

Project business case evaluation summary

Byford Rail Extension

Location

Perth, WA

Geography

Fast-growing cities

Category

National Connectivity

Capital cost

Pending (see endnote)

Indicative timeframe

Construction Start: Q2 2021

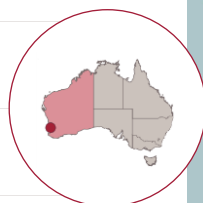
Project completion by: 2024–2025

Proponent

WA Government

Evaluation date

15 October 2020



1. Evaluation Summary

There is a strategic case for addressing growing transport issues within Perth's south-east corridor, which is undergoing significant urban development. These issues are likely to be nationally significant over the next 15 years and the WA Government is proposing a range of transport improvements in the area, including road upgrades and the extension of the rail network.

The **Byford Rail Extension proposal** has not been added to the Infrastructure Priority List as a project. The **Perth south-east corridor capacity improvements** will remain as a Priority Initiative on the Priority List and we would welcome the opportunity to review a revised business case.

The proponent's business case reports that the costs of the project will outweigh the quantified social, economic and environmental benefits, with a benefit cost ratio of 0.45 and a net present value of -\$379.5 million at a 7% real social discount rate.

As a METRONET project included in the WA Government's COVID-19 Recovery Plan, the Byford Rail Extension is a 'project under acceleration'. Infrastructure Australia acknowledges that the proponent has developed a business case based on a rapid economic assessment. The business case also considers some matters qualitatively. The level of design is currently strategic and will require refinement as project development progresses.

Rapid population growth in Perth's south-east corridor has added significant demand to the transport network in recent years. Continued population growth and urban development in and around the district centre of Byford and strategic metropolitan centre of Armadale is likely to result in transport demand exceeding the existing capacity of the public transport network in that area.

The WA Government has identified a need to improve transport options and encourage higher density and mixed-use development in the area to serve the growing population. These challenges and opportunities are recognised in the Priority Initiative for *Perth south-east corridor capacity improvements*, which recommends the various proposals be subject to detailed assessment of their costs and benefits, and in particular, how they work together as an integrated program.

The Byford Rail Extension (BRE) project proposes to improve accessibility for residents of the Byford area to Perth's metropolitan passenger rail network. The proponent's preferred option for the BRE project includes a 7.5km extension of the rail network from Armadale to Byford, the redevelopment of the existing Armadale rail station to accommodate the extension and the construction of a new at-grade rail station in the Byford town centre.

Infrastructure Australia's evaluation found that the BRE project aligns with Australian and WA Government strategic planning policies and objectives. However, the proponent's business case found that the project's quantified social, economic and environmental benefits are lower than its costs, with a net present value of -\$379 million and a benefit-cost ratio of 0.45, using a 7% real discount rate and a P50 capital cost estimate. The proponent also considered a 4% discount rate, which reported a benefit-cost ratio of 0.70 and a net present value of -\$274.0 million.

Infrastructure Australia identified several areas in the proponent's economic appraisal which may slightly overstate the quantified economic benefits, understate the capital costs and therefore overstate the benefit-cost ratio of the preferred option. The proponent's business case did not quantitatively include all land use benefits in the cost-benefit analysis, which could increase the benefits of the project. The business case included the costs and benefits of a travel behaviour change program to encourage additional take-up of an extended rail service, which could support the reduction of road congestion identified in the problem analysis.

The proponent evaluated the preferred option against a bus priority alternative option in the business case and found that the bus priority option had a higher benefit-cost ratio due to its lower costs, but that it would generate significantly lower economic benefits than the preferred rail option. The proponent selected the rail extension as the preferred option on the basis that it more effectively addresses identified problems and opportunities, realises project objectives, generates greater economic benefits and addresses broader land use and urban development objectives.

Our evaluation found that the net benefits and benefit-cost ratio of the bus priority alternative option may have been slightly understated. However, these areas of improvement in the economic appraisal are unlikely to have led to a different outcome in terms of selecting a preferred option, given that the proponent stated that the bus priority option did not sufficiently address project objectives or the identified problems.

