

6 Preliminary assessment of impacts and potential management measures

6.1 Preliminary assessment of impacts

A preliminary assessment of the potential environmental impacts of the proposed Warrell Creek to Urunga Highway Upgrade is summarised below. This assessment is based on the comprehensive investigations undertaken through the route planning stage and, where relevant, the findings from more recent studies.

6.1.1 Community impacts

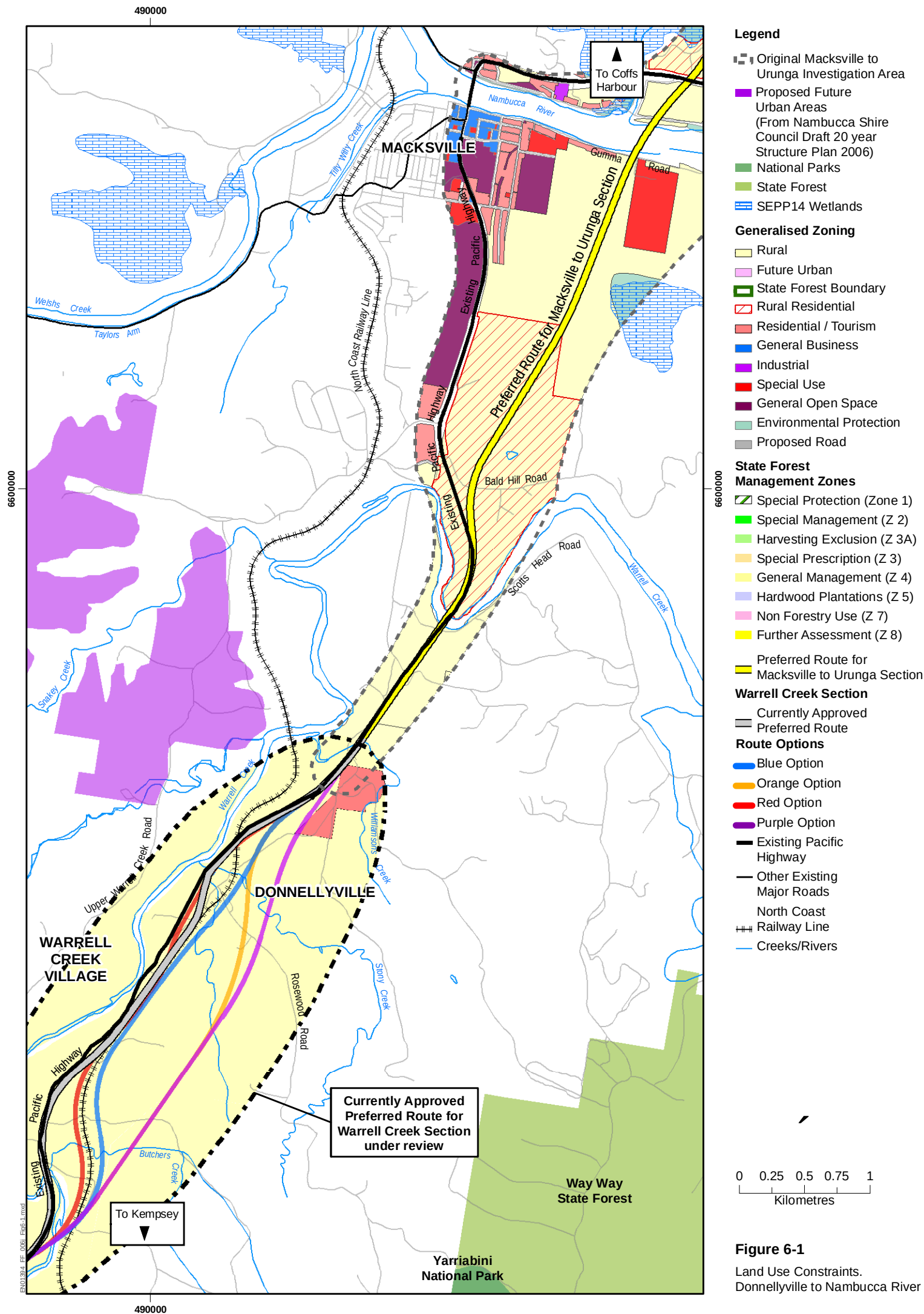
Land use considerations

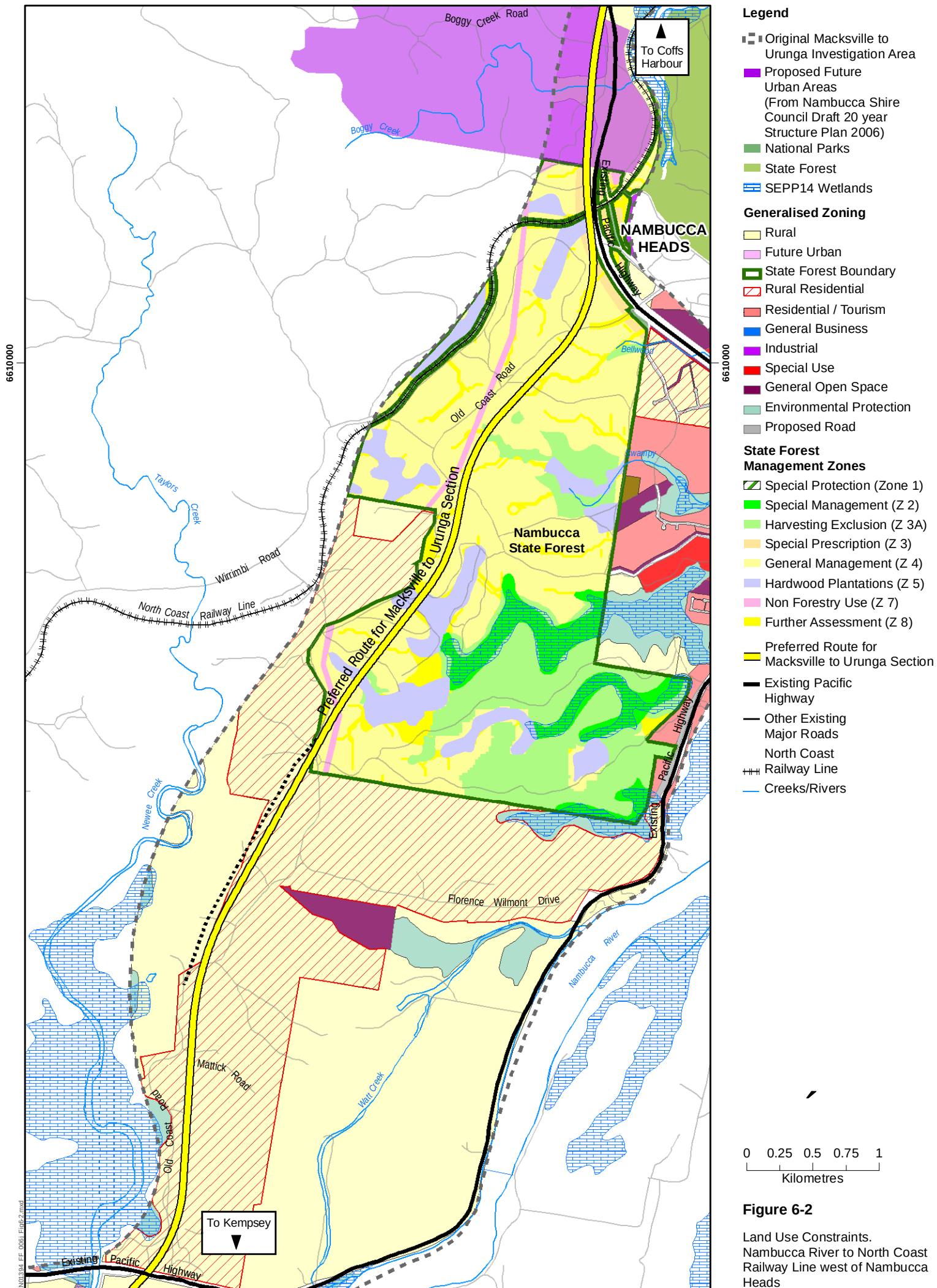
Figures 6-1 to 6-4 show the Proposal in relation to land use constraints. Table 6-1 provides a summary of the key quantifiable land use impacts of the Proposal. Impacts have been considered in terms of area of land directly affected (typically measured in hectares) and (where relevant) the length of the route through various land uses (to provide an indication of severance impacts).

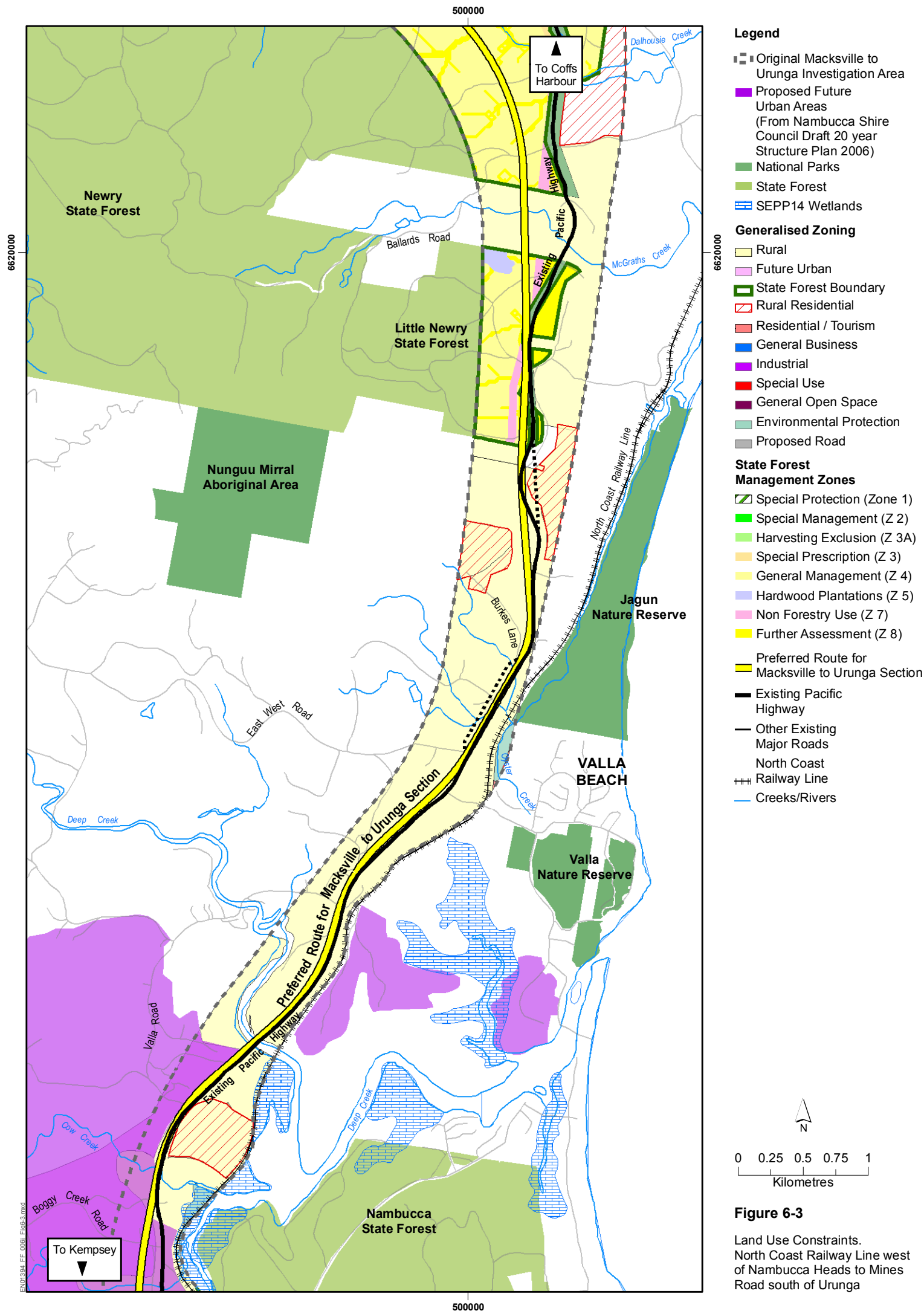
It should be noted that a corridor width of 200 metres was used to determine the number of dwellings shown as directly affected by the Proposal in Table 6-1. All other land use impacts were calculated on a corridor 100 metres wide.

