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Upgrading the Pacific Highway

Wells Crossing to Iluka Road

Glenugie upgrade section

Preliminary environmental assessment

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Level 17, 101 Miller Street
North Sydney

Contents

Attachments

Abbreviations and Glossary

Term	Definition
AADT	Annual Average Daily Traffic
AFG	Aboriginal Focus Group
AHIMS	Aboriginal Heritage Information Management System
ANZECC	Australian and New Zealand Environment Conservation Council
ARI	Average Recurrence Interval
CEMP	Construction Environmental Management Plan
CO	Carbon monoxide
CO_2	Carbon dioxide
DECC	Department of Environment and Climate Change
EEC	Endangered Ecological Community
EPA	Environment Protection Agency (now DECC)
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESD	Ecologically Sustainable Development
FM Act	*Fisheries Management Act 1994*
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LoS	Level of Service
LGA	Local Government Area
PAD	Potential Archaeological Deposit
PEA	Preliminary Environmental Assessment
PHUDF	Pacific Highway Urban Design Framework
PHUP	Pacific Highway Upgrade Program
REP	Regional Environmental Plan
RTA	Roads and Traffic Authority
SEPP	State Environmental Planning Policy
SWMP	Soil and Water Management Plan
TSC Act	*Threatened Species Conservation Act 1995*
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*

1 Introduction

1.1 Background

The proposed upgrade of the Pacific Highway at Glenugie (the proposal) forms part of the Pacific Highway Upgrade Program, a joint commitment by the New South Wales (NSW) and Australian Governments to upgrade the standard of the Pacific Highway between Hexham and the Queensland border to a four lane highway.

The regional context of the proposal is shown in Figure 1.1. The proposal is shown in Figure 1.2

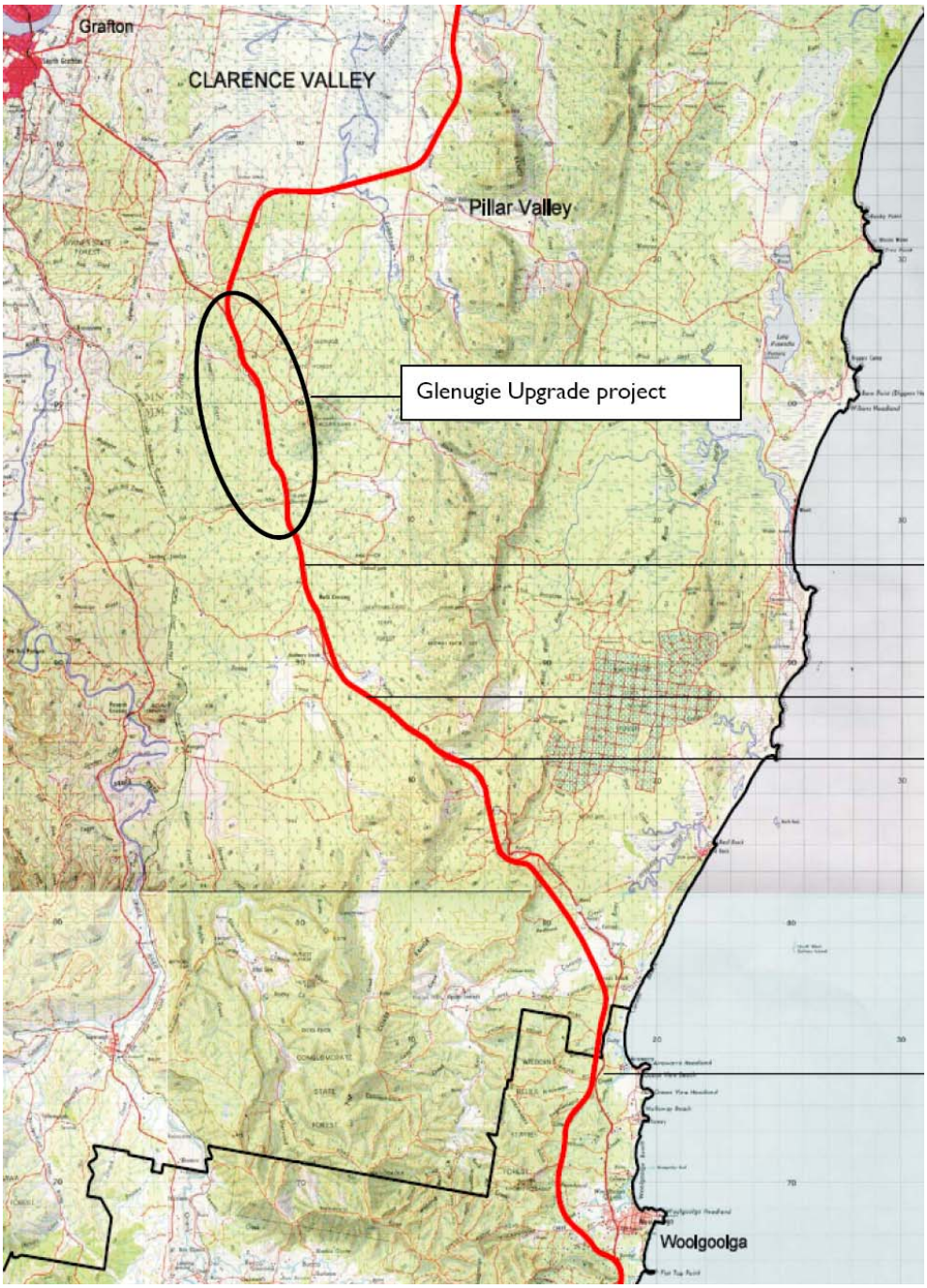
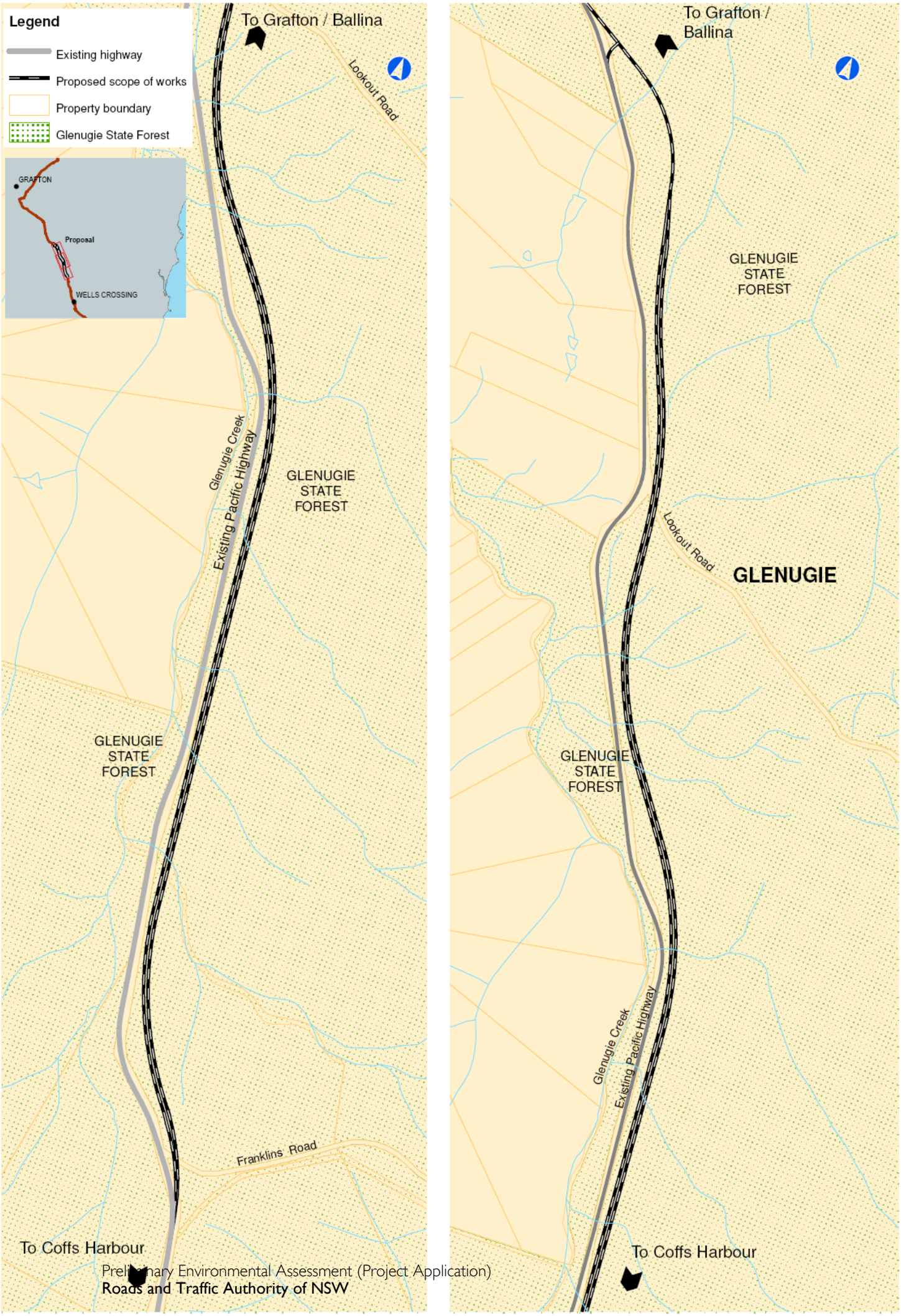


