Australian Government | Infrastructure Australia

BUSINESS CASE EVALUATION SUMMARY

Bruce Highway - Tiaro Bypass



PURPOSE OF EVALUATION
Committed and funded project

EVALUATION OUTCOME
Funded proposal (not eligible for the Infrastructure Priority List)[1]

ASSESSMENT FRAMEWORK STAGE

1 DEFINING PROBLEMS AND OPPORTUNITIES
2 IDENTIFYING AND ANALYSING OPTIONS
3 DEVELOPING A BUSINESS CASE
PROJECT DELIVERY
4 POST COMPLETION REVIEW

LOCATION
Fraser Coast Region, Queensland
Butchulla Land

GEOGRAPHY
Smaller cities and regional centres

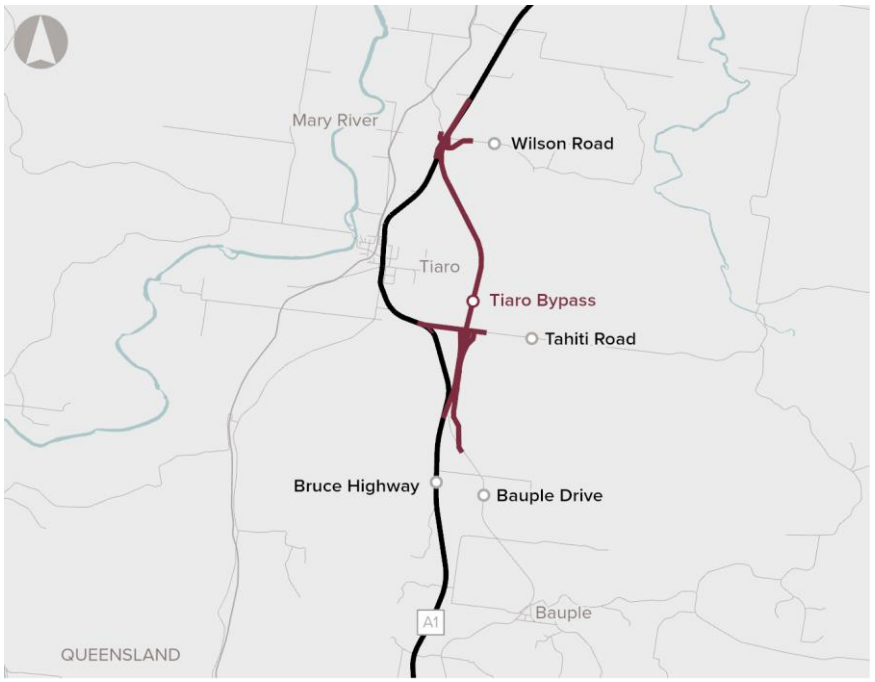
SECTOR
Transport

OUTCOME CATEGORY
Regional connectivity

PROPONENT
Queensland Government

INDICATIVE DELIVERY TIMEFRAME
Construction start: 2025
Completion by: 2027

EVALUATION DATE
7 June 2023



CAPITAL COST
$336.2 million (P50, outturn)
$356.9 million (P90, outturn)

FUNDING COMMITTED (P50)[2]



Australian Government: $268.8 million, June 2021

Queensland Government: $67.2 million, June 2021

[1] Our assessments of funded proposals focus on identifying risks for delivery and realising project benefits, and highlighting opportunities for improving overall project outcomes.
[2] The P50 cost estimate is $0.2 million over the current funding commitments. The proponent expects the detailed design phase to refine the estimate to bring it within the existing P50 allocation.

Review summary

Infrastructure Australia has evaluated the business case for **Tiaro Bypass** 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. **As the project is fully funded, it is not eligible for inclusion on the *Infrastructure Priority List.*** [3]

The Tiaro Bypass project proposes to deliver a four-lane bypass of Tiaro (60km north of Gympie) to improve the efficiency, safety and resilience of the Bruce Highway. Currently, the highway passes through Tiaro, with ten intersections, mixed traffic and varying speed limits, leading to safety issues and poor travel time reliability. Low flood immunity to both the north and south of the town also increases the risk of road closures, which has occurred in the past, with some closures lasting multiple days. Improvements to the highway at Tiaro have been planned as part of the Bruce Highway Upgrade Program (BHUP), which is identified on the *Infrastructure Priority List* as a Stage 2 proposal.

