

# Nowra Bridge project

## Preferred Option Report

Roads and Maritime Services | February 2018





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# Abbreviations

<b>Abbreviation</b>	<b>Definition</b>
AHIMS	Aboriginal Heritage Information Management System
HML	Higher Mass Limit
LEP	Local Environmental Plan
LGA	Local Government Area
LoS	Levels of Service
MHWS	Mean High Water Springs
PACHCI	Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PAD	Potential Archaeological Deposit
REF	Review of Environmental Factors
PEI	Preliminary Environmental Investigation
TfNSW	Transport for New South Wales
VKT	Vehicle Kilometres Travelled
VHT	Vehicle Hours Travelled

# Executive summary

The Princes Highway on the NSW south coast is the main road connecting Sydney with the Illawarra, Shoalhaven and other regional centres towards the Victorian border. It serves as the main transport corridor providing freight and passenger movements to and from the Illawarra and South Coast regions, supports south coast tourist travel demand and connects towns on the south coast with Wollongong and Sydney.

The Princes Highway currently crosses the Shoalhaven River at Nowra via two bridges.

- The *southbound 'Whipple' truss bridge* is a mixed cast and wrought iron structure that was opened in 1881. This bridge provides two narrow lanes for southbound traffic with a clip on pathway for pedestrians and cyclists on the downstream side.
- The existing northbound bridge is a concrete box girder structure and was opened in 1981. This bridge has three lanes for northbound traffic, one of which is a dedicated left turn into Illaroo Road. A pathway on the upstream side caters for pedestrians and cyclists.

The two bridges are the only crossings of the Shoalhaven River.

The existing crossings of the Shoalhaven River at Nowra require an upgrade to address the following issues:

- Reduced freight access due to restrictions for higher mass limit (HML) semi-trailers and B-doubles on the old southbound bridge
- Reduced overheight vehicle access due to a height restriction of 4.6 metres on the old southbound bridge
- The old southbound bridge is in poor condition with increasing costs for ongoing maintenance
- Higher than the state average annual crash rates on the Princes Highway between Bolong Road and Bridge Road for the same class of road
- High traffic volumes during peak times leading to congestion between Bolong Road and Bridge Road and the wider network
- Poor intersection performance at Bolong Road, Illaroo Road, Bridge Road and Pleasant Way.

Early investigations concluded the need for a new bridge over the Shoalhaven River. In 2014 the NSW Minister for Roads and Freight announced the preferred location for a new river crossing in Nowra was immediately to the west of the existing Princes Highway river crossings. This announcement was supported by numerous studies and workshops informing the decision making process. These investigations are described in detail in the *Site Options Development Report* (Roads and Maritime, 2014) available on the Roads and Maritime project website. Following this announcement Roads and Maritime focussed on further developing intersection options on either side of the new crossing aimed at addressing traffic congestion and safety.

The future of the old southbound bridge has been the subject of an extensive period of investigation which considered a number of options including its retention and demolition. In 2017 an independent assessment confirmed the old southbound bridge was unsuitable for the current and future operational demands of the Princes Highway and local road network. The assessment also concluded once a new crossing is constructed the old southbound bridge should be closed to vehicular traffic. The independent assessment acknowledged the heritage value of the old bridge and considered the long term life costs and annual maintenance costs to retain the old bridge. It concluded that these costs required to preserve the old southbound bridge were not considered excessive and its social and heritage value outweighed the costs to maintain it.

Investigations carried out by Roads and Maritime identified a total of 39 potential network combinations of bridge and intersection upgrades. The preliminary options generally included:

- At grade intersection upgrades
- Grade separated options
- Relocation of intersections
- Other major network changes such as relocating parts of the Princes Highway.

A subsequent shortlisting process modelled each combination to identify the six best performing options to be taken forward for consideration and further investigation. The options included:

- Option 1: a new four lane bridge with no intersection upgrades
- Option 2: a new three lane bridge with at grade intersection upgrades
- Option 3: a new four lane bridge with at grade intersection upgrades
- Option 4: a new four lane bridge with grade separation on the southern approach
- Option 5: Nowra Bomaderry Structure Plan which includes a new four lane bridge and mix of at grade and grade separated upgrades
- Option 6: a new four lane bridge with grade separation on both approaches.

The options were presented to an Options Assessment Workshop where the participants recommended Option 3 as the preferred option.

The preferred option is considered to be the most balanced proposal as it addresses the objectives of the project, meets the expectations of key stakeholders and the community and ensures that long term planning for the Princes Highway is not compromised while minimising impacts on the surrounding community and environment as much as possible. The preferred option for the Nowra Bridge project includes:

- A new four lane northbound bridge immediately to the west of the existing bridge crossings
- Reconfiguration of the existing northbound concrete bridge to carry three southbound traffic lanes
- Intersection upgrades at Illaroo Road including additional turning lanes
- An upgrade of the Bridge Road intersection to a T-intersection with access to Pleasant Way removed
- A new Pleasant Way intersection further to the south with all turning movements provided
- Additional lanes on the Princes Highway between Bolong Road and Bridge Road
- Keeping the old southbound bridge for adaptive reuse such as a shared pedestrian and cyclist path.

Subsequent traffic modelling studies confirmed that the proposed preferred option provides improved traffic conditions across the network study area beyond the extent of the traffic model at 2046.

Roads and Maritime is seeking community and stakeholder feedback on the preferred option from 19 February 2018 until 23 March 2018. Feedback from this display period will be used to develop the environmental assessment and design of the project. The environmental assessment will be on display later in 2018 for further community and stakeholder feedback.

