



South East Busway

Rochedale to Springwood

Concept Design Study

Volume 1 of 2: Report

South East Busway Extension Rochedale to Springwood

Concept Design Study Volume 1 of 2: Report

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Department of Transport and Main Roads



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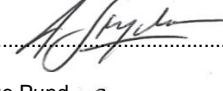
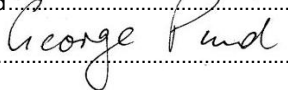
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Executive summary

Overview and background

The existing South East Busway between the city and Eight Mile Plains carries more than 150,000 passengers per day. As part of the Queensland Government's long-term public transport strategy the busway is to be extended to Springwood to meet the future transport needs of Brisbane's growing south-side communities. The South East Queensland Regional Plan 2009–2031 predicts population and employment growth in the southern region of Brisbane and nominates Springwood as a future regional hub for high-density housing, commercial activity and a larger range of government and administrative services. The busway extension will ensure that this future growth is supported by sustainable transport.

The 2009 revision of South East Queensland Infrastructure Plan and Program includes a notional estimate of \$230 million for delivery of the busway extension between 2011 and 2026.

Planning for the busway extension between Eight Mile Plains and Rochedale was completed in May 2007 as part of the Pacific Motorway Transit Project. Subsequently a Concept Design Study (this study) has been undertaken to protect a future busway corridor between Rochedale and Springwood.

Undertaking early planning for the busway extension will help minimise potential impacts in the future while ensuring the future extension is well integrated as Springwood and the surrounding communities continue to grow and develop. Another benefit of early planning is the opportunity of integrating with other projects, including the Greater Springwood Master Plan and the Pacific Motorway Transit Project.

The study area for the South East Busway extension from Rochedale to Springwood is on the eastern side of the Pacific Motorway between Underwood Road in Rochedale and Fitzgerald Avenue in Springwood. The total length of the study area is approximately 2.8 kilometres.

The Concept Design Study is a planning process that has been developed by the Department of Transport and Main Roads to enable a public transport corridor to be protected. The Concept Design Study is produced in draft format for community and stakeholder consultation after which it will be finalised for government approval with amendments incorporating feedback from the consultation process and any further technical investigations. The objectives of the Concept Design Study are to:

- identify a preferred alignment and concept design for the future South East Busway extension from Rochedale to Springwood
- develop a concept design that is economical and maximises the benefits of the busway extension for the community
- understand the impacts and local issues that will require management in the future construction and operation of the busway extension
- ensure strategies are available to enhance the benefits and minimise impacts in the construction and operation of the busway extension
- gain state government gazettal of the final alignment to ensure the protection of the busway corridor.

The study corridor has been investigated in the past through projects such as the South East Transit Project and Pacific Motorway Transit Project. Previous studies and investigations have been utilised in the development of the Concept Design Study where possible. New investigations were carried out in the following instances:

- where gaps in the available information were identified and new information was needed to effectively assess impacts
- where legislative changes meant that more investigation were needed
- where new data has become available.

The preliminary investigations were guided by a Terms of Reference that was developed by the Department of Transport and Main Roads and Parsons Brinckerhoff. The Terms of Reference covered a broad range of social, environmental and economic issues. An Impact Management Plan will be undertaken closer to the delivery of the busway. This plan will investigate the busway alignment in greater detail and suggest management strategies where appropriate.

Community consultation

The consultation activities undertaken at the launch phase of the project provided a number of opportunities for the community to learn about the project and provide feedback to the project team. The first round of consultation occurred between August and September 2008 and ran for four weeks.

Mechanisms used to inform and consult with the community were established to provide the community with various avenues for information exchange. These included an information session, staffed displays, newsletters, a free-call project hotline, dedicated project email address and reply paid mailing service. Letters were sent to property owners that owned property in close vicinity to the Pacific Motorway on the eastern side.

Key issues raised by the community included:

- the need for additional parking
- the need for improved bus services
- concerns about possible impacts on properties.