The proponent's analysis of options during the Preliminary Evaluation stage identified that a two-lane bypass was a cost-effective solution, and could accommodate upgrades to a four-lane bypass in the future, when required. However, a four-lane bypass was selected as the preferred option based on additional funding committed by the Australian Government in 2021. The higher cost of a four-lane bypass weakens the economic case for the project at this time.

The proponent's business case reports that the cost of the project is higher than its quantified benefits, with a Benefit Cost Ratio (BCR) of 0.65 and a Net Present Value (NPV) of -$81.4 million.[4] The greatest benefits are safety benefits (55% of total benefits), with an estimated 93% reduction in crashes (from 19 crashes to two per 100 million vehicle kilometres travelled). Other key benefits include travel time savings (22%) for road users. Quantifying improved local amenity and travel time reliability would increase project benefits, however it is unlikely that these benefits will significantly change the BCR.

Key risks to project delivery are related to environmental planning referrals, which are required as the project involves clearing an area of State Forest, impacting a number of protected species. Additionally, the project may impact several important Aboriginal cultural heritage sites. Delays in approvals, as well as costs of environmental offsets, may impact project timeframes and cost.

In addition to these risks, project delays and cost increases due to market capacity constraints also represent a major risk for project implementation. We note that project milestones have already been delayed by about one year as a result of delays during business case development. Economic sensitivity tests by the proponent indicates that delays are likely to reduce the project BCR, as the benefits of the project are not realised until a later date.

Overall, the project provides a comprehensive response to the safety, congestion and flooding issues identified at Tiaro, but at a significant cost. Due to the current BCR and near-term risk of cost escalation, staging the project should be considered, depending on the current status of the detailed design and procurement process for delivery of the project. Staging options may include commencing with the two-lane upgrade and progressing to four lanes when there is greater certainty of future demand. This approach could provide a more cost-effective and lower risk response to achieve the project objectives.

Project description

The Tiaro Bypass project aims to improve the efficiency, safety and resilience of the Bruce Highway. The project is part of the BHUP, which has been underway since 2013. The project involves:

- a new four-lane motorway standard bypass to the east of Tiaro
- two grade-separated interchanges: a southern interchange at Tahiti Road with south facing ramps, and a northern interchange at Wilsons Road with north facing ramps
- an improved cross-section, with concrete centre median barrier treatment separating opposing traffic lanes
- improved highway flood immunity, with a 1% Annual Exceedance Probability[5] plus climate change
- relocation of Bauple Drive intersection to Tahiti Road interchange via a service road, and reinstatement of local roads to the closest interchange.

[3] The Infrastructure Priority List only identifies those proposals which are seeking investment.

[4] Using a 7% real discount rate and a P50 capital cost estimate.

[5] In other words, the bypass would remain open during a 1-in-100 year flood event.

Further information about the project can be found at Bruce Highway (Gympie – Maryborough), Tiaro Bypass.

Review themes

Strategic Fit	The case for action, contribution to the achievement of stated goals, and fit with the community.
Case for change	The business case sets out four problem areas related to the current Bruce Highway alignment through Tiaro: 1. Ongoing safety concerns 2. Travel time delays due to variable speed limits and road standards 3. Insufficient road capacity for long-term traffic growth 4. Low flood immunity. These problems closely align with the challenges identified in the Stage 2 listing on the *Infrastructure Priority List* for the broader Bruce Highway upgrade program. The business case shows that safety issues and travel time delays on the Bruce Highway through Tiaro are significant problems with the greatest social and economic costs. Between 2010 and 2019, there were four fatal crashes and 22 crashes resulting in hospitalisations. Traffic delays are mostly due to the intersections along the existing route, particularly during school holiday periods. Some of these intersections are estimated to be congested (a Level of Service of F) by 2032. The bypass is expected to save each vehicle just under 1.5 minutes in travel time. Low flood immunity has led to multi-day road closures in the past, which can have significant impacts on interregional freight (11% - 18% of daily traffic) and other through traffic, as well as movements into and out of Tiaro. However, these events are relatively infrequent, as the average annual time of road closure is about two hours per year.
Alignment	The project directly contributes to shared objectives of the Queensland Government and Australian Government to improve safety, efficiency and resilience along the Bruce Highway – a key route on the National Land Transport Network. Strategic planning at a local government level recognises the importance of the Bruce Highway, however it does not explicitly identify the Tiaro Bypass.
Network and system integration	The project forms part of the broader upgrade program to the Bruce Highway and will improve travel efficiency through Tiaro. The four-lane, dual carriageway design would exceed the two-lane, single carriageway standard of the highway immediately south and north of the bypass, meaning there will continue to be other capacity limits for the highway. The project design has partially addressed local community feedback around local road connectivity, including grade separated intersections at the northern and southern ends. The design also includes a service road from the town of Bauple (a town southeast of the proposed bypass), however this inclusion is subject to available funding. Bypasses can have both positive and negative impacts on towns and different stakeholders, and it will be important for the proponent to work closely with the Fraser Coast Regional Council on managing these outcomes.
Solution justification	The proponent has selected the final project scope based on the additional funding committed by the Australian and Queensland Governments in 2021 to deliver the four-lane bypass option, as opposed to the two-lane bypass option recommended in the proponent's Preliminary Evaluation. The four-lane bypass provides greater capacity for long-term future traffic growth and avoids construction disruption when additional lanes are required in the future.[6] However, the higher capital cost and limited additional benefits in the short-term have contributed to a relatively weak economic case for the project.

