

5. Approach to route selection and design

5.1 Route selection

The preferred route for the proposed upgrade, with sub-options, was announced by the Minister for Roads in July 2004, thereby completing the route selection phase of the project. Documentation supporting the preferred route, including the *Preferred Route Option Report – Kempsey to Eungai – Upgrading the Pacific Highway* (NSW Roads and Traffic Authority 2004) and five volumes of technical reports, was placed on the RTA website immediately following the announcement of the preferred route.

5.1.1 Route options development

Route options were developed through an iterative process involving a range of environmental, engineering, community, safety and cost considerations and importantly consideration of the principles of ecologically sustainable development. A do nothing option was also considered. However, existing and projected traffic congestion in the Kempsey town centre and a high accident rate between Kempsey and Eungai necessitates a full upgrade and bypass of Kempsey.

In the initial stages of the proposed upgrade route options development, a series of route corridors was established, from which 18 feasible route options were developed, using information gathered during community consultations and preliminary environmental investigations. As illustrated in Figure 5-1, these corridors included route corridors produced by the QUANTM route optimisation software, and routes within these corridors identified by the community and the project team. A 'long list' of feasible options was then assessed against a set of assessment criteria. Assessment criteria included the capacity of the options to:

- Improve the reliability and efficiency of travel.
- Improve the safety of travel.
- Improve or maintain accessibility to local and regional centres.
- Support regional and local economic development.
- Enhance potential beneficial environmental effects and manage potential adverse environmental effects.
- Minimise the risk of construction and related project risks.
- Minimise financial costs to government.
- Enhance potential benefits to the community in the short and long term.
- Manage potential adverse impacts on the community.

These criteria reflected a commitment to striving towards a sustainable project in the context of ecologically sustainable development and meeting the project objectives set out in Section 2.5.

The outcome of the assessment process was the development of two short-listed route options, comprising:

- An eastern route option, 40.6 kilometres in length – starting at the dual carriageway south of Kempsey and diverging east of Kempsey, before crossing the Macleay River and existing highway north-east of Frederickton, and passing west of Doughboy Swamp and through the edge of the Tamban State Forest to join the existing highway at Barraganyatti.
- A western route option, 39.4 kilometres in length – starting at the existing dual carriageway south of Kempsey and diverging to the west, before crossing the Macleay River west of Kempsey and the North Coast Railway at Collombatti (Tamban), and then joining with the route of the eastern route option described above, west of Doughboy Swamp.

A through-town option was also short-listed. However, this option was subsequently eliminated from further consideration, as Kempsey Shire Council indicated that it was not a viable solution to Kempsey's traffic problems and would not be supported by Council or, in its opinion, the community.

These short-listed options are illustrated in Figure 5-1.

A value management workshop was held on 26 and 27 February 2003. This brought together a wide range of stakeholder interests and expertise to review investigations to date, and to assess the eastern and western route options in detail. The eastern alignment was endorsed by workshop participants as warranting further investigation prior to route selection. This recognised that there was a need to refine the route alignment through further analysis of the route and impacts on State Forest land, cultural heritage values, affected landholders, ecological and biodiversity values, property severances and telecommunications and electricity supply facilities.

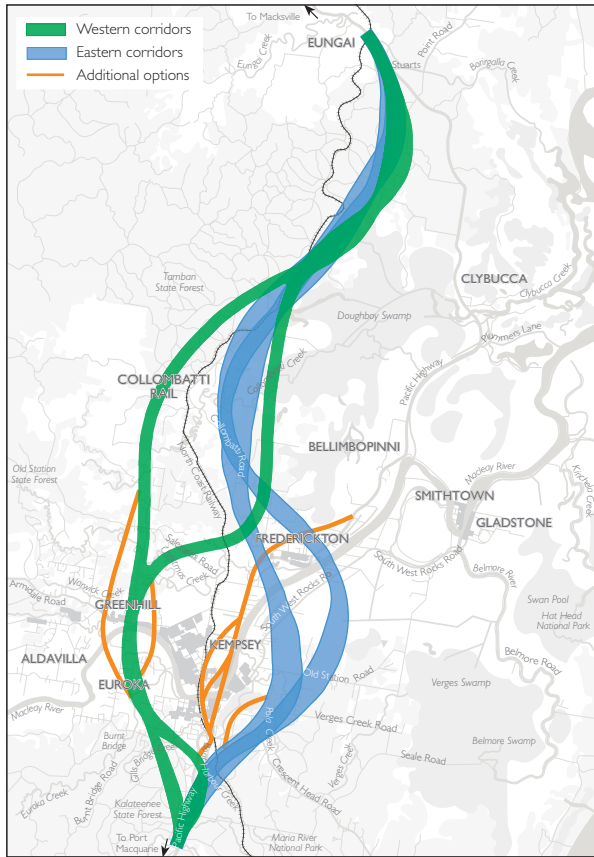
A conditional recommendation was made on the basis that the eastern route option (relative to the western route option) would result in greater environmental benefit and less environmental cost, as it would:

- Be able to be staged, which would provide earlier benefits to the community and allow flexibility for funding.
- Perform better, on balance, than the western route option according to most criteria.
- Provide good access to both the Kempsey town centre and the coast.
- Have impacts on fewer people and properties.
- Have less impact on the industrial area in South Kempsey.
- Have less impact on schools.
- Cause less severance of local communities.

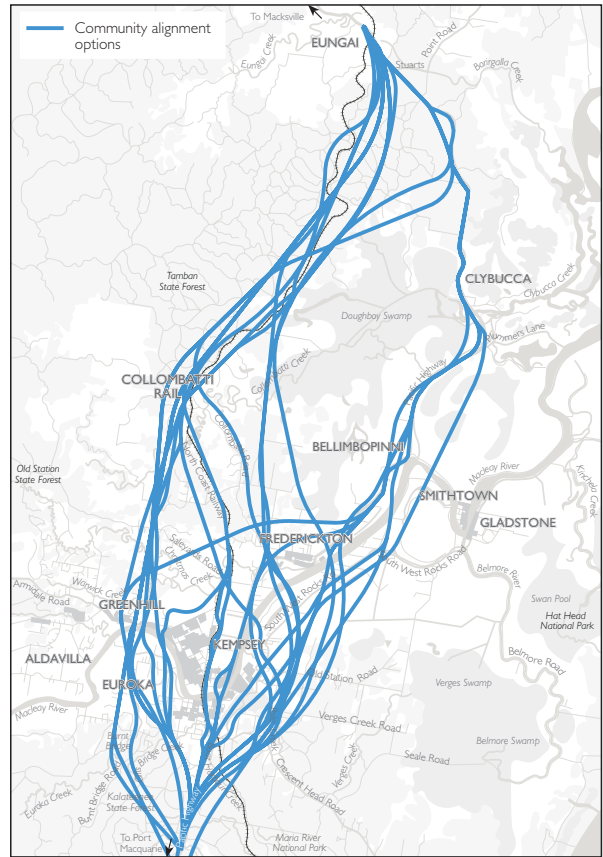
Following, and in accordance with, the conditional recommendation of the value management workshop further investigations and assessments were carried out for the eastern option in relation to:

- Flood impacts, opportunities to provide flood-free emergency and stock access, and address property impacts.
- Ecology.
- Land use and property severance.
- Geotechnical considerations.