Figure 1.1Regional context

Figure 1.2 - The Proposal



Preliminary Environmental Assessment (Project Application)
Roads and Traffic Authority of NSW

The proposal would involve the construction of approximately 7 km of the Pacific Highway, along the 71 km alignment defined in the *Wells Crossing to Iluka Road Concept Design Report* (RTA January 2009). The proposal would be located between approximately 61 and 68 km north of Coffs Harbour. The northern end of the proposal is approximately 15 km south of Grafton (refer to Figure 1.1). The study area for this preliminary environmental assessment encompasses the existing Highway alignment and the proposed new alignment. Major features of the initial staging of the proposal are shown in Figure 4.1.

The preferred route for the upgrade of the Pacific Highway at Glenugie has been identified and developed as part of the proposed Wells Crossing to Iluka Road Pacific Highway Upgrade project, which has been declared to be a project to which Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) applies. The proposal has also been declared to be critical infrastructure under the EP&A Act. The proposal section of the Pacific Highway falls within these declarations.

Funding has been made available to improve the road safety of this section of two-lane highway by eliminating several lower standard curves and providing a four lane divided highway. Construction of the proposal would add to the safety and travel efficiency benefits of recent Pacific Highway upgrade projects. The proposal would also generate employment, providing support for the local and regional economy.

The Roads and Traffic Authority of NSW (the RTA) has conducted extensive community consultation, environmental and engineering investigations to help develop a preferred concept design for the proposed Wells Crossing to Iluka Road Pacific Highway Upgrade project. Options considered are described and their environmental, social and functional constraints outlined in the *Wells Crossing to Iluka Road Route Options Development Report* (RTA October 2005). The preferred route is identified and further investigated in the *Wells Crossing to Iluka Road Preferred Route Report* (RTA September 2006).

The concept design and more detailed environmental investigations on the preferred route are presented in the *Wells Crossing to Iluka Road Concept Design Report* (RTA January 2009) and seven technical working papers. Each of these reports and working papers were made available to the public. Community input received was considered in each successive stage of the development of the proposed project and has influenced the development of the concept design. The design, which is described in this preliminary environmental assessment report, aims to minimise impacts on the environment and local community.

1.2 Purpose of this document

This preliminary environmental assessment report has been prepared to support a major project application under Section 75E of the *Environmental Planning and Assessment Act, 1979* (EP&A Act). The report does the following:

- Describes the proposal.
- Outlines the findings of the preliminary environmental assessment and nominates key environmental issues.
- Identifies the proposed scope of the subsequent environmental assessment for the proposal.
- Aims to assist the formulation of environmental assessment requirements by the Director-General under Section 75F(2) of the EP&A Act.

