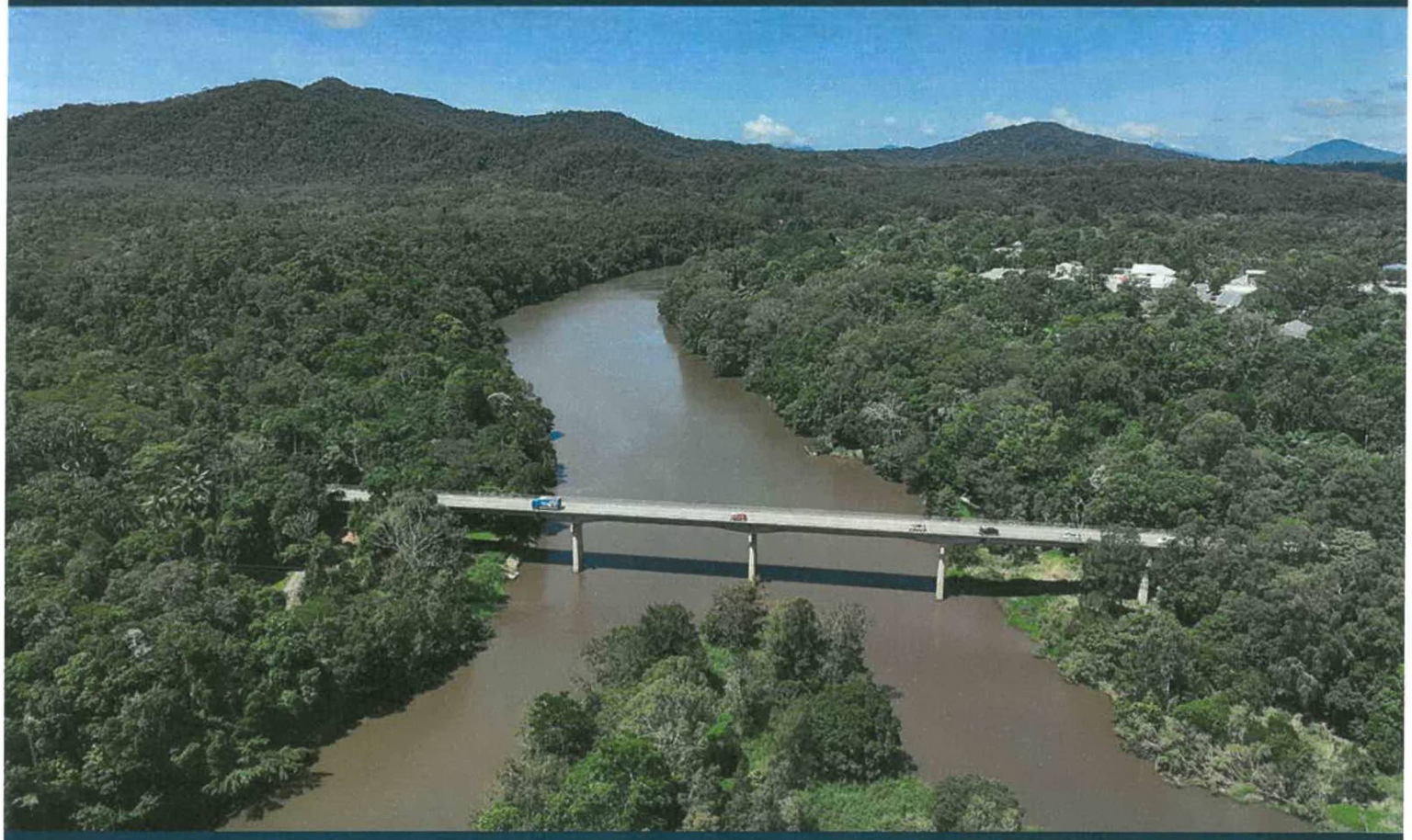
Department of Transport and Main Roads

Business Case Summary
Barron River bridge, Kuranda replacement

April 2025



Queensland Government

Planning process

The Department of Transport and Main Roads (TMR) undertakes rigorous planning for major road and transport infrastructure in accordance with Queensland Treasury's Project Assessment Framework (PAF) process.

The PAF process is used across the Queensland Government to ensure a common approach to assessing projects at each stage of their lifecycle. The PAF ensures that a project meets strategic objectives and demonstrates value for money.

The PAF documents form the basis of advice to the Queensland Government and key decision makers, enabling them to make an informed decision regarding whether to invest in the proposed project.

The Barron River bridge replacement project has completed three phases of planning – a Strategic Assessment of Service Requirements (SASR), completed as part of the Cairns to Northern Tablelands Access Strategy (C2NTAS), a Preliminary Evaluation and a Business Case.

The SASR considers the transport issues and service requirements of the project area. The Preliminary Evaluation considers and shortlists options to develop a preferred option. The Business Case further develops the preferred option and provides justification for undertaking the project. The Business Case is still a planning document, and more detail is required to further develop the project through detailed design and into implementation.

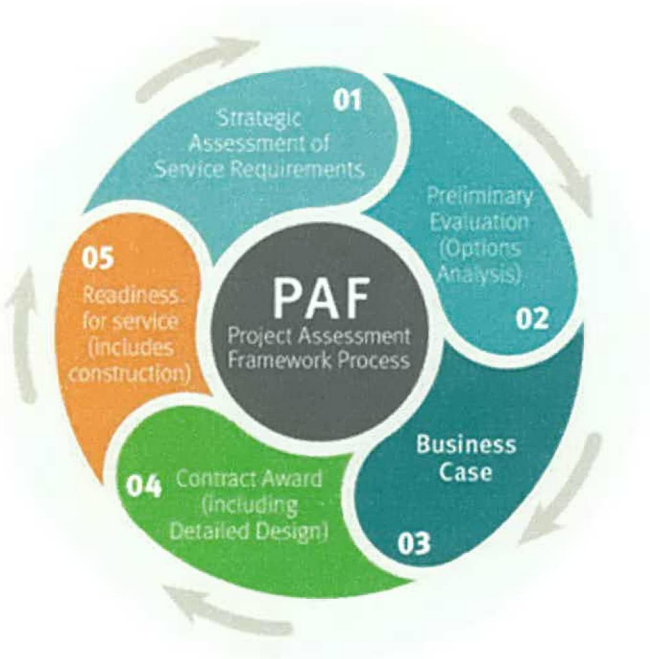


Figure 1: Project Assessment Framework Process. Source: TMR.