[6] Traffic flow on a two-lane section would be steady but limited (a Level of Service of C) in peak periods by 2034 with the reference growth rate of 1.3 %, and by 2030 under a higher growth rate scenario of 1.8 %.

	The proponent estimated that the P90 cost estimate for a two-lane bypass option (including at-grade intersections) was $131 million, with a BCR of 1.20. This implies that this option, relative to the preferred four-lane option, provides improved value for money and a net benefit to society. Given market capacity pressures and cost escalation risks, it would be prudent for the proponent to further investigate a staged approach to developing the bypass, with the delivery of a two-lane bypass initially and upgrade with additional lanes in future as demand requires. We recognise that consideration of staging options may not be feasible at this point depending on the status of the detailed design and procurement process for delivery of the project.
Stakeholder endorsement	There has been stakeholder engagement throughout project development and evidence of stakeholder input influencing project decisions. This includes the location and design of culverts based on landowner consultation and the inclusion of grade-separated interchanges based on investigations triggered by feedback from a local working group. An area of concern for some of the local community is accessibility to and from Bauple. In response, an additional service road to Bauple has been provisionally included in the project scope, subject to the program's ability to realise design and construction cost savings. Some stakeholders have sought additional on-ramps to the bypass to and from Bauple, however the proponent's investigations suggested these were not economically viable. The Butchulla People have been engaged at multiple points through the project planning process. This includes two separate cultural heritage surveys, as well as during geotechnical investigations. These investigations lead to the identification of multiple sites of cultural significance and will be a focus of ongoing engagement.
Societal Impact	**The social, economic and environmental value of the project, as demonstrated by evidence-based analysis.**
Quality of life	The project will improve the quality of life for bypass users through faster, safer and more reliable journeys. It will also provide similar benefits for road users in Tiaro, with reduced congestion in the town as a result of traffic shifting to the bypass. Road safety improvements are the largest benefit measured by the proponent, with an estimated 93% reduction in crashes. This represents a reduction in the crash rate from 19 crashes per 100 million vehicle kilometres travelled (VKT) to 2 crashes per 100 million VKT. The proponent has analysed the level of safety improvements against other comparable projects, with the nearby Cooroy to Curra Section B project achieving an 80% reduction in casualty crashes. This shows that the expected safety benefits of Tiaro Bypass are very high. Improving road safety is a key government priority, however, driver behaviour is also a major factor in road safety and behaviour change programs may be needed to complement the upgrade to achieve the forecast safety benefits. Tiaro residents will benefit from reduced traffic noise and disruption, but local businesses may be impacted by a loss of visitors and potential revenue. The Tiaro Community Working Group (which includes Queensland Government, Fraser Coast Regional Council and local community representatives) is developing a Tiaro Community Plan to help maximise the urban, social and economic outcomes in Tiaro following the project.
Productivity	The project will improve travel times and reliability for road users, the majority of which are travelling to destinations beyond Tiaro. Data from a 2018 traffic survey found that around 88% is direct through traffic, a further 11% travelled through Tiaro but stopped for a short period, and less than 1% of traffic is local. Bypass users will avoid ten intersections and lower speed limits within the town. This will improve productivity, particularly for freight vehicles. The proponent estimates that the Tiaro area facilitates 22% of heavy vehicle movements, 20% of net tonnes and 31% of the commodity value on the entire Bruce Highway. Example freight commodities that use this section of the highway are mining machinery, retail goods and bananas. The proponent estimates that an average of 490 full-time equivalent jobs will be supported over the life of the project.

