Australian Government | Infrastructure Australia

Business case evaluation summary

Barwon Heads Road Duplication – Settlement Road to Reserve Road

Location
Geelong, Victoria

Geography
Smaller Cities and Regional Centres

Category
Efficient urban transport networks

Capital cost
$362.8 million (P90, outturn)

Indicative timeframe
Construction Start: 2021
Project completion by: 2024

Proponent
Victorian Government

Evaluation date
August 2021

1. Evaluation Summary

Infrastructure Australia has evaluated the business case in accordance with our Statement of Expectations, which requires us to evaluate project proposals that are nationally significant or where Australian Government funding of $250 million or more is sought. This proposal has received an Australian Government funding commitment of $292 million. Due to the proposal's Australian Government funding status, it has not been considered for inclusion on the *Infrastructure Priority List*.

Barwon Heads Road is a north-south arterial road extending from the Armstrong Creek Urban Growth Area (ACUGA) to Geelong and tourism destinations along the Bellarine Peninsula and Surf Coast Highway. It is a primary transport route for residents within the five surrounding precincts, linking them to jobs, educational facilities, and other services. The Barwon Heads Road Duplication proposal seeks to duplicate a four-kilometre section of Barwon Heads Road between Settlement Road and Reserve Road. Key features of the proposal include construction of a new bridge over the rail line at Marshall and removal of the existing level crossing, upgrade of multiple intersections and implementing a shared path.

The business case identifies that the City of Greater Geelong is experiencing significant population growth that has been accelerating in recent years. Within the Geelong area, the ACUGA is a main growth area that has developed from farmland to a community of over 4,000 people and 1,500 residential dwellings in the five-year period to 2016. The proponent expects the area to grow by an additional 20,000 people within the next 20 years, reaching a total capacity of up to 65,000 residents and 22,000 jobs by 2060.

The business case identifies that some sections of Barwon Heads Road are already at, or exceed, capacity. This creates considerable congestion and delays on Barwon Heads Road and elsewhere on the road network. Additionally, Barwon Heads Road has numerous uncontrolled intersections and access points. This creates additional conflict, safety issues and sources of delay.

The proponent's business case states that the net present value (NPV) of the project is estimated to be $294.7 million with a benefit-cost ratio (BCR) of 2.1[1]. Our evaluation supports the finding that the benefits of the project are likely to exceed the costs.

The proponent has appropriately identified key project risks. However, the proposed delivery model includes 3 packages which may create some additional interface risks that were not clearly identified in the risk register. We support the proponent's approach to encouraging lower tier contractors into the market and its willingness to managing the inherent risks of trying to build capability at the same time as delivering the project. The proponent identified they have developed capability to support contractors and actively manage interface risks across the 3 packages. This will be critical to controlling project costs and realising project benefits.

2. Context

The ACUGA is a 2,600-hectare urban growth area located to the south of Central Geelong. It comprises four suburbs of Armstrong Creek, Charlemont, Marshall, and a part of Mount Duneed. Population forecasts suggest that Greater Geelong will experience some of the greatest total population growth in Victoria, growing by an additional 81,000 people between 2011 and 2031.

Barwon Heads Road extends 23 kilometres from South Geelong at Settlement Road (Princes Highway) to the coastal town of Barwon Heads. It is currently a two-lane arterial road that can be characterised as a rural road with narrow shoulders and no street lighting.

Barwon Heads Road provides connectivity between Greater Geelong, Armstrong Creek, Marshall, and Connewarre. It is also the main access for the Marshall and Northeast Industrial precincts, much of the Armstrong Creek East precinct, parts of the Horseshoe Bend precinct, and services the town of Barwon Heads further south-east.

3. Problem description

The proponent has identified three problems with respect to Barwon Heads Road:

1. Increasing traffic volumes are leading to delays, congestion, and safety risks on the road network.
2. Network constraints are limiting people's ability to access jobs, education opportunities, and services.
3. A lack of cycling and walking is constraining physical activity and social connectedness.

Barwon Heads Road was designed for the low-density and predominantly agricultural area that used to exist. The road's capacity and infrastructure have not kept pace with the changing nature of the area and are no longer appropriate for the rapidly growing communities that it serves.

The proponent's forecasts suggest that between 2016 and 2031, total job numbers within a 45-minute travel time are expected to increase by around 37,000 jobs. However, as congestion increases, many of these jobs will become less accessible beyond 2031 and most of the employment, education, and services supporting the ACUGA population will no longer be accessible within 20 minutes.