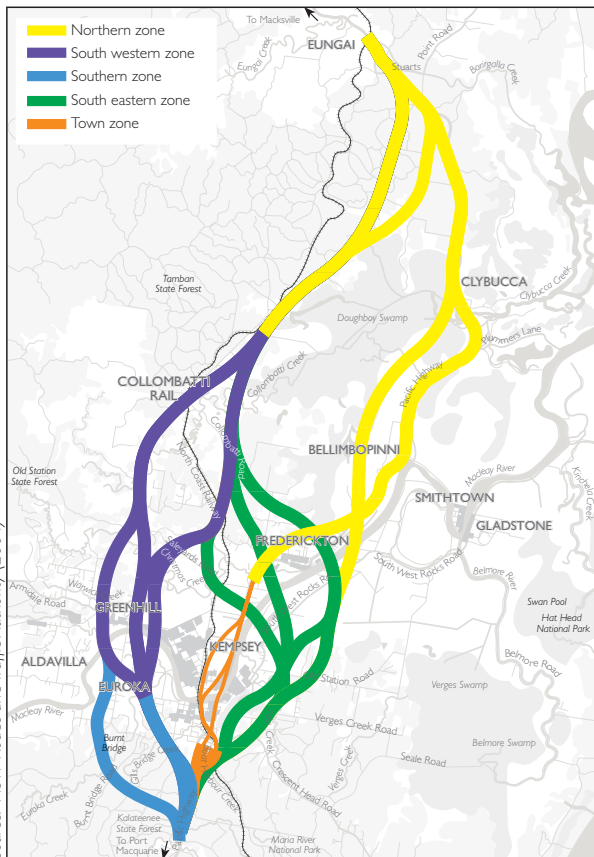
Figure 5-1 Route option development and selection



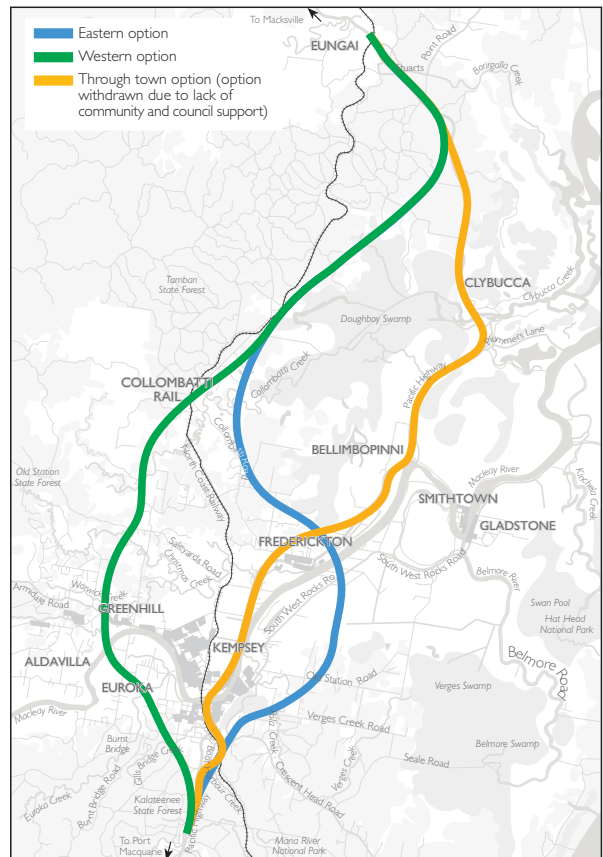
QUANTM corridors and routes



Community routes



'Long list' feasible routes



Short-listed route options

Source: NSW Roads and Traffic Authority (2004)



- Engineering and design.
- Noise and visual amenity.
- Sensitive land uses.

Supplementary investigations, along with the development and assessment of sub-options, supported the conditional recommendation of the eastern route option by the participants of the value management workshop. Aspects of the eastern route option identified as requiring further consideration included flooding, agricultural and ecological impacts.

Sub-options were then developed in response to potentially significant impacts on ecology and properties in both East Kempsey and Collombatti.

The alignment at East Kempsey was refined to avoid impacts on a colony of Grey-headed Flying Foxes (a Commonwealth and State-listed threatened species) on the eastern fringe of the East Kempsey wetland. Relative to the original alignment through East Kempsey, the East Kempsey sub-option, which took the road further east, provided more fill material and reduced noise and visual impacts on schools and residences. It also crossed less floodplain, soft soils and potential acid sulfate soils.

The alignment was refined at Collombatti to minimise property impacts and the potential fragmentation and barrier effects on regional fauna corridors.

Interchange locations were selected at South Kempsey, Frederickton and Barraganyatti. The exact location of the South Kempsey interchange required further assessment to determine the optimum position with regard to community, land use, environmental and engineering constraints. It was also identified that the configuration of the interchanges would require further assessment during the development of the concept design.

The assessment of the interchange location and configuration options is outlined in Section 5.2.

5.1.2 Selection of the preferred route

The amended eastern route option was considered to represent the best possible balance between social, environmental, engineering and cost factors, while continuing to provide for the future transport needs of both the local and wider community. It would also avoid other potential impacts associated with other route options, such as Aboriginal issues, threatened flora/fauna, noise and socio-economic impacts.

As a result, the eastern route with sub-options, described in Section 5.1.1, was identified as the preferred route for the proposed Kempsey to Eungai Pacific Highway Upgrade.

The preferred route was announced by the Minister for Roads and placed on exhibition for community input in July 2004.

5.2 Development of the concept design

A preliminary design for the proposed upgrade was developed as part of the selection of the preferred route in 2004. This was further refined during the concept design and environmental assessment phase. Design alternatives, including alignment refinements for component parts of the proposed upgrade, were assessed and selected considering various community, environmental and engineering criteria. Criteria used for assessment of the design alternatives were based on the proposed upgrade objectives outlined in Section 2.4 and the design principles and criteria outlined below.

5.2.1 Design and engineering principles and criteria

The development of the proposed upgrade concept design sought to integrate the proposed upgrade with the surrounding environment and complement the interests of the environment, community and road users, while also meeting the engineering and regulatory requirements of the RTA.

A set of design principles was developed to establish a framework for development of the proposed upgrade concept design. These principles were informed by relevant RTA guidelines and reflected the project objectives outlined in Section 2.5 and assessment criteria outlined in Section 5.1.1.

The key design principles centred around consideration of:

- *Local character* – complementing the natural topography and landscape, existing vegetation patterns and visual character and applying a suitable local design theme.
- *Gateways* – gateway treatments at prominent locations using consistent materials and themes with particular relevance to the local community to highlight entry to the Macleay Valley.
- *Crossings and linkages* – integrating bridges and overpasses with the surrounding terrain and designing these to minimise visual impacts on views and the landscape.
- *Embankments and cuttings* – minimising the number of large areas of fill and large cuttings, maximising opportunities for landscaping, and integrating these features with the surrounding topography where possible.
- *Planting and ecology* – protecting vegetation to be retained during construction, using a mix of endemic vegetation in landscaping to integrate with the existing vegetation, and preserving local character and views.
- *Water quality and control of run-off* – crossing watercourses at right angles, where possible, to minimise disturbance and maintain riparian corridors, and using grass swales and water quality ponds integrated into the landscape to screen and capture run-off prior to discharge to the local drainage system.
- *Noise attenuation* – using landscaped noise mounds in preference to vertical noise walls and, where this is not possible, integrating vertical noise barriers into the landscape by minimising heights, and using materials and plantings sympathetic to the local character of the area.
- *Signage, median treatments and lighting* – minimising road signage and placement of road signage in key locations, using wire rope barriers (in preference to concrete barriers) in conjunction with suitable landscaping, and lighting overpass structures, bridges and interchanges to provide a safe pedestrian environment and emphasise features.
- *Socio-economic impacts* – minimising impacts on settlement patterns, land use and the local economy, ensuring the proposed upgrade is accessible to all, and providing suitable and convenient routes for use by pedestrians and cyclists.
- *Ecologically sustainable development* – adopting the principles of ecologically sustainable development in the development of the preliminary design.

The primary engineering criteria used for the concept design of the proposed upgrade were adopted from a range of sources:

- *Road Design Guide* (NSW Roads and Traffic Authority 2006c).
- *Guide to the Geometric Design of Rural Roads* (Austroads 2003).
- *Grade Separated Interchanges – A Design Guide* (Austroads 1984).

- *Guide to Traffic Engineering Practice* (Austroads 1988 and subsequent updates) – appropriate parts from the series of publications.