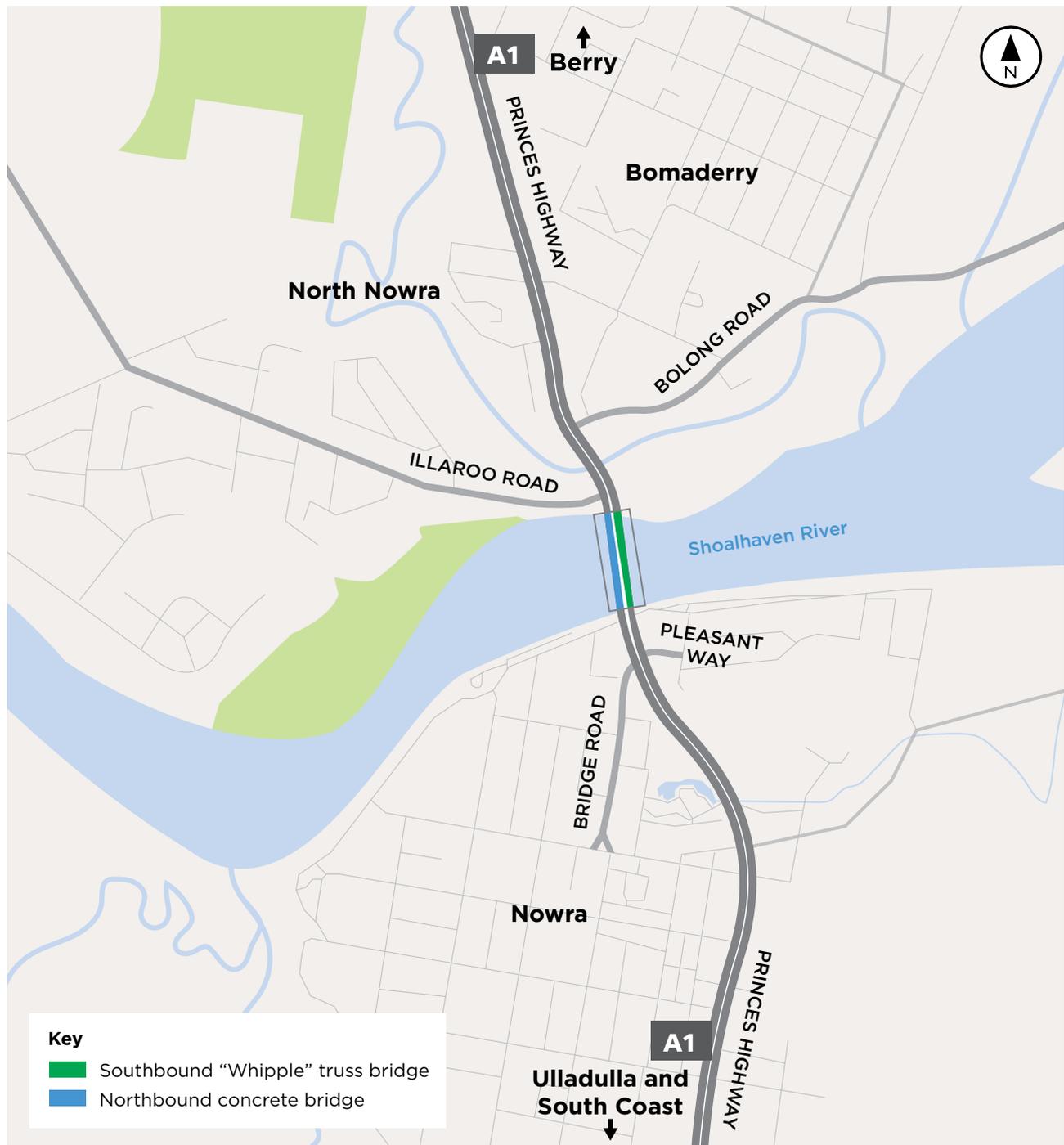
At this stage there is no commitment to funding or timing of construction of the Nowra Bridge project. Roads and Maritime will continue to seek funding wherever it is economically justified.

# 1 Context

## 1.1 Background

The A1 Princes Highway on the NSW south coast is the primary arterial road corridor connecting Sydney with the Illawarra, Shoalhaven and other regional centres towards the Victorian border. It serves as the main transport corridor providing freight and passenger movements to and from the Illawarra and South Coast regions, supports south coast tourist travel demand and connects towns on the south coast with Wollongong and Sydney.

Figure 1.1 Map of Nowra-Bomaderry



The Princes Highway currently crosses the Shoalhaven River at Nowra via two bridges.

- The *southbound 'Whipple' truss bridge* is a mixed cast and wrought iron structure that was opened in 1881. This bridge provides two narrow lanes for southbound traffic with a clip on pathway for pedestrians and cyclists on the downstream side
- The existing *northbound bridge* is a concrete box girder structure and was opened in 1981. This bridge has three lanes for northbound traffic, one of which is a dedicated left turn into Illaroo Road. A pathway on the upstream side caters for pedestrians and cyclists.

The two bridges are the only crossings of the Shoalhaven River.

Early investigations completed by Roads and Maritime concluded the need for a new bridge over the Shoalhaven River. In 2014 the NSW Minister for Roads and Freight announced the preferred location for a new river crossing in Nowra was upstream immediately to the west of the existing Princes Highway river crossings. This announcement was supported by numerous studies and workshops informing the decision making process. These investigations are described in detail in the *Site Options Development Report* (Roads and Maritime, 2014) available on the project website.

**Figure 1.2 The existing Princes Highway crossing of the Shoalhaven River in Nowra**



## 1.2 Need for the project

### 1.2.1 Traffic

The section of the Princes Highway across the Shoalhaven River bridges experiences some of the highest traffic volumes on the NSW south coast with about 50,000 vehicles crossing the river on an average day. The site is a pinch point and the old southbound bridge in particular is constrained by two narrow lanes. The level of service (LoS) is poor during morning and afternoon peak periods with average travel speeds regularly dropping below 20 km/h and queueing extending along both bridges.

Traffic conditions often deteriorate further during holiday periods when the Princes Highway becomes a popular tourist route for the Shoalhaven and surrounding areas on the NSW south coast. There is a clear seasonal increase in traffic over the summer months with daily volumes increasing by up to 50 per cent on public holiday long weekends.

### 1.2.2 Freight

Heavy vehicles and freight are estimated to make up about six per cent of the traffic that crosses the Shoalhaven River on an average day. The 'Whipple' truss design prevents oversized vehicles from using the old southbound bridge. High vehicles may be able to straddle the centre lane lines and travel down the middle of the carriageway to avoid truss members. However many oversized vehicles must be escorted across the river by contra flow on the northbound bridge, which imposes restrictions on the time these vehicles can travel, and also requires traffic control.

The truss structure is also vulnerable to impacts from large heavy vehicles, and routine inspections regularly identify many areas of minor damage to the bridge.

### 1.2.3 Road safety

The casualty crash rate for the southbound bridge across the Shoalhaven River is higher than the state average for the same class of road in an urban commercial environment. The dominant crash types on the old southbound bridge are associated with rear end collisions, mostly as a result of the intersection controls at the approaches to the river crossings. About 10 per cent of all crashes involve a vulnerable road user while crashes associated with vehicles impacting the bridge barriers are also highly represented.

In 2010 a fatal crash occurred at the northern approach to the southbound bridge when a vehicle entered the river after being hit by another vehicle. A similar near miss incident preceded this fatality earlier in the same year.

Road safety audits have identified objects that present themselves as potential safety hazards located in close proximity to the road.

### 1.2.4 Maintenance

The old southbound bridge is more than 135 years old and requires regular maintenance to ensure continued safe operation for the travelling public.

The ongoing maintenance includes work to address corrosion of the wrought and cast iron components, deterioration of the protective paint system, repair of bearings, pier strengthening and repairs to the concrete deck. There is also an accumulation of damage to truss members from the impact of vehicles. The southbound bridge remains capable of carrying the current legal loads that are allowed to use the bridge, but with a factor of safety slightly less than the design code requirements which is not unusual for a bridge of this age.