Additionally, morning peak travel times into Central Geelong have considerable variation in travel time ranging between 10 minutes from Lower Duneed Road to Settlement Road up to a maximum of 18 minutes, including an additional 8 minutes of delay on approach to Breakwater Road and Settlement Road intersections. Adding to the complexity is the Marshall level rail crossing where the Geelong to Warrnambool railway line intersects with Barwon Heads Road.

In many places along the corridor, traffic levels already exceed capacity. The proponent's forecasts indicate that traffic along Barwon Heads Road will grow by between 18% and 83% at various points. Recent increases in traffic volumes have resulted in negative road safety outcomes. Over a 5-year period from 2014 to 2018, 42 crashes occurred on Barwon Heads Road (Settlement Road to Lower Duneed Road) In 2015, to improve road safety, VicRoads reduced the speed limit between Reserve Road and Warralily Boulevard from 100 km/h to 80km/h. The most common crash type was a 'rear-end' crash, which is generally due to sudden changes in traffic conditions whereby vehicles brake abruptly without warning.

[1] Using a 7% real discount rate at a P90 cost estimate over a 30-year period.

4. Options identification and assessment

This proposal is part of the Victorian Government's 2018 commitment to upgrade Settlement Road and Breakwater Road, provide for new intersections at Crows, Barwarre, Tannery, and Reserve Roads, and construct a bridge to raise Barwon Heads Road where it crosses the train line north of Marshall Station.

The proponent undertook an options development process that defined high-level specifications for a number of options. These options were then refined in consultation with VicRoads, Major Road Projects Victoria technical advisors, City of Greater Geelong, Victorian Department of Transport and other key stakeholders.

The proponent applied a qualitative multi-criteria analysis framework to examine the potential for social impacts to local communities arising from the project and how the key differentiators between the options drive these impacts. The multi-criteria analysis results presented in the business case were not supported by information detailing the development of the evaluation criteria, criteria weightings justification and information used to assign scores.

The proponent selected two project options for detailed evaluation in the business case:

- Option 1: duplication of Barwon Heads Road between Settlement Road and Reserve Road
- Option 2: duplication of Barwon Heads Road between Settlement Road and Reserve Road, plus grade separation of Barwon Heads Road-Settlement Road intersection.

The analysis identifies that Option 2 will deliver similar benefits to Option 1, however Option 1 will incur additional costs. Incorporating additional costs for the grade separation at the Settlement Road intersection into the cost benefit analysis resulted in a lower BCR.

We encourage the development of a wide range of potential options and the application of a multi-criteria analysis process to refine and filter those options before defining a short list using robust quantitative techniques such as rapid cost benefit analysis. Whilst earlier phases may have assessed options, it is unclear from the business case whether a range of road and/or public transport options was considered using quantitative techniques to help alleviate the stated problems, and whether the preferred project option represents the best value for money in addressing the service need and meeting the project objectives. An enhanced strategic evaluation of options in the context of the broader development of this region and the required transport infrastructure, may have revealed alternative options and provided a clearer indication of value for money.

The business case outlines that the Victorian Government has developed a Regional Network Development Plan to guide investment in regional public transport infrastructure over the next 20 years, including for the Barwon South West region and the ACUGA corridor. This proposal is part of a suite of options to improve transport to the ACUGA and the wider Geelong region. The business case could have been strengthened by approaching the ACUGA corridor on a program basis. This would have allowed consideration of a broader range of options as the corridor is developed over time in conjunction with land use changes.

While there is an immediate need for additional capacity in the transport network, the business case did not provide clear evidence that alternative approaches or modes were assessed using quantitative techniques, either as independent schemes or as a package. Alternatives could have included a different scalable road configuration option that supported greater use of other transport modes and could be staged through time.

The business case does not document different demand modelling scenarios for each of the options. We recommend the proponent appropriately model demand for different options and scenarios in future business cases.

5. Proposal

The Barwon Heads Road duplication proposal involves upgrading 4km of the road as follows:

- Construction of a 5-lane divided carriageway (2 lanes southbound and 3 lanes northbound) between Settlement Road and Breakwater Road and a 4-lane divided carriageway (2 lanes in each direction) between Breakwater Road and Reserve Road

- Construction of new southbound carriageway to the east of the existing road reserve
- Rehabilitation of the existing carriageway to form the upgraded northbound carriageway
- Provision of two bicycle lanes, two through lanes, and shared use paths
- Construction of a road over rail overpass structure at the Geelong-Warrnambool Railway Line crossing at Marshall
- Upgrade of intersection layouts and signal phasing optimisation at Settlement Road and Breakwater Road
- Upgrade and signalisation of uncontrolled intersections at Crows Road, Barwarre Road, Marshalltown Road/Tannery Road, and Reserve Road
- Conversion of other intersections and property accesses to left in/left out arrangements, with cross median access and U-turn facilities at safe locations
- Installation of safety barriers, landscaping, drainage, signage, street lighting and line-marking.