In March 2005, the RTA released the first draft of *Upgrading the Pacific Highway, Upgrading Program Beyond 2006: Design Standards* (NSW Roads and Traffic Authority 2005a). These design standards were being developed to ensure design uniformity across the various Pacific Highway Upgrade Program projects. However, as this document was released for information only, it was decided to proceed with the current concept design, note any non-conformances with the draft standards and ensure that the proposed road reserve allowed sufficient space for their rectification during the detailed design phase.

Design criteria from the sources listed above were used throughout the concept design development of the proposed upgrade.

5.2.2 Design context and constraints

The proposed upgrade concept design development also responded to the local landscape and land use context and constraints. The design context is characterised by the wide rural floodplain of the Macleay River, the towns of Kempsey and Frederickton, and bushland to the south of Kempsey and south of the village of Eungai Rail.

The area comprises three distinct landscape character types, including:

- Low-lying flat pastureland, with occasional remnant clumps of trees, providing panoramic views across the floodplain to the more rugged topography to the north, west and east.
- Partially forested wetland areas, mostly in the northern and western parts of the proposed upgrade study area.
- Thickly forested land on rising ground on all sides of the floodplain, which generally limits most long distance views beyond it.

Each of these landscape character types presents a different design challenge. For example, low-lying flat pastureland is mostly flood-prone and contains soft soils; therefore, potential changes to the flood regime and potential construction constraints must be considered.

Constraints relating to soils and geology, flooding, flora and fauna, land use, heritage and the visual environment were used to develop specific design responses to avoid or minimise impacts. Where potential residual impacts existed, measures were proposed to mitigate these impacts.

Key constraints identified during the environmental investigations for the proposed upgrade included:

- The characteristics of the Macleay River flood regime and potential impacts of the proposed upgrade on local agricultural and residential land uses.
- The presence of SEPP 14 wetlands and various watercourses, including the Macleay River, creeks and local drains.
- The presence of potential soft soil conditions across the Macleay River and Collombatti Creek floodplains.
- The presence of species habitats and vegetation communities of significance within the corridor and on adjacent land, including habitat for fauna species such as the Glossy-black Cockatoo, Green-thighed Frog and Grey-headed Flying Fox, and flora species such as *Maundia triglochoides* and *Arthraxon hispidus* (Hairy Joint Grass).
- The presence of residential and other sensitive land uses and property adjoining or in close proximity to the proposed upgrade corridor.

- The cultural importance of heritage items, including remnants of an avenue of memorial trees at Ferry Lane, Frogmore and in Frederickton.
- The ability of the surrounding landscape to absorb the visual impact of the proposed upgrade, in particular across the floodplain and at high points in the landscape.

5.3 Design alternatives

In order to refine the design of the proposed upgrade, a series of alternatives were developed for different project components, to optimise the environmental, socio-economic and engineering performance. These included options for interchange locations and configurations, the length and composition of bridging across the Macleay River floodplain and local road connections.

Key design alternatives are illustrated in Figures 5-2a to 5-2g. A number of other design amendments were also made, as summarised in Section 5.4 and shown in Figures 5-2a to 5-2g.

5.3.1 Approach to assessment of design alternatives

Design alternatives for component parts of the proposed upgrade were identified, assessed and selected, considering various community, environmental and engineering issues. Criteria used for the assessment of design alternatives were based on the proposed upgrade objectives outlined in Section 2.5, together with the design and engineering principles outlined in Section 5.2.1.

A qualitative and objective assessment was used for the ranking of each design alternative.

5.3.2 Interchange locations and configurations

The proposed upgrade incorporates three interchanges. Alternative locations and designs for these interchanges are outlined and assessed below.

South Kempsey interchange

The primary purpose of the proposed South Kempsey interchange is to service the town of Kempsey and commercial land uses to the south of Kempsey, as well as arterial roads connecting various areas of the Macleay Valley.

The preliminary design development identified three alternatives for the location of the South Kempsey interchange, as shown in Figure 5-2a and 5.2g. The following three options were considered:

- Option 1 – Station 0 to -130.
- Option 2 – Station 500.
- Option 3 – Station 1300.

The primary considerations during the assessment of the interchange locations were urban design; the need to provide a 'gateway' to Kempsey; proximity to Kempsey and potential development areas to the east of the alignment to provide for economic sustainability; and impacts on local residences, access, and road safety.

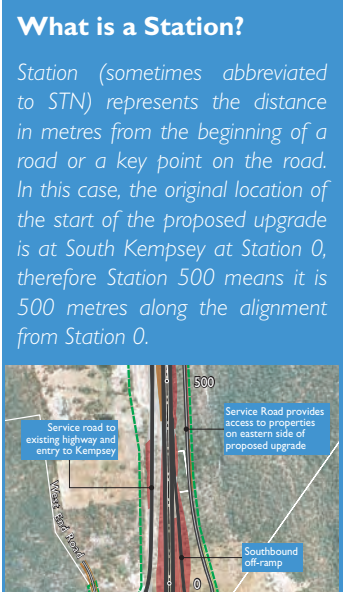
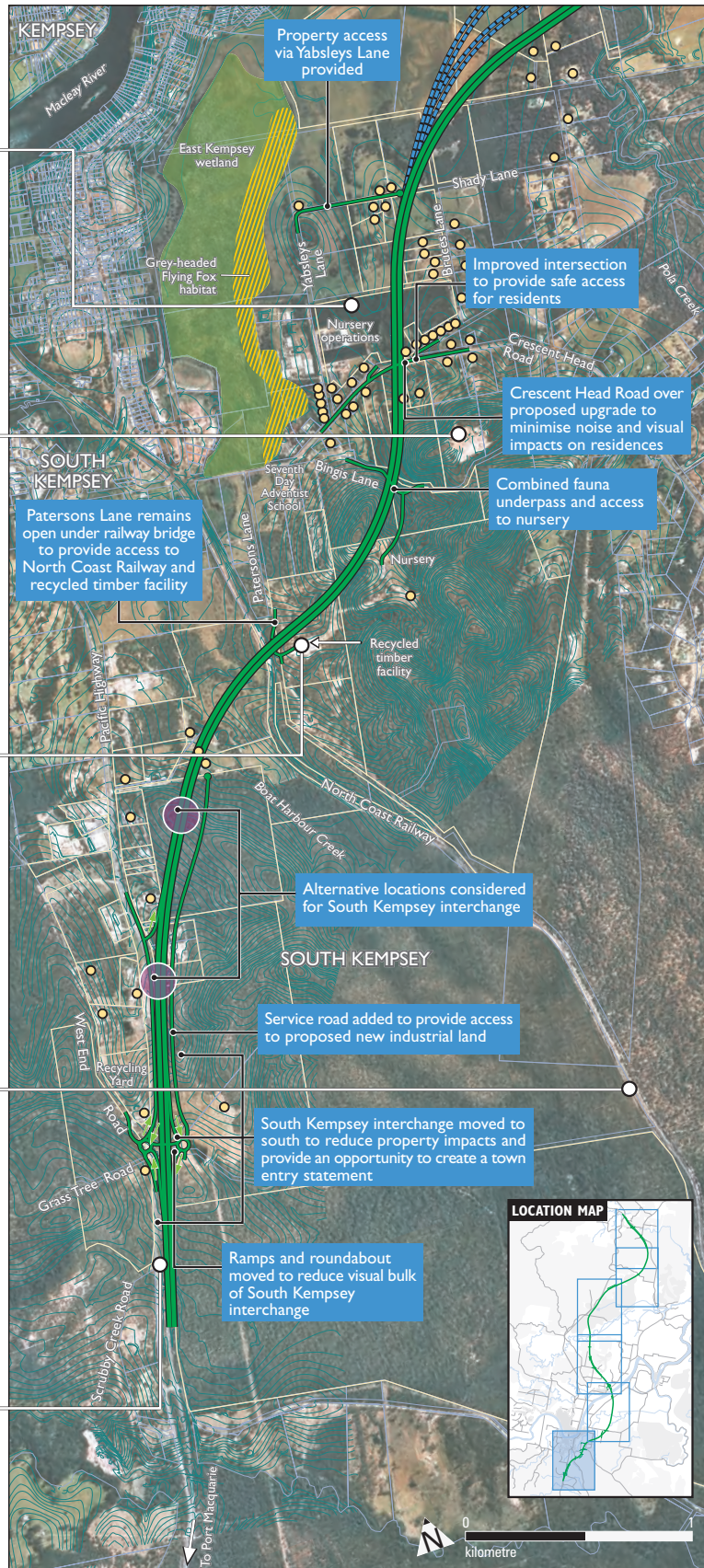