Environment	Improving travel speeds and providing a more direct route on the Bruce Highway is expected to provide some environmental benefits. About 4% of project benefits are from reduced environmental externalities, which includes reduced air pollution, greenhouse gas (GHG) emissions and noise. The business case identifies that the northern end of the bypass requires some clearing of a State Forest area. This will significantly impact on the Greater Glider marsupials (a Commonwealth protected species), as well as potentially impacting protected plant species. Accordingly, the project requires a referral under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). Since the business case was finalised, the proponent has identified changes to species listings that will require further consideration. The project cost estimate covers the cost of additional survey works based on costs incurred for similar projects. However, the estimate does not include budget for environmental offsets. These costs and uncertainty surrounding environmental planning processes represent risks to the budget and delivery timeframes of the project. The Tiaro Bypass Business Case was completed before the Infrastructure Australia *Guide to assessing greenhouse gas emissions (interim)* was published in February 2023. As such, several new requirements to consider the social cost of emissions have not been completed. The impact of project emissions on the Australian and Queensland Government's net zero emissions targets has not been assessed, and emissions were not a consideration in the scoping and selection of options. However, the business case quantifies the benefits of reduced levels of emissions due to changes in vehicle use of the road network.
Sustainability	A sustainability management plan has been developed for the project in line with Queensland Government policy. The project is targeting a rating of 'Excellent' under the Infrastructure Sustainability Council's Rating Scheme. While the business case has not measured GHG emissions from construction, achieving the 'Excellent' rating will require the project to set a performance level for GHG emissions, identify and implement GHG reduction initiatives and quantify the benefit of this.
Resilience	The project will improve the flood resilience of a section of the Bruce Highway, bringing it in line with the level of immunity planned with upgrades along other sections of the highway between Cooroy and Torbanlea. Together, these would provide 155km of improved flooding immunity (1% Annual Exceedance Probability). The bypass design is expected to result in some afflux impacts[7] on local properties that exceed Queensland Government hydraulic design guidelines. The proponent's analysis found that these impacts are limited to vegetated land and only pose a minor risk to people or property. The proponent has committed to further reviewing these impacts during the detailed design process to help mitigate them.
Deliverability	**The capability to deliver the project successfully, with risks being identified and sufficiently mitigated.**
Ease of implementation	The proponent has recommended a TIC-CO (Transport Infrastructure Contract - Construct Only) contract[8] to deliver the project given its scope, risks and nature. We agree with this approach and note that it is commonly used by the proponent to reduce risks and areas of uncertainty through the design process. There are limited opportunities to package the project into smaller contracts. The project is set to complete construction in July 2027 – a year later than planned in the business case. This is likely to increase cost escalation pressures and is a risk for project implementation.
Capability & capacity	The proponent is well-equipped to deliver the project, with a track record of delivering similar bypass projects and upgrades along the Bruce Highway. The proponent has recognised the current and projected future market capacity challenges, which align with the findings in

[7] Afflux impacts are upstream increases in water levels due to the bypass design obstructing water flow.

[8] The proponent has also identified suitable variants to the delivery model, such as Early Tenderer Involvement or Guided Tender Alternative.