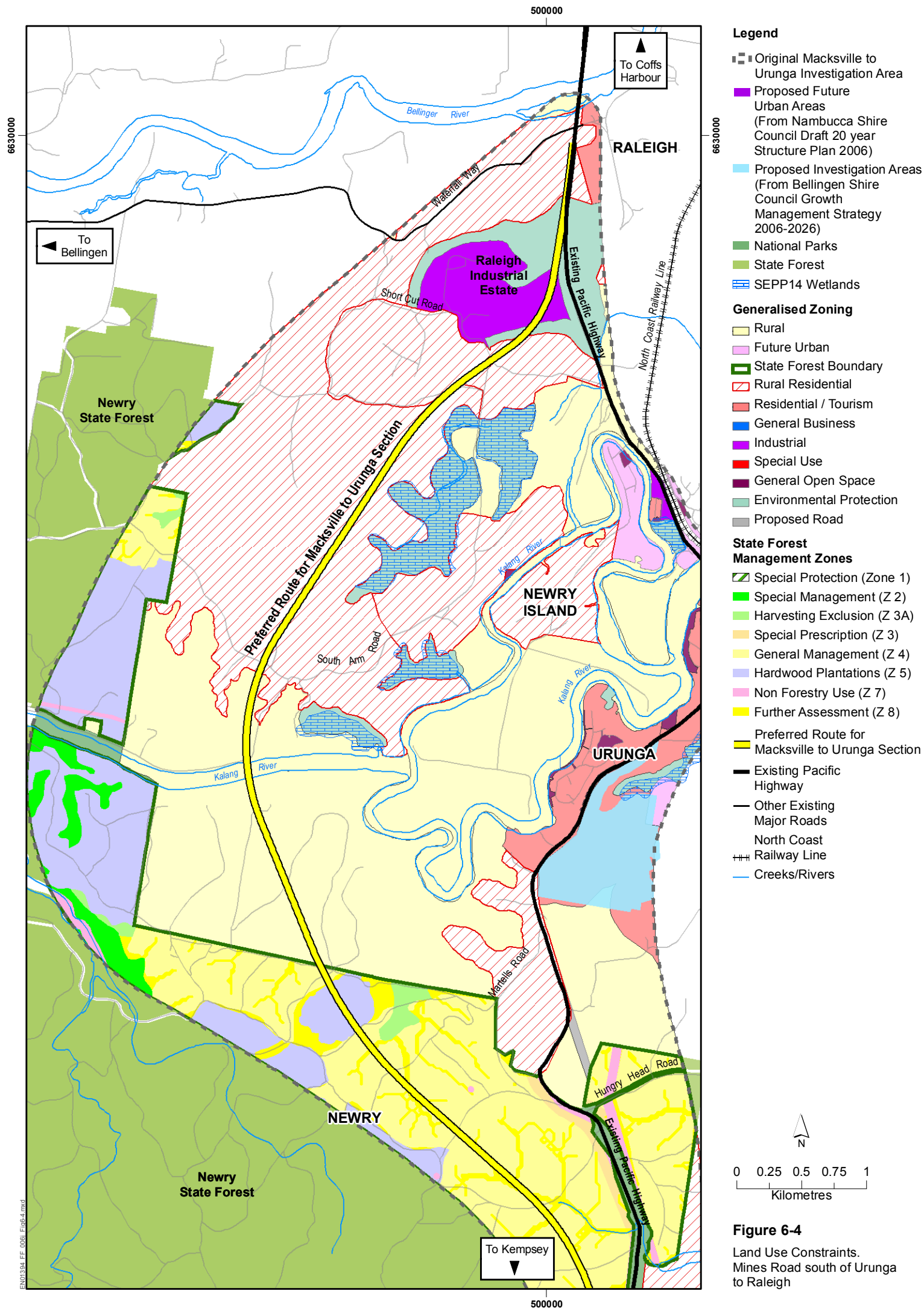
Table 6-1: Summary of land use impacts of the Proposal

Land use	Impact	Comment
Number of dwellings directly impacted	78-84 structures	Urban areas are avoided, impacts are on rural dwellings and rural residential areas
Area of rural residential zoned land directly impacted	114–123 ha	Primarily around Bald Hill Road, Old Coast Road and Short Cut Road
Length of route through rural residential zoned land	10.2-11.2 km	As above
Area of prime agricultural zoned land directly impacted	170–182 ha	Primarily within the Nambucca River floodplain
Length of route through prime agricultural zoned land	18.2-19.3 km	As above
Area of productive state forest land directly impacted (forest management zones 4, 5 and 8)	91 ha	Substantial land take within both the Nambucca and Newry State Forests
Length of route through productive forest management zones	8.9 km	Substantial length of route through both Nambucca and Newry State Forests, likely to result in significant fragmentation of forest resources and changes to forestry operations
Area of conservation land within state forests directly impacted (zones 1, 2, 3 and 3A)	4 ha	Minimal impacts only on a small area of conservation zoned land in Nambucca State Forest
Area of SEPP 14 wetlands directly affected	Nil	Proposal avoids all SEPP 14 wetlands in the investigation area
Area of industrial zoned land directly affected	5 ha	Impacts are within the Raleigh industrial area zone; existing industrial land uses are not impacted









Social issues

During the community consultation program, a number of social issues were raised in relation to the project. The community was most concerned about reducing accidents and injuries, minimising severance and impacts to properties and communities, providing effective and safe connections to/from the upgraded Highway and support for local businesses, tourism and agriculture.

The Proposal introduces a new highway, with its associated impacts, into developing rural residential areas east of Warrell Creek village, near Bald Hill Road, along Old Coast Road north of Macksville and to the west of Urunga.

While an upgraded Pacific Highway in the investigation area may result in localised social impacts, the Proposal would provide many social benefits to the region as a result of a safer upgraded highway with fewer accidents and reduced travel times.

Road safety

The existing Pacific Highway through the investigation area is primarily a two-lane road with occasional overtaking lanes. RTA crash data indicates that a total of 269 crashes occurred on the Pacific Highway in the study area in the five-year period between 1 April 2001 and 31 March 2006. These included 13 fatal crashes resulting in 16 fatalities, 122 injury crashes and 134 non-injury crashes. As the crash rates on the single carriageway sections of the Pacific Highway are higher in all categories (fatal, injury and total) than the adjacent dual carriageway sections, the Proposal will significantly reduce road accidents and costs.

Traffic and transport

The Proposal would result in a high-standard dual-carriageway road alignment in accordance with the Pacific Highway Upgrade Program objectives. The Proposal would reduce travel time along the highway through the investigation area by approximately 25 per cent at signposted speed limits from 32 minutes to 23 minutes. The provision of a higher standard dual-carriageway road, combined with a reduced overall length and travel time savings is expected to reduce present accident numbers on this section of the highway by at least 50 per cent.

Access between townships would not be adversely affected due to the retention of the existing highway and other local roads for access to townships, communities and properties. Where required, these roads would pass over or under the Proposal.

Rest areas for both heavy and light vehicles would be provided within the area to meet specific Pacific Highway requirements. Truck stopping bays are required to suit B-Doubles (one vehicle only needed) and be located approximately every 5 kilometres.

Landscape, visual and urban design

The visual impact of the Proposal varies along its length. However, it was assessed as either moderate to high or high in the vicinity of Wedgewood Drive, Bald Hill Road and Kerr Drive in the southern portion of the investigation area and in the vicinity of Letitia Close and Mattick Road north of the Nambucca River.

A number of measures could be implemented during the design stage of the project to provide an integrated urban design with landscape treatments to minimise negative impacts.

Noise impacts

A preliminary assessment of potential noise impacts of the Proposal was undertaken. Potential noise impacts in the village of Warrell Creek are subject to the outcomes of the review of the Warrell Creek Upgrade. As the route deviates to the east of the existing Pacific Highway north of Warrell Creek village, there is expected to be a decrease in traffic noise for residences located within Macksville. North of the Nambucca River, the topography through which the route passes would provide some shielding from road traffic noise although noise level increases would be expected for residences located on the western side of Old Coast Road and within the Letitia Close / Mattick Road area.

North of the crossing of the North Coast Railway Line, the route is expected to result in increased noise impacts to some adjacent residences as a result of the duplication of the highway to the west of its current alignment and the retention of the existing highway as a local access road for local traffic. The new alignment would be closer to residences located on the western side of the current highway in this area. While traffic noise levels may increase as a result of the duplication, these increases may be offset by the improved alignment and higher road standard. There are few identified residences south of the Kalang River and the benefit of topographic shielding is expected to be high in this area. Residential dwellings just north of the Kalang River are substantially removed from the existing highway and with little shielding expected to be provided by the topography, these residences are expected to experience an increase in traffic noise levels.

The Proposal bypasses Macksville, Nambucca Heads, Urunga and Warrell Creek village and would result in a significant reduction in road traffic noise for the many residences located in the vicinity of the existing highway in these townships. Subject to the outcomes of the review of the Warrell Creek Upgrade, many residences located in the vicinity of the existing highway at Warrell Creek village may also experience a significant reduction in road traffic noise. A preliminary estimate of the total number of dwellings predicted to experience night time road traffic noise, without mitigation, in the ranges 50 to 55 dB(A), 55 to 60 dB(A) and ≥ 60 dB(A) shown in Table 6-2.

Table 6-2: Assessment of night time noise impacts without mitigation

Number of dwellings predicted to experience road traffic noise without mitigation			
Section	Noise level range dB(A)		
	50 to 55 dB(A)	55 to 60 dB(A)	≥ 60 dB(A)
Warrell Creek	16-30	7-31	2-11
Albert Drive to Nambucca River	50	46	19
Nambucca River to North Coast Railway	89	27	0
North Coast Railway to Mines Road	28	59	8
Mines Road to Raleigh deviation	49	24	6
Total	232- 246	163- 187	35- 44

Notes:

- The above calculations were based on the route options for the Warrell Creek section displayed in July 2007 and the Preferred Route for Macksville to Urunga section displayed between November 2004 and February 2005 and do not take into consideration modifications made to the alignment, location of interchanges and/or local access roads.
- Calculations of dwellings relied on aerial photography dated May 2003 and therefore residences constructed since then are not included.
- Any residences located within 100 m of the proposed centreline have not been included as it has been assumed that these buildings would be acquired for the road.

