hour Inbound: Improvement in Bus Route Travel Speed[(1)] km/h	AM Peak Hour Inbound: Improvement in Bus Route Travel Speed[(1)] %	PM Peak Hour Outbound: Bus Volume (veh)	PM Peak Hour Outbound: % Change Total Traffic	PM Peak Hour Outbound: Improvement in Bus Route Travel Speed[(1)] km/h	PM Peak Hour Outbound: Improvement in Bus Route Travel Speed[(1)] %
A	Western Freeway and Milton Road	Western Freeway at Moggill Road Ramps	Milton Road at Petrie Terrace	84	-5%	9	28%	104	-2%	3	9%
K	Milton Road	Frederick Street	Petrie Terrace	84	-5%	10	33%		-2%	5	21%
D	Moggill Road	Western Freeway Ramps	Indooroopilly Westfield	131	-24%	1	4%	135	5%	0	0%
E	Moggill Road	Indooroopilly Westfield	Benson Street	142	-24%	2	7%	117	5%	-1	-2%
F	Coronation Drive	High Street	William Jolly Bridge	208	-26%	6	27%	200	-25%	5	23%
H	Kelvin Grove Road	Newmarket Road	Ithaca Street	141	52%	-4	-15%	116	14%	-4	-15%
I	Countess Street	Ithaca Street	Roma Street	186	-4%	2	9%	177	-1%	1	9%
J	Musgrave Road	Enoggera Terrace	Normanby 5 Ways	94	4%	1	5%	111	5%	0	-1%
Routes to UQ in Counter Peak Direction											
F	Coronation Drive	William Jolly Bridge	High Street	200	-15%	6	18%	208	-15%	8	31%
G	Sir Fred Schonell Drive	Benson St/High Street	Coleridge Road Roundabout	86	2%	0	0%	91	2%	1	3%

Table notes:
Source – Northern Link Traffic Model
(1) Improvement is compared to the without project scenario.



LEGEND

9 — 10	Route I	1 — 2	Route A	5 — 6	Route E
11 — 12	Route J	2 — 3	Route K	6 — 7	Route F
Travel Time Route		4 — 5	Route D	8 — 9	Route H

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 9-24

Bus Travel Time Routes

Northern Link

SKM Connell Wagner JOINT VENTURE

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9.11.2 Bus Use of Northern Link

The Project creates the opportunity for Rocket bus services from the western suburbs to use Northern Link as an express route from the Western Freeway to access the Inner Northern Busway via Kelvin Grove Road and Ithaca Street to access the Busway Stations in the CBD. Queensland Transport provided advice to the project team regarding the likely bus services that could be diverted to Northern Link and this is shown in **Table 9-18**. Queensland Transport advised that they would not be likely to divert bus services that accessed Indooroopilly and Toowong to Northern Link as the route to the CBD would be indirect and result in additional bus kilometres.

All of the bus services identified as potential users of Northern Link are Rocket services, and therefore only operate for two hours in the peak direction on weekdays.

- **Table 9-18 Possible Bus Service Diversion to Northern Link**

Service	Description	Service Type	Weekday Peak Direction Bus Trips	
			2016	2026
426	Chapel Hill - CBD via Western Freeway, Northern Link and INB	Rocket	11	17
431	Kenmore South - CBD via Western Freeway, Northern Link and INB	Rocket	10	14
436	Brookfield - CBD via Western Freeway, Northern Link and INB	Rocket	2	2
446	Figtree Pocket - CBD via Western Freeway, Northern Link and INB	Rocket	6	9
455	River Hills - CBD via Western Freeway, Northern Link and INB	Rocket	24	24
456	Mt Ommaney - CBD via Western Freeway, Northern Link and INB	Rocket	6	9
461	Forest Lake - CBD via Western Freeway, Northern Link and INB	Rocket	11	17
	Total		**64**	**92**

Table Notes
(1) Source – Queensland Transport
(2) Stopping pattern for all services - all existing suburban bus stops, then non-stop between Western Freeway and Normanby busway station. Stops at Roma St Busway station and QSBS (platform B)
(3) All services connect with Northern Link at the Western Freeway and at Kelvin Grove Road.
(4) All services connect with the Inner Northern Busway at Normanby via Ithaca Street and Kelvin Grove Road

The BSTM mode choice model was used to test the indicate patronage and mode share effects of diverting these bus services to Northern Link.

Key findings from the assessment for 2026 are:

- Routing buses through Northern Link would provide average time savings in 2026 of 12 minutes in the morning peak and 11 minutes in the evening peak period compared to the surface route.

- There would be a small increase on public transport trips overall, and a minor reduction in forecast private vehicle trips using Northern Link (<1%);
- A forecast 6,200 bus passengers would use Northern Link daily, with 5,500 of these trips were transferred from other bus services (principally using Milton Road and Coronation Drive) with some diversion of passengers from rail services to the bus services using Northern Link.
- A small increase (600 public transport trips per day) in the Brisbane Metropolitan area would occur due to modal shift from private vehicle to public transport.

9.11.3 Bus Infrastructure

A total of seven bus stops would be affected by the project when it is operational. The effect of construction activities on bus stops is discussed in **section 11.7**. Bus stops affected by the project are shown in **Figure 9-25**.

Western Connection

On Milton Road, between Frederick Street and Croydon Street, three bus stops would be affected. On the northern kerb (inbound direction) of Milton Road to the west of Gregory Street the existing bus stop would be relocated to a site approximately 50 m to the west so that is would be opposite Sylvan Road. Due to the availability of acquired land at this location, a replacement indented bus bay would be provided.

On the southern kerb (outbound direction) of Milton Road the existing bus stop to the immediate east of Sylvan Road would be relocated so that it is located by an enlarged traffic island at the entrance of Sylvan Road. This location allows for an indented bus bay, an enlarged pedestrian waiting area and has good pedestrian connectivity with Sylvan Road. The existing bus stop that is located to the west of Croydon Street would be permanently removed in order to allow the construction of the Northern Link on ramp from Milton Road and Croydon Street. A replacement is not planned due to the proximity and convenience offered via the new bus stop at Sylvan Road.

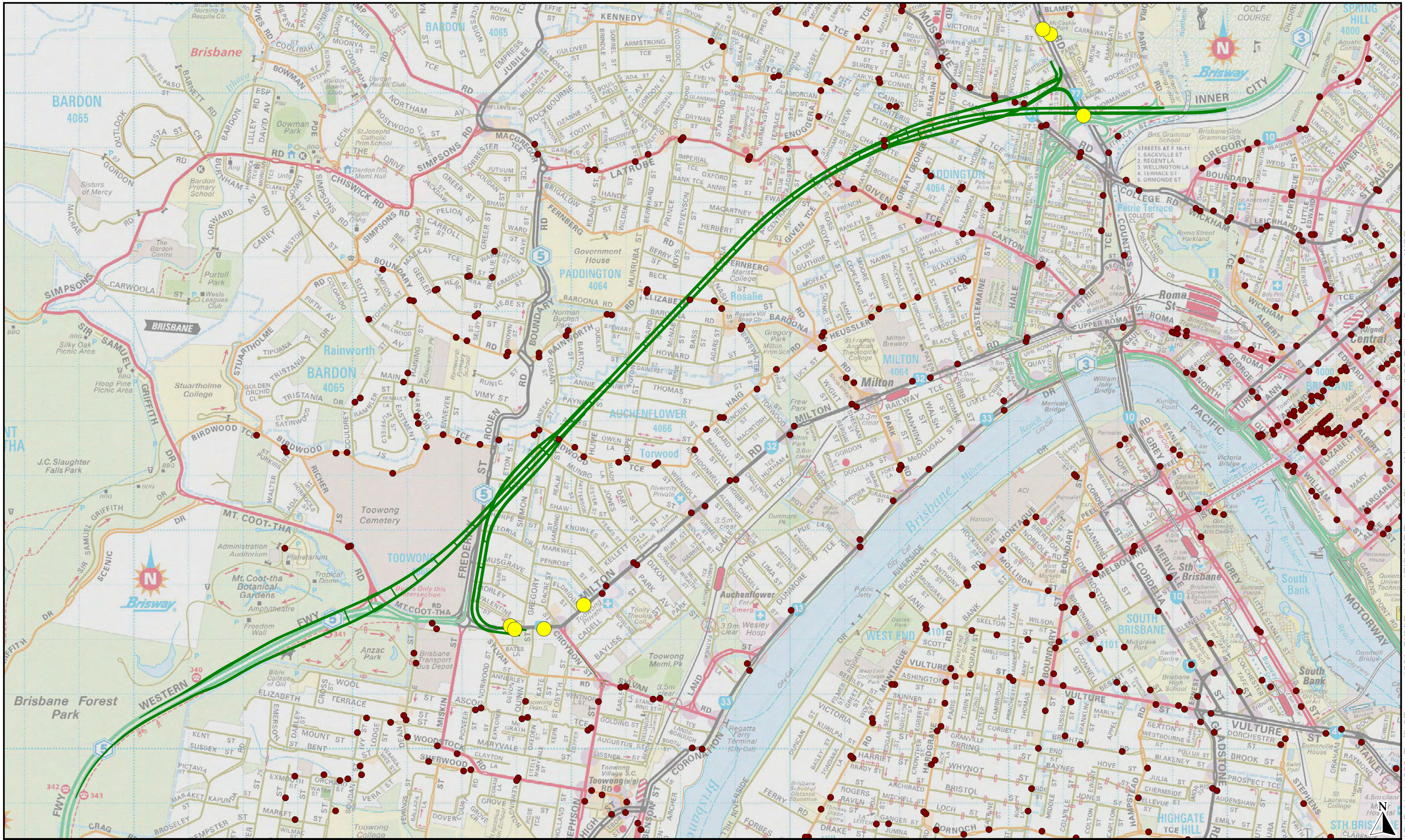
These changes would affect services 426, 431, 436, 446, 455, 456, 461 and 470 at these bus stops.

Eastern Connection

On Kelvin Grove Road, in the southbound direction, the existing indented bus bay to the immediate south of Blamey Street would be relocated marginally west into McCaskey Park due to proposed widening of Kelvin Grove Road at this location. The bus bay would continue to be indented. The bus stop that serves the northbound direction that is located south of Blamey Street would be relocated approximately 50m south so that is closer to Victoria Street. It would have an indented bus bay.

In the northbound direction on Kelvin Grove Road the existing indented bus stop that is located under the ICB overbridge would be relocated approximately 50m south so that it would be closer to the Normanby Five-Ways intersection. It would continue to have an indented bus bay and could be served by bus services that access Kelvin Grove Road from both Ithaca Street and the Normanby Five-Ways intersection.

These changes would affect services 325, 344, 345, 351, 356, 357, 359, 360, 361, 364, 372 and 390 at these bus stops.



LEGEND

- Impacted Bus Infrastructure
- Existing Bus Infrastructure
- Inner West Transport Study Area
- Northern Link Alignment

Northern Link
Environmental Impact Statement

Figure 9-25

Project Impacts on Bus Infrastructure

Northern Link

SKM Connell Wagner
JOINT VENTURE

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9.12 Active Transport

The potential effects of Northern Link on infrastructure for pedestrian and cycle movements are discussed below. Northern Link does not permit usage by pedestrians and cyclists. The main changes to the pedestrian and cycle network would occur around the tunnel portals and the connections of the tunnel ramps to the surface road network. The project's design has ensured that connectivity would be maintained in those areas for pedestrians and cyclists. A description of the relevant changes to the local pedestrian and cycle accessibility that have been included in the project design are detailed in the following sections.

Opportunities where the pedestrian and cycling connectivity of the existing or planned networks could be enhanced within the inner west transport study area due to improvements in the amenity of such routes have been identified and are described below.

9.12.1 Western Connection

The ramps that would connect the Western Freeway with the proposed Northern Link are in the vicinity of the Western Freeway bikeway and the Western Freeway Roundabout Cycle and Pedestrian Bridge that is currently being constructed by DMR. The works associated with Northern Link would result in re-alignment of the Western Freeway bikeway and the approaches to the Cycle and Pedestrian Bridge. The existing connectivity and function of the Western Freeway bikeway would be maintained as would the connectivity and functionality planned by DMR for the Cycle and Pedestrian Bridge.

The ability for pedestrians to cross at the signalised intersection of Milton Road/Croydon Street/Morley Street would be maintained through the provision of pedestrian crossings on three of the four approaches. A pedestrian crossing would not be provided on the Milton Road western approach. Due to the width of Milton Road, a staged crossing of the eastern approach with a wide median island would be provided. The number of pedestrians using the existing pedestrian facility on the western approach is low (see **section 4.9.2**) with a far greater number of pedestrian using the crossing on the eastern approach (which connects to the local shopping centre).

Pedestrian crossings of all approaches would be maintained at the Croydon Street/Jephson Street/Sylvan Road signalised intersection. Full pedestrian footpaths would be kept on both Croydon Street and Milton Road.

The on-road bike paths on Sylvan Road and its connectivity with the Western Freeway and the Bicentennial bikeway would be maintained. The on-road bike paths would be kept on the Sylvan Road approaches to the Croydon Street/Jephson Street/Sylvan Road signalised intersection. Improved amenity of these on-road bike paths would be experienced due to the traffic volume reductions that are forecast on both approaches of Sylvan Road to this intersection. (Refer to **Table 9-8** for forecast traffic volume reductions.)

9.12.2 Eastern Connection

The surface works associated with connecting Northern Link to the ICB would not impact on the off-road bikeway adjacent to the southern side of the ICB or on the bikeway and pedestrian paths on the ICB Landbridge. The off-road bikeway on the northern side of the ICB between Kelvin Grove Road and the ICB Landbridge would be re-aligned. Its existing connectivity and functionality would be maintained.

The connection of Northern Link with Kelvin Grove Road has been designed such that all pedestrian connections would be maintained with appropriate accessibility for mobility impaired users. The pedestrian facilities would maintain the linkages between the Kelvin Grove Urban Village and the community and bus stops to the west of Kelvin Grove Road. Key features of the pedestrian facilities are:

The existing pedestrian footpaths on both sides of Kelvin Grove Road between College Road and Musk Avenue would be maintained. The footpath on the eastern side of Kelvin Grove Road between Musk Avenue and the on ramp to the ICB would be widened. The footpath on the western side between the connecting loop from Hale Street and Musgrave Road would be re-aligned to suit proposed road surface works.

The existing pedestrian underpass of the connecting loop from Hale Street and Musgrave Road to Kelvin Grove Road would be maintained and lengthened to suit the additional traffic lanes that would access Northern Link. This would connect with the pedestrian footpath on the western side of Kelvin Grove Road, with the existing Kelvin Grove Road pedestrian over bridge that provides connectivity with the eastern and western sides of Kelvin Grove Road and with Lower Clifton Terrace via steps.

New pedestrian footpaths would be provided on both sides of Lower Clifton Terrace so creating a good quality pedestrian connection between Kelvin Grove Road and Musgrave Road.

Existing pedestrian crossing facilities of the signalised intersection of Kelvin Grove Road/Musk Avenue and Northern Link would be maintained. A pedestrian crossing would also be provided across the Northern Link approach to this intersection. Access from this intersection to Upper Clifton Terrace and the continuation of the footpath northwards on Kelvin Grove Road would be via steps or a switchback ramp that provide access to a pedestrian route over the tunnel portal. A pedestrian crossing would not be provided across the Northern Link north facing off-ramp to Kelvin Grove Road.

Pedestrian footpaths would continue to be provided on both sides of Kelvin Grove Road between Musk Avenue and Blamey Street.

At the signalised intersection of Kelvin Grove Road and Blamey Street pedestrian crossings would be provided on Blamey Street and the southern approach of Kelvin Grove Road. The existing crossing of Kelvin Grove Road is currently on the northern approach and it is proposed to relocate this crossing to the southern approach. This proposal would locate the pedestrian crossing closer to the bus stops that are located on both sides of Kelvin Grove Road to the south of Blamey Street.

9.12.3 Effect on Active Transport within the Inner West Transport Study Area

The Project would reduce traffic congestion on some regional radial roads in the study corridor, such as Milton Road and Coronation Drive; city distributors such as Caxton Street, Given Terrace and Latrobe Terrace and many local streets in Toowong, Milton, Red Hill and Rosalie. This would enable improved access within the study corridor, through improved movement of traffic, including for pedestrians and cyclists.

Roads that are either existing or planned principal cycle routes or are part of the BCC bikeway/Greenway network include Milton Road, Coronation Drive, High Street, Moggill Road, Frederick Street, Musgrave Road, Sylvan Road, Coonan Street and Sir Samuel Griffith Drive. **Section 4.9.2** detailed the existing daily number of pedestrians that cross roads at key locations in Toowong, Milton and Kelvin Grove. Through significant traffic volume reductions that are generally forecast on these roads in the future with Northern Link compared with the scenario without Northern Link (refer **Table 9-8**) improvements to pedestrian and cycle facilities could be provided. Options to improve pedestrian and cycle connectivity could include:

- Provision of additional pedestrian crossing opportunities at existing signalised intersections by amending the intersection phasing.
- Increasing the available pedestrian crossing time at signalised traffic intersections.
- Widened pedestrian and cycle paths.
- Additional on-road cycle routes.

Compared to the scenario without Northern Link the project would reduce traffic congestion on some regional radial roads in the study corridor, such as Milton Road and Coronation Drive; on some city distributors such as Caxton Street, Given Terrace and Latrobe Terrace and reduced traffic on some local streets by up to 30-50%, including in Toowong, Milton, Red Hill and Rosalie. This would enable improved access within the study corridor, through improved movement of traffic, including for pedestrians and cyclists.

9.13 Road Safety Effects

The crash history of major routes in the Inner West Transport Study area affected by the Northern Link project was analysed in **Section 4.10**. This assessment indicated that the highest crash rates had occurred on Coonan Street at Indooroopilly.

Crash rates calculated for existing conditions in **Section 4.10** have been used to determine the future number of accidents for 2014 and 2026, without and with the project, based on estimates of vehicle kilometres of travel (VKT). No future major works are expected on any other route within the Inner West Transport Study Area so it is reasonable to adopt existing crash rates for assessment.

A crash rate of 0.18 crashes per 100 million VKT has been applied for the Northern Link ramps and main tunnel, similar to that applied in the assessment of similar recent tunnel projects in Brisbane, and based on historical data for the Sydney Harbour Tunnel.

Estimated crashes for 2014 and 2026 without and with the project are shown for the key arterial routes within the Inner West Transport Study area and for Northern Link in **Table 9-19** . Average annual accidents from the crash history have been included for comparative purposes. The table shows that with Northern Link operational:

- An overall reduction of forecast crashes on major routes in the inner west in 2014 and 2026 with Northern Link of 3.4% and 2.0% respectively;
- An overall reduction in forecast crashes on Coronation Drive (18%) and Milton Road (6.5%) in 2026;
- Part of the MetRoad 5 north of the Toowong Roundabout up to and including Rouen Road experiences road safety benefits on average of 11%.
- The Western Freeway has been analysed in two sections, one located to the east of the Northern Link Western Freeway ramp connections, stretching 0.75km to the Mt Coot-tha Road Roundabout and the other for the 2.75km west to the Moggill Road off ramp. The majority of crashes on the Western Freeway have occurred in the eastern section. With the forecast decrease in traffic with the project in place an overall reduction in crashes would be expected (21%) in the eastern section. To the west of the Northern Link ramps would an increase in crashes (31%) in 2026 is forecast due to the increase in traffic volumes along this section of the Western Freeway; however the overall increase in the number of crashes would be small when the two segments area considered in combination.
- It is noted that with Northern Link, as discussed in **Section 9.4**, traffic relief forecast on a range of other regional routes south of the Brisbane River (such as Ipswich Road and Fairfield Road) that are heavily used by freight, and these locations would also benefit from crash reductions.

Table 9-19 Estimated Crashes on Key Routes Without and With Northern Link

Arterial	Section	2007	2014				2026			
		Average Annual Crashes	Without Project	With Project	Difference	% Change	Without Project	With Project	Difference	% Change
Northern Link	All	-	-	11	11	-	-	15	15	-
Coronation Drive	All	51	58	52	-7	-11.2%	62	51	-11	-17.9%
Milton Road	All	38	46	41	-5	-10.3%	48	45	-3	-6.5%
Moggill Road	Western Freeway ramps to Toowong	25	28	23	-5	-16.8%	30	26	-4	-12.3%
Frederick Street	All	5	5	5	-0.2	-3.7%	5	5	-0.61	-11.3%
Rouen Road	All	5	5	5	-0.15	-2.8%	6	5	-1	-12.3%
Boundary Road	All	7	7	7	0.17	2.5%	7	7	-0.37	-5.3%
Sir Fred Schonell Drive	All	9	10	10	-0.16	-1.6%	10	11	0.25	2.4%
Coonan	Walter Taylor Bridge to Moggill Road	19	20	20	-0.37	-1.9%	20	20	0.08	0.4%
Western Freeway (1)	Mt Coot-tha Road roundabout west for 0.75km	5	6	5	-1.0	-16.9%	7	6	-1.5	-20.8%
Western Freeway (1)	Moggill Road Ramps east for 2.75km	4	4	6	2	27.1%	5	7	2	31.0%
Total		**178**	**190**	**183**	**-6**	**-3.4%**	**201**	**197**	**-4**	**-2.0%**

Table Notes:
Source: BCC 2006 (crash data)
Northern Link Traffic Model (VKT, Distance)
(1) Crash rates analysed for individual sections of Western Freeway.

10. Cumulative Effects

10.1 Introduction

This chapter reviews the cumulative traffic impacts of Northern Link examining the following aspects:

- Cumulative operational impacts and cumulative construction traffic impacts associated with known infrastructure projects in the north and western suburbs of Brisbane (eg: Airport Link, East-West Arterial Upgrade, Gateway Motorway Upgrade, Northern Busway, Hale Street Bridge, Tank Street Bridge, Northbank); and
- Potential cumulative effects with other projects for the north and western suburbs of Brisbane emerging from contemporary transport plans, strategies and studies for SEQ.

10.2 Cumulative operational effects with known projects

The transport modelling of the operational effects of Northern Link as described and reported in **Section 9** has incorporated the following major transport projects:

- CLEM7: assumed to be open and operating a toll road by 2011.
- The Gateway Upgrade Project (GUP): assumed to be in operation by 2011.
- Airport Link: assumed to be operational as a toll road by 2012.
- Northern Busway (Windsor to Kedron): assumed as operational in interim form before 2026 and final form post 2026.
- Airport Roundabout upgrade: assumed operational by 2012.
- The Hale Street Link: open as a toll bridge by 2011.
- Ipswich Motorway Upgrade: complete by 2012.
- Centenary Highway and Western Freeway transit lane project (identified within SEQIPP) currently the subject of a DMR planning study: Based upon advice provided by DMR, for the purposes of modelling within the EIS this project has been coded as an upgrading from 4 to 6 lanes inclusive of a single T2 lane each way between Mount Coot-tha Road and approximately at Warrender Street. No upgrading over the Centenary Bridge has been assumed. Implementation in 2016 has been assumed.

The operational effects on these projects within the regional network are discussed in **Section 9.**

10.3 Cumulative construction effects with known projects

Potential cumulative construction effects would arise from the overlap of haulage and delivery route traffic associated with Northern Link with similar activities on other known projects.

As discussed in **Section 11.6** details of the routes to be used by delivery vehicles to the Western Freeway, Toowong connection, Kelvin Grove Road connection work sites and ICB work area are unknown at this stage of the planning process, however will be confined to major roads. In general delivery truck numbers are anticipated to be lower than that required for spoil haulage.

The two proposed spoil haulage routes that have the potential to overlap with construction activities of other projects are summarised as follows:

- Haul route to spoil placement site at Port of Brisbane - anticipated at 50 trucks per day to and from the Kelvin Grove Road connection work site/ICB work area between July 2010 and February 2012.
- Haul route to spoil placement site at Swanbank – anticipated at 60 trucks per day to and from the Western Freeway and Toowong connection work sites between April 2010 and June 2011.

Potential for cumulative construction effects based upon currently available information is as follows:

- North South Bypass Tunnel: The potential common route for spoil haulage is the Port of Brisbane route; however haulage activity from CLEM7 is expected to be complete prior to commencement of use of this route by Northern Link haul traffic in July 2010.
- Gateway Motorway Upgrade: It is understood that the Gateway Motorway Upgrade project has been generating material haulage activities on the Western Freeway-Centenary Highway route to the western corridor. If these continue beyond April 2010 there will be overlap with Northern Link spoil haulage, however it is noted that Northern Link haulage volumes (120 trucks per day two-way) would represent less than 0.2 % of traffic on this route, so cumulative effects would be minimal.
- Airport Link, Northern Busway and Airport Roundabout Upgrade Project: As the Airport Link, Northern Busway and Airport Roundabout Upgrade are being delivered together construction schedules are concurrent specifically to lessen the cumulative impacts of projects that are proceeding in the same areas. For the purposes of this assessment of cumulative impacts with Northern Link, these three projects are considered to be one, their potential impacts being aggregated.

  The potential common route for spoil haulage is the Port of Brisbane route from the ICB, Kingsford Smith Drive and Gateway Bridge from July 2010 onwards, where the Northern Link project would generate an anticipated 100 trucks per day. The anticipated use of this route by the Airport Link Changed Project would be up to 110 trucks per day, which is significantly lower than that initially envisaged for Airport Link construction due to the use of the spoil haulage conveyor from the northern worksite with the Airport Link Changed Project.

  The estimated peak combined haulage traffic associated with Airport Link and Northern Link (210 trucks per day) during 2010/11 would represent only 1.8% of the 2010 background truck traffic and approximately 0.3% of total traffic on this route. However, there are several intersections along Kingsford Smith Drive operating at close to nominal capacity during peak periods. The impact on performance of key intersections during peak periods would need to be examined during the preparation of the CTMPs, and haulage operations managed accordingly (eg: being restricted to outside peak hours if necessary).
- Hale Street Link: The proposed haulage routes associated with Northern Link would not be likely to have any direct effects on the Hale Street Link construction activities.
- Ipswich Motorway Upgrade: The haul route to Swanbank, used by 60 trucks per day to and from the Western Freeway and Toowong connection work sites between April 2010 and June 2011, would pass through several construction projects planned on the Ipswich Motorway. The timing of construction activities on these projects is understood to be:
  - Ipswich Motorway Upgrade - Wacol to Darra (approximately 3km widening of the motorway to 6 lanes and upgrading of the Centenary Highway Interchange to a multi-level interchange): April 2008 to late 2010. Northern Link spoil haulage vehicles would be using this part of the network from April 2010. Northern Link haulage volumes (120 trucks per day two-way) would represent only 0.1 % of traffic on this route, so cumulative effects would be minimal.
  - Ipswich Motorway Upgrade - Ipswich/Logan Interchange (interchange upgrade and minimum 6 lane standard on the 2km section of Ipswich Motorway between Goodna and Gailes): February 2007 to Early 2009. This project would be completed prior to its use by spoil haulage vehicles associated with Northern Link.
  - Ipswich Motorway Upgrade – Dinmore to Goodna (approximately 8km upgrading to minimum of 6 lanes including interchange upgrades): Early 2009 to 2012. Northern Link spoil haulage vehicles would be using this part of the network from April 2010 to June 2011. Northern Link haulage

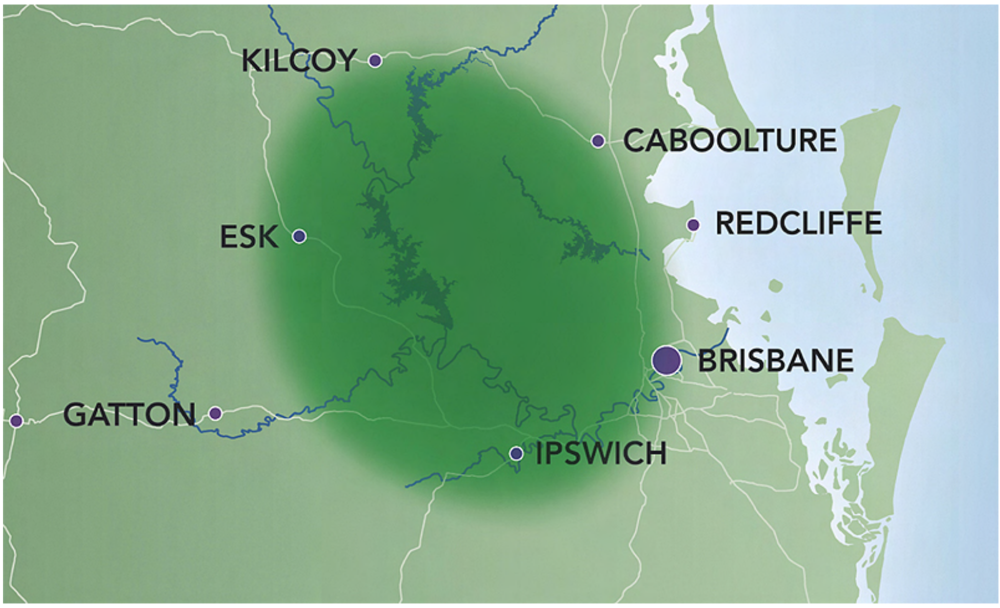
volumes (120 trucks per day two-way) would represent only 0.1 % of traffic on this route, so cumulative effects would be minimal.

- Centenary Highway and Western Freeway transit lane project (identified within SEQIPP): This project, assumed to be operational by 2016, is still in the planning phase by DMR so details of the proposed construction staging and timing are unknown. It is likely that use of the Centenary Highway and Western Freeway by Northern Link haulage vehicles will be finished prior to the start of substantial construction activities on this project.

10.4 Cumulative effects with projects emerging from contemporary studies

The key contemporary study in progress during the time of preparation of the Northern Link EIS examining transport planning issues for the western Brisbane area is the State Government's Western Brisbane Transport Network Investigation (WBTNI). The WBTNI study area extends from west of the Brisbane CBD, south to Ipswich, north to Caboolture and west to the region of the Brisbane Valley Highway. The study area is shown in Error! Reference source not found..

- **Figure 10-1 WBTNI Study Area**

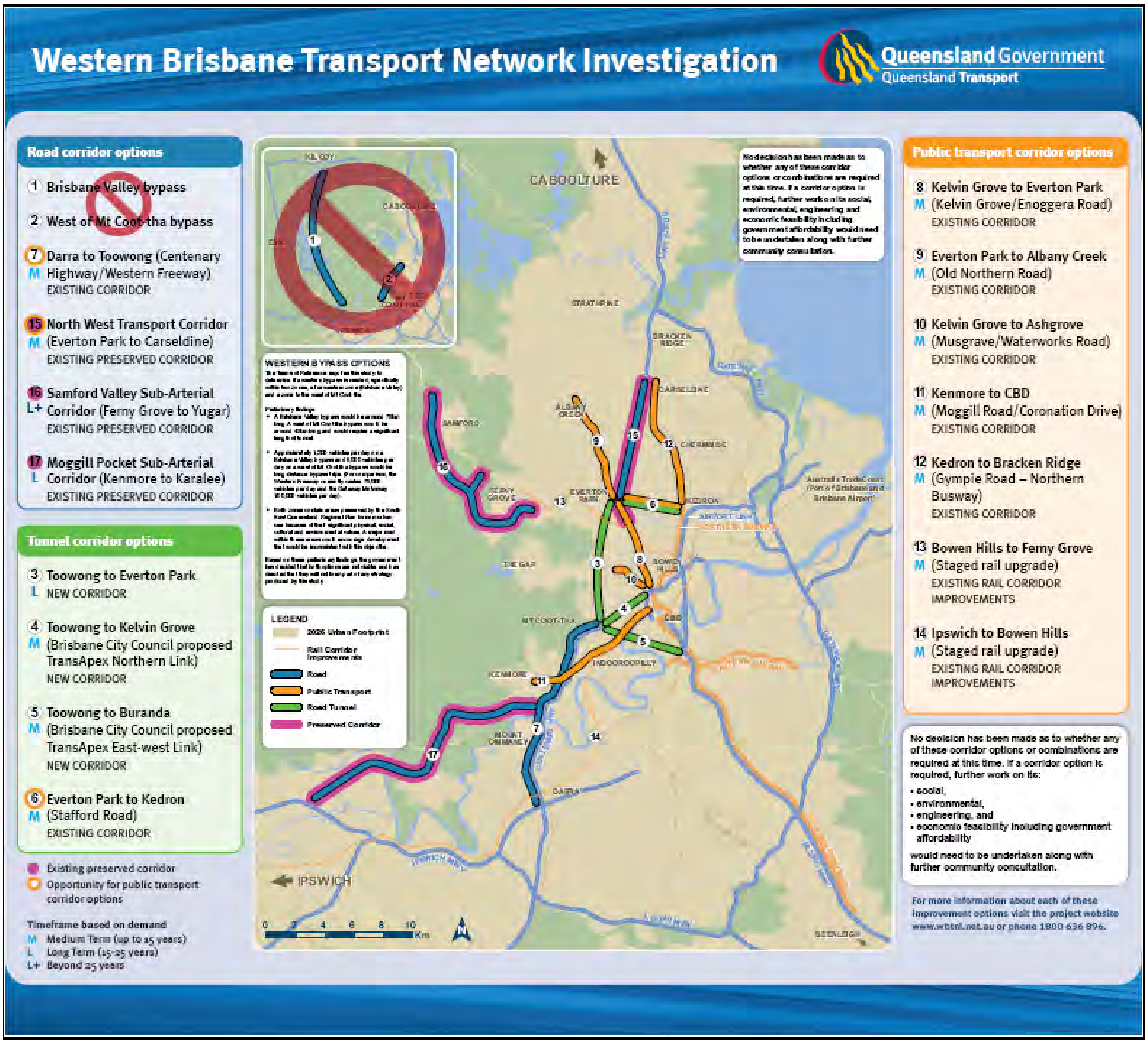


Source: Queensland Transport (2007), Western Brisbane Transport Network Investigation

The WBTNI is looking at the growth in demand for travel, including freight, and will determine the need for infrastructure improvements for the transport network in western Brisbane over the next 20 years. It will investigate all transport options - public transport, roads, freight, walking and cycling - and how these will be integrated with other transport initiatives of the South East Queensland Regional Plan. A range of other transport investigations are feeding into the WBTNI process including considerations regarding the Australia TradeCoast Transport Study, Centenary Highway bus priority/transit lanes investigations, Gateway Motorway North Planning Study, Inner City Rail Capacity Study, Inner City Bus Access Capacity Study, Kenmore Bypass Study, North Moreton Transport Network Study, Northern Busway (Royal Children's Hospital to Kedron to Bracken Ridge), Petrie to Redcliffe multi-modal corridor and Northern Link itself.

In April 2008 WBTNI released a range of options of possible corridors for public comment. These included active transport infrastructure for walking and cycling, bus improvements (bus lanes, bus priority and busways), rail upgrades and road improvements. These options (not including the active transport network improvement options) are shown in **Figure 10-2**. In early August 2008 WBTNI had not been finalised, although reporting to the State Government during the later half of 2008 was anticipated.

- **Figure 10-2 WBTNI - Possible Transport Corridor Options**



Source: Queensland Transport (2008), Western Brisbane Transport Network Investigation,

It is noted that Northern Link (WBTNI Tunnel Corridor Option 4) is incorporated in the listing of potential strategy elements displayed in April 2008. Based on the WBTNI preliminary findings, the State Government decided that two Western Bypass options, one in a far western zone (Brisbane Valley Bypass) and the other in a zone to the west of Mt Coot-tha, are not viable and directed that they will not form part of any strategy produced by the WBTNI.

Whilst a range of corridor options were identified by the WBTNI in the April 2008 consultation round, it was identified in the display material that no decision has been made as to whether any of the options or combinations are required at this time and that if a corridor option is required, further work on its social, environmental, engineering, and economic feasibility including government affordability would need to be taken along with community consultation.

10.4.1 Assessment of cumulative effects with WBTNI options

To assess the cumulative effects of the relevant key WBTNI corridor options, as displayed in April 2008, traffic modelling was undertaken using the Northern Link Traffic Model. In consultation with the State Government's WBTNI project team, a 2026 time horizon was identified as the appropriate time horizon for indicative assessment. The following WBTNI corridor options were identified as the most relevant for cumulative effect review for Northern Link and project coding for these options was supplied by the WBTNI project team in MapInfo format and was converted for use in the Northern Link Traffic Model:

Option 3: Toowong to Everton Park (New Corridor)

A proposed 10km tunnel with a minimum of four lanes between the Western Freeway at Toowong and Stafford Park at Everton Park. In combination with the Everton Park to Kedron (Stafford Road - Option 6) and North West Transport Corridor (Option 15) this would link to form part of a western ring road which would support a north/south link for longer distance traffic to the west of Brisbane. This initiative is being considered by WBTNI as it would:

- Complete a ring road link west of the city centre
- Relieve congestion at the Toowong roundabout and Western Freeway
- Reduce north-south traffic on existing roads in western Brisbane
- Enable improvements to public transport and walk/cycle movements
- Take long distance freight and private vehicles off the suburban network
- Provide alternative access to the ATC via Stafford Road

Option 6: Everton Park to Kedron (Stafford Road corridor)

This proposal within the existing 4 kilometre Stafford Road corridor between South Pine Road at Everton Part and Gympie Road at Kedron would incorporate an upgrade to the existing arterial road, including bus lanes and/or a new road in a tunnel with a minimum of four lanes to reduce congestion on Stafford Road and provide the opportunity for an east west public transport link from Mitchelton/Enoggera to the Northern Busway at Kedron. This option is being considered by WBTNI as it would:

- Link the eastern suburbs and the ATC via the planned Airport Link
- Improve public transport from western suburbs to the east, including to the ATC
- Provide access to the Northern Busway from the west.