The necessary maintenance and inspection works are becoming increasingly difficult to undertake during the day without introducing extensive queues and delays to the Princes Highway and the surrounding local road network. More costly options to undertake maintenance work at night will be required and this is expected to increase over time.

## 1.3 Project objectives

The Nowra Bridge project has been developed to address the above project needs and improve conditions on the Princes Highway over the Shoalhaven River at Nowra.

The objectives for the project are:

- To provide southbound access for over height vehicles and HML freight on the Princes Highway across the Shoalhaven River
- To enable safe and efficient maintenance activities on the Shoalhaven River crossings without causing extended delays to the road network
- To reduce crash rates on the Princes Highway between Bolong Road and Bridge Road
- To support future traffic growth accessing the Princes Highway associated with planned land use in the Nowra Bomaderry area
- To reduce delays and queuing on the Princes Highway between Bolong Road and Bridge Street.

These objectives relate to the function of the project. Roads and Maritime also places a high priority on achieving quality project outcomes from a safety, environmental, community and value for money perspective.

## 1.4 Purpose of this report

The purpose of this report is to document the decision making processes used to arrive at the preferred options of the Nowra Bridge project.

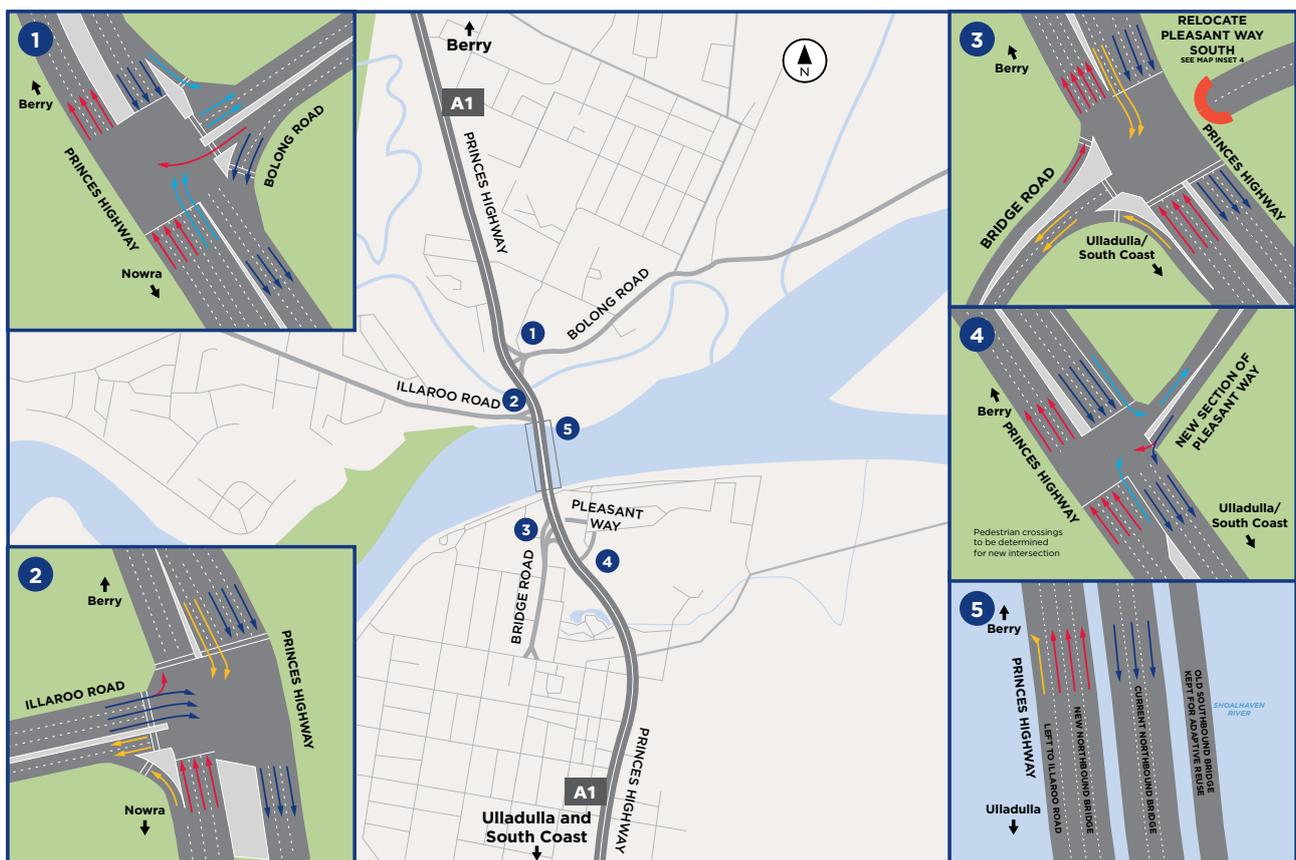
It includes the identification, consideration and assessment of a number of options for the future of the old southbound bridge, lane capacity requirements for a new bridge and configurations for intersection upgrades.

## 1.5 Preferred option

The preferred option is shown in Figure 1.4 and consists of:

- A new four lane northbound bridge immediately to the west of the existing bridge crossings
- Reconfiguration of the existing northbound concrete bridge to carry three southbound traffic lanes
- Intersection upgrades at Illaroo Road including additional turning lanes
- An upgrade of the Bridge Road intersection to a T-intersection with access to Pleasant Way removed
- A new Pleasant Way intersection further to the south with all turning movements provided
- Additional lanes on the Princes Highway
- Keeping the old southbound bridge for adaptive reuse such as a shared pedestrian and cyclist path.

Figure 1.4 Preferred option for the Nowra Bridge project



## 2 Future of the old southbound bridge

In order to progress the preferred option a decision about the future of the old southbound bridge was needed. Since the announcement of the preferred location for a new bridge in 2014, the future of the old southbound bridge has been the subject of an extensive period of investigations. A number of options to retain or demolish the bridge have been considered.

There have been multiple reviews by internal and independent external experts into:

- The heritage significance of the old southbound bridge and Roads and Maritime Services obligations under the Heritage Act
- The expectations of the community and stakeholders
- The anticipated maintenance activities and costs necessary to retain the old southbound bridge in its current location
- The estimated costs associated with any demolition or relocation activities.

### 2.1 Options considered

Roads and Maritime has considered a wide range of options for the future of the old southbound 'Whipple' truss bridge. These options have included:

- **Retain and maintain options** - These options would see the bridge remain in place and Roads and Maritime would continue to maintain it to a standard that would ensure structural integrity and that would satisfy heritage requirements. Such options could involve adaptive re-use or closure of the bridge to public access
- **Retain and transfer options** - These options would also see the bridge remain in place and Roads and Maritime could seek to transfer responsibility for the asset to another party

- **Partial demolition options** - These options would involve demolition of the bridge except for one or both of the spans immediately adjacent the shorelines. Such options could allow public access to the shoreline span(s)
- **Partial demolition options with relocation of spans** - These options would involve demolition of the bridge with one or more of the central spans relocated within the local area for posterity. One or both of the spans immediately adjacent the shorelines would be retained and could be accessible to the public
- **Full demolition options with relocation of spans** - These options would involve demolition of the bridge with one or more of the central spans relocated within the local area for posterity
- **Full demolition** - This option would involve complete removal of the entire bridge
- **Deferral or 'mothballing'** - In the absence of an identified preferred option, deferral of the decision or 'mothballing' could be a temporary measure until a longer term decision is made.