Where road traffic noise impacts exceed the noise guidelines for the project, possible mitigation measures would be investigated by the RTA. The cost effectiveness and practicality of providing mitigation would also be taken into consideration at this time.

Air quality

Measures to reduce dust emissions associated with the construction of the Proposal would need to be considered. Also progressive revegetation of disturbed areas would help reduce dust generation. Once operational, emissions from the upgraded highway would comprise hydrocarbons, carbon monoxide, carbon dioxide, oxides of nitrogen and particulate matter. The level of concentration of vehicle emissions and their subsequent impacts in the immediate vicinity of the Proposal depends on the volume, speed and type of traffic and on the ability of the local environment to disperse emissions. Carbon dioxide is a greenhouse gas and total emissions would be related to fuel use and vehicle kilometres travelled. The Proposal corresponds with one of the shortest route options investigated as part of the study and would therefore provide the lowest vehicle kilometres travelled and therefore the lowest carbon dioxide emissions. Anticipated improvement in traffic flow, reduced travel distances and travel times and decreased road grades would result in greater fuel efficiency and reduced particulate and gaseous emissions.

Heritage impacts

Non-Aboriginal heritage

A total of six non-Aboriginal heritage items were identified in the immediate vicinity of the Proposal. None of the items are currently listed on the Register of the National Estate or the State Heritage Register. Two items (South Arm Road Scenic Landscape and Remnant Forest 0280) are listed on the Conservation Register of Bellingen Shire Council. Two items (a farmhouse off Old Coast Road and the South Arm Road Scenic Landscape) would be directly affected by the Proposal. The preliminary heritage assessment concluded that the farmhouse has low heritage significance, although the South Arm Road Scenic Landscape was assessed as having potential local heritage significance.

Aboriginal heritage

The predictive model undertaken as part of the Aboriginal heritage assessment identified the crests of spurlines and raised areas within the Warrell Creek and Nambucca and Kalang River floodplains as having the potential to contain archaeological evidence. In summary, 20 areas of potential archaeological sensitivity were identified by the predictive model as being directly affected by the alignment of the Proposal. All of these areas have the potential to contain archaeological deposit and would be investigated in detail as part of a detailed investigation undertaken as part of the environmental assessment for the Proposal.

North of the crossing of the North Coast Railway Line west of Nambucca Heads, the Proposal is located on the western side of the existing highway. The Cow Creek Aboriginal Reserve, a site of high cultural significance, is located in this area and the alignment of this section of the Proposal has been adjusted to avoid any direct impact on the Aboriginal Reserve.

An area of high cultural significance to the local Aboriginal community is located on either side of the existing highway alignment to the north of Valla, although the eastern area is of far greater significance than the more disturbed western section. As the alignment of the Proposal runs parallel to and west of the current Pacific Highway alignment in an area of previous disturbance, there would be no direct impact on the highly sensitive area to the east of the current highway.

Further consultation with representatives from the Local Aboriginal Land Council as well as Elders and other Aboriginal community members would continue during the refinement of the design and environmental assessment of the Proposal.

6.1.2 *Biological and physical impacts*

Biodiversity

Figures 6-5 to 6-8 show the Proposal in relation to ecological constraints.

Fauna

The alignment for the Proposal between Warrell Creek and the Nambucca River potentially affects fragments of swamp forest and wetland vegetation. An important feature of these habitats is the presence of swamp mahogany (*Eucalyptus robusta*). This species is listed under Schedule 2 of SEPP 44 as a significant koala feed-tree species. As one of the few eucalypts to flower in winter it also provides an important foraging habitat in coastal areas for the swift parrot (*Lathamus discolor*) and regent honeyeater (*Xanthomyza phrygia*), both of which are listed as endangered under the *Environmental Protection and Biodiversity Conservation Act*.

The alignment north of the Nambucca River would affect fauna habitat located in the Nambucca State Forest. While much of this habitat has been identified as medium to low quality open forest, resulting from past logging activities, the

State Forest does provide an important link between the SEPP 14 wetlands in the Nambucca State Forest to the east of the route and forest habitats to the west. Koalas are likely to move through Nambucca State Forest to access the extensive Swamp Mahogany resources associated with the SEPP 14 wetlands in the forest to the east of the alignment. The provision of koala crossing opportunities in the vicinity of the Nambucca State Forest and measures to minimise road mortality would be considered during the further development of the Proposal.

East-west fauna movement opportunities north of Nambucca Heads have been hindered by the presence of the existing Pacific Highway. The development of the Proposal in this area presents an opportunity to improve this situation by reducing the volume of traffic on the existing highway providing fauna crossing structures (possibly combined with drainage structures) where appropriate under the new highway. The route alignment north of Mines Road, south of Urunga has been selected to avoid the larger fragments of swamp sclerophyll forest identified through flora and fauna investigations and significant habitat for the Glossy Black-Cockatoo located on the southern side of the Kalang River.

The Proposal in the northern section of the investigation area would result in the removal of areas of high-quality fauna habitat particularly to the north of the Kalang River. This may affect several fauna species, in particular. The loss of some large and mature trees in this area is expected which may affect hollow-dependent fauna.