Other issues raised included the busway station layout, design and location, busway alignment and noise impacts and mitigation. On feedback forms respondents were asked to indicate their support for the busway planning to Springwood. Of the 44 responses to this question, 43 were in support (98% support).

Consultation on the draft Concept Design Study was undertaken over a five week period between Monday 1 June 2009 and Friday 3 July 2009. As per the project launch round, details of the project hotline, email, reply paid address and website were advertised through consultation activities including project newsletters, website, public displays and advertisements. Letters were sent to property owners with a potential land requirement, inviting them to meet with the project team to discuss their concerns and options regarding the draft alignment.

Comments from the community, property owners and stakeholders along with the results of ongoing technical studies have been used to help refine the preferred alignment of the busway extension.

Sustainability

Sustainability is an underlying theme of busway planning. The Concept Design Study addresses sustainability through:

- encouraging a more sustainable transport network by ensuring the busway extension is well integrated with the surrounding network, which also helps to maximise the proportion of trips made on public transport
- recognising the need to achieve resource efficiencies in the detailed design, construction and operational phases of the project
- identifying potential strategies to protect and enhance the natural, physical and human environments, for example the utilisation of native species in landscaping
- promoting community capacity, equity and social well-being by undertaking community and stakeholder consultation throughout the project
- recognising the need to improve social connectivity by linking public transport to community facilities
- considering key factors in the growth of regional and local economies which include availability of employment, a mix of local services and recreational opportunities.

Legislative requirements and planning approval process

The Department of Transport and Main Roads is charged with investigating, planning, establishing, maintaining, managing and operating busways. The *Transport Infrastructure Act 1994* (Queensland) establishes a regime which allows the Queensland Government to investigate, plan and construct busway transport infrastructure in Queensland. In addition, the South East Busway extension from Rochedale to Springwood is referred to in statutory planning documents made under the *Transport Planning and Coordination Act 1994* (Queensland), e.g. the Integrated Regional Transport Plan for South East Queensland.

However, the provisions of the Transport Infrastructure Act and the Transport Planning and Coordination Act do not exempt the busway development from the provisions of the *Integrated Planning Act 1997* (Queensland) and other relevant legislation. Development of the busway extension is likely to involve all facets of 'development' as defined by the Integrated Planning Act and therefore some development approvals would be required.

The Concept Design Study identifies the following five major approvals processes:

- Integrated Development Assessment System
- Designation of land for community infrastructure
- Declaration of a significant project
- Authorised works
- Transport infrastructure.

The regime for planning and preservation of the South East Busway extension from Rochedale to Springwood is governed principally by the *Transport Infrastructure Act 1994* (Queensland). A range of approvals would be required for preservation of the corridor, and future construction activities and operation under the *Integrated Planning Act 1997* (Queensland), other state legislation and possibly Commonwealth legislation.

Determination of a preferred approvals pathway has not been undertaken at this stage due to the potential for changes to occur between now and when approval for the project is sought. This may be as a result of changes to planning legislation or local government planning

schemes. An assessment of the preferred approvals pathway will need to be undertaken prior to approvals for the project being sought.

Engineering

Design criteria, assumptions, adjoining planning projects, construction issues and other related information were considered in the planning stages as part of the design process. The Busway Planning and Design Manual (Queensland Transport 1998) was used as a point of reference during the design development. As with previous sections of the South East Busway, the busway extension has been designed to accommodate a different mode should capacity upgrades be required in future. The design is of a level appropriate for corridor preservation and determining a P50 cost estimate. Concept design drawings include layout plans, typical cross-sections, drainage plans and structures drawings — these are contained within Volume 2 of 2: Plans.

Design changes to the draft alignment

Since the release of the draft Concept Design Study, further technical work has been undertaken where necessary to address issues raised by the community. Minor changes to the busway concept design have resulted at the Rothon Drive bus access point and the intersection of Rochedale Road/Kumbari Street.