### 2.2 Considerations

#### 2.2.1 Heritage

The old southbound bridge is one of only three known American pin-jointed 'Whipple' trusses in Australia. It is the only one that is still intact in New South Wales and is the only one in the country that has historically been used for road traffic.

The bridge pre-dates by about a decade the popularisation of the majority of metal truss forms in the 1890's, making it a particularly early, rare and significant example of a technological innovation that had been previously untested in Australia. The bridge also symbolically demonstrates the movement at the time towards a less conservative approach to infrastructure within the Colonial Government, moving away from the traditional British construction methods that had been adopted previously.

Referring to the NSW Heritage Assessment Criteria, if an item meets one of the seven heritage criteria below and retains the integrity of its key attributes, it can be considered to have heritage significance (either Local or State). Table 2.1 summarises the most recent significance assessment from heritage specialists.

**Table 2.1 Assessment of significance of the old southbound 'Whipple' truss bridge**

<b>NSW Heritage Assessment Criteria</b>	<b>Assessed Significance</b>
<b>A Historical Significance</b> An item is important in the course or pattern of the local area's cultural or natural history.	STATE
<b>B Associative Significance</b> An item has strong or special associations with the life or works of a person, or group of persons, of importance in the local area's cultural or natural history.	STATE
<b>C Aesthetic Significance</b> An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in the local area.	LOCAL
<b>D Social Significance</b> An item has strong or special association with a particular community or cultural group in the local area for social, cultural or spiritual reasons.	LOCAL
<b>E Research Potential</b> An item has potential to yield information that will contribute to an understanding of the local area's cultural or natural history.	STATE
<b>F Rarity</b> An item possesses uncommon, rare or endangered aspects of the local area's cultural or natural history.	STATE
<b>G Representativeness</b> An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places of cultural or natural environments (or the cultural or natural history of the local area).	STATE

Overall the independent assessment of the bridge against the above criteria identified that it has significance for its historic value, its landmark aesthetic qualities, its ability to contribute to research questions relating to the construction of 'Whipple' truss bridges in Australia, its rarity, and its representativeness.

The bridge is currently listed on the Roads and Maritime S170 Register. Under Section 170A of the Heritage Act government instrumentalities are responsible for ensuring that the items entered on their registers under Section 170 that are under their care, control or management are maintained in accordance with State Owned Heritage Management Principles. These Principles state that management of redundant heritage assets should be planned and executed so as to conserve the item's heritage significance.

Heritage specialists have advised that the best outcome for the bridge from a heritage perspective would be "retention and adaptive re-use with heritage interpretation"; this would at least retain its aesthetic and technical significance.

## 2.2.2 Estimated costs

Estimating the costs associated with each of the different options was complex. Options to retain all or parts of the old southbound bridge required assumptions around the necessary activities and methods required to maintain it to a standard that would ensure structural integrity and that would satisfy heritage requirements.

### Retention options

The assumed maintenance activities were based on the results of the most recent available Roads and Maritime inspection and assessment reports, as well as the findings of multiple independent reviews by external specialists.

Activities considered necessary to maintain the old southbound bridge for adaptive re-use would require:

- Repainting of all truss elements
- Tightening or replacement of any loose, damaged or corroded truss elements
- Inspection and maintenance or replacement of pin joints
- Removal and replacement of the deck attachment system
- Maintenance of expansion bearings
- Pier strengthening
- Remediation of footings.

Historically the annual maintenance costs for the old bridge have been substantial in the order of about \$770,000 each year since 2008. It has been estimated that should the old bridge remain in its current location the total maintenance cost necessary over the next 50 years would be in the order of \$35 million.

### Demolition options

It is anticipated that demolition of the old bridge would be a complex activity. A general methodology for demolition would include:

- Removing any heavy components such as the deck and some supporting structures which do not impact on the structural integrity of the truss itself
- Removal of other non-structural components such as utilities and footways by truck or barge
- Demolition of the truss either by removal as a complete unit using cranes and barges, or by dismantling after supporting the truss via temporary structures
- Archiving and recording heritage aspects of the bridge as it is demolished or dismantled.

The option to demolish the bridge has been estimated to cost approximately \$18 million.

## 2.2.3 Community and stakeholder response

During late 2014 Roads and Maritime spoke to the community about the future of the old southbound bridge. As part of the consultation activities Roads and Maritime:

- Spoke to over 1,850 people at pop up kiosks in Stocklands Nowra, at the Shoalhaven River Festival and at two information sessions
- Received 38 email or mailed submissions
- Received around 676 online survey submissions
- Received six suggestions on Facebook.

The results of the community engagement activities indicated strong support for retaining the old southbound 'Whipple' truss bridge due to its engineering heritage and community value. Conversations with the community, written submissions and feedback from an online survey showed an overwhelming response to retain the old bridge in some form. There was a small proportion of the community that wanted to see the old bridge removed completely and money instead spent on other projects in the region.

Written submissions were received from Office of Environment and Heritage (OEH), National Trust of Australia, and Engineers Australia. All of these bodies referred to the historic significance of the old bridge and voiced their opposition to any options that would see it demolished or relocated.

More information on the outcomes of this consultation can be found in the *Nowra Bridge Project Consultation Summary* (May 2015) available on the project website.

### 2.2.4 Independent assessment of options

Roads and Maritime engaged an independent specialist to review all investigations completed to date relating to the future of the old southbound bridge. The independent assessment has confirmed the Roads and Maritime position that the old southbound bridge is operationally unsuitable for the current and future demands of the Princes Highway, and that once a new bridge crossing is constructed the old bridge should then be closed to vehicular traffic.

The independent assessment gives substantial weight to the heritage value and considers the community impacts of any option to remove the old southbound bridge. It also considers adaptive reuse to be viable in the medium term and does not consider the long term life costs and annual maintenance cost to be excessive in order to preserve the social and heritage value of the old southbound bridge.

## 2.3 Preferred option for the old southbound bridge

After consideration of both internal and independent assessments Roads and Maritime supports an option to retain the old southbound bridge for adaptive reuse. In doing so Roads and Maritime proposes:

- The old southbound bridge be retained and maintained for adaptive reuse, such as a pedestrian and cyclist path, but be closed to vehicular traffic
- The design for a new bridge should cater for pedestrian and cyclists as the old southbound bridge may not be a reliable alternative indefinitely
- The old southbound bridge should continue to be inspected annually or at such times deemed necessary to assess the ongoing viability of retention of the structure into the future
- The estimated costs associated with restoring the old southbound bridge as per the requirements of the Heritage Act should be included as part of the Nowra Bridge project.