Option 15: North West Transport Corridor (Everton Park to Carseldine – existing preserved corridor)

This option is located within the existing 8 kilometres of preserved transport corridor between Gympie Road at Carseldine and Stafford Road at Everton Park. This option would work in combination with the Everton Park to Kedron (Option 6) and Toowong to Everton Park (Option 3) to complete a motorway ring road and north/south link for longer distance traffic to the west of Brisbane. This initiative is being considered by WBTNI as it would:

- Assist transport movement between the northern suburbs, city and inner-western suburbs
- Improve the frequency and reliability of public transport between Strathpine and the city, and locally
- Reduce traffic on the local road network, for example Old Northern Road and Webster Road
- Provide for long distance north-south movement of freight and private vehicles.

In addition, WBTNI's **Option 5: TransApex East-West Link (Toowong to Buranda)** was also included in the testing of cumulative effects with these other potential WBTNI initiatives. The network coding representing the East-West Link was based on the TransApex Pre-feasibility study (2005).

All WBNTI links have been tested as tolled links operational in 2026. Demand matrices were established based on the inclusion of the WBTNI project infrastructure within the network. With the inclusion of several major tolled links branching from the Western Freeway (ie: Project 3, E-W Link and Northern Link) in 2026, it was assumed that the Western Freeway and Centenary Highway, including the Centenary Bridge, would operate as three general purpose lanes in each direction for this assessment.

Table 10-1 presents the findings of the cumulative effects test of the WBTNI corridor options (as described above) with Northern Link for 2026 based on preliminary modelling.

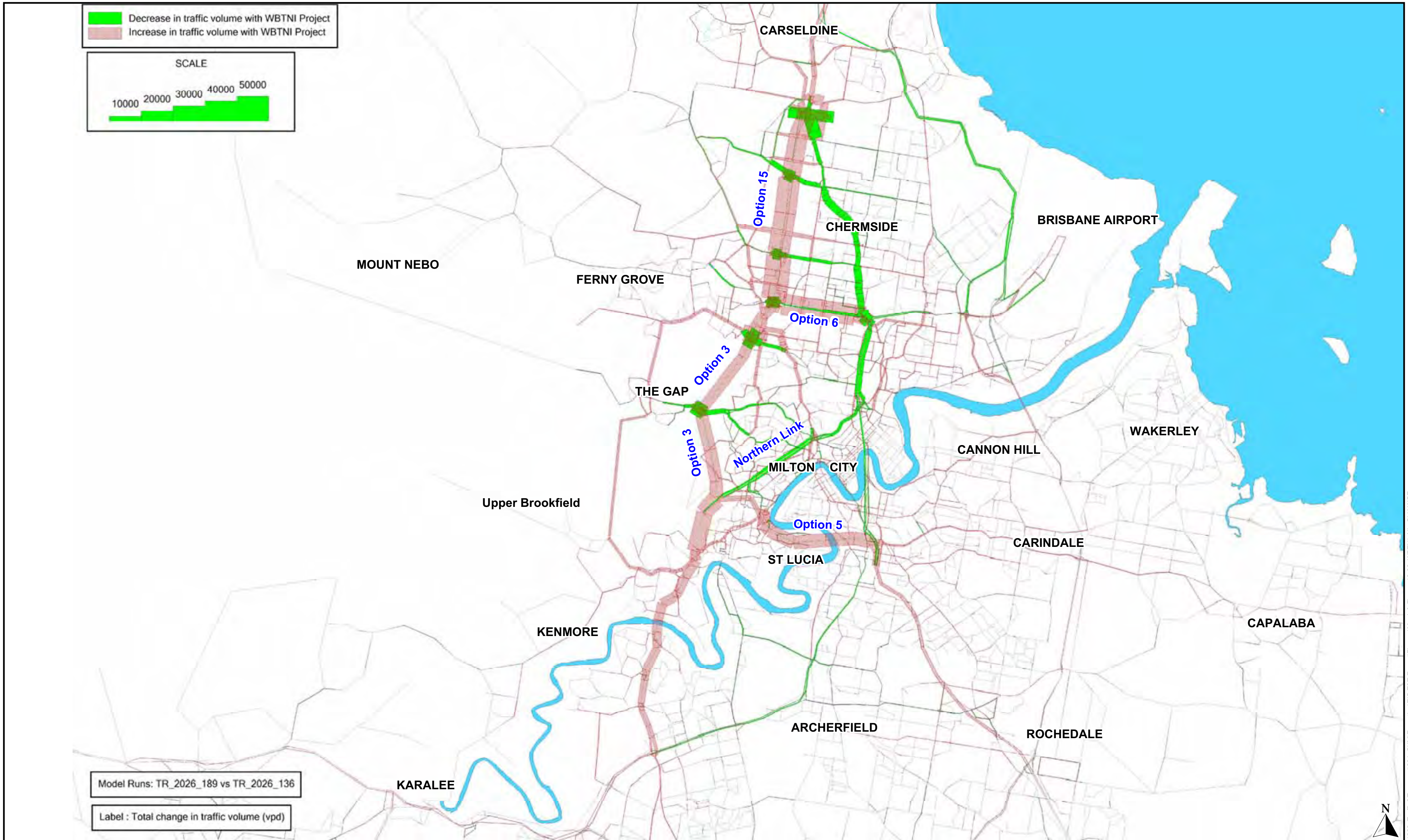
- **Table 10-1 Cumulative Effect with WBTNI Options**

Network Scenario	2026 Northern Link Average Weekday Traffic	Change in Northern Link Forecast Average Weekday Traffic	% Reduction in Forecast Traffic Volume on Northern Link
Northern Link Only	75,900	-	-
Northern Link plus WBTNI Options 3, 6, 15 and 5	66,500	-9,470	-12.4%

Table Notes:
(1) The WBTNI project representations are based on MapInfo coding provided by the State for use within Council's Northern Link Traffic Model.
(2) Preliminary modelling is based on an indicative 50c/km toll rate (in 2008 dollars) for WBTNI Options 3, 6 and 15, and a toll of $3.93 on E-W link and Northern Link.

Figure 10-3 presents the indicative traffic flow changes within the network in the cumulative scenario with Northern Link and WBTNI options 3, 6, 15 and 5; compared to the Northern Link only project case. **Figure 10-4** shows the indicative daily travel patterns that would be expected for use of Northern Link in the cumulative scenario. Key findings for this cumulative effects assessment are:

- As there is some overlap of the cross-city (west-east, west-north and west-south) functions performed by the WBTNI Options and Northern Link, a small reduction in traffic use of Northern Link is forecast. This preliminary modelling indicates hat the average weekday traffic use of Northern Link volume would reduce by 12.4%, from 75,900 vehicles per day in 2026 to 66,500 vehicles per day. It is noted that the proposed toll rates for these other facilities have not been published to date, so preliminary assumptions only have been applied.
- Northern Link would continue to cater for similar strong, east-west travel patterns between the Western Corridor and the ATC in the cumulative scenario (compare with **Figure 9-3** with **Figure 10-4**). Northern Link, as illustrated in **Figure 10-4,** would also function as a feeder within a west to north travel route via ICB, Airport Link, WBTNI Option 6 (Stafford Road upgrade) and WBTNI Option 15 (North-West Transport Corridor). Overall the predominant cross-city function provided by Northern Link between the west, east and north would be maintained.
- Traffic reductions in the cumulative scenario would result with key roads such as ICB, Gympie Road, and Gateway Motorway north, likely to benefit from congestion relief. Increased traffic volumes are forecast for the Western Freeway and Centenary Highway (in line with the capacity upgrades that would be implemented on these corridors to feed a combination of Northern Link and WBTNI project 3).
- The detailed surface road impacts in the north-west suburbs would need to be examined further when connection details are established for the WBTNI options. This preliminary testing of cumulative effects indicates minimal change to the local streets and city distributors in this the Inner West with the combination of Northern Link and the WBTNI projects.

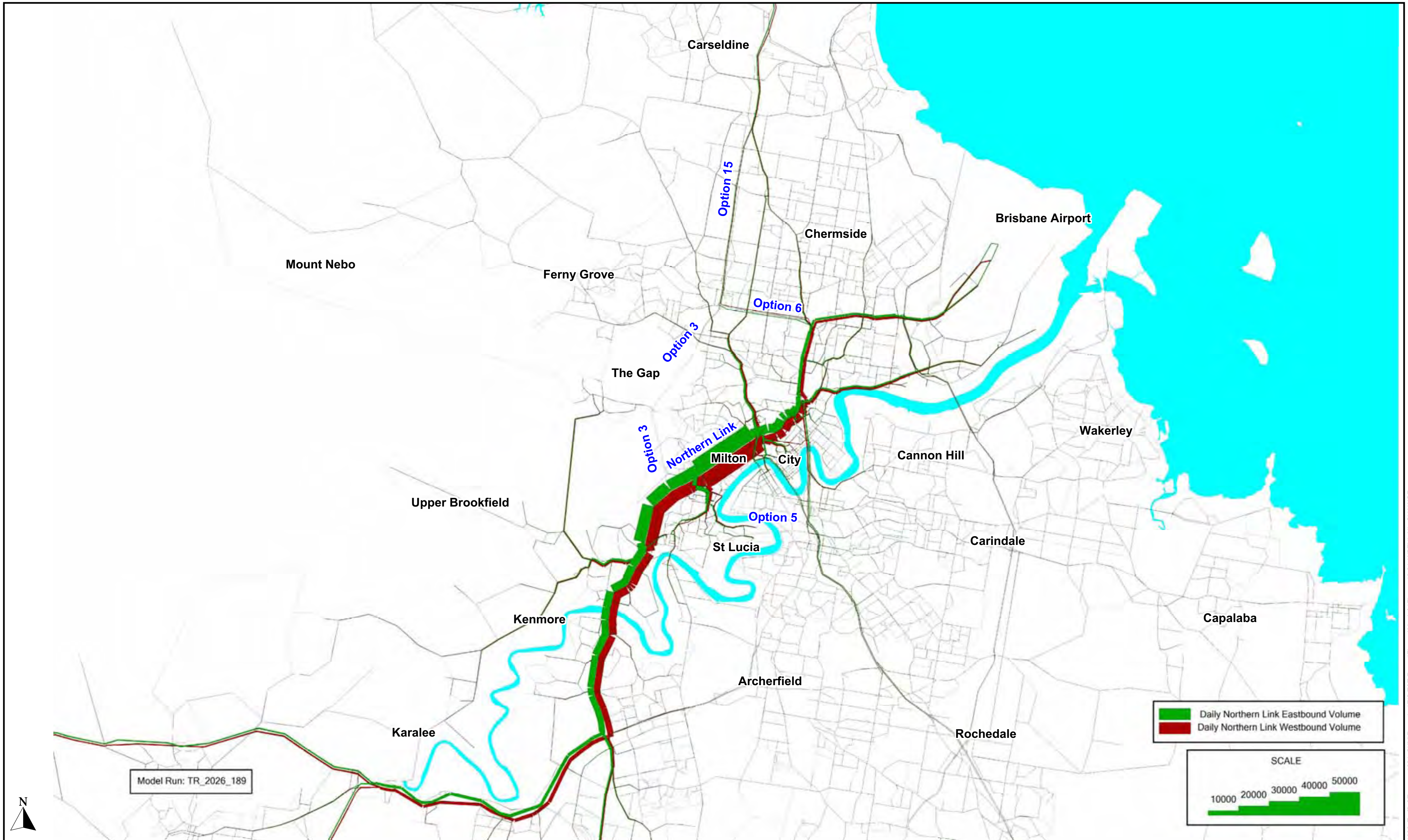


Northern Link
Environmental Impact Statement

Figure 10-3

Figure 10-3 Indicative Effect of WBTNI Project Options on Network including Northern Link (2026)

SKM Connell Wagner JOINT VENTURE



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 10-4

Indicative 2026 Travel Patterns for Northern Link with WBTNI Options

Northern Link

SKM Connell Wagner JOINT VENTURE

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11. Construction Impacts

11.1 Introduction

The construction of a major infrastructure project such as Northern Link may affect traffic and transport in the area, as a result of construction traffic generated by the project, physical changes to transport networks, and disturbance of traffic flows due to construction traffic management measures that could include diversions, lane closures, temporary realignment of traffic lanes and temporary access arrangements to local streets and properties.

The construction contractor would be required to prepare detailed Construction Traffic Management Plans (CTMP) for all elements of the works, in order to minimise adverse effects. The preparation of this plan would have to include performance analysis for lane closures and other disruptions that could be required. The safety and convenience of all road users would need to be addressed by the plan.

This chapter firstly presents a review of mitigation measures that have been used on similar projects and provides an assessment of the traffic and transport effects of the preliminary construction methodology presented in **Chapter 4** of the **EIS**. The assessment includes:

- Pre-construction demolitions
- Construction site traffic generation and access
- Local traffic impacts
- Regional traffic impacts
- Impacts on bus routes and operations
- Emergency service vehicle movements
- Construction impacts on active transport
- Construction impacts on rail infrastructure and operations

11.2 Review of Mitigation Measures from Similar Projects

Mitigation measures that have been adopted on similar projects such as the CLEM7 tunnel and the ICB and those that are proposed for the Airport Link tunnel to reduce construction effects on traffic and other road users during the construction phase have been reviewed and include:

- Measures to reduce the impact of site access, haulage and deliveries
- Measures to reduce the impact on traffic adjacent to the worksites
- Traffic management through the construction area
- Traffic management to minimise potential impact on the local community
- measures to reduce the impact on cyclists and pedestrians
- measures to reduce the impact on public transport
- Community awareness

All of the reviewed measures are suitable for implementation on the proposed Northern Link.

11.2.1 Measures to mitigate the impact of site access, haulage and deliveries

There a number of measures that can be used to mitigate the amount of deliveries to the proposed work site and the amount spoil that is removed. These measures should be employed so to reduce the number and impact of heavy vehicles that would access the work sites. Measures include:

- Reduce the amount of haulage through the use of spoil conveyor systems to a local spoil site. This would significantly reduce the number of spoil trucks that would be required to access the work sites.
- The use of on-site water treatment plants and/or storm water runoff harvesting to provide appropriate water supply for construction use, shotcrete and concrete batching plants. This would reduce the number of delivery vehicles that would be required.
- The use of drop holes from the surface down to the tunnel (external to the actual worksite locations) to transfer concrete/shotcrete from the surface down to the tunnel and reduce the number of trucks entering and leaving the worksites.
- Spoil haul routes via the regional road network and not through residential areas to reduce the impact on residential communities.
- Access to worksites via the regional road network and not via local streets and residential areas.
- Appropriate worksite access points such that truck/car queues would not occur on the road network and suitable deceleration/acceleration lanes provided for entry and exit locations.
- Satellite navigation of spoil haulage trucks to assist with minimising truck queues at worksites.
- Provision of construction staff parking areas with bus transport to work sites to eliminate the need for construction staff car parking in residential areas and therefore reduce the number of construction vehicles entering and exiting the worksites on a daily basis.
- Local area traffic scheme (such as permit parking or the zone extension of the inner city parking time limits) could be used to prevent the workforce from parking on streets in the vicinity of the worksites if such parking occurred.

11.2.2 Measures to reduce the impact on traffic adjacent to the worksites

Traffic management measures that could be put in please to reduce the impact of construction activities on traffic using the roads adjacent to the work sites include:

- Maintain the existing road capacity and connectivity by staging the construction sequence such that it would be possible to maintain the existing number of traffic lanes and connections to the local road network within the future road reserve.
- If it would not be possible to maintain the existing number of traffic lanes at all times then limit reductions in road capacity to outside peak periods such as at night and at weekends.
- Work site deliveries and spoil haulage could occur outside the peak traffic periods.
- Take into account public holidays and events when planning construction activities so to avoid peak traffic periods that occur outside of the typical commuter peak periods.

11.2.3 Traffic management through the construction area

Suitable mitigation measures also include the management of traffic through the construction area. These measures are aimed at minimising the number of traffic incidents that could occur in the construction area and the rapid removal of any vehicle or debris that would restrict traffic flow as a consequence of an incident and include:

- The installation of CCTV equipment so that traffic can be observed and incidents acted on at all times.
- Facilitate the rapid removal of vehicles in the event of traffic incidents and vehicle breakdowns by having recovery vehicles permanently located at strategic locations in the vicinity of the work areas. Such recovery vehicles would be alerted to incidents through the use of CCTV.
- The provision of barrier screens around the construction sites to reduce driver distraction.
- The reduction of speed limits in the vicinity of the construction worksites in order to reduce the occurrence and severity of incidents without creating a significant net loss of existing road capacity.

- The provision of street lighting through the work areas to improve driver visibility and awareness during hours of darkness.
- Satellite navigation of spoil haulage trucks would assist in minimising queues at work sites and so reduce the impact on traffic flow.

11.2.4 Traffic management to minimise potential impact on the local community

Mitigation measures should be provided that would reduce the impact of construction activities on the local community. Such measures are:

- To continue to provide existing connectivity to local streets, or provide reasonable alternatives if existing connections are closed, during the construction period.
- Provide an assessment of the likelihood for traffic to divert to local roads and, if necessary, mitigate such diversions by implementing local area traffic management schemes (such as permit parking or the zone extension of the inner city parking time limits).

11.2.5 Measure to Minimise Potential Impact on Cyclists and Pedestrians

The establishment of worksites and construction activities could result in the removal of cycle and pedestrian facilities such as paths and crossings unless measures are put in place to minimise the impact. Such measures include:

- Replace existing footpaths and cycleways with convenient, direct and safe alternatives. Temporary diversions should not require pedestrians and cyclists to complete multiple road crossings to bypass a worksite.
- Existing pedestrian and cycle crossings of roads should be maintained.
- Measures to provide safe pedestrian crossings of work site vehicular access points.

11.2.6 Measure to Minimise Potential Impact on Public Transport

The previously mentioned measures to reduce the impact on traffic and to provide traffic management through the construction area should minimise the impact on public transport. Maintaining existing road network connectivity and capacity would remove the need to divert bus services and maintain satisfactory bus journey times.

Bus stops should generally not be relocated due to construction activities and pedestrian access them should be maintained. In the event that a bus stop is relocated then a close alternative should be provided.

Northern Link construction activities would not impact on rail and ferry services.

11.2.7 Community awareness

The local community and the travelling public should be kept informed of construction related traffic management measures through the advertising of changes to traffic conditions sufficiently prior to their implementation. If necessary the community could be encouraged to use alternative routes or to alter their time of travel to minimise the impact of traffic management schemes.

11.2.8 Suitability of mitigation measures on Northern Link

All of the mitigation measures that have been reviewed are suitable for Northern Link. The preliminary construction plan and associated TMP have been prepared based on the strategy that the existing road capacity and connectivity should be maintained during the construction period.

11.3 Pre-construction demolitions

Pre-construction demolitions are related to the establishment of work sites. Suitable access would be provided with the regional road network at all worksites and where possible access points to existing properties would be used.

11.4 Construction Site Traffic Generation and Access

11.4.1 Work sites

The construction of Northern Link would be organised around four locations that would be located at the:

- Western Freeway
- Toowong Connection
- Kelvin Grove Connection
- ICB

Three indicative work site layouts have been identified for the Reference Project and these would be located at the Western Freeway, the Toowong Connection and at the Kelvin Grove Connection. The works at the ICB would consist of a work area and would be serviced from the Kelvin Grove work site.

Western Freeway work site

The Western Freeway work site would be located adjacent to the northern (inbound) carriageway of the Western Freeway in Toowong within the Botanic Gardens. This work site would extend from the roundabout of the Western Freeway with Mt Coot-tha Road westwards for about 1km adjacent to the Western Freeway. Work in this area would involve the construction of access ramps, cut and cover tunnels, cross passages, transition structures and surface works. Both of the Tunnel Boring Machines (TBM) would be launched from the Western Freeway work site.

The first stage of construction would be site clearance, access to and establishment of the Western connection work site area within the Botanic Gardens. This site would house the main project site offices. Spoil from both TBMs would be removed via a spoil conveyor to the Western Freeway work site from where it would be transferred onto another spoil conveyor to the Mt Coot-tha Quarry. The use of the proposed spoil conveyor would significantly reduce the amount of spoil haulage that would be required if trucks were used.

Toowong Connection work site

The Toowong Connection work site would have a work site located in the triangle of land that is bounded by Frederick Street, Valentine Street and Milton Road. Following establishment of the work site activities would involve the construction of access ramps, cut and cover tunnel, transition structures, bridges and surface works to connect to Milton Road and Croydon Street.

Road headers would be launched from this work site to excavate the Milton Road ramp tunnels and Y-Junctions. Trucks would transport spoil to the Western Freeway work site where it would be loaded onto the spoil conveyor for transportation to the Mt Coot-tha Quarry.

Kelvin Grove Connection work site

A work site would be located at the Kelvin Grove connection and would be located on the west side of Kelvin Grove Road. The work site would extend from the Lower Clifton Terrace area northwards to Victoria Street. Work at this area would consist of the construction of access ramps, cut and cover tunnels, transition structures and surface works to connect with Kelvin Grove Road.

In order to excavate the Kelvin Grove Road ramp tunnels and Y-Junctions twin road headers would be launched from the Kelvin Grove Road work site.

ICB work area
A work site would not be located at the ICB connection as this area would be serviced from the Kelvin Grove connection work site. The TBMs that would excavate the mainline tunnels to the ICB portal would be launched from the Western Freeway work site. Work within the ICB connection area would include cut and cover tunnels, transition structures and surface works.

11.4.2 Working hours
Working hours for surface works at these sites would typically be between 6.30am and 6.30pm Monday to Saturday with no works expected to be carried out on Sundays and public holidays. In some cases, works on major roads could have to be carried out at other times, if the impacts of daytime works are considered unacceptable by the relevant approval sections of Council or the DMR. These cases would be specified in the detailed CTMP. Underground works would continue 24 hours a day. Spoil haulage is proposed to be carried out at anytime of the day or night between 6.30am Monday until 6.30pm Saturday, with no haulage on Saturday night or Sunday, subject to approval conditions and any time limitations required to manage impacts on traffic, such as peak periods, or residential amenity.

11.4.3 Construction site access
Potential access arrangements during construction for each of the work sites have been identified on the indicative work site layouts that are contained in **Chapter 4** of the **EIS**. During the extent of the construction of the project the location of the work site accesses would generally not change so providing a degree of continuity.

Western Freeway work site
Access to this work site, which would be adjacent to the northbound (or inbound carriageway) of the Western Freeway, would be via a left in and left out access with long diverge and merge lanes. In order for spoil trucks and other heavy loads to avoid using the Mt Coot-tha Roundabout or the Toowong Roundabout to turn in order to travel to the west a cross passage tunnel could be constructed when the work site is established.

Suitable diverge and merge tapers would be provided in order to provide safe access to and from the work site to the Western Freeway. The length of these tapers would be to suit deceleration and acceleration of spoil trucks. Queuing capacity would be provided within the worksite to prevent vehicle queues from backing on to the Western Freeway.

As access to the Western Freeway work site would be exclusively from the Western Freeway there would not be any access impacts on other roads.

Toowong Connection work site
The Toowong Connection work site access would be via a left in only entrance on the northern side of Milton Road between the Toowong Roundabout and the current intersection with Gregory Street. This entrance would include a left in taper in order to minimise disruption to other traffic on Milton Road. The exit from the Toowong connection would be via a left out only movement to Frederick Street just north of the existing intersection of Valentine Street and via a left out movement directly on to Milton Road at a location that would be opposite Sylvan Road. The left out movement onto Milton Road would not be used by spoil trucks. These access arrangements would avoid the need for spoil trucks and all other construction related traffic from using the local streets.

Kelvin Grove Connection work site
As with the other work sites all spoil trucks would access the site from the regional road network. Access to the Kelvin Grove Connection work site would be at a location to the north of the ICB over bridge and would involve vehicles having to cross over the one lane connection from Hale Street and Musgrave Road to Kelvin Grove Road. To facilitate this access a truck stop bay with an appropriate length deceleration taper would be

provided on Kelvin Grove Road and vehicle actuated traffic signals would be installed to provide a truck jump to allow trucks to enter the work site.

The main exit out from the Kelvin Grove Connection work site would be a right turn onto Kelvin Grove Road through modification of the signalised intersection at Musk Avenue.

An auxiliary access would be provided at the north of the work site. This access would not be used by spoil trucks or other large vehicles. This exit would allow entry to the service road feeding Victoria Street with access either onto Victoria Street or Kelvin Grove Road.

11.4.4 Traffic Generation

Construction traffic would include:

- Workforce transportation;
- Haulage of excavated material;
- Deliveries of materials, machinery, etc;
- Servicing and repairs to construction equipment; and
- Site visitors.

It is anticipated that the workforce would consist of around 450 people working on-site over a 45 month construction period. An estimate of the division of the workforce during the daytime shift over the three work sites is shown in **Table 11-1**. The evening shift would be likely to involve a smaller workforce for tunnelling operations only.

- **Table 11-1 Construction Workforce**

Site Location	Tunnel/Portals(1)	Surface(1)
Western Freeway	24	30
Toowong Connection	24	30
Kelvin Grove Connection	24	30
Project Management (various)	40	60

Table Note: (1) Based on FTEs from cost estimate

The major traffic flows would occur during shift changes, with low volumes of deliveries, visitors and maintenance workers throughout the day.

The haulage of excavated material would involve approximately 1,700,000 bank cubic metres of spoil produced by the project. Of this total, approximately 1,150,000 bank cubic metres will be transported by conveyor to the Mt Coot-tha Quarry so significantly reducing the amount of spoil to be transported by truck. For the remaining spoil three potential locations have been identified for the placement of this excavated material:

- Swanbank, which would take approximately 220,000 bank cubic metres; and
- Port West Estate and Fisherman Islands at the Port of Brisbane. These sites would take a total of approximately 330,000 bank cubic metres.

Other modes to transport spoil, such as rail or barge, would not be possible. Although the Kelvin Grove Connection work site is close to the QR Exhibition Railway Line that is used by freight service, the lack of infrastructure to allow loading close to the work sites and unloading close to the spoil placement sites, the need for double handling of spoil material, the long indirect route for trains to the Port of Brisbane sites via the City, and the potential for disruption of existing rail services ruled out this option. Access to waterways and infrastructure to facilitate loading do not allow transport of spoil by barge.

The spoil haulage scenario is based upon road haulage to the Port of Brisbane and Swanbank sites using trucks, most likely tip truck and quad dog combinations with an approximate 13 bank cubic metres capacity (33 loose tonnes capacity). **Table 11-2** shows the approximate amount of spoil conservatively estimated at the three main worksites for the reference design, and the resulting overall average truck haulage movements for these sites.

- **Table 11-2 Estimated Average Truck Generation for Excavated Material**

Work Site	Estimated Volume of Spoil Generated (BCM)	Duration of Operation (months)	Average Rate of Spoil Removal Per Day (BCM/day)	Average Number of Truck Loads Per Day	Hours of Spoil Removal (Mon-Sat)(2)	Average Hourly Loaded Truck Movements
Western Freeway	265,000	14	750	58	18	3.5
Toowong Connection	260,000(1)	19	550	43	18	2.5
Kelvin Grove Connection	300,000	18	650	49	18	2.7
ICB	25,000	23	50	2	18	0.1

Table notes:
Approximately 20,000 BCM is assumed to be unsuitable for the Quarry and hence trucked to Swanbank disposal
18 hours used to avoid peak periods

At the Western Freeway work site spoil activity would commence at April 2010 (Year 1 Month 6) and last for approximately 14 months. The indicative schedule for the reference project indicates that the intensity of spoil movement would be constant at fewer than 60 loaded trucks leaving the site each day. This is equivalent to under 4 loaded truck movements per hour based on an 18 hour working day.

The main spoil activity at the Toowong Connection work site would be scheduled to commence in July 2010 (Year 1 Month 9) and would last for 19 months. The majority of this spoil would be taken to the Western connection work site for transfer to the Mt Coot-tha Quarry by conveyor. The indicative schedule for the reference project indicates that the intensity of spoil movement from the Toowong Connection work site would be constant at over 40 loaded trucks leaving the site each day. This is equivalent to under 2.5 loaded truck movements per hour based on an 18 hour working day.

Spoil from the Kelvin Grove Connection work site includes spoil from both the Kelvin Grove Connection work site and the ICB work area. This spoil would be taken to the Port of Brisbane. The Kelvin Grove Road work site would produce the main tunnel spoil from July 2010 (Year 1 Month 9) at a continuous rate of approximately 49 loaded trucks a day until January 2012 (Year 3 Month 3). Spoil movements from the ICB work area is forecast to commence in April 2010 (Year 1 Month 6) and continue at an approximate intensity of 2 loaded truck movements per day until February 2012 (year 3 month 7).

It is proposed that the Mt Coot-tha Quarry would stock pile the spoil such that the number of truck movements generated by the quarry would not exceed the number of truck movements that they currently have a licence for.

11.4.5 Truck Routes

Although it is intended that a significant quantity of spoil would be transported to the Mt Coot-tha Quarry by a conveyor there would be a need for a haulage operation that would require suitable routes and management.

Spoil haulage would have to be managed appropriately to minimise any adverse impact on the road network. The haulage operations would need to be detailed in the CTMP, and would need to be based on detailed analysis that looks at any potential impact that the operation may have on the road users and the community.

The main issues for transporting materials from the sites would include:

- Minimising truck traffic in local streets, by providing direct access to major roads and specifying haulage routes on the major road network;
- Minimising the effect on residential communities, by using routes through residential areas only where there is no practical alternative and preferably not operating after hours on these routes;
- Minimising congestion effects, by avoiding congested roads if a suitable alternative exists, or operating off peak only on these roads if possible, and also by analysing the capacity of intersections along the route to identify and mitigate against any operational impacts;
- Minimising the effect on businesses and conflicts with pedestrians, by avoiding busy commercial areas if a suitable alternative exists, or operating after work hours only on these routes if possible;
- Minimising the perceived impact of additional trucks, by using routes already used by heavy vehicles; and
- Avoiding conflicts with major events and peak holiday period traffic.

These principles would need to be followed in developing the CTMP for construction of the project. The likely traffic impacts would vary depending on the time of the day and the chosen route.

Preliminary investigation has identified potential haulage routes between the three worksites and the potential designated spoil sites that would all provide direct access to the regional road network. Many of the major roads on the haulage routes experience peak period congestion. Truck haulage mixed with peak hour traffic would create inefficiency for the trucks and may have unacceptable impacts on general traffic. Intersection operations along these routes would need to be analysed and consideration given to limiting haulage to off-peak periods. The number of trucks movements that would be generated from all of the worksites is such that limiting haulage to off-peak periods could be feasible.

Western Freeway work site

A spoil placement site has been identified to the immediate south of the Swanbank Power Station which is accessed from Swanbank Road. The suggested truck route would have direct access to and would be completely on regional roads that are currently utilised by heavy vehicles. Further, these roads do not have any significant active frontages. The proposed truck route is shown in **Figure 11-1** and consists of the Western Freeway, Centenary Highway, Ipswich Motorway, Cunningham Highway and Swanbank Road.

Toowong Connection work site

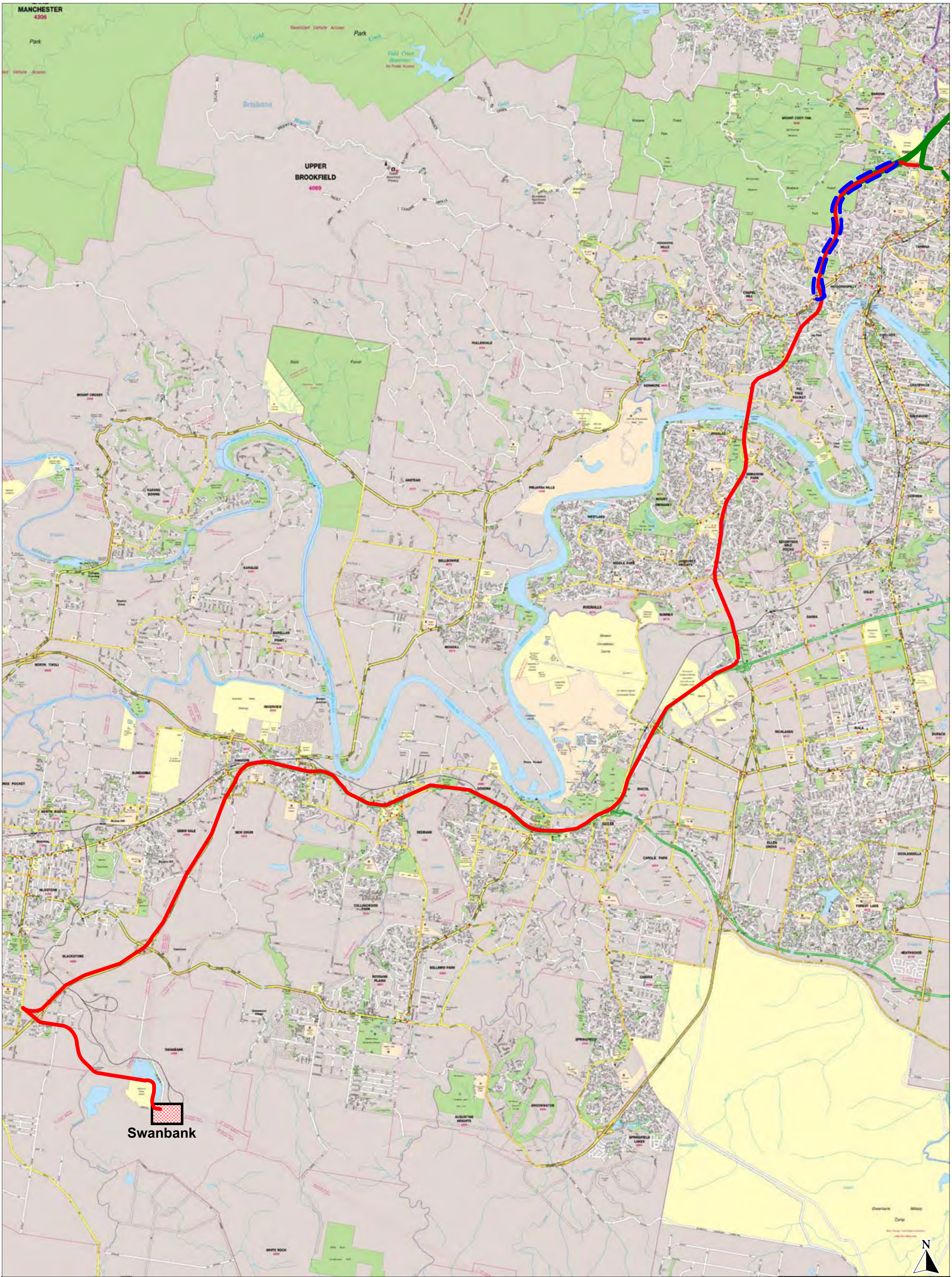
The haul route for suitable spoil from the Toowong Connection work site would be directly to the Western Connection work site for transportation to the Mt Coot-tha Quarry by conveyor. Spoil truck from the Toowong Connection work site would access the Western Freeway work site via the eastbound carriageway and would so have to turn at the Moggill Road intersection.

Other spoil would be transported to the spoil placement site at Swanbank and follow the truck route shown in **Figure 11-1**.

Kelvin Grove Connection work site

Spoil from the Kelvin Grove Connection work site would be taken to a soil placement site at Port West Estate or Fisherman’s Island at the Port of Brisbane. The route identified utilise regional roads that are already used by heavy vehicles and is shown in **Figure 11-2**. This route would consist of Kelvin Grove Road to access the ICB and then Kingsford Smith Drive, the Gateway Motorway, the Port of Brisbane Motorway and Lytton Road to access the spoil placement sites at the Port of Brisbane.

Upon completion of the Airport Link project in 2012 the truck route could be via the Airport Link tunnel and the East-West Arterial Road to access the Gateway Motorway so avoiding Kingsford Smith Drive.