Overview

The 256-metre Barron River bridge is located in Kuranda on the Kennedy Highway – the primary road link between Cairns and the Northern Tablelands. Opened in 1963, the bridge is nearing the end of its useful structural and economic life. It does not meet current safety and design standards for vehicles or active transport users and structural issues have necessitated a permanent 42.5 tonne load limit, and periodic single and full lane closures. The planning project aims to determine the best long-term solution for a safe and reliable crossing over the Barron River at Kuranda.

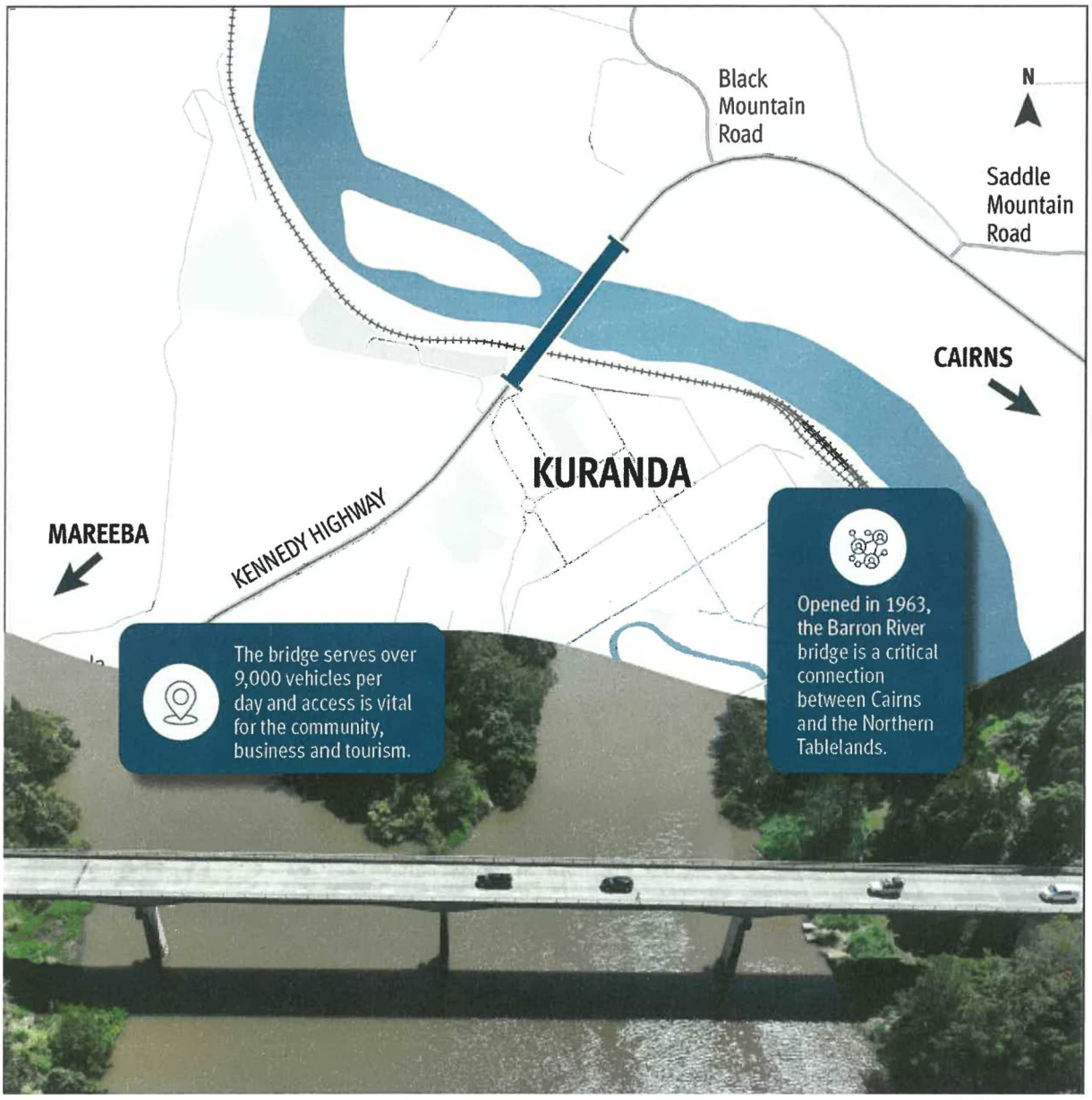


Figure 2: The Barron River bridge is located to the east of the Kuranda township. Source: TMR.

In 2020, investigations identified structural deficiencies in the existing bridge. A 42.5 tonne load restriction and one-way travel along the centreline was implemented while

TMR undertook necessary investigations and repairs. The bridge has since been reopened to two lanes and is closely monitored as part of a Structural Risk Management project (SRMP). A four-week inspection and maintenance program is conducted quarterly (or more frequently as required), during which the bridge is reduced to single-lane operation, with intermittent full lane closures. The SRMP will continue for the duration of the design and construction stages of the new bridge.

The current active transport path is narrow, offering a poor level of service and does not meet current safety standards for both pedestrians and bike riders. These problems reduce the attractiveness of active transport as a mode of travel between the residential areas on the Cairns side of the Barron River and Kuranda town centre.

Robust analysis and technical investigations recommend constructing a new two-lane bridge with an active transport path, located on the downstream side of the existing bridge, and decommissioning (removing) the existing bridge.