# 3 Intersection options identification

With three intersections and many potential network changes available, the development and short listing of options for the new bridge and intersection upgrades was complex. Options ranged from upgrading existing intersections, to the grade separation of intersections involving various forms of flyovers and overpasses. Some options also considered relocating intersections at different locations on the network. Given that the old southbound bridge would no longer be relied upon for vehicular traffic, the number of lanes for the new bridge would need to be sufficient to cater for future traffic growth.

Further, the intersections of the Princes Highway with Bolong Road, Illaroo Road, Bridge Road and Pleasant Way currently experience traffic congestion. High traffic volumes and insufficient capacity at intersections is creating congestion. It is appropriate that the Nowra Bridge project propose upgrades to the approach intersections.

## 3.1 Preliminary option identification

The preliminary identification of options was developed by reviewing the existing traffic volumes and performance of the intersections at Bolong Road, Illaroo Road, Bridge Road and Pleasant Way. Existing planning studies for the area were reviewed and key stakeholders such as Shoalhaven City Council were consulted.

The preliminary options generally included:

- At grade intersection upgrades
- Grade separated options
- Relocation of intersections
- Other major network changes such as relocating parts of the Princes Highway.

A total of 19 different options and sub options were identified resulting in about 39 possible network combinations for consideration.

The preliminary list of options was reviewed by Roads and Maritime Services and Shoalhaven City Council to identify the potential benefits and impacts associated with each option as well identify the assessment criteria to be used in subsequent options evaluation process.

## 3.2 Intersection options shortlisting

In order to reduce the number of options for wider assessment, a shortlisting process was carried out by specialists from Roads and Maritime and Shoalhaven City Council.

Due to the number of intersection option combinations, traffic modelling was an important tool used to assess the shortlisting process by testing combinations of intersections across the project study area. This traffic modelling was the first of many modelling exercises completed to help identify the preferred option for the Nowra Bridge project.

The traffic modelling used the latest 2014 traffic data from origin destination surveys and intersection counts. Forecast traffic growth was estimated at 2.7% compounding at five year intervals up to 2039. This growth rate was considered an upper limit and was adopted at the time to assess the impact of substantial increases in development planned within the area over a compressed time period and was consistent with modelling completed for neighbouring Princes Highway projects.

Many combinations of intersection arrangements were modelled. The outcome of this assessment was that some combinations of grade separated options were found to perform poorly as they created weaving and merging traffic movements that were inefficient and not safe.

This was specifically an issue for a northern grade separated option combined with at grade solutions on the southern side and a four lane northbound bridge. Although this option provided benefits on the local road network, it introduced additional congestion on the Princes Highway. As a result this option was not considered as a standalone shortlisted option.

The results of the traffic modelling provided a shortlist of the six best possible intersection option combinations.

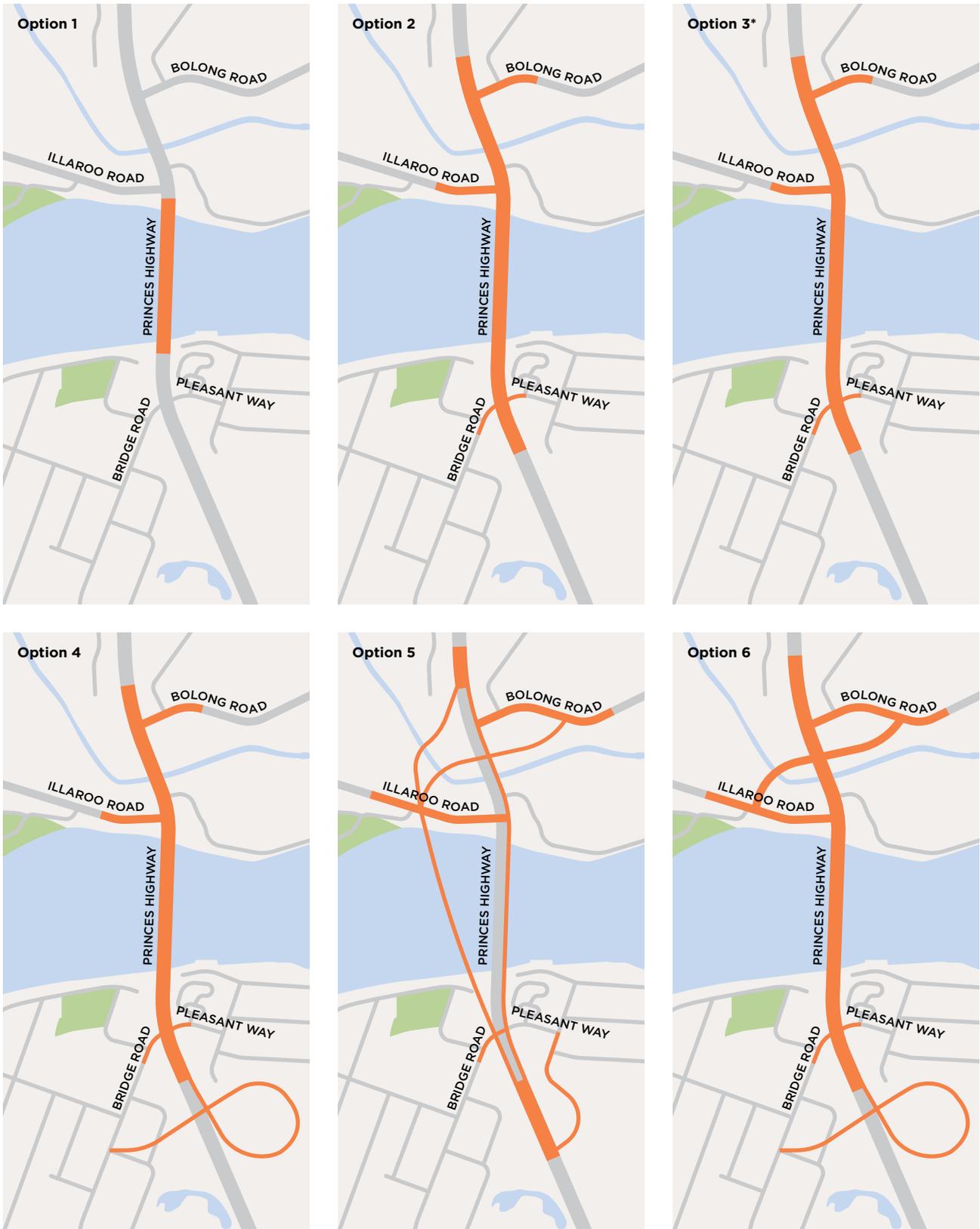
## 3.3 Intersection shortlisted options

The shortlisted intersection options for the Nowra Bridge project were:

**Table 3.1 Shortlisted options**

Option	Description
Base Case	Existing network
Option 1	New four lane bridge, no intersection upgrades
Option 2	New three lane bridge, at grade intersection upgrades
Option 3	New four lane bridge, at grade intersection upgrades
Option 4	New four lane bridge, grade separation on southern approach
Option 5	Nowra Bomaderry Structure Plan which includes a new four lane bridge and mix of at grade and grade separated upgrades
Option 6	New four lane bridge, grade separation on both approaches

Figure 3.1 Shortlisted intersection options



Option 3 initially included access to Pleasant Way.