LEGEND

- Indicative Haulage Route
- Potential Spoil Placement Site
- Northern Link Western Connection
- Moggill Road U-Turn to Western Freeway Worksite

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 11-1

Potential Spoil Placement Site at Swanbank and Truck Route

SKM Connell Wagner JOINT VENTURE

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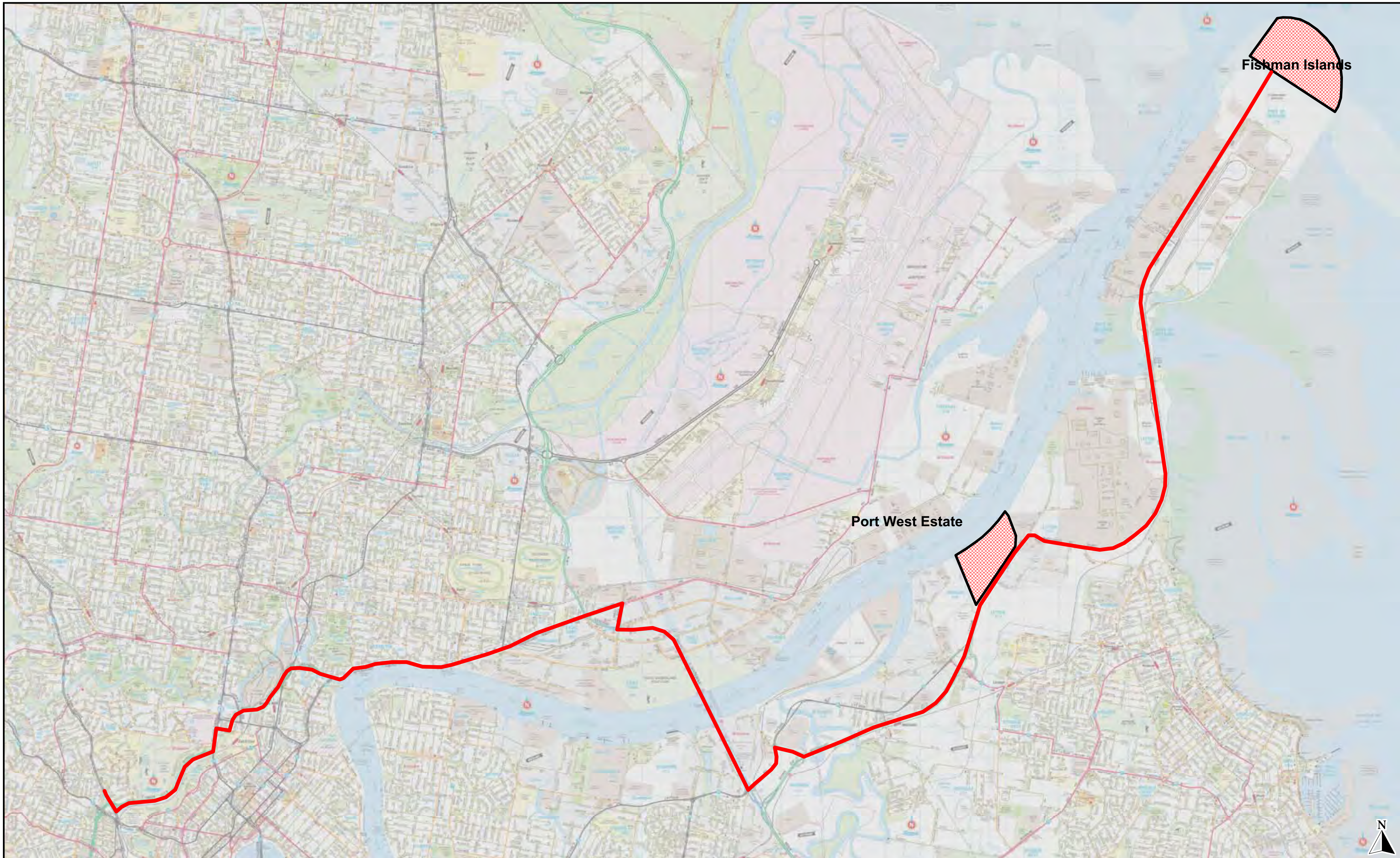


LEGEND

Indicative Haulage Route

Potential Spoil Placement Site

Northern Link
Environmental Impact Statement

Figure 11-2

Potential Spoil Placement site at the Port of Brisbane and Truck Route

SKM Connell Wagner JOINT VENTURE

11.5 Local Traffic Impacts

The preliminary project construction staging, which is contained in **Chapter 4** of the **EIS**, has been developed so that the impact on traffic flow, journey times and public transport due to worksite activities would be minimal as the following strategies have been incorporated:

- Construction staging has been developed following the strategy that the current number of traffic lanes and connectivity with other roads should not be reduced during the construction phase.
- Access to the worksites would be via diverge and merge tapers of length to suit the deceleration and acceleration of loaded vehicles.
- Queuing capacity would be provided within the worksites so that vehicles would not queue on the road network.
- The number of haulage vehicles that would be generated during the construction phase would be minimal (as illustrated in **section 11.6**).

Temporary construction works that may still affect traffic flow in the area surrounding the work sites during the construction period would include the following:

- Temporary traffic diversions.
- Realignment of traffic lanes.
- Partial road closures, for works staged to minimise any disruptions to traffic flow or property access.
- Intersection operational changes.

The CTMP that would outline the mitigation measures that would limit the impact on local traffic would be produced for each of the work sites and areas by the contractor. The CTMP would consider the convenience and safety of all road users, including public transport, pedestrians and cyclists. Access to properties would need to be maintained at all times wherever possible.

The TMPs would include, but not be limited to, a detailed description and plans for:

- Staging and timing of works on roads.
- Signage and delineation past the work site, including any diversion routes.
- Other measures to help ensure safety and manage the change in traffic flows, for example: traffic controllers; traffic signal operational changes using Council's BLISS system; dynamic advance warning using variable message signage (VMS); and real time monitoring of traffic conditions using closed circuit television (CCTV); and public awareness campaigns that would inform the travelling public of such works.

Although the preliminary project construction staging does not propose a reduction in through traffic lanes or any significant diversions it is recommended that, when preparing the CTMP, it would be necessary to predict the likely traffic redistribution as a result of the proposed temporary traffic arrangements.

Conditions surrounding the work sites and areas would need to be monitored throughout the construction period, and the CTMP reviewed as appropriate to address any negative impacts that could develop. This would include regular monitoring of traffic flows against the modelled traffic volumes.

11.5.1 Traffic operations

The preliminary project construction staging, which is contained in **Chapter 4** of the **EIS**, provides plans that show how the existing traffic lanes would be temporarily re-aligned at each work site and work area so that the number of traffic lanes would not be reduced and diversions are minimised. This section describes the proposed traffic operations at each of the work sites and work area.

Western Freeway Connection Local Traffic Arrangements

Construction of the west facing Northern Link entry and exit ramps on either side of the Western Freeway works would not generally require closure, re-alignment or diversion of the Western Freeway traffic lanes. Any lanes closures that maybe required would be carried out during off-peak periods such as night time.

At the Mt Coot-tha Roundabout construction of cut and cover tunnels would require the temporary re-alignment of traffic lanes during the staged construction process. It is proposed that the construction of the cut and cover tunnels would start in August 2010 and be completed by November 2011 and would be carried out in four stages. The existing number of traffic lanes and connectivity would be maintained with the exception of the free flow slip from Mt Coot-tha Road (northern approach) to Mt Coot-tha Road (eastern approach). This would be required to be closed for a period of time during stage 1 construction. The closure of the free flow slip would be mitigated by providing a short left turn pocket on the approach to the roundabout. The closure of the free flow slip is not expected to have an impact on the capacity of the Western Freeway.

Access to and from the worksite would be via diverge and merge tapers of suitable length and queuing of construction vehicles would not occur on the Western Freeway.

These measures would result in a minimal impact during the construction phase on traffic flow and journey times on the Western Freeway and Mt. Coot-tha Road.

Western connection works do not affect access to the Mt Coot-tha Botanic Gardens or any other property and they do not affect the operation of the Toowong Roundabout at Frederick Street.

Toowong Connection Connection Local Traffic Arrangements

The preliminary construction staging involves activity at the Toowong Connection worksite from July 2010. Until March 2012 works would be contained within the work site and would be predominantly associated with tunnelling activities and would not require re-alignment or diversion of traffic lanes on Frederick Street and Milton Road. The establishment of the work site would require the closure of Valentine Street at Frederick Street so creating a cul-du-sac. This closure would be permanent and alternative and convenient access would be possible via Gregory Street (accessed from Morley Street).

From March 2012 work associated with transition structures, elevated structures and road widening would take place on Milton Road. Construction works would be staged such that the existing capacity of Milton Road, Frederick Street, Croydon Street and the Toowong Roundabout would not be compromised. The existing number of traffic lanes would be maintained on these roads and the operation of the Toowong Roundabout would not be altered. The following turning movements would be altered:

- The right turn from Milton Road to Sylvan Road, which is proposed to be permanently removed when Northern Link is fully operational, would be closed during the early stages of these works and relocated to the signalised intersection of Milton Road and Croydon Street. The left out movement from Sylvan Road to Milton Road would be maintained.
- The left turn in and out movements of Gregory Street with Milton Road would also be closed during the early stages of these works. These movements are proposed to be permanently closed when Northern Link is fully operational. A suitable alternative to this movement would be via Morley Street.
- The access to Quinn Street would also be permanently closed when Northern Link is fully operational and would be closed during the early stages of works on Milton Road.

Surface works on Milton Road would be carried out after the cut and cover tunnels have been completed at the Mt Coot-tha Roundabout. This would limit construction activities to specific locations at the western connections of the project to separate times.

Access to and from the worksite would be via diverge and merge tapers of suitable length and queuing of delivery and haulage vehicles would occur within the Toowong connection worksite.

These measures would result in a minimal impact during the construction phase on traffic flow and journey times on the roads local to the Toowong connection worksite such as Milton Road, Frederick Street, Croydon Street and Morley Street.

Property access on the northern side of Milton Road between Gregory Street and Morley Street would be maintained. Property access on the southern side of Milton Road would be maintained until such times as these properties, which would be acquired for the widening of Milton Road, are demolished.

Kelvin Grove Connection Traffic Arrangements

Construction activity at the Kelvin Grove Connection worksite associated with tunnelling activities is proposed from August 2010 to October 2012. The connection of Lower Clifton Terrace with Kelvin Grove Road would be closed as part of the establishment of the work site in late 2009. This would create a cul-du-sac of an existing one-way road and would so require Lower Clifton Terrace to be converted to a two-way road with a left-out movement added to the intersection with Musgrave Road. This would result in a marginally increased travel time for a low number of people for trips to Kelvin Grove Road and the traffic flow on Lower Clifton Terrace would be reduced. This arrangement would be permanent when Northern Link is operational.

Establishment of the work site would also require Upper Clifton Terrace to be severed approximately 60m west from Kelvin Grove Road. This would require the three properties closest to Kelvin Grove Road to be accessed via a temporary road that would connect with Westbury Street. All other properties on Upper Clifton Terrace would continue to be accessed from Musgrave Road.

The intersection of Westbury Street, Kelvin Grove Road and the temporary access road to Upper Clifton Terrace would be realigned. Left-in and left-out access with Victoria Street and Kelvin Grove Road would be maintained. The impact of this local traffic arrangements during the construction phase would be minimal.

Surface works that would require realignment of traffic lanes would be carried out between October 2012 and October 2013. These works would be carried out in several stages so that the existing number of traffic lanes and connectivity with the ICB, Hale Street, Musgrave Road, Ithaca Street (including the access to the INB), Musk Avenue and Blamey Street would be maintained. As the existing number of traffic lanes on these roads would not be reduced during the construction of Northern Link the capacity of these roads would not be compromised.

Access to and from the worksite would be via diverge and merge tapers of suitable length and queuing of delivery and haulage vehicles would occur within the Kelvin Grove connection worksite.

These measures would result in a minimal impact during the construction phase on traffic flow and journey times on the roads local to the Kelvin Grove connection worksite such as the ICB, Hale Street, Musgrave Road, Ithaca Street, Musk Avenue and Blamey Street.

ICB Connection Local Traffic Arrangements

The works at the ICB work area would be carried out in four stages so that the impact on the existing capacity and connectivity would be minimised. In the eastbound direction of the ICB three traffic lanes would be maintained between Kelvin Grove Road and Victoria Park Road. The left-in and left-out access to Victoria Park Road would be maintained throughout the construction of Northern Link. The ICB would reduce to two lanes at Victoria Park Road and widen to three lanes to the east of the Inner Northern Busway overbridge.

In the westbound directions three traffic lanes would be maintained and as with the existing layout the outside lane would diverge and widen to two lanes as Ithaca Street. The capacity of Ithaca Street would not be affected by the preliminary construction design.

The ICB connection worksite would generally be serviced from the Kelvin Grove worksite such that delivery and haulage activities at the ICB connection worksite would be minimal.

These measures would result in a minimal impact during the construction phase on traffic flow and journey times on the ICB.

11.5.2 Traffic intrusion into local streets

The CTMP would be designed to provide sufficient capacity on the major traffic routes at all times, reducing the desire for drivers to seek alternative routes. The road network surrounding the work sites would generally not provide convenient alternative routes via local streets for both cross-city and radial trips.

11.5.3 Trucks queuing

Trucks entering the work sites should not create a queue that impacts on traffic flow on the road network. The critical time for truck queue space requirements would be at the start of a shift, when several trucks arrive early and queue to wait for their first load.

Each of the work sites would provide a significant length of access road within the site which would provide space for trucks to queue. Over 150 m of access road is provided within each work site that could be used for truck queuing space.

11.5.4 Construction workforce parking

The identified workforce is expected to generate a parking demand of approximately 350 vehicles. Shift changeovers for underground workers are expected to occur outside working hours for surface workers, providing ample parking for the short term double demand of the shift workers' vehicles. The majority of workforce car parking would not be provided at the worksite but at convenient sites close by from where the workforce would be taken to the work site by a shuttle bus.

At the western end of the project suitable options for an off site car park have identified on Mt Coot-tha Road and Sir Samuel Griffith Drive. From the selected location the workforce would be taken to the Toowong and Western Freeway work site by shuttle bus. To access the work site the shuttle bus would enter the Western Freeway work site from the eastbound carriageway of the Western Freeway.

The eastern end of the project would have a workforce car park located on BCC parkland that is located between the ICB and Gilchrist Avenue. This car park would be accessed from Gilchrist Avenue. Shuttle buses would transport the workforce to both the Kelvin Grove Connection work site and the ICB work area.

Each work site would also provide a small number of parking spaces for visitors and deliveries.

The off-site car parks should have sufficient capacity such that the workforce would not be required to park on the local streets. The Kelvin Grove Connection worksite is surrounded by residential streets. This area could be covered by a traffic area to prevent the workforce from parking on street. If necessary, and following consultation with the community and Brisbane City Council, this could be achieved by extending the Brisbane City Traffic Area.

On street car parking conditions should be monitored on the streets surrounding all work sites. Counter measures such as reminding staff of the parking policy to temporary on street parking restrictions could be applied if excessive parking was detected.

Workforce parking and associated management for surrounding residential or commercial areas, addressing issues such as safety, access and amenity, will need to be fully addressed in CTMP prepared by the construction contractor.

11.6 Regional Traffic Impacts

Impacts on regional traffic flow would be concentrated along the haulage routes. These are discussed below.

11.6.1 Haul routes

Western Freeway and Toowong Connection work sites

The haul routes associated with the Western Freeway and Toowong Connection work sites would be likely to follow the Western Freeway, Centenary Highway, Ipswich Motorway, Cunningham Highway and Swanbank Road to the potential spoil site at Swanbank.

An indicative scenario has been based on an average of an approximate total of 6 trucks per hour from the Western Freeway and Toowong Connection work sites. This scenario would generate a two-way total of over 100 haulage vehicles per day. This total would be a maximum total that would vary over time: early in the construction sequence an average of 2.5 trucks per hour (a two way total of 90 haulage vehicles per day) would be generated for 3 months from July 2010. This would increase to the maximum (two-way total of 100 haulage vehicles per day) for 11 months and then substantially decrease to no more than 1 truck per hour (two-way total of 6 haulage vehicles per day), for a further 8 months when haulage is no longer required from the Western Freeway work site but continues at the Toowong Connection work site.

These totals are small and the maximum number of trucks generated would represent an increase in traffic of less than 1% along the haulage route and account for an increase in commercial vehicles of 5% or less. Consequently, the haulage traffic is not expected to adversely affect the performance of any of the roads on the haul route.

The effect of trucks on the Western Freeway could be reduced further through the possibility of using a cross passage tunnel to enable trucks to access the westbound direction of the Western Freeway directly from the work site rather than using the Mt Coot-tha Roundabout as a turning location.

Additional haulage trucks from the Toowong Connection work site would take spoil to the Western Freeway work site. Spoil activity would commence in July 2010 and last for 19 months and would be equivalent to 4 trucks per hour (two-way total of just over 80 trucks a day). The additional volume would be small and consists of 0.2% of the total traffic on the Western Freeway. The proposed haulage route would be:

- Mt Coot-tha Road, Western Freeway, turn at Moggill Road interchange, Western Freeway to access the Western Connection work site from the eastbound direction of the Western Freeway.

These measures are not expected to adversely impact on traffic flow and journey times on the Western Freeway and Toowong spoil haulage routes.

There is an option to use a cross passage tunnel to enable haulage trucks to access the Western Freeway work site directly from the westbound direction of the Western Freeway and so removing the need for trucks to turn at the Moggill Road interchange.

Kelvin Grove Connection work site

Haul routes from this location would consist of Kelvin Grove Road to access the ICB and then Kingsford Smith Drive, the Gateway Motorway, the Port of Brisbane Motorway and Lytton Road in order to access the spoil placement sites at the Port of Brisbane.

The volume of haulage trucks expected is relatively low with a forecast of 3 trucks per hour each way, a daily two-way total of 108 truck trips.

The effects of this additional traffic on the haulage routes may include:

- The haulage vehicle volumes represent only a small increase (8%) in the background heavy vehicle traffic volume on Kelvin Grove Road, south of Musk Avenue, and an increase of less than 0.5% in total traffic.

- The increase in total traffic on the ICB, Kingsford Smith Drive, Gateway Motorway, the Port of Brisbane Motorway and Lytton Road that would be due to haulage traffic is less than 0.5%. It is not expected that the haulage traffic would affect the performance of any of the roads on the haul routes.

These measures are not expected to adversely impact on traffic flow and journey times on the Kelvin Grove spoil haulage routes.

11.6.2 Deliveries

Materials would be delivered to the three work sites and the ICB work area, depending on the nature of the work and material. The delivery routes would vary with the sources of materials and equipment, which are not known at this stage of the planning process. Deliveries would, however, be confined to major roads. For this reason similar effects would apply to those discussed in the previous section of this report (haul routes).

In general, truck numbers required for deliveries are expected to be lower than those required for spoil haulage. Therefore the effect of the deliveries would be expected to be relatively small, except at intersections which are already close to capacity and significantly congested. At these locations, deliveries in peak periods may have to be avoided. This issue would be investigated in detail during the preparation of the CTMP.

Some deliveries would need to be made using oversize vehicles. These deliveries would need to follow the guidelines set out by Queensland Transport, including loading, safety measures, and time of transport. The number of such deliveries and the routes required are not yet known. Planning for these deliveries would need to be examined in detail during the preparation of the CTMP.

In general delivery times would be restricted to daytime hours Monday to Saturday.

11.7 Impacts on Bus Routes and Operations

Acceptable traffic flow would be maintained past the worksites on all major roads throughout construction, using the management measures to be detailed in the CTMP. Bus routings would therefore not be affected. Also, the road sections affected by construction zone speed restrictions are likely to be too short to require schedule changes. Bus stops at the Toowong Connection and Kelvin Grove Connection work sites would be affected by construction works and they may require temporary relocation during construction of the Northern Link to locations as close as possible to the existing bus stops.

Construction of Northern Link would not affect bus operations on the Inner Northern Busway.

11.8 Emergency Service Vehicle Movements

Emergency service vehicle routes would not be affected by the construction of the project. This includes access to the Wesley Hospital in Auchenflower and the Royal Children's Hospital and the Royal Brisbane and Women's Hospital in Herston.

11.9 Construction Impacts on Active Transport

Pedestrian and cyclist routes will be provided through all work areas and access to all properties will be maintained. Temporary diversions may be required and this should be detailed in the contractors CTMP. All pedestrian crossings will be maintained throughout construction. Specific impacts in each area are discussed in the following sections.

11.9.1 Western Freeway

The Western Freeway bikeway and the Western Freeway Roundabout Cycle and Pedestrian Bridge, which is currently being constructed, would generally not be closed during the Northern Link construction phase as there are not satisfactory alternative routes for cyclist and pedestrians. The occasional closure to the Western Freeway Roundabout Cycle and Pedestrian Bridge may be required. To mitigate the impact of such closures they should be carried out during the night time when usage of the bridge by cyclists and pedestrians would be minimal. Sufficient notification of any closure would be given. The modifications to this facility that could be required are discussed in **Chapter 4** of the EIS.

11.9.2 Toowong Connection

Pedestrian access would be maintained along both sides of Milton Road and Croydon Street and on Frederick Street throughout construction. Pedestrian crossing facilities at the signalised intersections of Milton Road/Croydon Street/Morley Street and Croydon Street/Jephson Street/Sylvan Road would also be maintained. The exiting bikeway on Milton Road that provides a connection from the Sylvan Road to the Western Freeway bikeway would also remain operational.

Potential safety hazards for pedestrians and cyclists alike may be created by construction traffic leaving and entering the work site that would have access points on Frederick Street and Milton Road. To increase safety at these locations, a traffic control system may need to be set up that could consist of either manual control or flashing/audible alarms.

11.9.3 Kelvin Grove Connection

On Kelvin Grove Road the existing pedestrian footpaths would be maintained on its eastern and western sides through the work area. The existing pedestrian footpath on the western side of Kelvin Grove Road that connects the pedestrian underpass of the Musgrave Road and Hale Street connection to Kelvin Grove Road would be realigned to suit the work site boundary.

The work site would result in the closure of pedestrian access between Kelvin Grove Road and Lower Clifton Terrace and Upper Clifton Terrace. Suitable alternative pedestrian access would be provided by installing a temporary footpath around the southern boarder of the work site between Kelvin Grove Road and Lower Clifton Terrace. For pedestrians travelling between Upper Clifton Terrace and Kelvin Grove Road suitable alternative pedestrian access would be provided by a footpath on the western side of the work site between Upper Clifton Terrace and Westbury Street. A pedestrian crossing of the work site vehicular access at Westbury Street would be provided for pedestrians to walk to Kelvin Grove Road.

The current pedestrian crossing points at the signalised intersections of Kelvin Grove Road with both Blamey Street and Musk Avenue would also be maintained. Pedestrian safety hazards at the work site access points would be mitigated.

11.9.4 Inner City Bypass

The bikeways on both the northern and southern side of the ICB would remain operational. Realignment of the bikeway on the southern side would be required. The bikeway on the northern side, in the vicinity of Victoria Park Road may need some temporary re-alignment and the occasional night time or weekend closure.

11.10 Construction Impacts on Rail Infrastructure and Operations

The construction of Northern Link would not impact on rail infrastructure and operations, including access to QR property. Minor work at the QR access on the ICB in the vicinity of the Landbridge would be required. These works would not affect access to QR property.

12. Conclusions

The proposed Northern Link Project is a tunnel based motorway standard toll road extending for approximately 5km in length. It would connect the Western Freeway at Toowong with the ICB at Kelvin Grove. Northern Link would also provide connections to the Toowong precinct at Milton Road/Croydon Street and to the Kelvin Grove precinct at Kelvin Grove Road.

The objectives of Northern Link have been developed, having regard to Council's Corporate Vision as expressed in Living in Brisbane 2026, and the State and local planning strategies for land use and infrastructure. The primary project objectives are to:

- Provide an effective and convenient bypass of the Brisbane CBD for cross-city movement of people and freight;
- Address, in part, deficiencies in the national freight network to improve freight distribution in and around Brisbane;
- Improve safety and reliability of the regional road network and provide relief to congested roads in Brisbane's inner western suburbs;
- Provide opportunities for additional public transport network capacity; and
- Support the achievement of a sustainable urban environment for the inner western suburbs.

Northern Link is included in Council's *Draft Transport Plan for Brisbane*[27] and *TransApex*[28] initiative and is hence a component of an integrated transport plan for Brisbane. Northern Link is a key component in an overall strategy to improve the efficiency of Brisbane's road network, consistent with long-term regional and city wide transport planning objectives.

Northern Link is also identified in the South East Queensland Infrastructure Plan and Program (SEQIPP), developed to guide infrastructure planning and investment to support the preferred pattern of development in the South East Queensland Region. It is flagged as a transport infrastructure improvement that should be investigated to provide for future development of the Greater Brisbane area.

12.1 Investigations and analysis

The investigations undertaken in this traffic and transport study have yielded a range of findings that demonstrate that the project is of merit and supportive of its stated objectives.

The analysis of the existing traffic and transport system and performance for the Brisbane Metropolitan area and Inner West Transport Study Area showed that:

- Within the Brisbane Metropolitan Area motorised travel accounts for 80% of total travel, indicating the dominance of vehicle demand.
- There are gaps in the strategic road network that principally affect east-west transport efficiency, safety and reliability. A direct, high quality connection that serves the desire line between the west and the north region, which includes the ATC and the strategic road network in the north of Brisbane, is missing from the current network structure.

[27] Brisbane City Council (2007) *Draft Brisbane Transport Plan 2006-2026*, Brisbane City Council, Brisbane.

[28] Brisbane City Council (March 2005) *TransApex Prefeasibility Report*, Brisbane City Council, Brisbane.

- The key east-west regional routes, Milton Road, Coronation Drive and Frederick Street, cater for the major proportion of the traffic task within the network in inner west Brisbane. Milton Road currently provides a freight route between the Western Freeway and the CBD and the ICB.
- Highly congested traffic conditions occur during peak periods along Milton Road, Coronation Drive and Frederick Street. Coronation Drive operates under a tidal flow system that maintains two lanes in each direction and a third lane in the peak direction. The majority of its intersections are signalised and access to frontage properties is limited. Milton Road has a number of priority and traffic signal controlled intersections. The movements that are permitted at a number of these intersections are restricted and access is provided to properties. The Mt Coot-tha Roundabout at the eastern end of the Western Freeway would operate significantly over capacity in the future.
- Travel speed on both Coronation Drive and Milton Road fluctuate along the corridor due to traffic delays at numerous locations resulting in excessive and unreliable journey times during peak periods.
- Congested traffic conditions on the regional and arterial road network has created the pressure for through traffic use of some local roads, with consequential negative effects on the amenity of some residential areas in the inner west.
- A high proportion of commercial vehicles use the congested roads in the inner west area. This affects the amenity of the area. Travel time unreliability on congested roads impacts on productivity for businesses and industry.
- Bus services in the inner west area are affected by congestion on the road system. Both Milton Road and Coronation Drive are important bus corridors serving commuters from both a local and wider catchment area in Brisbane.

A key finding of the traffic and transport study is that both Coronation Drive and Milton Road carry approximately 75% of vehicles making cross-city travel movements. Both of these regional roads also function as important routes for radial or CBD oriented traffic, and for local traffic to land-uses along the routes.

This provides a clear indication that if traffic making cross-city movements were removed from these routes then there would be significant benefits through relief of traffic congestion and improved amenity on surface roads in the inner west area.

The assessment of forecast future traffic and transport patterns provides significant support for the project because:

- Due to the forecast population and employment growth in South East Queensland and the Brisbane area, the estimated growth in the travel task (in terms of person trips) and vehicle travel demand in the network is significant. Although enhanced use of public transport is forecast to result from TransLink's planned public transport initiatives, an increase in vehicle trips would still occur. By 2026, with a forecast population of 2.53 million in the metropolitan area (compared to 1.88 million in 2007), total vehicle trips (including commercial vehicles) are forecast to be 34% higher than current levels, reaching 5.5 million vehicle trips on an average weekday.
- A high growth in the demand for travel to key trip generators in the west, east and north is forecast. This would increase the cross-city travel demand through the project corridor. The Western Corridor has a forecast increase of almost 180% in vehicle demand from 2007 to 2026 due to significant population and employment growth as identified in the Regional Plan's Preferred Pattern of Development. To the north-east of the project corridor vehicle demand is forecast to increase by over 120% at the Australia Trade Coast North, which includes Brisbane Airport.
- Demand for travel to the central city has a forecast increase of 30% in vehicle demand due to its significance as a Primary Activity Centre and employment node. Travel demand to the Inner West

Transport Area, which includes activity centres at Toowong, Indooroopilly and St Lucia (UQ) is forecast to increase by 18%.

The effects of these significant additional demands on the road network, without the project, were found to be:

- A general increase in congestion on the road network and significant further decline in peak period journey times over the years, under pressure to cater for increases in vehicle travel demand within the metropolitan area network and the major travel generators to the west, north and east of the project corridor.
- Much of the traffic congestion that would occur in the inner west Brisbane's road system would be caused by cross-city traffic being forced to use the roads through the suburbs.

From the analysis of the existing traffic and transport system, and the future enhanced public transport mode share scenario without the project, it is evident that there is considerable support for the project. The studies undertaken have found that the proposed project would:

- Fulfil a function of regional significance by providing a cross-city connection for trips between the western, eastern and northern areas of the Brisbane Metropolitan area. Northern Link would provide the strategic road link between the Western Freeway and the ICB and so connect the growth areas of the Western Corridor and the Australia Trade Coast north precinct.
- Compared to the scenario without the project, Northern Link would reduce traffic volumes, including commercial vehicles, on many roads in the inner western suburbs so providing amenity benefits to residential precincts and activity centres.
- Reduce congestion and improve operating conditions on regional roads in the inner west. Traffic operations at the Mt Coot-tha and Frederick Street roundabouts would improve due to the traffic relief effects of the Project.
- Reduce the amount of travel on lower order roads in the network and redistribute travel to higher order roads. Improve freight distribution by completing a motorway standard corridor for freight routes and freight distribution from the west to the CBD, ATC and north Brisbane. This would reduce total vehicle hours of travel and vehicle kilometres of travel for commercial vehicles, providing important benefits to industry through reduced operating costs and improve travel time reliability.
- Provide substantial travel time savings of around 50% on cross-city regional routes and central city and inner west routes for tragic choosing to use Northern Link.
- Provide travel time benefits for traffic choosing to use the un-tolled surface routes instead of Northern Link due to congestion relief.
- Improve traffic operations via traffic reductions and so increase travel speeds on the surface bus routes along Milton Road and Coronation Drive.
- Provide the opportunity for Rocket bus services from the Brisbane western suburbs to use Northern Link as an express route from the Western Freeway to access the Inner Northern Busway stations in the CBD.
- Provide an overall reduction in forecast crashes on major routes within the inner west area.

Assessment of the travel patterns for traffic accessing Northern Link from the Western Freeway, ICB, Toowong and Kelvin Grove connections indicate all would have a predominant function of providing for cross-city travel.

Key findings include:

- The Western Freeway would cater over 70% of the traffic that enters Northern Link at its western connection with the Toowong ramps (Croydon Street) providing a secondary role. There would be minimal use of Milton Road or the adjacent local network to the north for travel access to Northern Link.
- The straight through connection to and from the ICB would cater for over half of the traffic movement at the eastern connection. Use of the Kelvin Grove Road ramps would be distributed in similar proportions to the north and south.

- The Toowong ramps would play a significant role in catering for traffic between the major activity centre at Toowong and the ICB and Kelvin Grove Road north.
- The Toowong ramps are more strongly linked to travel between cross-city destinations via Airport Link, Kingsford Smith Drive and CLEM7, rather than central city related travel.
- The majority of traffic using the Kelvin Grove ramps for Northern Link trips would travel west via the Western Freeway.

The investigations of the effect of the project have indicated some adverse effects, and where necessary, mitigative actions are recommended. Key impacts are:

- Beyond the immediate area of the Project, few key routes experience significant traffic increases.
- Sound traffic relief would be expected on several regionally important corridors, particularly by 2026 (when decreases of 7% to 21% are forecast), including the Ipswich Motorway east of the Centenary Highway, Riverside Expressway, CLEM7, Ipswich Road and Fairfield Road. The relief offered to the Riverside Expressway, as well, flows on into traffic reductions through the CBD, particularly Ann and Turbot Streets.
- The main feeder route at the western end of the project would be the Western Freeway. In 2014, average weekday traffic on the Western Freeway north of Moggill Road is forecast to reach 114,500 vpd with Northern Link. This is similar to the traffic levels carried during 2007 on the four lane section of the Gateway Motorway north of Kingsford Smith Drive (112,000 AWDT) . By 2026, an increase in traffic to 138,000 vehicles per day is forecast, representing a 31% compared to the without project scenario. By this time horizon, the forecast increased peak period demands would contribute to a decline in the LOS in the peak direction. However, overall demands are within the anticipated traffic lane capacities along this route which, as per SEQIPP, has been assumed to be upgraded by 2016 to add a T2 lane in addition to existing 2 lanes in each direction.
- A moderate increase of 12% in 2014 and 16% in 2026 is forecast at the four lane Centenary Bridge. Average weekday traffic demands with the project of 110,400 in 2014 rising to 137,400 in 2026 are forecast. By 2026 peak period congestion is forecast at the Centenary Bridge either without or with Northern Link in the peak direction of travel. This is because whilst corridor upgrading in the form of the Western Freeway-Centenary Highway Transit Lane project (identified in SEQIPP) has been included in the base future networks from 2016, widening of the bridge has been excluded. It is not uncommon to tolerate a lower level f service on a specific cross-rive link if feeder road capacity is available due to the high expense associated with capacity increases on such facilities. With peak spreading in the network over the next 20 years, it is considered not unreasonable to assume that a four lane cross-river facility could carry an AWDT of up to 140,000 vehicles per day.
- The ICB would experience increases in average weekday traffic in the order of 20% (compared to the without project scenario) resulting in 143,000 vehicles per average weekday by 2026. This is within the traffic carrying capacity of this 6-lane road link.
- At the Kelvin Grove Road connection, Kelvin Grove Road immediately north is forecast to experience a 20% increase in daily traffic by 2026. It is noted that this route will experience some relief of traffic growth effects due to the introduction of Airport Link into the network in 2012. The impacts of peak period traffic increases can be managed with the proposed project connection works at Kelvin Grove Road. Traffic changes on Kelvin Grove Road diminish rapidly to the north of the study area.
- Kelvin Grove Road south of the connection would experience little change in forecast traffic demand. This would occur because whilst some traffic is added to the network at this point associated with the Kelvin Grove south facing ramps from Northern Link, there would be compensating reduction in traffic achieved via westbound traffic use of the north facing ramps. This traffic would otherwise travel via Countess Street or ICB to Milton Road or Coronation Drive.

- Average weekday traffic increases of less than 15% are forecast for College Road and Musgrave Road, between College Road and Hale Street by 2026. West of Hale Street, Musgrave Road is forecast to experience traffic reductions. There would be no significant effect on level of service.
- The off ramp from Kelvin Grove Road (southbound) to College Road is forecast to experience traffic increases, with manageable peak period changes.
- The forecast effects of the project diminish quite rapidly to the south with minimal (5% or less) weekday traffic changes (either increases or reductions in traffic) on Countess Street and Petrie Terrace due to overall traffic re-rerouting effects.
- Approximately 40% of the traffic using the Western Freeway would be associated with Northern Link and hence would not pass through the Mt Coot-tha and Toowong roundabouts. Compared to the without project scenario in 2026, there would be a substantial reduction in volume of Western Freeway traffic that would pass through the Mt Coot-tha and Toowong roundabouts. This would generally improve travel conditions for commuter and local traffic use of this part of the network, and relieve pressure for use of local network for rat-running.
- Croydon Street and Jephson Street are forecast to experience increases in average weekday traffic in 2026 compared to the without project scenario. Increases range from 60% on Croydon Street to 28% on Jephson Street. To facilitate these increases in traffic volume widening of Croydon Street from an undivided four lane road to a divided six lane road has been incorporated with upgrades to the intersections of Milton Road/ Croydon Street/ Morley Street and Croydon Street/ Jephson Street/ Sylvan Road. Jephson Street is a four-lane City Distributor and Council has been actively preserving set-backs along this corridor over a number of years as re-developments occur in order to improve the traffic capacity of this route progressively over time. The Traffic Management Plan (Operations) should address issues such as signal co-ordination to accommodate increased traffic on the approaches of this corridor connecting to the project.
- Improved amenity on many roads in the inner west suburbs would be likely, due to forecast traffic reductions with the Northern Link project. Sound reduction in traffic on the Milton Road-Coronation Drive radial road corridors, and other roads used by east-west traffic, with a 19% to 24% reduction by 2026 in the network across the Toowong and Milton screenlines respectively. This includes traffic reductions of up to 22% on Coronation Drive and 9% on Milton Road.
- High Street in Toowong is forecast to experience a reduction of 27%, with resultant traffic levels in 2026 lower than existing. Forecast traffic reductions with the project compared to without the project scenario would be experienced on Sylvan Road (between Coronation Drive and Croydon Street) in 2026 in the order of 23%.
- As the project would have a wider effect on route choice within the network, a range of heavily trafficked regional radial and ring roads in the broader Western Brisbane area are forecast to experience traffic reductions and improved operation. Examples at 2026 include Moggill Road, Toowong (-13%); Moggill Road, Indooroopilly (-5%); Frederick Street (-11%) and Jubilee Terrace (-14%) which are components of MetRoad 5; Miskin Street (-12%); and Sherwood Road (-24%) to the west of Jephson Street.
- Significant daily traffic reductions on many City Distributors such as Sylvan Road south of Croydon Street (-23%), Caxton Street (-19%) and Latrobe Terrace (-15%). The traffic reductions on these streets should lead to improved amenity particularly as these streets typically provide a function for active transport and public transport trips, access to properties and local streets.
- Reductions in daily traffic are forecast on many local streets throughout the inner west suburbs such as Eagle Terrace (-24%), Haig Road (-30%), Stuartholme Road (-22%), Rainworth Road (-43%), Sylvan Road east of Milton Road (-38%), Morley Street (-25%) and Birdwood Terrace (-38%), Heussler Terrace (-27%), Birdwood Terrace (-38%), Morley Street (-25%), Park Road (-22%), Rainworth Road (-43%), Stuartholme Road (-22%), and Lang Parade (-21%).

- Sound reductions in the number of commercial vehicles on surface streets are forecast. At the Toowong screenline, 30% of commercial vehicles would be removed from roads from Mt Coot-tha Road across to Coronation Drive and at 24% of commercial vehicle traffic being removed from the surface network routes from Coronation Drive through Milton to Musgrave Road in 2026.
- The project is forecast to result in some increase in traffic flow through the western section of the study area (the Indooroopilly screenline) although overall traffic increases are confined to the higher order roads such as the Western Freeway.
- The project would also require changes to local traffic arrangements through access restrictions or changes in precincts adjacent to the connections to the surface road network. These effects are minor and the project design has been shaped so as to minimise impacts.
- To mitigate the risk of extraneous through traffic in the residential precinct at the Toowong precinct to the north of Milton Road it is recommended that a LATM measure be implemented. As this precinct will remain challenged over time by through traffic pressures, an expansion of the currently planned local area traffic management (LATM) measures would be prudent to further protect the amenity of this residential area. Due to the proximity of the project to this on-going problem, it has been identified that it would be beneficial to investigate further local area traffic management (LATM) measures as part of the Traffic Management Plan.
- The effect of the project on traffic volumes within the residential precinct north of Milton Road in the vicinity of the Toowong connection has been modelled, taking into account the potential for use of the Gregory Street- Morley Street route for traffic seeking to access the Northern Link ramp connection. The assessment concluded that only traffic from the immediate local area (forecast as 360 vpd) would find it beneficial to use Morley Street to access the Northern Link entry ramp via a right turn movement from Morley Street. Approximately 140 vpd are forecast to use Morley Street as an exit route, with this traffic exiting to Croydon Street and then travelling via a circuitous route to access Morley Street. Traffic reductions, compared to the without project scenario are forecast for the Gregory Street - Morley Street route. This occurs due to congestion relief effects that Northern Link provides within the wider network.