Upgrades will also be made to the bridge approaches and adjacent intersections at Black Mountain Road (roundabout or similar) and the Kuranda Cemetery Access Road to enhance safety and efficiency. These upgrades address identified issues while supporting resilience objectives of the broader road network by providing a turnaround facility in the event of a closure of the Kennedy Highway on the section locally known as Kuranda Range Road.

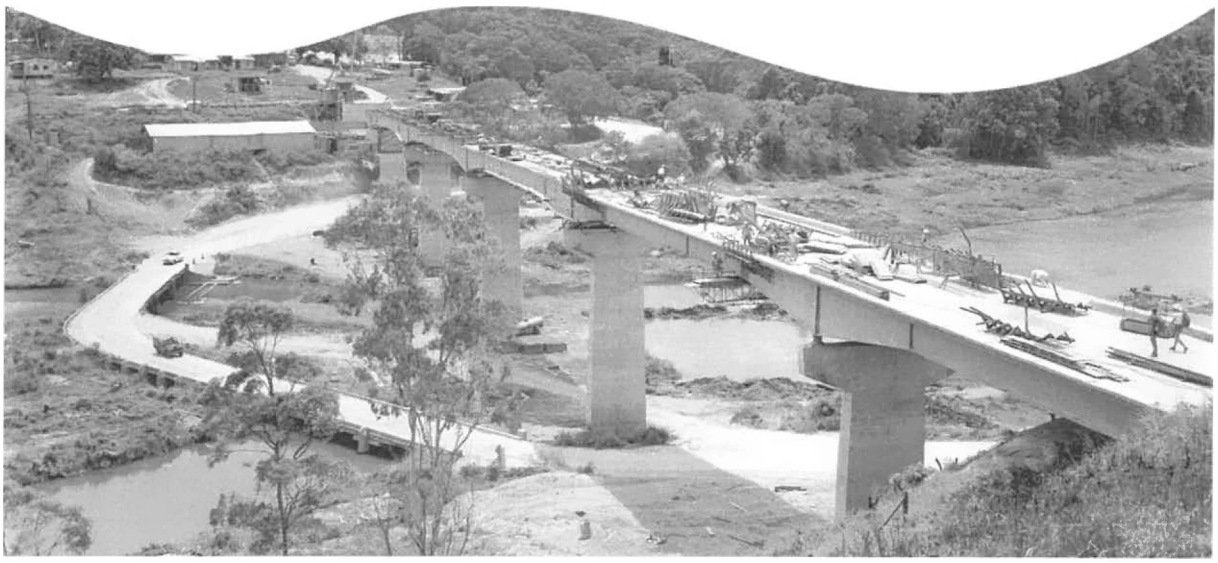


Image: Opened to traffic in 1963, Barron River bridge is nearing the end of its structural and economic life. Source: Queensland State Archives.

Project background

A critical transport network connection

The Kennedy Highway serves as the primary east-west connection between Cairns (east) and Mareeba/Kuranda (west) and provides a crucial link to the Gulf of Carpentaria and Cape York. The Barron River bridge at Kuranda is a critical part of this link between Cairns and the Northern Tablelands, furnishing an essential connection for vehicles, pedestrians, and bike riders.

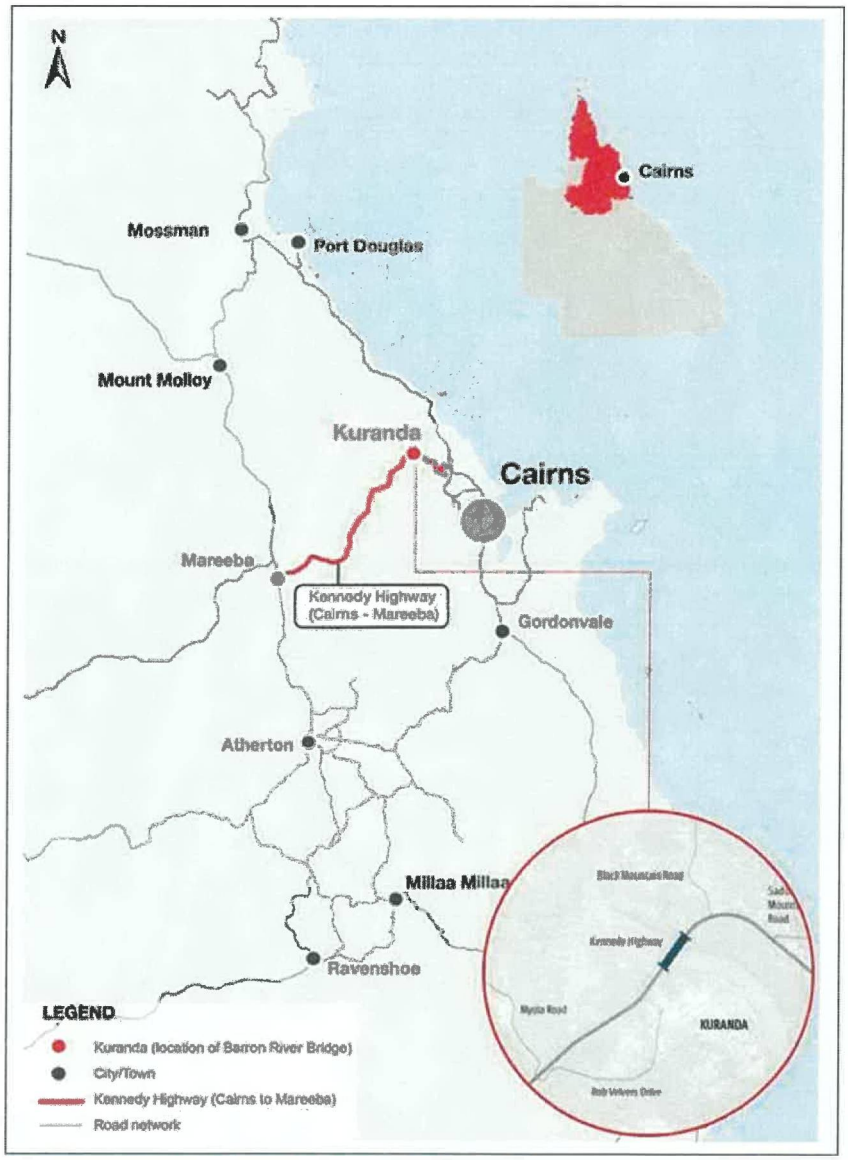


Figure 3: The Barron River bridge is a key structure on the Kennedy Highway linking Cairns to the Northern Tablelands and beyond. Source: TMR.

