

## 6. Selection of the preferred route

### 6.1 Wells Crossing to Harwood Bridge

The process of arriving at a preferred route for the project between Wells Crossing and Harwood Bridge involved a number of stages in the development and assessment of options, as described in this report. The key stages are summarised in **Figure 6-1**.

#### 6.1.1 Inputs to the decision on the preferred route

The project team held a two day route selection workshop in April 2006 to consider the route options and form a recommendation on a preferred route.

The consideration of route options was based on:

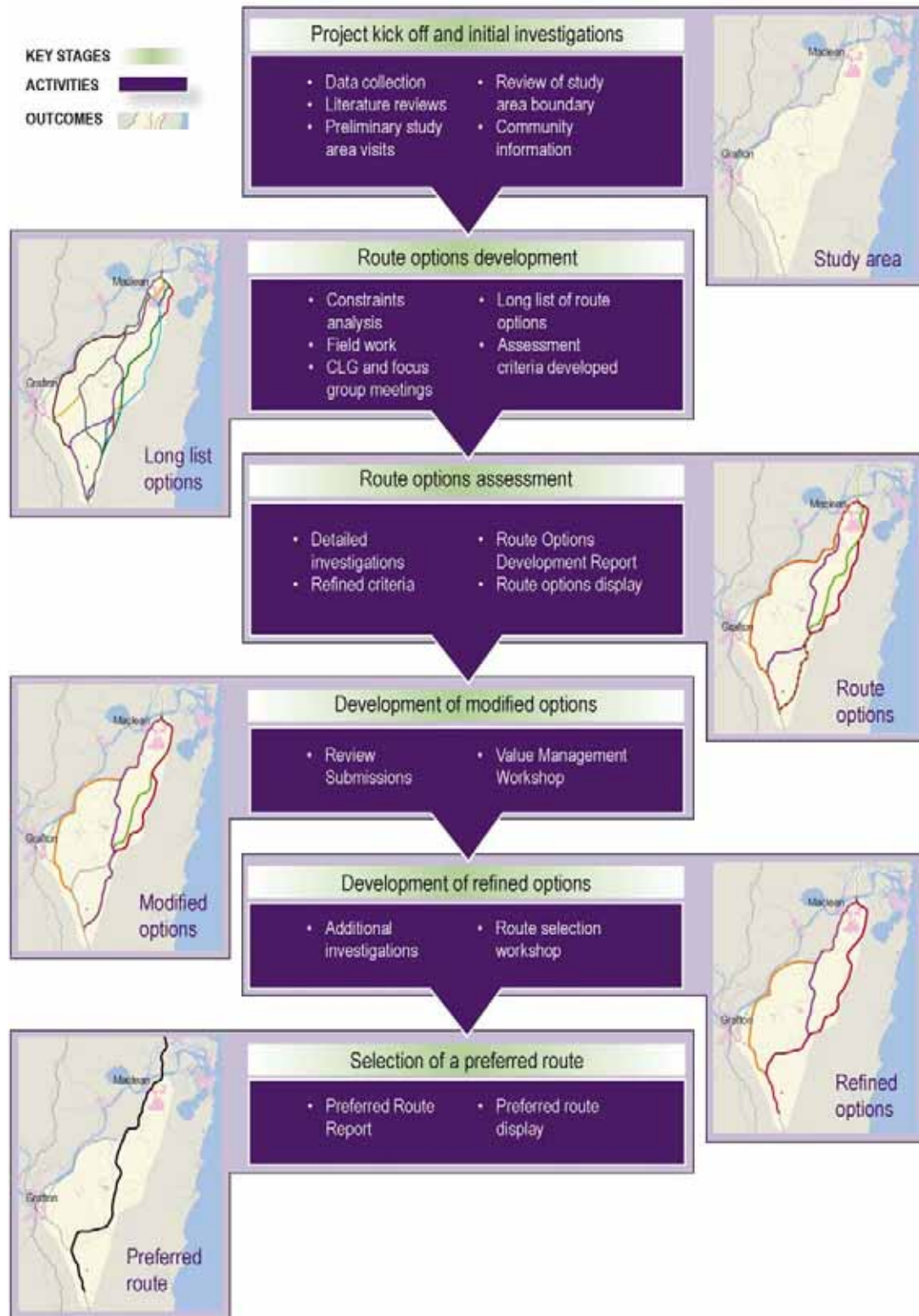
- A review of the assumptions, criteria and weightings used at the Value Management Workshop.
- Analysis of the findings from additional technical investigations (as summarised in **Section 5.4**), along with the findings of investigations presented in the *Route Options Development Report* (RTA, 2005) and finalisation of Working Papers.
- Review and analysis of the issues raised by the community as reported in the *Route Options Submissions Report* (RTA, 2006h), and consideration of implications for the selection of a preferred route.
- Further assessment and comparison of route options by the project team, using the same general approach as for the Value Management Workshop, but using revised criteria and weightings.

The outcome of the workshop was a preliminary recommendation of a preferred route, subject to further investigation and refinement.

#### 6.1.2 Criteria for the selection of a preferred route

The assessment criteria used in the route selection workshop were developed specifically to address the Pacific Highway Upgrade Program objectives and the project objectives. The project team re-examined the criteria used at the Value Management Workshop to address the potential for “double-counting” of some impacts, or to ensure that criteria were appropriate given the availability of data to evaluate the performance of the options. A refined set of criteria were developed, based on and closely reflecting the criteria from the Value Management Workshop. These criteria were then weighted by the workshop participants. The route selection criteria and weightings are summarised in **Table 6-1**.

■ **Figure 6-1: Route selection process**



■ **Table 6-1: Route selection criteria and weightings**

Functional	Social and Local Economic	Natural Environment
<ul style="list-style-type: none"> <li>■ Transport efficiency (travel times) (28%)</li> <li>■ Engineering risk (15%)</li> <li>■ Effective access to highway and local road network (5%)</li> <li>■ Ability to stage (0%)</li> <li>■ Safer 'traffic corridor' (52%)</li> </ul>	<ul style="list-style-type: none"> <li>■ Impact on Aboriginal heritage and culture (16%)</li> <li>■ Impact on non-Aboriginal heritage and culture (3%)</li> <li>■ Impacts of noise on existing and new receivers (17%)</li> <li>■ Extent of homes/residences lost (19%)</li> <li>■ Impact on local businesses (6%)</li> <li>■ Impact on farms and productive lands (15%)</li> <li>■ Social and economic risks of changes in flood impacts (12%)</li> <li>■ Impacts on amenity (12%)</li> </ul>	<ul style="list-style-type: none"> <li>■ Impact on native vegetation lost including threatened flora species (25%)</li> <li>■ Impact on EECs, SEPP 14 and other wetlands (30%)</li> <li>■ Impact on high value habitat including threatened fauna species (25%)</li> <li>■ Impacts on wildlife corridors (10%)</li> <li>■ Impacts of water quality and quantity on aquatic ecosystems (10%)</li> </ul>

Note: the weighting of each criterion is indicated in brackets.

### 6.1.3 Assessment of the route options

The route options were re-evaluated at the route selection workshop using a similar process to that of the Value Management Workshop, outlined in **Section 5.3**. The re-evaluation also took into consideration issues raised by the community and the results of additional technical investigations undertaken since the display of the route options and the Value Management Workshop, particularly in relation to flooding and ecology. The process included a number of stages:

- Paired comparison of the sections of options (shown on **Figure 5-1**) to determine the best possible combination of sections for each option. This resulted in the development of 'refined' options.
- Evaluation of the entire length of each of the new refined options from Wells Crossing to Harwood.
- Consideration of the proposed upgrade options between Harwood and Iluka Road, including options east of Harwood and along the existing highway.

### Paired comparison of sections 1+6 and section 9

At the Value Management Workshop, it was not possible to reach agreement as to whether sections 1+6 or section 9 was the preferred section (refer **Figure 5-1**). To progress the evaluation, it was agreed that section 9 would proceed to further the assessment, but that additional investigation was necessary. At the route selection workshop, sections 1+6 and section 9 were compared using updated information from additional investigations to determine which of the alternative routes performed the best against the criteria. The results of the ranking of the sections are summarised in **Table 6-2**.

#### ■ **Table 6-2: Paired comparison of sections 1+6 and section 9**

Criteria	Sections 1+6	Section 9
Functional Criteria	325 (2)	386 (1)
Social and Economic Criteria	380 (1)	382 (1)
Natural Environment Criteria	410 (1)	405 (1)
Cost	\$270 million	\$240 million

Note: A ranking of 1 indicates the best performing option. Where the difference in scores between the paired comparisons was not greater than the value of the highest weighted criterion (as shown in **Table 6-1**), the options were considered to have performed equally and were therefore ranked equally. For the functional criteria the value of the highest weighted criterion was 52, for social and economic this was 19 and for natural environment this was 30.

The paired comparison initially indicated section 9 to be preferable, on the basis of cost and functional criteria. However, the workshop participants further reviewed the findings of the comparison with reference to knowledge of community issues and consideration of the weighting of criteria as it applies to this part of the project. The participants collectively acknowledged the views that have been expressed by the Clarence Valley Council and business and community representatives in relation to locating interchanges as close as possible to Grafton. The participants concluded that local access and connections to Grafton should be given greater emphasis. Impacts on rural communities around Franklins Road and in Pillar Valley were also important considerations, as were the findings of additional ecological investigations.

In relation to the functional criteria, discussion amongst the workshop participants resulted in the following key conclusions:

- Section 1 would be used by the majority of corridor traffic, including local, regional and through traffic. A higher proportion of road users would benefit from the project as a result.
- Higher proportions of traffic using sections 1+6 as compared to section 9 would mean improvements in safety for a greater number of road users, of all categories.
- The interchange at Glenugie was identified by community, business and Council representatives at the Value Management Workshop as very important in terms of

managing the local economic impacts of the project. Those representatives argued strongly in favour of sections 1+6, with the interchange at Glenugie. This interchange location provides opportunities for existing and potential new businesses to benefit from the upgraded highway improving regional access to markets. It would locate the upgraded highway in closer proximity to Grafton and the growing commercial/industrial suburbs of South Grafton and with the best opportunity for access to Grafton Airport.

- The ability to initially construct section 1 as part of an overall staged development of the preferred route and improvements to the existing highway contributes to the better performance of the preferred route on economic grounds.

In relation to the social and local economic criteria, discussion amongst the workshop participants resulted in the following key conclusions:

- Following the existing highway corridor through Glenugie State Forest for section 1 avoids severance and other impacts on private properties. It would impact mostly on publicly owned land in the State Forest where it would create edge effects rather than a new corridor.
- Section 1 results in minimal changes in noise affectation and minimal changes in the amenity of rural areas outside the area of influence of the existing highway.
- Section 9 would create a new corridor through mostly privately owned properties. This would result in high property severance impacts and these would be in relatively remote areas with a greater resultant impact on the amenity of rural residents. These impacts would also result in parts of section 6.
- Amenity impacts of section 9 are high because of the isolation of areas that it passes through. These additional impacts are avoidable by following the existing highway, as with section 1. These impacts would also result in parts of section 6 for some properties, but to a lesser extent than for section 9.
- Section 9 passes to the eastern side of the Pillar Valley locality and would impact substantially on the character of this area. Section 6 passes to the west of Pillar Valley and would have some impacts on Pillar Valley, but to a lesser extent than section 9.
- Pillar Valley and its proximal area are highly sensitive in relation to Aboriginal cultural sites that have been identified to date. Consultation with relevant Tribal Groups has indicated that section 9 would not impact directly on these sites, but would pass very close to them. The risk of indirect impacts and impacts on the context of these areas of high cultural value is much higher for section 9 than for sections 1+6.
- Potential accessibility to the upgraded highway for local businesses that rely on it, or for access to Grafton, is a major benefit of sections 1+6 with an interchange at Glenugie. This has been identified by the community, Council and local business representatives as a

significant issue and these representatives at the Value Management Workshop argued very strongly for inclusion of this option to provide benefits to the local economy.

In relation to the natural environment criteria, discussion amongst the workshop participants resulted in the following key conclusions:

- Section 1 follows the existing highway corridor. The proposal would widen the existing corridor rather than creating a new corridor and severing areas that are currently largely intact.
- Section 6 traverses areas of relatively lesser ecological value, having been subject to ongoing agricultural activities and land clearing.
- Section 9 would result in far greater severance of areas of remnant native vegetation and areas with high habitat values, when compared to sections 1+6.
- The potential risk of impacts on Endangered Ecological Communities at the crossing of the Coldstream River for section 6 has been further assessed as part of the refinement of the recommended route. The crossing location has been carefully positioned to restrict impacts to (relatively degraded) areas of Endangered Ecological Communities.
- Section 9 has substantially greater potential to impact on fauna corridors in an east-west direction between the forest habitats of the Coast Range and the wetland habitats of the floodplain.