Alignment description

The South East Busway extension from Rochedale to Springwood starts approximately 200 metres south of Underwood Road where it joins to the proposed South East Busway extension from Eight Mile Plains to Rochedale. From here, the alignment runs in a general southerly direction adjacent to the Pacific Motorway through to the proposed Springwood busway station. Keeping the busway on the eastern side of the motorway simplifies construction (no motorway crossing points) and significantly reduces construction costs. An eastern alignment also produces staged delivery opportunities along Rochedale Road. Several layouts have been developed for the new busway station at Springwood. The new busway station needed to interact with local buses while minimising impacts on the local roads and surrounding properties.

The busway extension alignment potentially affects 124 properties along the eastern side of the motorway. These are a combination of 'full' and 'partial' takes. The Department of Transport and Main Roads will continue to engage with property owners as the project progresses.

A P50 cost estimate (a 50% probability that the total cost estimate will not be exceeded) was prepared for the busway extension using the concept design drawings. Where the concept design drawings do not provide sufficient information to price the project, informed engineering assumptions were made to ensure that the estimate can be priced accordingly. The cost estimate was calculated in 2008 dollar values and does not include provision of ongoing services to support maintenance and up-keep, nor any allowance for property acquisitions. The P50 estimate for the busway extension is \$155 million.

Opportunities

Coordination opportunities that provide better outcomes for both the busway extension project and the planned motorway works resulted in some changes to the Pacific Motorway Transit Project. These included moving the busway access point onto the motorway further south at Rothon Drive and relocating the Rochedale Road off-ramp further east. Joint delivery with the Pacific Motorway Upgrade project would result in improved constructability, reduced traffic management requirements and a shortened construction period — the overall benefit would be

reduced costs for busway and motorway construction and a safer Rochedale Road exit for the motorway.

Opportunities for resource efficiencies through the incorporation of sustainable design principles will be considered during the detailed design and construction phases of the busway extension. Future investigations should also include a detailed ground survey of the project site, detailed design of the preferred alignment and a P90 cost estimate.

Urban design

Rochedale South is characterised by low to medium density residential development. It was noted that some areas were very close to the Pacific Motorway and were subject to significant vehicle noise, close proximity to exhaust emissions and haphazard landscaping.

Commercial development characterises the Springwood area. There is also a significant amount of low intensity uses in this area such as car yards and smaller scale office uses. There is a lack of active street frontage within the core Springwood area and large amounts of on-street parking. It was also noted that the Springwood bus station is lacking in connectivity with the commercial precinct.

Urban design strategies were proposed in three precincts. The application of these strategies is dependant on further consultation with property owners that live adjacent to the motorway.

Three strategies applied to Precinct 1 including planting along noise walls, significant landscaping, and creation of a park area or protecting for a potential redevelopment site.

Precinct 2 proposed two strategies regarding the realignment of Rochedale Road. These protected for a park area or a potential redevelopment site.

Precinct 3 focused on the Springwood bus station and proposed activating the edges of the bus station precinct, improving the pedestrian environment and maximising safety.

Topography, geomorphology, geology and soil and geotechnical conditions

The existing topography and geomorphology is characterised by elevations in the range of 15 metres to 60 metres Australian Height Datum. Drainage is to the north and south of the extension towards the Bulimba and Slacks Creek floodplain respectively.

The materials likely to be affected by construction are fill (landfill and engineered fill), topsoil, medium to high plasticity clayey residual soils, including black soils, potentially dispersive soils, weathered sedimentary, possibly tuffaceous and basaltic rocks and less weathered higher strength sedimentary, tuffaceous and basaltic rocks. Very high strength basalt may be encountered at depths of between about 3 metres to 6 metres from the natural ground surface.

A portion of the corridor has historically and currently been used for commercial purposes. This land use presents a low risk with respect to contaminated land. There is also a low risk of acid sulfate soils being encountered during construction, however further investigation is recommended. No licensed mineral, energy or extractive material resources would be affected by construction.