Figure 5-2a Concept design development



- The proposed upgrade
- Residences within proximity of the proposed upgrade
- East Kempsey wetland
- Properties affected by the proposed upgrade
- Grey-headed Flying Fox habitat
- Alternative interchange locations
- Alternative alignment options

Figure 5-2b Concept design development

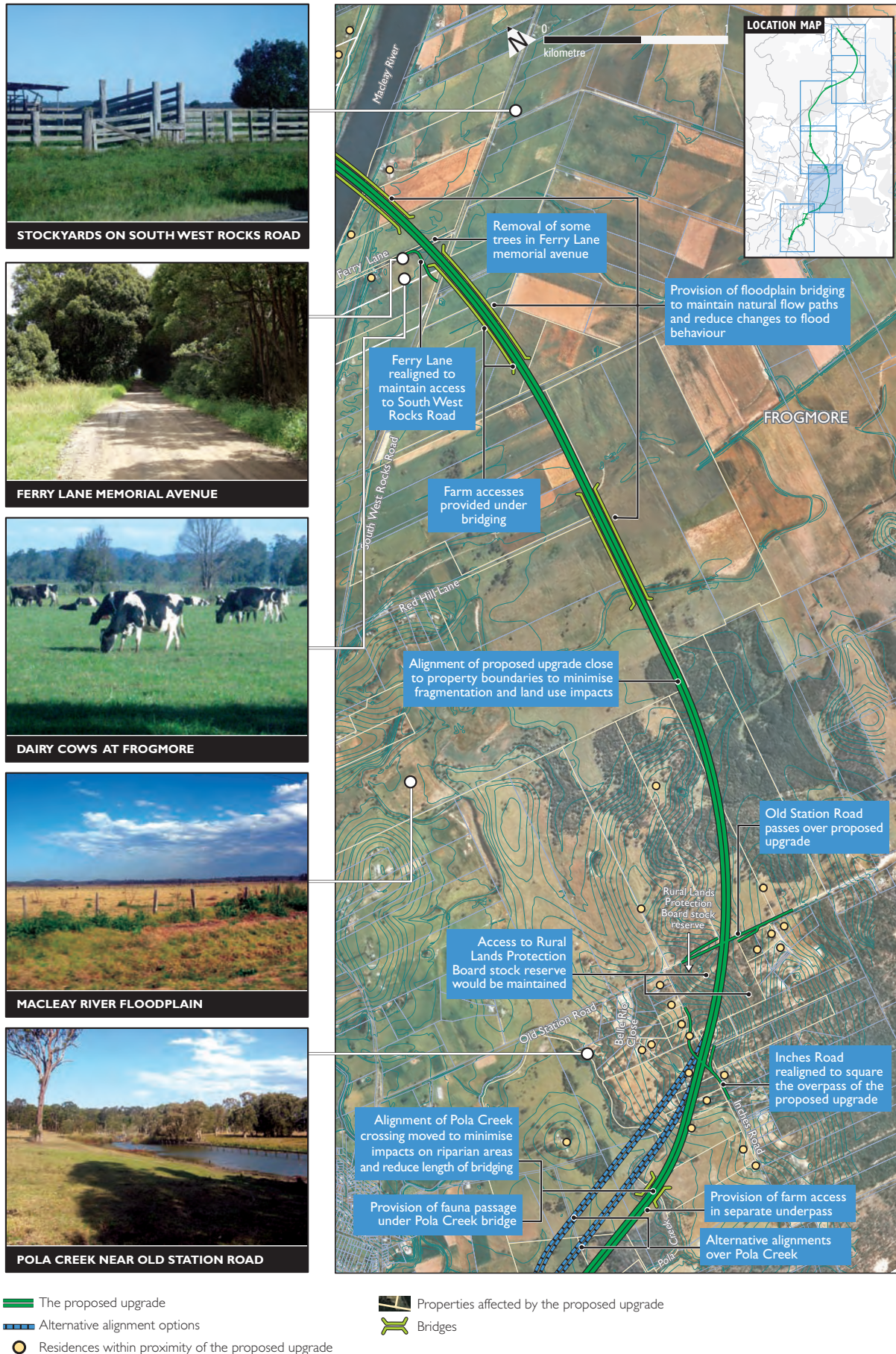


Figure 5-2c Concept design development

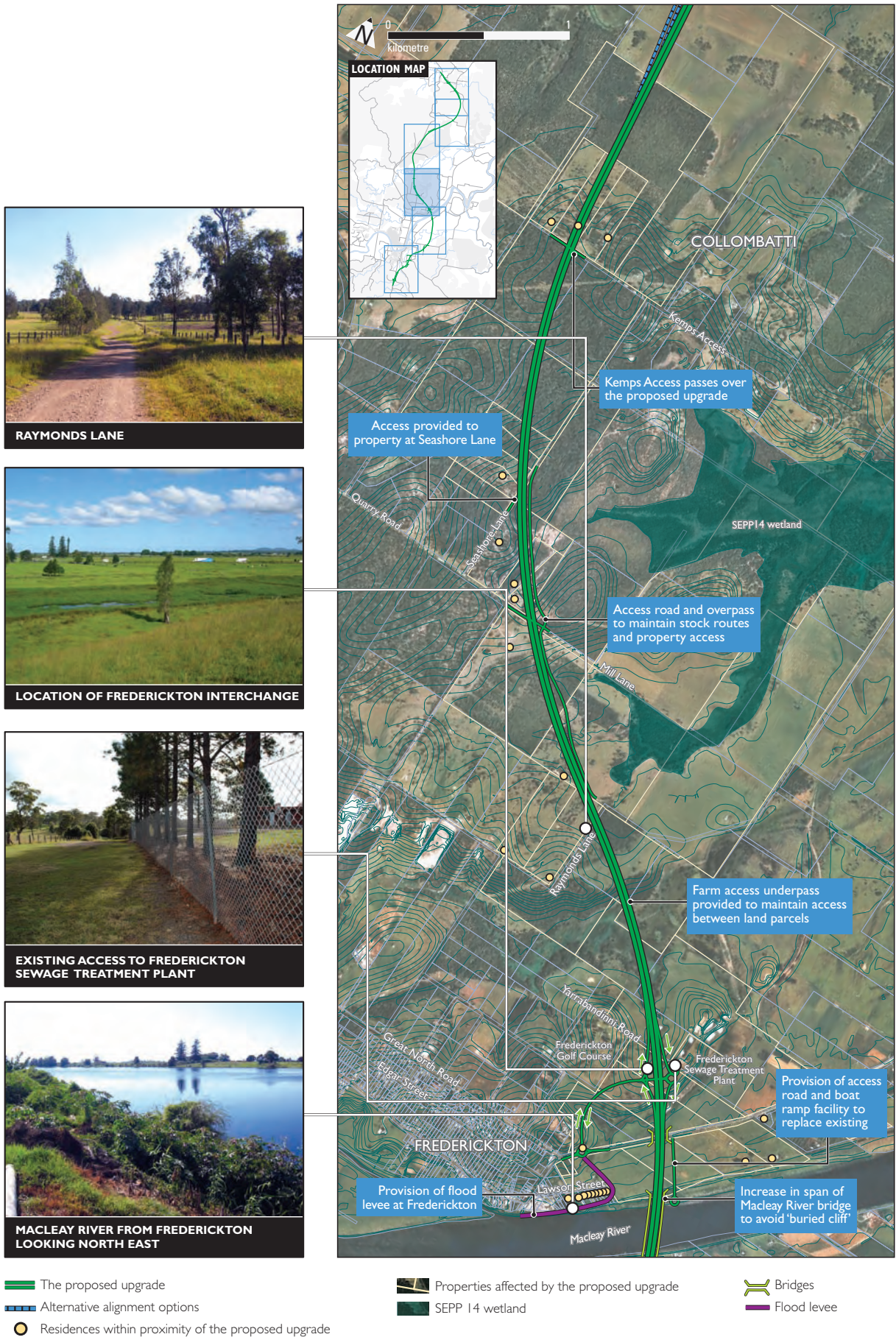
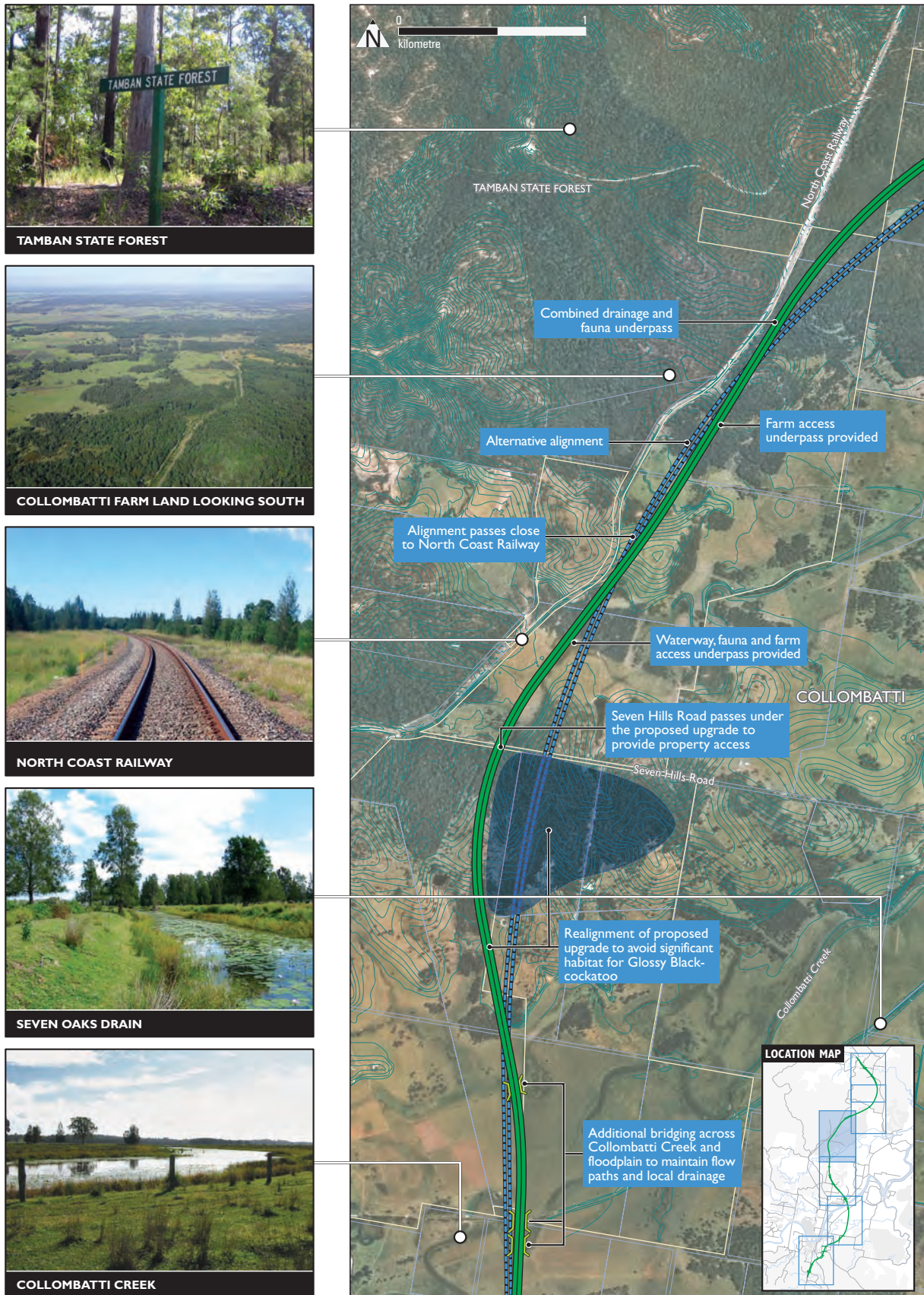




Figure 5-2d Concept design development



 The proposed upgrade
 Alternative alignment options




 Properties affected by the proposed upgrade
 Glossy Black-cockatoo habitat
 Bridges