12.2 Support for the project

It is evident that from a traffic and transport viewpoint the primary objectives of Northern Link would be supported:

- **Provide an effective and convenient bypass of the Brisbane CBD for cross-city movement of people and freight**

  Northern Link would provide a motorway standard link between the Western Freeway and the ICB that would remove the need to travel through the Brisbane CBD for cross-city movements between the west, north and east of Brisbane. Northern Link would predominantly cater for cross-city travel representing over 80% of all trips and 95% of commercial vehicles trips.

- **Address, in part, deficiencies in the national freight network to improve freight distribution in and around Brisbane**

  Northern Link, in conjunction with the Centenary Highway, Western Freeway, ICB and Airport Link would provide a motorway standard corridor between the far south-west, the Western Corridor and the central city, ATC, north Brisbane and the strategic road network to the north for long distance freight and regional freight distributors. This would provide an alternative freight route to the Brisbane Urban Corridor and the regional roads in the inner west and so improve travel times and reliability for freight.

- **Improve safety and reliability of the regional road network and provide relief to congested roads in Brisbane's inner western suburbs**

By redistributing travel to motorway standard routes from the local road network Northern Link would reduce congestion and improve travel time reliability on the regional roads through the inner west. There would be an overall reduction in crashes on regional roads in the inner west. Northern Link would provide an alternative route in the event of a major incident.

- **Provide opportunities for additional public transport network capacity**

  Northern Link would relieve congestion on the existing major bus routes on Coronation Drive and Milton Road that would improve bus journey times and reliability and could assist in increasing public transport operations. Northern Link also provides the opportunity for express bus services from the Western Corridor and Brisbane's western suburbs to be routed through it to access the Inner Northern Busway and the CBD.

- **Support the achievement of a sustainable urban environment for the inner western suburbs by:**

  Connectivity to the activity centres within the inner western suburbs would be improved. Forecast traffic reductions on the surface road network in the inner western suburbs would provide the opportunity for improvements to the active transport and public transport networks.

The traffic and transport study shows clear support for the projects objectives and in particular for providing for cross-city movement of people and freight.

13. References

Austroads (1998). Guide to Traffic Engineering Practice: Part 2 – Roadway Capacity

Brisbane City Council (1989) *Brisbane Traffic Study*, Brisbane City Council, Brisbane

Brisbane City Council (2003) *Transport Plan for Brisbane 2002-2016*, Brisbane City Council, Brisbane

Brisbane City Council (March 2005) *TransApex Prefeasibility Report*, Brisbane City Council, Brisbane

Brisbane City Council (February 2005) *TransApex Strategic Context Report*, Brisbane City Council, Brisbane

Brisbane City Council (September 2007) *Green Bridge Link Impact Assessment Study*, Brisbane

Brisbane City Council (April 2008) *Hale Street Link Project Modification Report*, Brisbane City Council, Brisbane

Brisbane City Council (2007) *Draft Brisbane Transport Plan 2006-2026*, Brisbane City Council, Brisbane

Brisbane City Council (2007) *Brisbane Long Term Infrastructure Plan*, Brisbane City Council, Brisbane

Cardno Eppell Olsen (2007) *Kelvin Grove Urban Village Transport Strategy*, Brisbane

Land Transport New Zealand. (October 2005). *Project Evaluation Manual Vol 1. amendment No 9. PFM 2* Appendix A11 Evaluation of Congested Networks and Induced Traffic Effects

Lend Lease Property Management (2007) Lend Lease Property Management, Sydney, viewed February 2008, www.indooroopillyshopping.com.au

National Association of Australian State Road Authorities (1982) *Guide to Traffic Engineering Practice TEC-10*

Office of Urban Management (June 2008) *South East Queensland Infrastructure Plan and Program*, the State of Queensland (The Co-ordinator General), Brisbane

Office of Urban Management (June 2005) *South East Queensland Regional Plan 2005-2026*, the State of Queensland (Queensland Department of Local Government, Planning, Sport and Recreation), Brisbane

Population and Information Forecasting Unit (PIFU) and National Institute of Economic and Industry Research (NIEIR) (2007/08) *SEQ Economic and Employment Forecasting Study* – Data sets supplied by Brisbane City Council, Economic Development

Queensland Rail (2007) www.citytrain.com.au

Queensland Transport (November 2004) *Brisbane Freight Matrix. Working Paper #2.* Prepared by Adam Pekol Consulting

Queensland Transport (2007) *SEQ Principal Cycle Network Plan*, Queensland Transport, Brisbane

Queensland Transport (2007) www.transport.qld.gov.au

Queensland Transport (2007/08) Western Brisbane Transport Network Investigation, www.wbtni.net.au, viewed May 2008

Scottish Executive (February 1997) Design Manual for Road and Bridges, Volume 12, Traffic Appraisal of Road Schemes Section 2, Traffic Appraisal Advice Part 2, Induced Traffic Appraisal

Sinclair Knight Merz – Connell Wagner JV (2006) *Airport Link Environmental Impact Statement*, prepared for Queensland Government and Brisbane City Council

Sinclair Knight Merz – Connell Wagner JV (2006) *Airport Link Environmental Impact Statement – Technical Paper No 1: Traffic and Transport*, prepared for Queensland Government and Brisbane City Council

Transport Research Board, National Research Council, USA (2000) *Highway Capacity Manua*

TransLink (2007) Rail Services and Infrastructure Requirements Study Extract only supplied

TransLink (2007) www.translink.com.au

TTM Consulting (March 2006) *Traffic Engineering Report: Proposed Car Park Expansion and Medical Suites, Wesley Hospital, Auchenflower*, Prepared for Wesley Hospital

University of Queensland (2007) University of Queensland, Brisbane, viewed February 2007, www.uq.edu.au

Wilbur Smith and Associates (1965) *Brisbane Transportation Study*, Brisbane City Council and Main Road, Brisbane

Appendix A Extract from Terms of Reference

The EIS is to provide an outline of the traffic and transport studies undertaken, to demonstrate the need for the project and to contribute data for other aspects of the impact assessment.

A.1 Description of existing transport network

The existing transport network and operations should be described (at a level of detail appropriate for the impact of the project), in terms of:

- the regional, arterial and local road network;
- road traffic composition and movement patterns, including the source and destination of such traffic;
- road capacity, degree of saturation and levels of service;
- public transport services (bus, ferry and rail) – existing service details service patronage (peak, daily) and facilities;
- rail corridors and associated rail infrastructure;
- bicycle and pedestrian infrastructure and modal proportions;
- freight traffic volumes, composition and existing designated freight routes;
- tolling; and
- emergency services vehicle flows.

A.2 Transport network performance

The performance of the existing road network should be described in terms of:

- traffic demands (through, local and regional context);
- local access and operational requirements, both for properties and local streets;
- traffic flows, speeds and travel times – peak, daily, composition;
- road capacity (level of service);
- cycle and pedestrian network connectivity;
- interchange and intersection operating LOS (delays and queuing);
- interaction with public transport (including reference to public passenger transport demand, capacity, LOS and mode share); and
- road user safety, (including pedestrian and cycle users).

A.3 Description of traffic forecasting methodology

A description of the studies undertaken for the project should be provided, with particular emphasis on:

- broad land use patterns – a description of the population, employment and demographic forecasts used and assumed generation rates, taking into consideration the most recent public information from the Planning Information and Forecast Unit (Department of Infrastructure and Planning);
- the scope and validity of the transport models used;
- the provision of year forecasts for relevant design years to 2026;
- an analysis of trends in household travel behaviour (by comparison of 1992, 2004 and any available more recent household travel survey data) and assessment of the sustainability as reflected by those trends;
- network improvements – which planned or proposed upgrades have been included in the traffic modelling and for what time;

- an explanation of how and what alternative future scenarios were considered, including tolling effects, vehicle operating costs and changes in mode share to public transport over the period to 2026;
- effects of the project on public and public transport services within or adjacent to the corridor;
- quantification of demand in both the tunnel and greater transport network affected by the project and the cumulative effects of other road infrastructure projects in the vicinity of the study corridor; and
- ability of the modelling approach to predict diversion of traffic and travel change behaviours.

The EIS should seek input from Queensland Transport in the development of the Northern Link traffic forecasting model, particularly with the coding of the future public transport network.

A.4 Forecast future base traffic conditions (no project)

Future conditions on the road network should be outlined from appropriate models for relevant design years such as the anticipated opening year 2014, and relevant design years up to 2026, without the project in place, in terms of:

- transport and traffic future demand, including forecast traffic volumes and speeds;
- through traffic demands and operational and access requirements;
- network performance within the local and broader network surrounding the project – interchange and intersection operation (eg: degree of saturation, delays and queues);
- public passenger transport services (including levels of service, and utilisation of bus and rail passenger transport capacity); and
- road user safety assessment including consideration of pedestrian and cycle users.

A.5 Effects of the project

The effects of the proposed works on the transport network should be investigated for future model years, as follows:

- traffic volumes – changes from the anticipated opening year in 2014, and other relevant years up to 2026 with the project;
- traffic flow and other impacts on major and minor roads (including the ICB, Coronation Drive, Milton Road, Kelvin Grove Road, Western Freeway, Centenary Highway and all other feeder and exit roads to the project);
- modifications needed on access and link roads to the project to ensure its effective operation;
- identification of potential impact of any anticipated change in the categories of vehicles using the proposed route (eg: potential increase in route usage by heavy vehicles);
- identification of broader road network upgrade requirements which would mitigate potential congestion points identified as resulting from construction or operation of the project;
- impacts on access to rail corridors for maintenance and repairs where relevant;
- interchange, intersection and road capacity performance (levels of service);
- car movements – eg: travel times, vehicle kilometres travelled (VKT), trip diversions, reliability;
- commercial vehicle movements (eg: travel times, VKT, trip diversions);
- aggregate road network performance – VKT, vehicle hours travelled (VHT), average vehicle speeds;
- identification of impacts as a result of changed traffic vehicle movements on stakeholders, including residents and businesses, both in the study corridor and areas surrounding the corridor;
- impacts on access to properties (including Mt Coot-tha Botanic Gardens and Anzac Park) and existing roads;

- impacts on pedestrian and bicycle movements and infrastructure within the transport system;
- accidents and severity of accidents and incident management (to be considered in consultation with the Queensland Police Service and other relevant agencies;
- bus operations (eg: existing, committed or approved bus services, travel times and new bus priorities) and infrastructure;
- rail services and infrastructure where relevant;
- emergency service vehicle movements (in consultation with DES and the Queensland Police Service);
- implications of tolling on untolled alternative routes;
- impacts on the Brisbane toll road network.

Traffic changes on the road network to provide for potential local improvements, such as urban regeneration opportunities, traffic management measures, community benefits and public and active transport benefits, (eg: opportunity for re-allocation of road space or a modified environment for active transportation (bicycle, pedestrian use) should be identified and their implications discussed. Any changes to the traffic network are to consider the range of users, including emergency vehicles accessing hospitals within the catchment and pedestrian and cyclists, particularly in the vicinity of major land uses or public transport facilities (eg: bus stops, train stations, and busway stations).

The operational interface of the project with the surrounding road network should be described. This should include how the project will operate in terms of enforcement (eg: speed and heavy vehicle limits) and the proposed interactions of the project traffic operations management with the Brisbane Metropolitan Transport Management Centre.

The EIS should also address any forecast changes in the overall number or length of trips that would result from the provision of increased traffic carrying capacity. The EIS should also address the impacts of the project on existing, committed or approved public transport infrastructure as well as overall public transport system patronage in the area impacted or serviced by the project. The EIS should also address the impacts of the project on the public transport and walking and cycling network in the general area of the Northern Link corridor.

The project has been identified by BCC as a key element of a proposed new Brisbane Northern Urban Corridor, to provide a bypass of the Brisbane CBD for cross-city trips. The identified route is Centenary Highway, Western Freeway, Northern Link Road Tunnel, ICB (ICB), Airport Link, East West Arterial and Gateway Motorway. Traffic impacts along this route and at key intersections with it and relevant Busways should be analysed.

The project impacts should also be identified in the context of contemporary transport plans, strategies and studies for SEQ, as far as is practicable.

A.6 Construction impacts

The transport implications for both impacts and mitigation measures of construction activities in relation to each anticipated construction stage and, where relevant, post completion, should be described with respect to:

- any pre-construction demolitions;
- construction site traffic generation, operational service requirements and access;
- local and regional traffic flows from temporary and permanent traffic changes, including road and lane closures at construction sites and the specific measures proposed to mitigate these impacts;
- proposed management measures for bus services and operations in the study corridor;

- an assessment of the likely impacts of construction on each of the public transport, road (including, State owned/managed road infrastructure such as connection roads), cycle, walking and rail networks potentially affected by the project, including travel time delays;
- arrangements to ensure safety and operational integrity of the adjacent road network, pedestrian and cycle accessibility and mobility, and access to public transport stops and stations and railway stations and infrastructure during construction including for individuals with a disability;
- police and other emergency services;
- the provision of adequate access to businesses, public facilities, schools, major community facilities (including the Toowong Cemetery and the Former Gona Barracks) in or adjacent to the study corridor, churches, parks and private residences by private vehicle, public transport, bicycle and foot;
- construction workforce parking and other existing public parking;
- effects of construction traffic (including the transport of materials to the project) on the road network or rail/waterway systems if appropriate;
- any existing, committed or approved proposals associated with any Local Growth Management Strategies or other land use plans; and
- impacts on traffic flow, travel times, active travel and public transport, in areas potentially affected by the project.

The EIS should review the success of mitigation measures used in other similar projects and the suitability of adopting such measures or alternative mitigation measures.

A.7 Pedestrian and cyclist issues

A.7.1 Description of environment

Describe the existing and planned future pedestrian and bicycle infrastructure, including usage levels, for pedestrian and bicycle movements and facilities within the study corridor and surrounding major points of origin and destination.

A.7.2 Potential impacts and mitigation measures

This section should describe the potential impacts of the project on existing, committed or approved infrastructure for pedestrian and cyclists and identify opportunities for walking and cycling network improvements. Any key points of conflict between the project and existing, committed or approved pedestrian and cycle connections through the study corridor should be identified. Proposals to mitigate such conflicts should be outlined.

The EIS should identify options to enhance pedestrian and cycling connectivity in the study corridor and in the inner western suburbs adjacent to the study corridor having regard for existing, committed and approved local and regional cycle and pedestrian infrastructure (including the Toowong Cycle and Pedestrian Overpass) and planning objectives for the study corridor. The potential, if any, for cyclists, usage of the tunnel should be outlined.

Appendix B Crash Record Analysis

Table B-1 Coronation Drive Corridor Intersection Accidents 2001-2006

Intersection	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total	Major Cause
Coronation Drive							
Coronation Dr Off Ramp (Eastbound)	0	0	0	0	1	1	Hit object
Coronation Dr Off Ramp (N)	0	1	0	0	1	2	Hit object
Coronation Dr On Ramp (S)	0	1	2	0	4	7	Rear-end
Cribb St	0	6	7	3	11	27	Angle
Exford St	0	1	1	1	0	3	Angle
Graham St	0	2	0	1	0	3	Rear-end
Hale St	0	0	0	0	1	1	Rear-end
High St	0	0	1	3	1	5	Rear-end
Land St	0	0	4	2	3	9	Angle
Landsborough Tce	0	2	1	0	1	4	Angle
Lang Pde	0	2	6	2	2	12	Angle
Park Rd	0	1	5	1	1	8	Rear-end
Patrick La	0	0	0	1	1	2	Hit pedestrian
Skew St	0	0	0	0	1	1	Angle
Sylvan Rd	0	4	1	2	2	9	Angle
William Jolly Bridge	0	1	2	0	4	7	Angle
Mid-block	0	24	48	29	55	156	Rear-end
Intersection	**0**	**21**	**30**	**16**	**34**	**101**	
Total	**0**	**45**	**78**	**45**	**89**	**257**	

Table Note – Source BCC 2006

Table B-2 Milton Road Corridor Intersection Accidents 2001-2006

Intersection	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total	Major Cause
Milton Road							
Morley St	0	0	0	0	1	1	Angle
Munro St	0	0	0	0	2	2	Hit object
Park Ave	0	3	5	0	1	9	Rear-end
Park Rd	0	0	3	1	0	4	Sideswipe
Paten St	0	0	0	1	1	2	Angle
Petrie Tce	0	0	0	1	0	1	Rear-end
Quinn St	0	0	1	0	0	1	Rear-end
Rathdonnell St	0	0	0	0	1	1	Angle
Ridley St	0	1	2	0	0	3	Angle
Sylvan Rd	0	1	3	3	4	11	Angle
Torwood St	0	0	1	4	3	8	Rear-end
Upper Roma St	0	0	1	1	2	4	Rear-end
Valentine St	0	0	0	1	0	1	Rear-end
Western Arterial Rd (1/04)	0	1	0	0	1	2	Angle
Wienholt St	0	3	0	0	1	4	Rear-end
Mid-block	0	15	43	21	35	114	Rear-end
Intersection	**0**	**9**	**16**	**12**	**17**	**54**	
Total	**0**	**24**	**59**	**33**	**52**	**168**	

Table Note – Source BCC 2006. Analysis does not include Toowong Roundabout

Table B-3 Frederick Street Corridor Intersection Accidents 2001-2006

Intersection	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total	Major Cause
Frederick Street							
Musgrave St	0	0	0	0	1	1	Rear-end
Sleath St	0	0	1	0	0	1	Angle
Mid-block	0	1	3	1	2	7	Rear-end
Intersection	**0**	**0**	**1**	**0**	**1**	**1**	
Total	**0**	**1**	**4**	**1**	**3**	**9**	

Table Note – Source BCC 2006. Analysis does not include Toowong Roundabout – this has been separately analysed.

Table B-4 Toowong Roundabout Accidents 2001-2006

Intersection	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total	Major Cause
Toowong Roundabout							
Frederick St	0	1	6	1	7	15	Sideswipe, angle and rear-end
Milton Rd	0	0	2	1	2	5	Angle
Miskin St	0	0	0	0	2	2	Sideswipe and rear-end
Total	**0**	**1**	**8**	**2**	**11**	**22**	Sideswipe, angle and rear-end

Table Note – Source BCC 2006.

Table B-5 Moggill Road Corridor Intersection Accidents 2001-2006

Intersection	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total	Major Cause
Moggill Road							
Moorak St	0	1	3	0	1	5	Angle
Morrow St	0	0	0	0	1	1	Rear-end
Nelson Pde	0	0	1	0	0	1	Angle
Payne St	0	0	1	0	0	1	Rear-end
Russell Tce	0	3	5	1	8	17	Angle
Stamford Rd	0	0	5	1	0	6	Rear-end
Station Rd	0	1	1	0	3	5	Rear-end
Swann Rd	0	0	0	1	0	1	Rear-end
Taringa Pde	0	1	1	3	0	5	Angle
Union St	0	0	2	0	2	4	Angle
Waverley Rd	0	0	1	1	2	4	Angle
Whitmore St	0	0	3	3	4	10	Angle
Woodville St	0	0	3	1	3	7	Angle
Mid-block	1	6	17	14	21	59	Rear-end
Intersection	**0**	**6**	**26**	**11**	**24**	**67**	
Total	**1**	**12**	**43**	**25**	**45**	**126**	

Table Note – Source BCC 2006.

Table B-6 Rouen Road Corridor Intersection Accidents 2001-2006

Intersection	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total	Major Cause
Rouen Road							
Vimy St	0	1	0	0	0	1	Hit object
Mid-block	0	3	6	4	11	24	Hit object
Intersection	**0**	**1**	**0**	**0**	**0**	**1**	
Total	**0**	**4**	**6**	**4**	**11**	**25**	

Table Note – Source BCC 2006.

Table B-7 Boundary Road Corridor Intersection Accidents 2001-2006

Intersection	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total	Major Cause
Boundary Road							
Brown St	0	0	1	0	0	1	Angle
Hebe St	1	1	0	1	2	4	Hit object
Mackay Tce	0	0	0	0	1	1	Rear-end
Rouen Rd	0	1	1	2	0	4	Hit object
Stuartholme Rd	0	1	0	0	1	2	Angle
Western Arterial Rd (1/04)	0	0	0	1	0	1	Hit object
Mid-block	0	1	7	3	9	20	Rear-end
Intersection	**1**	**3**	**2**	**4**	**4**	**13**	
Total	**1**	**4**	**9**	**7**	**13**	**33**	

Table Note – Source BCC 2006.

Table B-8 Sir Fred Schonell Drive Corridor Intersection Accidents 2001-2006

Intersection	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total	Major Cause
Sir Fred Schonell Drive							
Walcott St	0	2	1	1	0	4	Angle
Warren St	0	0	0	0	1	1	Rear-end
Mid-block	1	8	8	5	17	39	Rear-end
Intersection	**0**	**2**	**1**	**1**	**1**	**5**	
Total	**1**	**10**	**9**	**6**	**18**	**44**	

Table Note – Source BCC 2006

Table B-9 Coonan Street Corridor Intersection Accidents 2001-2006

Intersection	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total	Major Cause
Coonan Street							
Keating St	0	1	2	1	0	4	Angle
Moggill Rd (1/04)	0	2	14	5	13	34	Rear-end
Radnor St	0	0	1	0	0	1	Hit pedestrian
Riverview Tce	0	1	0	0	0	1	Fall from vehicle
Station Rd	0	1	1	1	6	9	Angle
Westminster Rd	0	4	4	7	10	25	Angle
Mid-block	0	1	5	5	12	23	Rear-end
Intersection	**0**	**9**	**22**	**14**	**29**	**74**	
Total	**0**	**10**	**27**	**19**	**41**	**97**	

Table Note – Source BCC 2006

Table B-10 Pedestrian Accidents - Inner West Transport Study Area 2001-2006

Age Bracket	Fatal	Hospitalisation	Medical treatment	Minor injury	Total
0-16	0	1	2	0	3
17-24	2	19	14	9	44
25-29	0	4	5	4	13
30-39	0	6	6	4	16
40-49	0	11	6	2	19
50-59	0	2	3	5	10
60-74	1	4	2	1	8
75 and over	1	2	1	1	5
Unknown	0	0	1	1	2
Total	**4**	**49**	**40**	**27**	**120**

Table Note – Source BCC 2006

Table B-11 Cyclist Accidents - Inner West Transport Study Area 2001-2006

Age Bracket	Fatal	Hospitalisation	Medical treatment	Minor injury	Property damage	Total
0-16	0	0	0	1	0	1
17-24	0	11	21	14	0	46
25-29	0	9	13	5	0	27
30-39	0	14	11	10	1	36
40-49	1	7	9	9	0	26
50-59	0	4	7	6	0	17
60-74	0	1	3	1	0	5
75 and over	0	1	1	0	0	2
Unknown	0	3	4	1	0	8
Total	**1**	**50**	**69**	**47**	**1**	**168**

Table Note – Source BCC 2006.

Appendix C Northern Link Traffic Model Development and Network Assumptions

C.1 Introduction

This section provides supplementary explanation of some of the key features of the Northern Link Traffic Model development, validation and application processes.

It also includes a comprehensive listing of the road network assumptions adopted for future transport network modelling.

C.2 Overview of the Traffic Forecasting Process

A traffic forecasting process has been applied in the Northern Link EIS to provide forecasts of traffic demands on the proposed Northern Link facility and surrounding roads. It employs a combination of computer based models responsive to forecast demographics, travel characteristics and transport infrastructure supply. The overall process is represented graphically in **Figure C-1**.

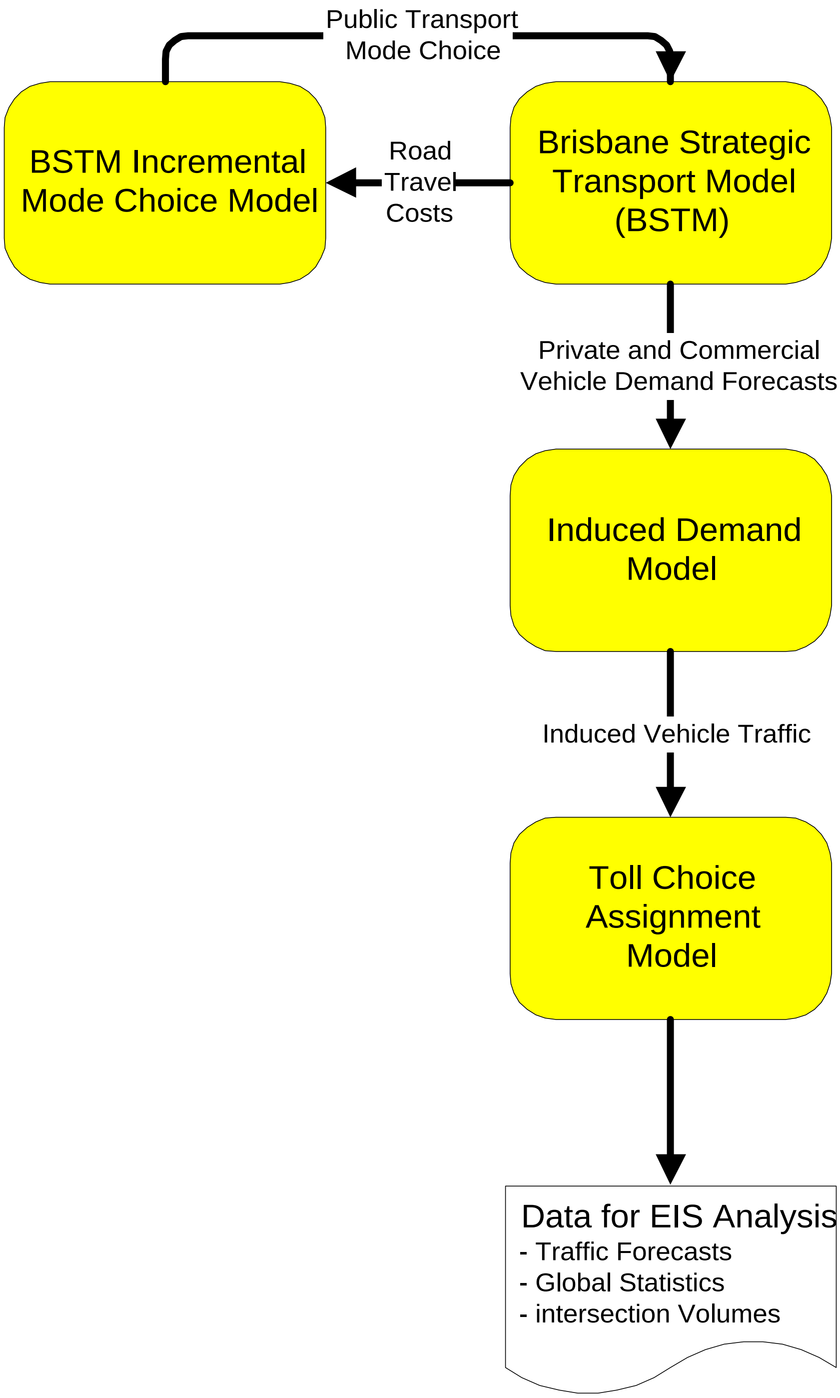
The Northern Link Traffic Model is underpinned by the Brisbane Strategic Transport Model (BSTM) as updated in 2005, which is widely accepted as the most up to date traffic-forecasting model for Brisbane. The BSTM provides average weekday travel demand forecasts for the Brisbane Metropolitan Area (or the ABS Brisbane Statistical Division (BSD)) up to and including the year 2026. Within the overall Northern Link Traffic Model, additional models have been utilised to address public transport mode choice and induced traffic effects in an integrated manner. A more complex route choice model (compared to that which is applied in the standard BSTM) has been applied to the road traffic market to forecast private and commercial vehicle use of Northern Link in a network that includes other toll roads such as the Gateway Bridge, CLEM7, Airport Link and Hale Street Link. The model produces average weekday forecasts by combining forecast traffic for four separate time-periods (am and pm peaks, daytime and night-time off-peaks).

The basic structure of the Northern Link Traffic Model is similar to that used in recent years for the environmental impact assessment of other TransApex toll road projects including CLEM7, Airport Link and Hale Street Link. The Northern Link Traffic Model includes:

- Use of a modified version of the standard BSTM that includes specific intersection representation and provides improved estimation of road delays at intersections;
- Updated existing road network database for the Northern Link study corridor;
- Incorporation of toll choice behaviour data relating to potential Brisbane inner city and cross city toll facility users;
- Use of a toll choice traffic assignment model using the toll choice survey data;
- Enhancement of the toll choice traffic assignment model applied for Airport Link and Hale Street Link to better address the additional route choices available to private vehicles with the addition of Northern Link;
- Adjustments to the model application to model heavy commercial vehicles with greater model stability and efficiency;
- Inclusion of an external cordon traffic forecast process based on the Western Brisbane Transport Network Investigation (WBTNI) model which incorporates a more sophisticated modelling of travel demand interaction between urban areas within SEQ;
- Application of the BSTM Incremental Mode Choice Model to assess the effects of future TransLink PT initiatives;

- Review of public transport service coding and future frequencies for routes in the Northern Link corridor, including addition of the Darra-Springfield railway and service plans associated with the Eleanor Schonell Bridge;
- Incorporation of processes to calculate induced demand effects of major transport infrastructure;
- Updated descriptions of future road infrastructure projects with respect to Council's City draft Transport Plan (BCC, 2007) and Main Roads' Department Metropolitan District current planning;
- Validation of the base year (2007) model within the Northern Link corridor against observed 2007 traffic count and journey time information; and
- Use of updated future demographic forecasts developed from the SEQ Economic and Employment Forecasting Study (PIFU and NIEIR, 2007/08).

■ **Figure C - 1 Northern Link Traffic Model Structure**



C.3 Base Demand Model - BSTM

The Brisbane Strategic Transport Model (BSTM) is a strategic transport model, developed originally in 2000, that has been widely used by Brisbane City Council (BCC), Queensland Department of Main Roads (DMR) and Queensland Transport (QT) over many years to assess transport projects within the Brisbane Metropolitan Area. The BSTM modelling has been undertaken using the EMME software. EMME is a transport modelling package that is utilised widely for travel demand forecasting both in Australia and internationally. An update calibration of the BSTM parameters and validation of its performance for a 2004 base year was undertaken in 2005 for BCC, resulting in Version 5.2 of the BSTM. This process retained the general structure of the model from its original 2000 form, improved several technical features and updated various model parameters updated using travel characteristics information from the 2003/04 South East Queensland Travel Surveys (SEQTS).

The methodology adopted for BSTM is a typical four step transport model in that it employs the successive four steps of Trip Generation, Trip Distribution, Trip Mode Choice and Trip Assignment. This general model methodology is used worldwide for forecasting transport demands for strategic planning of large contiguous urban areas. The BSTM produces average weekday forecasts by combining forecast traffic for four separate time-periods (am and pm peaks, daytime and night-time off-peaks).

The BSTM has been the subject of a significant amount of detailed technical documentation in previous reports, the most comprehensive and directly relevant of these being the Airport Link EIS Technical Paper No 1 – Traffic and Transport (SKM-CW, 2006). The BSTM methodology, as implemented in the EMME transport modelling suite, is shown in **Figure C-2**.

The area covered by BSTM is the Australian Bureau of Statistics Brisbane Statistical Division (BSD) covering, in full or part, six local government areas (post 2008 amalgamation) centred on Brisbane City. The study area is divided into many smaller discrete traffic zones to allow travel to be modelled to specific areas. The resolution of the zones is finer within the Brisbane City area with larger zones in the outer local authorities. Additional zones were added to BSTM for the previous TransApex project models to give better resolution in the various respective project catchments. Similar zone resolution changes were made for the Northern Link Traffic Model.

C.3.1 Incremental Mode Choice Model

To enable assessment of the effects of the major planned public transport initiatives (eg: changes to bus and rail frequencies and routes, new Busway and rail projects) on travel behaviour within the Metropolitan Area, a mode choice modelling component was included within the strategic traffic model and added with direct links to BSTM. The same public transport sub-model structure, incorporating an incremental choice model, has been adopted for the Northern Link Traffic Model as was applied in the Airport Link EIS model.

An audit of the public transport service representation in the model was undertaken for the Northern Link study area, resulting in improvements to the base and future route descriptions coded into previous versions of the model. In addition, the Darra-Springfield rail project and services were coded into the future public transport network. Future service plans for 2014, 2016, 2021 and 2026 were updated based on planning data provided by TransLink Transit Authority in early 2008. Modelling the effects of these service plans and projects for the future time horizons yields the enhanced public transport mode share scenario.

Originally developed by Brisbane City Council, the incremental choice model consists of a logit mode choice function to forecast change in PT patronage and a subsequent PT assignment within EMME. The term incremental model, or pivot model, refers to the methodology that forecasts the PT patronage change compared to an observed base PT demand, as opposed to a full mode choice process that forecasts the absolute quantum of PT patronage.

The mode choice methodology has been adapted slightly for use in the Northern Link Traffic Model to provide revised public transport mode choice factors for direct use in the BSTM Base Demand Model. Road costs taken from the standard BSTM multi-class equilibrium assignment are extracted and compared to public transport cost skims from a PT assignment for the same forecast year.

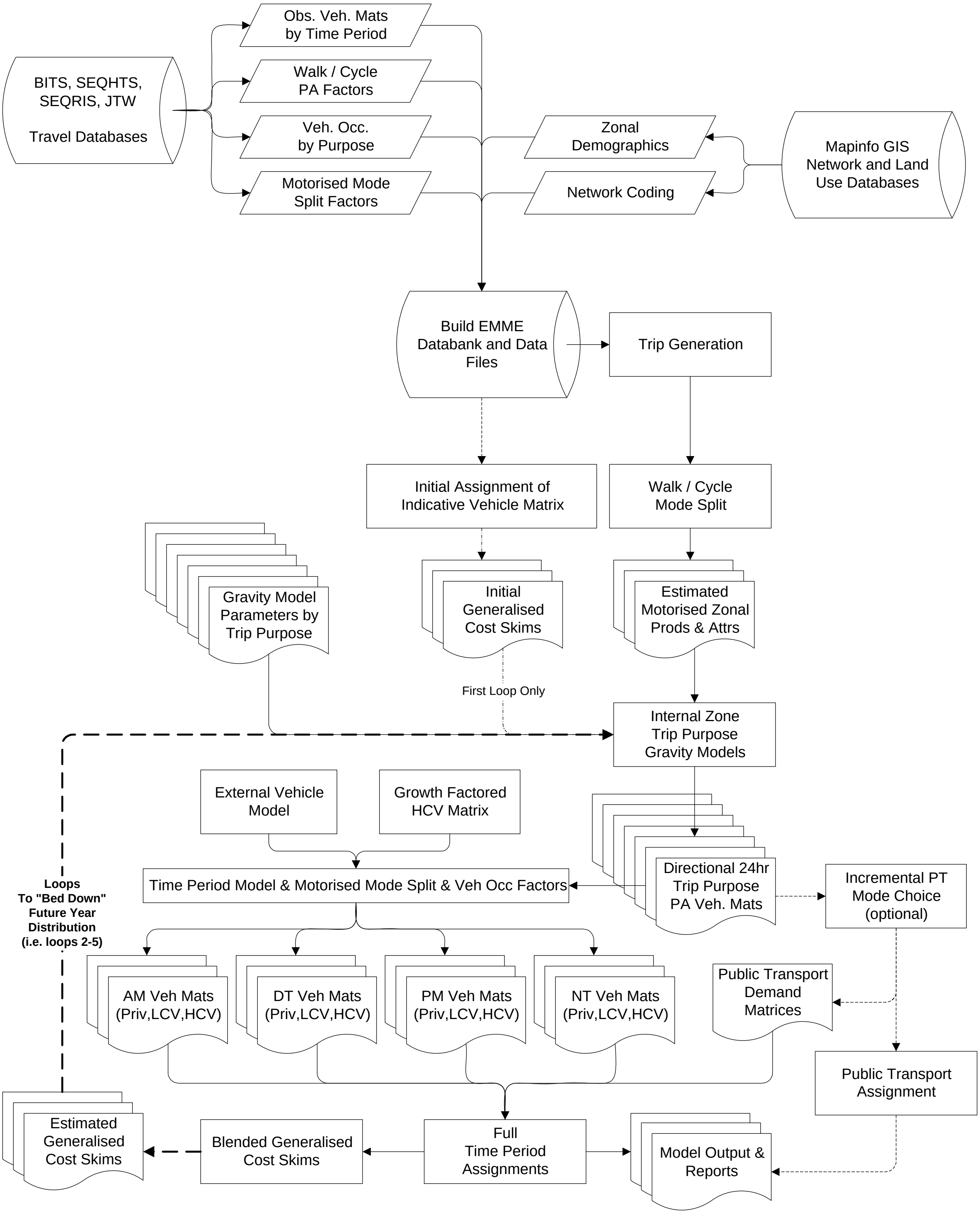
The relative shift in generalised cost for zone-to-zone movements by time period compared to base year is used to calculate the proportional shift in PT patronage using a logit (or binary choice) function. Travel times are expressed in minutes and are calculated for private and public transport by combining (with suitable weights) all components of travel time (eg: access/egress, waiting, in-vehicle, and parking access times), fares, toll and parking costs.

Improvements to the base model PT coding and assignment process were undertaken to improve validation against available base year observed PT boarding counts (bus) and link patronage (rail) for a 2007 base year.

Inspection of the results and iterative refinements of the PT service plan was undertaken in the Northern Link corridor. The revised public transport mode choice proportions emergent from the incremental mode choice model, were then used in revised subsequent runs of the BSTM model to produce consistent private vehicle road demand matrices for an enhanced PT scenario.

An assessment of the motorised person and PT trips resultant from the incremental mode choice model process for the base and future year modelling indicates the overall reduction in vehicle trips within the BSTM demand matrices for the enhanced mode choice scenario rises from 1.0% in 2014 to 3.3% in 2026, with public transport patronage rising by 10% to 38% over the trend scenario for that same period.