2 Planning and assessment process

2.1 Approval process under Part 3A of the *Environmental Planning and Assessment Act, 1979 (EP&A Act)*

Section 75B (2) of the EP&A Act provides that for Part 3A:

> *The following kind of development may be declared to be a project to which this Part applies:*
>
> *(a) major infrastructure or other development that, in the opinion of the Minister, is of State or regional environmental planning significance…*

In accordance with the above provision, the Minister for Planning has declared by Order dated 5 December 2006 and published in NSW Government Gazette No. 175 (copy attached in Appendix A) that the 'Pacific Highway Upgrade Planning Projects' are to be a project to which Part 3A of the EP&A Act applies (the declared project). The proposal forms part of the declared project and therefore is a project to which Part 3A applies.

Section 75C of the EP&A Act provides that the Minister for Planning may declare a project to be a critical infrastructure project because it is, in the opinion of the Minister, essential for the State for economic, environmental or social reasons. The Minister for Planning has formed the view that the declared projects, which incorporates the proposal, is essential to the State for economic and social reasons and declared it to be a critical infrastructure project. The critical infrastructure declaration was published in NSW Government Gazette No. 175 on 8 December 2006 (copy attached in Appendix A).

2.2 Statutory planning

2.2.1 State Environmental Planning Policies (SEPPs)

Section 75R(2) of the EP&A Act states that SEPPs apply to:

> *(a) the declaration of a project to which this Part applies or as a critical infrastructure project, and*
>
> *(b) the carrying out of a project (but in the case of a critical infrastructure project) only to the extent that the provisions of such a policy expressly provide that they apply to an in respect of the particular project.*

The proposal (being a part of the gazetted 'Pacific Highway Upgrade Planning Project') has been declared to be a critical infrastructure project. To date, there are no SEPPs that expressly apply to the proposal.

SEPPs that may provide useful guidance, rather than statutory requirements, regarding potential issues to be addressed within the environmental assessment include:

- SEPP No. 44 – Koala Habitat Protection.
- SEPP No. 55 – Remediation of Land.
- SEPP No. 71 – Coastal Protection.
- SEPP (Infrastructure) 2007.

2.2.2 Other environmental planning instruments

Section 75R(2) of the EP&A Act states that *"environmental planning instruments (other than State environmental planning policies) do not apply to or in respect of an approved project.*

Section 75J(3) states:

"In deciding whether or not to approve the carrying out of a project, the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project if approved.

As the project is critical infrastructure, regional environmental plans (REPs) and local environmental plans (LEPs) do not apply to the proposal. The Minister may, but need not consider these plans in the determination of the application.

The following REPs and LEPs may apply to the land on which the proposal would be located and would be reviewed where relevant as part of the environmental assessment:

- North Coast Regional Environmental Plan.
- Ulmarra Local Environmental Plan 1992.

2.3 Other State legislation

The following NSW legislation may have relevance to the project, and would be considered in the environmental assessment:

- Coastal Protection Act 1974.
- Contaminated Land Management Act 1997.
- Fisheries Management Act 1994.
- Forestry Act 1916
- Heritage Act 1977.
- National Parks and Wildlife Act 1974.
- Native Vegetation Act 2003.
- Protection of the Environment Operations Act 1997.
- Roads Act 1993.
- Rural Fires Act 1997.
- Threatened Species Conservation Act 1995.
- Waste Avoidance and Resource Recovery Act 2001.
- Water Act 1912.
- Water Management Act 2000.

2.4 Federal legislation

The following Federal legislation may have relevance to the proposal, and would be addressed in the environmental assessment, if applicable:

- Aboriginal and Torres Strait Islander Heritage Protection Act 1984.
- Environment Protection and Biodiversity Conservation Act 1999.
- Native Title Act 1993.

2.4.1 Federal approvals

The Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides controls for impacts on:

- Matters of national environmental significance.
- The 'environment', where a proposed project would be carried out by the Federal government or agency or on Commonwealth land.

If the proponent considers that there is likely to be a significant impact on any of the above matters (or if it is unclear whether a significant impact would occur), a referral is required to be made to the Federal Minister for the Environment, Heritage and the Arts in order to determine if the proposed project is considered to be a 'controlled action'. Should the proposal be deemed a controlled action then approval to carry out the works is required from the Federal Minister in addition to the necessary State approval(s).

Matters of national environmental significance of potential relevance to the proposal include nationally threatened species (see Section 5.4). Based on investigations to date, a referral may be required for submission to the Federal Department of the Environment, Water, Heritage and the Arts to determine whether the proposed project constitutes a controlled action.

A bilateral agreement is in place between the Federal Government and NSW Government under section 45 of the *Environment Protection and Biodiversity Conservation Regulations 2000* relating to environmental impact assessment. Under the agreement, the preparation of an environmental assessment under Part 3A is a recognised form of environmental impact assessment to the Federal Government.

The bilateral agreement also establishes the mechanism for the assessment requirements of the Department of the Environment, Water, Heritage and the Arts to be incorporated into the relevant state environmental assessment requirements issued by the Director-General of the NSW Department of Planning. However, if the EPBC Act is triggered, approval from the Federal Minister for the Environment, Heritage and the Arts would still be required in addition to approval of the NSW Minister for Planning.

3 Strategic context and need for the project

3.1 Strategic context

The proposal is an important component of the Pacific Highway Upgrade Program (PHUP), which is needed to meet the NSW and Federal governments' commitments to upgrade the Pacific Highway between Hexham in NSW and the Queensland border. The objectives of the Pacific Highway Upgrade Program are to:

- Significantly reduce road crashes and injuries.
- Reduce travel times.
- Reduce freight transport costs.
- Develop a route that involves the community and considers its interests.
- Provide a route that supports economic development.
- Manage the upgrading of the route in accordance with ecologically sustainable development principles.
- Provide the best value for money.

The Pacific Highway Upgrade Program is needed, in part, because of population growth and the associated pressures placed on transport infrastructure. However, the program itself also plays a role in facilitating that population growth. The proposal has been developed to be consistent with the objectives of the Pacific Highway Upgrade Program.

AusLink White Paper

The AusLink White Paper *Building our National Transport Future* (the White Paper) (Commonwealth of Australia 2004) is the Australian Government's formal policy statement on land transport that identifies national objectives for the AusLink investment program.