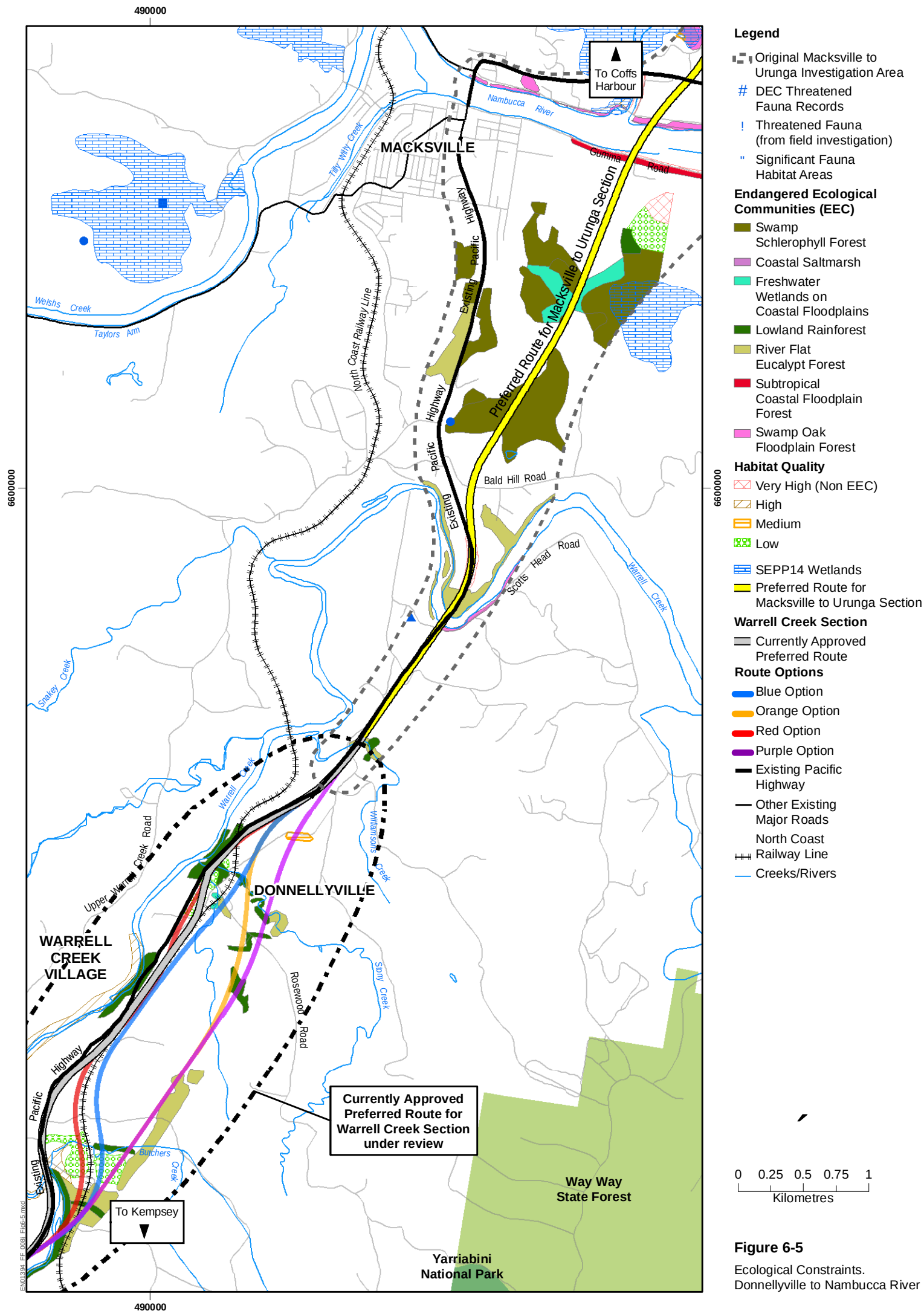
Flora

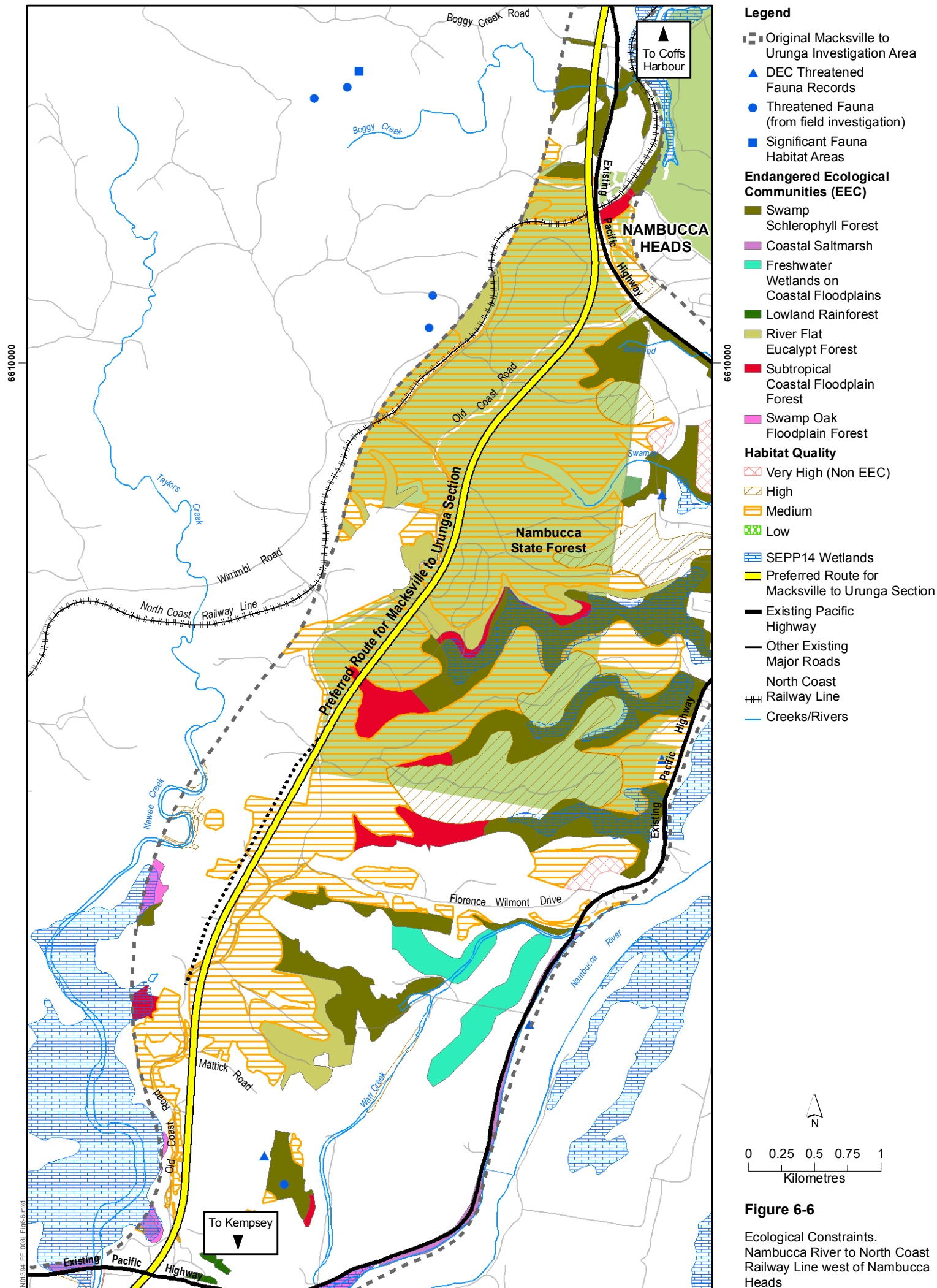
No threatened flora species, as currently listed under the NSW *Threatened Species Conservation Act* or the Commonwealth *Environmental Protection and Biodiversity Conservation Act* were recorded within the investigation area for the project. There is however, potential for threatened flora species to occur in the areas of better quality vegetation within the road corridor. Additional flora surveys will be undertaken to assess the presence of threatened flora species within the road corridor.

Several stands of at least five different endangered ecological communities, as listed under the NSW *Threatened Species Conservation Act*, would be directly impacted as a result of the Proposal as indicated in Figures 6-5 to 6-8. The impact of the Proposal on these communities is summarised in Table 6-3 (based on a 100metre corridor width).

Table 6-3: Total area of endangered ecological communities potentially affected by Proposal

Community	Total EEC Area (ha)
Swamp sclerophyll forest of the NSW North Coast, Sydney basin and south east corner bioregions	35.4
Swamp oak floodplain forest of the NSW North Coast, Sydney basin and south-east corner bioregions	1.2
River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney basin and south-east corner bioregions	17.5
Freshwater wetlands on coastal floodplains of the NSW north coast, Sydney basin and south east corner bioregions	2.6 – 2.7
Subtropical coastal floodplain forest of the NSW north coast bioregion.	14.0
Lowland rainforest	2.8 - 4.7
Moist blue gum	2.0 - 5.6
Total EEC area affected by Proposal	75.5–81.1





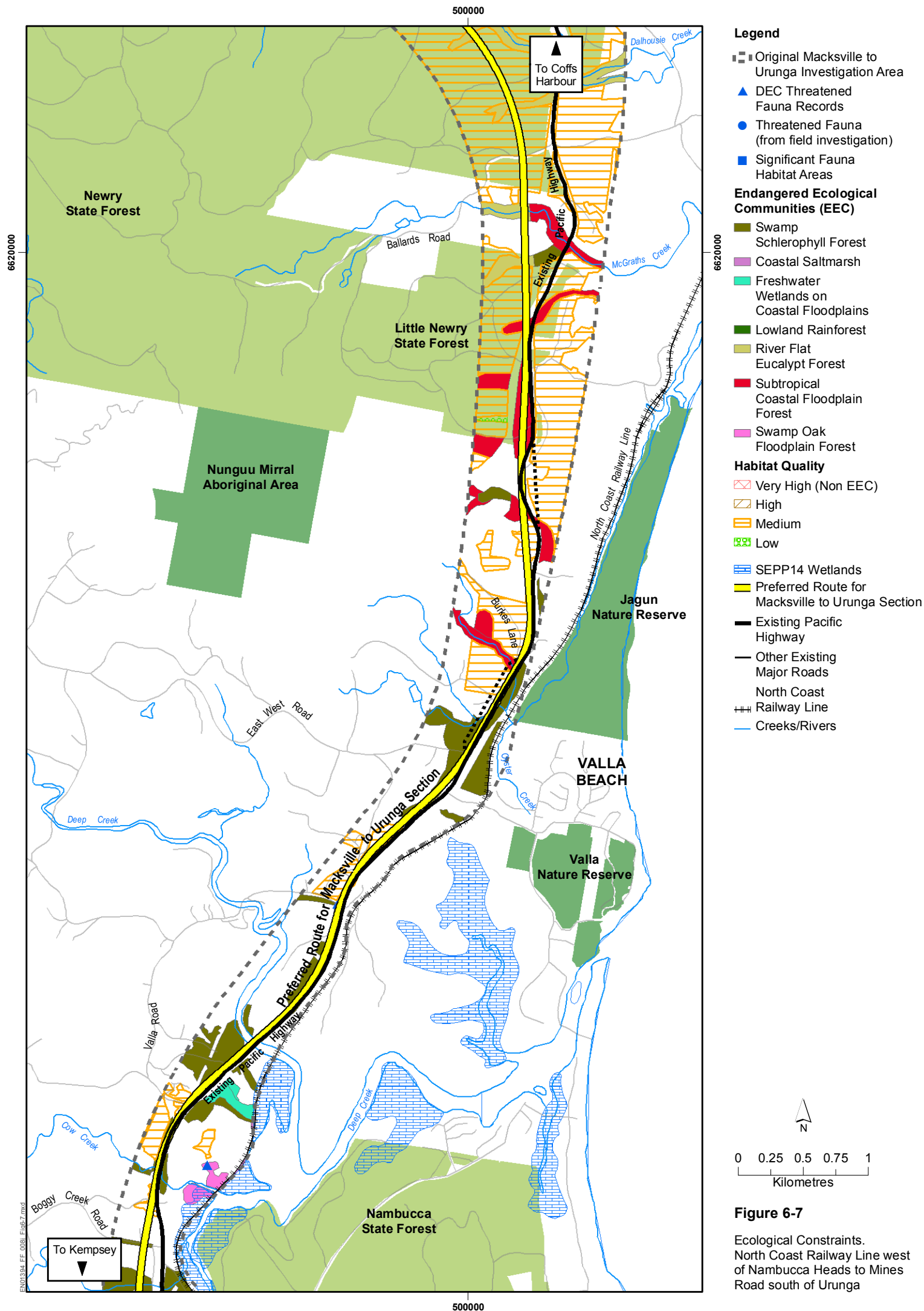
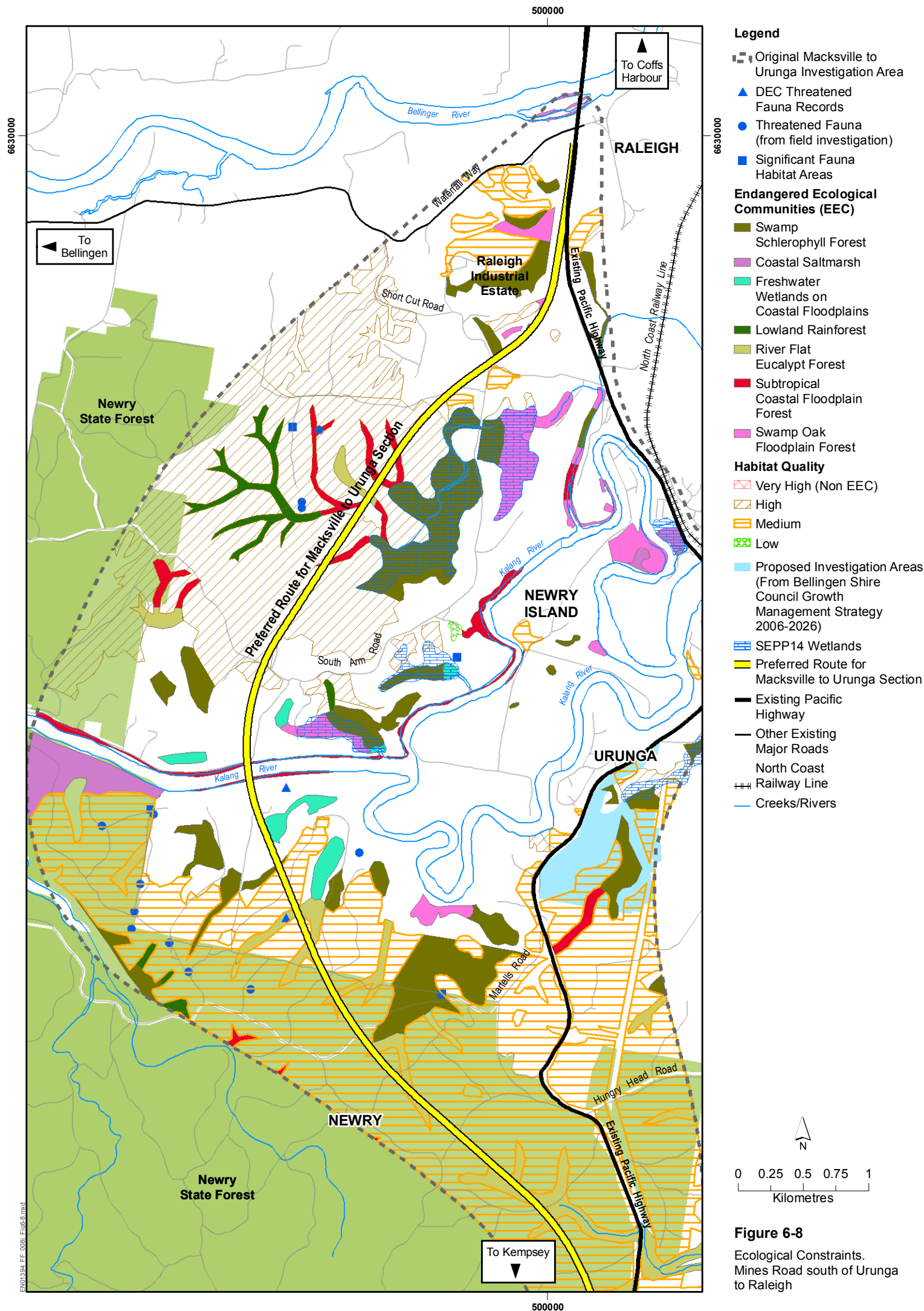


Figure 6-7

Ecological Constraints.
North Coast Railway Line west
of Nambucca Heads to Mines
Road south of Urunga



Additional threatened flora and fauna species and/or communities may be listed under the *Threatened Species Conservation Act* or the *Environmental Protection and Biodiversity Conservation Act* during the further development of the Proposal. Listings under these Acts will be monitored and the potential impact of the Proposal on additional listed species and / or communities assessed.