Figure 5-2e Concept design development

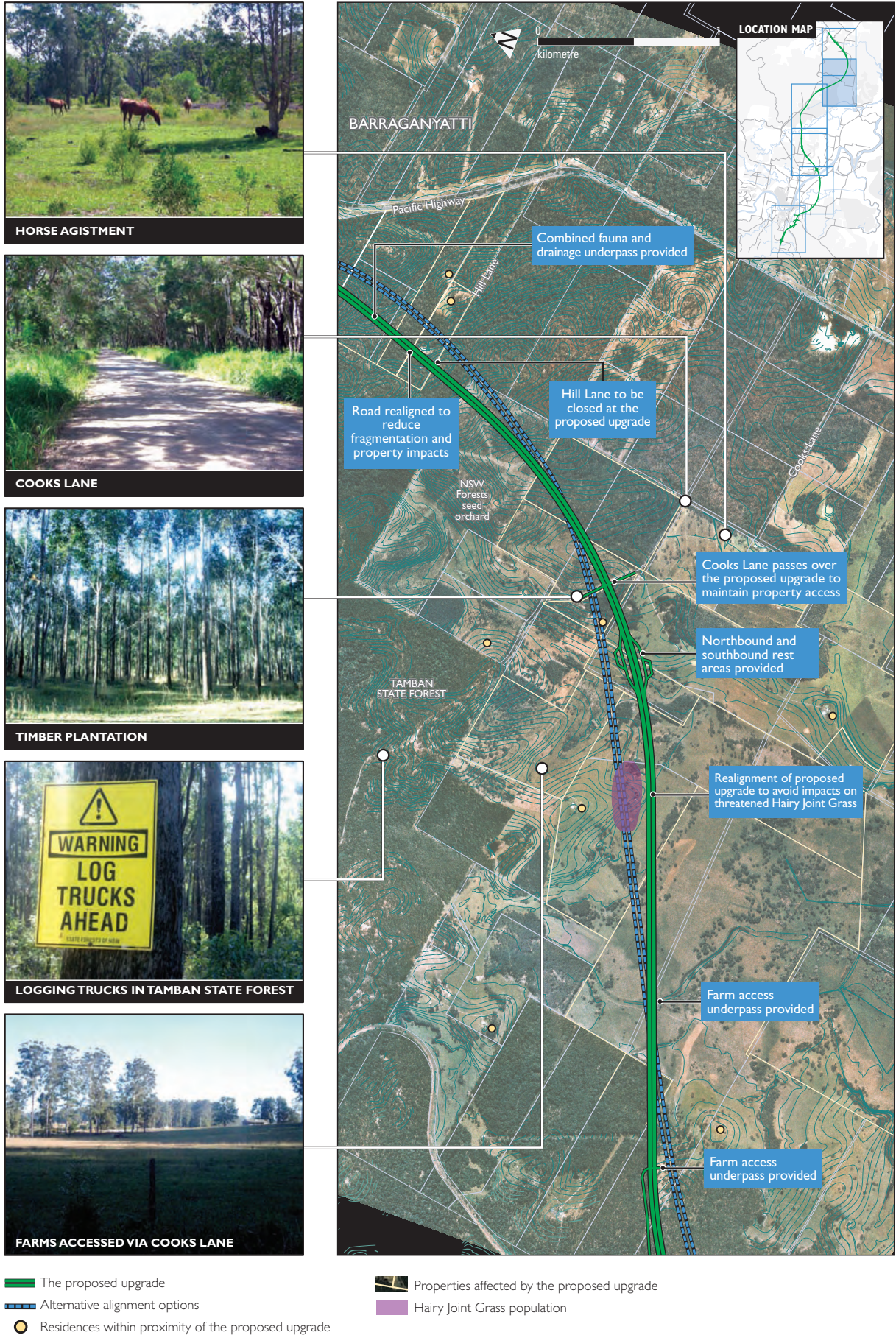


Figure 5-2f Concept design development

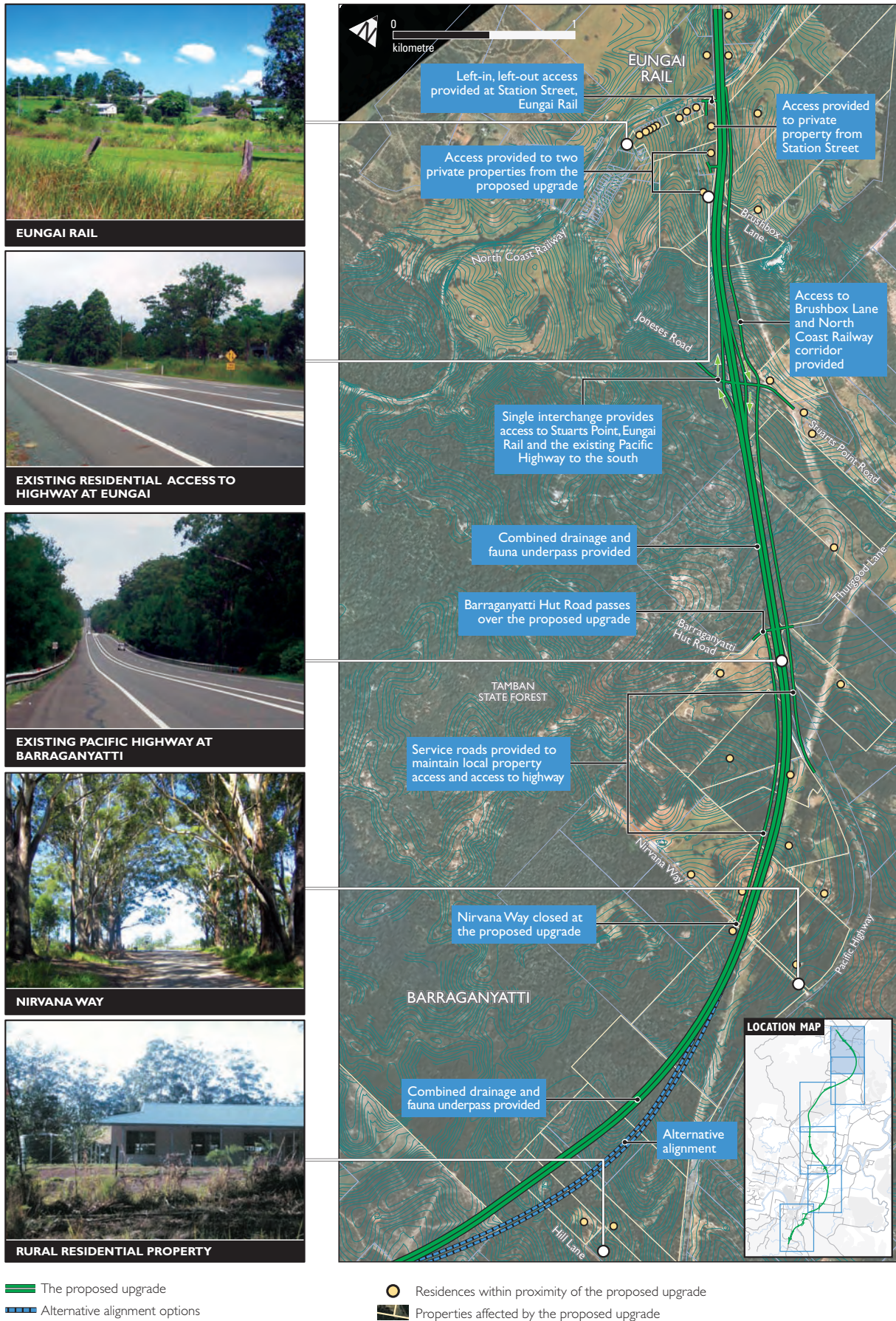
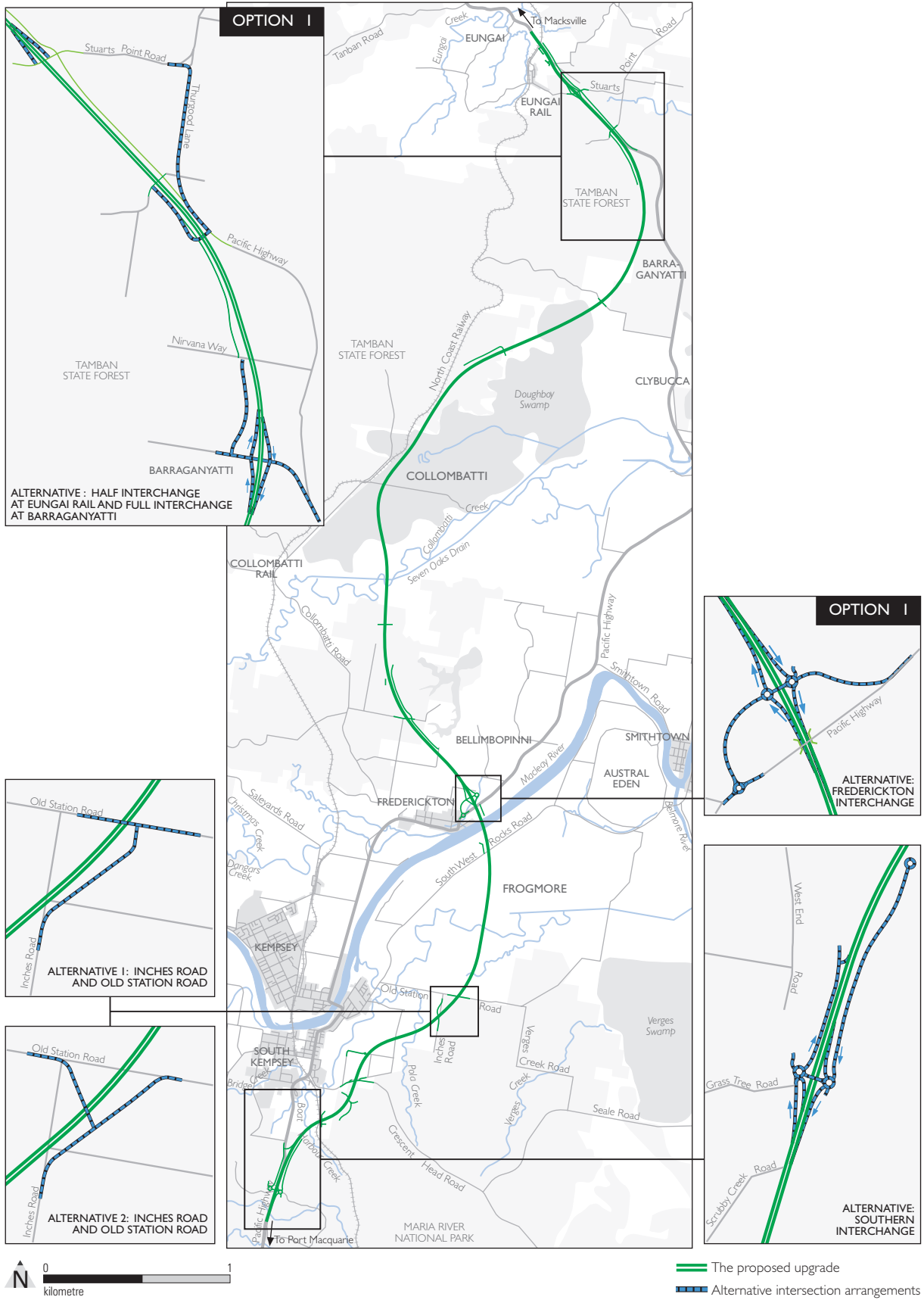


Figure 5-2g Concept design development



Option 1 was selected as the preferred interchange location, as it provides good access to the Kempsey township, takes advantage of the existing terrain and provides a visual gateway to Kempsey for traffic travelling northwards on the highway. This option would also be located away from the majority of residences in the area.

