

9. Structures

9.1 Cross section requirements for bridges

9.1.1 Highway

The Woolgoolga to Wells Crossing project contains a number of bridges along the length of the highway, required to either cross existing service roads, creeks or for new bridges over the highway.

The lengths of the bridges range between 45 m and 90 m. The bridges are generally reinforced concrete precast girder bridges.

The proposed distance between barriers on the bridges will be 11.0 m made up of:

- 1.0 m right shoulder.
- 2 x 3.5 m traffic lanes.
- 3.0 m left shoulder.

The 11.0 m width allows for the bridge cross section to match the upgrade road design cross section. The future requirement to upgrade the highway to motorway standard has allowed for widening on the inside for both carriageways. All minor bridges have been designed to allow adequate width to widen, so as to match the future motorway design cross section.

In addition to the 11.0 m width, shoulder widening has been provided as required to suit the sight distance requirements for bridges on curves, including the bridge crossing at Range Road, the new twin bridges at Halfway Creek and the new twin bridges at Wells Crossing.

9.1.2 Service roads

New bridges for service and access roads, either over or parallel to the highway will match the road width on the approaches and will be generally 11.0 m in width consisting of:

- 2 x 2.0 m shoulders.
- 2 x 3.5 m traffic lanes.

Shoulders may vary depending upon service road design speed, road geometry (barriers), sight distance and provision for cyclists.

The bridges over the new carriageways at Kangaroo Trail Road will be 12.0 m in width for the allowance of a shared cycleway / footpath.

9.2 Existing structures

The capacity of the existing structures on the highway have been reviewed and are the subject of the “Woolgoolga to Wells Crossing Preliminary Structures Planning Report (GHD, 2005)”. This report identifies a number of bridges along the existing highway that do not meet the design load requirements of AS5100.2 (2004) using SM1600 vehicle loads. They also do not meet the minimum cross sectional requirements stated in the RTA Pacific Highway Guidelines. As the indicative alignment in Section B and C is largely on a new alignment, the majority of the existing bridge structures on the existing highway are to be retained as part of the service roads strategy. The existing highway bridges likely to be reconstructed as part of the upgrade include:

- Halfway Creek bridge (Section E).

The bridges at the following locations are likely to be retained as part of the service road system:

- Corindi Creek Bridge (Section B).
- Blackadder Creek Bridge (Section B).
- Cassons Creek Bridge (Section B).
- Redbank Creek Bridge (Section B).
- Wells Crossing Bridge (Section E – motorway scenario).

It is anticipated that ownership and maintenance of each of the above bridges will be transferred to Coffs Harbour City Council or Clarence Valley Shire Council as appropriate.

In Section E it is unlikely that the existing bridge at Halfway Creek can be reused due to the indicative alignment of the proposed upgrade in this location. The alignment design for the highway upgrade has been significantly constrained by the need to reduce the impact two parcels of Indigenous owned land which has resulted in a horizontal alignment that precludes the existing Halfway Creek bridge being reused. For similar reasons, it is unlikely that the existing bridge over Wells Crossing could be reused as part of the proposed upgrade works. There is an opportunity however, to reuse the existing bridge over Wells Crossing as part of the proposed service road strategy in Section E. The existing bridge at this location does not satisfy the 1:100 year average recurrence interval flood immunity, so further investigation may be required if this option is taken up. The current bridge is non-conforming to the current cross sectional requirements in the Pacific Highway Guidelines with a width between barriers of 9.35 m versus a required width of 11 m. The existing bridge may also not satisfy current bridge design standards (AS5100.2, 2004) and further assessment and possible strengthening may be required as part of the detailed design phase of the project.

9.3 Bridges

9.3.1 Preliminary bridge designs

The bridges likely to be constructed for the arterial road upgrade are summarised in Table 9-1 below. A possible design for each of the bridges is shown in the concept design drawings.

Table 9-1 Indicative bridges

Chainage	Description	Type	No. of spans	Length (m)	Width (m)
4600	Overbridge at Kangaroo Trail Road	Precast prestressed T-roff girders	4	84	12
5560	Twin bridges over Corindi Creek	Precast prestressed RTA deck planks	6	90	11
11,360	Range Road Underpass	Refer Section 8.4	-	-	-
22,780	Twin bridges over Halfway Creek	Precast prestressed RTA deck planks	3	45 ¹	13 (NB) 11.2 (SB)
22,430	Twin bridges over Wells Crossing	Precast prestressed RTA deck planks	4	60	11 (NB) 13 (SB)

1. Existing bridge to be demolished and replaced with a bridge that meets current design specifications.

9.4 Range Road structure

There is a range of structures that may provide the functionality of the adopted solution described below. These alternate options are not discussed in this report and would be more closely examined in the detailed design phase of the project.