The White Paper seeks to promote sustainable national and regional economic growth, development and connectivity by contributing to the development of an integrated national transportation network. The Pacific Highway is identified as part of the national network defined in the National Land Transport Plan under the AusLink investment program and is also the key road in the Sydney-Brisbane transport corridor. The overall Pacific Highway Upgrade Program, including the proposal would help to achieve the key objectives of the AusLink investment program by improving connectivity within and between communities in the growing region, enhancing road safety, incorporating ecologically sustainable development principles, and assisting in promoting economic growth and development.

Sydney-Brisbane Corridor Strategy

The *Sydney-Brisbane Corridor Strategy* has been jointly developed by the Federal Department of Transport and Regional Services, the RTA, NSW Ministry of Transport, Queensland Department of Main Roads and Queensland Transport. The strategy identifies the Sydney-Brisbane corridor as one of the busiest links on the Australian transport network, catering for passenger and commercial freight traffic moving between Sydney and Brisbane. Growth challenges to the corridor include strong population growth along the coastal regions, increased freight movements and significant and rapid growth in passenger and local traffic. The strategy identifies deficiencies along the corridor including safety, amenity, congestion and efficiency for freight operations. One of the short-term priorities of the strategy is the substantial completion of the duplication of the Pacific Highway and the completion of the duplication of the whole Pacific Highway as a longer term priority. Upgrading the Pacific Highway, including the proposal would assist in achieving these priorities.

NSW State Infrastructure Strategy

The *State Infrastructure Strategy – New South Wales* 2008-09 to 2017-18 (NSW Treasury 2008) provides strategic direction for planning and delivery of infrastructure in NSW to support the growing population. The strategy was first published in 2006 and is updated every two years. It is a rolling 10-year plan for infrastructure projects. The strategy highlights the continued upgrading of the Pacific Highway as a priority investment. The proposed Wells Crossing to Iluka Road section of the Pacific Highway Upgrade project is identified in the strategy as necessary to improve road safety for all motorists and improve transport efficiency. As part of the Wells Crossing to Iluka Road Pacific Highway Upgrade project, the proposal would improve safety and improve transport efficiency.

NSW State Plan

The *NSW State Plan: A New Direction for NSW* was released in November 2006, identifying priorities for the government over the next ten years. The Plan provides goals and targets focusing on areas such as strengthening regional economies, environmental protection, employment, and improving the efficiency and safety of the road network including maintenance of and investment in transport infrastructure. Development of safer and more efficient transport infrastructure such as the proposal, would work towards achieving some of the goals.

Mid North Coast Regional Strategy

The *Mid North Coast Regional Strategy* establishes the guiding principles for the planning and management of the future sustainable growth of the Mid North Coast. The strategy recognises the Pacific Highway as the primary north-south corridor for both inter/intra-regional movements. It identifies the growth pressures that will be faced by the region and the importance of safe and efficient transport connections within and between regions along the Sydney/Brisbane corridor. These growth pressures are further explained in Section 5.6. The proposal would assist by further improving traffic safety and efficiency within and to and from the Mid-North Coast region.

Action for Air

The NSW government initiative *Action for Air* (Environmental Protection Authority 1998) is a 25 year air quality management plan to improve air quality. The plan was updated in 2006. The highest priority has been given to reducing emissions from motor vehicles. The plan sets specific targets for reducing (per capita) the vehicle kilometres travelled. To achieve the targets, the government has developed two key transport initiatives:

- An integrated transport plan.
- An integrated freight management strategy across road, rail and other transport modes.

Action for Air has a focus on reducing air pollutants in urban environments in NSW. However, measures to improve the flow of traffic can also have beneficial effects in non-urban environments. In a related, but separate issue, improving transport efficiency can also have the effect of reducing greenhouse gas emissions per vehicle kilometre travelled.

The proposal would assist in meeting the objectives of *Action for Air*.

Road Safety 2010

This strategy provides a framework for coordinating the road safety initiatives of the federal, state, territory and local governments with the aim of reducing death and injury on Australian roads. The strategy target is to reduce the number of road fatalities per 100,000 people by 40 per cent, from 9.3 in 1999 to no more than 5.6 in 2010. Achieving this target will save 3,600 lives over the next ten years. Improving the safety of roads and improving road user behaviour are key strategic objectives to achieve this goal. Upgrading the Pacific Highway, which includes the proposal, would assist in achieving these safety aims.

3.2 Current road network limitations

3.2.1 Road conditions

The condition of the Pacific Highway between Hexham and the Queensland border varies considerably from high-standard, four lane divided carriageways to long sections of narrow two-lane roads. The roads also vary in their pavement condition and road geometry, which affects driver safety and transportation efficiency.

The section of the existing Pacific Highway which will be upgraded by the proposal is a two-lane single carriageway road with occasional overtaking lanes, and is typified by poor horizontal and vertical geometry, narrow shoulders and numerous traffic hazards in close proximity to the highway. Accident histories show unacceptably high levels of traffic incidents in many areas. Many crashes occur on sections with substandard curves. The combination of these factors contributes to unacceptable road conditions on the section of the Pacific Highway upgraded by the proposal.

3.2.2 Traffic and road safety

Existing traffic

The RTA publishes historical Annual Average Daily Traffic (AADT) data for various Pacific Highway count stations, which have been used to provide an indication of historical growth in the study area. The AADT data has shown that traffic has increased from 6700 vehicles in 2001 to 9200 vehicles in 2007 – a rate of about 2.6 per cent per annum (base year 2004).

Future traffic

Traffic volumes on the Pacific Highway have grown in recent years due to natural growth in demand for travel, improvements to the Pacific Highway, population growth in the Mid North Coast region and along the eastern seaboard, and the resultant increase in economic activity.

With the overall improved efficiency of the Pacific Highway, freight transport has shifted from the New England Highway corridor to the Pacific Highway. Although the settlements in the vicinity of the study area are expected to contribute little to the projected overall increase in travel demand, the Mid North Coast region in general will generate significant travel demand over the next 20 years.

Road safety

The crash history for section of the Pacific Highway to be upgraded by the Proposal has a poor crash record. Between 2003 and 2008, there were 35 crashes which comprised:

- 2 fatalities.

- 23 injuries.