Soil erosion and sedimentation could be managed appropriately with the development and implementation of an Erosion and Sediment Control Plan. The instability of embankments and cut batters may be mitigated with a number of measures including removal of high plasticity soils, anchoring/soil nailing and shotcreting of steep cut batters.

It is recommended that the use of heavy ripping and hydraulic rock breaking equipment or drill and blast techniques be carried out to minimise excavation difficulties. The transportation of excavated and imported materials must also meet engineered fill specifications.

Future investigations are needed to characterise the subsurface geotechnical condition in the areas where limited investigations were carried out previously. Review and analysis of the field investigation results and previous investigations to determine soil and rock properties for design purposes may need to be carried out. In addition, further investigations along the corridor to determine the extent of acid sulfate soils and contaminated land may also be needed.

Hydrogeology

The majority of bores are located northeast and northwest of the proposed Rochedale busway station, with little groundwater information between Rochedale and Springwood. The groundwater conditions along the busway extension are highly variable, in depth to water, water quality and expected yields. Generally, shallow water levels are expected in areas underlain by Quaternary sediments, which occur along the busway extension, primarily north of the proposed Rochedale busway station, and between Rochedale South and Springwood. Yields of up to 3 litres per second can be expected from Quaternary sediments. Water level fluctuations and discharge to creeks is seasonally dependent and also likely to be affected by groundwater extractions from local bores.

Water quality of groundwater along the busway extension is generally potable, however the Brisbane Aquifer project noted that nitrate levels in groundwater around Rochedale South can be elevated. The source of the contamination is groundwater seeping through soils affected by historic farming activities.

Subsurface excavations may encounter seepage and be affected by stabilisation problems, such as slumping particularly where deposits of the Corinda, Sunnybank and Moorooka Formations are exposed. Stabilisation structures may be required in subsurface excavations located in areas of unconsolidated sediments. Dewatering of excavations may be required during the construction phase and ongoing seepage management structures such as sumps and drains may be required.

Any groundwater that seeps into subsurface excavations needs to be tested for water quality and disposed of in an environmentally manner that complies with occupational health and safety standards.

Hydrology and hydraulics

A high level hydrological and hydraulic review of the major drainage paths traversing the Pacific Motorway and proposed busway extension corridor was undertaken to identify drainage infrastructure and flood susceptible property that may be impacted by the proposed busway extension.

Hydrologic calculations for the major four crossings of the corridor have been made to estimate peak flow rates likely to occur at these structures. Two of the major culverts crossing the corridor require extension to accommodate the busway and these extensions require some mitigation measures to prevent negative impacts on adjacent property. Further detailed hydrologic and hydraulic modelling will be required to demonstrate a 'non-worsening' condition for adjacent properties.

Preliminary investigations indicate that negative impacts on the existing local hydrology can be adequately mitigated without major consequences (in terms of construction cost or land

requirements). There is the potential for the use of resumed land to provide overland flow paths and storage areas which are impacted upon by the extension.

A significant drainage system will require relocation because of the proposed realignment of Rochedale Road. The construction of this has been included in the estimated construction cost. The extension corridor will require a surface drainage system which has been sized using approximate methods which are also included in the construction cost estimates.

It is envisaged that the proposed alterations (necessitated by busway extension) to the Springwood bus station can be undertaken without adversely impacting upon the existing stormwater detention basin at this location and therefore the current discharges from the basin can be maintained when the busway extension is built. Some remedial earthworks and retaining walls may be necessary as part of the alterations at the bus station to accommodate this storage volume requirement. Attention should be made to the need to retain the current basin's storage volume in further stages of the corridor planning.

Further verification of the extent, sizing and location of existing drainage infrastructure is recommended during future design and investigative works.