On balance, it was concluded that sections 1+6 were preferable to section 9. Sections 1+6 provide the opportunity for an interchange substantially closer to Grafton than section 9, and this issue has been identified by Clarence Valley Council and community representatives at the Value Management Workshop as important to the economic sustainability of Grafton and surrounds. Sections 1+6 would have less substantial social impacts because the route follows the existing highway in part and can be aligned to minimise property impacts north of Glenugie State Forest. Section 9 would impact on the Franklins Road and Pillar Valley communities, and present greater risks of impacts on sites of very high Aboriginal cultural significance. Sections 1+6 would pass through areas that are fragmented and degraded, and of lesser ecological value than the relatively intact bushland in the area of section 9. Section 9 has greater potential for impacts on the natural environment than sections 1+6 because of the extent of native vegetation and habitat to be cleared and the potential for impacts on fauna corridors. Section 9 would fragment a large area of intact remnant vegetation, and sever fauna corridors that pass from east to west through forested areas to the floodplain. For these reasons, the workshop participants decided to progress sections 1+6 to the next stage of assessment.

### Paired comparison of sections 16+4 versus Section 8

Sections 16+4 comprise the Tyndale connection between the Purple/B and Orange/A options and the section of the Orange/A option north of Tyndale (refer to **Figure 5-1**). Section 8 is part of the Purple/B option that passes east of Tyndale and connects to the existing highway at Shark Creek. These sections were compared to determine which section would best contribute to development of a Refined Purple option. The results of the paired comparison at the route selection workshop are summarised in **Table 6-3**.

■ **Table 6-3: Paired comparison of Sections 16+4 and section 8**

Criteria	Section 16+4	Section 8
Functional Criteria	414 (1)	357 (2)
Social and Economic Criteria	355 (2)	488 (1)
Natural Environment Criteria	480 (1)	230 (2)
Cost	\$310 million	\$310 million

Note: A ranking of 1 indicates the best performing option. Where the difference in scores between the paired comparisons was not greater than the value of the highest weighted criterion (as shown in **Table 6-1**), the options were considered to have performed equally and were therefore ranked equally. For the functional criteria the value of the highest weighted criterion was 52, for social and economic this was 19 and for natural environment this was 30.

It was concluded that Sections 16+4 perform better on functional criteria. This is largely associated with the inclusion of an interchange at Tyndale, which would greatly improve the performance of this option in terms of attracting local and regional traffic between Tyndale and Harwood Bridge.

The social impacts of Sections 16+4 were assessed to be higher than for section 8, primarily because of proximity to Tyndale, the number of houses that would need to be acquired and the impacts on prime agricultural land. A key outcome of the comparison of these options was an undertaking to investigate refinements to the alignment of Sections 16+4 to minimise impacts on houses and farm land.

Sections 16+4 perform better in relation to the natural environment criteria. This is because they avoid the Shark Creek wetlands and would require less vegetation clearing. Section 4 follows the existing highway corridor and would therefore have less potential for severance of fauna corridors and impacts on other ecological values such as wetlands and Endangered Ecological Communities.

Sections 16+4 were taken forward to the next stage of the assessment. This is consistent with the evaluation of these sections at the Value Management Workshop, although at that stage it was recognised that further investigation of some issues was necessary to confirm this conclusion.

### Paired comparison of section 12 and section 15

The workshop compared section 12 and section 15, the northern sections of the Green/C and Red/D options, to determine which would perform best in connecting an easterly option to Harwood Bridge (refer to **Figure 5-1**). The results of the paired comparison at the route selection workshop are summarised in **Table 6-4**.

■ **Table 6-4: Paired comparison of section 12 and section 15**

Criteria	Section 12	Section 15
Functional Criteria	330 (1)	285 (1)
Social and Economic Criteria	340 (2)	390 (1)
Natural Environment Criteria	335 (2)	430 (1)
Cost	\$200 million	\$225 million

Note: A ranking of 1 indicates the best performing option. Where the difference in scores between the paired comparisons was not greater than the value of the highest weighted criterion (as shown in **Table 6-1**), the options were considered to have performed equally and were therefore ranked equally. For the functional criteria the value of the highest weighted criterion was 52, for social and economic this was 19 and for natural environment this was 30.

The workshop participants concluded that section 15 best met the objectives of the project. The sections perform equally against the functional criteria, because the sections were similar in terms of a safe transport corridor, transport efficiencies and ability to stage. Against both the social and natural environment criteria, section 15 performed better than section 12, which is much closer to the communities of Gulmarrad and James Creek. These issues were particularly emphasised by the community in the vicinity of these sections, and the evaluation took into consideration issues raised in submissions. Maximising the separation distance of the road from these communities to avoid noise, visual and other amenity impacts were the key determinants of the better performance of section 12 against the social and local economic criteria.

While section 15 has a higher cost estimate, cost was not a significant factor in the decision.

A number of environmental factors contributed to section 15 ranking higher than section 12 in the comparison. Section 12 would have more direct impact on Endangered Ecological Communities east of James Creek. These areas include known habitats for water birds, some of which are threatened species. In addition, section 12 is located upstream of a SEPP 14 wetland and therefore presents greater risk of water quality impacts on the wetland. While section 15 is closer to Wooloweyah Lagoon than section 12, it is sufficiently set back to minimise the risk of impacts.

On balance, the workshop participants agreed that section 15 should proceed to the next stage of assessment. This is consistent with the evaluation of these sections at the Value Management Workshop.



### Paired comparison of sections 17+5 and sections 11+15

Sections 17+5 link from the Green/C option north of Shark Creek across to the existing highway and then north to Harwood Bridge (refer to **Figure 5-1**). Sections 11+15 also commence north of Shark Creek. These sections were compared to determine whether a better outcome would be achieved through a refined Green option that re-connects to the existing highway near Shark Creek or that traverses to the east of Gulmarrad and reconnects at Harwood Bridge. The results of the paired comparison at the route selection workshop are summarised in **Table 6-5**.

■ **Table 6-5: Paired comparison of sections 17+5 and sections 11+15**

Criteria	Sections 17+5	Sections 11+15
Functional Criteria	305 (1)	340 (1)
Social and Economic Criteria	384 (2)	438 (1)
Natural Environment Criteria	420 (1)	310 (2)
Cost	\$460 million	\$270 million

Note: A ranking of 1 indicates the best performing option. Where the difference in scores between the paired comparisons was not greater than the value of the highest weighted criterion (as shown in **Table 6-1**), the options were considered to have performed equally and were therefore ranked equally. For the functional criteria the value of the highest weighted criterion was 52, for social and economic this was 19 and for natural environment this was 30.

The comparison of these sections resulted in mixed conclusions for the various criteria. The sections were assessed to perform equally in relation to the functional criteria. Sections 17+5 present higher construction risks associated with longer lengths within the floodplain and the need to work near traffic on the existing highway for section 5. However, the ability to stage the construction of sections 17+5 (by building section 5 first) is an advantage over sections 11+15, which have no opportunities for staged construction. On balance, the advantages and disadvantages of each of the sections equalise the options.

Sections 11+15 performed marginally better against the social and local economic criteria. This is primarily because it would have less direct impacts on houses and prime agricultural land than sections 17+5.

Sections 17+5 performed significantly better against the natural environment criteria. This is primarily because it follows the existing highway for much of its length, whereas sections 11+15 would be an entirely new corridor through some areas with very high habitat values. Sections 11+15 would also impact on higher quality Endangered Ecological Communities east of James Creek.

Cost was a significant consideration in the comparison of these sections. Sections 17+5 are approaching twice the cost of sections 11+15. The cost of sections 17+5 would contribute to an additional \$200 million in the overall project cost. These sections were not seen to provide significant advantages over sections 11+15 in relation to the other route selection criteria. On balance, and including cost considerations, sections 11+15 were progressed to the next stage of

assessment. This is consistent with the evaluation of these sections at the Value Management Workshop.

### Paired comparison of sections 18+11 and section 14

Sections 18+11 and section 14 are options for the middle section of the Red/D option, north of Shark Creek to approximately Brooms Head Road (refer to **Figure 5-1**). Paired comparison of these sections was undertaken to determine whether a refined Red option would perform better by following the route of the Red/D option, or traversing the Shark Creek Range (using section 18) and following the Green/C alignment (section 11). The results of the paired comparison at the route selection workshop are summarised in **Table 6-6**.

■ **Table 6-6: Paired comparison of sections 18+11 and section 14**

Criteria	Sections 18+11	Section 14
Functional Criteria	367 (2)	490 (1)
Social and Economic Criteria	358 (1)	300 (2)
Natural Environment Criteria	385 (1)	350 (2)
Cost	\$88 million	\$79 million

Note: A ranking of 1 indicates the best performing option. Where the difference in scores between the paired comparisons was not greater than the value of the highest weighted criterion (as shown in **Table 6-1**), the options were considered to have performed equally and were therefore ranked equally. For the functional criteria the value of the highest weighted criterion was 52, for social and economic this was 19 and for natural environment this was 30.

Against the functional criteria, section 14 performed better than sections 18+11. This is because it is a flatter and more direct route than sections 18+11, so would have better travel efficiency and less construction risks. In terms of the social and local economic criteria the better performance of sections 18+11 was primarily due to avoidance of houses in the Taloumbi/Wallaby Lane area, south of Brooms Head Road. Sections 18+11 performed slightly better against the natural environment criteria than section 14 because section 14 would impact on a greater area of Endangered Ecological Communities. Cost was not a significant differentiator between these sections.

On balance, the workshop participants agreed that sections 18+11 should proceed to the next stage of assessment. This is consistent with the evaluation of these sections at the Value Management Workshop.

### Paired comparison of section 10 and sections 13+18

Section 10 and the combination of sections 13+18 were compared to differentiate between the middle sections of the Green/C and Red/D options (refer to **Figure 5-1**). Section 10 was part of the Modified Green option and Section 13 was part of the Modified Red option as assessed at the Value Management Workshop.

■ **Table 6-7: Paired comparison of section 10 and sections 13+18**

Criteria	Section 10	Sections 13+18
Functional Criteria	386 (1)	343 (1)
Social and Economic Criteria	354 (1)	370 (1)
Natural Environment Criteria	365 (2)	430 (1)
Cost	\$315 million	\$310 million

Note: A ranking of 1 indicates the best performing option. Where the difference in scores between the paired comparisons was not greater than the value of the highest weighted criterion (as shown in **Table 6-1**), the options were considered to have performed equally and were therefore ranked equally. For the functional criteria the value of the highest weighted criterion was 52, for social and economic this was 19 and for natural environment this was 30.

The paired comparison concluded that functional and social criteria were not able to be differentiated between these sections. The comparison also concluded that section 10 has greater potential impacts on the natural environment than sections 13+18. This is because of impacts on the Shark Creek SEPP 14 wetland, high value habitat and high quality Endangered Ecological Communities. This conclusion was based on additional ecological investigations that were undertaken after the Value Management Workshop. With all other factors being assessed as equal, sections 13+18 were progressed to the next stage of assessment.

These sections of the options were not subject to paired comparison at the Value Management Workshop. The paired comparison at the route selection workshop enabled the options to be further refined, and resulted in progression of the Orange/A option and two refined options to the next stage of assessment, rather than the Orange/A and three modified options that were assessed at the Value Management Workshop. Orange/A is unable to be refined. The two refined options that were progressed were Refined Purple and Refined Red, as discussed in the following section.