Figure C - 2 BSTM Model Structure



C.4 Intersection Delay

The Northern Link Traffic Model incorporates a process that explicitly incorporates the calculation of delays at intersections. This inclusion allow allows travel time on competing routes to be represented more accurately (than using only a link based approach), particularly in the context of representing inner city congestion delays. The BSTM delay calculation procedure applied was as incorporated in the Airport Link EIS and Hale Street Link IAS modelling, and is now incorporated in BSTM Version 6. It includes:

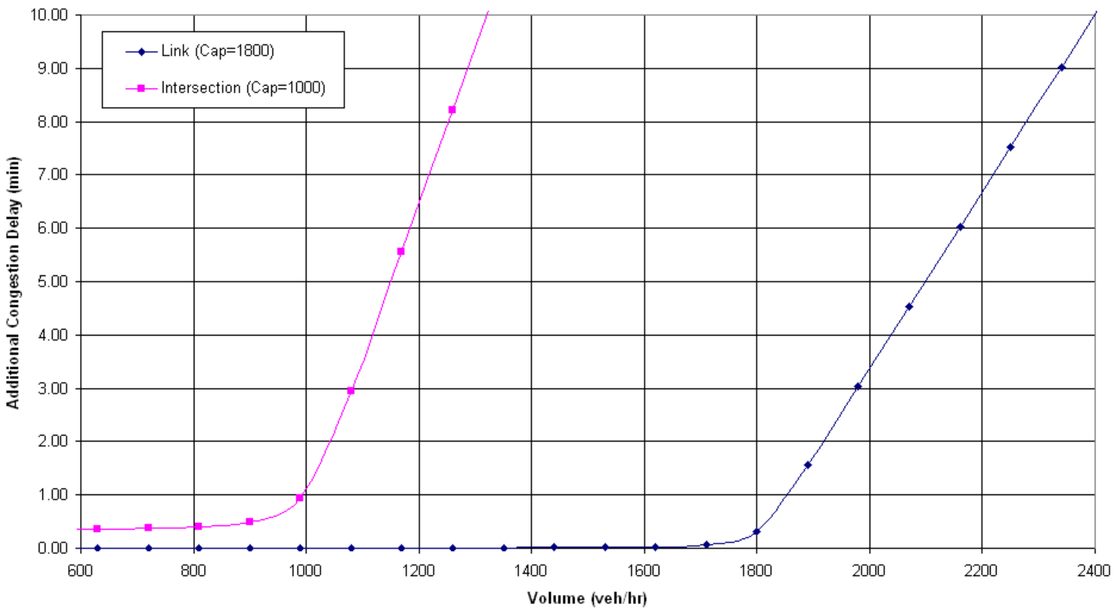
- Coding of intersection types and lane allocations into the network representation;
- Calculation of intersection approach capacities based on available lanes by turns, hierarchy of intersecting links, and intersection control;
- Separate calculation of intersection delays and link mid-block travel times using a modified BSTM "volume delay function"; and
- Adjusted parameters to refine the model's performance relative to observed delay data.

Figure C - 3 depicts the two components of additional delay (over free flow travel times) as applied in model, one for a notional intersection delay and another for a notional link travel time. The figure shows additional delay so the link free flow time has been removed.

Guiding principles for the delay function and associated assignment as used in the model are as follows:

- Link delays are calculated using a standard Akcelik function as per BSTM Version 5.2, although posted speed was found to be appropriate instead of the (somewhat arbitrary) lower "impedance" based free flow speeds. The link delay is to include all time associated with travelling the entire length of the link, exclusive of intersection delays but inclusive of any mid-block capacity delays.
- Intersection delays are calculated as an average per vehicle for each link approaching an intersection. The intersection delay component nominally includes all deceleration, queuing, gap acceptance, geometric and acceleration delays associated with passing through the intersection at the end of the link. Essentially, the intersection delay is all time spent over and above the time spent traversing the link (at the speed calculated by the link component of the delay curve).
- The capacity to calculate the intersection delays is a combined capacity of all turns on the approach link of the intersection. Some modification of the capacities was undertaken to better match observed delays from available BCC data (travel time runs and/or signal delay data).

- **Figure C - 3 Delay Curves**



Application of the intersection delay, as a modification of the BSTM link delay function, provided an appropriate level of sophistication consistent with scope and function of the Northern Link Traffic Model. More detailed intersection delay processes are implemented in dedicated traffic simulation models (eg: Paramics) and are relatively computationally intense methodologies. The approach used within the Northern Link Traffic Model allows for improved assignment sensitivity and provided the delay components for the toll choice process without unduly slowing down the normal model operation.

C.5 Toll Choice Model

The Toll Choice Model is essentially a sophisticated assignment model. Demands in the form of time period private and commercial vehicle demand matrices are transferred directly from a given base demand or induced demand model that has been previously run within EMME. The toll choice process splits the vehicle matrices for a given time period (am peak, off-peak and pm peak all run separately) into toll route users or alternative route users and assigns them accordingly to their chosen paths.

The critical element of this model is the simulation of route choice and specifically the decision as to whether to pay a toll to secure additional time savings. This decision is included as the toll choice module within the overall process. The final Northern Link process used in the toll choice model is complex to cater for the possible variations in toll route choice. The model structure is depicted in **Figure C - 4**. Key features of the approach are:

- An initial multi-class equilibrium generalised assignment is performed to provide a representative starting point for the main toll choice model iterations and to obtain Commercial Vehicles volumes. A factor of 0.5 toll is used as a ‘proxy’ to get starting tolled/untolled matrices close to final network conditions.
- Volume delays have been modified and data relating to intersection capacity has been coded. Congestion delays are included separately from link delays, to allow weighting of these separate components of travel time. To allow this the Commercial Vehicle volumes, from the initial multi-class assignment, are included as fixed traffic volumes in the toll choice model iteration process.
- As a result of investigation into the possible toll route combinations, seven toll route combinations are specifically tested, with the Gateway Bridge considered on the alternative route path (albeit being tolled) to ensure direct competition is possible.

- Convergence testing based on toll utility stability is used before exiting for a final multi-class equilibrium of further split toll markets and alternative route traffic. As noted above, commercial vehicle traffic is taken as a fixed demand for the toll choice multi-class assignments.

C.5.1 Logit Model Form

The form of the logit function implemented within the Northern Link Traffic Model includes sensitivity to quality of travel time measures by directly modelling intersection delays and including these in the route/toll choice trade-off. In the logit choice model, the probability of choosing a particular route R, from one of K route alternatives is:

$$P_R = \frac{e^{U_R}}{\sum_{k=1}^{K} e^{U_k}}$$ where U_k is the utility of route k

The components of the route utility can be expressed in terms of:

- attributes of the route such as travel time and cost;
- the relative importance (weighting) of these attributes to the individual; and
- attributes of the route that the individual does not account for explicitly, but are implicitly included in the decision (eg: driving environment, safety).

In application, the utility function in the corridor assessment model takes the following form:

$$U_k = \beta_1 * Toll + \beta_2 * TravelTime + \beta_3 * DelayTime + ASC$$

where $\beta_1, \beta_2, \beta_3$ are the relative weights for each of the toll, travel time and delay time attributes of each route (tolled route and alternate free route); and ASC is the alternative specific constant and reflects both individual's bias towards a particular route (ie: other than that explained by the other parameters) and model accuracy.

C.5.2 Private Vehicle Logit Model

The increasing complexity of the tolled route options was of particular relevance to the formulation of the toll choice model incorporated within the Northern Link Traffic Model. The final model structure addresses the various major route choice options with definitions as follows:

Route A - the alternative route (but inclusive of existing tolled facilities eg: Gateway Bridge);

Route B - CLEM7 only toll route trips;

Route C – Airport Link only toll route trips;

Route D – Hale Street Link only toll route trips;

Route E – Northern Link only toll route trips;

Route F – TransApex East West Link only toll route trips (allowance made for testing);

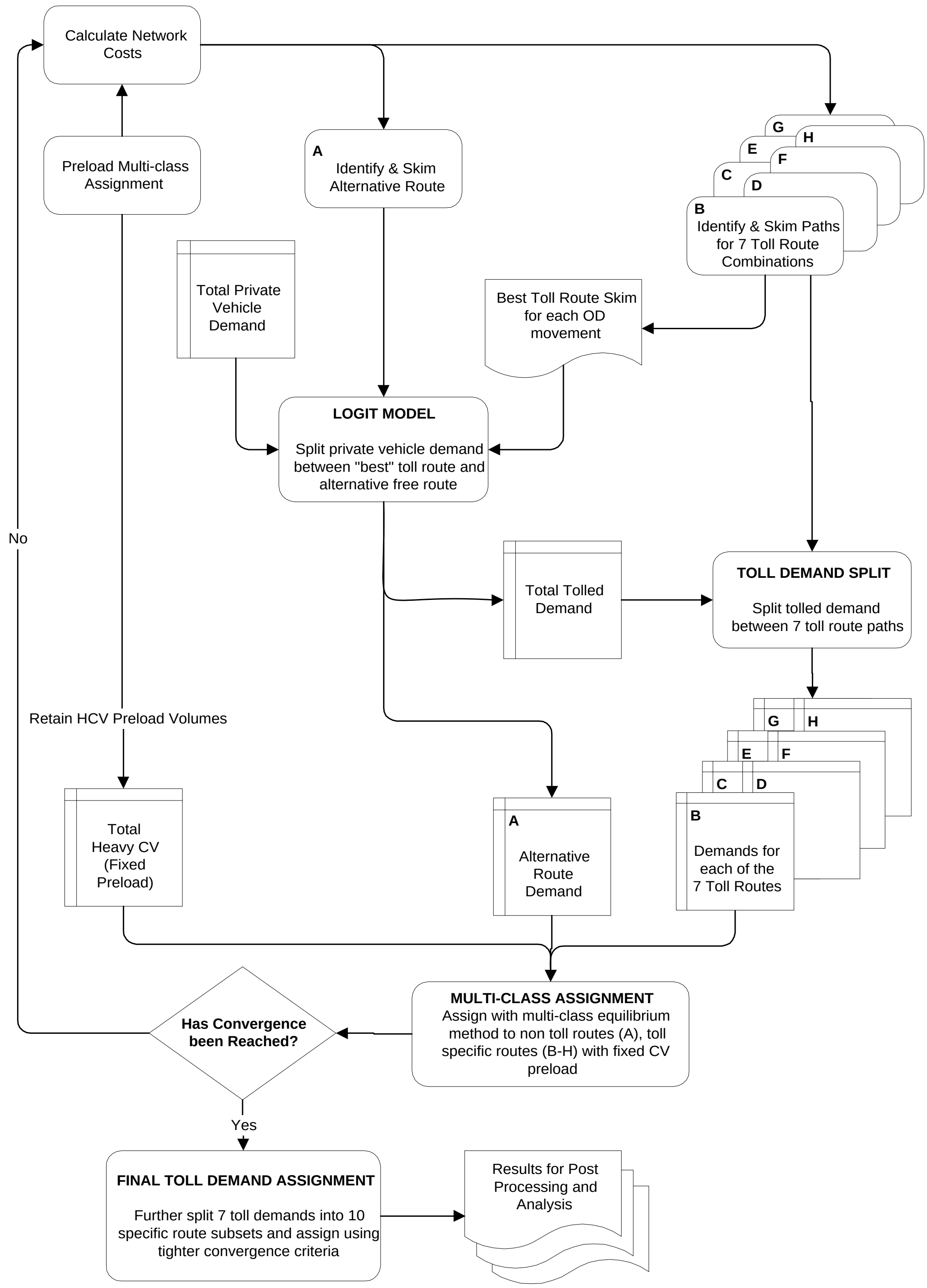
Route G – Toll routes with Airport Link, CLEM7 and Northern Link allowed.

Route H - Toll routes with Airport Link, Hale Street Link and Northern Link allowed.

The above represents a pragmatic choice set given the likelihood of toll facility combinations occurring and the major emphasis/requirements of the model. Following consideration of the separate toll route combinations, the resulting route costs are compared to remove any duplicate routes in the sets (eg: separate AL+NL only trips from routes G and H, identify single toll facility routes common with G and H sets).

Additional adjustments were made to the toll choice process to allow the sensitivity testing of the potential cumulative effects of the various toll road projects identified as transport improvement options within the Western Brisbane Transport Network Investigation (WBTNI).

Figure C - 4 Toll Choice Model Structure



C.5.3 Stated and Revealed Preference Surveys

Stated preference and revealed preference surveys were collected in 2005 to gain an understanding of route choices on the proposed TransApex facilities (with a focus on Airport Link and Hale Street Link), particularly with regards to values of travel time savings and willingness to pay toll, and to explore the factors influencing the route choice. A computer aided personal interview (CAPI) approach was employed by a local data survey agency to collect a total of 842 complete surveys, each including 2 separate stated preference experiments.

No new toll facilities have become operational within Brisbane since these surveys were undertaken in late 2005. A cross-section of potential toll road users was surveyed, covering variations in home location, trip origin and destination, trip purpose, and whether tolls are regularly paid. Survey quota segmentation was designed to capture samples of different movements deemed relevant to future TransApex route choice, and allow testing sensitivity to directly related alternatives on the proposed facilities. Quotas were set to achieve respondents across the full range of trip times and purposes, in sufficient numbers for conclusions within the segment to be drawn with statistical significance.

The analyses of the 2005 SP/RP data demonstrated willingness-to-pay for travel time and drive quality benefits and provided data on toll choice parameters for application in the previous Airport Link Traffic Model. Within the analysis, an investigation of the effects of origin-destination markets was undertaken. No significant bias was found and the analysis indicated that the parameters would be equally applicable to potential Northern link users. The toll choice parameters have therefore been adopted from the Airport Link Traffic Model.

The parameters applied in the model reflect average driver behaviour with respect to the willingness to pay a toll to improve travel time, avoid congestion and use higher quality roads during different periods of the day.

C.6 Model Validation

The Northern Link Traffic Model development utilised a series of model audit and refinement activities designed to produce a suitable project model. These activities included:

- Base year audit model coding of road network within the study area and along Centenary Highway;
- Base year audit model coding of public transport service descriptions;
- Refinement of model land use zones and demographic data;
- Extension of toll choice assignment market definitions to improve Northern Link markets representation; and
- Validation of a base year model (2007) using up-to-date screenline vehicle counts and journey time survey observations.

A key step in traffic modelling is validation of the modelled traffic flows against known traffic conditions. Accurate traffic modelling requires a reasonable representation of trip distribution patterns in order for the modelling results to be reliable.

The Northern Link Traffic Model base year model was validated by undertaking a detailed comparison of the base demand forecast traffic volumes and travel time for 2006/7 in the Northern Link corridor.

C.6.1 2007 Count Validation Comparison

Traffic count information was collected in October 2007 across a series of local screenlines and at additional key locations within the Northern Link study area. Additional count data was also sourced from DMR’s count databases and also from BCC via data capture from detector loops within BLISS (Council’s Traffic Signal Control System).

A summary of the count validation is given in **Table C-1** for daily and peak (2 hour) comparisons.

- **Table C - 1 2007 Traffic Count Validation Comparison**

Screenline/Data Set Name	AM Peak (2h total 7am-9am)			PM Peak (2h total 4pm-6pm)			Weekday Daily Average (24 h)		
	Count	Model	%Diff	Count	Model	%Diff	Count	Model	%Diff
1-Indooroopilly	24,200	22,800	-5.8%	27,900	26,300	-5.7%	165,400	159,400	-3.6%
2-St Lucia - University	12,000	11,900	-0.8%	11,500	11,600	0.9%	76,700	73,300	-4.4%
3-Toowong	24,200	24,900	2.9%	25,200	27,200	7.9%	162,900	171,200	5.1%
4-Milton	35,800	36,800	2.8%	37,400	40,900	9.4%	245,200	251,900	2.7%
5-Hale Street	28,500	28,400	-0.4%	29,600	32,100	8.4%	192,600	194,700	1.1%
6-Ithaca Creek	8,800	10,200	15.9%	9,600	11,500	19.8%	56,000	59,900	7.0%
7-Brisbane River	78,000	88,000	12.8%	82,400	90,300	9.6%	525,600	549,600	4.6%
TOTAL ALL SCREENLINES	**211,500**	**223,000**	**5.4%**	**223,600**	**239,900**	**7.3%**	**1,424,400**	**1,460,000**	**2.5%**
Additional Study Area Locations	116,700	111,100	-4.8%	120,600	120,000	-0.5%	779,700	782,100	0.3%
TOTAL ALL DATA SETS	**328,200**	**334,100**	**1.8%**	**344,200**	**359,900**	**4.6%**	**2,204,100**	**2,242,100**	**1.7%**

Results show that the model is within 10% on all local data sets (screenlines and the set of additional study area locations) for daily flows, with lower confidence for the peak periods. The am peak is better than the pm peak period across all data sets, although in the am peak only 6 of the 8 data sets are within 10% of observed demands, compared to 7 of the pm data sets agreeing within 10% of observed counts. All peak data sets are less than 20% different from the observed values. These results are within the normal acceptable range for a strategic model of this nature.

C.6.2 Journey Time Validation Comparison

Changes made to the network description within the Northern Link study area have improved modelled travel time compared to observed journey time surveys. Journey time data has been collated from Queensland Transport 2006 data for routes relating directly to the Northern Link study area or major alternative routes. In addition, travel time data was collected in 2007 for the project specifically relating to the Northern Link study area.

Results of comparisons between the surveys (2006 and 2007) and the modelled results (2007) are given for the am peak in **Table C-2** and the pm peak in **Table C-3**. The information tabled shows the large variation in surveyed journey times for most of the comparison routes. Most modelled times along the routes are generally within (or very close to) the range of surveyed travel times. Peak travel times (am and pm) are being replicated at relatively equal accuracy. The comparisons demonstrate that the validated model provides a reasonable representation of travel times within the corridor and on key surface routes.

Table C - 2 AM Peak Journey Time Comparisons

Route Description	Survey Runs	AM Peak Travel Times (Minutes)				
		Mean Time	Min Time	Max Time	Std Dev	Model Time
2007 Travel Time Surveys						
Route 1 Inbound: Moggill Road to Kingsford Smith Drive	6	23	20	28	3.5	20
Route 1 Outbound: Kingsford Smith Drive to Moggill Road	6	23	15	34	6.9	16
Route 2 Inbound: Moggill Road to CBD	6	24	14	32	6.1	18
Route 2 Outbound: CBD to Moggill Road	6	13	11	14	1.3	13
Route 3 Inbound: Coonan St to Kelvin Grove Road	6	17	15	21	2.5	15
Route 3 Outbound: Kelvin Grove Road to Coonan St	6	19	14	23	3.2	15
2006 DMR Travel Time Surveys						
Ipswich Rd - Route 5 am Inbound	24	21	14	32	4.6	21
Ipswich Rd - Route 5 am Outbound	24	18	16	20	1.2	19
Pacific Motorway to Lytton Rd - Route 11 am Northbound	25	13	9	18	2.7	11
Lytton Rd to Pacific Motorway- Route 11 am Southbound	25	8	8	9	0.3	7
Gateway Motorway to Ipswich Motorway - Route 14 am Westbound	23	20	15	26	3.2	14
Ipswich Motorway to Gateway Motorway - Route 14 am Eastbound	25	17	14	21	2.1	15
River Rd to Granard Rd Ramps - Route 43 am Inbound	25	7	5	13	2.5	7
Granard Rd Ramps to River Rd - Route 43 am Outbound	24	5	5	5	0.1	4
South Pine Rd to Gympie Rd - Route 13A am Eastbound	23	10	6	19	2.9	6
Gympie Rd to South Pine Rd - Route 13A am Westbound	24	8	5	11	1.3	6
Milton Rd to South Pine Rd - Route 13B am Northbound	23	16	12	19	1.7	16
South Pine Rd to Milton Rd - Route 13B am Southbound	24	21	13	29	5.0	22
Centenary Hwy - Route 13C am Northbound	25	8	6	15	2.5	7
Centenary Hwy - Route 13C am Southbound	24	9	6	16	2.4	7
East-West Arterial - Route 13A am Eastbound	23	5	2	15	3.8	4
East-West Arterial - Route 13A am Westbound	24	3	2	4	0.7	3

■ **Table C - 3 PM Peak Journey Time Comparisons**

Route Description	Survey Runs	PM Peak Travel Times (Minutes)				
		Mean Time	Min Time	Max Time	Std Dev	Model Time
2007 Travel Time Surveys						
Route 1 Inbound: Moggill Road to Kingsford Smith Drive	6	16	15	17	0.5	15
Route 1 Outbound: Kingsford Smith Drive to Moggill Road	6	23	17	24	4.1	18
Route 2 Inbound: Moggill Road to CBD	6	17	14	21	2.7	18
Route 2 Outbound: CBD to Moggill Road	6	14	12	18	2.6	16
Route 3 Inbound: Walter Taylor Bridge to Kelvin Grove Road	6	34	13	49	13.1	15
Route 3 Outbound: Kelvin Grove Road to Walter Taylor Bridge	6	20	15	26	4.1	14
2006 DMR Travel Time Surveys						
Ipswich Rd - Route 5 pm Inbound	25	17	15	21	1.4	17
Ipswich Rd - Route 5 pm Outbound	25	17	13	22	2.3	22
Pacific Motorway to Lytton Rd - Route 11 pm Northbound	25	8	8	10	0.5	7
Lytton Rd to Pacific Motorway- Route 11 pm Southbound	25	14	8	15	2.0	13
Gateway Motorway to Ipswich Motorway - Route 14 pm Westbound	24	18	16	23	1.7	15
Ipswich Motorway to Gateway Motorway - Route 14 pm Eastbound	25	19	14	29	4.3	15
River Rd to Granard Rd Ramps - Route 43 pm Inbound	25	5	5	5	0.2	5
Granard Rd Ramps to River Rd - Route 43 pm Outbound	25	7	5	10	1.4	5
South Pine Rd to Gympie Rd - Route 13A pm Eastbound	23	9	7	10	0.9	6
Gympie Rd to South Pine Rd - Route 13A pm Westbound	24	8	6	11	1.3	5
Milton Rd to South Pine Rd - Route 13B pm Northbound	24	21	13	26	3.6	26
South Pine Rd to Milton Rd - Route 13B pm Southbound	24	16	12	25	3.1	16
Centenary Hwy – Route 13C pm Northbound	25	6	6	8	0.4	7
Centenary Hwy – Route 13C pm Southbound	25	9	7	12	2.4	8
East-West Arterial - Route 13A pm Eastbound	24	3	2	6	1.0	4
East-West Arterial - Route 13A pm Westbound	24	4	2	12	3.0	3

C.6.3 Conclusion

Previous sections have described the general structure of BSTM, the additional sub-models created for use in the TransApex feasibility studies and the specific customisation of the model to enhance its suitability for application for the Northern Link project feasibility study and environmental impact assessment.

The resultant Northern Link Traffic Model has been found to be sufficiently accurate to represent base traffic conditions within the Brisbane Metropolitan Area road network as well as in the environs of the Northern Link corridor and Inner West area of Brisbane. As such it was considered an appropriate tool to be used in the assessment of future traffic conditions.

C.7 Demographics

Within the strategic model structure, a key input to the base demand model is the base year (2007) and forecast years' (2014, 2016, 2021 and 2026) demographics. The zonal information used by the model includes:

- Population
- Households
- Education Enrolments (Pre-school/Primary, Secondary, Tertiary)
- Employment Opportunities (ie: Jobs - Retail, Service, Professional, Industry, Other)
- Household Averages (Persons/HH, Workers/HH, Dependants/HH by age category)

The data covers the Brisbane Metropolitan Area, which represents the entire modelled area covered by the BSTM, at zone level (originally 1,488 zones, increased for the Northern Link Traffic Model to 1,557 zones).

In addition special generator target volumes for key land-uses in the inner west area were examined. For example, the Wesley Hospital special generator vehicle target volumes were adjusted to match site surveys and the University of Queensland vehicle generation targets were adjusted based on traffic counts and consideration of trips/student rates compared to other Brisbane universities.

Up to date demographic forecasts of population and employment within the area covered by the BSTM have been incorporated in the Northern Link Traffic Model. In 2007 the Office of Urban Management, Queensland Government and the Council of Mayors (SEQ) commissioned the National Institute of Economic and Industry Research (NIEIR) to develop employment and economic projections for South East Queensland. The state's Planning Information Forecasting Unit (PIFU) provided revised medium series population and housing estimates as input to NIEIR's work in 2007. The data was not provided in a format directly suitable for use within the Northern Link Traffic Model and was thus converted by the project team.

Using this updated data, medium and high series demographic data sets were established for use in the Northern Link Traffic Model. The previous Brisbane Long Term Infrastructure Plan (BLTIP) demographic data set (prepared in 2005) used for the pre-feasibility stage was used to represent the low case.

Table C-4 summarises the total population and employment projections within the Brisbane Metropolitan area adopted for the low, medium and high demographics cases.

Table C-4 Demographic Projections for Brisbane Statistical Division

	Total Population Projections			Total Employment Projections		
	Low	Medium	High	Low	Medium	High
2007	N/a	1,879,800	N/a	N/a	963,800	N/a
2014	2,031,700	2,126,300	2,198,400	1,010,400	1,185,100	1,185,100
2016	2,090,000	2,196,800	2,287,000	1,048,600	1,236,500	1,236,500
2021	2,231,800	2,369,700	2,525,700	1,147,300	1,373,100	1,373,100
2026	2,361,000	2,533,400	2,764,900	1,192,900	1,484,100	1,484,100

Data Sources:

(1) Medium and High Series: PIFU and NIEIR forecasts – SEQ Economic and Employment Forecasting Study (2007/08).

(2) Low Series: Brisbane Long Term Infrastructure Plan (data prepared in 2005).

C.8 Base Road Network Assumptions

Planned or potential future projects and their timing were listed from anticipated capital works programs (including SEQIPP) in consultation with DMR and BCC. The agreed list of Do Minimum network projects for forecasting years 2014, 2016, 2021 and 2026 is provided in **Table C - 4**.

A review was also undertaken of the lane capacities incorporated within the model for higher quality road links. It is expected in the future that improved vehicle designs, braking and acceleration performance, improved driver information (including in-vehicle guidance technology), and more advanced traffic management/information systems will combine to increase and enhance lane efficiency and throughput. The recent update of the Highway Capacity Manual included an increase of motorway lane capacities by 16%. The assumptions were supported by recent empirical evidence on increases in lane efficiency in the Brisbane region. For example, on the 2.6 kilometre section of the four-lane Gateway Motorway between Kingsford Smith Drive and Airport Drive which operates with an 80 to 90km/h posted speed limit, and where a significant degree of merging, weaving and diverging movements occur, lane throughputs of over 2,300 pcu/hour were achieved on a average weekday during 2007.

As a result of the review, updated lane capacities have been incorporated within the Northern Link Traffic Model for the following link types:

- Standard Motorway: increased progressively from 2,100 pcu/hour/lane in base year (2007) to 2,200 pcu/hour/lane by 2026.
- New toll roads and Gateway Upgrade Project: increased progressively to 2,400 pcu/hour/lane by 2026.
- High Quality Expressway: increased progressively to 2,100 pcu/hour/lane by 2026.
- Entry and entry and exit ramps to toll road facilities: lower capacities are applied (up to 2,100 pcu/hour/lane maximum), and intersection capacities (and delays) are applied at the terminal intersections where the project connections interface with the surface road network.

C.9 Public Transport Service Assumptions

TransLink supplied future service plans for use in the strategic forecasting model. These were based on detailed forward planning being undertaken for the TransLink Network Plan and SEQIPP initiatives.

Key service planning assumptions incorporated in the incremental mode choice model to establish the enhanced mode share scenario are as follows:

- Where TransLink did not provide new specific bus service and frequency data, frequencies for existing bus services are forecast to increase by 6% up to 2016 and by 4.4% from 2016 to 2026. Service frequencies for 2014 and 2021 have been interpolated.
- The Northern Busway service patterns and frequencies adopted for the Airport Link models were retained unchanged for Northern Link modelling.
- Data was provided by TransLink for 2016 and 2026 for the proposed Eastern Busway. Existing services with increased frequencies were assumed prior to 2016.
- Other new future year bus services data, not included above, was generally adopted as per the Airport Link model (eg: Green Bridge services).
- TransLink provided extracts from their report *Rail Services and Infrastructure Requirements Study (2007)* that enabled new rail service and frequencies to be coded for the model forecast years, including the proposed Springfield rail services.

C.10 Model Sensitivity Testing

Sensitivity testing was undertaken using the model to test the changes in model outputs to changes in key parameters and assumptions. Key findings of this testing is summarised as follows:

- **Effect of Northern Link Public Transport Initiatives.** A scenario that examined the effect of diverting rocket bus services to Northern Link was examined and is reported in **Section 9.11.2**. The model indicated some modal transfer to both from car to bus and rail to bus. Bus travel time improvements led to a reduction in rail passenger loading on the Ipswich line (due to a reduction in Park'n'Ride travel).
- **Effect of Changes in Northern Link Tolls.** These were tested within the toll choice model development and application. Changes in toll were tested for independent movements on the facility across a range of toll levels. As expected, as toll was increased, Northern Link forecast volumes decreased with the sensitivity declining over time, as congestion impacts on route choice are widespread. The model's elasticity to toll for Northern Link journeys in the 2026 peak period, for example, is between -0.23 and -0.24 (ie: between 2.3% and 2.4% less traffic on Northern Link for a toll increase of 10%). Toll sensitivity

in the off-peak periods was greater due to reduced congestion (elasticity of -0.27 in 2026); with commercial vehicle being more sensitive due to higher tolls compared to private vehicles. Tests were carried out to check the elasticity to toll for the basic vehicle classes, and these found that the model reacted reliably.

- **Effect of other Major Road Infrastructure.** Examination of the potential effects of the additional TransApex facility (East-West Link) plus the key WBTNI projects was conducted for the 2026 time horizon. The effect on Northern Link in 2026, with the inclusion of WBTNI and East-West Link projects, shows a forecast reduction in traffic of 12.4%.
- **Effect of Land Use and Demographic Changes.** A medium demographic forecast was used for the general assessment of Northern Link impacts. Additional sensitivity tests were conducted to assess the effect of low and high demographic scenarios. For the low demographic scenario, the forecast traffic volumes on Northern Link were estimated to reduce by 8.7% in 2014 and 4.8% in 2026, compared to the medium scenario. For the high demographic scenario, the forecast traffic volumes on Northern Link were estimated to increase by 1.6% in 2014 and 4.2% in 2026, compared to the medium scenario.
- **Effect of Increased Vehicle Operating Costs.** These effects were simulated in a model test by doubling the weight applied to route distance within the toll choice assignment model path cost calculation. This explores a potential response to rise in fuel prices. The effect generally across the study area was a consolidation of traffic on the more direct routes. As a result, traffic transferred from longer bypass routes (eg: Gateway Motorway) in favour of more direct routes such as via Airport Link. The overall forecast traffic volumes on Northern Link were found to be similar to those forecast with standard operating cost assumptions.

Table C - 4 Base Road Network Assumptions

Source	Project Title Project Coding Description	Network Year			
		2014	2016	2021	2026
Network Year Key: ✓ = Include in Do Minimum Network; T = Also include in Northern Link Tests					
DMR (existing[1])	**Brisbane-Beenleigh Road (Church Road to Crest Street)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
DMR (existing)	**Redland Bay Road (Windermere Road to Vienna Road)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
DMR (existing)	**Bruce Highway (Dohles Rocks Road to Boundary Road)** Upgrade to 6 lanes.	✓	✓	✓	✓
DMR (existing)	**Bruce Highway (Boundary Road to Morayfield Road)** Upgrade to 6 lanes.	✓	✓	✓	✓
DMR (existing)	**Bruce Highway (Morayfield Road to Bribie Island Road)** Upgrade to 6 lanes.	✓	✓	✓	✓
DMR (existing)	**Linkfield Road Connection (Lemke Road)** New 4 lane divided arterial from South Pine Road to Linkfield Road (joining Nolan Road and Millar Road). Includes realignment of Carseldine Road to connect to new link, and closure of Millar Road between Carseldine Road and Gympie Road.	✓	✓	✓	✓
DMR (existing)	**Gympie Road/Leckie Road** Ban right turn from Gympie Road N/B into Leckie Road (allows turn lane extension for Gympie/Stafford)	✓	✓	✓	✓
BCC (existing)	**Compton Road Upgrade (Gateway Motorway to BCC Boundary)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
BCC (existing)	**Progress Road (Centenary Hwy to Inala Avenue)** Upgrade to 4 lanes divided. Already at this standard between Mira Street and Inala Avenue. Includes closure of Tamarind Street and Progress Road E of Orchard Road, and new connection from Orchard Road to Poinsettia Street.	✓	✓	✓	✓
BCC (existing)	**Goggs Road (Sinnamon Road to Seventeen Mile Rocks Road)** Upgrade to divided (remains 2 lanes).	✓	✓	✓	✓
BCC (existing)	**Chermside Shoppingtown Access** New links N and E of Chermside Shoppingtown, including new access to Gympie Road and Murphy Road. Includes reduction of Kingsmill Street, Kuran Street and Barker Street to 40km/h, and upgrading of Kittyhawk Street to 60km/h divided district access.	✓	✓	✓	✓
BCC (existing)	**Ropely Road (Kianawah Road to Wynnum Road)** Extend Ropley Road E-W section to Wynnum Road, bypassing Beverley Road, as 2 lane undivided local access (50km/h). Reduce Beverley Road and N-S section of Ropley Road to 40km/h.	✓	✓	✓	✓
BCC (existing)	**Montpelier Road Signals** Upgrade and signalise Ann/Breakfast Creek/Montpelier/Wickham intersection.	✓	✓	✓	✓
OTHER (existing)	**Paradise Road/Logan Motorway Interchange** New motorway interchange, east and west facing ramps.	✓	✓	✓	✓
DMR	**Mt Lindsay Highway (Johnson Road to Chambers Flat Road)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
DMR	**Augusta Parkway (Jones Road to Springfield Parkway)** Upgrade to 4 lanes divided.	✓	✓	✓	✓

Source	Project Title Project Coding Description	Network Year			
		2014	2016	2021	2026
Network Year Key: ✓ = Include in Do Minimum Network; T = Also include in Northern Link Tests					
DMR	**Moggill Road (Kenmore Road to Pinjarra Road)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
DMR	**Samford Road (Cobalt Street to England Road)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
DMR	**Pacific Motorway (Gateway Motorway to Loganlea Interchange)** Upgrade to 8 lanes (including 1 T2 lane each way).	✓	✓	✓	✓
DMR	**Gateway Northern Deviation (Nudgee Road to Gateway Bridge)** New 4 lane motorway standard more direct connection from Gateway Bridge to opposite Raubers Road (100km/h). Includes interchange and new Airport connection at Cannery Creek. Reduce posted speed on bypassed section of existing Gateway Motorway to 80km/h. Upgrade Gateway Motorway from Raubers Road to Nudgee Road to 3 lanes. Details as per refinement of GUP reference project, as updated by DMR in April 2007. Includes south facing Kingsford Smith Drive ramps.	✓	✓	✓	✓
DMR	**Gateway Motorway South (Port Of Brisbane Motorway to Wynnum Road)** Upgrade to 8 lanes. Includes upgrading of Gateway Motorway from Port Motorway to Lytton Road to 6 lanes, and new ramp from Gateway Motorway S/B to Port of Brisbane Motorway E/B. Details as per GUP reference project.	✓	✓	✓	✓
DMR	**Gateway Motorway (Wynnum Road to Mt Gravatt-Capalaba Road)** Upgrade to 6 lanes.	✓	✓	✓	✓
DMR	**Gateway Motorway Bridge Duplication (GUP reference scheme details)** Upgrade to 12 lanes.	✓	✓	✓	✓
DMR	**Houghton Highway** Upgrade to 6 lanes (including 1 BL each way).	✓	✓	✓	✓
DMR	**Port of Brisbane Motorway (Stage 2a-Gateway Motorway to Lytton Road)** Upgrade to 4 lanes east of Paringa Road west facing ramps. Includes upgrading Lytton Road between Port Motorway and Pritchard Street, and Pritchard Street between Lytton Road and Port Drive, to 2 lanes divided.		✓	✓	✓
DMR	**Mt Cotton Road (Mt Gravatt-Capalaba Road to Lyndon Road)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
DMR	**Logan Motorway/Ipswich Motorway** Interchange Grade Separation, ramp changes, overpass Brisbane Terrace-Old Logan Road.	✓	✓	✓	✓
DMR	**Centenary Highway (Springfield-Ripley, Ripley-Yamanto)** New 2 lane 80km/h motorway with connections at Ripley Road and Cunningham Hwy, Yamanto.	✓	✓	✓	✓
DMR	**Pacific Motorway/Loganlea Road Interchange** Interchange upgrade, service roads, and associated surface road upgrades. Includes changes to Old Chatswood Road, Paradise Road, Winnets Road/Village Drive, Loganlea Road and Centenary Road motorway ramps, and motorway widening to 8 lanes including T2 lanes in project area.	✓	✓	✓	✓
DMR	**Centenary Highway (Ipswich Motorway to Logan Motorway)** Upgrade to 6 lanes divided, including grade separation at Boundary Road with north facing ramps.				✓
DMR	**Bruce Highway (Bribie Island Road to External)** Upgrade to 6 lanes.		✓	✓	✓