Both conventional and modified diamond interchange configurations were assessed. It was decided that a modified diamond configuration was preferred, as it provides a more direct southern connection into and out of Kempsey and minimised impacts on local residences.

An illustration of the interchange location and arrangement for the South Kempsey interchange is shown in Figure 5-2g.

Further refinement of this interchange is outlined in Table 5-2.

Frederickton interchange

The primary purpose of the proposed Frederickton interchange is to service the Frederickton community and surrounding rural areas.

During the route selection process, it was determined that the optimum location for the Frederickton interchange was on the ridge east of Frederickton and north of the existing Pacific Highway. This location allowed a flood-free route to be provided from Frederickton to the proposed upgrade, and minimised impacts of construction on the floodplain. Two interchange configurations were developed for this site. The options comprised:

- *Option 1* – full diamond interchange with eastern and western approach roads.
- *Option 2* – full diamond interchange with a single western approach road.

Local drainage, urban design, property, land use and traffic impacts were also important considerations in the development and assessment of these options.

Option 2 was selected as the preferred option, as it required the placement of less embankment and bridging on the floodplain than Option 1 (see Figure 5-2g). Also, by eliminating the eastern approach road, the floodway would be less affected at this location. The potentially negative visual impact of the interchange was also minimised and there were less property impacts.

Northern interchange

The primary purpose of the proposed northern interchange is to service the communities of Stuarts Point, South West Rocks and Eungai Rail.

The location and configuration of the northern interchange was reassessed during the development of the concept design.

Two options for the northern interchange were developed. The options comprised:

- *Option 1* – full diamond interchange at Barraganyatti and half diamond interchange at Stuarts Point Road.
- *Option 2* – full diamond interchange at Stuarts Point Road.

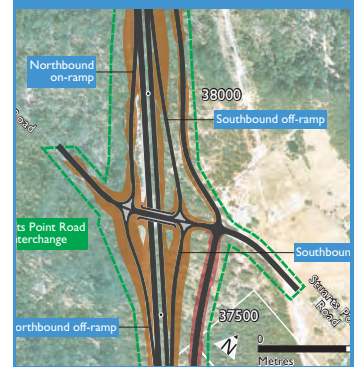
Factors that influenced the location of the interchange included community issues, environmental impacts, and road safety issues.

Option 2 (the Stuarts Point Road interchange) was selected as the preferred option, as it provided a direct connection to the proposed upgrade from the existing highway at Eungai Rail and Stuarts Point, at a similar location to the existing situation. This configuration also resulted in significant cost savings relative to Option 1.

An illustration of the alternative interchange arrangement for the Stuarts Point Road interchange is shown in Figure 5-2g.

What is a full diamond interchange configuration?

A full diamond interchange configuration denotes the shape of the interchange when viewed from above. Full diamond interchanges have northbound and southbound on and off ramps stemming from an overpass that connects to local roads.



5.3.3 Floodplain bridging

The proposed upgrade crosses the Macleay River floodplain. The Macleay River has a large catchment, which can result in major flood events. The local community is greatly concerned about potential changes to flooding behaviour as a result of the proposed upgrade. A detailed assessment of flooding behaviour and the optimum floodplain bridging configuration was, therefore, undertaken, with the overall objective of minimising the changes to flooding behaviour adjoining the proposed upgrade alignment and achieving no change to the predicted flooding behaviour at Kempsey.

Various bridge options were modelled to determine the optimum configuration. In general, the configurations involved three lengths of bridging: one over the Macleay River and two lengths over floodways within the floodplain to suit the flood flow paths. A full bridging option was also considered. The bridge options assessed are outlined in Table 5-1.

Table 5-1 Bridging options assessed

Option	Total length of bridges (kilometres)	Lengths of individual bridges (metres)		
		Main river bridge	Middle bridge	Southern bridge
1.7	1.7	600	400	700
1.9	1.9	600	600	700
2.1	2.1	600	800	700
2.45	2.45	1,750 ¹	–	700
2.5	2.5	600	1,200	700
Full bridge	4.2	–	–	–

Note

1. Main river bridge and middle bridge were joined for this option

A detailed assessment of flooding impacts and bridging options is provided in the report: *Kempsey to Eungai Pacific Highway Upgrade Project Application Report: Supporting Information* (NSW Roads and Traffic Authority 2006a). The options assessment included consideration of changes to flood levels, flow velocity, flow paths, impacts on land use and heritage, cost, constructability and community concerns.

Based on the flood modelling, the optimum total bridge length for floodplain bridging was determined to be 2.1 kilometres. Incorporating other considerations such as access and local drainage, it was concluded that a bridge length of 2.17 kilometres was required. This length of floodplain bridging provided minimum highway flood immunity for a 1-in-20-year flood event, and did not inhibit the ongoing use of land on the floodplain. Potential changes to the flood regime as a result of the proposed upgrade, and impacts on land use and property, are outlined in Chapter 10 – *Hydrology and water management* and Chapter 15 – *Land use and property*, respectively.

5.3.4 Local road connections

Crescent Head Road

The proposed upgrade intersects with Crescent Head Road in close proximity to a residential area east of Kempsey.

Two options were assessed to determine a suitable method of crossing Crescent Head Road:

- *Option 1* – proposed Upgrade over Crescent Head Road.

- *Option 2* – Crescent Head Road over proposed Upgrade.

Issues that influenced the options development and assessment were impacts on residences and property, construction costs, fill requirements, road safety, property access, traffic, safety, noise, visual impacts and impacts on an existing dam.

Option 2, with Crescent Head Road over the proposed upgrade was selected as it has less effect on the community in this area, and greater cost benefits to the proposed upgrade. Option 2 is shown in Figure 5-2a.

Inches Road and Old Station Road

The proposed upgrade intersects with Inches Road and Old Station Road. Three options were assessed to determine a suitable method for crossing these roads:

- *Option 1* – Old Station Road over the proposed upgrade (i.e. close Inches Road at the proposed upgrade and construct a service road connection to Inches Road).
- *Option 2* – Inches Road and Old Station Road over the proposed upgrade on a single bridge.
- *Option 3* – Inches Road and Old Station Road over the proposed upgrade on separate bridges.

Issues that influenced the options development and assessment were cost, property and community impacts, local road access, safety and engineering design.

Option 3 was selected as the preferred option as it would maintain traffic along existing road corridors and minimise impacts on the local community. Option 3 is illustrated in Figure 5-2b.

5.4 Summary of design responses and other refinements

The proposed upgrade concept design was developed in accordance with the design criteria and principles outlined in Section 5.2. It also required responses to community, environmental and engineering issues.

A summary of the design responses outlined in Section 5.3 and other design refinements is provided in Table 5-2 and illustrated in Figures 5-2a to 5-2g.

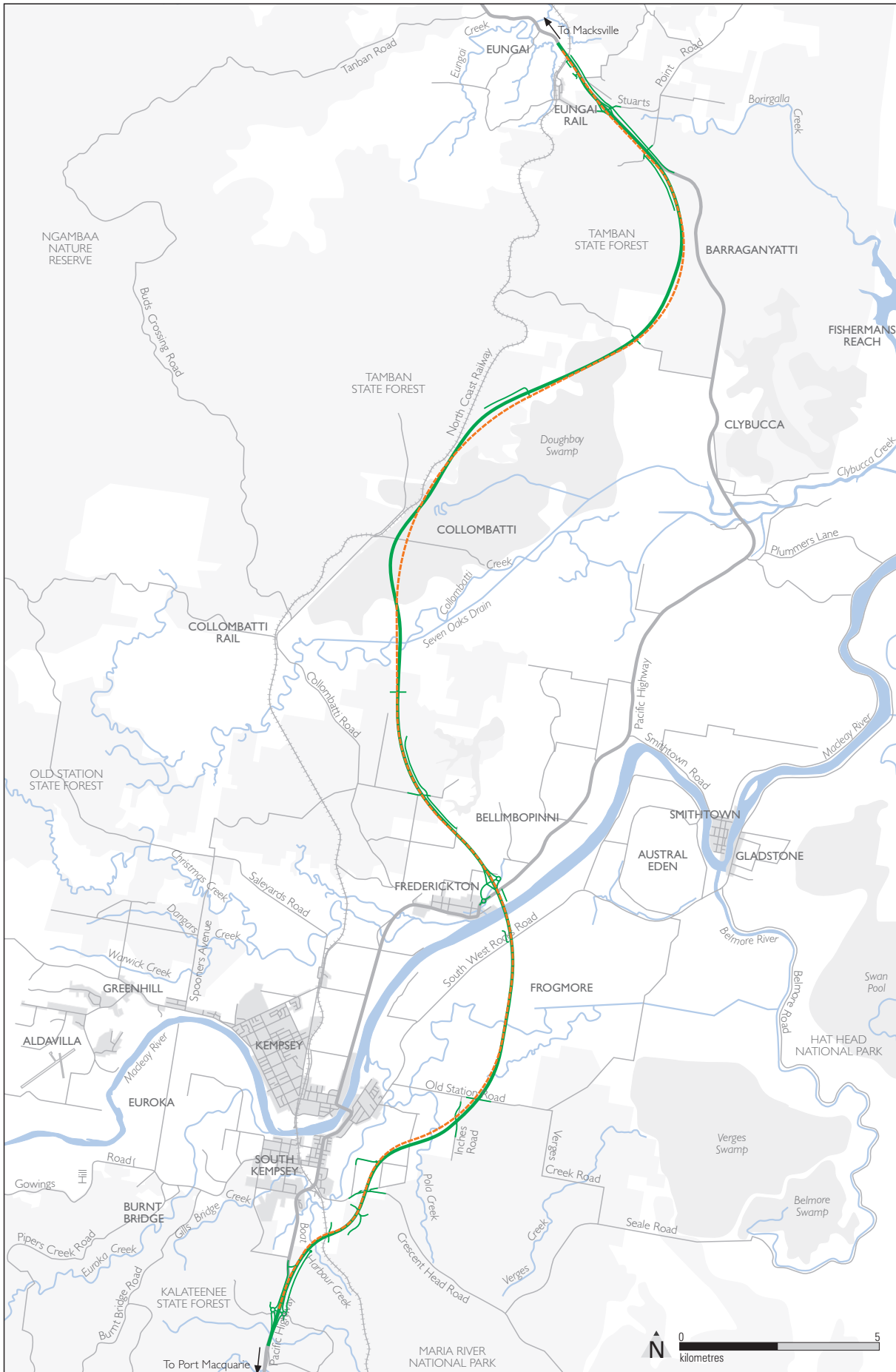
Table 5-2 Summary of design responses and refinements

Component	Response
Alignment	<ul style="list-style-type: none"> • Realignment at South Kempsey to minimise impacts on commercial and residential land uses and the East Kempsey wetland. • Realignment at Pola Creek to reduce potential impacts on creek riparian areas. • Realignment to minimise impacts on the memorial avenue of trees at Ferry Lane. • Realignment through Collombatti to improve the road geometry and earthworks balance; avoid stock refuge areas, Glossy-black Cockatoo habitat and Hairy Joint Grass (<i>Arthraxon hispidus</i>); and minimise impacts on agricultural land use and infrastructure, including a spring-fed dam. • Realignment to avoid an electricity easement and a Department of Primary Industries (Forests) seed orchard, and to reduce impacts on residential properties in close proximity to the preferred route.

Component	Response
Interchange location and configuration	<ul style="list-style-type: none"> • Relocation of the South Kempsey interchange approximately 250 metres to the south to minimise impacts on the operation of a recycled waste facility, whilst improving road geometry and creating an opportunity for a town entry statement. • Creation of a service road from the eastern roundabout of the South Kempsey interchange to provide access to proposed new industrial land to the east. • Reconfiguration of the Frederickton interchange. • Integration of the proposed split Barraganyatti and Eungai Rail interchanges into a single full interchange at Stuarts Point Road.
Bridges and crossings	<ul style="list-style-type: none"> • Bridging across the floodplain to cost-effectively address changes to the Macleay River flood regime and impacts on adjacent land uses. • An increase in the clearance of bridging across the Macleay River to minimise impacts on navigable waters. • An increase in the span of the Macleay River bridge to avoid a buried cliff at Frederickton. • Provision of bridge screens at the Mill Lane and Kemps Access overpasses to assist with cattle crossing. • Relocation and extension of bridging over the Seven Oaks drain, Collombatti Creek and Collombatti Creek overflow. • Provision of fauna crossings in co-location with drainage culverts to allow fauna passage.
Local road connections	<ul style="list-style-type: none"> • Retention of access to the recycled timber manufacturing yard, nursery and North Coast Railway corridor. • Realignment of Crescent Head Road, Inches Road and Old Station Road over the proposed upgrade to reduce visual impacts and maintain local access. • Improvement of the intersection layout at Bruces Lane and Crescent Head Road. • Provision of access to properties on the western side of Shady Lane via Yabsleys Lane. • Realignment of Ferry Lane to maintain access to properties. • Alignment of Mill Lane and Kemps Access over the proposed upgrade to maintain stock routes and local access. • Alignment of Cooks Lane and Barraganyatti Hut Road over the proposed upgrade to maintain local access.
Frederickton levee	<ul style="list-style-type: none"> • Amendments to the design of the proposed levee to include levee walls to reduce visual bulk. • Architectural treatments for residences affected by impacts on residential and visual amenity. • Relocation of recreational boat ramp and facilities to the north-western side of the proposed Macleay River bridge.

The proposed upgrade concept design is described and illustrated in detail in Chapter 6 – *Concept design*. A comparison of the preferred route (July 2004) and the proposed upgrade is illustrated in Figure 5-3.

Figure 5-3 Comparison of preferred route (July 2004) and proposed upgrade



- The proposed upgrade
- - - Preferred route (July 2004)

5.5 How the community and stakeholders influenced the concept design development

The community as well as council and agency and stakeholders were consulted throughout the development of the preferred route and the proposed upgrade concept design, so that community concerns and ideas were appropriately incorporated into the design and assessment studies. Community and stakeholder involvement is described in Chapter 4 – *Community and stakeholder involvement*.

The community's input to the development of the concept design and environmental assessment was considerable. Some examples of local knowledge that contributed to the concept design and environmental assessment include:

- Indigenous and non-Indigenous heritage and culture in the area.
- Flood patterns, drainage issues and emergency evacuation routes and flood refuge areas.
- Agricultural land use, particularly farm operations and infrastructure.
- Local business and economic drivers in the towns of Kempsey and Frederickton, including the status of the dairy and cattle industry, local employment and the function the town has in providing services and facilities to the Macleay Valley and Pacific Highway users.
- Current and future land use development activities in South Kempsey, Frederickton and Eungai Rail.
- Traffic patterns.

The community contributed directly to developing the concept design, in terms of:

- The location and design of the South Kempsey interchange, considering access to proposed and potential future industrial land at South Kempsey and land uses on the existing Pacific Highway.
- The configuration of the Frederickton interchange and the provision for stock movement near this interchange in flood events.
- The configuration of the Stuarts Point Road interchange.
- Realignment of the proposed upgrade near Crescent Head Road to minimise property and operational impacts on farms, a recycled timber facility, nurseries and residences.
- The length of bridging across the floodplain.
- Relocation of boat ramps and park facilities to the north-eastern side of the proposed Macleay River bridge.
- The provision and configuration of property access underpasses and overpasses at various points along the route.
- Concept design and location of the proposed Frederickton levee.
- Design of bridges to encourage stock to pass over them.