### **Assessment of the refined options**

The paired comparisons of sections of the options resulted in the definition of refined options, similar to those developed at the Value Management Workshop (as described in **Section 5.3** and illustrated on **Figure 5-2**). These are shown on **Figure 6-2**. The refined options are made up of sections of the route options (refer **Figure 5-1**) as follows:

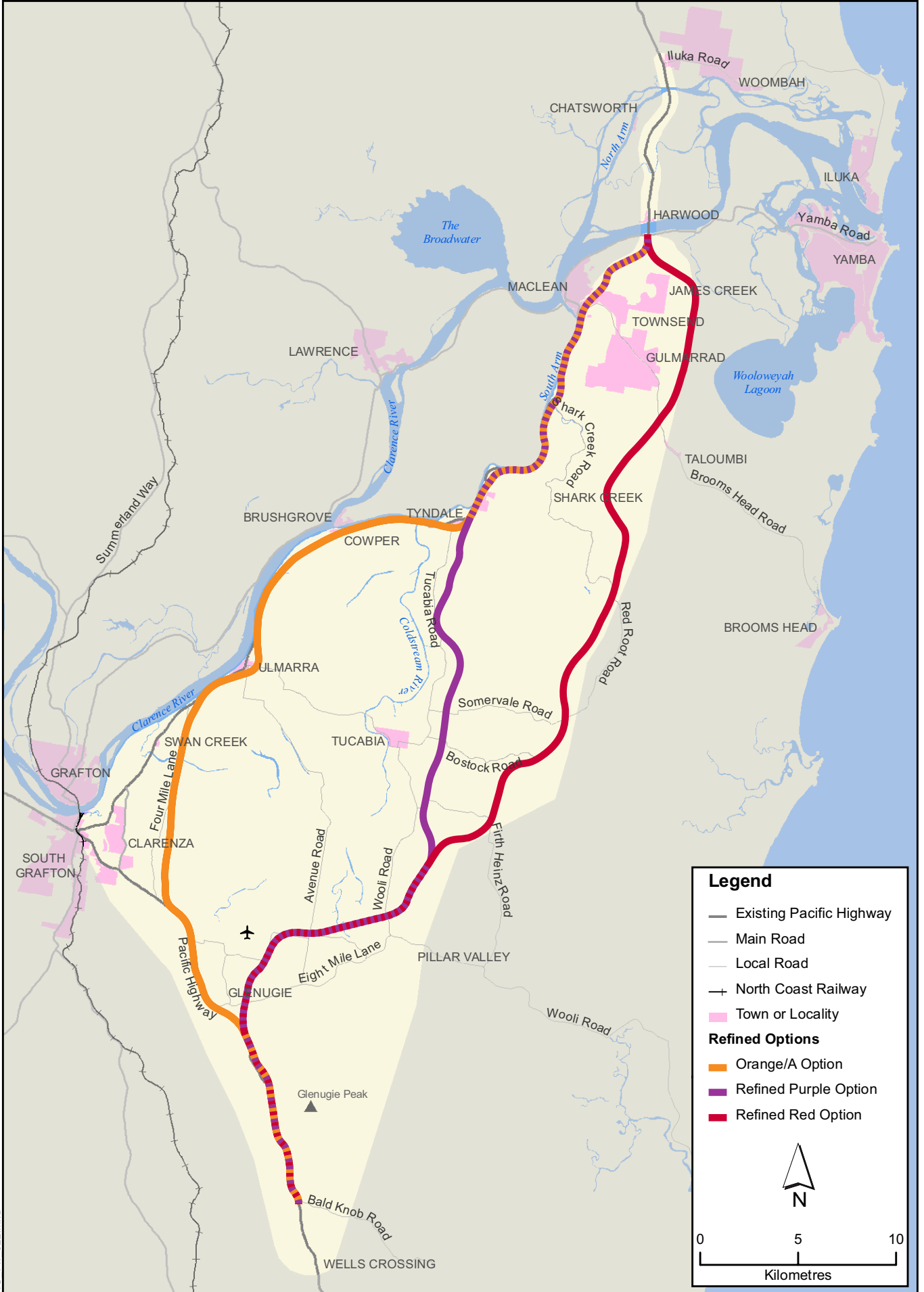
- Orange/A option. The original Orange/A option, which is not able to be refined by combining sections of other options.
- Refined Purple option. This option comprises sections 1, 6, 7, 16, 4 and 5.
- Refined Red option. This option comprises sections 1, 6, 13, 18, 11 and 15.

However, some key differences emerged between the modified options developed at the Value Management Workshop and the refined options. These were:

- Adoption of sections 1+6 for the easterly options, rather than section 9.
- Adoption of sections 13+18 rather than section 10, which resulted in progression of a Refined Red option rather than a Refined Green option to the next stage of assessment.

The next stage of assessment at the route selection workshop was the evaluation of the full length of the Orange/ A option and refined options, from Wells Crossing to Harwood Bridge.

The Orange/A option and refined options were assessed against the criteria in **Table 6-1**. Conclusions were drawn from the overall assessment and the results of the assessment were compared with the outcomes from the Value Management Workshop. The scores for each of the modified options from the Value Management Workshop and the refined options are summarised in **Table 6-8**.



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Wells Crossing to Iluka Road  
Upgrading the Pacific Highway

**Figure 6-2: Refined options**

■ **Table 6-8: Ranking of options from the Value Management Workshop and route selection workshop**

Option	Modified options assessed at the Value Management Workshop			Refined options assessed at the route selection workshop		
	Functional	Social and Economic	Natural Environment	Functional	Social and Economic	Natural Environment
<b>Orange/A</b>	372.5 (1)	299 (3)	464 (1)	384 (2)	223 (3)	470 (1)
<b>Modified/ Refined Purple</b>	381.5 (1)	311.5 (3)	282 (2)	465 (1)	335 (2)	300 (2)
<b>Modified Green</b>	362 (1)	358 (1)	268 (3)	-	-	-
<b>Modified/ Refined Red</b>	345.5 (1)	363.5 (1)	198 (4)	410 (2)	442 (1)	195 (3)

Note: The number is the raw score of the option when assessed against the criteria within each assessment perspective. The number in brackets (from 1 to 4 for the Value Management Workshop and 1 to 3 for the route selection workshop) is the ranking of the options based on that score.

A ranking of 1 indicates the best performing option. Where the difference in scores between the paired comparisons was not greater than the value of the highest weighted criterion (as shown in **Table 6-1**), the options were considered to have performed equally and were therefore ranked equally. For the functional criteria the value of the highest weighted criterion was 52, for social and economic this was 19 and for natural environment this was 30.

The cost estimates for the modified options are provided in **Table 5-6**. The estimates for the refined options are shown in **Table 6-9**. The estimates were updated to reflect extra costs for bridges identified from additional flood modelling, including bridges for the Orange/A option at Swan Creek and other locations in the Coldstream Basin as well as Shark Creek; bridges for the Refined Purple options at Shark Creek; and additional length of floodplain bridges for the Refined Red option east of Gulmarrad. In addition, the cost of an interchange was included at Tyndale for the Refined Purple option.

■ **Table 6-9: Revised cost estimates, from the route selection workshop**

Option	Length (km)	Cost estimate
Orange/A	65.6	\$1,713 million
Refined Purple	61.5	\$1,288 million
Refined Red	63.2	\$1,130 million

Costs are in \$2006

The ranking of the refined options at the route selection workshop was broadly consistent with the ranking of the modified options at the Value Management Workshop.

At the Value Management Workshop it was assumed that interchanges would be located south of Harwood Bridge and at Bald Knob Road only for the Modified Purple option. This resulted

in poor performance in terms of access to Grafton and other towns, as well as attracting local and regional traffic. The Refined Purple option included an interchange at Tyndale and therefore performed better functionally compared to the Modified Purple option and was assessed to have the best functional performance of all the route options.

Further assessment of the traffic and transport impacts of the refined options has been undertaken, and is described in the *Traffic and Transport Working Paper* (RTA, 2006j). This assessment indicates that the Refined Purple option would attract the majority of all traffic from the existing highway between Tyndale interchange and Harwood Bridge, and a proportion of local and regional as well as all through traffic from Glenugie interchange to Tyndale interchange. It achieves a balance between serving the needs of through traffic by reducing travel time and distance, and attracting local and regional traffic, thereby providing benefits to a greater proportion of road users than previously anticipated.

In comparison, the Orange/A option would attract the majority of local, regional and through traffic, but would provide less benefits to through traffic because it is longer. The Refined Red option would attract only through traffic, and local and regional traffic would need to continue to use the existing highway. Of the refined options, Refined Purple is the shortest and would result in the greatest travel time savings for through traffic.

The assessment of the options at the route selection workshop assumed that the Refined Purple and Refined Red options would be developed in conjunction with a package of improvements to the existing highway, as described in **Section 5.4.1**. However, because the Refined Purple option would attract more traffic to it (in some sections) than the Refined Red option it would achieve greater safety improvements than the Refined Red option, even with improvements to the existing highway.

The inclusion of the Tyndale interchange and sections 1+6 (with an interchange at Glenugie) was assessed to result in improved performance of the Refined Purple option in relation to impacts on the local economy and businesses. This is because it would enable relatively direct access to Grafton, is close to Grafton Airport, and would enable traffic to exit the upgraded highway and travel along the existing highway to visit towns like Ulmarra. The Refined Purple option would impact on cane farms along the existing highway north of Tyndale. It would also require acquisition of a number of houses along the highway in this section.

The Refined Red option was assessed to perform best in terms of minimal potential for noise impacts, acquisition of houses and impacts on agricultural land. It would result in larger changes in amenity for residents in more remote parts of the study area that are not currently subject to impacts from major roads. It would also divert through traffic a long distance from

Grafton, and has the potential to have a greater adverse impact than the other options on the local economy.

The Orange/A option was assessed to have the greatest potential for social impacts because the many houses requiring acquisition, the potential for impacts on agricultural land and of the number of people predicted to experience noise impacts,. Importantly, for the Orange/A option between South Grafton and Tyndale the risk of flooding impacts is substantially greater than for the Refined Purple and Refined Red options, both of which avoid crossing the Coldstream basin floodplain. The risk of flooding impacts and the potential consequences of changes in flooding for rural communities and towns such as Grafton was a significant consideration in the ranking of the Orange/A option in the social and local economic criteria.

The potential risk of adverse flooding impacts between Tyndale and Harwood Bridge was assessed to be manageable given the much smaller scale of the Shark Creek basin and the nature of flood behaviour in that area.

There was greater differentiation between the scores for the natural environment criteria than for the other criteria. This indicates the greater relative difference in impacts of the options and is consistent with the Value Management Workshop.

The Orange/A option has the least potential for impacts on the highly sensitive ecological features of the study area, because it largely avoids areas of high value habitat, Endangered Ecological Communities and the fauna corridors that cross the eastern parts of the study area. It performs the best against the natural environment criteria. The Refined Purple option mostly avoids the areas of greatest ecological value in the study area. It would impact on some areas of high ecological value, including crossing the Coldstream wetlands and passing through the fringe of areas of high value habitat south of Tyndale. However, avoids many of the areas of greatest ecological value in the east of the study area. The Refined Red option was assessed to have a very high level of impact on the natural environment. It would fragment large areas of very high value habitat, sever fauna corridors and impact on a large area of the habitat of the coastal Emu sub-population. It would also impact on areas of relatively high quality Endangered Ecological Communities in the east of the study area.



### **Recommended preferred route**

Similar to the conclusion of the Value Management Workshop, no refined option emerged from the route selection workshop as clearly performing the best in relation to all three criteria groups of functional, social and local economic, and the natural environment. Functionally, options that attract a high proportion of total traffic are longer and less direct, and as a result do not perform well in terms of meeting the needs of through traffic. Because of the characteristics of the study area, options that perform well in terms of reducing social impacts tend to have a high environmental impact and vice-versa.

The selection of a preferred route is a process to identify the option that provides the best balance across all the criteria, as well as providing a cost effective solution.

The Refined Purple option has a positive cut and fill balance, meaning that more material would be obtained from excavation of cuttings than is required to provide fill for road construction across floodplain areas. This means that it would create minimal pressure on local sources of construction materials. In combination with improvements to the existing highway, the Refined Purple option has good potential for staged construction, and this is important because of the size of the project and the relatively high construction cost. Staging means that sections of the preferred route could potentially be operational earlier than if the entire route were constructed and opened as a single project.

Improvements to the existing highway could be implemented as the first stage of the upgrade, until such time as funding is available to construct the upgraded highway. The sections of the Refined Purple option that use the existing highway alignment south of Glenugie and north of Tyndale could also be built to Class A until traffic volumes require upgrading to Class M.

Interchanges at Glenugie and Tyndale would result in higher volumes of traffic using this option than the Refined Red option, providing benefits for local and regional traffic, as well as through traffic, which would experience reduced travel times and distances. All users of the Pacific Highway would benefit under this option from either improvements to the existing highway (and reduced volumes of large heavy vehicles) or the ability to use the new road for longer trips.

The provision of interchanges as proposed between the existing highway and the upgraded highway would also assist in providing access for emergency vehicles.

The Refined Purple option has a number of negative and some positive aspects in terms of social and local economic impacts. It would affect a number of people along the existing highway between Tyndale and Maclean through acquisition of houses and farm land. Between Glenugie and Tyndale it would affect noise and amenity in areas currently unaffected by a

highway and would result in severance and direct acquisition of farm land. These impacts will be assessed and minimised through the detailed design phase in consultation with landholders.