	Infrastructure Australia's *2022 Infrastructure Market Capacity report*. The business case recommends further market sounding prior to starting detailed design, which we strongly support. Cost increases are a major risk for the project, particularly given the existing funding commitment is based on a P50 cost estimate.
Project governance	Project development has followed the proponent's governance guidelines, which draw on lessons learned from recent projects that have been delivered. A Project Steering Committee, with Queensland Government and Australian Government representation, provides advice to the Project Leadership Group. The Project Leadership Group also provides advice to governance bodies for other major projects in the region, which is beneficial for aligning outcomes and sharing knowledge. The proponent also established a Tiaro Community Working Group involving the Fraser Coast Regional Council and local businesses and residents. Strong community engagement has helped the local community shape the project's scope and outcomes.
Risk	Design and cost maturity is appropriate for the stage of the project, although several major risks will need to be managed carefully as the project progresses. The proponent has identified the following high-rated risks: • changes in scope/design due to stakeholder expectations • non-compliance due to changes to regulatory requirements • delays in environmental approvals. We agree with these risk ratings, but also consider cost increases due to market capacity constraints and project delays a major risk for the project. The proponent updated the cost estimate in early 2022 to account for local price risks (estimated at approximately $4 million). However, we consider that the cost escalation rates should be further reviewed, or additional contingency added to reflect the ongoing market capacity constraints. The proponent's Project Cost Estimating Manual specifies that a business case should have a P90 cost estimate in the range of 30-40% above the base estimate. While the P90 cost estimate for the project estimate falls within this range (at approximately 32%), funding has been committed at a P50 level.[9] Value engineering during the detailed design phase and engaging closely with the market will be critical for delivery within the available budget. The proponent has commenced the development of a cultural heritage management plan to support the treatment of identified cultural heritage sites. Finalising and putting this plan in place will be critical for project delivery timeframes.
Lessons learnt	The project has drawn heavily on learnings from the Cooroy to Curra Section D project: • engaging stakeholders earlier in the process on land resumption and state forestry revocation to manage expectations • establishing the community working group to enable input during the concept design process (as opposed to waiting for community feedback on a draft design) • engaging a bypass expert to draw on recent bypass experiences across Australia. The proponent has developed a benefits realisation plan and is committed to conducting a post completion review. The plan has been developed to align with the broader BHUP, however specific project benefit target values have not yet been determined. The proponent should finalise these targets as soon as possible to ensure they reflect the benefits identified in business case and allow for a balanced review of project outcomes. We encourage the proponent to publish the findings of any reviews undertaken to capture the lessons learned from design and delivery for the benefit of future projects.

[9] The funding commitment differs from the National Partnership Agreement on Land Transport Infrastructure Projects, which states that the Commonwealth will commit funding to projects at a P90 level.

Economic appraisal results (preferred option)

The proponent's business case states that the NPV of the project is estimated to be -$81.4 million with a BCR of 0.65,[10] indicating that project costs outweigh the quantified benefits and the project represents a net cost to society.

We consider that the analysis is generally robust and a fair representation of the project. However, our evaluation has identified some potential upside benefits, as well as risks to achieving the full safety benefits that have been estimated in the business case. The following table presents a summary of the economic appraisal results for the preferred option considered in the business case.

	Discount rate:	4%	7% (central)	10%
Core evaluation results[1]	**BCR:**	0.95	0.65	0.47
	NPV ($m):	-$12.8	-$81.4	-$109.1
Key benefits measured:	The majority of project benefits relate to improved safety for road users (55%), followed by direct travel time savings (22%) and vehicle operating cost savings (12%). The proponent has estimated the potential safety benefits by analysing previous crash data, assessing the potential improvements from the design features of the bypass and estimating the overall safety improvement. Travel time, vehicle operating cost and externality cost savings are driven by through-traffic switching to the bypass, which provides a more direct route, avoids intersections, school zones and other congested sections within Tiaro. The proponent has also estimated waiting time savings and cancelled trip cost savings due to reduced road closures from flooding, although these are relatively small due to the low annual likelihood of closures. Potential road damage cost savings were also separately estimated, although these savings only total around $0.01 million over the appraisal period. While not quantified, the business case identifies both positive and negative impacts on Tiaro. Reduced congestion and noise can improve amenity and placemaking in the town centre, while local business revenue may also be negatively impacted by fewer drop-in shoppers.			
Key observations and issues	The analysis uses a 30-year evaluation period from 2026 based on microsimulation traffic modelling of a base case and project case every ten years from 2024. The proponent assumes that traffic will grow by 1.3% per year based on regional population and employment forecasts. After 2042, traffic growth rates are assumed to reduce by 25%. This conservative reduction has been adopted due to the uncertainty around growth rates seen in recent years. The proponent has included a scenario test on the BCR for a higher traffic growth scenario. Under a high traffic growth scenario (1.8% per year instead of 1.3% per year) the BCR increases slightly to 0.70 under the central scenario (7% discount rate). While the proponent has not undertaken specific COVID-19 sensitivity testing, we recognise that, due to the location and nature of local industry, population growth and working from home, traffic volumes are unlikely to be materially affected by changes resulting from COVID-19 in the long term. We consider that there is some potential upside from benefits which have not been quantified, including improved travel time reliability, local amenity and placemaking benefits. However, including these benefits is unlikely to significantly change the BCR. The proponent tested the impact of deferring the project by one-year on the BCR. This led to a slightly lower BCR (0.60) and NPV (-$92.8 million), suggesting that the problems identified in the case for change will continue to worsen over time. However, adopting the four-lane option instead of a two-lane bypass has significantly increased the cost of			