Source	Project Title Project Coding Description	Network Year			
		2014	2016	2021	2026
Network Year Key: ✓ = Include in Do Minimum Network; T = Also include in Northern Link Tests					
DMR	**Redbank Plains Road (Krueger Parade to Collingwood Drive)** Upgrade to 4 lanes divided.		✓	✓	✓
DMR	**Ipswich Motorway (Rocklea to Riverview)** Upgrade to 6 lanes from Fairfield Road to McEwan Street. Includes upgrading of Centenary Hwy interchange (to low impedance), deletion of Archerfield Road W/B on ramp (replaced by overpass to Scotts Road), deletion of Rudd Street ramps (replaced by service road to Kimberley Street), and upgrading of W/B on-ramp at Granard Road to 2 lanes. Note 4 lane section W/B between Archerfield Road and Kelliher Road.	✓	✓	✓	✓
DMR	**Centenary Highway (Logan Motorway to Springfield Parkway)** Upgrade to 4 lanes divided.		✓	✓	✓
DMR	**Centenary Highway/Western Freeway HOV** Upgrade to 6 lanes (including 1 T2 lane each way) between Mount Coot-tha Road and approx Warrender Street, Darra and 8 lanes (including 1 T2 lane each way) between Frederick Street and Mount Coot-tha Road. No change on Centenary Bridge over Brisbane River.		✓	✓	✓
DMR	**Pacific Motorway (Loganlea Interchange to Logan Hyperdome)** Upgrade to 8 lanes (including 1 T2 lane each way).		✓	✓	✓
DMR	**Gateway Motorway South (Mt Gravatt-Capalaba Road to Pacific Motorway)** Upgrade to 6 lanes (south facing Pacific Motorway ramps 2 lanes).		✓	✓	✓
DMR	**Port of Brisbane Motorway (Stage 2b-Lytton Road to Tanker Street)** Extend 4 lane divided motorway. Includes realignment of Pritchard Road.		✓	✓	✓
DMR	**North-South Arterial (Mango Hill)** New 4 lane divided arterial from Gateway Motorway at Bruce Hwy to Anzac Avenue at Kinsellas Road. Includes new 1 lane undivided arterial connection to Lawnton Pocket Road.		✓	✓	✓
DMR	**Cleveland-Redland Bay Road** Upgrade to 4 lanes divided between South Street and Boundary Road. Includes new 1 lane undivided arterial connection to Lawnton Pocket Road. Excludes 130 m south of Beveridge Road and 190 m north of Thornlands Road, which both remain 1 lane undivided.		✓	✓	✓
DMR	**Beaudesert Road (Johnson Road to Granard Road)** Upgrade to 6 lanes (including 1 T2 lane each way).		✓	✓	✓
DMR	**Duncan Road-Boundary Road (Lyndon Road to New Cleveland Road)** Upgrade to 4 lanes divided.		✓	✓	✓
DMR	**Petrie-Kippa-Ring Bus Corridor** Anzac Avenue widened to add bus lanes between North Lakes (Kinsellas Drive) and Kippa-Ring (Kroll Street).		✓	✓	✓
DMR	**Redlands Bus Priority Upgrade** Finucane Road**/**Shore Street to add T2 lanes between Capalaba (Redland Bay Road) and Cleveland (Waterloo Street) ; upgrade Redland Bay Road**/**Boundary Road to 6 lanes including T2 lanes between Capalaba (Old Cleveland Road) and Victoria Point (Cleveland-Redland Bay Road).		✓	✓	✓
DMR	**Warrego Highway to Cunningham Highway Connection** New 2 lane 60km/h urban limited access connection road.		✓	✓	✓
DMR	**Cunningham Highway (Ripley-Yamanto, Yamanto-Ebenezer)** Duplication - upgrade to 4 lanes divided.		✓	✓	✓

Source	Project Title Project Coding Description	Network Year			
		2014	2016	2021	2026
Network Year Key: ✓ = Include in Do Minimum Network; T = Also include in Northern Link Tests					
DMR	**Brisbane Urban Corridor (Griffith Arterial)** New grade separated interchange at Kessels/Mains.		✓	✓	✓
DMR	**Deception Bay Road (Bruce Hwy to Lipscombe Road)** Upgrade to 4 lanes divided.		✓	✓	✓
DMR	**Burpengary-Caboolture Road** Upgrade to 4 lanes (undivided).		✓	✓	✓
DMR	**East-West Arterial/Gateway Upgrade (EWAG)** Conceptual upgrade involving grade-separated connection between East-West Arterial west of Nudgee Road and Airport Drive east of Lomandra Drive, with grade separated access between East-West Arterial and Gateway Motorway south. Links to grade separation of Airport Drive/Lomandra Drive Intersection and includes signalisation of Airport Drive/Gateway Motorway roundabout.	✓	✓	✓	✓
BCC	**Learoyd Road (Watson Road to Beaudesert Road)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
BCC	**Hamilton Road Connection (Old Northern Road to Gympie Road)** New 2 lane undivided suburban route connecting Hamilton Road past The Chermside Hills. Upgrade existing sections of Hamilton Road between Old Northern Road and Maundrell Terrace to 60km/h suburban route.	✓	✓	✓	✓
BCC	**Nudgee Road (Gerler Road to East-West Arterial)** Upgrade intersections.	✓	✓	✓	✓
BCC	**Beckett Road (Rode Road to Albany Creek Road)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
BCC	**Beenleigh Road (Persse Road to BCC Boundary)** Upgrade to 4 lanes divided. Includes grade separation of Beenleigh Road Rail Crossing.	✓	✓	✓	✓
BCC	**Telegraph Road** Upgrade to 4 lanes (divided E of Lacey Road). Includes new alignment between Linkfield Road and Norris Road, with grade separation at railway, and closure of existing Telegraph Road at railway level crossing.	✓	✓	✓	✓
BCC	**Boundary Road (Skepper Street to Blunder Road)** New 2 lane connection through Wacol Army Barracks between Bukulla Street and Fulcrum Street.	✓	✓	✓	✓
BCC	**Wynnum Road (Gateway Motorway to Cranston Street)** Upgrade to 4 lanes divided between Gateway Motorway and Plaza Street, and upgrade to 6 lanes divided between Plaza Street and Cranston Street.	✓	✓	✓	✓
BCC	**Manly Road (Wynnum Road to Preston Road)** Upgrade to 4 lanes divided between Wynnum Road and Amberjack Street, and upgrade to 2 lane divided between Amberjack Street and Preston Road.	✓	✓	✓	✓
BCC	**Appleby Road (Albany Creek Road to Stafford Road)** Provide an additional lane in each direction at major intersections.		✓	✓	✓
BCC	**Blunder Road (Crossacres to Stapylton)** New 2 lane alignment between Blunder Creek and Stapylton Road.	✓	✓	✓	✓
BCC	**Shand Street (Stafford Road to Pickering Street)** Signalise and upgrade Sicklefield/Pickering intersection. Close South Pine Road at Pickering Street and signalise Sicklefield/Shand intersection. Upgrade Shand Street approach to Stafford Road intersection.	✓	✓	✓	✓

Source	Project Title Project Coding Description	Network Year			
		2014	2016	2021	2026
Network Year Key: ✓ = Include in Do Minimum Network; T = Also include in Northern Link Tests					
BCC	**Tilley Road Extension (Kianawah Rd to Manly Rd)** New 2 lane section connecting Kianawah Road and Manly Road.		✓	✓	✓
BCC	**Meadowlands Road (Belmont Road to midway Epala Street and Hilltop Court)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
OTHER	**Grade Separation of Airport Drive/Lomandra Drive**	✓	✓	✓	✓
OTHER	**Lomandra Drive (Qantas Drive to Boronia Road)** Upgrade to 4 lanes.	✓	✓	✓	✓
OTHER	**Airport Northern Roads (as per GUP reference project)** Northern Access Road connecting Airport Drive to Northern Access Interchange on Gateway Northern Deviation, plus new internal western roads within Airport site.	✓	✓	✓	✓
BCC	**Skyring Terrace Extension** New 2 lane local connection from Montpellier Road to Skyring Terrace.	✓	✓	✓	✓
BCC	**Robinson Road East + Robinson Road West (Murphy Road to Bilsen Road)** Upgrade to 4 lanes divided. Includes connection of Robinson Road West and Robinson Road East over Geebung Station, and closure of Newman Road at railway level crossing.		✓	✓	✓
BCC	**Sherwood Road (Oxley Road to Oxley Creek)** Upgrade to 4 lanes.				✓
BCC	**Progress Road (Ipswich Motorway to Centenary Hwy)** Upgrade to 4 lanes divided.		✓	✓	✓
BCC	**Inala Avenue (Blunder Road to Watson Road)** Upgrade to 4 lanes divided (Inala Avenue and King Avenue).		✓	✓	✓
BCC	**Newnham Road (Creek Road to Logan Road)** Intersection upgrades.			✓	✓
BCC	**Coonan Street (Westminster Street to Radnor Street)** Upgrade to 4 lanes divided (from 4 lanes undivided).		✓	✓	✓
BCC	**Boundary Road (Beenleigh Road to Troughton Road)** Upgrade to 4 lanes. Includes grade separation of Boundary Road Rail Crossing.			✓	✓
BCC	**Wadeville Street (Stapylton Road to Forest Lake Boulevard)** Upgrade to 4 lanes divided.	✓	✓	✓	✓
BCC	**Wondall Road (Manly Road to Bonniebrae Street)** Upgrade to 4 lanes.		✓	✓	✓
BCC	**Beams Road (Gympie Road to Sandgate Road)** Upgrade to 4 lanes. Includes grade separation of Beams Road Rail Crossing.			✓	✓
BCC	**Kingsford Smith Drive/Eagle Farm Road (Links Avenue Nth to Eagle Farm Road)** Upgrade to 6 lanes divided between Links Avenue North and Tingiria Street.	✓	✓	✓	✓
BCC	**Hanford Road (Depot Road to Gympie Road)** Upgrade to 4 lanes.		✓	✓	✓
BCC	**Wacol Station Road (Ipswich Motorway to Sumners Road)** Upgrade to 4 lanes divided. Includes upgrade to 2 lanes on Sumners Road from Wacol Station Road E to existing section of this standard (700 m).			✓	✓

Source	Project Title Project Coding Description	Network Year			
		2014	2016	2021	2026
Network Year Key: ✓ = Include in Do Minimum Network; T = Also include in Northern Link Tests					
BCC	**Illaweena Street (Beaudesert Road to Wembley Road)** Upgrade to 4 lanes, divided W of Gowan Road.				✓
BCC	**New Cleveland Road (Manly Road to Greencamp Road)** Upgrade to 4 lanes divided.			✓	✓
BCC	**Freeman Road (Garden Road to Blunder Road)** Upgrade to 4 lanes divided.		✓	✓	✓
BCC	**New Cleveland Road (Greencamp Road to Old Cleveland Road)** Upgrade to 4 lanes divided.		✓	✓	✓
BCC	**Ermelo Road-Dairy Swamp Road (Belmont Road to New Cleveland Road)** Upgrade Ermelo Road and Dairy Swamp Road N of Formosa Road to 4 lanes divided suburban route. New connection from Meadowlands Road to Dairy Swamp Road and connection of Ermelo Road sections.			✓	✓
BCC	**Stapylton Road (Wadeville Street to Johnson Road)** Upgrade to 4 lanes divided.		✓	✓	✓
BCC	**Toombul Road (Nudgee Road to Melton Road)** Upgrade to 6 lanes divided.			✓	✓
BCC	**Rode Road (Old Northern Road to Edinburgh Castle Road)** Upgrade to 4 lanes between Glenrowan Street and Hilltop Avenue. Sections between Old Northern Road and Glenrowan Street (2.5km) or between Hilltop Avenue and Edinburgh Castle Road (2.7km) remain 1 lane			✓	✓
BCC	**Hellawell Road (Beaudesert Road to Gowan Road)** Upgrade to 4 lanes divided.				✓
BCC	**Cavendish Road (Rail Grade Separation)** Upgrade to low impedance between Clarence Street and Temple Street. Includes grade separation of Cavendish Road Rail Crossing.				✓
BCC	**Nottingham Road (Algester Road to Beaudesert Road)** Upgrade to 4 lanes.				✓
BCC	**Seventeen Mile Rocks Road (Goggs Road to Kingsgate Street)** Upgrade to 4 lanes divided.			✓	✓
BCC	**Pannard Street Extension** New 2 lane connection from Pannard Street/Darra Avenue to Douglas Street/Blivest Street.		✓	✓	✓
BCC	**Underwood Road (Warrigal Road to Millers Road)** Upgrade to 4 lanes divided.		✓	✓	✓
BCC	**Kingsford Smith Drive (Seymour Road to Links Avenue North)** Upgrade to 6 lanes.		✓	✓	✓
TransApex	**RCM CLEM7** New tolled river crossing approximately on Story Bridge alignment, with connections to ICB, Lutwyche Road, Shaftson Avenue, Ipswich Road and Pacific Motorway. Configuration from RiverCity Motorway plans.	✓	✓	✓	✓
TransApex	**CLEM7 Ancillary Projects for RCM** Surface Road connections and modifications to accompany RCM CLEM7.	✓	✓	✓	✓

Source	Project Title Project Coding Description	Network Year			
		2014	2016	2021	2026
Network Year Key: ✓ = Include in Do Minimum Network; T = Also include in Northern Link Tests					
TransApex	**Airport Link** New tolled motorway connection from CLEM7/ICB to Stafford Road/Gympie Road and Sandgate Road/East-West Arterial. Alignment and interchange details as per Airport Link EIS Reference Design.	✓	✓	✓	✓
TransApex	**Airport Link East-West Connection** New tolled motorway connection from Stafford Road/Gympie Road to Sandgate Road/East-West Arterial. Alignment and interchange details as per Airport Link EIS Reference Design.	✓	✓	✓	✓
TransApex	**Hale Street Link** New tolled bridge connection from Hale Street/Coronation Drive to Boundary Street/Montague Road, Cordelia Street and Merivale Street. Alignment and interchange details as per Hale Street Link Project Modification Report (April 2008) Includes double right turn from Coronation Drive to William Jolly Bridge.	✓	✓	✓	✓
TransLink	**Northern Busway Staging Project – Interim** Auto network impacts of Northern Busway Interim works, including bus lanes on Lutwyche Road between Newmarket Road and Stoneleigh Street, two way bus and local traffic access only on Truro Street, and bus and local traffic access only (southbound only) on Roblane Street. Lutwyche Road improvements to provide 2 general traffic lanes in each direction in the affected sections. Details as per Northern Busway CDIMP.	✓	✓	✓	
TransLink	**Northern Busway Staging Project – Ultimate** Auto network impacts of Northern Busway Ultimate works, modifying Interim works: primarily the conversion of bus lanes to T3 lanes between Fosbery Street and Newmarket Road. Details as per NB CDIMP.				✓
TransApex	**Northern Link** New tolled motorway connection from Western Freeway to Inner City Bypass. Alignment, interchange details and ancillary works to match business case scenario	**T**	**T**	**T**	**T**
OTHER	**Airport Drive (Lomandra Drive to Domestic Terminal)** Upgrade to 6 lanes.	✓	✓	✓	✓
OTHER	**Schneider Road Extension** Extension over rail line to Lomandra Drive/Qantas Drive	✓	✓	✓	✓
OTHER	**Hercules Street Link** Connection to Kingsford Smith Drive	✓	✓	✓	✓
DMR	**Pacific Motorway (Logan Hyperdome to Logan Motorway)** Upgrade to 8 lanes (including 1 T2 lane each way).			✓	✓
BCC	**Muriel Avenue (Fairfield Road to Beaudesert Road)** Upgrade to 4 lanes in remaining section, between Anson Street and Gladstone Street.			✓	✓
BCC	**Bracken Ridge Road (Hoyland Street to Deagon Deviation)** Upgrade to 4 lanes divided. Includes upgrading of Hoyland Street to 4 lanes divided.	✓	✓	✓	✓
BCC	**Green Camp Road (Manly Road to New Cleveland Road)** Upgrade to 4 lanes divided.			✓	✓
BCC	**Johnson Road (Mt Lindesay Hwy to Woogaroo Road)** Upgrade to 4 lanes divided.			✓	✓

Source	Project Title Project Coding Description	Network Year			
		2014	2016	2021	2026
Network Year Key: ✓ = Include in Do Minimum Network; T = Also include in Northern Link Tests					
BCC	**Boundary Road (Skepper Street to Blunder Road)** Upgrade to 4 lanes.			✓	✓
BCC	**Beatty Road/Sherbrooke Road (Granard Road to King Avenue)** Upgrade to 4 lanes.			✓	✓
BCC	**Bridgman Road (Albany Creek Road to Millar Road)** Upgrade to 70km/h 4 lane divided arterial, including new connection from Beams Road to Roghan Road. Includes upgrading of sections of Roghan Road and Carseldine Road.			✓	✓
BCC	**Pickering Street/Sicklefield Street (Grade Separation of Rail)** Upgrade to divided between Enoggera Road and Pickering Street, including grade separation of Enoggera Road Rail Crossing. (Remains 4 lanes)			✓	✓
BCC	**Blunder Road (Crossacres to Stapylton)** Upgrade to 4 lanes divided. Bypassed western section of Blunder Road reduced to 50km/h district access.			✓	✓
BCC	**Beams Road (Bridgman Road to Gympie Road)** Upgrade to 4 lanes.			✓	✓
BCC	**Archerfield Road (Ipswich Motorway to Poinsettia Street)** Upgrade to 4 lanes.			✓	✓
BCC	**Trouts Road** New 2 lane undivided 50km/h district access connection between northern and southern sections of Trouts Road (adjacent to the Chermside Hills).			✓	✓
DMR	**Gateway Motorway North (Bridge to Raubers Road) (existing alignment)** Upgrade to 6 lanes.				✓
DMR	**Gateway Motorway North (Nudgee Road to approx Woodcroft Street)** Upgrade to 6 lanes.				✓
DMR	**Gateway Motorway North (Deagon Deviation to Bruce Highway)** Upgrade to 6 lanes. Also includes upgrading Depot Road on ramp to Deagon Deviation off ramp N/B to 4 lanes.				✓
DMR	**Gateway Motorway (Pacific Motorway to Logan Motorway** Upgrade to 6 lanes.				✓
DMR	**Logan Motorway Upgrade (Ipswich Motorway to Pacific Motorway)** Upgrade to 6 lanes.				✓
BCC	**Oxley Road (Ipswich Motorway to Sherwood Road)** Upgrade to 4 lanes.				✓
BCC	**Rickett Road (Thorneside Road to Green Camp Road)** Upgrade to 80km/h 4 lanes divided.				✓
BCC	**Dawson Parade (Samford Road)** Upgrade to 4 lanes between Samford Road and Patricks Road, including grade separation of Dawson Parade Rail Crossing.				✓
BCC	**Mt Gravatt-Capalaba Road (Mt Cotton Road to Old Cleveland Road)** Upgrade to 4 lanes divided.				✓
BCC	**Belmont Road (Manly Road to Meadowlands Road)** Upgrade to 4 lanes divided.				✓

Source	Project Title Project Coding Description	Network Year			
		2014	2016	2021	2026
Network Year Key: ✓ = Include in Do Minimum Network; T = Also include in Northern Link Tests					
BCC	**Eagle Farm Road (Tingiria Street to Main Myrtletown Road)** Upgrade to 4 lanes.				✓

Notes: (1) Existing denotes project was not in 2004 base network but is now included in 2006/7 base network.

Appendix D SIDRA outputs

This Appendix contains the SIDRA outputs (am and pm peak periods) for the years 2014 and 2026 for scenarios with Northern Link for the following intersections on the State Strategic Road Network:

- Moggill Road/Western Freeway on Ramp
- Moggill Road/Western Freeway off Ramp
- Mt Coot-tha Roundabout (Western Freeway/Mt Coot-tha Road)
- Toowong Roundabout (Frederick Street Milton Road/Miskin Street)

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway On Ramps
AM Peak 2014 - TR_2014_135 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 T		385		385	4	1949	119		0.238	2.1	46	500
2 T		385		385	4	1949	119		0.238	2.1	46	500
3 R			20	20	5	1949	9		0.174	77.9	15	45
	0	769	20	789	4				0.238	4.0	46	
West: Moggill Road West												
1 L	882			882	1	1949	119		0.565	10.8	127	500
2 T		945		945	3	1950	119		0.581	3.3	139	500
3 T		945		945	3	1950	119		0.581	3.3	139	500
	882	1890	0	2772	3				0.581	5.7	139	
Pedestrians												
Across W approach				50	Stage 1		6		0.097	64.1	0.2	
					Stage 2		6		0.097	64.1	0.2	

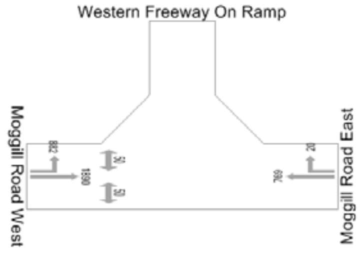
ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	3561	3	140	0.581	5.3	139

Peak flow period = 60 minutes.

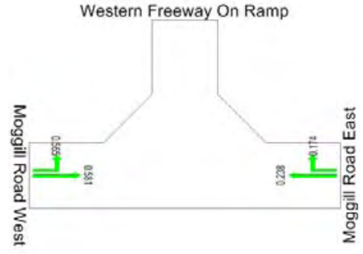
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

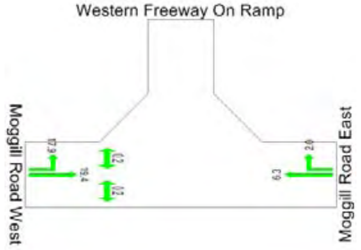
Demand Flows



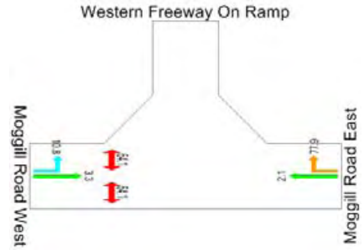
Degree of Saturation



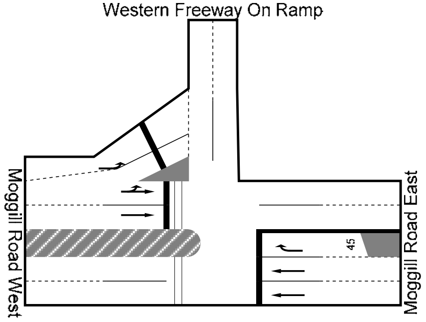
Queue Distance (m)



Control Delay



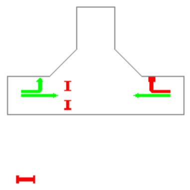
Geometry



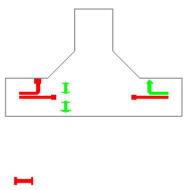
Phase Sequence

Cycle Time 140 secs

Phase A 125 secs



Phase B 15 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2014 AM Peak Hour

Moggill Road / Western Freeway On Ramp Without Northern Link

Northern Link
SKM Connell Wagner
JOINT VENTURE

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway On Ramps
AM Peak 2014 - TR_2014_136 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 T		414		414	4	1949	119		0.256	2.1	50	500
2 T		414		414	4	1949	119		0.256	2.1	50	500
3 R			58	58	10	1949	9		0.522	80.9	42	45
	0	828	58	886	4				0.522	7.3	50	
West: Moggill Road West												
1 L	945			945	2	1949	119		0.607	11.0	144	500
2 LT	622	360		983	2	1950	122		0.607	7.4	134	500
3 T		990		990	3	1950	119		0.607	3.4	150	500
	1567	1350	0	2917	2				0.607	7.2	150	
Pedestrians												
Across W approach				50		Stage 1	6		0.097	64.1	0.2	
						Stage 2	6		0.097	64.1	0.2	

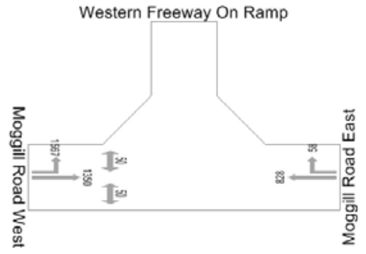
ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	3803	3	140	0.607	7.2	150

Peak flow period = 60 minutes.

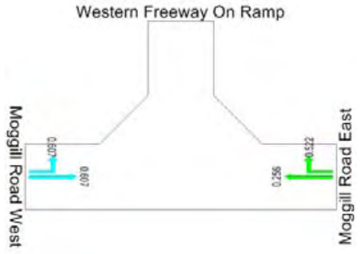
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

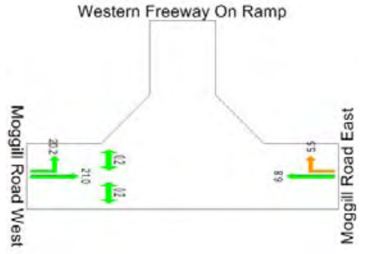
Demand Flows



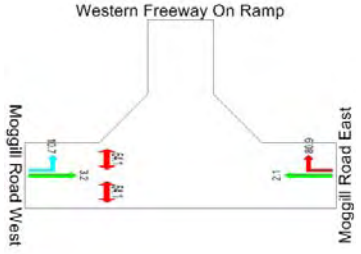
Degree of Saturation



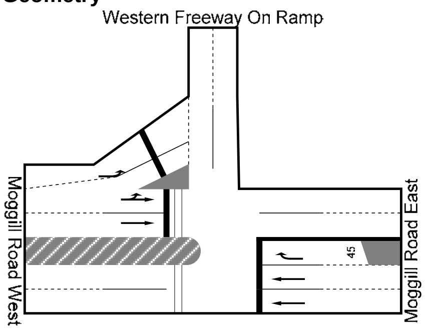
Queue Distance (m)



Control Delay

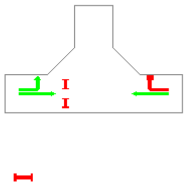


Geometry

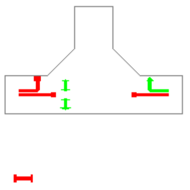


Phase Sequence
Cycle Time 140 secs

Phase A 125 secs



Phase B 15 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2014 AM Peak Hour

Moggill Road / Western Freeway On Ramp With Northern Link

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway On Ramps
PM Peak 2014 - TR_2014_135 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road West												
1 T		991		991	1	1949	119		0.601	3.4	147	500
2 T		991		991	1	1949	119		0.601	3.4	147	500
3 R			249	249	0	1949	84		0.769	37.4	78*	45
	0	1982	249	2231	1				0.769	7.2	147	
West: Moggill Road West												
1 L	447			447	2	1949	44		0.774	55.4	199	500
2 LT	339	112		451	2	1950	44		0.774	53.4	201	500
3 T		466		466	3	1950	44		0.774	47.5	208	500
	786	578	0	1364	2				0.774	52.0	208	
Pedestrians												
Across W approach				50		Stage 1	81		0.007	12.4	0.1	
						Stage 2	6		0.097	64.1	0.2	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	3595	1	140	0.774	24.2	208

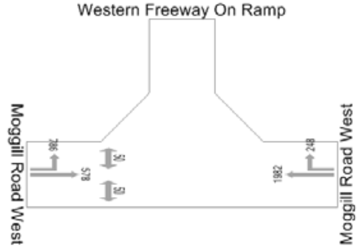
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

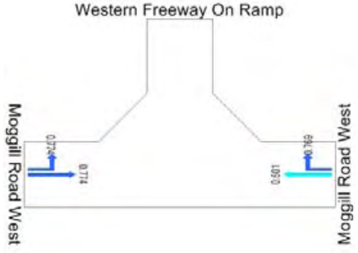
Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

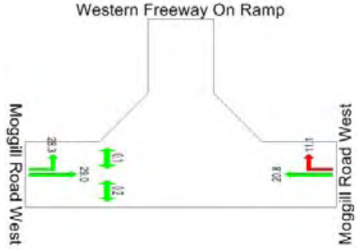
Demand Flows



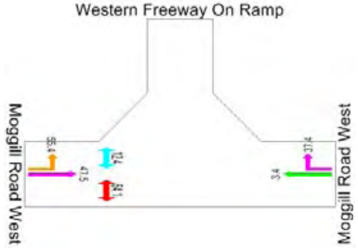
Degree of Saturation



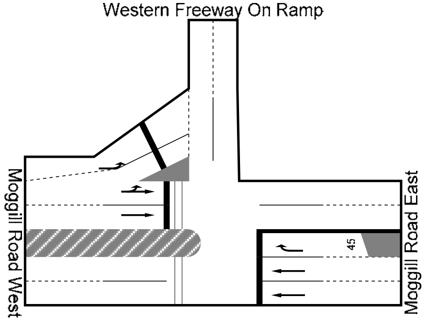
Queue Distance (m)



Control Delay

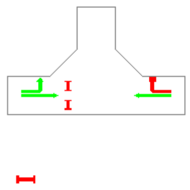


Geometry

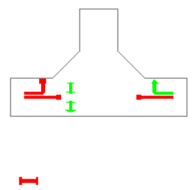


Phase Sequence
Cycle Time 140

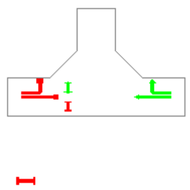
Phase A 50 secs



Phase B 15 secs



Phase B 75 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2014 PM Peak Hour

Moggill Road / Western Freeway On Ramp Without Northern Link

NorthernLink
SKM Connell Wagner
JOINT VENTURE

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway On Ramps
PM Peak 2014 - TR_2014_136 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road West												
1 T		1038		1038	1	1949	119		0.630	3.5	160	500
2 R		959	76	1034	1	1949	119		0.630	33.4	85	500
3 R			354	354	1	1949	90		1.000	33.4r	85*	45
	0	1997	430	2427	1				1.000	7.9	160	
West: Moggill Road West												
1 L	495			495	2	1949	38		0.995	128.0	367	500
2 LT	438	60		498	2	1950	38		0.995	126.9	368	500
3 T		518		518	3	1950	38		0.995	119.1	383	500
	933	578	0	1511	2				0.995	124.6	383	
Pedestrians												
Across W approach				50		Stage 1	87		0.007	10.0	0.1	
						Stage 2	6		0.097	64.1	0.2	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	3938	1	140	1.000	52.7	383

Peak flow period = 60 minutes.

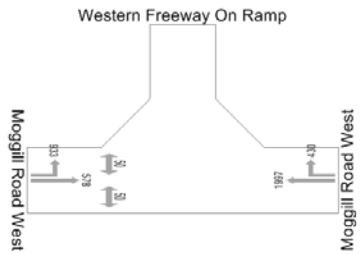
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

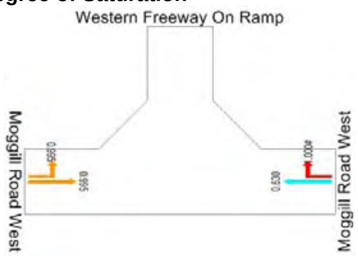
* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

r Delay, stops and queue length for this lane have been cut down to fit in the queuing space. The amount cut may not be accounted for fully in the adjacent lane performance statistics. You may wish to change the short lane to a full lane to investigate the extent of this effect.

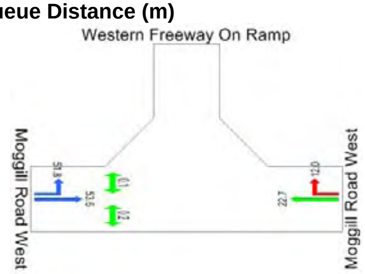
Demand Flows



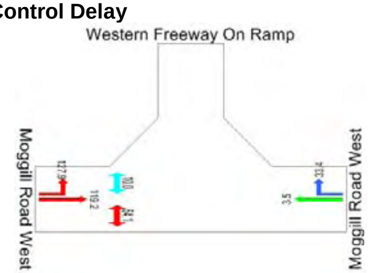
Degree of Saturation



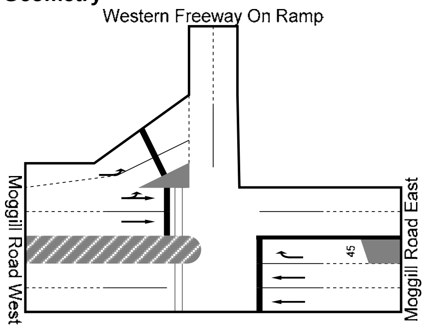
Queue Distance (m)



Control Delay



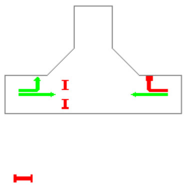
Geometry



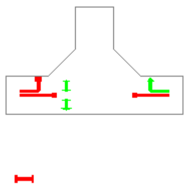
Phase Sequence

Cycle Time 140 secs

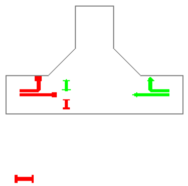
Phase A 44 sec



Phase B 15 secs



Phase C 81 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2014 PM Peak Hour

Moggill Road / Western Freeway On Ramp With Northern Link

Northern Link
SKM Connell Wagner JOINT VENTURE

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway On Ramps
AM Peak 2026 - TR_2026_135 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 T		341		341	4	1949	119		0.212	2.0	40	500
2 T		341		341	4	1949	119		0.212	2.0	40	500
3 R			20	20	5	1949	9		0.174	78.1	15	45
	0	682	20	702	4				0.212	4.2	40	
West: Moggill Road West												
1 L	952			952	2	1949	119		0.609	11.0	145	500
2 LT	27	964		991	3	1950	120		0.609	3.3	147	500
3 T		989		989	3	1950	119		0.609	3.4	152	500
	979	1953	0	2932	3				0.609	5.9	152	
Pedestrians												
Across W approach				50		Stage 1	6		0.097	64.1	0.2	
						Stage 2	6		0.097	64.1	0.2	

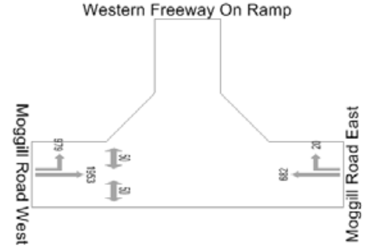
ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	3634	3	140	0.609	5.5	152

Peak flow period = 60 minutes.