The BRE project has been designated by the WA Government as a 'project under acceleration' as part of its commitment to economic recovery in the wake of the COVID-19 pandemic, as outlined in the State Government's WA Recovery Plan. Infrastructure Australia acknowledges that the proponent has developed the business case based on a rapid economic assessment. The level of design is currently strategic and will require refinement as project development progresses. As such, consideration of deliverability issues will require further development if the project proceeds.

2. Context

The BRE project proposes to extend the Armadale rail line from its current terminus at Armadale to the district centre of Byford. Armadale is located approximately 40km south-east of Perth, with Byford a further 8km south of Armadale.

Armadale and Byford are both activity centres, serving as hubs for local services and social infrastructure (such as tertiary medical facilities, courts and high schools) catering to a population that is widely dispersed beyond the south-east fringe of the Perth metropolitan area. Under *State Planning Policy 4.2: Activity Centres for Perth and Peel* (SPP4.2) the role of these activity centres are to reduce the overall need to travel by bringing services closer to residential communities; support the use of public and active transport modes; and promote an energy-efficient urban form.

Armadale currently lags behind other strategic metropolitan centres across a range of economic indicators, including the number and diversity of jobs and industries. The proponent attributes this to a lack of accessibility to the public transport network for residents to the south-east of Armadale. Increased accessibility to public transport is also likely to support the district centres of Byford and Mundijong-Whitby to fulfil their roles under SPP4.2.

The area has experienced significant population growth over the last decade, which is expected to continue in the future. The population of the Byford SA2 was estimated at around 19,500 in 2018; this is projected to more than double to around 47,000 residents by 2041. Population growth is expected to be supported by significant residential development, including a high proportion of medium- and high-density dwellings.

While the area has been the subject of significant investment in the road network over recent years, residents of the Byford and Mundijong-Whitby district centres currently have limited access to the metropolitan passenger rail network. Planned future investment in road capacity, including the extension of Tonkin Highway to Mundijong, is likely to deliver significant benefits to freight users but may not adequately address the problem of commuter demand exceeding capacity.

The BRE project is part of the wider METRONET portfolio of rail network developments planned by the WA Government. The objectives of the METRONET program are to enhance rail network capacity and accessibility, and to support the achievement of strategic land use and planning objectives through investment in the Perth metropolitan public transport network. An extension of the Armadale rail line to Byford was identified as a proposed investment in the METRONET Stage 1 as a transit solution to cater to growing population in the Byford corridor.

3. Problem description

Growth in transport demand, accompanied by limited access to the metropolitan public transport network, is likely to result in a reliance on private vehicle travel and demand exceeding capacity on the road network in Perth's south-east corridor. These problems are identified in a Priority Initiative for *Perth south-east corridor capacity improvements* on the *Infrastructure Priority List*.

Future population growth is expected to exacerbate this problem. The population of Byford is forecast to grow at 9% per annum to 2026, adding demand to the road network. Urban and industrial growth will exacerbate existing congestion and safety issues particularly on Tonkin Highway, which recorded an above-average rate of rear-end incidents between 2013 and 2016 relative to the Perth metropolitan average.

In the Priority Initiative for *Perth south-east corridor capacity improvements priority initiative*, the proponent proposed an integrated multimodal solution to address the identified problems. This included road widening, grade separations at major intersections and the extension of Tonkin Highway to provide improved transport access for both residential and freight users. It also identified the extension of the Armadale rail line to Byford. Separate to the BRE project, the proponent has committed to some of the identified initiatives, including the Tonkin Highway extension.

The proponent further identified a problem that the Armadale, Byford and Mundijong-Whitby centres are not fulfilling their intended strategic planning role as a result of transport capacity constraints. This limits the ability to optimise land use and attract employment to these centres.

4. Options identification and assessment

The proponent's stated objectives of the BRE project are to deliver a cost effective, timely and integrated transport and precinct development solution within the target area that provides:

- Reduced car dependency, resulting in a reduction in congestion on the road network
- A sustainable transport system with improved connectivity to current and future development, and access to critical functions such as employment and education within strategic and district centres
- Connected 'Places' with an improved urban form, that builds on existing character, culture and identity and incorporates environmentally sustainable design, to provide improved liveability and lifestyle options
- A catalyst for long-term sustainable community and economic development within strategic and district centres.