The crash record for this section of the Pacific Highway is approximately 23 crashes per 100 million vehicle kilometres travelled (MVKT), which is well above the target of 15 per 100MVKT for the Pacific Highway upgrade.

Travel times

There have been substantial improvements to the Pacific Highway in the last 12 years, which have resulted in a significant reduction of intra and inter-regional travel times. Travel times in the study area are adversely influenced by substandard curves on the existing highway alignment and limited overtaking opportunities.

Two of the objectives of the Pacific Highway Upgrade Program are to reduce travel times and freight transport costs. The proposal would assist in reducing travel times on the Pacific Highway with the combined benefits of the reductions in travel times and an efficient high standard dual carriageway highway would result in decreased freight transport costs.

3.3 Statement of project need

The proposal forms an essential part of the overall upgrade of the Pacific Highway between Hexham and the Queensland border. The projects that make up the Pacific Highway Upgrade Program are intended to achieve the core objectives of improved road safety and reduced travel times.

The RTA's accident-rate target for the Pacific Highway Upgrade Program is 15 accidents per 100 million vehicle kilometres travelled (MVKT). The current accident rate on the section of the Pacific Highway to be upgraded by the proposal is about 23 accidents per 100 MVKT. This rate is well above the RTA target, and is a key reason why the proposal is needed. There is a need to provide higher standard road to better serve existing and future road users. The proposal would improve road safety and efficiency by upgrading a two lane highway with poor horizontal and vertical geometry, narrow shoulders and numerous traffic hazards in close proximity to the highway.

3.4 Project objectives

The objectives for the proposal are consistent with those identified for the Wells Crossing to Iluka Road Pacific Highway Upgrade project. Table 3.1 describes the objectives of the Proposal and identifies how they relate to the overall objectives of the Pacific Highway Upgrade Program.

Table 3.1 Project objectives

Pacific Highway Upgrade Program Objectives	Objectives of the proposal
Significantly reduce road accidents and injuries	▪ Provide a dual-carriageway road with a maximum crash rate of 15 crashes per 100 MVKT over the project length. ▪ Provide a concept design that achieves a 110 km/h design speed for the vertical alignment for class M (motorway) standard road sections, and a minimum 100 km/h design speed for class A (arterial road) standard sections.[1] ▪ Provide a concept design that achieves a 100 km/h design speed for the horizontal alignment. ▪ Provide no access points between interchanges along the length of the project for class M standard road sections, and minimise access points for class standard sections. ▪ Provide a route that can be upgraded to class M standard in the future. ▪ Retain or replace existing rest areas within the study area.
Reduce travel times	▪ Provide a route that minimises travel time for Pacific Highway traffic. ▪ Provide intersections designed to at least a Level of Service LOS C, 20 years after opening for the 100th highest hourly volume. ▪ Provide a route that minimises user delays from incidents and road closures on the highway, including from flooding. ▪ Provide a route that reduces delays from holiday congestion. ▪ Minimise disruption and delay during construction.
Reduce freight transport costs	▪ Provide a route that reduces the overall freight transport costs of trucks using the highway. ▪ Provide a route that meets or exceeds B-Double truck requirements.
Develop a route that involves the community and considers their interests	▪ Develop a project that meets the objectives of the community and stakeholders involvement plan and specifically, the Criteria for Successful Projects. ▪ Provide a route that minimises physical and traffic impacts such as traffic noise, intrusion, community severance and loss of access. ▪ Provide a route that minimises the physical impacts on heritage (indigenous and non-indigenous) sites. ▪ Provide transport developments that are complementary with land use. ▪ Maintain access to affected properties and land during construction. ▪ Upgrade and improve the existing highway where it is retained as part of the project.
Provide a route that supports economic development	▪ Maintain accessibility for local industries to regional and interstate markets. ▪ Maintain access to local and regional centres of economic importance. ▪ Minimise impacts on business/service facilities dependent on highway traffic, and create opportunities for businesses to capitalise on benefits that may arise from the upgrade. ▪ Provide flood immunity on at least one carriageway between 1 in 100 ARI flood event (target) and 1 in 20 year ARI (absolute minimum).

[1] 110km/hr horizontal alignment and 100km/hr vertical alignment are desirable for class A standard sections (upgrading/duplication of the existing Pacific Highway) where it can be achieved cost effectively and without compromising environmental or social impact standards.

Manage the upgrading of the route in accordance with Ecologically Sustainable Development (ESD) principles	▪ Minimise the effects on sensitive habitats. ▪ Minimise the effects on native vegetation. ▪ Avoid direct impacts on National Parks and SEPP 14 wetlands. ▪ Effectively encapsulate the principles of ESD in the project framework and approach.
Provide the best value for money	▪ Minimise the project's whole of life costs. ▪ Maximise the use of the existing road reserve for duplicated sections of the project, where possible. ▪ Achieve a benefit-cost ratio of greater than two[2]. ▪ Ensure that expenditure supports Federal government, NSW government and Clarence Valley Council development policies.

[2] Within the context of the overall Pacific Highway upgrade. BCR's may vary from project to project."

4 Description of the proposal

The proposal is for construction of an approximately 7 km long section of dual carriageway located between Coffs Harbour and Grafton (refer to Figure 1.1). The proposal involves construction of new carriageway to be located on the eastern side of the existing Pacific Highway. The existing highway alignment is to be retained as a service and local access road.

At its southern extent the proposal will connect with the existing Pacific Highway alignment near Franklins Road, approximately 60.5 km north of Coffs Harbour (refer to Figure 1.2). The route then heads north on the eastern side of the existing Pacific Highway within the Glenugie State Forest. The route involves a minor crossing of the upper reaches of Glenugie Creek and of a number of other intermittent unnamed waterways. The proposal then continues north before tying in with the existing three lane section of Pacific Highway just to the south of the existing intersection with Eight Mile Lane, approximately 68 km north of Coffs Harbour (approximately 15 km south of Grafton).

Approval is being sought for a motorway style (class M) upgrade. This would comprise two lanes in each direction, with the capability of a 110 kilometres per hour posted speed through restricting access to the roadway at grade-separated interchanges only. The median would be wide enough to accommodate future upgrading to three lanes in each direction. The environmental assessment would assess the impacts associated with the motorway-style upgrade. This would ensure that all impacts are assessed, should the proposal be constructed in stages.