[10] Using a 7% real discount rate and a P50 capital cost estimate.

	the project, which contributes to the weaker economic case. The proponent has noted that an extended scope avoids traffic disruption from constructing additional lanes when they are needed in the future. These road disruption costs were estimated at $13.2 million by the proponent. The proponent estimates that the bypass will lower crash rates by 93% – a substantial reduction that may be difficult to achieve without further programs targeting driver behaviour. The economic case for the project may also be weakened if costs increase beyond the P50 estimate used in the appraisal.

(1) Costs reported in this table are based on P50 cost estimates.

Project development

Upgrades to the Bruce Highway at Tiaro were identified in the *Bruce Highway Action Plan* in 2012. A Preliminary Evaluation (PE) was developed between 2017 and 2019 to consider the priority and affordability of project options. In particular, it considered a range of options along the existing corridor and bypass options of various configurations through multi-criteria analysis and cost-benefit analysis. While both existing corridor and bypass options improved flooding resilience and safety, the bypass option provided significantly greater capacity and improved travel times.

The PE recommended a two-lane bypass as the preferred option, noting it should be compatible with future planning and allow for upgrade to a four-lane bypass.

Following the PE recommendations, further technical analysis and stakeholder consultation feedback, the Australian and Queensland Governments committed to increasing the project scope, with associated funding, to the four-lane bypass option. The detailed business case only considered the four-lane bypass option. The Infrastructure Australia Assessment Framework recommends considering at least two options in the business case. Without a comparison to alternative options, the appraisal does not provide certainty that the preferred option delivers the greatest benefit. A robust business case and economic appraisal would include analysis of alternative option(s).

Project engagement history

The Bruce Highway upgrade has been included on the *Infrastructure Priority List* since February 2016. Projects within this program are at various stages of development and a number of business cases within the program have been assessed by Infrastructure Australia. The proponent did not provide a Stage 2 submission for this project, but Infrastructure Australia was included as an observer in the Project Steering Committee for the business case. As this project was fully funded at the time of the Stage 3 submission, it is not eligible for inclusion on the Infrastructure Priority List.



BHUP recommended for the Priority List: February 2016	Not submitted for Infrastructure Priority List consideration at Stage 2	Submitted to Infrastructure Australia as a funded proposal

Detailed economic appraisal results

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,2021/22)			% of total for 7% results
Discount rate (real)	**4%**	**7%**	**10%**	
Costs				
Total capital costs (P50)	$254.6	$229.9	$208.4	99.8%
Operating costs	$5.9	$0.5	-$2.5	0.2%
Total costs[1,2]	**$260.5**	**$230.4**	**$205.9**	**100%**
Benefits				
Safety improvements	$131.4	$82.3	$54.9	55.2%
Travel time savings	$53.3	$33.3	$22.1	22.3%
Vehicle Operating Cost savings	$28.0	$17.6	$11.7	11.8%
Residual value	$24.3	$9.2	$3.6	6.2%
Externality savings	$10.3	$6.5	$4.3	4.3%
Waiting time savings	$0.2	$0.1	$0.1	0.1%
Cancelled trip cost savings	$0.2	$0.1	$0.1	0.1%
Total benefits[1]	**$247.7**	**$149.0**	**$96.8**	**100%**
Net present value (NPV)[3]	**-$12.8**	**-$81.4**	**-$109.1**	**n/a**
Benefit-cost ratio (BCR)[4]	**0.95**	**0.65**	**0.47**	**n/a**

Source: Proponent's business case

(1) Totals may not sum due to rounding.

(2) Costs reported in this table are based on P50 cost estimates.

(3) The net present value is calculated as the present value of total benefits less the present value of total costs.

(4) The benefit–cost ratio is calculated as the present value of total benefits divided by the present value of total costs.