The Barron River bridge is a composite steel and concrete bridge comprising a six-span structure totaling 256 metres in length. The main spans are 45.7 metres long with 36.6 metre end spans. The bridge also crosses a non-electrified Queensland Rail track.

The existing pedestrian path on the bridge is narrow, does not meet current safety standards for pedestrians and bike riders, is not separated from traffic, offers no protection, and has limited connectivity to the residential areas within Kuranda impacting active transport opportunities for communities.

Structural issues

In 2020, inspections revealed fatigue cracks in certain steel components. These cracks were attributed to decades of exposure to heavy vehicle loads, which have significantly increased since the bridge's construction. While difficult to predict, if left unmanaged the cracks could lead to a partial collapse or collapse of a segment of the bridge. The ongoing SRMP is required to: prevent further restrictions; ensure the existing bridge is performing as expected; and manage any further deteriorations in a timely and appropriate manner.

To ensure the ongoing safety of road users, a scheduled inspection and maintenance program will remain in place until the new bridge is constructed. Inspection and maintenance is carried out over four weeks, every three months. During this time, the road is reduced to single-lane operation with short full road closures needed to prevent vibration of the bridge during welding operations.

Project need

Planning confirms the need to improve access, resilience and active transport safety and amenity, and the need to address growing safety issues.

Freight efficiency

The bridge carries approximately 9000 vehicles per day, including around 1100 freight trips per day. Restrictions are in place to ensure the safety of the bridge including a 42.5 tonne load limit, with additional operating restrictions including single lane flow required during maintenance and monitoring activities. All vehicles exceeding the 42.5 tonne load limit are required to use an alternate route such as Gilles Range Road or the Palmerston Highway. The alternate Palmerston Highway route increases travel time and associated costs,

between Mareeba and Cairns, from 48 minutes to two hours and 50 minutes.

It is noted that the restrictions imposed on the bridge are variable and implemented in response to structural issues as they are identified. If inspections identify issues with heavy vehicle loads, additional restrictions, including for vehicles under 42.5 tonne, may be required to ensure safety and protect the bridge.

Transport reliability

Load limit, lane restrictions, and short-term closures for maintenance activities are affecting efficiency and reliability of the wider Kennedy Highway and impacting access to essential services for Northern Tablelands residents. This is particularly the case for the Kuranda community (population 4826, 2021 Census), with many residents travelling to/from Cairns on a daily basis for employment, education, access to goods and services, and healthcare. The shortest alternate route from Kuranda to Cairns, via Gillies Range Road, is two hours and 15 minutes, compared to 35 minutes via the Kennedy Highway.

Driver safety

The current bridge structure does not meet current safety and design standards. The existing traffic lanes are narrow and sub-standard, with no separation between opposing traffic streams. Given the extended length of the bridge, this presents a potential risk of head-on crashes with a high likelihood of fatality or serious injury. Similarly, there is no road shoulder width on the existing bridge, reducing drivers' ability to avoid temporary hazards or recover should they lose control of their vehicle. Delays associated with bridge access may also impact road safety on the wider road network, with poor driver behaviour a key contributing factor in crashes on the Kennedy Highway.

Sub-standard active transport

Active transport options on the bridge are sub-standard for pedestrians and bike riders and do not meet current *Disability Discrimination Act 1992* (DDA) standards. Walkers, bike riders, and mobility device users access the bridge via a narrow two-way path that is not separated from traffic. There is no lighting or facilities to cross or continue along the Kennedy Highway, adding to safety concerns.

Project options

The options below have been assessed for their ability to address the project issues using the following criteria:

- improve overall safety for all road users
- improve network reliability and resilience
- minimise potential environmental and cultural heritage impacts
- improve accessibility and uptake of active transport modes
- remove risk from the TMR road network.

Project service requirements

The following service requirements were established during the planning stages.

SR01: Improve transport efficiency, reliability, and resilience for all modes and road users, considering the future condition of the road network.

SR02: Improve overall road safety to reduce the risk of fatal and serious injury.

SR03: Provide an asset that facilitates community access and connectivity, including safe and connected active transport facilities.

SR04: Minimise the impacts to environmental and culturally sensitive areas, and ensure the asset maintains or enhances the amenity of Kuranda.

Image: An underbridge inspection unit in use as part of the SRMP. Source: TMR.