6. Strategic fit

The proposal presents an opportunity to further some of the Victorian Government's strategic priorities outlined in the *Victorian Infrastructure Plan*, *Towards Zero 2016-2020 Road Safety Strategy and Plan*, and the *Regional Network Development Plan – Barwon Southwest*.

Specifically, these plans collectively outline the importance of reducing congestion and addressing infrastructure demands in areas of high population growth. This provides greater access to employment and services for people in regional areas, improves access and connections for the new residential areas, assists with the implementation of improvements to public transport as demand for services change, and reduces crashes.

Additionally, Plan Melbourne and the Victoria Cycling Strategy, both aim to support regional cities and provide for social and economic participation and healthy communities and to increase the number, frequency, and diversity of active transport options for Victorians.

The business case identifies several major transport infrastructure improvements to cater for growth in the area, notably the duplication of the Warrnambool rail line between South Geelong and Waurn Ponds and corridor planning for the Armstrong Creek Transit Corridor and the Bellarine Link. The business case does not clearly articulate network alignment and demand impacts between this project and these initiatives.

7. Societal impact (social, economic and environmental value)

The proponent's business case states that the NPV of the project is estimated to be $293.7 million with a BCR of 2.1, using a 7% real discount rate, a P90 capital cost estimate, and evaluated over a 30-year period. We have considered the sensitivity of the appraisal to the discount rate[2] and note that:

- Using a 4% discount rate results in a NPV of $729.0 million and a BCR of 3.5.
- Using a 10% discount rate results in a NPV of $113.1 million and a BCR of 1.5.

The cost-benefit analysis shows a typical benefits profile for highway network upgrade projects with travel time savings the most significant benefit (63%), followed by vehicle operating cost savings (33%). Environmental benefits are marginal (1%) reflecting a small decrease of the in-vehicle time associated with start-stop traffic and idle vehicles.

The economic appraisal results are largely driven by relatively high forecast growth in trips on Barwon Heads Road (77% increase between 2016 and 2041). This assumes that the planned growth in the ACUGA is realised and that this growth continues to the end of the appraisal period.

A relatively high proportion of heavy vehicle traffic is assumed to be B-Double vehicles (21%), which appears uncharacteristic of comparable low density residential areas. We were unable to identify any corresponding land use changes within the business case, however the proponent

[2] Compared to the P50 BCR of 2.2 and the NPV of $315.4 million at 7% discount rate

identified that this corridor provides links to the Northeast Industrial precinct and Breakwater industrial area and is part of a coordinated strategy to ultimately remove heavy vehicles from central Geelong.

Further, the traffic forecasts could be impacted by COVID-19, given an increase in working from home, regional migration, and reduction in net international migration. The demand modelling was completed in 2019, prior to COVID-19. As a result, we are unable to determine whether any impacts on demand would likely be positive or negative. Infrastructure Australia encourages the use of scenario analysis where underlying assumptions material to the decision may be subject to wider social and economic factors.

We estimate that accounting for these factors could have negative impacts on the estimated benefits. However, several potential upside impacts have also been identified that could offset these.

The business case has not quantified urban amenity improvements or how the project might serve as a catalyst for wider precinct development. Additionally, it does not account for potential synergies from complementary public transport investment such as the Melbourne-Geelong rail capacity enhancements[3], a more granular land use assessment to account for additional growth or urban renewal enabled by the proposal, or a program approach to account for synergies from updating the full Barwon Heads Road corridor.

Other upside risks not included in the reported benefits include:

- Rural rather than urban factors to annualise demand
- Additional benefits from grade separation of the rail line
- Residual value of the asset.

On balance, considering the upside and downside risks, we are confident that the project's benefits will exceed its costs.

The following table presents a breakdown of the benefits and costs stated in the business case.

Benefits and costs breakdown

Proponent's stated benefits and costs	Present value ($m,2019/20) @ 7% real discount rate[4]		% of total
Benefits			
Travel time benefit	$356.0		62.6%
Vehicle operating cost savings	$187.5		33.0%
Crash cost savings	$9.5		1.7%
Environmental cost savings	$5.4		1.0%
Total Benefits[1]	**$568.7**	(A)	**100%**
Total capital costs	$247.7		90.0%
Operating costs	$27.0		9.8%
Total Costs[1]	**$274.7**	(B)	**100%**
Net benefits - Net present value (NPV)[2]	**$293.7**		n/a
Benefit-cost ratio (BCR)[3]	**2.1**		n/a

Source: Proponent's business case

(1) Totals may not sum due to rounding.
(2) The net present value is calculated as the present value of total benefits less the present value of total costs (A – B).
(3) The benefit–cost ratio is calculated as the present value of total benefits divided by the present value of total costs (A ÷ B).