Water quality

The busway extension occurs within areas of low to medium density residential development and large areas of commercial development. The additional non pervious area generated by this development does not increase the overall impervious area of this catchment significantly. However it is likely to generate an increase of pollutants carried by surface water run-off which can potentially threaten the quality of the receiving waters.

Current industry practice is to consider Water Urban Sensitive Design when planning, designing and constructing infrastructure such as roads. The Water Sensitive Urban Design approach aims to promote the integration of surface water management at the outset of any proposed development to ensure the negative impacts on natural water cycles and ecosystems be minimised and or improved.

During subsequent planning and design phases of the busway extension, it is important to keep abreast of current data provided by advisory organisations and of legislation from local and national governing bodies in regards to acceptable standards for water discharge into natural waterways. Project-specific monitoring may also be necessary to be able to establish and compare pre- and post-water quality condition of water surface run-off. Further planning and design phases of the busway corridor should also include water quality modelling and further design of stormwater quality improvement devices.

Ecology

The corridor for the busway extension lies within a heavily urbanised area with little in the way of remnant bushland. Habitat for native flora and fauna along the corridor is limited mainly to backyards, roadside vegetation and areas of government owned land.

No vegetation communities of conservation significance were identified within or adjacent to the busway corridor. The busway extension does not bisect any areas mapped as wetland, though it does cross a small section of unmapped open creek alongside the Pacific Motorway.

Several rare and threatened species (under the *Environment Protection and Biodiversity Conservation Act 1999* and/or *Nature Conservation Act 1992* (Queensland)) and migratory species were identified as potentially occurring within the busway extension corridor.

For most of these species however, the likelihood of occurrence within the project area is considered low with exception to the koala and grey-headed flying fox.

The majority of flora and fauna species known or likely to occur within the corridor and adjacent lands are common native and introduced species considered resilient to anthropogenic disturbances.

In the longer term, opportunities may exist to enhance the value of habitat for fauna along the busway extension corridor, through the planting of food trees and provision of artificial shelter. Potential mitigation strategies were identified to minimise any impacts including the use of spotter catchers during clearing operations.

Habitat values within the busway extension corridor and adjacent lands should be investigated in more detail closer to delivery of the busway. Of particular importance in this regard is the identification of significant habitat trees, especially those likely to be utilised by species of conservation significance (i.e. grey-headed flying fox, koala and locally significant bird species).

Land use planning

The Pacific Motorway divides Logan City in two, with large sections of the land immediately to the east of the motorway in the study area dominated by low to medium density residential development. The motorway provides a major access corridor for residents from the Springwood area as well as those living further south of the Brisbane central business district.

An increase in population and the number of households are predicted for the Rochedale South and Springwood areas which will create pressure on existing modes of transport in this area. Significant retail and commercial expansion is also expected at Springwood, the Logan Hyperdome and Beenleigh. In addition significant expansion of industrial-based employment is also planned surrounding the Pacific Motorway to the south.

The South East Queensland Regional Plan 2009–2031 identifies Springwood as a principal activity centre — that is, a key node in the regional public transport system. Direct access to a busway in this area would be consistent with the objectives of the regional plan and further support the predicted residential and employment growth.

In addition to the regional plan, development of the busway extension to Springwood supports several other existing plans and strategies, including the Logan City Local Growth Management Strategy and TransLink Network Plan.

State government investment in busway infrastructure may help lead the redevelopment of Springwood town centre. The Department of Transport and Main Roads will continue to work with Logan City Council to capture strategic land use planning opportunities, where the integration of busway planning and master planning can support beneficial outcomes. A detailed review of actual land uses and zoned land uses need to be undertaken in future planning phases to inform impact management strategies.

Social environment

The study area for the social environment included the following postcodes:

- 4123 (Underwood Road, Rochedale and Rochedale South)
- 4127 (Springwood, Daisy Hill, Priestdale and Slacks Creek).