Benefits of the Refined Purple option for the local community relate to reductions in traffic volumes through towns, opportunities for local businesses that rely on the highway to continue to operate, and opportunities for new enterprises to develop. Interchanges at Glenugie, Tyndale and Yamba Road would provide relatively direct access to the main employment centres of Grafton, Maclean and Yamba. The interchanges at Glenugie and Tyndale would lessen the potential for direct adverse economic impacts on Grafton and other towns and businesses along the existing highway.

The Refined Purple option avoids impacts on the majority of areas of high conservation value, which are mainly located in the east and north-east of the study area. It would result in some impacts on Endangered Ecological Communities and the fringes of areas identified as having high habitat values. Potential impacts on fauna access to the Coldstream wetlands may be mitigated by the inclusion of long bridges in the design that will also act as fauna crossings, but the effectiveness of this is subject to further investigation. By comparison, the Refined Red option would substantially fragment high value habitat areas, impact on areas of high quality Endangered Ecological Communities, involve a greater area of clearing of remnant bushland and would present a much higher risk of restricting access to the important wetland habitats of the floodplain and the habitat of the coastal Emu sub-population.

On balance, it was concluded at the route selection workshop that the option that best meets the objectives of the project is the Refined Purple option, combined with a package of measures to improve the safety of the existing highway. This option was assessed to perform the best because it avoids key risk areas in terms of both ecology and flooding and balances outcomes in relation to the functional, social and local economic, and environmental criteria.

## **6.2 Harwood Bridge to Iluka Road**

The upgrade of the highway between Harwood Bridge and Iluka Road, as presented at the route options display, allowed for widening of the existing highway to the east or west to create a Class A standard road. Following feedback from the community during the public display of the route options, the RTA undertook to investigate the feasibility of diverting the highway around Harwood to avoid potential impacts through the village that would be associated with upgrading along the existing highway.

The RTA reviewed three options including the upgrading of the existing highway (Option 1), an option to the east of Harwood Mill (Option 2) and an option west of Harwood (Option 3) (see **Figure 6-3**). Option 2 includes two sub-options to enable connection with the various route options under consideration for the project south of Harwood Bridge. Option 2A connects to

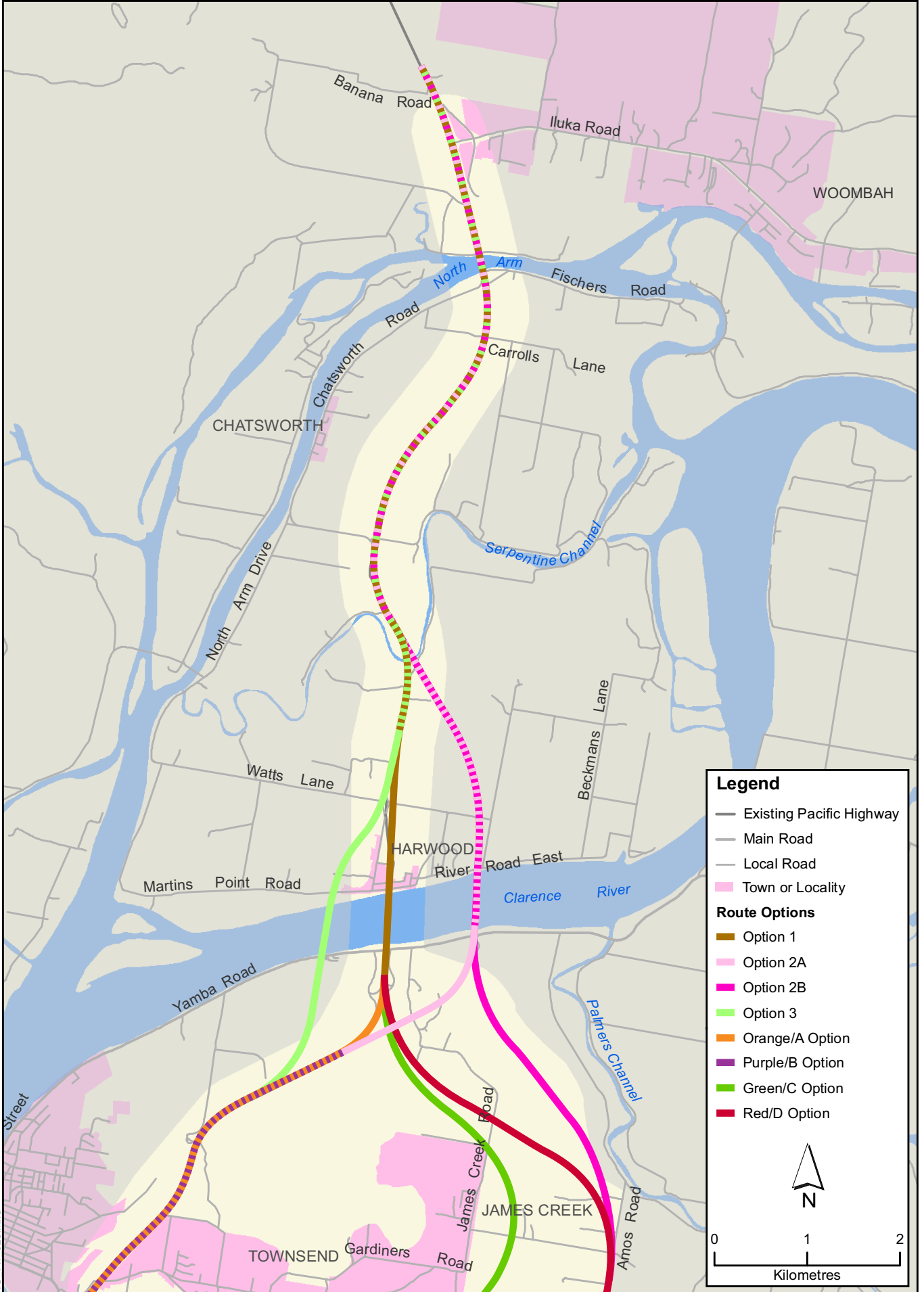
the Refined Purple and Orange/A options, while Option 2B connects to the Refined Red option. Because the Refined Purple option was progressed as the preferred route south of Harwood Bridge, the assessment summary that follows focuses on Option 2A.

The main issues addressed in the assessment of these options relate to community impacts on Harwood village and impacts on agricultural land. Assessment criteria similar to those adopted for the Wells Crossing to Harwood section of the project were used to evaluate the options for this section of the project. The main assessment criteria by which the options could be differentiated were:

- The extent of community severance and houses to be acquired.
- Impacts on the character and amenity of the local community including visual impacts.
- Heritage impacts.
- Impacts on productive agricultural land, including direct land take and severance of properties.
- Noise impacts.
- Ecological impacts, in particular impacts on Endangered Ecological Communities.
- The ability to stage the development of the road with initial development to Class A standard and potential for later upgrading to Class M.
- Potential impediments to use of the Clarence River as a working waterway, including boat access upstream and turning movements.

### **6.2.1 Community severance and houses to be acquired**

Option 1 would require widening of the existing highway road reserve to the east through Harwood village. The main impacts associated with this option would be direct land take and severance of the community of Harwood. The existing highway through Harwood village results in some severance of the community. Widening of the corridor for Option 1, by up to 50 additional metres, and construction of one or two new carriageways, would result in more substantial severance of the community. While physical links such as the connection along River Street between the two sides of the highway would be maintained, the perception of community fragmentation would be increased as a result of the widened road reserve. The upgraded highway would become a more prominent feature in the village.



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Wells Crossing to Iluka Road  
Upgrading the Pacific Highway

**Figure 6-3: Options assessed for the project between Harwood Bridge and Iluka Road**

Option 2A would result in minimal community severance. South of the Clarence River, Option 2A would sever mainly rural land used for grazing and cane farming, and community severance impacts would be minimal. North of the river, Option 2A would result in substantially less severance of the Harwood community than Option 1, as it would pass to the east of the sugar mill and effectively bypass the village.

Option 3 would also have minimal community severance impacts. South of the Clarence River it would pass through cane farms. It would require acquisition of up to three houses fronting Yamba Road. North of the river it would pass to the west of Harwood village, and has minimal potential for community severance. However, it would require acquisition of one house west of Harwood and, where it re-joins the existing highway at Watts Lane, it would require acquisition of a number of houses.

Option 1 would require acquisition of approximately nine houses. Option 2A would require acquisition of approximately six houses. Option 3 would require acquisition of approximately 11 houses. While Option 3 avoids direct impacts on Harwood, it has the potential to have high community impacts because of the acquisition of more houses than the other options.

### **6.2.2 Character and amenity**

The current bridge is a relatively low structure, but has a lift span with steel towers that are significant features in the local landscape. The new bridge or bridges would either include a lift span or would need to have sufficient clearance (up to 30 metres) to enable vessels to pass underneath. New bridges with lift spans could be designed to integrate with the scale and character of the existing bridge. However, high clearance bridges would substantially alter the existing visual environment and diminish the value of the existing bridge as a feature of the local area with historic significance.

Option 1 has the greatest potential to impact on the character and amenity of Harwood village because it would pass through the middle of the village. If a high bridge option is pursued, the bridge approaches would be substantially elevated through Harwood (either on fill or pylons) and this would become a major structure within the village. An opening bridge would be approximately the same height as the existing Harwood bridge and the bridge approaches would be similarly elevated. An opening bridge would have substantially less impact on the character and amenity of Harwood. However, the widening of the road reserve and additional carriageways would impact on the character of the town by increasing the perception of community severance. The new structures would also be inconsistent with the scale and historic character of the village.

Option 2A would have less potential for impacts on character and amenity. It would require large bridges or opening bridges similar to Option 1. However, these would be approximately

one kilometre downstream from the existing bridge and the road would not pass through Harwood village. The potential for impacts on the character and amenity of the town and the potential to detract from the positive character of the existing bridge, is therefore less for this option than for Option 1. The bridges would however, be a major new feature in the floodplain and across the river and would change the rural and river landscape of the local area. The nature and extent of impacts is dependent on the design of the bridges, which will be further developed as part of the concept design.

Option 3 would have similar impacts on character and amenity to Option 2A. It would have minimal impact on Harwood, and pass through predominantly cane farms and near rural residences. It would result in changes to the visual character of the local area.

### **6.2.3 Heritage impacts**

There are a number of heritage items listed under Maclean LEP within the village including the Harwood Island Public School and several residences. Harwood Island Public School and the Harwood sports field and grandstand are listed as heritage items on the North Coast Regional Environmental Plan 1988.

Harwood village has been identified by Council, as part of the *Maclean Community Based Heritage Study* (Clarence Valley Council, 2006b), as having heritage values associated with the historic character of the village as a whole. The study proposes that the area east from Morpeth Street to the sugar mill be identified as a conservation area under Maclean LEP and considers that this area has potential State heritage significance, although it is not currently identified under the NSW *Heritage Act, 1977*. In addition to items already listed on Maclean LEP, the heritage study identifies 13 items in and around Harwood as appropriate for listing under the Maclean LEP.

Those items in proximity to the routes being considered for the project include:

- The Harwood Mill complex.
- Convent, Water Brigade Hall, Post Office, and former police station, all on River Street east of the existing highway.
- The War Memorial and street trees on River Street.
- A residence at 18 Morpeth Street.
- Tram tracks, Old Pacific Highway.

Additional items identified in the study as having potential heritage values, but not recommended for listing include the Harwood Bridge and the Church Street group. The Maclean Community Based Heritage Study was still in draft form at the time of preparation of

this report. A key recommendation of the study is the incorporation of heritage items identified in the study in statutory heritage listings.

Option 1 would not directly impact on any of the listed heritage items or those proposed for listing through the Maclean Community Based Heritage Study. However, it would impact on the proposed Harwood Conservation Area, identified in the heritage study.

Option 2A would not impact on any currently listed items or items proposed for inclusion in the LEP by the Maclean Community Based Heritage Study. It would pass close to the Harwood Mill but would not directly impact on it.

Option 3 would not impact on any listed heritage items. However, it would pass close to a residence at 86 Martins Point Road, listed as a heritage item on Maclean LEP.

#### **6.2.4 Agricultural impacts**

Option 1 would require widening of the existing road reserve by approximately 50 metres to accommodate the upgraded highway and any necessary service roads. This would result in impacts on prime agricultural land on Harwood and Chatsworth Islands. Impacts would be limited to edge effects rather than severance of properties. This still, however, has the potential to impact on the viability of cane growing and the efficiency of harvesting operations. The total area of prime agricultural land to be impacted by Option 1 is approximately 95 hectares; however, approximately 40 hectares is already within the road reserve, meaning the total area of land requiring acquisition is in the order of 55 hectares.