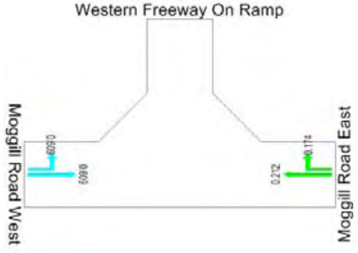
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

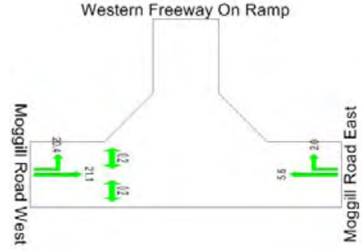
Demand Flows



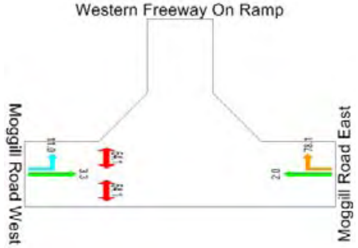
Degree of Saturation



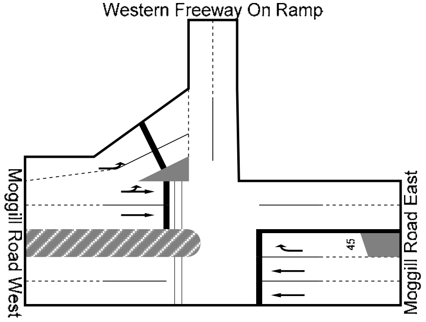
Queue Distance (m)



Control Delay

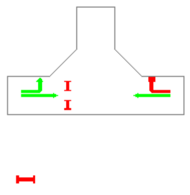


Geometry

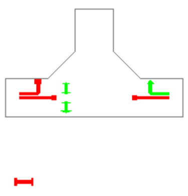


Phase Sequence
Cycle Time 140 secs

Phase A 125 secs



Phase B 15 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT
2026 AM Peak Hour

Moggill Road / Western Freeway On Ramp Without Northern Link

Northern Link
SKM Connell Wagner JOINT VENTURE

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway On Ramps
AM Peak 2026 - TR_2026_136 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 T		386		386	5	1949	119		0.239	2.1	46	500
2 T		386		386	5	1949	119		0.239	2.1	46	500
3 R			124	124	10	1949	30		0.761	65.0	72*	45
	0	771	124	895	5				0.761	10.8	72	
West: Moggill Road West												
1 L	969			969	2	1949	98		0.758	21.8	291	500
2 LT	728	277		1005	3	1950	101		0.758	18.2	291	500
3 T		1011		1011	4	1950	98		0.758	14.1	306	500
	1697	1288	0	2985	3				0.758	18.0	306	
Pedestrians												
Across W approach				50		Stage 1	27		0.022	45.6	0.2	
						Stage 2	6		0.097	64.1	0.2	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	3880	3	140	0.761	16.3	306

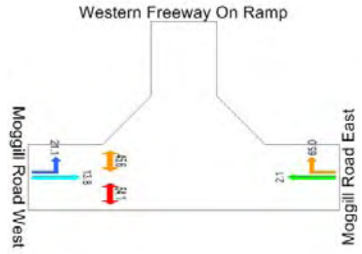
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

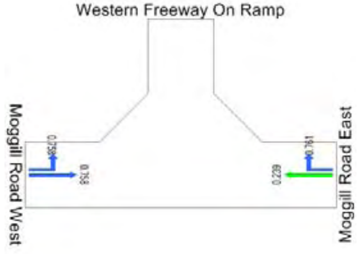
Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

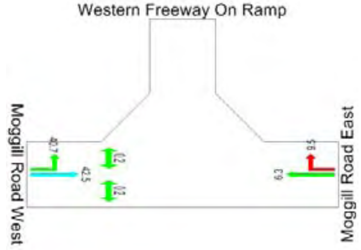
Demand Flows



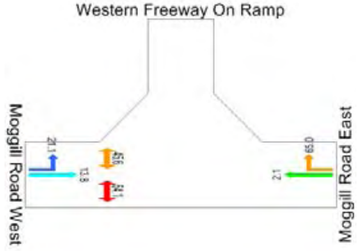
Degree of Saturation



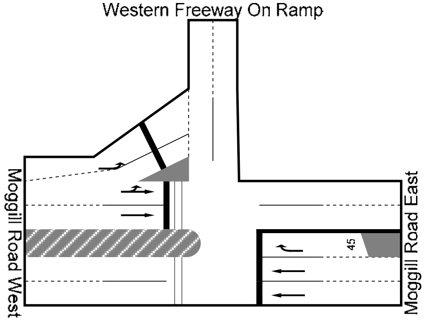
Queue Distance (m)



Control Delay

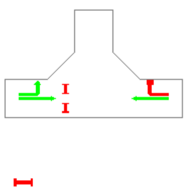


Geometry

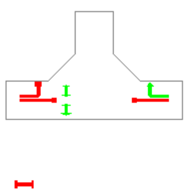


Phase Sequence
Cycle Time 140 secs

Phase A 104 secs



Phase B 15 secs



Phase B 21 secs

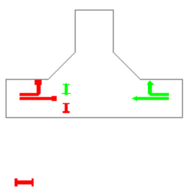


Table S14 from Sidra Output Tables
Moggill Road / Western Freeway On Ramps
PM Peak 2026 - TR_2026_135 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road West												
1 T		974		974	1	1949	119		0.591	3.3	142	500
2 T		974		974	1	1949	119		0.591	3.3	142	500
3 R			256	256	0	1949	84		0.791	41.0	84*	45
	0	1948	256	2204	1				0.791	7.7	142	
West: Moggill Road West												
1 L	459			459	2	1949	44		0.795	56.9	209	500
2 LT	327	137		464	2	1950	44		0.795	54.6	212	500
3 T		476		476	4	1950	44		0.795	49.0	219	500
	786	613	0	1399	3				0.795	53.4	219	
Pedestrians												
Across W approach				50	Stage 1		81		0.007	12.4	0.1	
					Stage 2		6		0.097	64.1	0.2	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	3603	1	140	0.795	25.4	219

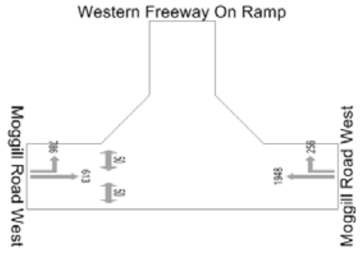
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

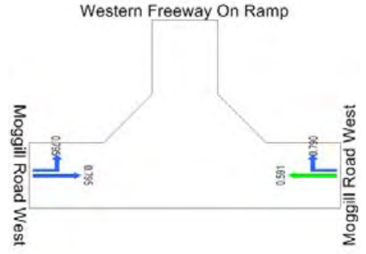
Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

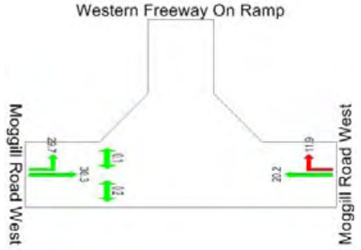
Demand Flows



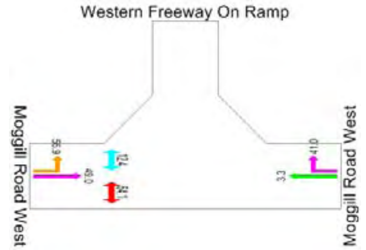
Degree of Saturation



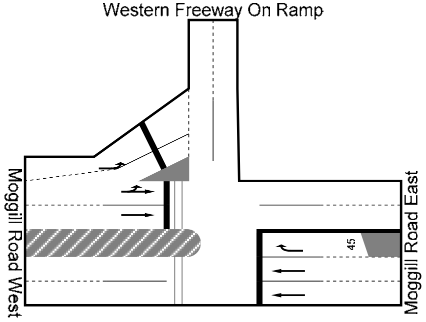
Queue Distance (m)



Control Delay



Geometry



Phase Sequence

Cycle Time 140

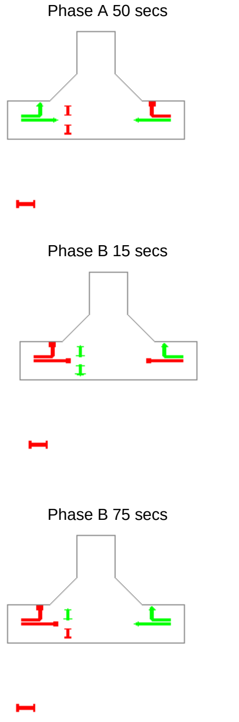


Table S14 from Sidra Output Tables
Moggill Road / Western Freeway On Ramps
PM Peak 2026 - TR_2026_136 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road West												
1 T		1087		1087	1	1949	119		0.660	3.8	176	500
2 R		971	111	1082	1	1949	119		0.660	33.9	85	500
3 R			348	348	1	1949	89		1.000	33.9r	85*	45
	0	2058	459	2517	1				1.000	7.9	176	
West: Moggill Road West												
1 L	510			510	2	1949	39		0.999	131.8	385	500
2 LT	435	77		513	2	1950	39		0.999	130.5	388	500
3 T		531		531	3	1950	39		0.999	123.0	403	500
	945	608	0	1553	3				0.999	128.3	403	
Pedestrians												
Across W approach				50		Stage 1	86		0.007	10.4	0.1	
						Stage 2	6		0.097	64.1	0.2	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	4070	2	140	1.001	53.9	403

Peak flow period = 60 minutes.

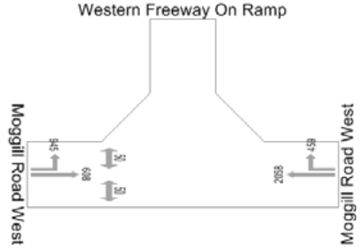
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

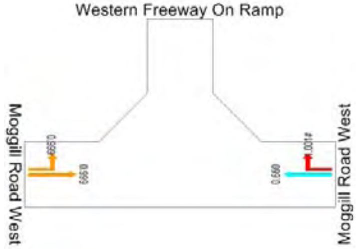
* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

r Delay, stops and queue length for this lane have been cut down to fit in the queuing space. The amount cut may not be accounted for fully in the adjacent lane performance statistics. You may wish to change the short lane to a full lane to investigate the extent of this effect.

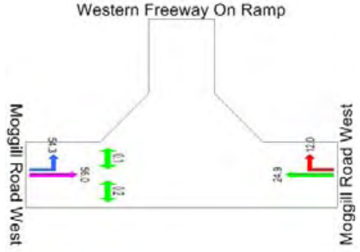
Demand Flows



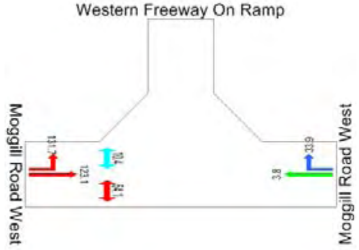
Degree of Saturation



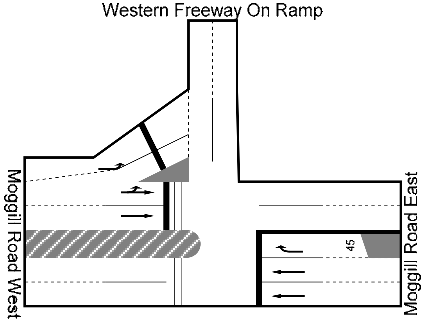
Queue Distance (m)



Control Delay



Geometry

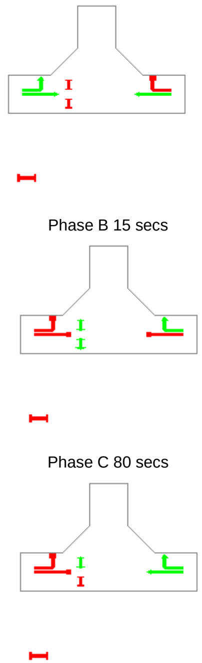


Phase Sequence
Cycle Time 140 secs

Phase A 45 sec

Phase B 15 secs

Phase C 80 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2026 PM Peak Hour

Moggill Road / Western Freeway On Ramp With Northern Link

Northern Link
SKM Connell Wagner JOINT VENTURE

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway Off Ramps
AM Peak 2014 - TR_2014_135 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 L	319			319	1	1949	79	48	0.250	8.0	14	100
2 T		65		65	8	1949	39		0.126	40.2	34	500
3 T		65		65	8	1949	39		0.126	40.2	34	500
	319	130	0	449	3				0.250	17.3	34	
North: Western Freeway Off Ramp												
1 L	313			313	1	1949	34	50	0.559	35.3	123*	110
2 R			321	321	4	1949	34		0.730	61.7	152	160
3 R			321	321	4	1949	34		0.730	61.7	152	215
	313	0	641	954	3				0.730	53.0	152	
West: Moggill Road West												
1 T		943		943	3	1949	94		0.734	15.7	288	500
2 T		943		943	3	1949	94		0.734	15.7	288	500
3 R			20	20	5	1949	49		0.122	40.0	10	35
	0	1885	20	1905	3				0.734	15.9	288	
Pedestrians												
Across E approach				50			26		0.022	46.4	0.2	
Across N approach				50			36		0.016	38.6	0.1	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	3308	3	140	0.734	26.8	288

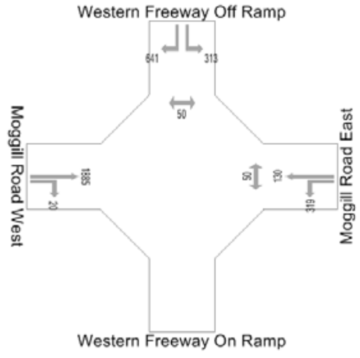
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

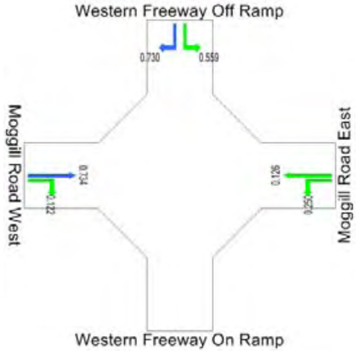
Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

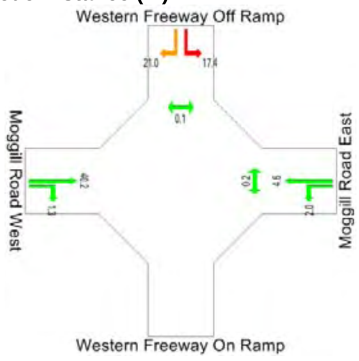
Demand Flows



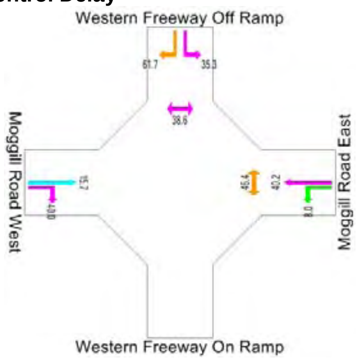
Degree of Saturation



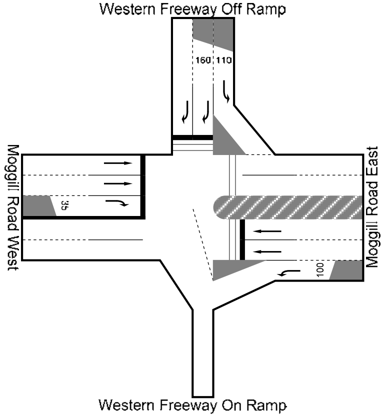
Queue Distance (m)



Control Delay



Geometry



Phase Sequence

Cycle Time 140 secs

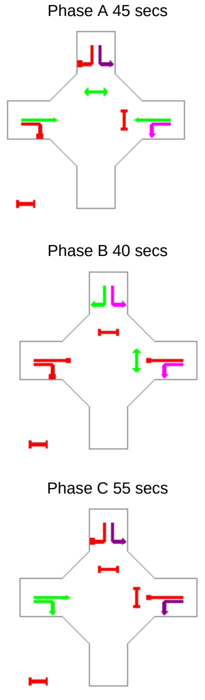


Table S14 from Sidra Output Tables
Moggill Road / Western Freeway Off Ramps
AM Peak 2014 - TR_2014_136 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 L	300			300	1	1949	102	25	0.215	8.0	14	100
2 T		91		91	9	1949	45		0.154	36.0	44	500
3 T		91		91	9	1949	45		0.154	36.0	44	500
	300	182	0	482	4				0.215	18.6	44	
North: Western Freeway Off Ramp												
1 L	426			426	3	1949	51	43	0.645	27.2	138*	110
2 R			327	327	4	1949	51		0.571	45.2	131	160
3 R			376	376	4	1949	51		0.571	46.5	153	215
	426	0	703	1129	4				0.645	38.8	153	
West: Moggill Road West												
1 T		675		675	3	1949	77		0.640	23.1	224	500
2 T		675		675	3	1949	77		0.640	23.1	224	500
3 R			20	20	5	1949	26		0.153	58.8	12	35
	0	1350	20	1370	3				0.640	23.6	224	
Pedestrians												
Across E approach				50			43		0.014	33.6	0.1	
Across N approach				50			42		0.014	34.3	0.1	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	2981	3	140	0.645	28.6	224

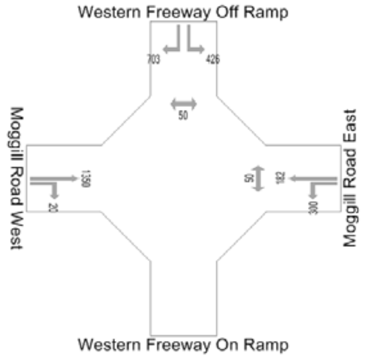
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

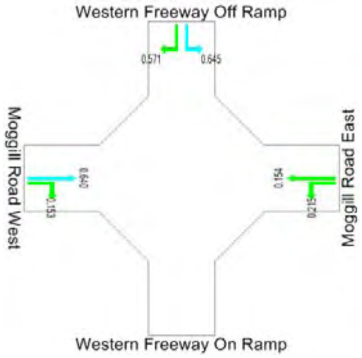
Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

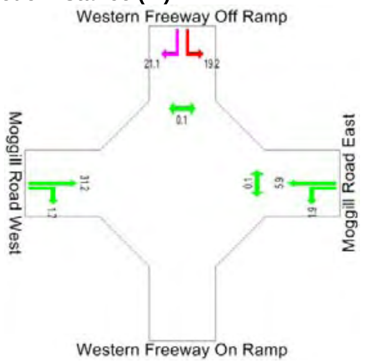
Demand Flows



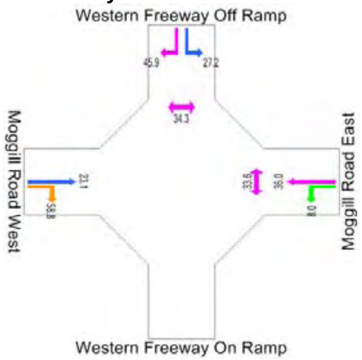
Degree of Saturation



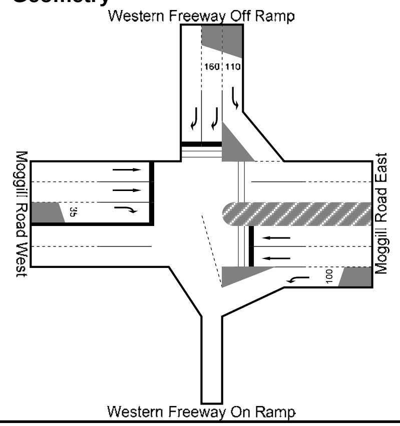
Queue Distance (m)



Control Delay



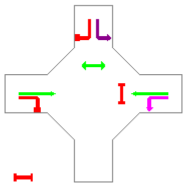
Geometry



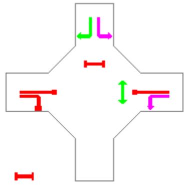
Phase Sequence

Cycle Time 140 secs

Phase A 51 secs



Phase B 57 secs



Phase C 32 secs

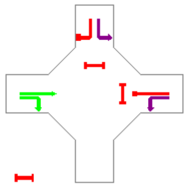


Table S14 from Sidra Output Tables
Moggill Road / Western Freeway Off Ramps
PM Peak 2014 - TR_2014_135 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 L	1206			1206	0	1949	122	5	0.891	11.0	119*	100
2 T		443		443	1	1949	41		0.782	50.2	200	500
3 T		443		443	1	1949	41		0.782	50.2	200	500
	1206	885	0	2091	1				0.891	27.6	200	
North: Western Freeway Off Ramp												
1 L	341			341	1	1949	75	38	0.357	10.3	49	110
2 R			568	568	1	1949	75		0.785	31.7	183*	160
3 R			777	777	1	1949	75		0.785	35.8	290	215
	341	0	1345	1686	1				0.785	29.3	290	
West: Moggill Road West												
1 T		286		286	3	1949	53		0.393	33.7	110	500
2 T		286		286	3	1949	53		0.393	33.7	110	500
3 R			20	20	5	1949	6		0.260	83.1	15	35
	0	571	20	591	3				0.393	35.4	110	
Pedestrians												
Across E approach				50			67		0.009	19.0	0.1	
Across N approach				50			38		0.015	37.2	0.1	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	4368	1	140	0.891	29.3	290

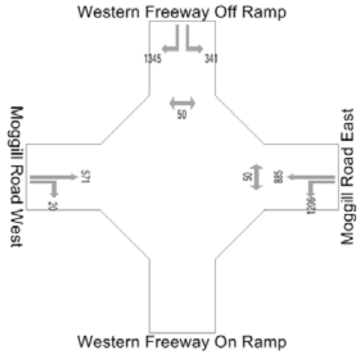
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

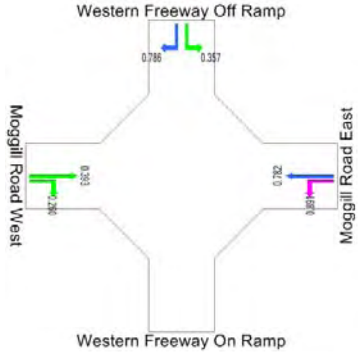
Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

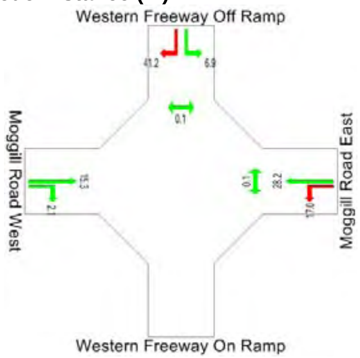
Demand Flows



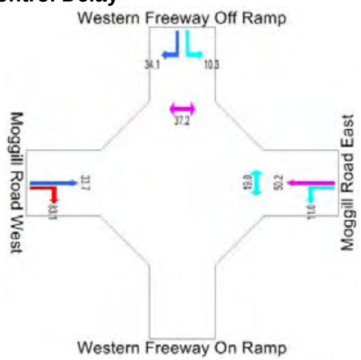
Degree of Saturation



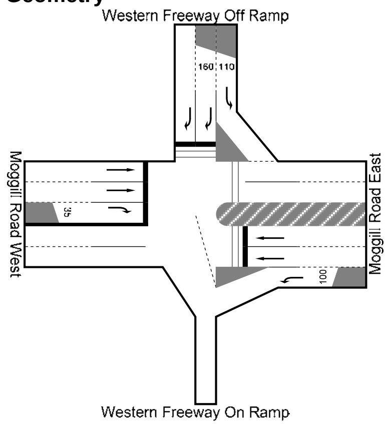
Queue Distance (m)



Control Delay

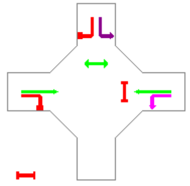


Geometry

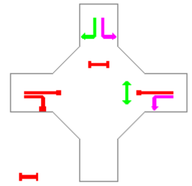


Phase Sequence
Cycle Time 140 secs

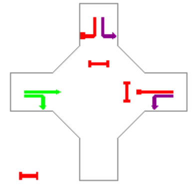
Phase A 45 secs



Phase B 40 secs



Phase C 55 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2014 PM Peak Hour

Moggill Road / Western Freeway Off Ramp Without Northern Link

Northern Link
SKM Connell Wagner JOINT VENTURE

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway Off Ramps
PM Peak 2014 - TR_2014_136 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 L	1196			1196	0	1949	122	5	0.883	9.5	106*	100
2 T		552		552	1	1949	48		0.832	49.0	254	500
3 T		552		552	1	1949	48		0.832	49.0	254	500
	1196	1104	0	2300	1				0.883	28.5	254	
North: Western Freeway Off Ramp												
1 L	352			352	1	1949	68	46	0.416	10.2	49	110
2 R			569	569	1	1949	68		0.841	42.8	221*	160
3 R			754	754	1	1949	68		0.841	43.7	317	215
	352	0	1323	1675	1				0.841	36.4	317	
West: Moggill Road West												
1 T		286		286	2	1949	60		0.348	28.4	102	500
2 T		286		286	2	1949	60		0.348	28.4	102	500
3 R			20	20	5	1949	6		0.260	83.1	15	35
	0	572	20	592	3				0.348	30.3	102	
Pedestrians												
Across E approach				50			60		0.010	22.9	0.1	
Across N approach				50			45		0.013	32.2	0.1	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	4567	1	140	0.883	31.6	317

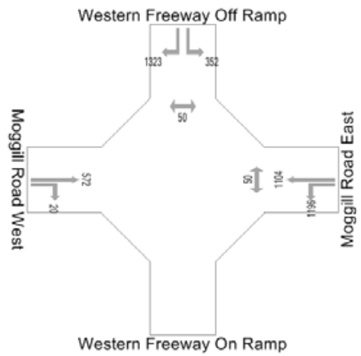
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

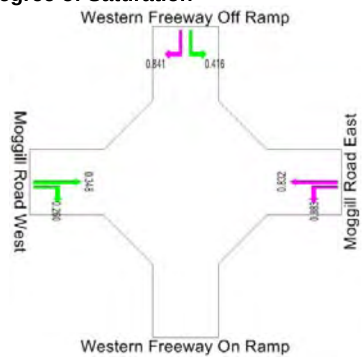
Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

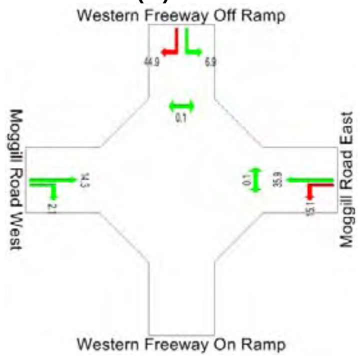
Demand Flows



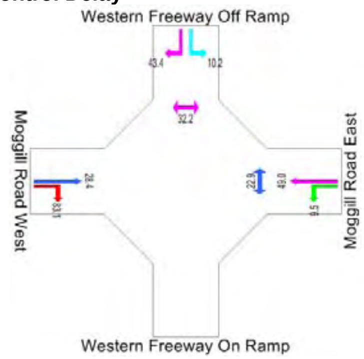
Degree of Saturation



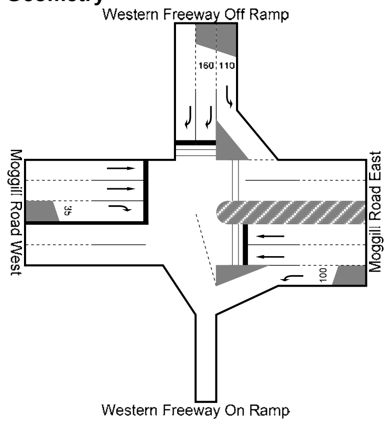
Queue Distance (m)



Control Delay



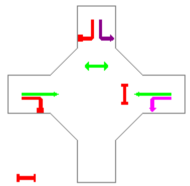
Geometry



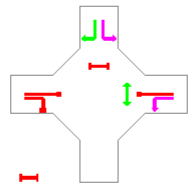
Phase Sequence

Cycle Time 140 secs

Phase A 54 sec



Phase B 74 secs



Phase C 12 secs

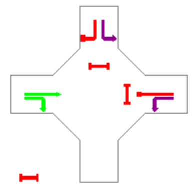


Table S14 from Sidra Output Tables
Moggill Road / Western Freeway Off Ramps
AM Peak 2026 - TR_2026_135 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (Sum of User-given Phase Times)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 L	353			353	1	1949	119	8	0.260	8.0	17	100
2 T		63		63	11	1949	92		0.053	8.9	17	500
3 T		63		63	11	1949	92		0.053	8.9	17	500
	353	126	0	479	4				0.260	8.2	17	
North: Western Freeway Off Ramp												
1 L	281			281	2	1949	21	73	0.587	30.3	124*	110
2 R			280	280	4	1949	21		1.037	184.1	248*	160
3 R			280	280	4	1949	21		1.037	184.1	248	215
	281	0	560	841	4				1.037	132.7	248	
West: Moggill Road West												
1 T		975		975	3	1949	107		0.668	8.3	224	500
2 T		975		975	3	1949	107		0.668	8.3	224	500
3 R			20	20	10	1949	9		0.179	78.3	15	35
	0	1949	20	1969	3				0.668	9.0	224	
Pedestrians												
Across E approach				50			13		0.045	57.6	0.2	
Across N approach				50			89		0.007	9.3	0.1	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	3289	3	140	1.037	40.5	248

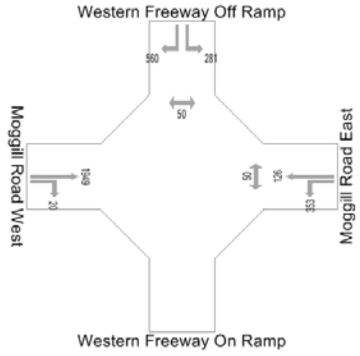
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

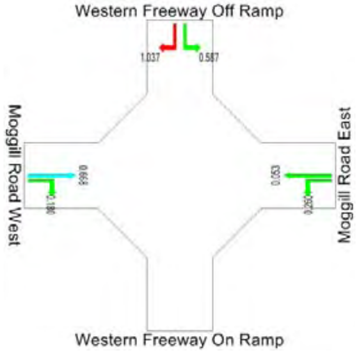
Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

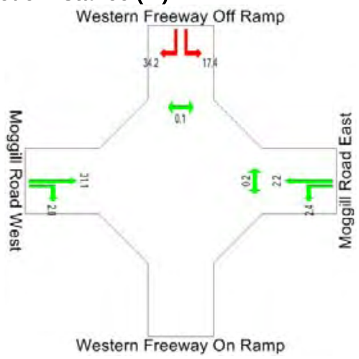
Demand Flows



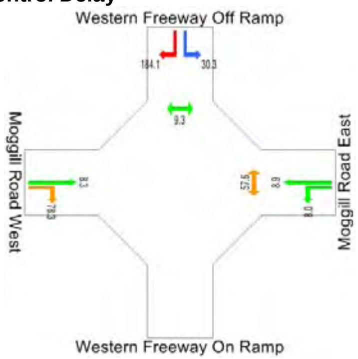
Degree of Saturation



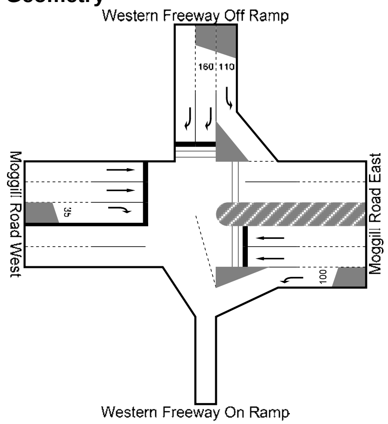
Queue Distance (m)



Control Delay



Geometry

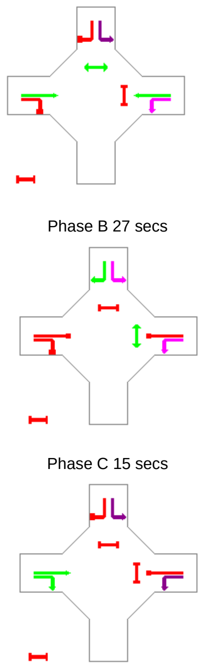


Phase Sequence
Cycle Time 140 secs

Phase A 98 secs

Phase B 27 secs

Phase C 15 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2026 AM Peak Hour

Moggill Road / Western Freeway Off Ramp Without Northern Link

SKM Connell Wagner JOINT VENTURE

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway Off Ramps
AM Peak 2026 - TR_2026_136 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 L	335			335	1	1949	112	15	0.244	8.0	16	100
2 T		121		121	10	1949	53		0.174	30.6	53	500
3 T		121		121	10	1949	53		0.174	30.6	53	500
	335	242	0	577	5				0.244	17.5	53	
North: Western Freeway Off Ramp												
1 L	416			416	4	1949	53	42	0.629	26.0	134*	110
2 R			300	300	5	1949	53		0.519	43.0	119	160
3 R			353	353	5	1949	53		0.519	44.3	140	215
	416	0	653	1069	5				0.629	36.8	140	
West: Moggill Road West												
1 T		644		644	4	1949	75		0.631	24.1	218	500
2 T		644		644	4	1949	75		0.631	24.1	218	500
3 R			20	20	5	1949	16		0.168	69.1	14	35
	0	1288	20	1308	4				0.631	24.8	218	
Pedestrians												
Across E approach				50			45		0.013	32.2	0.1	
Across N approach				50			50		0.012	28.9	0.1	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	2954	4	140	0.631	27.7	218

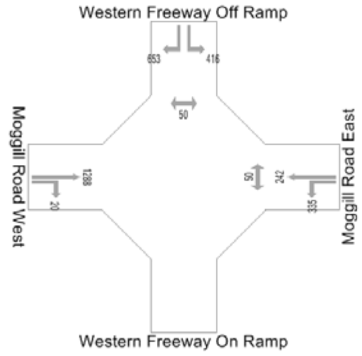
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

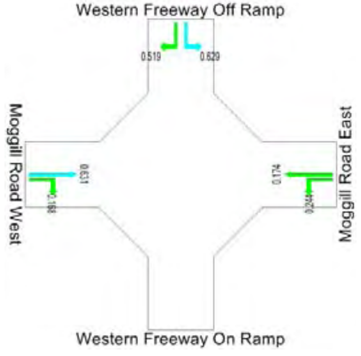
Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

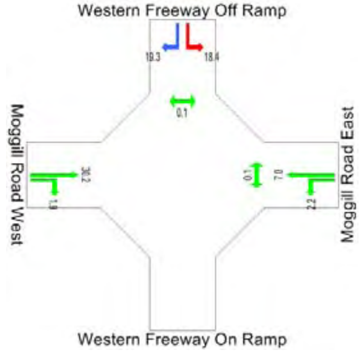
Demand Flows



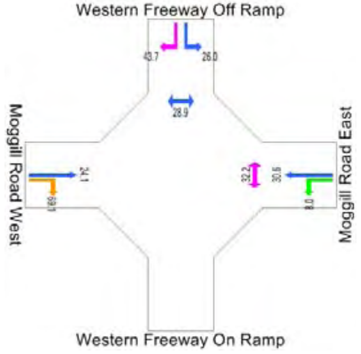
Degree of Saturation



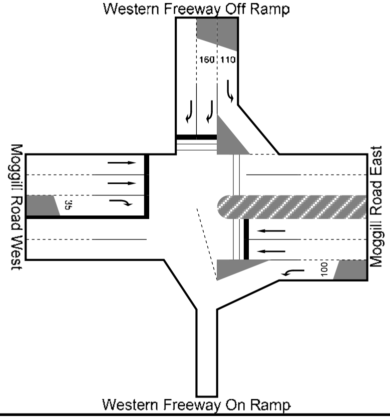
Queue Distance (m)



Control Delay



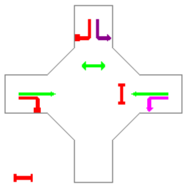
Geometry



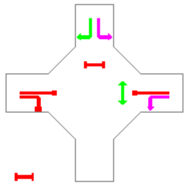
Phase Sequence

Cycle Time 140 secs

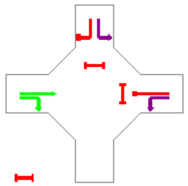
Phase A 59 secs



Phase B 59 secs



Phase C 22 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

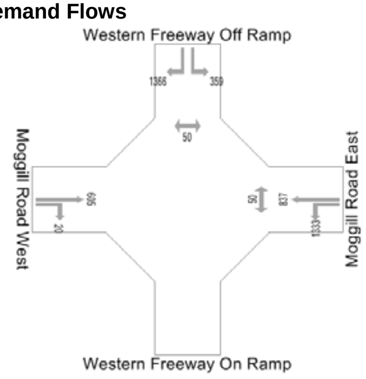
2026 AM Peak Hour

Moggill Road / Western Freeway Off Ramp With Northern Link

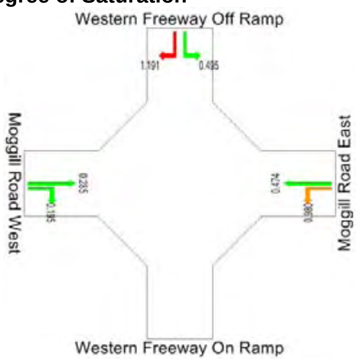
Northern Link
SKM Connell Wagner
JOINT VENTURE

```
Table S14 from Sidra Output Tables
Moggill Road / Western Freeway Off Ramps
 PM Peak 2026 - TR_2026_135 Model Volumes
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 140 (Sum of User-given Phase Times)

 ---------------------------------------------------------------------------
  Lane    Demand Flow (veh/h)        Adj.  Eff Grn   Deg   Aver. Longest Shrt
  No.    -------------------- %HV  Basic  (secs)   Sat   Delay  Queue  Lane
           L    T    R   Tot       Satf. 1st 2nd    x    (sec)   (m)    (m)
 ---------------------------------------------------------------------------
  East: Moggill Road East
 1 L    1333           1333    0  1949  120   7  0.980   13.0r  166*  100
 2 T         419        419    2  1949   64      0.474   27.9   143   500
 3 T         419        419    2  1949   64      0.474   27.9   143   500
        -------------------------------------------------------------------
        1333  837    0  2170    1                 0.980   18.7   166
 ---------------------------------------------------------------------------
  North: Western Freeway Off Ramp
 1 L     359            359    1  1949   50  67  0.495    9.6    45   110
 2 R              581   581    1  1949   50      1.000   53.4r  258*  160
 3 R              785   785    1  1949   50      1.191  430.2  1176   215
        -------------------------------------------------------------------
         359    0 1366  1725    1                 1.191  215.8  1176
 ---------------------------------------------------------------------------
  West: Moggill Road West
 1 T         303        303    4  1949   78      0.285   17.2    88   500
 2 T         303        303    4  1949   78      0.285   17.2    88   500
 3 R               20    20    5  1949    8      0.195   79.6    15    35
        -------------------------------------------------------------------
           0  605   20   625    4                 0.285   19.2    88
 ---------------------------------------------------------------------------
  Pedestrians
   Across E approach       50               42      0.014   34.3   0.1
   Across N approach       50               61      0.010   22.3   0.1
 ===========================================================================
  ALL VEHICLES           Total    %        Cycle      Max   Aver.  Max
                         Flow    HV        Time        X    Delay  Queue
                         4520     1         140     1.191   94.0  1176
 ===========================================================================
 Peak flow period = 60 minutes.

 Queue values in this table are 95% back of queue (metres).

 Note: Basic Saturation Flows (in through car units) have been adjusted for
       grade, lane widths, parking manoeuvres and bus stops.

   *  Queue length exceeds short lane length due to specification of a
      percentile queue in the Tools-Options (Model tab). For calculation
      of this statistic, you may specify the lane with full length.

   r  Delay, stops and queue length for this lane have been cut down to fit in
      the queuing space.  The amount cut may not be accounted for fully in the
      adjacent lane performance statistics.  You may wish to change the short
      lane to a full lane to investigate the extent of this effect.
```

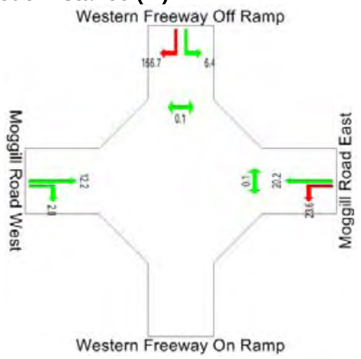
Demand Flows



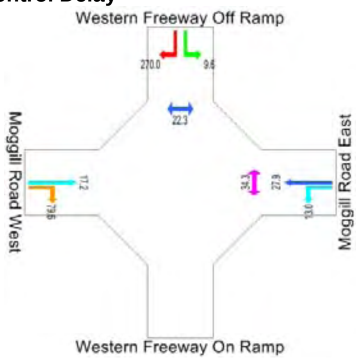
Degree of Saturation



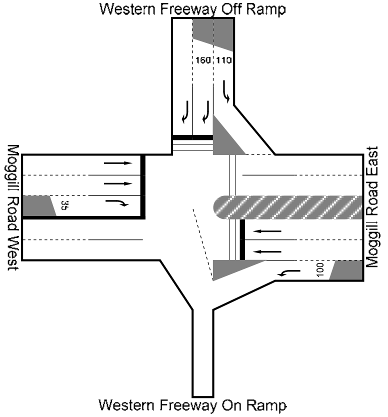
Queue Distance (m)



Control Delay

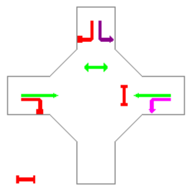


Geometry

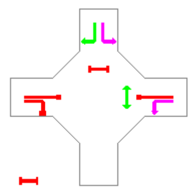


Phase Sequence
Cycle Time 140 secs

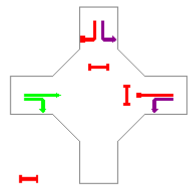
Phase A 70 secs



Phase B 56 secs



Phase C 14 secs



NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2026 PM Peak Hour

Moggill Road / Western Freeway Off Ramp Without Northern Link

Northern Link
SKM Connell Wagner
JOINT VENTURE

Table S14 from Sidra Output Tables
Moggill Road / Western Freeway Off Ramps
PM Peak 2026 - TR_2026_136 Model Volumes
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 140 (User-given Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Moggill Road East												
1 L	1347			1347	0	1949	122	5	0.995	11.3r	166*	100
2 T		530		530	2	1949	44		0.874	57.5	265	500
3 T		530		530	2	1949	44		0.874	57.5	265	500
	1347	1060	0	2407	1				0.995	31.6	265	
North: Western Freeway Off Ramp												
1 L	427			427	2	1949	72	41	0.476	10.8	68	110
2 R			620	620	1	1949	72		0.884	49.1r	258*	160
3 R			838	838	1	1949	72		0.884	47.7	385	215
	427	0	1458	1885	1				0.884	39.8	385	
West: Moggill Road West												
1 T		301		301	3	1949	56		0.394	31.7	113	500
2 T		301		301	3	1949	56		0.394	31.7	113	500
3 R			20	20	5	1949	6		0.260	83.1	15	35
	0	601	20	621	4				0.394	33.4	113	
Pedestrians												
Across E approach				50			64		0.009	20.6	0.1	
Across N approach				50			41		0.014	35.0	0.1	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	4913	1	140	0.995	35.0	385

Peak flow period = 60 minutes.