[3] Melbourne-Geelong rail capacity enhancements is an early-stage proposal on the Infrastructure Priority List
[4] Utilising P90 costs

The proponent's reported capital costs and funding is presented in the following table.

Capital costs and funding	
Total capital cost	$331.8 million (P50, undiscounted) $362.8 million (P90, undiscounted)
Australian Government funding contribution	$292.0 million
Other funding (Victorian Government)	$73.0 million

8. Deliverability

Major Road Projects Victoria (MRPV) will deliver the project on behalf of the proponent. MRPV is a dedicated government body charged with planning and delivering major road projects and is part of the Major Transport Infrastructure Authority (MTIA) within the Victorian Department of Transport (DoT). As the project value is greater than $250 million, the project is subject to the Victorian Department of Treasury and Finance's (DTF) *Investment Lifecycle and High Value High Risk Guidelines*.

The proponent assessed three options to procure the works from a longlist of six options. The three options included a traditional fixed price design and construct model, a collaborative design and construct model, and a two-stage delivery model. The proponent concluded that the two-stage delivery model is the most suitable procurement model.

The business case identifies that in response to the surge of demand in the construction market, MRPV have developed an innovative procurement strategy for its broader program. The objective is to target smaller contractors to build greater market capability, create a more sustainable construction market, achieve greater collaboration, and to better understand and price risk. The proponent has identified that lower tier contractors are being limited by the size and nature of project packages that come to market creating a scenario where competition is narrowed. In response, the proponent has separated the delivery of the project into three packages to attract greater interest from smaller contractors to grow their capability, and future market capacity, resiliency and competition.

While the business case does not provide details on how the delivery strategy was formulated, it is supported by a procurement and packaging plan developed by an external specialist that provides context to the proponent's decision making. We believe that in a highly active infrastructure market, the two-stage delivery model with three separate packages creates an interface risk that could potentially lead to cost escalation and timing delays.

The proponent has undertaken workshops with project stakeholders to define, assess and develop mitigation measures to minimise or manage project risks. Key risks identified through this process include technical challenges associated with construction, visual impact to surrounding properties, delays in obtaining planning approvals from council, and flooding and negative impacts to wetlands. As outlined above, interface risks resulting from the packaging approach were not included in the risk register. We recommend more clearly identifying package interface risks in the risk register and developing appropriate mitigation strategies to manage these risks, including ensuring that there is adequate time and cost contingency.

The proponent has incorporated contingencies into their budget estimates and undertaken P50 and P90 probabilistic costings. The project's risk assessment approach is consistent with guidance in the Infrastructure Australia Assessment Framework.

The proponent identified that acceleration of investment into the Barwon Heads Road project presents an opportunity to directly stimulate the economy post-COVID-19 by supporting an estimated 496 jobs, including 338 direct jobs and 158 indirect jobs. We have not been able to validate the calculation approach, but they appear to be reasonable in the context of the project.

The proponent has not yet completed a Post Completion Review plan as recommended by the Assessment Framework. We encourage the proponent to plan for, conduct and publish a Post Completion Review to assess the extent to which the project benefits and costs set out in the business case were realised. This will help inform the development of future projects.

Consideration of COVID-19

The COVID-19 pandemic has significantly affected the use of infrastructure. Infrastructure Australia has been working collaboratively with the Australian Government to provide advice on a staged response for managing, and recovering from, the impacts of the COVID-19 pandemic.

One critical element of our advice is to maintain a pipeline of nationally significant infrastructure investments. Nationally significant infrastructure projects are long-term investments, typically considering a 30-year view of the project's social, environmental, and economic impacts. In undertaking this evaluation, Infrastructure Australia continues to take a long-term view and has also considered the sensitivity of key planning assumptions using the best data available to us.

As noted in the 2019 Australian Infrastructure Audit, we must continue to evolve the way we plan for Australia's infrastructure to embrace uncertainty. There are still many uncertainties regarding the long-term impact of the COVID-19 pandemic on infrastructure use.

We will continue to collaborate with industry, the community, and governments at all levels to understand the impacts of the COVID-19 pandemic on infrastructure decisions in Australia.