Option 2A would result in impacts on farm land both south and north of the Clarence River. Most farm land in this area is used for cane production. The total area that would require acquisition (excluding land within the current road reserve north of Serpentine Channel) is approximately 80 hectares. More significantly, Option 2A would result in severance of farms in addition to the direct land acquisition impacts. Option 2A therefore is assessed to have substantially more potential for impacts on agricultural production than Option 1.

Option 3, similar to Option 2A, would impact on farm land both south and north of the Clarence River. South of the river, it would pass along the edge of cane fields and would have some direct impacts. Severance of paddocks would not result south of the river. North of the river, Option 3 would impact on cane farms by direct acquisition and severance, although to a lesser extent than Option 2A, because it joins the existing highway further south. The total area of prime agricultural land to be impacted by Option 3 (excluding land within the current road reserve north of Watts Lane) is approximately 90 hectares.

### 6.2.5 Noise

The criteria for a redeveloped road are likely to be most relevant for Option 1, as it would involve duplication of the existing alignment. The criteria for a new freeway are likely to be most relevant for Option 2A (south of Serpentine Channel), as it would involve establishment of a new road corridor. North of Serpentine Channel, the criteria for a redeveloped road would be applicable. The new road noise criteria would also be relevant for Option 3 between where it leaves the existing highway south of the river to where it connects with the existing highway near Watts Lane. North of Watts Lane, the redeveloped road criteria would be likely to apply.

The number of houses predicted to experience noise within a range of levels has been estimated for Option 1 (based on noise modelling), and is discussed in **Section 7.6.4**. Modelling has not been undertaken for Option 2 or Option 3. However, it is possible to undertake a qualitative assessment of potential noise impacts based on proximity of the options to sensitive receivers, for the purposes of comparing the options.

Option 1 passes directly through Harwood village which contains numerous sensitive receivers close to the proposed route alignment, including houses, a community hall and a primary school. In the vicinity of Harwood village the proposed road would be elevated to provide flood immunity and to allow for appropriate design of approaches to the new bridges crossing the Clarence River. This is likely to influence noise affectation within the village by bringing the road closer to some residences and potentially causing noise to travel over greater distances. Receivers affected by noise levels above the criteria would be subject to mitigation measures and this may result in improvement in noise conditions for some residents. Harwood Island Public School may also be subject to noise mitigation measures and this may improve the noise environment for students and teachers compared to the existing situation.

Development of the road to Class M standard (that is, two new bridges) would result in the majority of traffic using new bridges across the Clarence River. This would be expected to result in improvements to the noise environment for houses on either side of the river under any of the options. Community members have identified vibration from vehicles using the existing Harwood Bridge as a significant contributor to noise levels and impacts in this area. Substantially reducing traffic volumes using the existing bridge would be expected to result in substantial reductions in noise affectation, particularly where a high proportion of heavy vehicles at night use the new bridges. Development of the options to Class A (that is, one new bridge) would have less benefit, as traffic travelling in at least one direction (northbound for Options A and B1 and southbound for Option 3) would continue to use the existing Harwood Bridge. However, traffic volumes on the existing bridge would be roughly halved, and this would still result in some benefits to the local community.



Option 2 and Option 3 generally traverse sparsely populated agricultural land to the east and west of Harwood. Development of these options to Class M would result in substantial reduction in noise exposure for many houses and sensitive receivers close to the existing highway within Harwood village as the majority of traffic would be diverted around the village. These options would result in some houses close to the alignments experiencing an increased noise exposure. North of Serpentine Channel, substantial changes to noise affectation would be unlikely.

Development of Options 2 and 3 to Class A would result in some benefit to houses and other sensitive receivers in Harwood, as approximately half the traffic would be diverted around the town. However, traffic continuing to use the existing highway carriageway would continue to pass through town and would contribute to ongoing noise affectation, albeit at reduced levels from the existing situation. South of the Clarence River, Option 2A would result in new noise impacts to rural houses, particularly along Yamba Road but also potentially around James Creek Road and Palmers Channel Road. Option 3 would result in noise affecting residences along Yamba Road and Martins Point Road. It would create a new noise source from the west for residences along Morpeth Street in Harwood, where currently noise from the existing highway is from the east. Under a Class A development, noise would come from both the east and west for these residences. Mitigation measures would be implemented as necessary under both Class A and Class M development scenarios with the aim of meeting the NSW DEC criteria.

In the absence of noise mitigation, and leaving aside the potential for acquisition of houses identified as noise affected, Option 1 has the greatest potential for noise impacts.

### **6.2.6 Ecological impacts**

The impacts of the options on Endangered Ecological Communities are summarised in **Table 6-10**. Option 2 has the greatest potential to impact on Endangered Ecological Communities, particularly south of the Clarence River where it would impact on large areas through both direct clearing and severance of remnants. It would also impact on a relatively wide band of mangroves along the southern bank of the Clarence River.

Option 3 would impact on a relatively large area (up to 3.8 hectares) of Endangered Ecological Communities. South of the Clarence River it would result in edge effects on a large high quality remnant of Swamp Oak Floodplain Forest, resulting in clearing of approximately 2.6 hectares in this location. North of the river, Option 3 would pass through a relatively intact remnant of Swamp Oak Floodplain Forest and would result in clearing of approximately 0.8 hectares of vegetation in this location.

Mangrove remnants are patchy on the northern bank of the Clarence River at Harwood, and impacts would be minimal. Mangroves on the south bank of the Clarence River are wider in the

area crossed by Option 2 than for Option 1. In addition, Option 2 would create new severance of this community, whereas Option 1 would result in widening of an existing area of disturbance. Option 3 would impact on a very narrow band of mangroves on the southern bank of the Clarence River, and would have less impact than the other options. Depending on the height of the bridges at the river margins, it may be possible for mangrove communities to re-establish under the bridges over time, reducing severance and enabling recovery from the impacts of direct clearing.

■ **Table 6-10 Impacts on Endangered Ecological Communities**

Option	Area of EEC impacted
Option 1	0.5 ha
Option 2A	9.5 ha
Option 3	3.8 ha

**6.2.7 Staging**

Development of the project between Harwood Bridge and Iluka Road is initially planned to be to Class A standard, because of relatively low traffic volumes on this part of the highway and the need to maintain local access. For all options, a Class A upgrade would involve use of the existing Harwood Bridge and parts of the existing highway for traffic travelling in one direction (northbound for Options A and B1 and southbound for Option 3), and development of a new bridge and carriageway for traffic travelling in the other direction.

The RTA has not determined at what time in the future this section of the project would be developed to a full motorway (Class M) standard. Class M development would require two new bridges across the Clarence River and two new carriageways, with the existing highway and Harwood Bridge becoming a local access road. Class M development would result in all through and regional traffic using the new motorway, with only traffic requiring access to locations within Harwood or Chatsworth Islands using the existing highway.

Option 2A and Option 3 present traffic and access difficulties in initial development to Class A standard. Splitting of northbound and southbound traffic through and around Harwood village has the potential to result in greater amenity impacts. It would also be difficult and potentially more costly to ensure appropriate access to and from the upgraded highway was provided for properties and local traffic, including cane trucks requiring access to Harwood Mill. The likely need to construct temporary on and off ramps to provide access at locations such as Watts Lane may result in additional construction costs and surplus land following development to Class M.

### **6.2.8 Impacts on boating activity**

Potential impacts on boating and shipping activity within the Clarence River is an important consideration in the evaluation of options for crossing the Clarence River. Consultation with stakeholders with an interest on water traffic on the Clarence River was undertaken to gain an appreciation of the relevant issues. The required height of new bridges to enable vessels to travel upstream of Harwood is an important issue for the project, but is common to all options and is further discussed in **Section 6.3**. The key issue in terms of differentiating between the options is the location of the bridges and how this may affect water transport on the river.

A turning basin is located off the Harwood Mill and is used by ships and other vessels accessing the dry dock to the east of Harwood. A new bridge (or two bridges, under a Class M standard road) downstream of the existing bridge has the potential to impede use of the turning basin. Discussions with stakeholders in the local area including the Yamba Harbourmaster have indicated that the potential relocation of the turning basin further downstream would not be possible due to the requirement for significant dredging and the constraint of bends in the river.

It is noted that the current turning circle is tight for some vessels and that some dredging may be required for a new bridge (or bridges) located adjacent to the existing bridge.

The deepest parts of the river in the location of Option 2A are near the banks rather than in the middle of the channel. The bridge would have to be of considerable height at the river banks to enable boats to pass under it. A bridge with clearance of up to 30 metres near the banks would require very high approaches extending for considerable distance to the north and south, with associated impacts on surrounding land use and visual amenity, and resultant costs. Option 2A is therefore considered likely to have substantial potential for impacts on boating and shipping activity within the Clarence River.

It is understood from current knowledge that Option 3 would have minimal potential for impacts on vessel movements on the river.

### **6.2.9 Conclusions of the options assessment**

All options considered for this section of the project are potentially feasible. On balance, it was concluded that Option 1 best meets the objectives of the project. The main advantages of Option 1, compared to the other options considered, are:

- Minimal impacts on cane farms by using the existing road reserve as much as possible for the upgrading, and widening of the existing road rather than creation of a new corridor through farms.

- Ability to stage the development of the project with initial development to Class A standard by duplicating the existing highway and Harwood Bridge, rather than splitting northbound and southbound traffic through and around Harwood village.
- Minor risk of impacts on shipping activity in the Clarence River, in particular turning movements within the turning basin off Harwood Mill.
- Minimal impacts on Endangered Ecological Communities on the floodplain and mangroves along the banks of the Clarence River.

Option 1 provides good connections with the preferred route south of Harwood Bridge. While Option 1 would result in impacts through Harwood village, these may be mitigated to an extent by designing a narrower road corridor. It would impact directly on less houses than Option 3. Noise mitigation measures would be implemented to reduce traffic noise impacts on the local community, and this is likely to improve the noise environment for some residents that currently experience noise above the NSW DEC criteria. Visual impacts of the new bridge (or bridges) required over the Clarence River are largely a function of the required bridge height to enable river traffic to pass, and require further attention at the concept design stage of the project. The use of an opening bridge would reduce the cost of the project and have less impact on the landscape and historic character of Harwood village.

Option 2A and Option 3 (to a lesser extent) would result in substantial additional impacts on cane farms both to the south and north of the Clarence River, but particularly on Harwood Island. Several properties would be subject to large areas of direct acquisition as well as severance. When considered cumulatively with impacts of the preferred route south of the Clarence River, these impacts may further contribute to reducing the viability of the local cane industry. Option 1 would result in some impacts on cane farms, but to a much lesser extent than Option 2A or Option 3 because it follows the existing road corridor rather than creating a new corridor through farms.

Option 2A would also have the greatest impact on Endangered Ecological Communities and mangroves, resulting in significantly more clearing than Option 1 and greater severance of remnants. Option 3 would result in more impacts than Option 1, but these would mostly be edge effects on existing remnants rather than severance impacts, except for a small remnant north of the Clarence River that would be split by this option. Option 1 has the least potential for ecological impacts.

Option 2A would have substantial impacts on shipping and boating activity on the Clarence River downstream of the existing Harwood Bridge. This is a major issue for this option and is not able to be cost-effectively addressed through the design of this option. Option 1 and Option 3 would have minimal impacts on boating activity and these are manageable through the design

of the new bridges. Further consultation with maritime authorities and operators would be undertaken as part of the concept design to ensure that maritime issues are addressed.

The potential to stage the development of the options is an important consideration in the selection of a preferred route. Option 1 provides the most cost effective and efficient solution in terms of initial development to Class A standard, with the use of the existing highway as the north bound carriageway. Option 1 would retain all traffic within a single road corridor, whereas the other options would split traffic around Harwood.

### **6.3 The preferred route**

#### **6.3.1 Overview of the preferred route**

Between Wells Crossing and Harwood Bridge, the preferred route is the Refined Purple option, with minor adjustments in some locations to address impacts or design issues. Between Harwood Bridge and Iluka Road, the preferred route is Option 1, adjacent to the existing Pacific Highway, generally to the east of the existing road.

Adjustments have been made in some sections of the preferred route to minimise impacts on properties, ecological features such as Endangered Ecological Communities, houses and businesses. The locations of interchanges have been refined and interchanges have been provided to maximise benefits to local and regional traffic. Utilisation of the road reserve of the existing Pacific Highway has been maximised where practical to minimise the need for private property acquisition.