The proponent identified an initial longlist of more than 60 potential options to address the identified problems and meet project objectives. An initial filtering process refined this longlist to 10 options for intervention at Byford, which were subject to multi-criteria assessment (MCA). The 10 options were scored in the MCA according to five assessment themes: land use, transport, constructability, environment and cost. A separate MCA process was undertaken for Armadale station.

The MCA results for Byford and Armadale were matched to produce seven shortlist options, which were subject to rapid cost-benefit analysis (CBA). The rapid CBA identified two options for further evaluation:

- Option 4: Heavy rail extension with at-grade stations at Armadale and Byford
- Option 5: Bus priority route from Byford town centre to Armadale station.

These two options were subject to detailed CBA. The detailed CBA found that Option 4 delivered significantly greater gross economic benefits (\$308 million in real present value terms using a 7% discount rate) than the benefits of Option 5 (\$113 million). However, the capital and operating costs of Option 4 (\$686 million in real present value terms) were greater the costs of Option 5 (\$75 million). This resulted in a substantially lower benefit-cost ratio for Option 4 (0.45) relative to the bus priority alternative (1.51).

The proponent identified Option 4 as its preferred option for investment despite it having a lower benefit-cost ratio than the alternate option. The proponent discounted Option 5 on the basis that it did not address project problems, opportunities and objectives, including an objective to intensify land use in the Byford town centre and surrounds. While it is positive to see a range of options considered in the options assessment and business case, the assessment criteria could have been strengthened to filter options at an earlier stage.

While a relatively large number of options (seven) were subject to quantitative assessment at the rapid CBA stage, six of the seven options were conceptually similar, involving a heavy rail extension between Armadale and Byford and differing only in whether the two stations were underground, elevated or at-grade. Infrastructure Australia acknowledges that based on the definition of project objectives, only limited options were available.

5. Proposal

The key features of the preferred option include:

- New rail station in the Byford town centre, with 500 Park n Ride bays, cycling facilities and integrated bus bays
- 7.5km electrified dual-track rail between Armadale and Byford stations
- Level crossing removals
- New pedestrian crossings
- Reconfiguration of Armadale station, including a new platform for Australind regional rail services
- Upgrade of local roads surrounding both Armadale and Byford stations.

The business case notes that a potential future extension to Mundijong, a further 8.5km south of Byford, has been taken into account in the concept design for Byford station.

The proposed rail service would operate on a timetable consistent with the base case, with service frequencies of 8 trains per hour in the AM peak period (7am-9am), 5 trains per hour in the PM peak period (4pm-6pm) and lower frequencies at other times of the day.

By 2041, the project is expected to result in a 10% increase in public transport trips originating or ending in the study area, relative to the base case. The rail extension is expected to result in an average 10-minute reduction in travel times for people travelling from the study area to the Perth CBD during the AM peak period, from 91 minutes in the base case to 81 minutes with the project.

6. Strategic fit

The BRE project is part of the WA Government's METRONET integrated transport and land use program, designed to increase the capacity and accessibility of Perth's metropolitan passenger rail network. The BRE project, and wider METRONET program, are consistent with strategies identified in the WA Government's *Perth and Peel @3.5 million* (PP@3.5m) strategic planning framework, including:

- Supporting future population growth to maintain high levels of liveability
- Enhancing connectivity and accessibility
- Encouraging sustainable development.

The BRE project is designed to address capacity constraints identified in *Perth south-east corridor capacity improvements*, a Priority Initiative listed on the *Infrastructure Priority List*.

The project is aligned with other WA Government strategic planning policies, including *State Planning Policy 4.2: Activity Centres for Perth and Peel* (SPP4.2), which seeks to reduce the overall need to travel, support the use of public and active transport modes and promote a more energy-efficient urban form. The BRE project impacts key locations of Armadale (designated a strategic metropolitan centre under SPP4.2) and Byford and Mundijong-Whitby (both designated district centres under SPP4.2).

More than 4,400 boardings per average weekday are expected to occur at the new Byford station, approximately 40% of which represent boardings by patrons who currently use the Armadale station and 60% being new users of the rail network (including those switching from private vehicle travel).