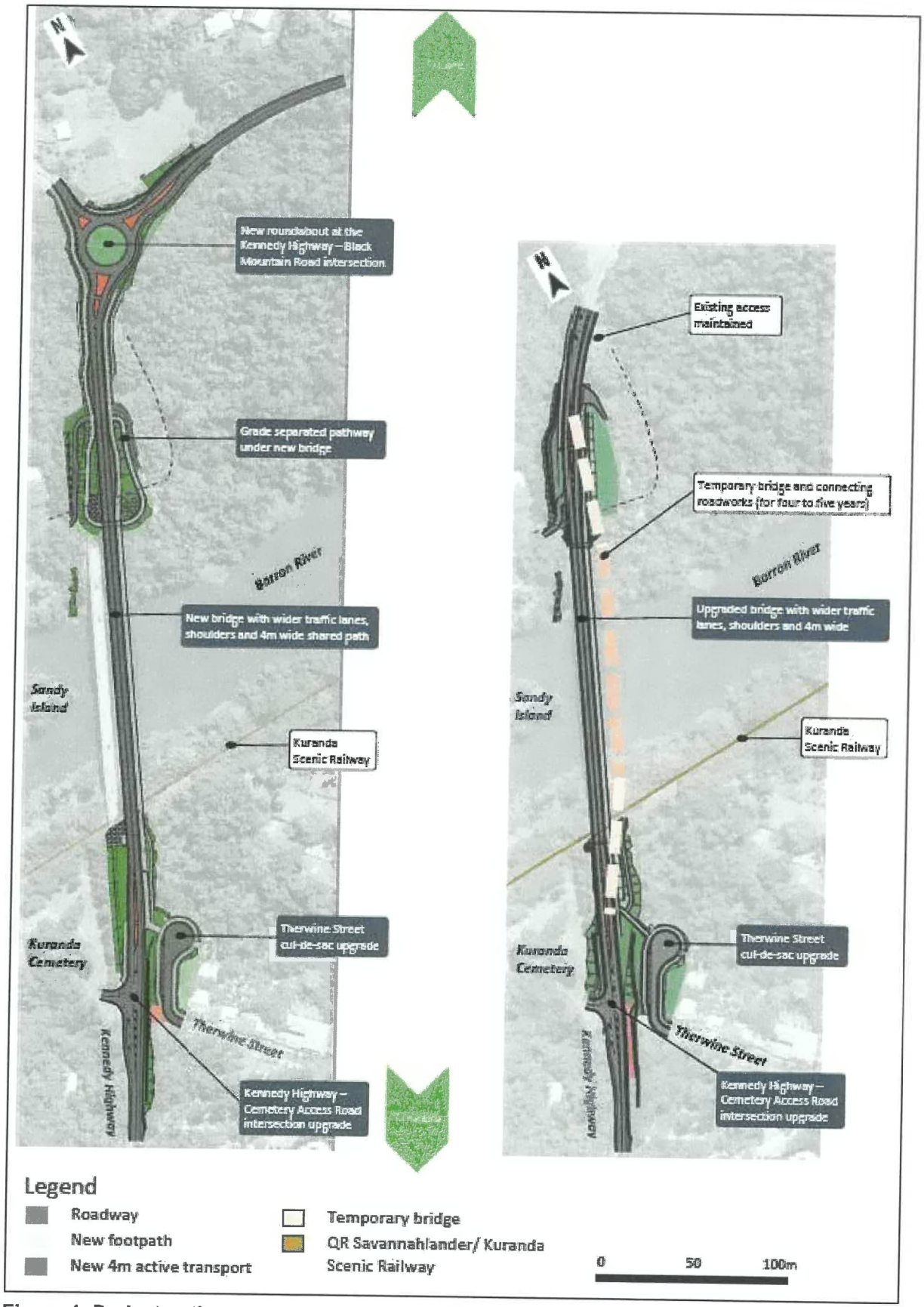


Figure 4: Project options, a new bridge (left) and re-use of the existing bridge (right). Source: TMR.

Shortlisted options

Following an assessment of the options against service requirements, the options outlined below were shortlisted for further technical development and assessment as they:

- addressed the project needs and aligned with community consultation feedback
- satisfied all service requirements
- aligned with the long-term Cairns to Northern Tablelands Access Strategy (C2NTAS)
- consistently perform better than other options against the assessment criteria.

Both shortlisted options deliver improved safety outcomes as identified through a safe systems assessment. A key distinction between the re-use bridge option and the new bridge option is the inclusion of a roundabout at the Kennedy Highway/Black Mountain Road intersection in the new bridge option, which is expected to reduce the likelihood and severity of intersection crashes.

Another significant difference is the addition of a grade-separated pedestrian crossing facility on the Cairns side of the bridge removing the need for pedestrians and bike riders to cross the Kennedy Highway.

The re-use bridge option requires a significant temporary bridge on the downstream side of the existing bridge, has higher ongoing operational costs, and requires a stricter longer term maintenance regime to maintain steel protective coating and bearing maintenance. Implementation of the temporary bridge as part of a reuse option requires environmental disturbance on a similar scale of that needed to construct a new bridge.

The shortlisted options were further investigated and developed for detailed technical evaluation.

Table 1: Shortlised options evaluation

Options	New bridge option	Re-use of existing bridge option
Consideration	**New bridge with active transport upgrades.**	**Rehabilitation of the existing bridge superstructure and upgrades to active transport.**
Bridge design	• Approximately 270 metres long with three spans. • New piles, piers, headstocks, and superstructure. • Constructed offline to allow traffic to continue use of existing bridge. • Decommissioning of existing bridge structure when new bridge is opened to traffic. • New alignment downstream of the existing bridge.	• 256 metres long with six spans (existing configuration). • Existing piles, piers and headstocks to remain, however strengthening works required. Further investigations needed to confirm extent of works. • Upgrade to existing superstructure. • Significant temporary bridge needed to maintain traffic flows during upgrades to existing structure.
Bridge configuration	• Two x 3.5 metre traffic lanes in opposing directions separated with a 1.0 metre wide center line treatment. • Wider shoulders provided for on-road bike riders. • Separation of shared path facility with traffic via barriers.	• Two x 3.5 metre traffic lanes in opposing directions separated with a 1.0 metre wide center line treatment. • Wider shoulders provided for on-road bike riders. • Separation of shared path facility with traffic via barriers.
Active transport (AT)	• Segregated shared pathway on new bridge. • Off-road shared paths on eastern and western approaches to connect the bridge to existing networks to provide safer community connectivity.	• Segregated shared pathway on upgraded existing bridge. • Localised connectivity to existing networks where available; multiple road crossings.
Western approach	• Realignment of Therwine Street cul-de-sac • Upgraded access into Kuranda Cemetery Road • Relocation of services including sewage pumping station.	• Realignment of Therwine Street cul-de-sac • Upgraded access into Kuranda Cemetery Road Relocation of services including sewage pumping station.
Eastern approach	• Upgrade of existing Black Mountain Road intersection to a roundabout, improvements to road geometry, and turn-around capability.	• Link of upgraded bridge into existing road network including existing turn lanes at Black Mountain Road.
Incident management	• Ability to turn vehicles around at Black Mountain Road roundabout if incident management is required on Kuranda Range Road.	• As per existing network.