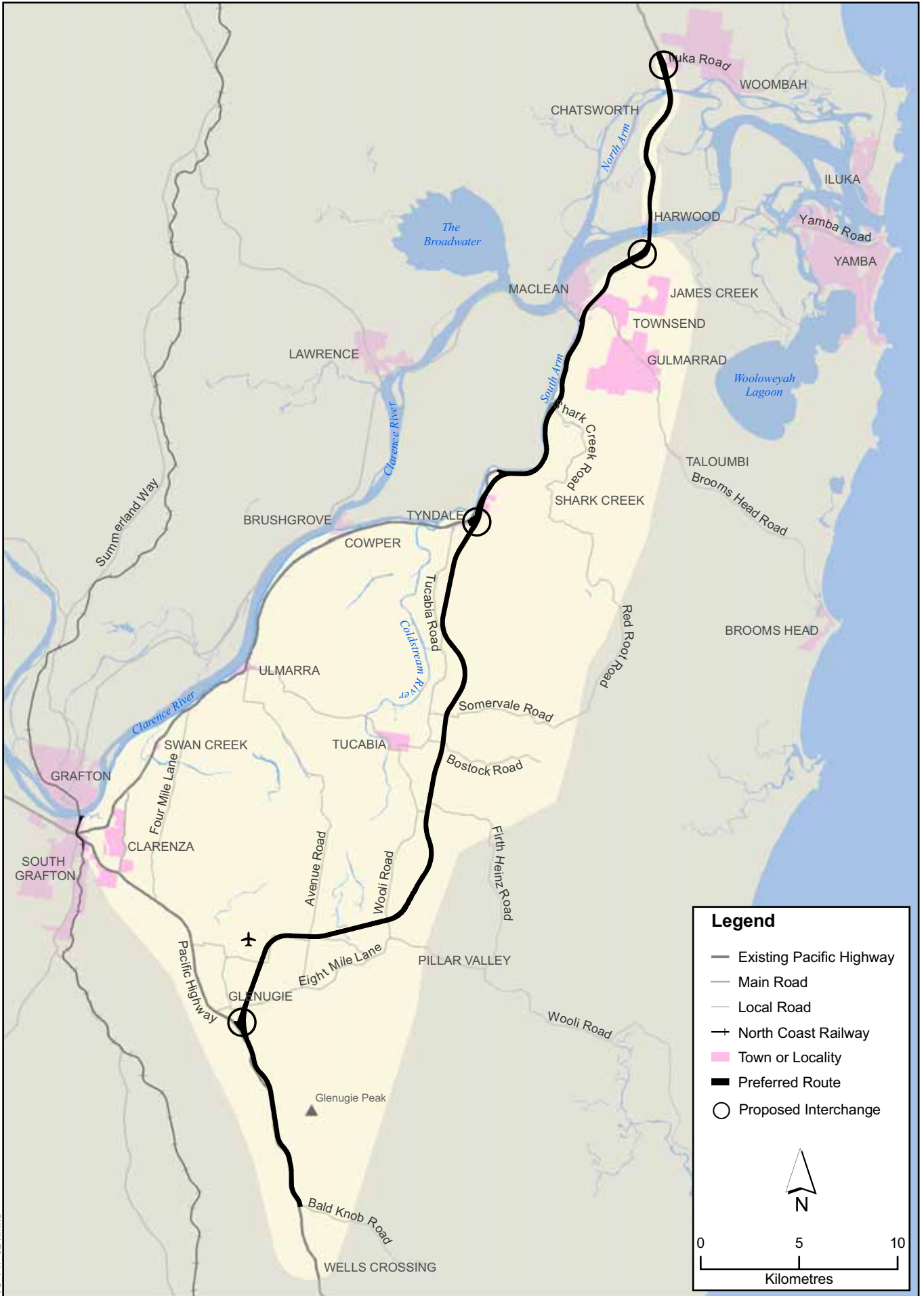
The preferred route corridor is generally shown as 150 metres wide. In some locations, like interchanges it is wider to accommodate the additional land required for exit and entry ramps. In some locations, like near Townsend and through Harwood, the corridor is narrower because of constraints from surrounding land uses.

The 150 metre corridor is wider than the road reserve that would ultimately be acquired. The road corridor would generally be about 100 metres which is sufficient for the dual carriageway and a service road. There may be the potential to narrow the corridor and the corridor could be reduced further if a service road is not required. The corridor boundary and road footprint will be refined during the concept design and detailed environmental impact assessment. Identifying a wider corridor at this stage allows for refinements and adjustments to be made, and for interchanges and local access arrangements to be further developed within the corridor. In some locations the road reserve may be slightly wider than 100 metres, however, it is generally anticipated that the width as shown would be sufficient for all required infrastructure. Wider areas are shown at likely interchange locations. In some locations a narrower road reserve is to be designed to minimise impacts on environmental features or communities.

In the area around the Coldstream River and Woolli Road, there is a potential opportunity for further refinement of the preferred route, and for this reason this area has been identified as being subject to further investigation. Consultation with individual land owners, and with Council in relation to local roads and their other assets, will be undertaken prior to finalising the alignment and this would occur during the concept design and environmental assessment period.

As part of the preferred route, the RTA is proposing to implement a substantial package of measures to improve the safety of the existing Pacific Highway between Glenugie, South Grafton and Tyndale. Even with the construction of the preferred route, some sections of the existing highway will continue to experience high traffic volumes and ongoing growth in local and regional traffic. The package of measures is necessary to ensure the development of a safer transport corridor between Wells Crossing and Iluka Road.

The preferred route is illustrated at **Figure 6-4**. An overview of the key features of the preferred route is provided in **Table 6-11**. More detailed description of the preferred route and the package of measures to upgrade the existing highway is provided in the following sections.



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Wells Crossing to Iluka Road  
Upgrading the Pacific Highway

**Figure 6-4: The preferred route**

■ **Table 6-11: Key features of the preferred route corridor from Wells Crossing to Iluka Road**

Features	Description for preferred route		
	Wells Crossing to Harwood Bridge	Harwood Bridge to Iluka Road	Total
Total length (kilometres)	61	10	71
Travel time saving (current travel time is 51 minutes from Wells Crossing to Iluka Road)	11 minutes	1 minute	12 minutes
Interchange locations	Glenugie, Tyndale, Yamba Road	Iluka Road	-
Number of bridges	29	10	39
Length of bridges (km)	2.7	2.7	5.4
Distance within floodplain (km)	16	8	24
Preliminary cost estimate (\$2006)	\$1140 million (Class M) + allowance of \$110 million for existing highway improvements, total \$1250 million  \$1030 million (Class A) + allowance of \$110 million for existing highway improvements, total \$1140 million	\$550 million (Class M)  \$330 million (Class A)	\$1800 million (Class M) including \$110 million allowance for existing highway improvements  \$1470 million Class (A) Including allowance of \$110 million for existing highway improvement
<b>Potential social and land use impacts</b>			
Number of land parcels less than 5 hectares within the 100 metre corridor	90	40	130
Number of land parcels more than 5 hectares within the 100 metre corridor	125	35	160
Approximate number of residences within the 100 metre corridor (to be acquired)	34	7	41
Approximate number of residences within 500 metres of the road centreline	320	160	480
Prime agriculture land within the 100 metre corridor	220 hectares	60 hectares	280 hectares
Other agricultural land within the 100 metre corridor	280 hectares	2 hectares	282 hectares
Rural residential zoned land within the 100 metre corridor	10 hectares	3 hectares	13 hectares
Urban zoned land within the 100 metre corridor	2 hectares	0.5 hectares	2.5 hectares
State Forests within the 100 metre corridor	135 hectares	0	135 hectares



Wells Crossing to Iluka Road  
Upgrading the Pacific Highway  
Preferred Route Report

Features	Description for preferred route		
	Wells Crossing to Harwood Bridge	Harwood Bridge to Iluka Road	Total
National Parks and Nature Reserves within the 100 metre corridor	1.5 hectares – Impact to be reduced by narrowing footprint	No direct impact, but close to Mororo Creek Nature Reserve.	-
Number of residences predicted to be affected by noise above night time criteria (excluding residences to be acquired)	151	18	169
Cumulative change in night time noise affectation above NSW DEC criteria for residences	Approximately 300 less residences affected by night time noise above criteria, compared with predictions in 2021 without the preferred route.	Little change in cumulative noise impacts.	-
Impact on towns and communities	Diverts through traffic from South Grafton, Swan Creek, Ulmarra and Tyndale. Would impact on communities around Pillar Valley, Tyndale and Townsend.	Traffic would continue to pass through Harwood village.	-
Impacts on Aboriginal heritage and cultural sites	Potential for impact on one recorded site (artefact scatter). Passes close to culturally significant site in the Clarence River near Tyndale, but would not impact.	No impact on known sites.	-
Impacts on European heritage sites	No direct impacts.	Potential impacts on the heritage character of Harwood.	-
<b>Potential environmental impacts</b>			
Area of native vegetation within the 100 metre corridor	445 hectares	10 hectares	465 hectares
Area of Endangered Ecological Communities within the 100 metre corridor	68 hectares	0.5 hectares	68.5 hectares
Area of high value habitat within the 100 metre corridor	120 hectares	0	120 hectares
Number of major waterway crossings	5 hectares	3 hectares	8 hectares
Impacts on SEPP 14 wetlands within the 100 metre corridor	No direct impacts but passes close to SEPP 14 wetlands at Coldstream River, Shark Creek, and Yaegl Nature Reserve.	No direct or indirect impacts.	-

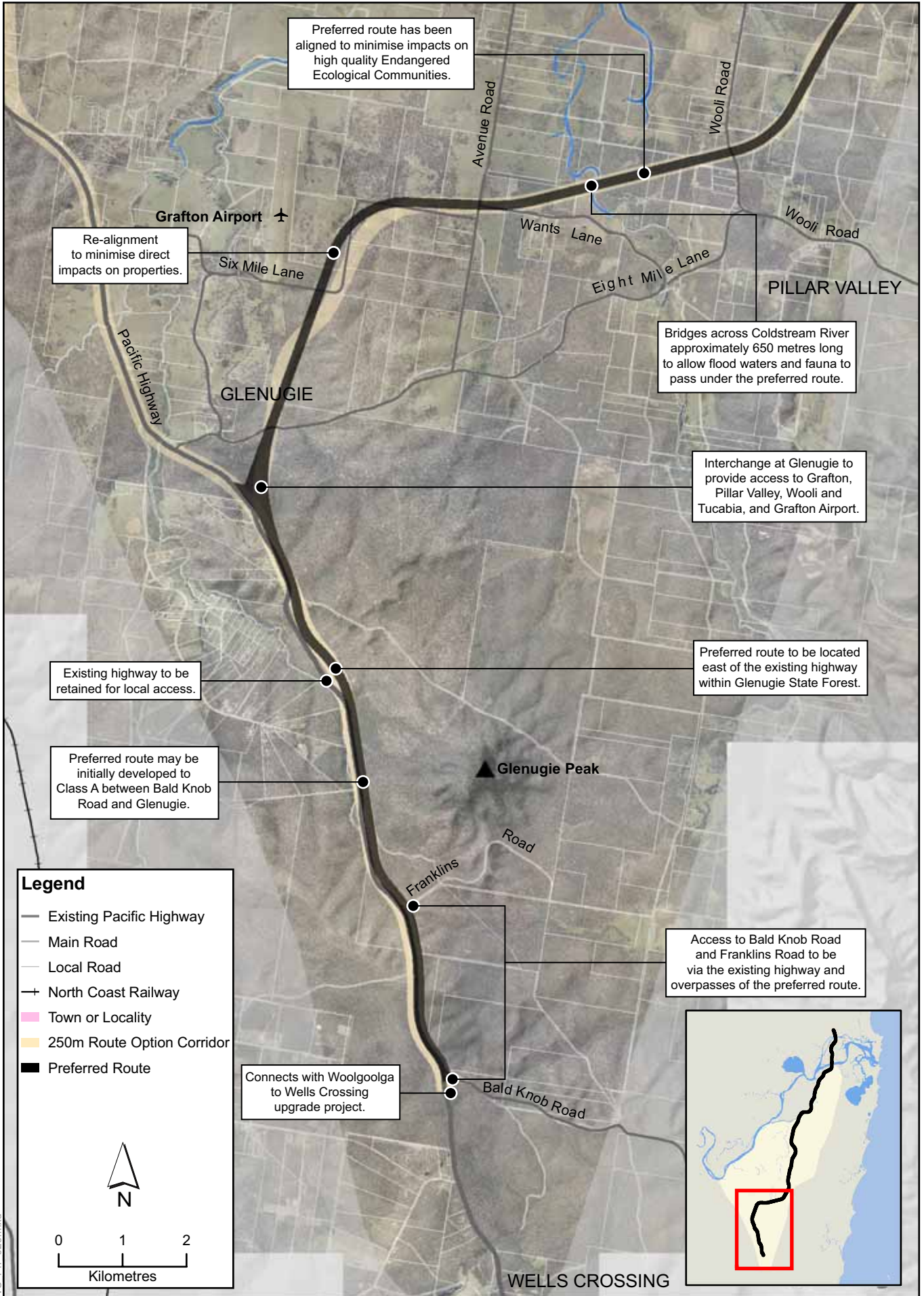
### **The preferred route from Wells Crossing to Wooli Road**

The preferred route between Wells Crossing and Wooli Road is shown on **Figure 6-5**. This section of the preferred route is approximately 23 kilometres long, beginning at Bald Knob Road, approximately 23 kilometres south of Grafton, where it joins with the Woolgoolga to Wells Crossing project. Both projects would be located generally on the eastern side of the existing highway. The existing highway would be retained as a local road, and access to intersecting roads such as Franklins Road would be via overpasses across the new road. In some locations the alignment would be straightened to achieve design standards, and some areas of cut and fill would be required to improve sight distances and gradients. Through this section the road would be outside the floodplain and the two carriageways would be at the same height, with a 12 metre wide median. As the majority of this section is through Glenugie State Forest, it avoids private property impacts and noise impacts would be minimal.