The total study area population in 2006 was 37,349 people. The largest proportion of dwellings in the study area was separate houses — this indicates a preference for low-density residential living in the study area. Housing tenure statistics indicate a more settled area with 30% of households in the study area being fully owned.

In 2006, a total of 60.6% of employed persons that resided in Logan City worked outside of Logan City, with the majority of these employed in Brisbane city. A total of 74.5% of commuters travelling from Logan City made the commute to work by private transport. The high proportion of people working outside of Logan City and travelling by private transport supports the need for an improved public transport network and busway.

The study area had a high number of dwellings with two or more motor vehicles and three or more vehicles when compared to Logan City and Greater Brisbane. This therefore may compound impacts on local roads and the Pacific Motorway. It was found that the community value private vehicle ownership and the mobility it provides, however ongoing planning work conducted by Logan City Council and the first round of consultation for the busway extension demonstrates a potential change in attitudes and growing support for public transport, pedestrian areas and cycleways.

Feedback from the busway extension launch consultation (August 2008) raised issues regarding the impacts of the road-dominated environment such as noise and air quality. 'Lessening the number of cars on the road' was seen as a key benefit of providing a busway to Springwood. A total of 98% of respondents in the first round of consultation were supportive of planning the busway extension.

An integrated public transport system that provides well-serviced links from residential areas to commercial and community destinations will increase public transport use and would support a reduction in private vehicles. It is anticipated that the construction and operation of the South East Busway extension from Rochedale to Springwood will have a minor impact on the study area's demographic profile. There will be some loss of property owners from the area due to property resumption or lifestyle changes, but this is unlikely to create an overall long-term change in the area.

Further investigations into the social environment closer to the time of construction will ensure any changes in the social environment will be taken into account before the busway extension is constructed. The potential for demographic change is highlighted through the classification of Springwood as a principal activity centre and the development of the Rochedale Urban Village. The Rochedale Urban Village has been planned by Brisbane City Council and is just north of the study area. The development of 900 hectares of semi-rural land to house more than 15,000 people will have an impact of the social environment of the study area by providing additional population, community facilities and demand for public transport.

The busway extension would help to address future transport needs of a growing community and business centre. This project will also be valuable in helping reduce the area's reliance on private vehicles and supporting and encouraging a sustainable community. It is expected the busway extension will provide more options for older community members and increase their mobility now and in the future.

Economic environment

Logan City has a strong and robust economy that is supported by large manufacturing and retail trade sectors. Manufacturing, retail trade and construction account for respectively 15.8%, 12.6% and 11.3% of employment in Logan. There are however a number of other industries that make significant contributions to Logan's economy, including wholesale trade, education,

property and business services, health and community services, communication services and government administration and defence.

Market acceptance (of public transport) has a direct impact on patronage levels, which impact directly on the contribution that the busway extension could potentially make to economic development in Springwood. Since its opening in 2000 the South East Busway has achieved a very high level of market acceptance; based on a customer satisfaction survey which was undertaken in 2004.

Much of the economic activity in Logan City is generated in Springwood, which has a strong property and business services profile. Long-term planning for Logan City suggests a focus on commercial business services that are concentrated in a high-density area in Springwood centre. Employment will have to grow by 145% to achieve the target employment for Springwood Centre of 5,600 job opportunities in 2026. The Springwood centre will also have to accommodate an additional 1,500 dwelling units by 2026. An efficient public transport system is therefore essential if the growth targets of the Springwood principal activity centre are to be realised.

The busway extension from Rochedale to Springwood would have a number of potential economic benefits and impacts for public transport users, the local and broader community, landowners and businesses in the study area.

Benefits/issues of the busway extension for transit passengers include:

- reduced travel cost due to a modal shift from car
- reduced travel time
- reduced discomfort and inconvenience, in particular a reduction in uncertainty and unreliability of services operating in congested conditions
- change in risk of injury in road accidents.