The majority (71.5%) of project benefits are expected to accrue to public transport users, mostly in the form of travel time savings. This is consistent with the transport modelling showing shorter public transport travel times between the study area and the Perth CBD.

A relatively small share of benefits (13%) accrue to road users, and there is an overall dis-benefit from an increase in vehicle operating costs in the project case. Further evidence that the project partially relieves congestion on the road network in the project area is demonstrated through reduced accident costs (4.9% of total benefits) and reduced environmental externalities from road vehicles (3%).

One of the identified problems concerns key activity centres in the study area fulfilling their land use and employment potential. The proponent undertook qualitative analysis of the potential land use benefits arising from the project, however these benefits were not quantified in the economic appraisal.

7. Economic, social and environmental value

The proponent's economic appraisal of the preferred option for the BRE project stated total economic benefits of \$306.8 million against costs of \$686.2 million, in real present value terms using a real discount rate of 7% per annum and P50 capital cost estimate. This results in a project net present value of -\$379.5 million and benefit-cost ratio of 0.45.

The appraisal found that the bus priority alternative option generated a net present value of \$38 million and benefit-cost ratio of 1.51. The higher benefit-cost ratio is predominantly due to significantly lower costs (\$75 million in present value terms) being outweighed by benefits (\$113 million) that are also significantly lower than the preferred option. Infrastructure Australia also found that the assumed timing of benefits and operating costs for the bus priority alternative option may have resulted in its net present value and benefit-cost ratio being slightly understated.

Infrastructure Australia assessment of the business case found that:

- The proponent's appraisal excluded several capital cost items (including land acquisition, environmental offsets and acquisition of additional bus rollingstock)
- Beyond the final modelled year, economic benefits were extrapolated using a relatively high rate of annual growth
- Some transport demand modelling outputs, which the proponent judged may have led to dis-benefits, were excluded from the economic appraisal.

A qualitative analysis of land use outcomes was undertaken, but benefits relating to land use were not fully quantified in the economic appraisal.

The proponent also included option / non-use benefits (i.e. the value of improved infrastructure to non-users) in the core economic appraisal. We recommend reporting these benefits separately as a sensitivity test, as the methodology for measuring these benefits are still in development.

While our evaluation identified several limitations with the proponent's analysis, we estimate that these would only slightly affect the social, economic and environmental benefits of the project, with the proponent's preferred option still having significantly higher costs compared with its benefits.

The business case identifies several key environmental impacts including unavoidable clearing of threatened ecological communities and native vegetation in the rail corridor, disturbance of contaminated groundwater and soils and disturbance of terrestrial fauna habitat. The business case also notes that limited environmental assessment has been undertaken to date given the project's status as a 'project under acceleration'.

The proposed rail corridor also traverses three water sub-catchments, which include sites of Aboriginal heritage significance. The proponent indicated an approach to areas of Aboriginal engagement consistent with the METRONET Aboriginal engagement strategy ('Gnarla Biddi').

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

Benefits and costs breakdown

Proponent's stated benefits and costs	Present value (\$m, 2020-21) @ 7% real discount rate	% of total
Public transport user benefits	\$219.3	71.5%
Value of travel time savings	\$138.4	45.1%
Farebox revenue	\$61.2	19.9%
Station amenity improvements	\$13.6	4.4%
Travel behavior change	\$4.3	1.4%
Park n Ride revenue	\$1.8	0.6%
Road user benefits	\$39.8	13.0%
Value of travel time savings	\$29.5	9.6%
Accident cost savings	\$15.1	4.9%
Value of travel time reliability savings	\$3.5	1.1%
Vehicle operating cost (VOC) savings	\$1.9	0.6%
VOC savings – resource cost correction	-\$10.2	-3.3%
Other benefits	\$47.5	15.5%
Second-round transport benefits	\$21.6	7.0%
Option / non-use value	\$14.6	4.8%
Reduced environmental externalities	\$9.2	3.0%
Residual value of new assets	\$1.6	0.5%
Health benefits for new walking / cycling trips	\$0.5	0.2%
Total Benefits¹	\$306.8	(A) 100%
Total Costs¹ (see endnote)	\$686.2	(B) 100%
Net benefits - Net present value²	-\$379.5	n/a
Benefit-cost ratio³	0.45	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).