Approval is also sought to construct the proposal in stages. The initial stage could involve a combination of arterial style highway (class A) and motorway standard highway, Class A highway would be two lanes in each direction, 100 kilometres per hour posted speed, with limited access to the roadway.

As highlighted in Figure 4.1, the initial staging would comprise:

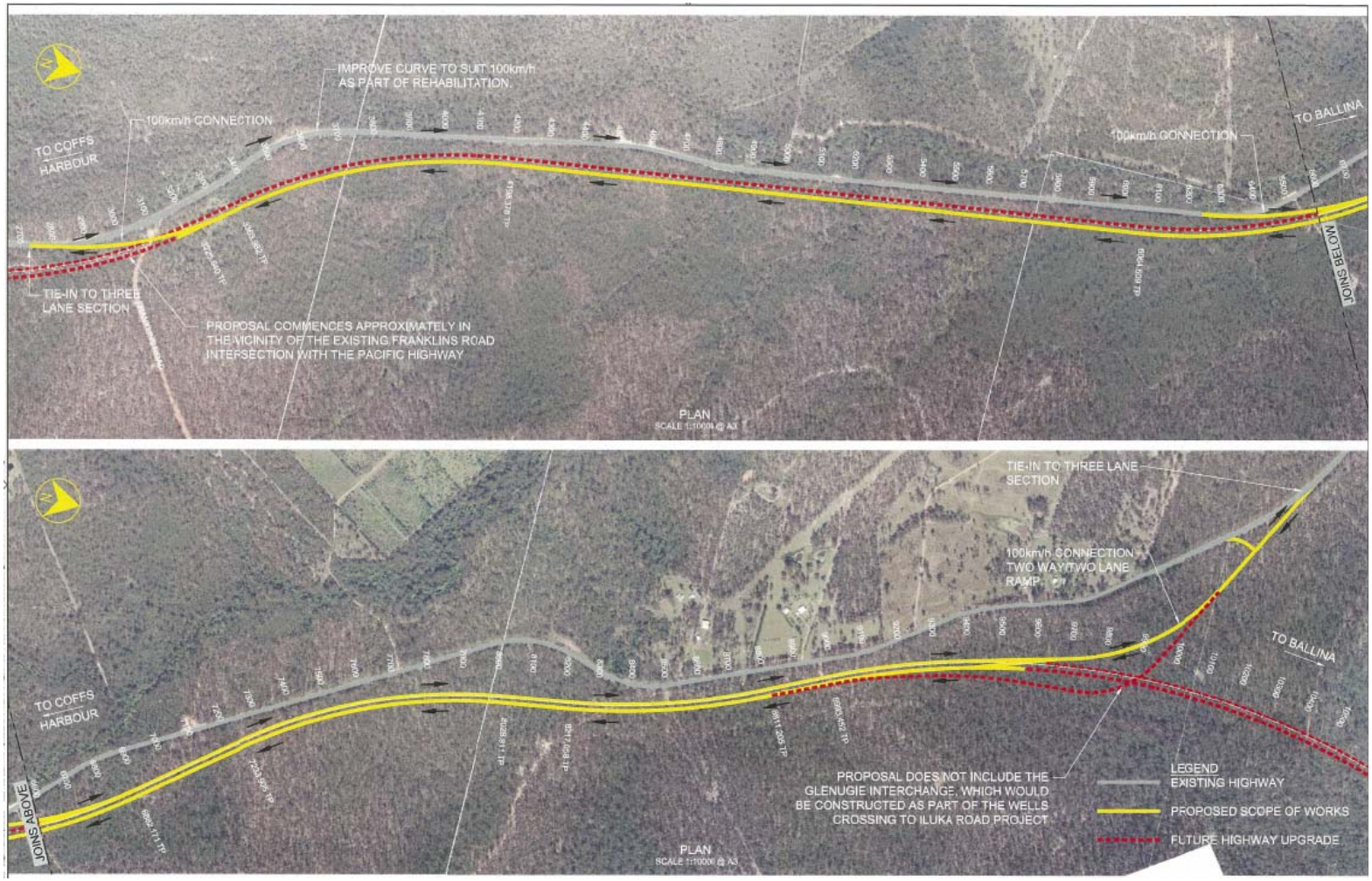
- A 2.9 km motorway style (class M) upgrade at the northern end of the proposal (chainage 6400 to chainage 9500) where the existing highway would be retained as a local road for traffic.
- A 3.4 km arterial style (class A) upgrade at the southern end of the Proposal (chainage 3200 to chainage 6400) where a new carriageway would be built for southbound traffic and the existing highway would be retained as the new northbound carriageway.

At the northern tie-in to the existing highway, access to and from Grafton would be via a two lane single carriageway.

When required in the future and when further funding becomes available:

- The tie-in at the northern end of the proposal would become part of the Glenugie interchange which would be constructed as part of the Grafton bypass section of the Wells Crossing to Iluka Road Pacific Highway Upgrade project.
- The southern end of the proposal would be upgraded by building a new northbound carriageway and retaining the use of the old carriageway as a local access road.

Figure 4.1: The proposal – possible initial staging option



Under the initial class A standard upgrade, direct local access to the proposal would be retained at Lookout Road and Franklin Road. The existing Pacific Highway would be used as a local access road to the west of the northern section of dual carriageway.

For the future upgrade to class M, the Franklins Road access would be replaced with grade separated access across the new highway to the bypassed section of the existing highway, which would act as a local access/service road. Lookout Road would be connected to the proposed State Forests access track which would link with Eight Mile Lane in the north and Bald Knob Road in the south.

Further design refinement would occur in response to the outcomes of the environmental assessment.

Ancillary facilities such as batch plants, construction compounds and stockpile sites would be required to implement the Proposal. Preliminary locations for these sites would be identified and assessed in the environmental assessment.

Urban design principles have been considered throughout the development of the Wells Crossing to Iluka Road upgrade, drawing on the RTA's *Pacific Highway Urban Design Framework* (PHUDF). The framework contains an overarching vision, objectives and design principles to achieve the objectives and vision as defined in the following extract:

> 'The upgrade should be a sweeping, green highway providing panoramic views to the Great Dividing Range and the forests, farmlands and coastline of the Pacific Ocean; sensitively designed to fit into the landscape and be unobtrusive; and characterised by simple and refined road infrastructure.