An interchange with the existing highway would be provided at Glenugie (just to the south of Eight Mile Lane) where the alignment of the preferred route deviates from the existing highway. This interchange would provide access to Grafton, Glenugie, Grafton Airport, Pillar Valley, Tucabia, Minnie Water and Wooli. A full interchange would be provided at this location to allow for travel to the north and south.

North of Eight Mile Lane, the preferred route passes to the east of Grafton Airport and turns north-east along Old Six Mile Lane, passing through open farmland and bushland. It crosses the Coldstream River north of Wants Lane and Sandy Crossing, through an area of remnant floodplain vegetation. It intersects with Wooli Road north of Eight Mile Lane, and Wooli Road would pass over the preferred route on a new bridge. Some adjustments to local roads would be required to maintain access to properties along this part of the route.

The alignment of the preferred route in the area around the Coldstream River crossing, west of Wooli Road (shown on **Figure 6-5**) is subject to further investigation, including consultation with land owners that is to be undertaken by the RTA following the announcement of the preferred route. The concept design of the preferred route will include a finalised alignment in this section based on the outcomes of consultation and investigations.



Wells Crossing to Iluka Road  
Upgrading the Pacific Highway

**Figure 6-5: The preferred route from Wells Crossing to Woolli Road**

### **The preferred route from Wooli Road to Tyndale**

This section of the preferred route is approximately 19 kilometres long and is shown on **Figure 6-6**. The preferred route passes through a mix of open grazing land and remnant bushland, largely on private property. The alignment has been refined to minimise severance of private property where practical, taking into account issues raised by property owners, design standards for the road and other environmental and social constraints.

The preferred route generally avoids the floodplain, travelling along the edge of the low range extending south from Bondi Hill, to the east of Wooli Road and Tucabia Road. In some locations it crosses waterways that experience high velocity flows following rainfall.

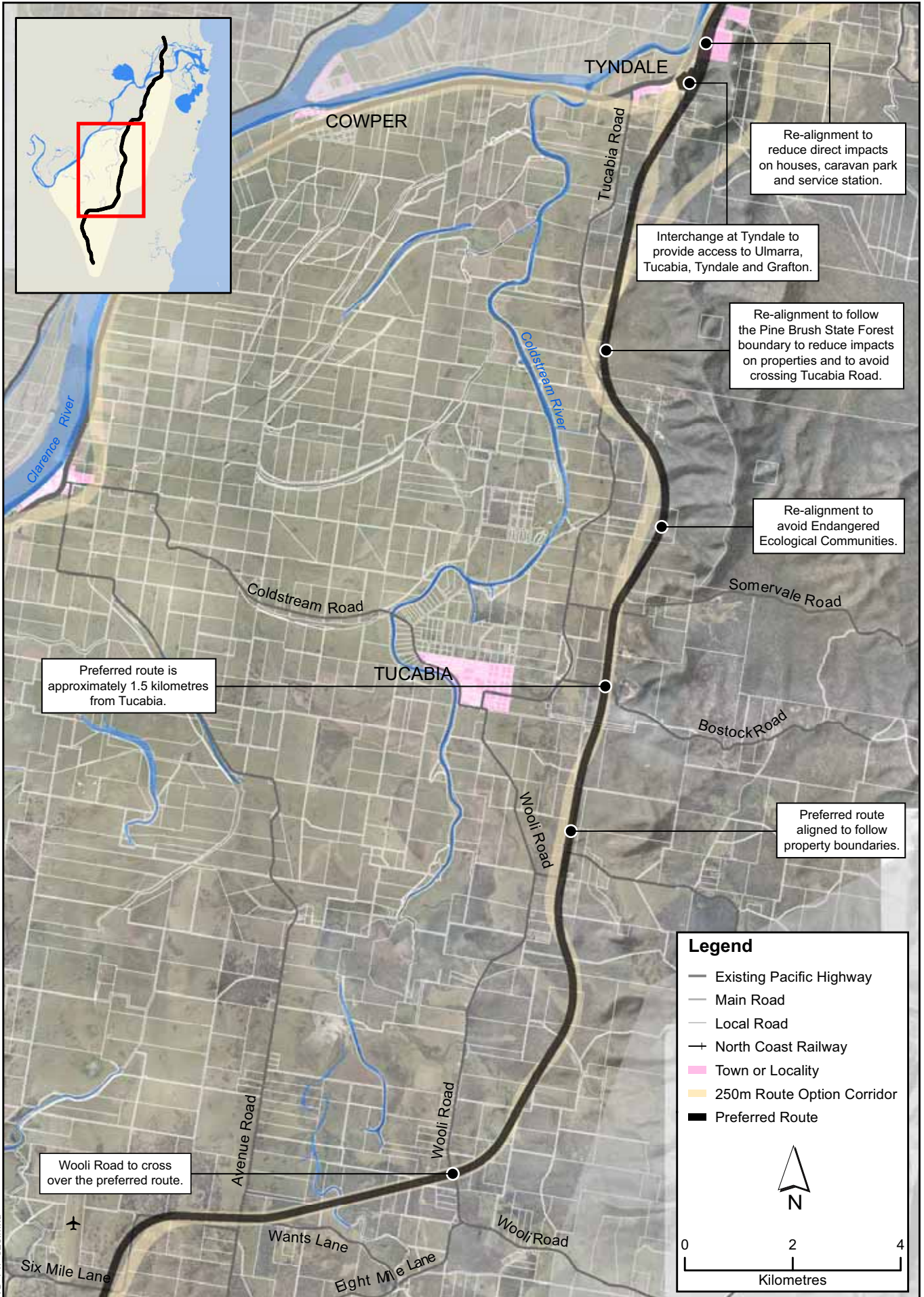
Roads crossed by the preferred route in this section include Firth Heinz Road, Bostock Road and Somervale Road. Access along these roads would be maintained through incorporation of underpasses or overpasses in the design. The need for service roads parallel to the preferred route is minimal, but some local roads and property accesses may require adjustment to ensure access is maintained.

The alignment of the preferred route has been adjusted in some locations to minimise impacts. Locations where the alignment has changed are shown on **Figure 6-6**. Most adjustments have been within the 250 metre wide corridor identified at the route options stage. In some locations minor deviation outside the previous corridor has been necessary. This includes a section near Pine Brush State Forest, where the route has been adjusted to avoid crossing Tucabia Road and to minimise property impacts including the loss of higher ground that is important to farmers in times of flood. The preferred route runs along the western boundary of the Pine Brush State Forest.

The alignment of the preferred route in the area immediately east of the Wooli Road crossing (shown on **Figure 6-6**) is subject to further investigation, including consultation with land owners that is to be undertaken by the RTA following the announcement of the preferred route. The concept design of the preferred route will include a finalised alignment in this section based on the outcomes of consultation and investigations.

An interchange is proposed at Tyndale to provide a connection to the existing Pacific Highway. The approximate location of the interchange is to the east of the village, south of the service station and caravan park. This interchange means that the majority of traffic that currently uses the existing highway between Harwood Bridge and Tyndale would assign to the preferred route, improving safety for road users.





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Wells Crossing to Iluka Road  
Upgrading the Pacific Highway

**Figure 6-6: The preferred route from Woolli Road to Tyndale**

### **The preferred route from Tyndale to Harwood Bridge**

This section of the preferred route is approximately 18 kilometres long. Approximately 13 kilometres of this section is within the floodplain. The preferred route in this section is shown on **Figure 6-7**.

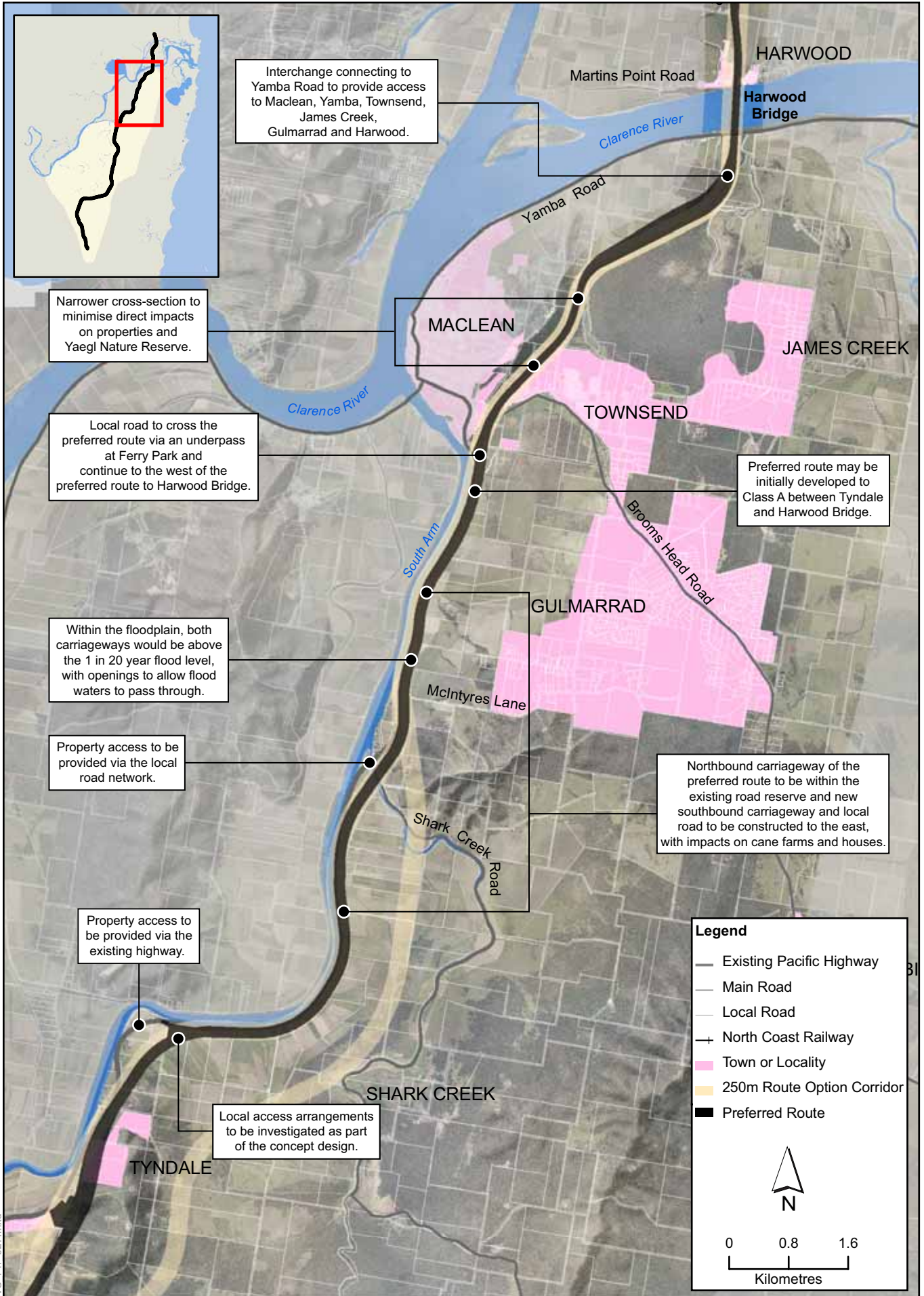
At Tyndale, the preferred route has been re-aligned to pass to the east of the service station, caravan park, and some residences fronting the existing highway. This has been done to avoid direct impacts on these properties. The refinement to the preferred route would also move the road further away from houses in Tyndale, reducing noise and amenity impacts.