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

Capital costs and funding	
Total capital cost	Pending (see endnote)
Proposed Australian Government funding contribution (committed under the National Rail Program)	\$240.5 million ¹
Other funding	The Western Australian Government would fund the components of the project not funded by the Commonwealth.

(1) The Australian Government funding commitment was based on an estimated project cost of \$481 million.

8. Deliverability

The proponent has outlined the following approximate delivery schedule:

- Finalisation of concept designs by December 2020
- Contract award by June 2021
- Construction commencement by December 2021
- Project completion by June 2024.

METRONET is the agency responsible for project planning. The WA Government's Office of Major Transport Infrastructure Delivery would be the lead delivery agency for the project.

A procurement options analysis was undertaken to form a view on the delivery strategy for the preferred option. The analysis included an assessment of packaging approaches and possible procurement approaches.

Ten packaging options were initially considered. These were filtered to two final packaging options based on consideration of quality, risk, cost and project delivery experience. Lessons learnt from current and recent METRONET and PTA projects were also taken into consideration for the packaging assessment.

Two procurement options were selected as potential preferred options: an Alliance model and a Design and Construct with early contractor involvement model. The BRE project's status as a 'project under acceleration' means that a more detailed procurement and delivery assessment has not been undertaken and will need to be developed at the project definition stage.

The approach and assessment undertaken for the packaging and procurement analysis suggests a level of confidence as it relates to the Proponent's capability to deliver the project via the preferred delivery models. It is worth noting that other METRONET projects are predominantly, or planned to be, delivered via Design and Construct or Alliance contract models. Due to the concept level of design available and the fast-tracked nature of the project, the Alliance model enables design acceleration and appropriate apportioning of risk (as informed by METRONET representatives).

The proponent has proposed a joint funding arrangement between the Australian Government and WA Government, as outlined in the table above. The proponent did not consider alternative funding models, such as user funding, in its business case. It is noted that private and user funding models are not currently in use in the Perth metropolitan transport system.

The design and construction cost estimate for the preferred option was developed by an independent cost estimator. The cost estimates reflect a Class 5 estimate in accordance with the project classification categories defined by the Department of Infrastructure, Transport, Regional Development and Communications. Class 5 estimates represent a 0-2% maturity level of project definition deliverables and is appropriate for concept screening. While the design and construction cost estimate appears reasonable for the current stage of the project, it is not yet at the concept design stage.

The risk assessment for the project was undertaken in accordance with the METRONET Risk Management Framework and METRONET's wider Risk Management Policy. The risk assessment process documented appears robust and appropriate for a project at the business case stage. Where risks were identified, appropriate controls and treatment action plans were developed to manage and mitigate the risks. The risk register provided also captures key causes of risks, owners and the status of risks.

Key risks identified for the project relate to:

- Failure to reach a timely agreement with utilities stakeholders regarding the relocation and protection of their assets
- Environmental and social impacts
- Timeframe for environmental approvals do not meet the anticipated construction start date.

A probabilistic risk assessment was undertaken to arrive at P50 and P90 capital cost contingencies. The risk contingency is considered reasonable at 24.8% for the P50 and 34.3% for the P90 cost estimate.

The business case does not include a Post Completion Review Plan, although a Benefits Realisation Plan has been included. The Benefits Realisation Plan appears to be reasonable and includes nine measures to quantitatively demonstrate the performance of the rail extension. The proponent has also indicated that Post Completion Reviews are planned for all METRONET projects at appropriate intervals following commissioning of the new infrastructure. Infrastructure Australia recommends a Post Completion Review of the project be conducted to accurately evaluate whether it delivered the expected benefits.

Consideration of COVID-19

The COVID-19 pandemic has significantly affected the use of infrastructure. Infrastructure Australia has been working collaboratively with the Commonwealth 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 making this recommendation, 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.

This evaluation summary has been amended to exclude the capital cost (nominal, undiscounted) as the project is currently in active procurement.