# 4 Intersection options assessment

This section outlines the process used to assess the shortlisted intersection options to confirm the preferred option for the Nowra Bridge project.

## 4.1 Intersection option considerations

As part of the assessment process, criteria considered to be the most influential for choosing a preferred intersection option were identified. The chosen criteria related to the Nowra Bridge project objectives including:

- Potential traffic efficiency improvements:
  - Travel time on the Princes Highway
  - Reduced delay on local roads.

The chosen criteria which best enabled differentiation between options included:

- Potential impacts:
  - Heritage impacts
  - Environmental impacts
  - Impacts on residential property owners
  - Impacts on other sensitive property or future land use
  - Work health and safety and whole of life maintenance.

### 4.1.1 Traffic modelling

Traffic modelling<sup>1</sup> of the shortlisted options shown in Figure 3.1 was completed using the same methodology discussed in Section 3.2.

A key finding from the modelling was at grade intersection upgrades could perform satisfactorily for about 20 years before any grade separation might be necessary, but only if the new bridge was built with four northbound lanes.

The traffic modelling suggested that Option 1 does not perform well and that some form of treatment is required at the intersections (a new bridge alone would not provide long term traffic improvements).

The key findings of the traffic modelling were:

- The performance of the existing network is poor. There is insufficient capacity in the right turn into Bridge Road from the Princes Highway in the morning peak period. This results in queues extending up the Princes Highway and affects the Illaroo Road intersection
- Providing a new three lane northbound bridge without upgrades to the Bridge Road and Illaroo Road intersections results in minimal improvements. These results do not improve if an additional northbound lane is provided on the new bridge
- Providing intersection upgrades and a three lane northbound bridge performs well in the short and medium term
- Intersection upgrades and a four lane northbound bridge improves performance into the long term
- Grade separated options perform only marginally better than the best performing at-grade option
- Some grade separated options introduce weave, merge or queuing issues that don't currently exist.

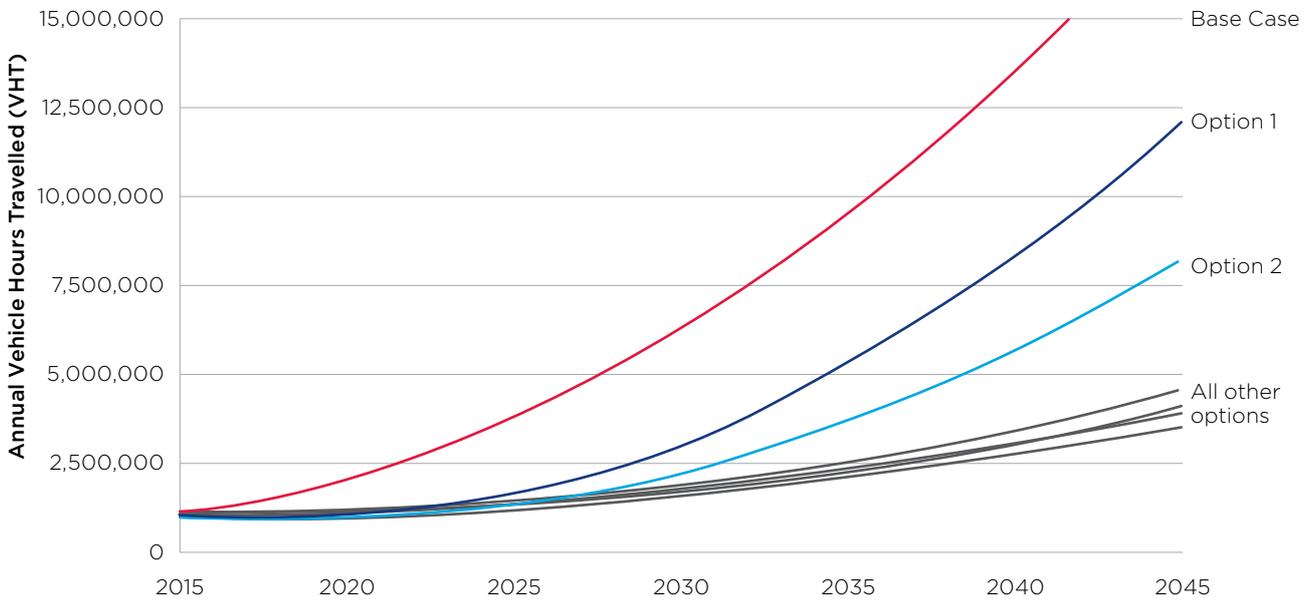
### 4.1.2 Other impacts

While the traffic modelling generally identified potential benefits of each option compared to the existing network, other criteria were considered that did not provide differentiation between the options included:

- Road safety
- Design
- Urban design including access to the waterfront and pedestrian connectivity
- Utility relocation.

<sup>1</sup> The traffic modelling at this stage adopted a conservative growth rate to be consistent with the Regional TRACKS model and other traffic modelling completed for Princes Highway projects in the area. Subsequent traffic modelling later tested the sensitivity of results to lower growth rates, as described in Section 4.3.1.

**Figure 4.1 Network delay (VHT) for shortlisted options at 2.7% growth per annum, 2015-2045**



The criteria that helped provide differentiation between the options included:

- Heritage impacts
- Environmental impacts
- Impacts on residential property owners
- Impacts on other sensitive property or future land use
- Work health safety and whole of life maintenance.

### Heritage

At the time of the options assessment no specific items of archaeological significance had been identified during searches of the Aboriginal Heritage Information Management System (AHIMS). The area was recognised as having a high potential of Aboriginal heritage however it was considered that any impacts would likely be common to all options.

Non-Aboriginal heritage listed items were identified in different locations within the study area (both local and state heritage). Buildings such as Graham Lodge which has state heritage listing is likely to be impacted by grade separated options on the southern side of the river.

### Biodiversity and Environment

An area of high conservation value was identified to the north of Bolong Road, with potential conservation value identified along creek line vegetation near Bomaderry Creek.

### Property and land use

Impacts on property were considered likely across all options however it was recognised these would be different for each option. Options involving grade separation to the north were considered likely to impact existing residential properties, businesses and farmland, while options involving grade separation to the south were considered likely to impact businesses and land identified by Shoalhaven City Council as having the potential to develop in the future.