Geotechnical considerations

The crossing of the floodplain south of the Nambucca River is approximately 2 km wide and has moderately and highly compressible soils to depths in excess of 20 metres. Preliminary embankment stability analysis suggests that 5 metre high embankments could be constructed on the floodplain without the need for staging. Measures may be required in some sections of the embankment to accelerate settlement conditions and / or to reduce the risk of instability. Foundation conditions on the floodplain on the northern side of the Nambucca River are similar to those across the floodplain on the southern side.

The total thickness of compressible soils in the vicinity of the Proposal on either side of the Kalang River was found to be variable and ranged up to 18.5 metres to the north of the river. Preliminary settlement analysis for floodplain embankments suggests that a 5-metre high embankment, away from the bridge approaches (without foundation treatment) would experience primary settlement of up to 700 millimetres over a period of 3.5 to 4 years under worst-case conditions.

Compressible soils are also likely to be encountered in the vicinity of the crossings of Warrell and Deep Creeks.

Additional geotechnical investigations will be required for the further development and construction of the project. These additional investigations are included in the Proposal.

Flooding and drainage

The hydrology and hydraulics study concentrated on the flooding impacts of the Nambucca River and Kalang River floodplains.

Nambucca River

The Proposal crosses the Gumma Swamp floodplain downstream of Macksville. The route would result in a reduction in the storage volume of Gumma Swamp of approximately 275,000m³ or 1.8 per cent. This decrease would have a negligible impact on flood levels.

A flood model was prepared to assess the potential impacts on flood flow patterns. The investigations indicated that the majority of floodplain flow occurs east (downstream) of the Proposal. The number and size of culverts that would be required for the maximum of upstream or downstream flow is outlined in Table 6-4. The culverts have been sized to conservatively pass the peak flow at a velocity of 0.5m/s and drainage patterns and flood levels in either Macksville or the floodplain are not expected to be significantly altered by the Proposal.

Table 6-4: Hydraulic structures required (Nambucca River)

Details of structures	Approximate culvert area	Approximate required bridge length	Actual bridge length
Nambucca River Crossing		280m	340m
Equalising culvert	3m ²		
Passes flows from town drain	90m ²		
Floodplain	20m ²		
Floodplain	100m ²		
Floodplain	100m ²		
Total culvert area	313m²		

Deep Creek

An additional bridge would be required to be constructed over Deep Creek. Existing houses are clear of the floodplain and would not be impacted by the predicted 100mm increase in flood levels in the 100 year ARI flood event.

Kalang River

The Proposal crosses a number of inundated side branches of the Kalang River and each crossing would require a structure to allow for local drainage as outlined in Table 6-5.

Table 6-5: Hydraulic structures required (Kalang River)

Details of structures	Approximate culvert area	Approximate required bridge length	Actual bridge length
Kalang River Crossing		130m	155m
Balancing	20m ²		
Floodplain	238m ²		
Floodplain	96m ²		
Balancing	51m ²		
Balancing	101m ²		
Balancing	55m ²		
Total culvert area	590m²		

The area of impact would not affect any existing dwellings and extends approximately 1000metres upstream of the Kalang River crossing. The affected area is a combination of dense natural vegetation and cleared agricultural lands.

More detailed hydrologic and hydraulic studies, including studies for Warrell Creek, are proposed to be undertaken for the refinement of the concept design and environmental assessment of the Proposal.

Water quality

The Proposal crosses a number of significant water courses including Crouches Creek, Warrell Creek, Nambucca River, Deep Creek and the Kalang River. Overall, the water quality of creeks and rivers crossed by the Proposal generally met

the ANZECC / ARMCANZ (2000) guidelines for the protection of aquatic ecosystems during dry weather. However, water quality deteriorated following wet weather with one or more water quality parameters exceeding the guidelines.

The proposed upgrade of the Pacific Highway between Warrell Creek and Urunga has the potential to affect the water quality through erosion and sedimentation during the construction phase and by the generation of additional pollutants directly attributable to the highway.

The RTA's *Water Policy* identifies a set of objectives for the management of water issues and seeks to ensure that the RTA, and its contractors and sub-contractors, consistently apply the most appropriate water management practices. The RTA's *Water Policy* objectives are achieved through compliance with the environmental principles outlined in the RTA *Code of Practice for Water Management, Road Development and Maintenance (April 1999)*. The Code of Practice provides water management principles for RTA staff and contractors involved in activities that may affect water-flow patterns and water quality.

Road construction works are subject to various controls to minimise the potential for adverse water quality impacts. These are documented prior to commencement of the works in a soil and water management plan (SWMP). The plan documents the controls that limit movement of sediment (erosion controls) and controls that remove sediment from runoff prior to discharge to downstream creeks and waterways (sediment controls). Erosion and sedimentation controls for the Proposal would be prepared with reference to the 4th edition of *Managing Urban Stormwater: Soils and Construction* (the "Blue Book").

6.1.3 *Proposal assessment*

A preliminary assessment of the potential environmental impacts of the proposed Warrell Creek to Urunga Highway Upgrade Proposal and likely significance of these impacts is summarised in Table 6-6. The table also identifies possible environmental management and mitigation measures that the RTA currently proposes to incorporate in finalising the concept development of the Warrell Creek to Urunga Proposal.

The proposed measures represent a combination of best practice designs, techniques, systems and methods that the RTA has implemented on many recent and current highway projects. It is possible that some of these measures will be supplemented and refined as the technical design is advanced and the concurrent planned environmental impact assessments are completed over the coming months.

In considering each environmental planning issue, a level of "Proposed Assessment and Management" was assigned. This indicates whether additional environmental assessment is required or whether standard management measures are sufficient to address the issue. These Proposed Assessment and Management levels are defined as follows:

- *Issues manageable – no further assessment proposed*

No further assessment proposed on this issue as the RTA considers that the issue can be adequately managed using standard or previously approved procedures that are accepted within the industry. The proposed procedures will be identified in the relevant environmental management plan for the project. These measures will also be summarised in the environmental assessment.

- *Define management measures – design / environmental management plan*

The issue is not routine and may have some site-specific or project peculiarities but the RTA has assessed that the standard or proven management measures can be readily adapted or tailored to address the specific circumstances to achieve an effective outcome. The proposed measures will be detailed as necessary in the refined design and / or the relevant environmental management plan (EMP) for the project. As well as being subject to a preliminary environmental assessment (as identified in Table 6-6), proposed future actions for these issues are identified in Table 6-8.

- *Further environmental assessment proposed*

The RTA considers that this issue requires further assessment during the refined design / environmental assessment phase. Proposed measures to manage this issue will be detailed in the refined design and the environmental assessment. As well as being subject to a preliminary environmental assessment (as identified in Table 6-6), proposed future actions for these issues are identified in Table 6-7.

Appendix C provides a Draft Statement of Commitments, which will be developed further and presented in the environmental assessment.

Table 6-6 provides a summary of the environmental assessment issues of interest for the construction and operation of the Warrell Creek to Urunga Proposal. Further details are provided in the main body of this report and in a series of Reports and Working Papers developed during the route option identification stage. The purpose of this table is to identify those issues which are expected to be most important in the final decision process, as well as those more routine issues which can be readily managed through standard environmental management measures. In the case of the latter, this has been based in on the findings of extensive previous studies and / or design changes to the project in order to eliminate or significantly reduce environmental risks associated with the issue. Furthermore, to ensure the level of residual impacts remain acceptable and that there is a consistent approach to managing issues, the RTA includes a commitment to adopt standard conditions of approval (as developed by the Department of Planning). It is expected that this commitment would be carried through to the environmental assessment and ultimately to the final conditions of approval as issued by the Minister for Planning. It is noted that the level of potential impact, the judgement as to importance of an issue and the proposed assessment and management level will be confirmed during the detailed environmental assessment process and that the evaluation at this time is based on the results of the technical studies undertaken to date.

Table 6-6: Investigations, assessment and management measures

Issue	Previous investigations and assessment	Potential impact and level of significance)	Proposed assessment and management level	Scope of assessment or management
CONSTRUCTION PHASE				
Community				
Land use, property and access	A qualitative assessment of impacts on external and internal access to private properties was carried out during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. This assessment included one-on-one and small group meetings with land owners and field assessment. The objective of the design was to maintain access and current land uses on private properties. Preliminary access arrangements have been incorporated into the design.	Changes to internal and external access arrangements for private properties. Changes to configuration of allotments. Interruptions to agricultural, commercial and other land use activities during construction. <i>Level of significance – Moderate</i>	Define management measures – Design / environmental management plan.	Where feasible and practical, road alignment and concept design to be refined to minimise potential impacts on properties. Where feasible and practical, new access to be provided to severed parcels and/or possible consolidation of severed parcels to be pursued. Acquisition would be undertaken in accordance with the provisions of the <i>Land Acquisitions (Just Terms Compensation) Act 1991</i> . Residual impacts expected to be manageable through the application of appropriate management plans,

				controls, mitigation measures and safeguards. Refer to <i>Section 16.3</i> of the Draft Statement of Commitments (<i>Appendix C</i>).
Traffic and transport	A traffic and transport assessment was undertaken by suitably qualified specialist / experts during the route options investigation phase for the Macksville to Urunga section. Local road network changes have been incorporated into the design in consultation with council and the local community. Impacts of construction of the project on the local road network have been considered during the design development.	Construction of the proposed upgrade would result in temporary disruptions to local traffic and some disruptions to existing highway traffic. Temporary road closures will be required on occasions. <i>Level of significance – Moderate</i>	Define Management Measures – Design / environmental management plan	Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Management measures would be outlined in a construction traffic management plan. Refer to <i>Section 4</i> in the Draft statement of Commitments (<i>Appendix C</i>).
Landscape, visual and urban design	Assessment of visual impacts of the road on the landscape and views was undertaken by suitably qualified specialist / experts during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections.	Visual impacts of construction would be mostly short -term and intermittent. Impacts on visual amenity would include stockpiling of raw materials, removal of vegetation and exposure of soils, construction waste and vehicles and machinery. <i>Level of impact – Low</i>	Issues Manageable – no further assessment proposed	Suitable urban design and landscape management strategies/plans to be developed and incorporated into the project design. Management measures to be included in the construction environmental management plan. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 13</i> of the Draft Statement of Commitments (<i>Appendix C</i>).
Noise and vibration impacts	Preliminary noise impact assessments have been carried out by suitably qualified specialist / experts during the route options investigation phase for	Noise from machinery during the construction of the proposed Upgrade may exceed the criteria contained in the RTA's Environmental Noise Management	Issues Manageable – no further assessment proposed	Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and