The following six urban design objectives would help achieve this vision and should be factored into the route selection and project development and procurement process:

- Provide a flowing road alignment that is responsive and integrated with the landscape.
- Provide a well vegetated, natural road reserve.
- Provide an enjoyable, interesting highway.
- Value the communities and towns along the road.
- Provide consistency-with-variety in road elements.
- Provide a simplified and unobtrusive road design.

5 Preliminary environmental assessment

5.1 Overview

The proposal would upgrade approximately 7 km section of the Pacific Highway just to the south of Grafton. Glenugie State Forest lies immediately to the east of the section of the existing highway that will be upgraded by the Proposal. Scattered rural and rural residential developments occur north west and south east of the Proposal.

Glenugie Creek parallels the western side of the existing Pacific Highway in this location, and crosses under the existing highway approximately 1.5 km north of Franklins Road. Glenugie Creek is an intermittent watercourse and a tributary of Coldstream River, which is a tributary of the Clarence River. The proposal crosses Glenugie Creek and a number of other minor unnamed intermittent streams.

Extensive environmental investigations have been undertaken during the development of the route options, the preferred route and the concept design for the proposed Wells Crossing to Iluka Road Pacific Highway Upgrade project, which includes the environments traversed by the proposal. The information presented in this chapter is sourced from those investigations.

During route development, the biophysical, social and economic characteristics of a broad study area were investigated. This included desktop reviews of available information, predictive modelling and/or field verification, and targeted investigations for many environmental aspects, including: ecology and biodiversity; Aboriginal and non-Aboriginal heritage; drainage and flooding; and water quality. This information, presented in the *Wells Crossing to Iluka Road Route Options Development Report* (RTA October 2005), assisted in the selection of a short-list of route options.

Each of the short-listed route options were subject to further environmental investigation which are presented in the working papers and summarised in the *Wells Crossing to Iluka Road Preferred Route Report* (RTA September 2006). Specialist investigations included:

- Traffic and transport.
- Flooding.
- Geotechnical.
- Terrestrial and aquatic ecology.
- Aboriginal and European heritage.
- Water quality.
- Noise and vibration.
- Land use and planning.
- Socio-economic impacts.
- Visual impacts and landscape assessment.

Following selection of the preferred route, more detailed specialist investigations were undertaken to inform the concept design. These included:

- Terrestrial ecology.
- Aquatic ecology.
- Cultural heritage.
- Hydrology and hydraulics.

- Water quality.

Specialist studies on the impacts of the proposed Wells Crossing to Iluka Road Pacific Highway Upgrade project on the local cane industry, and a working paper on options for a new bridge crossing at Harwood were also prepared. These studies do not contain information relevant to the proposal.

The findings of each of these studies were presented in working papers appended to the *Wells Crossing to Iluka Road Concept Design Report* (RTA January 2009). Additional investigations into soils, traffic and transport, public utilities and property were also undertaken to support development of the concept design.

5.2 Preliminary risk analysis

A preliminary environmental risk analysis was undertaken for the proposal to identify key environmental issues. It comprised a qualitative assessment based on information gathered during preliminary investigations. The level of environmental risk was assessed by considering potential environmental impacts of the proposed project and the ability to manage those impacts in a way that minimises harm to the environment.

While the approach is qualitative, it provides an important step in the process of project planning and assessment of environmental impact. In particular, it facilitates scoping of environmental investigations and assessments, guides project design, and assists in identifying appropriate mitigation measures and management responses. The identified risks are based on the following risk categories summarised in Table 5.1.

Table 5.1: Environmental risk categories

Risk category	Description
A	May have high or moderate impacts. Detailed assessment necessary to determine the level of potential impact and to develop appropriate measures to mitigate and manage the impacts.
B	May have high or moderate impacts. These can be mitigated by the application of standard environmental management measures.
C	Has low impacts. These can be managed by standard environmental management measures.

Those issues that were assigned risk category A have been nominated as key issues.

5.3 Key environmental issues

Preliminary environmental assessment indicates that the following key environmental issues would require further detailed assessment and may require project specific impact mitigation measures:

- Biodiversity.
- Noise.
- Traffic.

A number of other environmental issues have also been identified in the preliminary environmental assessment. These issues are outlined in Chapter 6 and are generally considered to be common issues frequently encountered in road construction projects. The potential impact of these additional environmental issues would be mitigated during construction and/or operation, largely through the application of best practice impact mitigation and management measures.

5.4 Biodiversity

5.4.1 Background

Preliminary environmental investigations into Biodiversity are documented in the Terrestrial Ecology Working Paper and Aquatic Ecology Working paper prepared for the *Wells Crossing to Iluka Road Concept Design Report* (RTA, January 2009). As described in these reports, the proposal would be constructed within Glenugie State Forest and generally adjacent to or slightly east of the existing highway. The proposal would involve the clearing of native vegetation comprising 110ha of State forest of which approximately 80ha is also National Forest. The estimate of vegetation to be removed would be further refined as part of the environmental assessment

The vegetation impacted by the proposal is predominately dry sclerophyll forest. The preliminary environmental investigations have identified four different vegetation communities affected by the proposal. These are: Spotted Gum – Ironbark Association; Spotted Gum – Square-fruited Ironbark Association; Narrow-leaf Redgum – Paperbark Association; and Grey-Box - Spotted Gum Association. These communities have been heavily logged and modified through frequent fire regimes and contain relatively low species diversity compared with other habitats in the region. These communities retain a moderate diversity of groundcover and shrubs and provide habitat for a range of common and threatened fauna.

A listed threatened species, *Eucalyptus tetrapleura* (Square-fruited Ironbark) as shown in Figure 5.1, is found along a large proportion of the project area. While it is common in and adjacent to the study area it has a relatively limited distribution and is considered a vulnerable species under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The proposed project would include clearing a number of individuals of this species.