Preferred option

The second stage of planning assessed the shortlisted options to determine a preferred option.

The multi-criteria assessment of the shortlisted options included a range of sensitivity test scenarios to confirm the robustness of the assessment. Analysis determined that the new two-lane bridge with active transport was the preferred option.

The new bridge with wider traffic lanes, wide centre line treatment (WCLT), painted median, and separated active transport, was selected as the preferred option as it:

- removes risk from the TMR road network by building a new bridge and decommissioning the existing bridge
- delivers positive outcomes and accommodates all service requirements
- improves safety for all users including vulnerable network users
- provides road network redundancy with turnaround facility if an incident occurs on Kuranda Range Road
- increases active transport accessibility and capacity
- aligns with community and stakeholder feedback
- increases resilience to unplanned events
- has a lower initial construction cost (capital outturn cost) and whole-of-life cost than the re-use option.

The preferred option addresses the service requirements. Based on analysis, this option meets both project objectives and community expectations. Cost analysis demonstrates the new bridge option is financially more economically viable than a re-use option in both the implementation and operations phases of the lifecycle of the structure.

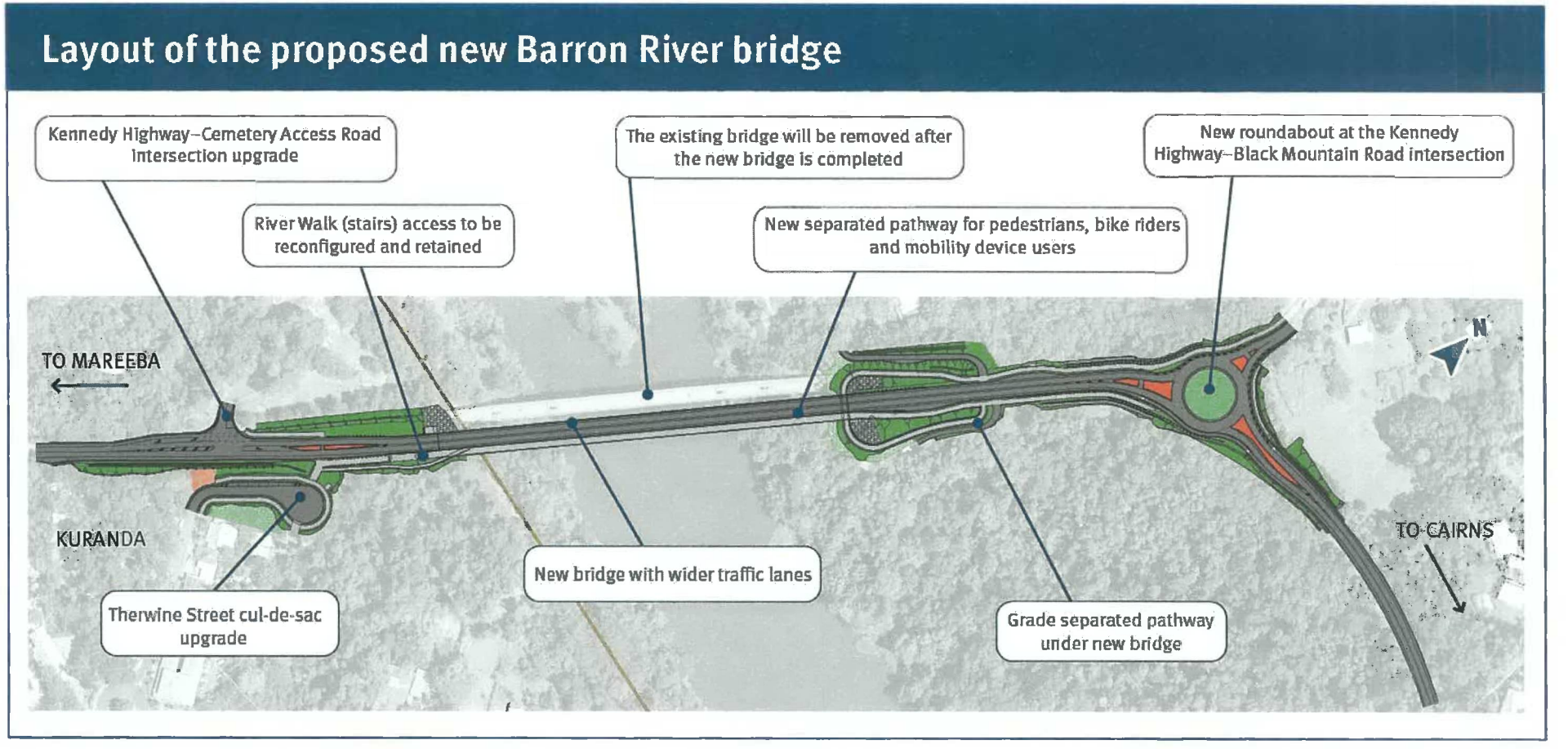


Figure 5: Concept layout of the new Barron River bridge at Kuranda. Source: TMR.

Transport modelling

Since opening in 1963, the bridge experienced a steady increase in traffic volumes and loads up to 2020, after which load limits were set coinciding with the identification of structural issues. In 2022, usage was consistent with approximately 9000 vehicles traversing the bridge per day.

While the Barron River bridge caters to a variety of users, including pedestrians and bike riders, it is primarily used by vehicle traffic. Existing conditions on the bridge usage were assessed, including daily and hourly traffic volumes, as well as forecasting traffic growth.

Overall traffic growth on the Kennedy Highway is expected to increase by approximately 1.1 per cent per annum for the next 30 years, as forecast by the Cairns Strategic Transport Model. Growth in freight volumes is also expected to increase in line with this figure, with the growth predicted by the Queensland Freight Model (QFM) varying in the order of 1.5 per cent to 3.0 per cent per annum (noting that QFM only represents a small portion of heavy vehicle traffic on the link). The new bridge option will ensure this traffic growth is catered for.