	both the Warrell Creek and Macksville to Urunga sections.	Manual and the Construction Noise Guideline in the NSW Environment Protection Authority Noise Control Manual for short and irregular periods of construction activities. <i>Level of significance – Low</i>		safeguards. Management measures would be included in the construction environmental management plan construction environmental management plan. Refer to <i>Section 5</i> in the Draft Statement of Commitments (<i>Appendix C</i>).
Air quality	A qualitative assessment of the air quality impacts was carried out during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections.	Local air quality impacts resulting from vehicle/machinery emissions and dust, particularly during earthworks. <i>Level of significance – Low</i>	Issues Manageable – no further assessment proposed	Management measures would be included in the construction environmental management plan Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 11</i> in the Draft Statement of Commitments (<i>Appendix C</i>).
Aboriginal heritage	An Aboriginal heritage assessment was undertaken by suitably qualified specialist / experts in consultation with the Department of Environment and Climate Change (DECC), the local Aboriginal community, Land Councils and Elders groups during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. This assessment included desk-top and field surveys.	Direct impacts on 20 areas of potential archaeological sensitivity. Discovery of new sites / areas of Aboriginal heritage significance / during construction Adverse impacts on items of archaeological significance. <i>Level of significance – Moderate to high</i>	Further environmental assessment proposed	The scope of the environmental assessment is outlined in <i>Table 6-7</i> . Further consultation with DECC and the Aboriginal community based on the <i>DECC Interim Community Consultation Requirements for Applicants (December 2004)</i> during the further refinement of the concept design for the Proposal and during the development of the Aboriginal cultural heritage management plan. Where feasible and practical, concept design to be refined to avoid and / or minimise potential impacts on Aboriginal heritage items. Where not feasible and practical to avoid and/or minimise potential impacts, concept

				design to be refined to include Aboriginal heritage protection measures. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 8</i> of the Draft Statement of Commitments (<i>Appendix C</i>).
Non-Aboriginal heritage	A non-Aboriginal heritage assessment was undertaken by suitably qualified specialist / experts during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. This assessment involved a review of available archival information, discussions with councils, local heritage groups and field surveys.	Direct impacts on 2 of 6 heritage items in the immediate vicinity. These include: Farmhouse, corner of Pacific Highway and Old Coast Road, Macksville South Arm Road Scenic Landscape listed on Conservation register of Bellingen Council Additional 2 items (Boulton Hotel and early ferry / punt crossing from Macksville) located adjacent to the route may be impacted. <i>Level of significance – Low</i>	Issues Manageable – no further assessment required	Relevant statutory controls would be complied with by the RTA. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 9</i> of the Draft Statement of Commitments (<i>Appendix C</i>).
Local and regional economy	An assessment of the potential impacts on local businesses was undertaken during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. This assessment involved consultation with existing businesses and local councils.	Potential benefits to the economy are expected during construction including employment, use of local contractors and general stimulus for commerce. There may be some impacts on local businesses directly impacted by construction activity. <i>Level of significance – Moderate</i>	Issues Manageable – no further assessment required	Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards.
Utilities and services	An assessment of the potential impacts on key utility services was undertaken during the route options investigation phase for both the Warrell Creek and	Construction of the proposed upgrade would require the relocation of some utilities and possible temporary disruption to some services.	Issues Manageable – no further assessment required	Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and

	Macksville to Urunga sections. This assessment involved consultation with utility service authorities and local councils. Further detailed discussions with service providers and councils will be undertaken as part of the concept design phase.	<i>Level of significance – Low</i>		safeguards. Refer to <i>Section 16.1</i> of the Draft Statement of Commitments (<i>Appendix C</i>).
Hazards and risks		Hazards and risks associated with construction of a major highway upgrade generally include activities such as the storage of hazardous materials and use of heavy machinery. Exposure to extreme weather events, such as flooding, also poses a risk. <i>Level of significance – Low</i>	Issues Manageable – no further assessment required	Management measures would be included in a Hazards and Risk Management Sub Plan(s). Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 14</i> in the draft statement of commitments (<i>Appendix C</i>).
Biological and physical				
Terrestrial flora and fauna	A preliminary ecological impact assessment including flora survey and terrestrial fauna investigations was undertaken by suitably qualified specialist / experts during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. The route alignment and design of the proposed upgrade considered opportunities to avoid and / or minimise ecological impacts. Where not feasible and practical to avoid and / or minimise potential impacts, concept design has been refined to include flora and fauna	Direct and indirect impacts on the following endangered ecological communities (EECs): ■ Freshwater wetlands on coastal floodplains. ■ Subtropical coastal floodplain forest. ■ Swamp oak floodplain forest. ■ Swamp sclerophyll forest ■ River-flat eucalypt forest. ■ Lowland rainforest on floodplains ■ Coastal saltmarsh. Based on a corridor width of 100metres,	Further environmental assessment required.	The scope of the environmental assessment is outlined in <i>Table 6-7</i>. Where feasible and practical, concept design to be further refined to avoid and/or minimise potential impacts on threatened / endangered flora and fauna species and endangered ecological communities. Where not feasible and practical to avoid and/or minimise potential impacts, concept design to be refined to include flora and fauna protection measures – including fauna underpasses and fencing. Commitment to implement compensatory habitat proposals based on findings of supplementary

	protection measures.	total area of EECs affected is 75.5 to 81.1ha. Potential indirect impacts on SEPP 14 wetlands adjacent to the route. The Proposal would impact on fauna habitat, particularly within the Nambucca State Forest and north of the Kalang River. <i>Level of significance – High</i>		investigations if not feasible or practical to refine concept design to avoid and/or minimise potential impacts or to include flora and fauna protection measures. Residual impacts expected to be manageable through the application of measures detailed in a Flora and Fauna Management Sub Plan. Refer to <i>Section 7</i> in the Draft statement of commitments (<i>Appendix A</i>). Based on investigations to date, the Proposal is not perceived to have a significant impact on threatened and migratory species or require a referral under the EPBC Act to the Department of Environment and Water Resources (DEWR). However, a referral will be made if identified as required by further investigations.
Aquatic ecology	A preliminary ecological impact assessment including flora survey and aquatic fauna investigations was undertaken by suitably qualified specialist / experts during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. The route alignment and design of the proposed upgrade considered opportunities to avoid and / or minimise ecological impacts. Where not feasible and practical to avoid and/or minimise potential impacts, concept design has been refined to include flora and fauna protection measures.	Potential direct impacts on aquatic vegetation and potential habitat for: Black cod (<i>Epinephelus daemeli</i>). Green sawfish (<i>Pristis zijsron</i>). Potential indirect impacts on SEPP 14 wetlands adjacent to the route. <i>Level of significance – Moderate</i>	Further environmental assessment required	The scope of the environmental assessment is outlined in <i>Table 6-7</i>. Where feasible and practical, concept design to be further refined to avoid and/or minimise potential impacts on aquatic vegetation and habitat. Where not feasible and practical to avoid and/or minimise potential impacts, concept design to be refined to include protection measures. Design to be undertaken in accordance with Department of Primary Industries Fisheries Guidelines. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and

				safeguards. Refer to <i>Section 7</i> in the Draft Statement of Commitments (<i>Appendix A</i>). Based on investigations to date, the Proposal is not perceived to have a significant impact on threatened and migratory species or require a referral under the EPBC Act to the Department of Environment and Water Resources. However, a referral will be made if identified as required by further investigations.
Geotechnical, soils and contamination	Geotechnical investigations incorporating subsurface assessment, preliminary soil and groundwater contamination assessment and acid sulphate soil assessment were undertaken by suitably qualified specialist / experts during the route options investigation phase for the Macksville to Urunga section. A preliminary geotechnical assessment of the proposed upgrade corridor was undertaken by suitably qualified specialist / experts during the route options investigation phase for the Warrell Creek section. The assessment included a desktop review and a two day field investigation of the study area. The soils underlying the floodplains are expected to be potential Acid Sulphate Soils.	Potential impacts include sedimentation of waterways, soil and water contamination due to run-off during construction, presence of soft soils and exposure of potential acid sulphate soils. A key geotechnical issue is the presence of low strength and highly compressible soils of alluvial and estuarine origin that underlie the relatively low-lying floodplains. <i>Level of significance – Moderate</i>	Define Management Measures – Design / environmental management plan	Adequate protection of both cut batters and fill embankments to be provided. Measures would include grassing and the provision of cut-off drains and landscaping to divert water away from the cut and fill batters. Sediment traps to be implemented. Removal of vegetation to be minimised during construction. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 10</i> in the Draft Statement of Commitments (<i>Appendix A</i>).
Groundwater	A desktop assessment and targeted field investigations were carried out by suitably qualified specialist / experts during the route options investigation	Potential to encounter groundwater in deep cuts in Section 4 – Urunga Bypass section. Deep cuts may locally lower the water	Issues Manageable – no further assessment required.	Bore holes to be monitored during and post-construction. Residual impacts expected to be manageable through the application of

	phase for the Macksville to Urunga section. A desktop assessment was carried out by suitably qualified specialist / experts during the route options investigation phase for the Warrell Creek section. Investigations included a preliminary soil and groundwater contamination assessment as well as groundwater bore information received from the Department of Natural Resources.	table and may have adverse affects on water levels and yields in existing water bores. Low / minimal risk of groundwater contamination. <i>Level of significance – Low</i>		appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 10</i> of the Draft Statement of Commitments (<i>Appendix A</i>).
Hydrology and flooding	Hydrologic and hydraulic investigations were undertaken by suitably qualified specialist / experts during the route options investigation phase for the Macksville to Urunga section.	During concept design any proposed crossings of the Warrell Creek floodplain would be designed with the objective of achieving a maximum increase in flood levels upstream of the Proposal of less than 50millimetres. Investigations into the assessment of route options for the Macksville to Urunga section concluded that the maximum increase in 1 in 100 year ARI flood levels in the Nambucca would be less than 50millimetres downstream of Macksville and less than 30millimetres in Gumma swamp. These increases occur immediately upstream of the route options and would not affect flood flows or flood levels in Macksville. Investigations also found that any of the proposed crossings of the Kalang River floodplain could be designed to achieve maximum increases in flood levels upstream of the route options of approximately 50millimetres. Deep Creek is also an important waterway, although with a significantly smaller catchment area than the	Further environmental assessment required	The scope of the environmental assessment is outlined in <i>Table 6-7</i>. Further hydraulic modelling to be undertaken to refine predictions of impact on proposed flooding characteristics. Concept design to be refined to incorporate identified management / mitigation measures. Predicted impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 10</i> in the Draft Statement of Commitments (<i>Appendix A</i>).

		Nambucca or Kalang Rivers or Warrell Creek. <i>Level of significance – Moderate</i>		
Water quality	A qualitative assessment of potential water quality impacts during construction was undertaken by suitably qualified specialist / experts during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections.	Water quality in the Nambucca and Kalang Rivers and creeks generally met Australian and New Zealand Environment Council / Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ) (2000) guidelines. Potential for impact upon the turbidity, pH, DO, concentration of ions and TDS of these local waterways. <i>Level of significance – Low to moderate</i>	Define management measures – Design / environmental management plan	Waterways to be monitored during and post construction. Measures to minimise risk to the environment to be implemented. Special emphasis would be placed on gully and watercourse crossings, vehicle set down and repair areas, fuel storage and waste disposal areas. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 10</i> in the Draft Statement of Commitments (<i>Appendix A</i>).
Regional and cumulative				
Wastes, energy & resources	The concept design for the project minimised the earthworks requirements and achieved a balance of earthworks within sections of the Proposal.	Generation of construction wastes. Increased energy use. Increased demand on local and regional resources. Water use. <i>Level of significance – Low</i>	Issues Manageable – no further assessment required	Measures to minimise waste and the usage of energy and resources to be included in the construction environmental management plan. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 15</i> in the Draft Statement of Commitments (<i>Appendix A</i>).