From a bus operations perspective, benefits/issues include:

- reduction in bus vehicle operating cost due to improvement in bus operating speed
- operational improvements due to improved operating speeds and greater certainty about turnaround times
- changes in the risk of accident damage.

Other transport users can expect the following:

- reduced conflict between buses and other traffic on the motorway
- impact of delays during construction
- delays at conflict points where bus services join the public road network.

The general public will experience the following benefits/impacts:

- positive impact on businesses
- increase in land value due to proximity to high-quality public transport
- loss of property required for busway reserve
- positive environmental effects of reduced emissions.

Additional studies may be needed in further planning stages of the busway extension. These may include a cost-benefit analysis, economic modelling to assess the total economic impact of the investment and assessment of the business impact through land use changes and property values.

Cultural heritage

The purpose of the cultural heritage investigations is to determine known or potential heritage values that relate to the development area and the implementation of the development. It also assesses how those values should be recognised in the future development and management of the busway extension.

Registers and historical agencies were consulted to determine the presence of known historical or Indigenous sites within the study area. There were no sites registered or listed in the study area which would be impacted by the proposed development.

For the most part, the busway extension is located within previously disturbed areas. The majority of the land within the study area has been subject to previous disturbance from road construction, residential, commercial and industrial development. The proposed activities in the study area are generally unlikely to harm Aboriginal heritage where the development remains within the previously constructed road reserve or highly disturbed areas. The potential for Aboriginal sites to be uncovered at locations where road widening is required or in previously undisturbed areas is considered to be low.

There are currently two native title claims that exist over the study area. The relevant Aboriginal parties should be consulted with regards to their involvement in the project.

Air quality

The Department of Environment and Resource Management Springwood monitoring station was used to calculate existing air pollutant levels in the study corridor. It was found that air pollutant levels in the study corridor were within nominated standards. Climatic data has also shown that wind speeds are highest in the summer months, and throughout the year wind speed is higher in the afternoon than in the morning.

The majority of air pollutants in the study corridor are produced by vehicles on the Pacific Motorway. The overall air pollutant levels in the study corridor are not expected to be significantly influenced by the busway, as bus exhaust emissions are expected to be reduced in the future with the utilisation of cleaner fuel technologies. There are significant advantages for air quality when comparing a bus to a car. A full bus produces 11 times less greenhouse gas emissions per person, per kilometre than an average car with just the driver. It only takes six passengers to make the bus a cleaner option. Busways also allow buses to cut their pollution levels in half, by travelling on uncongested roads.

It was noted that emissions from buses are highest right on the kerb of the busway and decrease rapidly with distance. A 'buffer zone' between the busway and sensitive sites can help manage potential emissions. Other issues noted include the need to manage potential dust generation during construction and the need to consider road gradients with respect to engine acceleration.

Future studies will ensure that air quality within the corridor remains within the relevant standards in the future.

Noise and vibration

The design of a transport corridor requires careful consideration of potential noise and vibration impacts at sensitive locations adjacent the corridor. There is also the potential for significant noise and vibration impacts from the construction and operation of the busway.

Traffic noise from the Pacific Motorway forms a significant component of the existing acoustic environment along the Rochedale to Springwood corridor. The noise from the motorway is assessed using the Department of Transport and Main Roads Code of Practice. It was noted that the noise generated from the busway would also be assessed using the Department of Transport and Main Roads noise criteria, as specific busway noise criteria do not currently exist.

This study presented possible issues from the development and opportunities for minimising the potential impacts. This encompassed the following areas:

- road gradient, speed and elevated structure design
- construction noise and vibration
- cumulative impacts from the busway extension and the Pacific Motorway.

Further investigation will be required closer to construction to review the existing or 'background' noise levels within the corridor. Also, it is anticipated that up-to-date predictions of the busway noise emissions would be provided. A comprehensive review of potential mitigation strategies may be required at later design phases of the project due to advancements in bus and road technologies in future years. The review of strategies may include incorporating quieter buses, alternative screening methods and road design. Any future investigation must also review and incorporate relevant legislation and standards.

Traffic and transport

The Concept Design Study describes the alignment for the busway extension in brief and elements that represent a change in traffic operations from the current scenario are also discussed. The supporting analysis includes an assessment of the operation of key intersections, access to the extension and likely construction effects.

The existing South East Busway generally runs alongside the southbound carriageway of the Pacific Motorway from the Brisbane central business district and terminates at the Eight Mile Plains busway station just north of the Gateway Motorway connection. Buses travelling further south to Springwood (and beyond) join the Pacific Motorway at this point. Buses travelling between the Eight Mile Plains and Springwood stations face delays on the motorway as well as at various intersections on the local road network.

The Pacific Motorway Transit Project planned three lanes for general traffic, a T2 lane and a bus lane for the Pacific Motorway between the Gateway Motorway merge to just south of Springwood. However, if the current growth of 3% per annum is maintained, the Pacific Motorway is predicted to reach capacity by 2016, even with the upgrades in place. Therefore in the future all commuters are likely to face increased delays on the Pacific Motorway. Further planning for the motorway is currently being undertaken as part of the Pacific Motorway Upgrade project.

The traffic and transport issues surrounding the busway extension include:

- bus access points and implications on nearby intersections
- changes to local traffic routes
- parking associated with the busway
- implications on local traffic and bus operations during construction.

The opportunities surrounding the busway extension include:

- improving the reliability of bus travel times between Eight Mile Plains and Springwood
- improving the bus service to Springwood, and connections to the wider public transport network, to cater for predicted growth in the area.

The above issues will be investigated in more detail by undertaking traffic modelling. The modelling work will need to be revised with updated traffic volumes and public transport patronage and route information closer to implementation.

Pedestrian and cycle access

The busway extension will help address the transport needs of a growing community and play an important role in promoting the use of public transport for commuting and recreational trips in the local area. The existing pedestrian and cycle network consists of off-road shared pathways and both sealed and unsealed footpaths. There are no on-road cycle facilities serving the existing Springwood bus station. The environment surrounding the station is dominated by vehicles, making it difficult for pedestrians and cyclists to easily access the station.

The Pacific Motorway creates a largely impermeable barrier to pedestrians and funnels cyclists wanting to cross the motorway onto busy roads. There are only three crossing points along the busway extension corridor between Rosedale and Springwood. The existing pedestrian and cycle network lacks key elements such as appropriate lighting, surveillance and safe road-crossings. Cycle and pedestrian access to the new and existing stations need to be designed and planned to encourage cycling and walking as viable modes of access to the stations. This will help reduce the area's dependence on private vehicles and encourage sustainable commuting.

Network integration

The network integration strategy outlines how the busway extension would most likely integrate with the transport network in Brisbane and Logan City. The existing public transport network is guided by the TransLink Network Plan which outlines how the network will be developed and identifies priorities for implementation. The Brisbane busway network consists of a number of busway spines, which aim to fill the gaps between the rail network. The busway spines are designed to connect to the local street network to maximise the catchment of public transport users. The line haul rail network forms the spine of the Greater Brisbane transport system. The Beenleigh and Gold Coast rail lines are an important transport mode in the southern region of Brisbane.

The Rosedale South and Springwood suburbs are highly car dependent and demand for north-south trips on the Pacific Motorway is high. Buses are forced to compete with general traffic on the Pacific Motorway and local streets, which often become congestion in peak times. It was noted that bus priority should be considered on key feeder routes in the future.

A reference network was developed by the Department of Transport and Main Roads in conjunction with the TransLink Transit Authority to evaluate the proposed busway extension on the basis of a realistic potential operating environment, and inform the concept design process. This reference network assumed a 2026 timeframe and predicted possible future bus frequencies, stopping patterns on the busway and new bus routes for future introduction. It also considered the need to facilitate sustainable modes of access to the busway stations.