Previous studies into the future transport needs of the region, including the Cairns to Northern Tablelands Access Strategy which investigated the four transport corridors linking Cairns to the Northern Tablelands (including Kuranda Range Road), have been considered during this phase of the planning process. While the focus of this project is the Barron River bridge, the preferred option includes the capacity should upgrades to the broader road network be undertaken.

Image: Sub-standard active transport lanes discourage pedestrian and bike rider use. Source: TMR.

Environment and cultural heritage

The project is in the Wet Tropics, in an area adjacent to the Wet Tropics World Heritage Area with both flora and fauna having Matters of National Environmental Significance and Matters of State Environmental Significance.

Therefore, the project is located in an environmentally sensitive area that includes remnant vegetation, habitat for threatened species, and the Barron River. A number of Matters of National Environmental Significance (MNES) were identified as present or having a high likelihood of occurrence within the project area following ecological field surveys, including the critically endangered Kuranda Tree Frog listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Cairns side of the bridge has a dry fauna corridor which has a high likelihood of use by the Southern Cassowary which is listed as endangered under the EPBC Act. Due to the presence of MNES in the project area and potential for a significant impact, referral to the Australian Government is proposed under the requirements of the EPBC Act. Environmental management during construction will be important to avoid or minimise impacts to sensitive areas including habitat of threatened species.

The Barron River is a mapped purple waterway, indicating a major risk of impacts to fish passage, under the *Fisheries Act 1994*.

No tangible cultural heritage sites were identified during the cultural heritage field assessment however historical and natural heritage values were identified. The majority of the project is Category 5 (high risk) under the Aboriginal Cultural Heritage Duty of Care Guidelines, including areas of waterways and remnant vegetation. Sandy Island (located in the Barron River near the bridge) is an unrecorded cultural heritage story place.

One site is listed on the Queensland heritage register being the Redlynch to Crooked Creek Bridge section of the Cairns Railway, located underneath the Barron River bridge on the Kuranda side. There is one recorded local heritage place: the grave of J.W.H Keating, located on Therwine Street on the Kuranda side of the bridge. There are three unrecorded local heritage places: Kuranda cemetery, Barron River bridge memorial plaque, and Old Sandy Island crossing.

TMR has and will continue to consult with the Traditional Owners, the Djabugay people, regarding identification and management of cultural heritage issues and appropriate participation in future project phases.

The environmental characteristics of the project area have considerable influence on the scope, approval requirements, investigation and project timeframes, construction methodology and costs. A Review of Environmental Factors (REF) was informed by

water quality, soil and land management, biodiversity, cultural heritage, noise, amenity, resource use, and land tenure assessments.

The REF identified that approvals will be required for the project to progress subsequent project activities. The project has prepared an Environmental Management Plan (Planning) and mapped the applicable legislation, referrals, approvals, and indicative timeframes for the project. This will enable TMR to appropriately plan the investigation, development, and delivery phases and manage any potential time risks associated with environmental and cultural heritage approvals.

The project will consider the following acts and regulations during subsequent phases of the project including, but not limited to:

- approval under the *Environment Protection and Biodiversity Conservation Act 1999*
- development approval for operational works under the *Planning Act 2016*, that is constructing or raising waterway barrier works for permanent or temporary works
- species management program under the *Nature Conservation Act 1992*
- soil disposal permit under the *Environmental Protection Act 1994*.

The project may also trigger potential environmental offsets and require mitigation measures, depending on the footprint of construction activities and extent of impacts. Further detail will be provided in future project stages.

As legislation changes regularly, and field investigations must be renewed annually, it is appropriate for detailed investigations to occur during the preconstruction phase. Further noise assessments will also be required during the detailed design phase to consider the need, potential location, and design of noise mitigation treatments.

Image: The critically endangered Kuranda Tree Frog. Source: Edward Evans.

Cost and risk

Risk adjusted cost estimates were prepared in accordance with TMR's Infrastructure Cost Estimating Policy and Project Cost Estimating Manual, and the Project Risk Management and Contingency Development Process Manual (aligned to the International Standard for Risk Management ISO31000).

The expected project cost is $490 million.

Key project risks include:

Existing bridge: The existing bridge is at the end of its structural and economic life. Replacement of the existing bridge with a new bridge removes the risk on the TMR road network, currently managed by the SRMP.

Environmental: Approvals due to the project's location in the Wet Tropics, in an area adjacent to the Wet Tropics World Heritage Area. The environmental characteristics of the project area have considerable influence on the scope, approval requirements, investigation and project timeframes, construction methodology and costs. Several endangered species of fauna have been identified during the planning phase of the project, most notably the critically endangered Kuranda Tree Frog.

Geotechnical: While preliminary investigations have been undertaken for the bridge, further assessment is required to provide sufficient detail to inform design and construction methodology. Investigation to inform the approach road embankment is also required. Detailed investigations are recommended to occur during the design phase.

Community and stakeholders: While extensive community consultation and engagement has informed the planning and concept design process, the final project scope and impacts during construction will require additional consultation. It is imperative that road traffic is appropriately managed during construction/SRMP and the community is further consulted during design development.

Whole-of-government policy issues

The whole-of-government (Queensland Government) policy analysis has determined there are no issues that may prevent, impede, or have significant implications for the project options currently under consideration . This assessment has considered relevant State and Commonwealth legislation including procurement, climate change, relevant tolling frameworks, and employee, employment and skills development.

Public interest assessment

For the project to be in the public interest, there should be equity between the recipients of benefits and bearers of associated costs. The public interest assessment examined the project's ability to meet the service requirements, ensure public access and equity, achieve accessibility compliance, ensure accountability and transparency in project activities, and address consumer rights, security, and privacy.

The assessment found that the communities of Kuranda, Mareeba, Cairns, and the Northern Tablelands will substantially benefit from delivering this project. The identified service requirements will be addressed by the bridge's replacement and approach works which will improve the reliability of access for the community and emergency services, increase safety for all road users, and improve accessibility and amenity for active transport movements.