Cumulative impacts	Cumulative impacts of the Pacific Highway Upgrade program and interactions with other major activities in the region were considered during route options investigation phase for both the Warrell Creek and Macksville to Urunga sections.	Impacts associated with the simultaneous construction of road projects such as traffic, air quality, noise and visual amenity. <i>Level of significance – Low</i>	Issues Manageable – no further assessment required	Consideration will be given to the potential cumulative impacts associated with the simultaneous construction of the project and other road projects during identification of the staging and / or timing of construction of the project.
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OPERATIONAL PHASE

Community				
Land use, property and access	A survey of land uses within and surrounding the corridor has been completed and mapped during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. Existing zoning and development permissibility and strategic planning direction for land affected by the proposed upgrade has been assessed. Bellingen and Nambucca Shire Council and landholders with interests in future development of land in the vicinity of the proposed upgrade have been consulted during the design development. Provision for access to strategic and future development areas from interchanges has been included in the design.	Potential land use, property and access impacts of the Proposal include: • Agricultural: ▪ Loss of farm viability. ▪ Loss of pasture/cultivable land. ▪ Fragmentation. • Residential: ▪ Amenity related impacts (e.g. noise, air and visual impacts). ▪ Uncertainty about property access / acquisition. • Commercial: ▪ Impacts on macadamia farms, service station and accommodation adjacent to highway. • Utilities and infrastructure: ▪ North Coast Railway. Other utility services. • Industrial: ▪ Impact on timber mill/manufacturers. Possible changes in zoning/ land use	Further environmental assessment required.	The scope of the environmental assessment is outlined in <i>Table 6-7</i>. Impacts on existing and future land uses to be assessed. This would include field assessment and meetings with councils, small groups and individuals. One objective of the design development is to maintain, where possible, current activities on affected private properties. Arrangements would be discussed with individual land owners and incorporated into the design. Access arrangements to be further defined and incorporated into the concept design. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards.

		surrounding the corridor, e.g. land surrounding the Nambucca Heads interchange. Benefits to Macksville and Urunga economy through provision of access to strategic industrial land. Benefits to adjoining communities from improved access and / or removal of highway traffic (e.g. Warrell Creek village, Macksville, Nambucca Heads and the Urunga urban areas). <i>Level of significance – Moderate</i>		
Traffic and transport	A traffic and transport assessment was undertaken by suitably qualified specialist / experts during the route options investigation phase for the Macksville to Urunga section. The traffic and transport assessment included assessment of impacts of changes in the local road network. The objective of design development and traffic management assessment was to achieve an acceptable level of service and provide alternative access arrangements for local traffic. Interchanges and local road network changes have been incorporated into the design in consultation with council and the local community.	Changes to the local road network and access to the Pacific Highway. <i>Level of significance – Moderate</i>	Define Management Measures – Design / environmental management plan	Adopt standards in the Pacific Highway Design Guidelines. Design to provide for off-highway local road along full length of corridor with controlled access to the highway at strategic locations. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 4</i> in the Draft Statement of Commitments (<i>Appendix A</i>)
Visual landscape	An assessment of visual impacts of the road on the rural landscape character and views was undertaken by suitably qualified specialist / experts during route options investigation phase for both the Warrell Creek and Macksville to Urunga sections.	Proposal has the potential to have visual impacts on residents with views to new highway. Impact on views and landscape character including: ▪ District views across floodplain south	Define Management measures – Design / environmental management plan	The RTA would implement measures outlined in an Urban Design and Landscape Report. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and

	Potential visual impacts have been identified and urban design principles developed.	of Nambucca and Kalang Rivers and across low lying areas north east of Ridgewood Drive. - Visual impacts at Letitia Close and Mattick Road. - Impact on views across the Nambucca and Kalang Rivers. Alterations to natural landscape features including vegetation and topographical features. <i>Level of significance – Moderate</i>		safeguards. Refer to <i>Section 13</i> of the Draft Statement of Commitments (<i>Appendix A</i>).
Noise and vibration	A comparative assessment of the number of noise sensitive receivers was carried out by suitably qualified specialist / experts during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. Preliminary noise modelling undertaken during the route options investigation phase has predicted operational noise levels based on traffic forecasts.	Adjacent residents adversely affected by operational traffic noise. Some sensitive receivers would experience noise levels (L_{Aeq}) above the noise goals specified in the DECC <i>Environmental Criteria for Road Traffic Noise</i> (1999) without noise mitigation measures. <i>Expected level of impact – Moderate negative</i>	Define Management Measures – Design / environmental management plan	Noise assessment to be undertaken. Assessment would identify potential noise impacts of the Proposal and proposed mitigation measures. Proposed mitigation measures to be incorporated into refined concept for the Proposal. Proposed mitigation measures to be detailed in an Operational Noise Management Report and incorporated into the refined design for the Proposal. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 6</i> of the Draft Statement of Commitments (<i>Appendix A</i>).

Air quality	A qualitative air quality assessment was undertaken during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections.	Some community concern about local air pollution from vehicle emissions. Minor improvement in regional air quality with localised reduction in air quality adjacent to the Proposal. <i>Level of significance – Low</i>	Issues Manageable – no further assessment proposed	Adopt the Draft Pacific Highway Design Guidelines with minimal gradients and curves to facilitate free flow traffic conditions. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards.
Aboriginal heritage	An Aboriginal heritage assessment was undertaken by suitably qualified specialist / experts in consultation with the Department of Environment and Climate Change, the local aboriginal community, Land Councils and Elders groups during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. This assessment included desk top and field surveys.	<i>Level of significance – Nil</i>	Issues Manageable – no further assessment proposed.	No management measures required.
Non-Aboriginal heritage	A non-Aboriginal heritage assessment was undertaken by suitably qualified specialist / experts during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. This assessment included desktop and field surveys.	<i>Level of significance – Nil</i>	Issues Manageable – no further assessment proposed.	No management measure required.
Local and regional economy	A local Business Impacts survey of the study area was undertaken during the route options investigation phase for the Macksville to Urunga section. Individual property owners with commercial operations within the proposed corridor have been consulted.	Potential loss of trade for highway-based businesses. Reduction in size of agricultural properties may impact on viability of farm business. Potential stimulus for growth due to improved transport links and improved planning/economic outcomes for local	Further environmental assessment proposed.	The scope of the environmental assessment is outlined in <i>Table 7.1</i> . In conjunction with councils and Chambers of Commerce, identify possible schemes to attract motorists into existing townships and businesses, e.g. signposting and gateway

	Nambucca and Bellingen Councils have been involved in discussions with regard to potential economic impacts.	communities. Reduction in heavy vehicle through-traffic in Warrell Creek village, Macksville, Nambucca heads and Urunga. Potential impacts on accommodation businesses along existing highway. <i>Level of significance – Low to moderate</i>		treatments. Design to provide for off-highway local road along full length of corridor with controlled access to the highway at strategic locations. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Raised as a key issue by community.
Utilities and services	An assessment of the potential impacts on key utility services was undertaken during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. This assessment involved consultation with utility service authorities and local councils. Further detailed discussions with service providers and councils will be undertaken as part of the concept design phase.	<i>Level of significance – Nil</i>	Issues Manageable – no further assessment proposed	No management measures required.
Hazards and risks	Criteria to achieve an acceptable level of risk in operation of the proposed upgrade were developed during the route options investigation and design development phases for both the Warrell Creek and Macksville to Urunga sections.	Reduced potential of hazard and risk associated with travel on the Pacific Highway with higher standard road. <i>Level of significance – Low</i>	Issues Manageable – no further assessment proposed	Spill containment measures / facilities for incidents near sensitive environments to be incorporated into the design. A Road Safety Audit of the concept design to be undertaken. Consultation will occur during the refinement of the design and development of the hazards and risks sub-plan. Environmental management measures would be included in the operational environmental management plan to be

				prepared prior to opening of the Proposal to traffic. The RTA will implement hazards and risk management sub plan(s). Refer to <i>Section 14</i> in the Draft Statement of Commitments (<i>Appendix A</i>).
Biological and physical				
Terrestrial flora and fauna	The potential for long term impacts on habitat corridors and fauna movements in the area were considered during route options development and route selection.	Direct and indirect impacts on the following EECs: ▪ Freshwater wetlands on coastal floodplains. ▪ Subtropical coastal floodplain forest. ▪ Swamp oak floodplain forest. ▪ Swamp sclerophyll forest. ▪ River-flat eucalypt forest. ▪ Lowland rainforest on floodplains. ▪ Coastal saltmarsh. Potential indirect impacts in terms of noise, water quality and increased edge effect on flora, fauna and the SEPP 14 wetlands adjacent to the route. The provision of fauna crossings and fencing to be investigated and developed as part of the concept and detailed design phase to mitigate any habitat severance issues and to prevent injury or death to fauna on the road. <i>Level of significance – Moderate</i>	Define Management measures – Design / environmental management plan	Environmental management measures would be included in the operational environmental management plan to be prepared prior to opening of the Proposal to traffic. The operational environmental management plan will include procedures to monitor and manage weed invasion and to inspect and maintain fencing and fauna crossings. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 7</i> in the Draft Statement of Commitments (<i>Appendix A</i>).

Aquatic ecology	The route alignment and design of the proposed upgrade considered the long term impacts on water courses, wetlands and the associated ecosystems.	Potential direct impacts on aquatic vegetation and potential habitat for: ▪ Black cod (<i>Epinephelus daemeli</i>) ▪ Green sawfish (<i>Pristis zijsron</i>) Potential indirect impacts on water quality as a result of runoff from the road or spills on creeks and SEPP 14 wetlands adjacent to the route. The stormwater drainage and incident management facilities will be designed to incorporate measures to prevent impacts resulting from contaminated runoff or from spill incidents. <i>Level of significance – Moderate</i>	Define Management Measures – Design / environmental management plan	Environmental management measures would be included in the operational environmental management plan to be prepared prior to opening of the Proposal to traffic. This would include incident management procedures to protect adjacent wetlands in the event of a spill and for the ongoing monitoring and maintenance of stormwater infrastructure. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 7</i> in the Draft Statement of Commitments (<i>Appendix A</i>).
Geotechnical, soils and contamination	Geotechnical investigations incorporating subsurface assessment, preliminary soil and groundwater contamination assessment and acid sulphate soil assessment were undertaken by suitably qualified specialist / experts during the route options investigation phase for the Macksville to Urunga section. A preliminary geotechnical assessment of the proposed upgrade corridor was undertaken by suitably qualified specialist / experts during the route options investigation phase for the Warrell Creek section. The assessment included a desktop review and a two day field investigation of the study area. The soils underlying the floodplains are expected to be potential acid sulphate	Potential for deep soft soils and resulting long term settlement – primarily across floodplains. Potential batter slope and stability impacts. Potential impact on footprint and location of Road Reserve boundary. Potential impact on the management of construction materials. Potential impact of foundation conditions for bridges and other structures. <i>Level of significance – Moderate</i>	Define Management Measures – Design / environmental management plan	Targeted geotechnical investigations and further design refinement proposed. Management measures would be included in the operational environmental management plan to be prepared prior to opening of the Proposal to traffic. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 10</i> in the Draft Statement of Commitments (<i>Appendix A</i>).

	soils (ASS).			
Groundwater	A desktop assessment and targeted field investigations were carried out by suitably qualified specialist / experts during the route options investigation phase for the Macksville to Urunga section. A desktop assessment was carried out by suitably qualified specialist / experts during the route options investigation phase for the Warrell Creek section. Investigations included a preliminary soil and groundwater contamination assessment as well as groundwater bore information received from the Department of Natural Resources.	Potential to encounter groundwater in deep cuts in Section 4. <i>Level of significance – Low</i>	Issues Manageable – no further assessment proposed	Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 10</i> in the draft statement of commitments (<i>Appendix A</i>).
Hydrology and flooding	Hydrologic and hydraulic investigations were undertaken by suitably qualified specialist / experts during the route options investigation phase for the Macksville to Urunga section.	Further investigation required to ensure concept design does not cause significant adverse flooding and drainage impacts. Concept design to be refined to provide higher level of confidence in flooding impacts and proposed structures. <i>Level of significance – Moderate</i>	Define Management Measures – Design / environmental management plan	Further hydrologic and hydraulic investigations and design refinement proposed. All waterway crossings to be located and sized so as not to cause significant adverse flooding and drainage impacts. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards as well as monitoring and maintenance. Refer to <i>Section 10</i> in the Draft Statement of Commitments (<i>Appendix A</i>).

Water quality	A qualitative assessment of potential water quality impacts during operation of the Proposal was undertaken by suitably qualified specialist / experts during the route options investigation phase for both the Warrell Creek and Macksville to Urunga sections. Baseline surface and ground water conditions were determined.	Potential for impacts on water quality of sensitive waterways and wetland areas. Impacts on water quality would include sedimentation and contamination from road run-off. <i>Level of significance – Low</i>	Issues Manageable – no further assessment proposed.	Measures to manage accidental spills during the operation of the project to be identified. Management measures would generally be in the form of detention structures or contingency plans or a combination of both. Areas considered having particularly high conservation and sensitivity values would be identified and additional management measures instigated. Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards. Refer to <i>Section 10</i> in the Draft Statement of Commitments (<i>Appendix A</i>).
Regional and cumulative				
Wastes, energy and resources		Reduced potential for hazardous material spillage or incident with higher standard road. Reduced consumption and resources with shorter, more efficient road. <i>Level of significance – Low</i>	Issues Manageable – no further assessment proposed	Residual impacts expected to be manageable through the application of appropriate management plans, controls, mitigation measures and safeguards incorporated in the operational environmental management plan.
Cumulative impacts	Cumulative impacts of the Pacific Highway Upgrade program and interactions with other major activities in the region were considered during route options investigation phase for both the Warrell Creek and Macksville to Urunga sections.	The overall Pacific Highway Upgrade Program is expected to generate cumulative impacts (both beneficial and adverse) with issues related to traffic growth (especially in heavy vehicles) being of particular community concern due to potential traffic noise and road safety concerns. <i>Level of significance – Low to moderate.</i>	Issues Manageable – no further assessment proposed	Adopt design standard and capacity of the Proposal that provides acceptable safety outcomes and level of service for the life of the project.

6.2 Proposed scope of environmental assessment

6.2.1 Key issues for environmental assessment

One of the objectives of the new planning approvals process under Part 3A of the *Environmental Planning and Assessment Act 1979* is to encourage proponents to prepare more focused environmental assessments to ensure that appropriate weight is given to addressing the more significant environmental issues in detail. In order to focus the environmental assessment documents, impacts that can be mitigated through the use of standard environmental management measures can be addressed through the preparation of a Draft Statement of Commitments.

As identified in Table 6-6, there would be a number of relatively minor impacts associated with the construction and operation of the Proposal that could be effectively managed and / or adequately mitigated through the application of standard or tailored mitigation measures (including standard conditions of approval developed by the DoP) addressed through a draft statement of commitments. A draft statement of commitments for the Warrell Creek to Urunga Project is shown in Appendix C.

There are also a number of other environmental impacts which require further investigation and assessment.

The environmental assessment for the proposed Upgrade will focus on those key issues for which further environmental assessment is proposed. This approach recognises the substantial amount of environmental assessment undertaken during the route investigation and selection process by technical experts / specialists in their relevant fields and that the preliminary design for the proposed Upgrade has considered and addressed key issues through refinements to the alignment and design of the highway to avoid / minimise impacts and include measures to mitigate potential impacts.

The key issues that have been identified as requiring further assessment during the environmental assessment stage are shown in Table 6-7 and the suggested scope of those further assessments has been summarised. The proposed scope of the environmental assessment has been based on the assessment of the issues in Section 6.

Table 6-7: Key issues for environmental assessment

Key Issue	Proposed scope of environmental assessment
CONSTRUCTION PHASE	
Community	
Aboriginal heritage	Further consultation with the DECC and the Aboriginal community (including Buchanan descendents) based on the <i>DECC Interim Community Consultation Requirements for Applicants</i> (December 2004) during the environmental assessment of the Proposal and further refinement of the concept design and during the development of the Aboriginal cultural heritage management plan. Undertake targeted heritage surveys with Local Aboriginal Land Council and Elders including Buchanan descendents. More accurately identify likely impacts on identified sites / areas of significance (including the Cow Creek Aboriginal Reserve) and, if appropriate, evaluate modifications to the Proposal to minimise impacts.

Biological and physical	
Terrestrial flora and fauna	Undertake targeted flora and fauna surveys to augment earlier investigations and identify threatened species and populations / communities likely to be affected by the Proposal. Assess significance of Proposal on threatened species and populations / communities likely to be affected. Where feasible and practical, refine concept design to avoid and / or minimise potential impacts on threatened species and populations / communities. Where not feasible and practical to avoid and/or minimise potential impacts, refine concept design to include flora and fauna protection measures – including fauna underpasses and fencing. Implement compensatory habitat proposals based on findings of supplementary investigations if not feasible or practical to refine concept design to avoid and / or minimise potential impacts or to include flora and fauna protection measures.
Aquatic ecology	Undertake targeted surveys to augment earlier investigations and identify aquatic vegetation and habitat likely to be affected by the Proposal. Assess significance of the Proposal on aquatic vegetation and habitat likely to be affected. Where feasible and practical, refine concept design to avoid and/or minimise potential impacts on aquatic vegetation and habitat. Where not feasible and practical to avoid and/or minimise potential impacts, refine concept design to include protection measures.
Hydrology and flooding	Undertake further flood assessment, including ongoing liaison with council(s) (including Floodplain Management Committee) and the Department of Water and Energy (previously the Department of Natural Resources), to refine predictions of impact on proposed flooding characteristics. Waterway crossings to be located and sized so as not to cause significant adverse flooding and drainage impacts. Refine concept design to incorporate identified management / mitigation measures. Review existing hydro surveys and/or undertake new surveys to confirm location of navigable channel.
OPERATIONAL PHASE	
Community	
Land use, property and access	Ongoing liaison with Nambucca and Bellingen Shire Councils, Department of Primary Industries (State Forests), local bushfire and emergency services agencies/groups and property owners Assess impacts of Proposal on existing and future land uses – including field assessment and meetings with councils, small groups and individuals. In consultation with individual land owners, consider refinements of the concept design to minimise impacts on current activities on affected private properties. Refine concept design to further define property access arrangements.
Local and regional economy	Assess impacts of Proposal on existing and future businesses – including additional business survey, field assessment and meetings with councils and Chambers of Commerce. In conjunction with councils and chambers of commerce, identify possible schemes to attract motorists into existing townships and businesses, e.g. signposting and gateway treatments. Design to provide for off-highway local road along full length of corridor with controlled access to the highway at strategic locations.

The relevant management measures for the issues shown in Table 6-8 will be identified during the design refinement / environmental assessment phase. Those measures will be summarised in the environmental assessment and detailed in the refined design or the relevant environmental management plan for the project.

6.2.2 Other issues for environmental investigations

The issues identified in Table 6-6 as requiring further consideration to identify or locate suitable mitigation / management measures are shown in Table 6-8.

Table 6.8: Other issues for further environmental investigations

Issue	Proposed actions
CONSTRUCTION PHASE	
Community	
Land use, property and access	Ongoing liaison with Nambucca and Bellingen Shire Councils, Department of Primary Industry (State Forests), local bushfire and emergency services agencies / groups and property owners Ongoing liaison with Nambucca and Bellingen Shire Councils regarding new development proposals and future landuse. Where feasible and practical, refine road alignment and concept design to minimise potential impacts on properties. Where feasible and practical, provide new access to severed parcels and/or consolidate severed parcels. Acquisition would be undertaken in accordance with the provisions of the <i>Land Acquisitions (Just Terms Compensation) Act 1991</i>. If required, take planning action to protect the corridor.
Traffic and transport	Identify and describe local road network changes during construction. Outline traffic management measures to be included in the construction traffic management plan.
Biological and physical	
Geotechnical, soils and contamination	Undertake targeted geotechnical investigations and refine design. Identify erosion and sedimentation control measures prepared with reference to the 4th edition of <i>Managing Urban Stormwater: Soils and Construction</i> (the "Blue Book"). Measures could include grassing and the provision of cut-off drains and landscaping to divert water away from the cut and fill batters, sediment basins and minimisation of vegetation removal during construction.
Water quality	Monitor waterways during and post construction. Implement measures to minimise risk to the environment. Special emphasis to be placed on gully and watercourse crossings, vehicle set-down and repair areas, fuel storage and waste disposal areas.

OPERATIONAL PHASE	
Community	
Traffic and transport	Adopt standards in the Pacific Highway Design Guidelines. Design to provide for off-highway local road along full length of corridor with controlled access to the highway at strategic locations.

	Identify benefits of Proposal and estimate crash reduction potential. Describe and quantify local road network changes including benefits and disbenefits. Prepare local traffic access strategy. Finalise location and design of interchanges. Describe existing and possible future bus routes (including school bus routes) and assess the potential benefits and disbenefits of the Proposal.
Visual landscape	Assess visual impact of Proposal. Describe how urban design and landscape management strategies / plans have been developed and incorporated into the design for the Proposal. Prepare an Urban Design and Landscape Report and implement proposed mitigation measures.
Noise and vibration	Undertake noise assessment to identify potential noise impacts of Proposal and proposed mitigation measures. Incorporate proposed mitigation measures into refined concept design for the Proposal. Proposed mitigation measures to be detailed in an Operational Noise Management Report and incorporated into the refined design for the Proposal.
Biological and physical	
Terrestrial flora and fauna	Identify environmental management measures and include in the operational environmental management plan.
Aquatic ecology	Identify environmental management measures and include in the operational environmental management plan.
Geotechnical, soils and contamination	Identify environmental management measures and include in the operational environmental management plan.
Hydrology and flooding	Undertake further hydrologic and hydraulic investigations and design refinement. Locate and size waterway crossings so as not to cause significant adverse flooding and drainage impacts.