The adopted Range Road underpass structure allows the realigned existing Pacific Highway to pass under the new highway approximately 300 m south of the existing intersection at Range Road. The structure is approximately 110 m long and comprises of two vertical propped cantilever abutment retaining walls. The walls will be located either side of the realigned existing highway. Prestressed propping beams span between the two abutment walls to prop the retaining walls as well as supporting the bridge deck. The bridge deck is an insitu concrete composite deck using composite action with the propping beams. The bridge deck is stiffened along its edges of each carriageway with the integral concrete barriers. The structure remains open to the air due to the spacing of the propping beams minimising the requirements for lighting and ventilation as required for tunnels and underpasses.

The approaches to the underpass include reinforced soil wing walls on the eastern approach, and rock nailed cut batters on the western approach.

Widening of the carriageway over has been included on the northbound carriageway due to the sight distance requirements based on the radius of the horizontal alignment.

9.5 Design assumptions

9.5.1 Design life

The design life for all new structures has been adopted to be 100 years in accordance with AS 5100– Bridge Design and the “Upgrading the Pacific Highway — Upgrading Program beyond 2006 - Design Guidelines, July 2005, Issue 2.1”.

9.5.2 Design loads

Design loads for all new structures has been adopted to be in accordance with the AS 5100 – Bridge Design Code and relevant sections of the RTA Pacific Highway Guidelines.

The design vehicle adopted is SM1600 in accordance with AS5100.2.

HLP400 (Heavy Load Platform) has been allowed for in a restricted manner only, using strict traffic management and vehicle loading locations. Heavy Load Platform 400 loading has not been allowed for at Kangaroo Trail overbridge.

9.5.3 Clearances

The required vertical clearances to the soffit of all overbridges crossing the new highway have been adopted to be 5.3 m in accordance with the RTA Pacific Highway Guidelines.

The minimum vertical clearance provided to the soffit of bridges on service roads is 4.3 m. This has only been adopted where oversize or heavy vehicle access is not required, or there is an alternative route.

9.5.4 Barrier loads

All bridge barriers have been adopted to be medium level barriers in accordance with AS5100.

9.5.5 Foundation requirements

Generally, bored piles have been adopted at locations where adequate strength rock is found at appropriate depths. At other locations, such as river or creek crossings, driven piles have been adopted as the foundation support.

9.5.6 Flood immunity

All bridges designed to cross rivers, creeks or streams have allowed flood immunity for the 1:100 Year Average Recurrence Interval flood levels. The superstructure of these bridges has been designed to be above these levels including a 300 mm minimum freeboard.

Ultimate design of the bridges will be based on the 1:2000 year average recurrence interval flood levels in accordance with AS5100. Hold down restraint at all abutments and piers at all bridges affected by the 1:2000 year average recurrence interval flood levels has been included.

9.5.7 Pavement drainage

A minimum crossfall of 3 per cent has been adopted to match the road design and provide adequate pavement drainage. This crossfall is increased to 4 per cent where the longitudinal grade requires additional fall.

Where practical, the vertical alignment of the bridges has adopted a minimum longitudinal grade of 0.5 per cent to allow for pavement drainage along the bridge.

Drainage conduits have been provided within the barrier so as to capture pavement drainage and drain this to an appropriate location. No pavement drainage from the bridges has been allowed to fall directly into the creek without prior capture.

9.5.8 Public utilities

Conduits within the concrete bridge barriers have been allowed for on all bridges to allow for services and public utilities to run across the bridge in the future if required. Additional services may be provided within the pedestrian / cycleway on the Kangaroo Trail overbridges.

9.5.9 Fauna crossing

All bridges at existing creek locations will provide fauna access across the new highway alignment. Where required, the existing banks have been flattened so as to provide appropriate access at these locations as recommended by the Department of Environment and Climate Change.

9.6 Existing structures to be retained

The capacity of the existing structures on the highway has been reviewed and is the subject of a separate report¹. A number of bridges do not have the capacity to carry the design loads specified in AS 5100 and would need reconstructed or strengthened if these bridges are to be reused as part of the upgrade. However, because the indicative alignment in Section B and C is largely on a new alignment, the existing bridges would only be reused as part of the Service Road strategy.

The bridges at the following locations are likely to be retained as part of the service road system:

- Corindi Creek Bridge (Section B).
- Blackadder Creek Bridge (Section B).
- Cassons Creek Bridge (Section B).
- Redbank Creek Bridge (Section B).
- Wells Crossing Bridge (Section E – Class M Scenario).

¹ Pacific Highway upgrade – Woolgoolga to Wells Crossing: Preliminary Structures Planning Report (GHD 2005).

In Section E it is unlikely that the existing bridge at Halfway Creek can be reused due to the alignment of the proposed upgrade in this location. The alignment design for the Highway upgrade has been constrained by the need to reduce the impact two parcels of Indigenous owned land which has resulted in a horizontal alignment that precludes the existing Halfway Creek bridge being reused. For similar reasons, it is unlikely that the existing bridge over Wells Crossing could be reused as part of the proposed upgrade works. There is an opportunity however, to reuse the existing bridge over Wells Crossing as part of the proposed service road strategy in Section E.