Community and stakeholder consultation and engagement has informed the planning and concept design. A High Risk Communication and Engagement Plan (CEP) was developed and approved by the Queensland Government in 2022. In late 2023, a dedicated project consultation webpage on the TMR online 'Your say' consultation platform provided project information and sought community feedback on the preferred option via an online survey.

This consultation revealed strong community support for the new bridge, the need to improve reliability of access, and the need to resolve accessibility and safety issues for active transport users. The preferred option aligns well with community and stakeholder feedback received. The results of community consultation are available on the project page on the TMR website.

Project implementation

A delivery model assessment recommended that a Transport Infrastructure Contract – Construct Only (TIC-CO) with Early Tenderer Involvement (ETI) or Collaborative Project Agreement (CPA) with Early Contractor Involvement (ECI) as the preferred contract forms. TMR is mature in delivering major projects of this nature, and both are well understood by industry and suited to managing a wide range of construction and legal risks.

These models provide the opportunity for TMR to seek contractor involvement in the design process to address potential constructability challenges. This delivery model will be subject to review when funding is allocated for construction.

Substantial investigation and approvals are required for the project to proceed. The development phase will progress investigations, approvals and design, followed by construction activities. While an indicative program has been developed to inform project estimating, a detailed project schedule will be developed during future project stages.

The bridge construction program is expected to consist of several construction phases: enabling works, construction works, and decommissioning works. The enabling works are expected to occur over a 12-month duration and include all works required prior to the commencement of the main bridge and approach construction works.

Subsequent construction phase works are expected to occur over a three-year duration for the preferred option and account for wet season mobilisation and demobilisation.

Water and communications infrastructure on the existing bridge will be relocated to the new bridge. Upgrades to the bridge approaches require relocation of water, sewer, energy, and communication services with further investigation to be undertaken during design.

The existing Barron River bridge is the key connection between Cairns, the Northern Tablelands, and beyond to the Cape York Peninsula and is expected to remain open during construction. There will be periods of partial and full lane closures during ongoing inspections, testing, and repairs under the SRMP.

The preferred option allows for construction of the new bridge offline. During the design phase TMR will undertake further consultation with the community around impacts during construction.

Economic analysis

Due to the structural condition of the Barron River bridge, its age and integral location on the Kennedy Highway, it is imperative that significant action is undertaken to replace the bridge to ensure the operational functionality of this important transport link for the community and economy.

Economic analysis indicates benefits delivered by the project will range from travel time savings, improved reliability of access, reduced vehicle operating costs, avoided crashes, access to educational and essential services, to improved active transport that meets current standards encouraging walking and bike riding.

Next steps

Following consideration of the planning outcomes by the Queensland Government and funding commitment, TMR will undertake procurement activities for a detailed design and construction contractor.

TMR will keep the community updated on project progress as key milestones are reached.

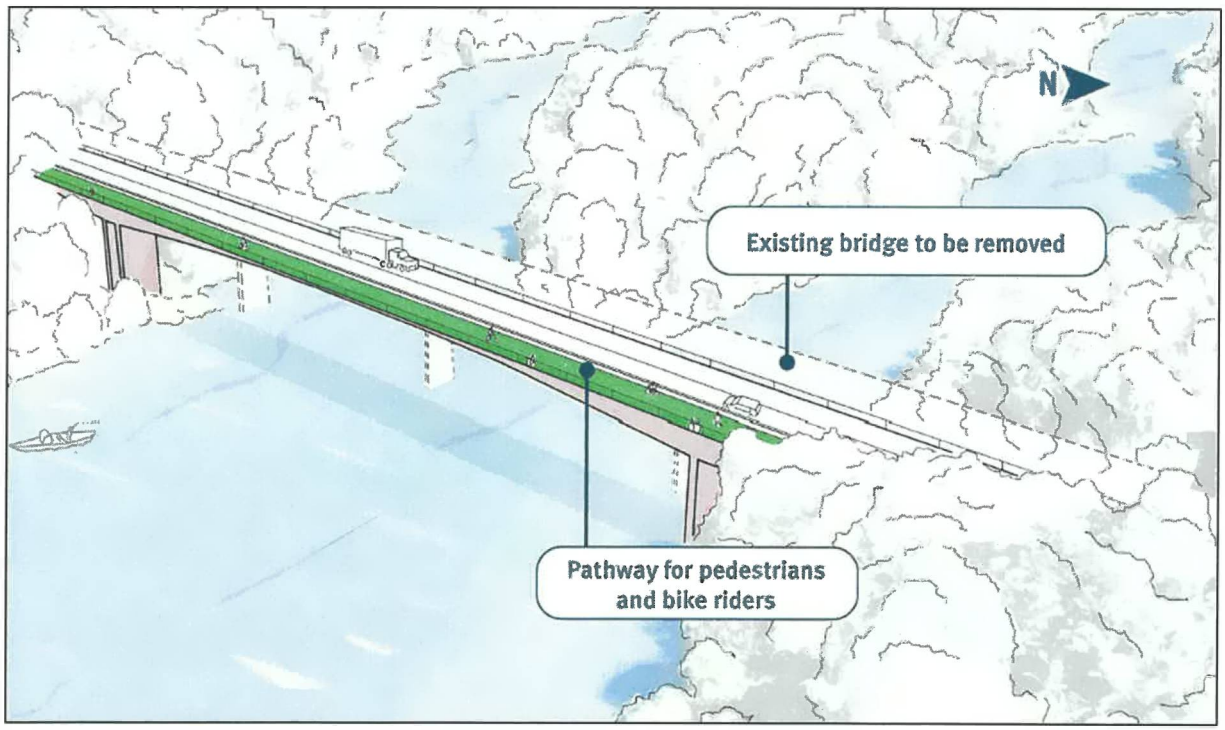


Figure 6: Artist's impression of the new bridge. Source: TMR.

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Front cover image: The existing Barron River bridge at Kuranda. Source: TMR.


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By Leave
MP: Hon Michael Berry
Clerk's Signature: