Infrastructure Australia

Project Business Case Evaluation

Project name	M1 Pacific Motorway-Gateway Motorway Merge Upgrade (southbound lanes)
Rating	Priority Project
Date of IA Board rating	27 July 2016

Location	Brisbane, Queensland
Proponent	Queensland Government
Project timeframe	Anticipated construction start date: mid to late 2017 Anticipated completion date: mid-2019

Evaluation Summary

The lack of capacity on the road network between Brisbane and the Gold Coast was identified as a problem in the *Infrastructure Australia Audit 2015* (the Audit), and the M1 Pacific Motorway – Gateway Motorway Merge project is currently listed as a Priority Initiative on the Infrastructure Priority List.

The Pacific Motorway between Tugun and Brisbane is the busiest road corridor in Queensland, with an average of 78,500 vehicles travelling southbound per day. The corridor, which links Brisbane to Logan, the Gold Coast and New South Wales, is a significant component of South East Queensland's road transport network and is part of the National Land Transport Network. During peak periods, the corridor experiences the most significant congestion between Eight Mile Plains and Springwood, where currently seven lanes of traffic merge into a three-lane carriageway. The Audit projected that, in the absence of intervention, the cost of congestion on the Pacific Motorway (City to Beenleigh) corridor would increase from $75 million in 2011 to $374 million in 2031.

The project would provide additional capacity along a 3.8 kilometre southbound section of the Pacific Motorway by closing the bus on-ramp at Eight Mile Plains and using the existing pavement to provide a total of 4 southbound lanes on the Pacific Motorway under the Gateway Motorway Overpass, merging back to three lanes prior to the convergence of the Gateway Motorway and Pacific Motorway. From that point, the Pacific Motorway would comprise 5 lanes, for a distance of 2.5 kilometres. The northbound lanes for both motorways do not form part of the project case.

Alleviating congestion on this section of the motorway would improve the overall efficiency of the National Land Transport Network in South East Queensland, with significant economic benefits likely to be delivered through reduced travel time savings for freight movements, as well as business and commuter travel.

The proponent's economic evaluation indicates that the project has a net present value of $864.5 million and a benefit-cost ratio (BCR) of 6.3 using a 7% real discount rate and P50 cost estimate. Infrastructure Australia is confident that the BCR is greater than 1.

Context and Problem Description

1. Strategic Context

The Pacific Motorway between Tugun and Brisbane is the busiest road corridor in Queensland, and is part of the National Land Transport Network between Sydney and Brisbane. In addition to facilitating inter-state movement of freight and people, the corridor is also a key connection between Brisbane and the Gold Coast for domestic and international visitors.

According to the proponent, 78,500 vehicles on average travel southbound per day along the corridor, of which 7-8% are heavy vehicles and 32-33% are light commercial vehicles. During peak hour periods, this results in significant congestion in some sections.

Queensland's population is expected to grow by 44% between 2011 and 2031, exacerbating congestion, and resulting in additional economic, social and environmental impacts.

2. Problem description

The project seeks to address southbound congestion along the Pacific Motorway between Tugun and Brisbane. Analysis conducted for the Audit shows that during peak periods, the section from Logan River to the Gateway Merge is one of the most congested road corridors in South-East Queensland. The most significant congestion and delays along this corridor occur at the junction of the Gateway Motorway and Pacific Motorway, where seven lanes of traffic (four from the Pacific Motorway, two from the Gateway Motorway and one from the South East Busway) merge into a three-lane carriageway. Delays result from the weaving and merging of traffic. Vehicles travelling on the Pacific Motorway and leaving at the Rochedale Road exit must cross the traffic merging from the Gateway Motorway.

Southbound travel speeds following the Gateway Motorway merge on the Pacific Motorway are significantly below the 100km/h speed limit during the PM peak. In 2015, average PM peak speeds were below 30km/h, with around 6,096 vehicles per hour travelling southbound, in excess of the hourly design capacity of 5,400 vehicles. The road currently operates at capacity with irregular traffic flow and significant variation in speed. By 2031, in the absence of alleviating measures, the modelling suggests that the effects of this congestion will have worsened considerably, with travel speeds expected to fall further to 21km/h. The Audit projected that, in the absence of intervention, the cost of congestion on the Pacific Motorway (City to Beenleigh) corridor would increase from $75 million in 2011 to $374 million in 2031.

Demand along the corridor is expected to be supported by strong population and employment growth. The combined population of Brisbane, Logan and the Gold Coast is expected to increase from 1.9 million in 2011 to 2.5 million in 2031, and many of these new residents will be reliant upon the Pacific Motorway for access to services and employment. Southbound PM peak traffic demand is likely to be driven by strong population growth in Logan and the Gold Coast accompanied by strong employment growth in the Brisbane CBD. Unless the existing capacity constraint is addressed, future increases in travel demand will place considerable additional strain on the network, leading to worsening congestion and increasing economic costs.

Project description

3. Project overview

The project would provide additional capacity along a 3.8 kilometre southbound section of the Pacific Motorway by closing the bus on-ramp at Eight Mile Plains and using the existing pavement to provide a total of four lanes on the Pacific Motorway under the Gateway Motorway Overpass, merging back to three lanes prior to the convergence of the Gateway Motorway and Pacific Motorway. From that point, the Pacific Motorway would comprise 5 lanes (two from the Gateway Motorway and three from the Pacific Motorway) to Rochedale Road, a distance of around 2.5 kilometres. The Pacific Motorway returns to three lanes following the Rochedale Road exit.

The works required to enable the widening include:

- construction of a concrete barrier between the north and south bound carriageways and pavement widening from the Gateway Motorway merge to Rochedale Road (approximately 2.5 kilometres)

- replacement of the Underwood Road overpass with a new bridge with a wider span to accommodate five general traffic lanes, and a new bus on-ramp and lane from School Road under the bridge
- re-routing of southbound buses affected by the closure of the bus on-ramp at Eight Mile Plains.

The objectives of the project are to:

- improve journey time and journey time reliability of all motorway users, particularly freight vehicles travelling between the Gateway Motorway and the Pacific Motorway
- 'future-proof' the extension of the South East Busway alongside the Pacific Motorway
- develop an effective whole-of-life cost solution that is compatible with the long-term master plan for the Brisbane to Gold Coast transport corridor
- reduce congestion by reducing existing motorway merge points
- provide a safe motorway corridor for all road users that complies with contemporary operating and design standards.

Business Case and Economic Evaluation

4. Options identification and assessment

The proponent developed seven initial engineering configuration options for the upgrade of the Pacific Motorway from the Gateway Motorway merge. Of these seven options, four did not meet typical design standards or were inconsistent with the master plan for this section of the Pacific Motorway to provide five lanes between the Gateway Motorway and Rochedale Road.

The remaining three options were:

- Option 5 – closing the bus on-ramp at Eight Mile Plains, a new bus on-ramp under the Underwood Road overpass, a new Underwood Road overpass, provision of four lanes plus the new bus on-ramp under the Underwood Road overpass, and a new park and ride bus facility, with a cost of $225.1 million.
- Option 5A – as for option 5, but without the park and ride bus facility, with a capital cost of $202.8 million.
- Option 6 – as for option 5A, but with 5 narrow lanes and a new bus on-ramp under the Underwood Road overpass, with a capital cost of $207.9 million.

A multi-criteria analysis (MCA) was conducted to assess the options based on the following five criteria and weightings:

- traffic analysis (25% weight), based on the forecast travel times under each option
- public transport analysis (20% weight), based on travel times for buses under each option
- project Cost (25% weight), related to capital cost of the project
- compatibility with M1 Master Plan (20% weight), all options were determined to be compatible
- construction Impacts (10% weight), measured as the impact on surrounding properties.

The MCA indicated that Option 6 was the preferred option.

The three options were then evaluated using cost-benefit analysis (CBA). This analysis found that Option 6 was the preferred option.

The options assessment did not consider options beyond the proposed motorway upgrade, such as non-infrastructure or multi modal solutions. The Queensland Government has indicated that a range of multi-modal options are being considered as part of the Brisbane-Gold Coast Transport Investment Strategy. Given the magnitude of congestion along the Pacific Motorway, other multi-modal investments along the corridor, in addition to the proposed motorway merge upgrade, may be economically viable. Infrastructure Australia encourages proponents to investigate regulatory solutions to address road congestion, including road pricing.

5. Economic evaluation

The proponent's economic evaluation of the project indicates a net present value of $864.5 million and a BCR of 6.3 using a 7% real discount rate and P50 capital costs.

The majority of benefits are derived from travel time savings and reduced vehicle operating costs to users, with only a small benefit attributed to vehicle accident reduction. These include residual asset values and environmental externality benefits.

The merging of seven lanes of traffic into three lanes results in a high level of congestion costs in the base case. By decongesting the merge point, the project will bring about significant travel time savings to existing road users, which drives the very strong BCR stated by the proponent. However, the user benefits might be overstated because the proponent has modelled the 'all day' traffic using three 1-hour periods, including the AM peak hour and the PM peak hour. The use of the highest hour in the AM peak hour and the PM peak hour as the base data might lead to a higher all day traffic figure. Typically, extrapolation of peak period traffic to all day traffic is based on a 2-hour or 3-hour peak period which tends to smooth out the highest levels in the peaks.

The very strong BCR also results from the relatively low capital costs of improving an existing asset. Therefore, infrastructure Australia is confident that the project will realise a BCR higher than 1.

Major cost items

The costs evaluated were as follows:

- capital costs: $166.2 Million (Present values at 7% discount rate, P50)
- operating cost savings: $2.2 million (PV).

Total capital cost (nominal, undiscounted)	$207.9 million (P90, 2015) $197.7 million (P50, 2015)
Proponent's proposed Australian Government funding contribution (nominal, undiscounted)	$166.3 (P90) (80:20 Australian Government to State Government split)
Other funding (source / amount / cash flow) (nominal, undiscounted)	$41.6 million (P90) (Queensland Government)

Major sources of benefit

The benefits evaluated were as follows:

- travel time savings: $720.8 million (PV)
- vehicle operating cost savings: $305.7 million (PV)
- vehicle accident reduction: $2.0 million (PV).

Deliverability

Project development is still at an early stage, with construction expected to commence in 2017, subject to funding approval in 2016.

A number of procurement options were evaluated for the project, against a range of criteria, including the scope of the project, delivery time, risk, constructability, the impact on stakeholders, and the capacity and capability required of contractors to deliver the project. The proponent determined that a 'double' Early Contractor Involvement Contract

was the preferred delivery method, primarily due to the accelerated timeframes for the delivery and opportunities to deliver additional value from the project. This procurement approach involves selecting two design and construct companies to prepare concept designs and undertake pricing. One of the tenderers is then selected to undertake the project, while the unsuccessful party is compensated for their efforts and for their project-related intellectual property.

The proponent identified a number of risks to be included in the risk management strategy. Of these risks, the proponent identified two high risks, which related to changes in the Government's policy position and investment funding delays.

As part of best practice project development, Infrastructure Australia recommends that a post-completion review of the project be conducted to accurately gauge whether works have delivered high levels of service, and discover any lessons that could be used to inform future projects.

For similar projects, Infrastructure Australia would encourage proponents to consider network-based road user charging as part of the funding options assessment.

This evaluation summary was considered by the Infrastructure Australia Board in July 2016.

Following Infrastructure Australia's process of fact checking the evaluation summary prior to publication, the brief was amended to clarify the cost of congestion on the Pacific Motorway (City to Beenleigh) corridor, and the expected construction commencement date.