## 4.2 Multi criteria assessment

A multi-criteria assessment process was adopted to evaluate the shortlisted intersection options. An *Options Assessment Workshop* was held on 20 November 2015 and involved the following:

- A review of available information
- Agreement of assessment criteria
- Identification of any 'fatal flaws' that could exclude a particular option
- Assessment using a qualitative performance matrix process.

### 4.2.1 Option assessment criteria

The assessment criteria were adopted from the considerations outlined in section 4.1.

The following assessment criteria were proposed and agreed by the workshop participants:

- Travel time on the Princes Highway
- Reduced delay on local roads (network VHT)
- Heritage
- Environmental impacts
- Impacts on residential property owners
- Impacts on other sensitive property or future land use
- Work health safety and whole of life maintenance.

### 4.2.2 Assessment approach

The assessment approach proposed and agreed to by the workshop participants included rating each of the shortlisted options relative to the others. No weightings were applied to the assessment criteria.

### 4.2.3 Assessment outcomes

Based on the agreed assessment criteria the workshop participants collectively rated each of the shortlisted options as shown in Table 4.1.

**Table 4.1 Performance matrix for multi criteria assessment**

Option	Highway travel time	Network VHT	Heritage	Environment	Residential Property	Property and land use	Maintenance
Option 1	Not assessed due to poor traffic performance						
Option 2	Not assessed due to poor traffic performance						
Option 3	✓	✓	✓✓	✓	✗	✓✓	✓
Option 4	✓✓	✓✓	✓	✗	✗	✗	✗
Option 5	✓✓	✓✓	✗✗	✗✗	✗	✗✗	✗✗
Option 6	✓✓	✓✓	✗	✗	✗	✗✗	✗✗
Key	✓✓ = Better, ✓=Good, ✗ = Poor, ✗✗=Worst						

Based on the results of the multi criteria assessment, Option 3 was considered the preferred option as it best balances the benefits with potential impacts.

## 4.3 Confirmation of preferred option

### 4.3.1 Preliminary design review

Once the preferred option was identified a series of design review were completed to further test the feasibility of the option. These reviews included a series of workshops to assess possible design issues and consulting with key stakeholders. As a result a number of features were identified for consideration and included:

- The likely need for a new bridge structure on the Princes Highway over Bomaderry Creek
- The likely need to relocate the Bridge Road intersection slightly to the south
- The likely need to relocate Pleasant Way as a result of the changes to the Bridge Road intersection.

### 4.3.2 Traffic efficiency review

Further modelling was undertaken of Option 3 to confirm its robustness by challenging a number of assumptions of the earlier traffic modelling.

Specifically the new traffic modelling was used:

- To test a less conservative traffic growth rate of 1.7 per cent
- To incorporate pedestrian phases at all intersections
- To test the relocation of the Pleasant Way intersection.

### Growth rate

Traffic modelling in the early stages of project development adopted a conservative growth rate of 2.7% to assess the impact of substantial increases in development planned within the study area over a compressed time period.

Further analysis of historical data for annual traffic volumes suggests the growth rate has been lower over the last two decades. It was therefore appropriate to test the impact of a lower growth rate. Roads and Maritime adopted a 1.7% growth rate for further analysis based on the latest traffic volumes and growth rates in the recently published *Princes Highway Corridor Strategy*.

### Pedestrian phases

Early modelling did not include pedestrian phases in the traffic light timings at each intersection. Given the long crossing lengths at some intersections it is appropriate that any impacts as a result of pedestrian phases should be tested.

### Relocation of intersections

During the identification and reviews of intersection options, potential benefits of relocating the Bridge Road intersection further to the south was identified. This change would result in turning movements into Pleasant Way problematic. To address this, a new Pleasant Way T-intersection further to the south was suggested.

**The results of the modelling review indicated:**

- The preferred option layout with a three lane bridge would reach the end of its design life in about 2031. By 2036 it would operate at a lower level of performance compared to current conditions
- The preferred option with a four lane bridge provides substantially improved performance and performs at an improved level compared to current conditions up to and beyond the 30 year project forecast.

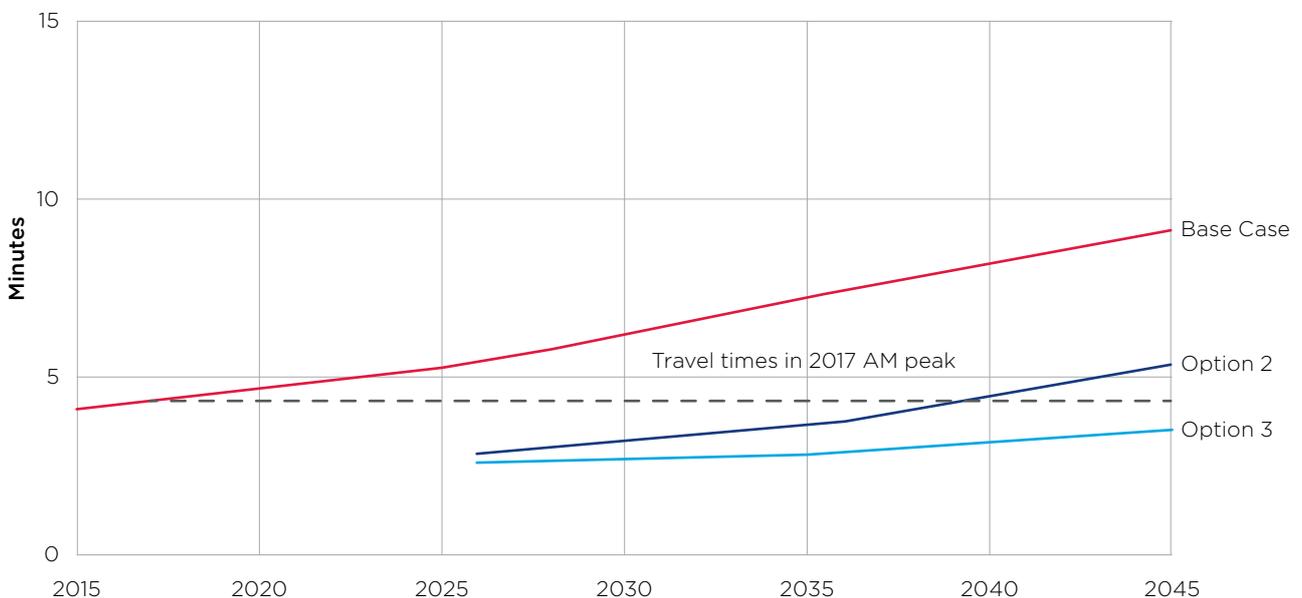
The travel time benefits of the preferred option over time when compared to the existing arrangement are shown in Table 4.2 and indicate a travel time saving of up to six minutes in 2036.

**Table 4.2 Average time saved by people travelling in the study area**

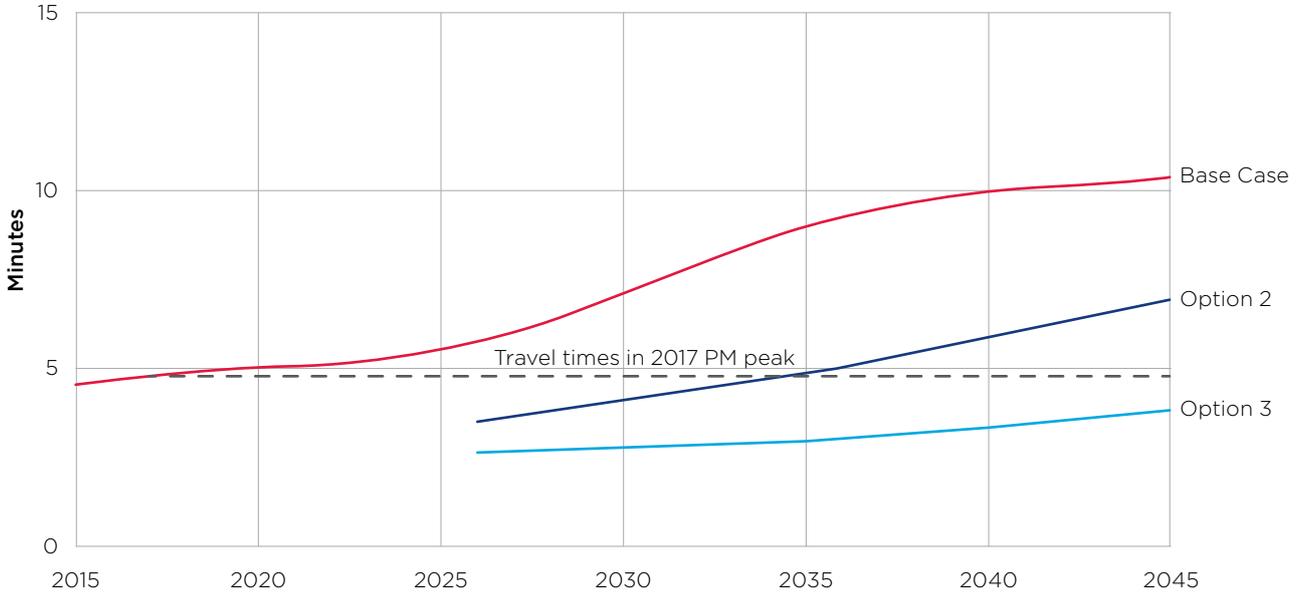
Year	Morning weekday peak period	Afternoon weekday peak period
2026	Around three minutes	Around three minutes
2036	Four and a half minutes	Over six minutes
2046	Close to six minutes	Over six and a half minutes

Figure 4.2 and Figure 4.3 show the comparison of the peak hour performance of the preferred option against the current traffic conditions. It also shows a comparison of an upgraded three lane bridge performance against the current layout. This indicates that under the preferred option (Option 3), traffic conditions usually experienced in the morning and afternoon peaks would not be reached within the 30 year project forecast.

**Figure 4.2 Average morning peak travel times for at grade intersection upgrade options, 2015-2045**



**Figure 4.3 Average afternoon travel times for at grade intersection upgrade options, 2015-2045**



Please note travel time results are shown as an average time saved by people travelling within the study area.

### 4.3.3 Constructability review

Roads and Maritime had previously identified possible issues during construction of any option at this location.

This is mainly due to the high traffic volumes accessing the area and the need ensure locals roads such as Illaroo Road can remain open to traffic during construction. Providing adequate space for site offices and ancillary sites for storage of equipment and materials was also an important consideration.

As such, Roads and Maritime engaged an independent construction specialist to carry out a review of the preferred option.

Specifically Roads and Maritime wanted to independently review and confirm:

- Traffic could be suitably managed during construction
- Work could be carried out safely during construction
- Potential property requirements and impacts.

As part of this review Roads and Maritime also considered:

- Bridge construction methods
- The extent of utilities within the area.

The review confirmed while there would be challenges during construction of the preferred option, there are no constructability issues which would prevent the preferred option from being built.

## 4.4 Conclusion

The results of the multi-criteria options assessment process discussed in Section 4 selected Option 3 as the preferred option.

Subsequent constructability and traffic efficiency reviews confirmed that the proposed preferred option is feasible and can provide improved traffic conditions across the network study area beyond the extent of the traffic model at 2046.

# 5 Preferred option

The preferred option is considered to be the most balanced proposal as it addresses the objectives of the project, meets the expectations of key stakeholders and the community and ensures that long term planning for the Princes Highway is not compromised while minimising impacts on the surrounding community and environment as much as possible.

The preferred option for the Nowra Bridge project includes:

- A new four lane northbound bridge immediately to the west of the existing bridge crossings
- Reconfiguration of the existing northbound concrete bridge to carry three southbound traffic lanes
- Intersection upgrades at Illaroo Road including additional turning lanes
- An upgrade of the Bridge Road intersection to a T-intersection with access to Pleasant Way removed
- A new Pleasant Way intersection further to the south with all turning movements provided
- Additional lanes on the Princes Highway between Bolong Road and Bridge Road
- Keeping the old southbound bridge for adaptive reuse such as a shared pedestrian and cyclist path.

The preferred option would:

- Improve safety, capacity and efficiency across the Shoalhaven River at Nowra
- Improve freight movements and access to the South Coast of NSW
- Improve travel times by up to around six minutes by 2036
- Improve pedestrian connectivity and access to the foreshore
- Preserve the heritage of the old southbound bridge
- Provide infrastructure for the future.

# 6 Next steps

## 6.1 Actions following the options assessment workshop

Roads and Maritime is progressing work on the concept design for the Nowra Bridge project and preparing the environmental assessment for the project. This will be on display later in 2018 for community and stakeholder feedback. We will continue to keep the community and stakeholders updated as the project progresses.

## 6.2 Preferred option

Roads and Maritime is seeking community and stakeholder feedback on the preferred option from **Monday 19 February 2018** until **Friday 23 March 2018**. Feedback from this display period will be used to develop the environmental assessment and design of the new bridge.

## 6.3 Meet the project team

We invite you to meet the project team, provide feedback and understand more about the preferred option. The project team will be at the following locations:

### **Stocklands Nowra**

Thursday 1 and Saturday 3 March 2018  
11am to 3pm  
60 East Street, Nowra

### **North Nowra Shops**

Thursday 8 and Saturday 10 March 2018  
11am to 3pm  
1-13 McMahons Road, North Nowra

### **Nowra School of Arts Annex**

Saturday 17 March 2018  
10am to 1pm  
Berry Street, Nowra



-  [rms.nsw.gov.au/nowrabridge](https://rms.nsw.gov.au/nowrabridge)
-  1800 331 713 (toll free)
-  Customer feedback  
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