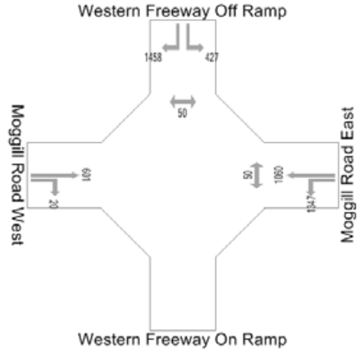
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

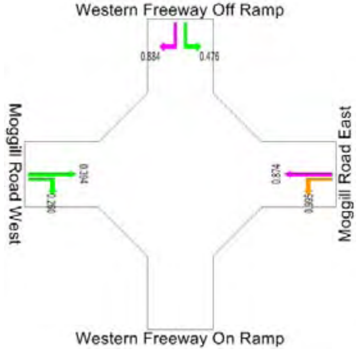
* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

r Delay, stops and queue length for this lane have been cut down to fit in the queuing space. The amount cut may not be accounted for fully in the adjacent lane performance statistics. You may wish to change the short lane to a full lane to investigate the extent of this effect.

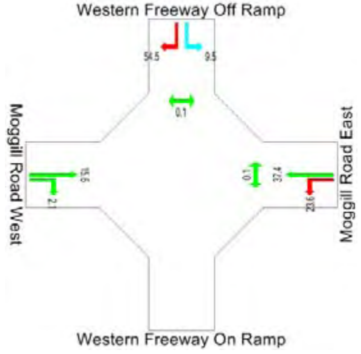
Demand Flows



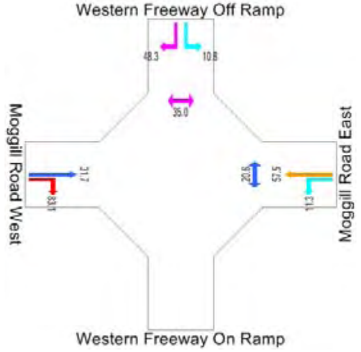
Degree of Saturation



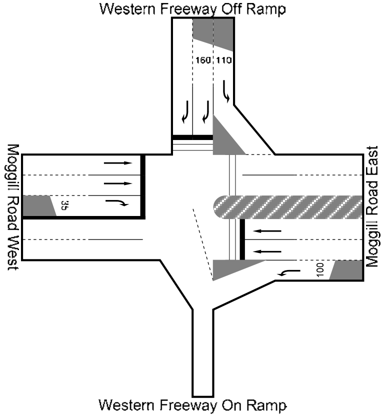
Queue Distance (m)



Control Delay



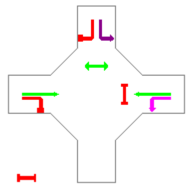
Geometry



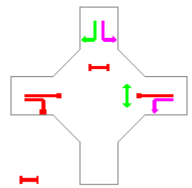
Phase Sequence

Cycle Time 140 secs

Phase A 50 sec



Phase B 78 secs



Phase C 12 secs

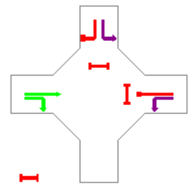


Table S14 from Sidra Output Tables
Western Freeway / Mt Coot-tha Road
AM Peak 2014 - TR_2014_136 Model Volumes
Intersection ID: 0
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Mt Coot-tha Road (e)												
1 R			121	121	19				0.172	14.1	8	500
	0	0	121	121	19				0.172	14.1	8	
North: Mt Coot-tha Rd (n)												
1 L	144			144	17	1950			0.087	5.7		70
2 R			365	365	4				0.735	29.2	57	500
3 R			238	238	4				0.735	34.6	46	70
	144	0	603	747	6				0.735	26.4	57	
West: Western Freeway (w)												
1 L	444			444	5				0.320	5.8	16	70
2 T		1163		1163	2				0.783	5.6	81	500
3 T		1026		1026	2				0.783	5.8	80	500
	444	2189	0	2633	3				0.783	5.7	81	

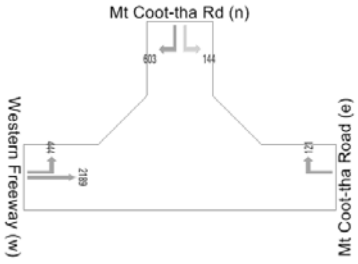
ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	3501	4	0.783	10.4	81

Peak flow period = 60 minutes.

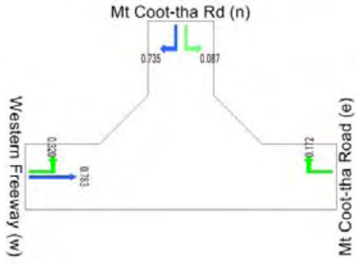
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

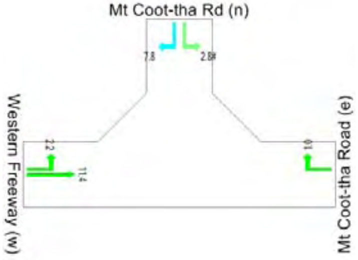
Demand Flows



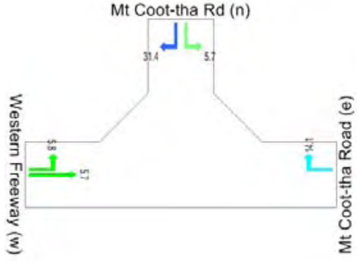
Degree of Saturation



Queue Distance (m)



Control Delay



Phase Sequence

Geometry

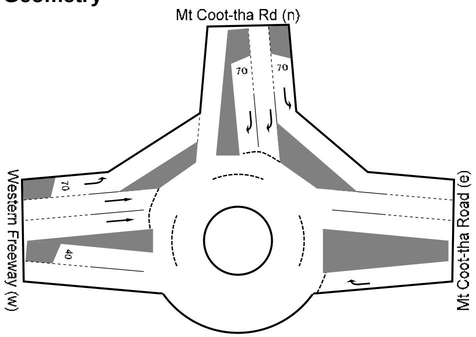


Table S14 from Sidra Output Tables
Western Freeway / Mt Coot-tha Road
PM Peak 2014 - TR_2014_136 Model Volumes
Intersection ID: 0
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Mt Coot-tha Road (e)												
1 R			253	253	4				0.261	12.8	12	500
	0	0	253	253	4				0.261	12.8	12	
North: Mt Coot-tha Rd (n)												
1 L	199			199	9	1950			0.114	5.4		70
2 R			239	239	4				0.419	17.1	24	500
3 R			166	166	4				0.419	19.5	20	70
	199	0	405	604	6				0.419	13.9	24	
West: Western Freeway (w)												
1 L	613			613	2				0.459	6.4	28	70
2 T		974		974	1				0.730	6.8	68	500
3 T		861		861	1				0.730	7.4	69	500
	613	1835	0	2448	2				0.730	6.9	69	

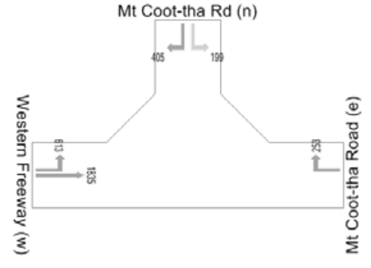
ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	3305	2	0.730	8.6	69

Peak flow period = 60 minutes.

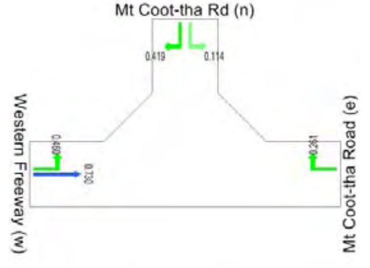
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

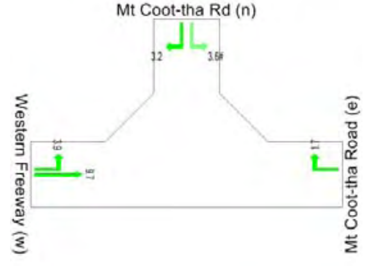
Demand Flows



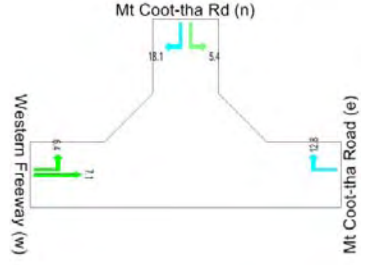
Degree of Saturation



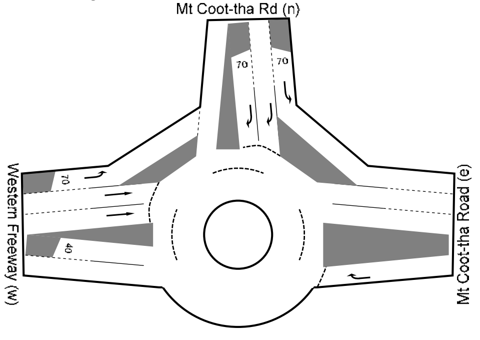
Queue Distance (m)



Control Delay



Geometry



Phase Sequence

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2014 PM Peak Hour

Western Freeway / Mt Coot-tha Road Roundabout with Northern Link

Table S14 from Sidra Output Tables
Western Freeway / Mt Coot-tha Road
AM Peak - 2026 - TR_2026_136
Intersection ID: 0
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Mt Coot-tha Road (e)												
1 R			118	118	19				0.161	13.9	8	500
	0	0	118	118	19				0.161	13.9	8	
North: Mt Coot-tha Rd (n)												
1 L	130			130	18	1950			0.079	5.7		70
2 R			335	335	5				0.709	29.3	53	500
3 R			216	216	5				0.709	34.8	43	70
	130	0	551	681	7				0.709	26.5	53	
West: Western Freeway (w)												
1 L	714			714	3				0.508	5.8	31	70
2 T		1194		1194	2				0.800	5.6	87	500
3 T		1053		1053	2				0.800	5.8	85	500
	714	2247	0	2961	3				0.800	5.7	87	

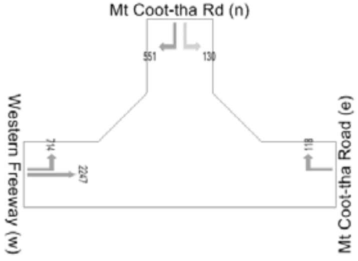
ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	3760	4	0.800	9.8	87

Peak flow period = 60 minutes.

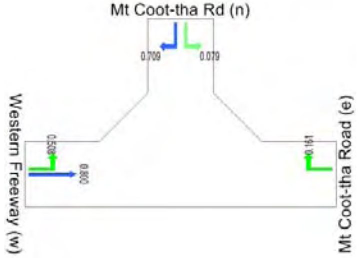
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

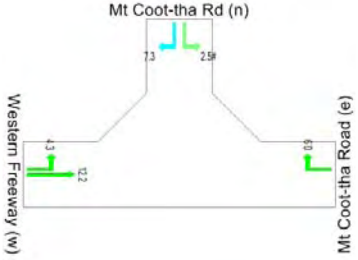
Demand Flows



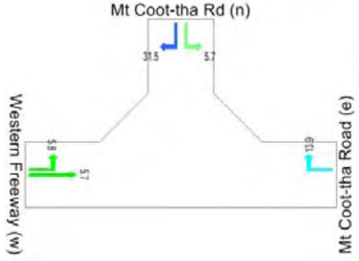
Degree of Saturation



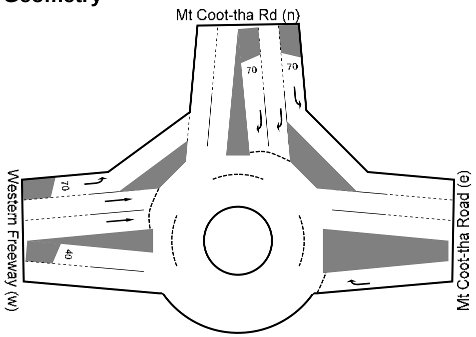
Queue Distance (m)



Control Delay



Geometry



Phase Sequence

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2026 AM Peak Hour

Western Freeway Off Ramp / Mt Coot-tha Road With Northern Link

SKM Connell Wagner JOINT VENTURE

Table S14 from Sidra Output Tables
Western Freeway / Mt Coot-tha Road
PM Peak - 2026 - TR_2026_136
Intersection ID: 0
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: Mt Coot-tha Road (e)												
1 R			235	235	5				0.279	13.4	13	500
	0	0	235	235	5				0.279	13.4	13	
North: Mt Coot-tha Rd (n)												
1 L	192			192	9	1950			0.110	5.4		70
2 R			360	360	2				0.682	22.7	47	500
3 R			245	245	2				0.682	26.4	39	70
	192	0	605	797	4				0.682	19.7	47	
West: Western Freeway (w)												
1 L	687			687	3				0.509	6.4	33	70
2 T		1029		1029	1				0.763	6.9	78	500
3 T		909		909	1				0.763	7.6	79	500
	687	1938	0	2625	2				0.763	7.0	79	

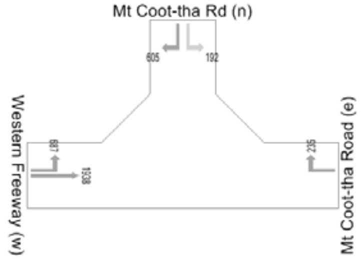
ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	3657	2	0.763	10.2	79

Peak flow period = 60 minutes.

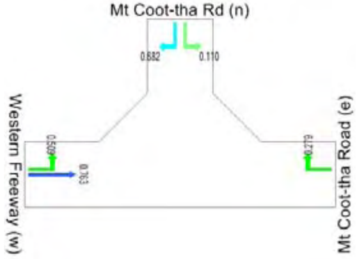
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

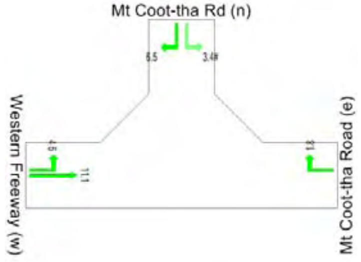
Demand Flows



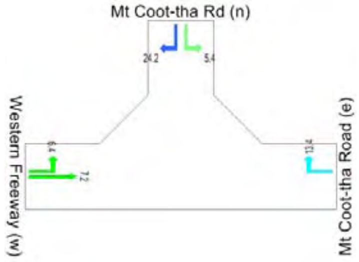
Degree of Saturation



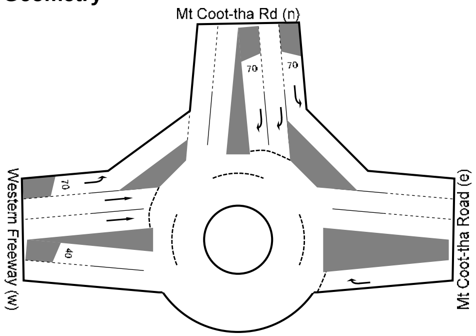
Queue Distance (m)



Control Delay



Geometry



Phase Sequence

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2026 PM Peak Hour

Western Freeway Off Ramp / Mt Coot-tha Road With Northern Link

Table S14 from Sidra Output Tables
Milton Road / Frederick Street Roundabout
AM Peak 2014 - TR_2014_136 Model Volumes
Intersection ID: 0
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
South: Miskin St (s)												
1 LT	20	231		251	5				0.355	7.0	19	90
2 R			85	85	5				0.171	15.5	8	500
	20	231	85	336	5				0.355	9.2	19	
East: Milton Rd (e)												
1 LT	68	741		809	10				0.690	6.8	62	500
2 TR		392	296	688	10				0.690	10.9	61	500
	68	1133	296	1497	10				0.690	8.6	62	
North: Frederick Street												
1 LT	220	85		305	5				0.611	15.2	42	500
2 T		206		206	5				0.611	17.0	35*	35
	220	291	0	511	5				0.611	15.9	42	
West: Mt Coot-tha Rd (w)												
1 L	536			536	5	1950			0.299	4.7	*	500
2 T		944		944	5				0.859	13.4	118	500
3 TR		682	101	783	5				0.859	16.3	112	500
	536	1626	101	2263	5				0.859	12.3	118	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	4607	7	0.859	11.3	118

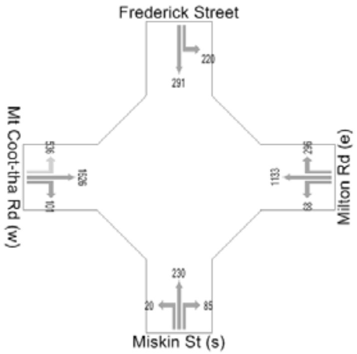
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

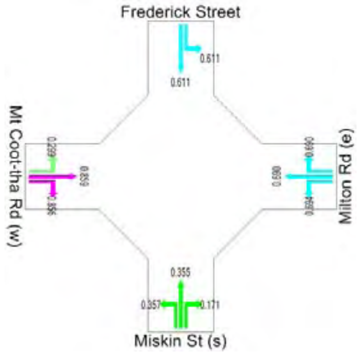
Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

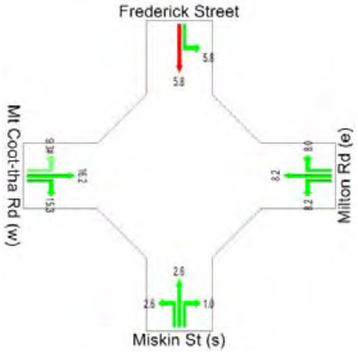
Demand Flows



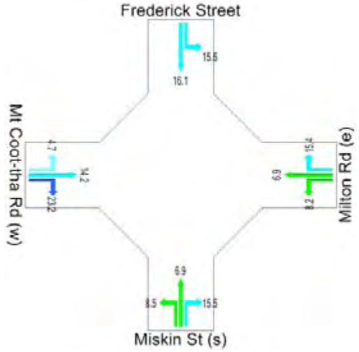
Degree of Saturation



Queue Distance (m)



Control Delay



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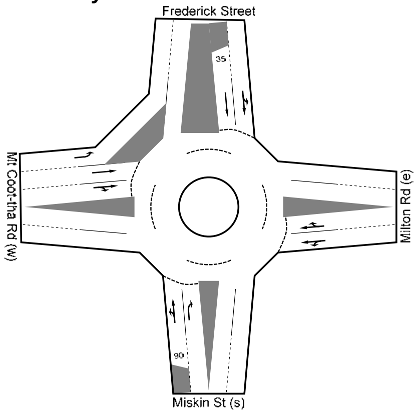


Phase Sequence

Milton Road / Frederick Street Roundabout with Northern Link

Table S14 from Sidra Output Tables
Milton Road / Frederick Street Roundabout
PM Peak 2014 - TR_2014_136 Model Volumes
Intersection ID: .
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
South: Miskin St (s)												
1 LT	20	307		327	5				0.705	18.2	51	90
2 R			53	53	6				0.145	18.7	7	500
	20	307	53	380	5				0.705	18.2	51	
East: Milton Rd (e)												
1 LT	71	1022		1093	10				0.867	9.3	125	500
2 TR		690	246	936	10				0.867	12.8	125	500
	71	1712	246	2029	10				0.867	10.9	125	
North: Frederick Street												
1 LT	109	77		186	5				0.295	8.4	16	500
2 T		132		132	5				0.295	8.6	14	35
	109	209	0	318	5				0.295	8.5	16	
West: Mt Coot-tha Rd (w)												
1 L	600			600	10	1950			0.346	4.8		500
2 T		762		762	10				0.757	10.4	81	500
3 TR		531	102	633	10				0.757	13.0	76	500
	600	1293	102	1995	10				0.757	9.5	81	

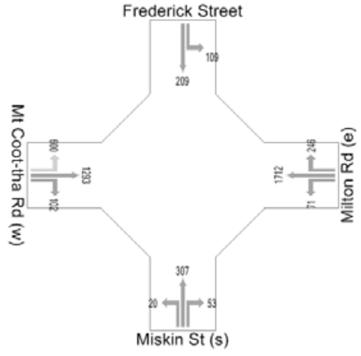
ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	4722	9	0.867	10.7	125

Peak flow period = 60 minutes.

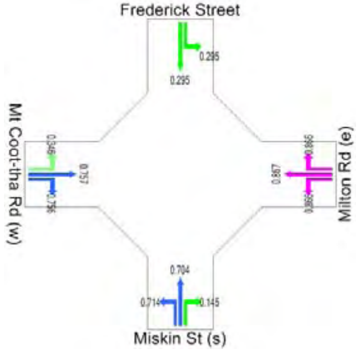
Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

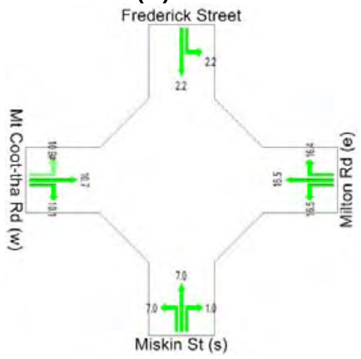
Demand Flows



Degree of Saturation



Queue Distance (m)



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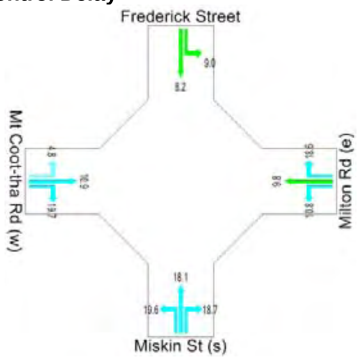
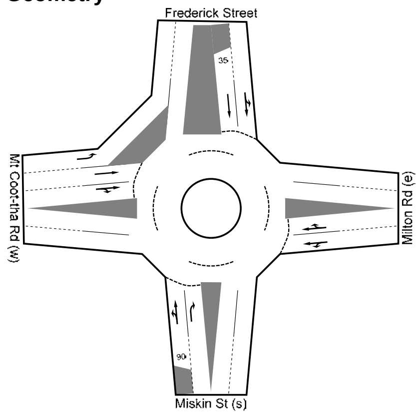


Geometry



Phase Sequence

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2014 PM Peak Hour

Milton Road / Frederick Street Roundabout with Northern Link

Northern Link
SKM Connell Wagner JOINT VENTURE

Table S14 from Sidra Output Tables
Milton Road / Frederick Street Roundabout
AM Peak 2026 - TR_2026_136 Model Volumes
Intersection ID: 0
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
South: Miskin St (s)												
1 LT	20	221		241	5				0.345	7.1	18	90
2 R			88	88	5				0.179	15.7	8	500
	20	221	88	329	5				0.345	9.4	18	
East: Milton Rd (e)												
1 LT	62	766		828	10				0.692	6.5	62	500
2 TR		421	286	707	10				0.692	10.4	61	500
	62	1187	286	1535	10				0.692	8.3	62	
North: Frederick Street												
1 LT	168	92		260	5				0.523	13.4	34	500
2 T		176		176	5				0.523	15.0	29	35
	168	268	0	436	5				0.523	14.1	34	
West: Mt Coot-tha Rd (w)												
1 L	558			558	5	1950			0.311	4.7		500
2 T		951		951	5				0.856	12.8	116	500
3 TR		694	96	790	5				0.856	15.7	110	500
	558	1645	96	2299	5				0.856	11.8	116	

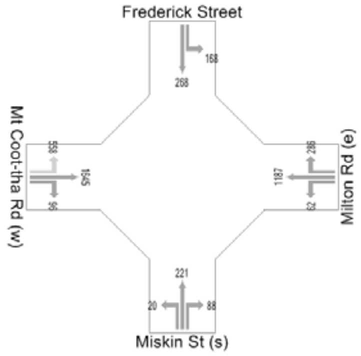
ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	4599	7	0.857	10.7	116

Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Demand Flows



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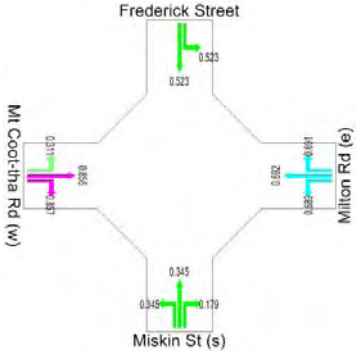
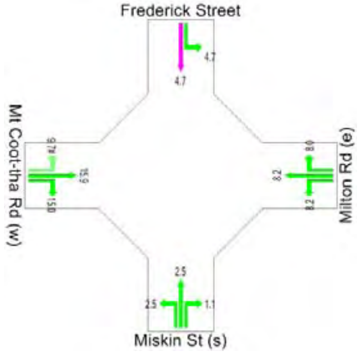
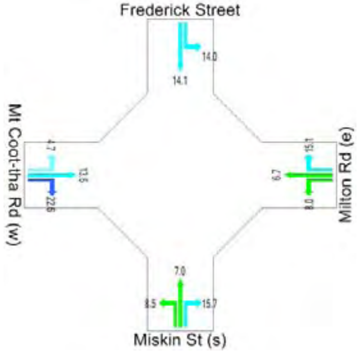


Queue Distance (m)



Control Delay



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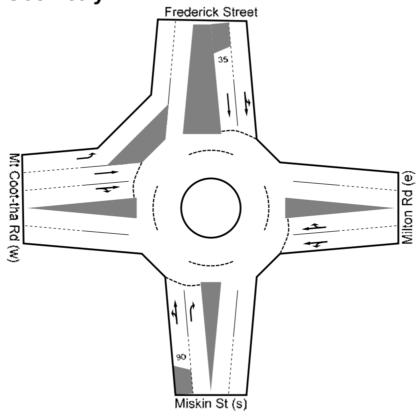


Phase Sequence

Table S14 from Sidra Output Tables
Milton Road / Frederick Street Roundabout
PM Peak 2026 - TR_2026_136 Model Volumes
Intersection ID: .
Roundabout

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
South: Miskin St (s)												
1 LT	20	368		388	5				0.910	44.5	98*	90
2 R			48	48	4				0.136	19.4	7	500
	20	368	48	436	5				0.910	41.8	98	
East: Milton Rd (e)												
1 LT	67	1067		1134	10				0.886	9.8	139	500
2 TR		823	149	972	10				0.886	12.6	139	500
	67	1890	149	2106	10				0.886	11.1	139	
North: Frederick Street												
1 LT	73	75		148	5				0.246	8.5	14	500
2 T		104		104	5				0.246	8.9	12	35
	73	179	0	252	5				0.246	8.7	14	
West: Mt Coot-tha Rd (w)												
1 L	633			633	10	1950			0.365	4.8		500
2 T		793		793	10				0.778	10.2	87	500
3 TR		546	116	662	10				0.778	12.9	82	500
	633	1339	116	2088	10				0.778	9.4	87	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	4882	9	0.909	13.0	139

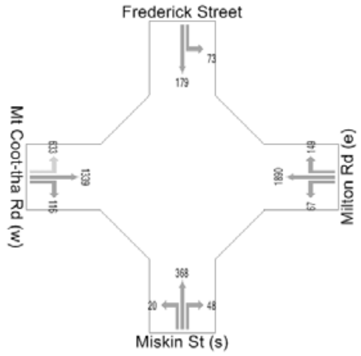
Peak flow period = 60 minutes.

Queue values in this table are 95% back of queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

* Queue length exceeds short lane length due to specification of a percentile queue in the Tools-Options (Model tab). For calculation of this statistic, you may specify the lane with full length.

Demand Flows



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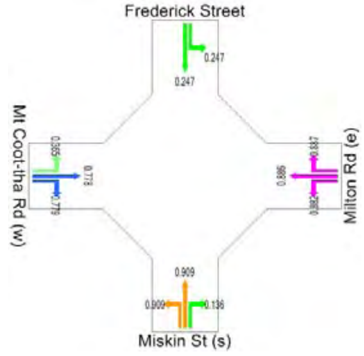
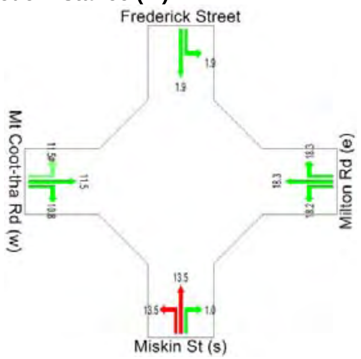
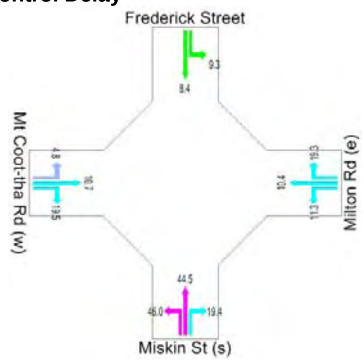


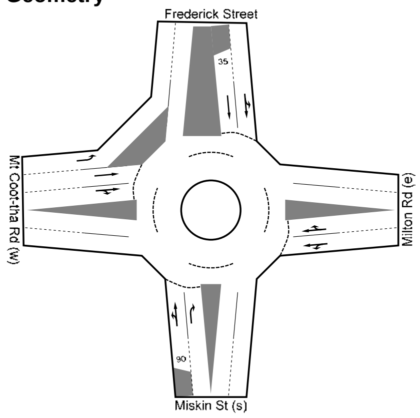
Queue Distance (m)



Control Delay



Geometry



Phase Sequence

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

2026 PM Peak Hour

Milton Road / Frederick Street Roundabout with Northern Link

Appendix E Technical Terms

Australia TradeCoast (ATC): A joint marketing initiative by the Queensland Department of State Development, Brisbane Airport Corporation, Port of Brisbane Corporation and Brisbane City Council. A primary purpose of the Australia TradeCoast is to market the 2,200 ha of vacant land north and south of the Brisbane River for general and transport-related industry purposes.

Australia TradeCoast North: The area north of the Brisbane River and bounded by the Gateway Motorway and Nudgee Road to the east. ATC North includes the Brisbane Airport and associated developments, Hamilton Lands, Eagle Farm, Pinkenba, Myrtleown and the proposed TradeCoast Central.

B-Double: A long articulated heavy vehicle.

Brisbane Metropolitan Area: Brisbane and the surrounding area extending to Caboolture in the north, Beenleigh in the south, Ipswich in the west and Redlands in the east. Also known as the Brisbane Statistical Division (BSD).

Brisbane Strategic Transport Model (BSTM): A computerised, calibrated transport planning model that forecasts travel demand and traffic flows based on demographic and land use parameters and transport network characteristics.

Busway: A busway provides a high level of service characterised by bus stations and dedicated right of way for buses.

Central Brisbane: The zone of extensively commercial and other activity in the centre of Brisbane, for this study designated as coinciding with City, Fortitude Valley, New Farm, Newstead, Spring Hill and Bowen Hills south. This area includes the Central Business District (CBD)

Central Business District (CBD): An area of extensive commercial, retail, finance and government activity located within an area that extends from Eagle Terrace (near William Jolly Bridge) to Kemp Place (near the Story Bridge) including all land to the south and east of Ann and Turbot Streets.

Commercial Vehicle (CV): Medium or heavy commercial vehicle commonly referred to as a truck, and specifically equivalent to an AustRoads Class 3 to Class 12 vehicle.

Cost Skims: The process within the Northern Link Traffic Model to extract travel costs (in terms of time, distance and toll) from each zone to every other zone.

Cycle Time: The time taken for one complete sequence of signal phases at an intersection.

Dangerous Goods: Good defined under the Australian Dangerous Goods Code as either dangerous goods or too dangerous to be transported.

Degree of Saturation (X value): This is the calculated ratio between the demand flow rate and the capacity for each movement. When the maximum X value for any movement is above 95% then the intersection is regarded as over saturated or operating above its practical capacity. This means that it will take more than one cycle of the signals to progress through the intersection. X values above 1.0 typically indicate that several movements will fall within this category.

Demographics: Results from the study of the characteristics of human populations, such as size, growth, density, distribution, vital statistics and land use

Elasticity: Elasticity is the ratio of the incremental percentage change in one variable with respect to an incremental percentage change in another variable; for example, change in demand with change in toll.

EMME: A software transport-modelling package that is used widely for travel demand forecasting both in Australia and internationally

Full journey: A full journey for tolling purposes includes a movement between the west and east connections of Northern Link, and the respective return journey.

High Occupancy Vehicle (HOV): Vehicle carrying more than one occupant (generally two or more occupants), taxis or motorbike.

Induced Traffic Demand: The responses of the travelling public to improvements in network connectivity or reduced congestion. This can result in increased vehicle kilometres on the road network

Inner West Transport Study Area: A study specific area encompassing suburbs to the west of the CBD where local effects of the project require consideration. It includes the suburbs of Milton, Paddington, Auchenflower, Bardon, Toowong, Taringa, Indooroopilly and St Lucia. The boundaries of this area coincide with zones of the BSTM.

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

Level of Service (LOS): Traffic conditions as perceived by drivers. A key measure of the performance of the road network, it can be measured at a mid-block point or at an intersection.

Major Activity Centre: Major activity centres accommodate key district concentrations of employment, services, limited comparison and major convenience retail.

Network volume difference plots: Identify the increase or decrease in total vehicles on each link of a road network as the result of a new road project.

Orbital or ring road network: Part of the overall road system that allows people to travel around rather than through a city centre.

Principal Activity Centre: Principal activity centres accommodate key concentrations of employment, business, major comparison and convenience retail, government regional offices, regional health, education, cultural and entertainment facilities.

Priority Intersection: Un-signalised intersection.

Road Hierarchy: The classification of roads into major and minor routes to safely and efficiently manage the movement of people and goods while maintaining the liveability of urban areas. Council's draft Transport Plan 2006 – 2026 uses a five level hierarchy.

Select link plots: Highlight the distribution of origin and destinations of users of a particular road link selected for examination.

SIDRA: A computer analysis package that is a widely accepted tool for specifically assessing the operation of intersections.

Signal Phase: A phase is the part of a signal cycle which commences at the start of the green time for a specific pattern of traffic movement and ends at the start of the green time for another specific pattern of traffic movement, of which some individual movements may be common to both traffic movement patterns. Signal Phasing is the complete sequence of these patterns which apply in a repeating cycle at a specific intersection.

South East Queensland: The geographical region comprising the local government areas of Beaudesert, Boonah, Brisbane, Caboolture, Caloundra, Esk, Gatton, Gold Coast, Ipswich, Kilcoy, Laidley, Logan, Maroochy, Noosa, Pine Rivers, Redcliffe, Redland and Toowoomba.

Specialist Activity Centre: Specialist activity centres have a primary non-retail or commercial function, such as specialised economic activity, employment and/or education.

Traffic Zone: A traffic analysis zone is the unit of geography used in conventional transportation planning models. The size of a zone and the spatial extent of zones can vary ranging from very large areas such as suburbs to small city blocks or buildings.

Traffic zones in the Northern Link Traffic Model Link model are based on Census Collection Districts, the smallest level at which census demographic data is available, further sub-divided in some locations where more detailed investigation was relevant and data was available.

TransApex: Brisbane City Council's proposed tri-axis based framework of strategic road connections that would allow Brisbane's cross-city travel movements to bypass the CBD and inner suburbs

Transit Lane: Lane available for travel by buses and other vehicles with a specified minium occupancy eg T2 lane (2 or more persons) or T3 lane (3 or more persons).

TransLink (TransLink Transit Authority): Co-ordination and marketing body developed to integrate public transport services, fares and ticketing throughout South-East Queensland.

Trip: A one-way journey by an individual using one or many transport modes.

Appendix F Acronyms and Abbreviations

AADT	Annual average daily traffic
AWDT	Average week day traffic
ABS	Australian Bureau of Statistics
AL	Airport Link
am	Before Noon
ATC	Australian TradeCoast
BCC	Brisbane City Council
BL	Bus Lane
BLISS	Brisbane Linked Intersection Signal System
BLTIP	Brisbane Long Term Infrastructure Plan
BSD	Brisbane Statistical Division
BSTM	Brisbane Strategic Transport Model
CAPI	Computer Aided Personal Interview
CBD	Central Business District
CCTV	Closed Circuit Television
CLEM7	Clem Jones Tunnel (previously known as the North-South Bypass Tunnel)
CPI	Consumer Price Index
CTMP	Construction Traffic Management Plan
CV	Commercial Vehicle
DMR	Queensland Department of Main Roads
DOS	Degree of Saturation
E/B	Eastbound
EIS	Environmental Impact Statement
GST	Goods and Services Tax
GUP	Gateway Upgrade Project
HSL	Hale Street Link

ICB	Inner City Bypass
INB	Inner Northern Busway
JV	Joint Venture
Km/h	Kilometres per hour
LOS	Level of Service
N/B	Northbound
NB	Northern Busway
NSBT	North-South Bypass Tunnel (now know as CLEM7)
PEM	Land Transport New Zealand Project Evaluation Manual
PIFU	Planning, Information and Forecasting Unit
pm	After noon
PT	Public Transport
QT	Queensland Transport
RAPID	Real Time Advanced Priority and Information Delivery
RCM	RiverCity Motorways
RP	Revealed Preference
S/B	South bound
SEQ	South East Queensland
SEQIPP	South East Queensland Infrastructure Plan and Program
SEQTS	South East Queensland Travel Surveys
SIDRA	Signalised and un-signalised Intersection Design and Research Aid
SP	Stated Preference
T2 or T3	Transit Lane
TBM	Tunnel Boring Machine
TMP	Traffic Management Plan
TOD	Transit Oriented Development
VMS	Variable Message System
VHT	Vehicle hours travelled

VKT	Vehicle kilometres travelled
VOC	Vehicle operating costs
VPH	Vehicles per hour
W/B	West Bound
WBTNI	Western Brisbane Transport Network Investigation