Between Tyndale and Maclean, the preferred route for the most part follows the existing Pacific Highway. The existing road reserve is not wide enough to accommodate the upgraded highway. The northbound carriageway of the upgraded highway would generally follow the existing highway and be within the existing road reserve. The southbound carriageway and the local road would be constructed to the east and would encroach into private property. The road design would be as narrow as possible (through a narrow median and minimal service roads) to reduce impacts on private properties. North of Tyndale and near Shark Creek, the preferred route deviates from the alignment of the existing highway to meet design standards.

Adjacent to Maclean Hill and Townsend, a narrow road design is proposed to minimise impacts on residences and areas of ecological value. The Yaegl Nature Reserve consists of several parcels of land including a small parcel to the west of the existing highway. The existing road reserve is not wide enough to accommodate the upgraded highway, however, the width of the preferred route would be minimised to reduce impacts to the greatest extent possible.

A full interchange would be located south of the Harwood Bridge with connections to Yamba Road. This would provide access to Maclean, Townsend, Gulmarrad, James Creek, Yamba, Harwood and other towns in the area.





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Wells Crossing to Iluka Road  
Upgrading the Pacific Highway

**Figure 6-7: The preferred route from Tyndale to Harwood Bridge**

### **The preferred route from Harwood Bridge to Iluka Road**

This section of the preferred route is approximately 10 kilometres long. The route generally follows the alignment of the existing Pacific Highway and would be located as much as possible within the existing road reserve. The preferred route in this section is shown on **Figure 6-8**.

Initially, this section of the road would be constructed from the interchange south of Harwood Bridge to Iluka Road as a Class A standard road. Only one new carriageway and bridge over the Clarence River would be required. At a time when traffic demand warrants it, this section of the road would be upgraded to Class M with an additional bridge and carriageway, and the existing bridge would be used as a local service road or alternative route.

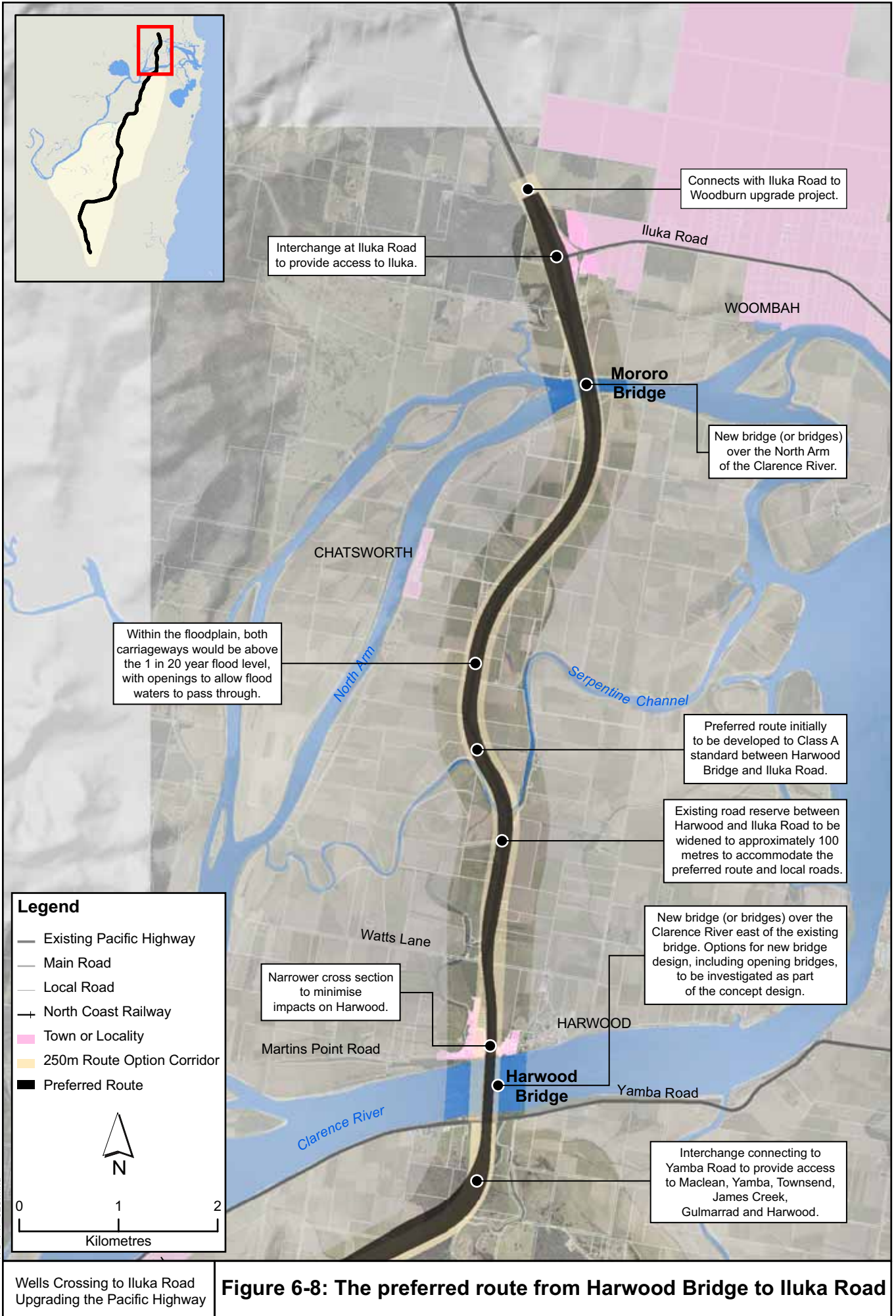
The new bridge or bridges would be on the eastern side of the existing Harwood Bridge. The bridge height and design options will be further investigated as part of the preferred route concept design. Options currently being considered are a fixed bridge of 30 metres clearance or an opening bridge with a deck height the same as the existing Harwood Bridge. Options for the vertical clearance of the bridges do not influence the location of the bridges or the road reserve boundary.

Through Harwood, the existing road reserve is approximately 40 metres wide. Generally, the road reserve would be widened to the east to a total width of approximately 100 metres, although it could be narrower in some places. There is the opportunity to provide minimal treatment and widening to achieve four lanes in this area. For future planning purposes, provision is to be made for two new bridges and carriageways. However, initial development of the project through Harwood to Class A standard would involve one new bridge and one new carriageway.

North of Harwood village initial development of the project to Class A standard would involve one new carriageway and service roads where required to maintain access to properties. Widening of the existing road reserve would be widened to approximately 100 metres. As part of the concept design stage there will be further consideration of land acquisition requirements through liaison with property owners, to minimise acquisition, and to maintain access to properties.

Development to Class M standard would require construction of two new carriageways, and a local road on one side of the upgraded highway for the entire length. Service roads, for access to properties adjacent to the highway, may be required in some locations on the opposite side to the local road. Encroachment into private property would be greater for Class M than for Class A.





At the North Arm (Mororo), one new bridge would need to be constructed as part of upgrading to Class A, as the existing steel northbound bridge would not be suitable for the new carriageway. There are a number of issues that would need to be considered, including the possibility of retaining the bridge for a future service road. These issues will be considered as part of the concept design. A full interchange would be located at Iluka Road, providing access to Woombah and Iluka.

### **Improvements to the existing highway as part of the project**

As part of the upgrading of the Pacific Highway, the RTA proposes to undertake a substantial package of improvements to the existing Pacific Highway between Glenugie and Tyndale. This is to address road safety for traffic that would continue to use the existing highway, and would contribute to a safer overall traffic corridor. The section of the highway between Glenugie and Tyndale would continue to carry a high volume of traffic even with the construction of the preferred route. It is this section of the highway along which the package of improvements would be implemented. There are a number of places where the existing highway is of a lower standard or where safety improvements would be likely to be most effective in reducing the incidence or severity of accidents.

The improvements would be developed and implemented in consultation with Clarence Valley Council. A detailed investigation of the requirements for the existing highway would be undertaken as part of the concept design for the preferred route.

The improvement measures could include some or all of the following:

- Realignment of bends that do not currently meet 100km/h design standards.
- Widening of road shoulders in some sections where they currently provide insufficient room for vehicles to pull off the carriageway.
- Upgrade of some major intersections to “seagull” treatments.
- Provision of additional overtaking lanes.
- Installation of wire rope on the road edges or medians in areas where the potential for accidents involving head on collisions or vehicles running off the road is highest.

The Ulmarra bypass will be considered as part of this process.

### **6.3.2 Reasons why the preferred route was selected**

All route options considered for the project have advantages and disadvantages when considered against the broad range of functional, social and environmental criteria. The preferred route has been selected because it provides the best balance of objectives when all the assessment criteria for the project are considered. In functional terms, the route balances the travel time needs of through traffic with the importance of delivering benefits for the high proportion of local and regional highway users.

The social impacts of the preferred route are shared between communities within the study area and have been balanced with the need to maintain local access for highway related businesses and to encourage future economic growth.

The preferred route best addresses the principles of ecologically sustainable development, which is an objective of the Pacific Highway Upgrade Program and a statutory requirement for environmental assessment in NSW. Areas of greatest ecological value are mostly avoided by the preferred route, and while some impacts are unavoidable, it is considered that the preferred route has a manageable level of environmental impact when considered in the context of other project objectives.

A significant benefit of the preferred route is the ability to stage construction by building sections of the preferred route and undertaking improvements to the existing highway. It provides a cost effective solution to the achievement of the objectives of the project for all traffic that uses the Pacific Highway corridor.

While the preferred route provides a number of advantages, potential adverse impacts are acknowledged. A number of issues will need to be addressed in more detail in the next stages of the development of the project. These include:

- Social impacts including the number of houses that would need to be demolished and the number of properties that would need to be acquired.
- Noise impacts.
- Impacts on agricultural activities, the cane industry, and on local businesses.
- Ecological impacts including impacts on Endangered Ecological Communities, high quality habitat and wildlife corridors used by a number of fauna including the coastal Emu.
- Changes to property access and to local roads.

The following sections provide further discussion of the reasons why the preferred route was selected, with reference to the objectives and the assessment criteria for the project.

### **Functional characteristics**

The preferred route was assessed to achieve the functional objectives of the project more effectively than the other options. It provides a balance between serving the needs of local traffic and through traffic, and has opportunities for more cost efficient construction. It performs well in terms of the critical safety objectives of the Pacific Highway Upgrade Program. Key functional advantages of the preferred route include:

- Ability to stage construction including implementation of improvements to the existing highway before a new alignment is built.
- Achievement of a safe transport corridor, particularly because it would attract a higher proportion of local and regional traffic than other easterly route options that were considered.
- Good transport efficiency through travel time and distance savings and relatively flat gradients to minimise fuel consumption.
- Making good use of the existing highway corridor, thereby maximising the use of the RTA's existing assets.

### **Social and local economic performance**

Achieving good social and local economic outcomes is a critical challenge for this project because of the characteristics of settlement and economic activity in and around the study area. Key social and economic advantages of the preferred route include:

- Avoidance of major flood impacts on Grafton
- Avoidance of high risk flood areas through Swan Creek, Ulmarra and Cowper by skirting the edge of the Coldstream Basin, which is the largest flood storage area in the Clarence catchment.
- Retention of areas important to local farmers as flood refuges including access to these areas from farms located on the floodplain.
- Support for economic development by providing good access to Grafton Airport, Grafton, Tyndale, Maclean and Harwood Mill.
- Good local access with interchanges at Glenugie, Tyndale, Yamba Road, and Iluka Road.
- Sensitivity to the cultural values of known Aboriginal and European heritage and generally avoids direct impacts on the areas of greatest cultural and historic significance.
- Achievement of a good balance of lifestyle issues for communities along the Clarence River and in bushland areas.
- Support for future land uses (based on Council's plans for future growth) and the Clarence Valley Council *Economic Development Strategic Plan*.

### **Natural environment performance**

The preferred route was selected based on careful and detailed consideration of the substantial ecological values of much of the study area. Consideration was given to the potential risks of all route options of impacting on important ecological features such as wetlands and the large areas of remnant vegetation that have high habitat values for a wide range of threatened species. Key features of the preferred route in relation to the natural environment include:

- Minimising the risk of significant impacts on the endangered coastal Emu sub-population by largely avoiding fragmentation of its known habitat and access to important wetland, grassland and forest habitats.
- That it provides opportunities to conserve high value habitat areas and wildlife corridors, specifically by avoiding areas of known high habitat value around Shark Creek, Taloumbi and Pillar Valley.
- Important wildlife corridors have been retained to enable movement to wetland areas.
- Retention of wetlands and hydraulic conditions that are important to aquatic species.