The proposal may also require clearing of a small area of a Mixed Floodplain Forest association adjacent to Glenugie Creek and some minor tributaries. Although the impacted area is small it is likely that this vegetation type meets the definition of Sub-tropical Coastal Floodplain Forest, an Endangered Ecological Community under the TSC Act.

Glenugie Creek is the only major creek crossed by the proposal. It flows in a northerly direction primarily on the western side of the existing highway. It is an intermittent watercourse and is generally characterised by sandstone rock bars separating pools. The proposal would cross Glenugie Creek in its upper reaches, approximately 1.5 km north of Franklins Road. Field surveys undertaken for preliminary environmental investigations concluded that Glenugie Creek was of moderate to minimal fish habitat class (2-3). It was considered that there was a lack of interconnection between pools for the habitat to be considered good condition. The investigation concluded that the creek was unlikely to be habitat for threatened aquatic species.

The preliminary environmental investigations included database and literature searches, habitat assessment and survey generally in accordance with guidelines prepared by the Department of Environment and Climate Change (DECC) and the Department of Primary Industries (DPI). Targeted surveys for threatened flora species and fauna survey included trapping and nocturnal survey. Terrestrial fauna surveys were undertaken in July, August and October 2007 – October surveys targeted species unlikely to be found during cooler weather. Aquatic surveys were undertaken in June 2007. Glenugie Creek was included and water quality and AusRivAS habitat and macro invertebrate assessments undertaken.

Figure 5.1: *Eucalyptus tetrapleura* (Square-fruited Ironbark). Photo courtesy of DECC website.

5.4.2 Summary of potential issues identified

The proposal would result in a range of biodiversity impacts, including impacts on species and ecological communities listed as threatened under the TSC Act species listed under the EPBC Act.

As a result of preliminary ecological investigations undertaken, the following potential biodiversity issues have been identified for the proposed project:

- The clearing of native vegetation communities comprising primarily dry sclerophyll forest communities dominated by Spotted Gum and Ironbark species within Glenugie State Forest.
- The clearing of native vegetation communities comprising floodplain forest adjacent to Glenugie Creek. These communities are likely to comprise an Endangered Ecological Community (EEC) - Sub-tropical Coastal Floodplain Forest - listed under the TSC Act.
- The clearing of up to 3000 individuals of *Eucalyptus tetrapleura* within Glenugie State Forest predominantly in the area between Lookout Road and Reserve Road. *Eucalyptus tetrapleura* is listed as a vulnerable species under the TSC Act and the EPBC Act. This estimated impact was calculated on a nominal corridor width of 150 metres. It is likely that the final corridor width would be less than 100 metres wide. As such, the number of individuals to be impacted would be more accurately determined as part of the environmental assessment. The local population of *E. tetrapleura* is estimated to comprise between about 30,000–40,000 individual trees. There are known records of *E. tetrapleura* in other parts of Glenugie State Forest and within nearby Pine Brush State Forest and Newfoundland State Forest. There are also records of *E. tetrapleura* 10-20 km west of the proposal within the Orara River catchment, forested areas west, north and north-east of

Grafton and scattered records in forested areas between Grafton and Casino (Bionet search).

- The clearing of potential habitat for a range of state (indicated with the symbol *) and Commonwealth (C) threatened fauna species. Species identified as potentially affected by the project in the preliminary environmental investigation include the Black-chinned Honeyeater (*Melithreptus gularis gularis*)*, Brown Treecreeper (*Climacteris picumnus*)*, Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)*, Grey-headed Flying-Fox (*Pteropus poliocephalus*)*(C), Little Bentwing-Bat (*Miniopterus australis*)* and Rufous Bettong (*Aepyprymnus rufescens*)*.
- An increase in the barrier to movement for a range of fauna and the need to make provision in the design for fauna connectivity measures.
- Potential impacts on fish passage and aquatic habitat due to proximity of works to Glenugie Creek and the requirement for a crossing of Glenugie Creek and small tributaries.

5.4.3 Further assessments

Further investigation is required to assess the impact of the proposal on biodiversity and to confirm appropriate impact minimisation and mitigation measures. Further investigations would generally comprise:

- Detailed surveys to identify and confirm the flora and fauna impacted by the project. The surveys would include targeted surveys of potentially occurring threatened species that were not identified in the preliminary environmental assessment.
- Assessment of the extent of clearing of native vegetation by native vegetation type for the proposal including identification of key habitat features such as trees with hollows and the presence of endangered ecological communities.
- An assessment of the *Eucalyptus tetrapleura* population to more accurately assess the impact of the clearing on the local and regional populations of the species.
- Significance assessment for all potentially impacted threatened species would be undertaken in accordance with the draft *Guidelines for Threatened Species Assessment under Part 3A* (DECC 2006) and the EPBC Act 1999 *Significant Impact Guidelines (DEWHA 2006).*
- Identification of fauna species and groups whose movement may be impacted by the proposal and an assessment of the connectivity measures appropriate to the fauna groups. Specific attention would need to be made to the needs of the Rufous Bettong, a terrestrial threatened species that is known to occur in the study area surrounds.
- Further survey to confirm that no threatened aquatic species would be impacted by the proposal and an assessment of the proposed waterway crossings and the impact on aquatic habitats.

5.4.4 Management and mitigation measures

Subject to the outcomes of further assessment the following management and mitigation measures are proposed to be adopted for the project:

- Minimise clearing of native vegetation, Endangered Ecological Communities, threatened species and minimise loss of habitat features such as trees with hollows. Further design refinement would identify opportunities to reduce habitat clearing.
- Procedures would be applied to ensure that clearing limits are maintained.
- Procedures for managing any fauna found on site would be implemented.

- Implementation of habitat replacement measures (such as nest boxes and placement of coarse woody debris) where further assessment indicates that these are feasible and required to replace habitat features lost during construction.
- A strategy would be developed to manage the impact of the project on the *E. tetrapleura* population. Subject to further assessment the strategy could include minimising impact, seed collection and replanting.
- The preliminary environmental assessment identified a number of options for fauna crossings along the proposal. Subject to further assessment of the species types that require fauna crossings, these options would be further refined and incorporated into the final design. Specific consideration would be given allowing passage for the identified population of Rufous Bettong which inhabits the northern parts of Glenugie State Forest.
- The proposal would comply with provision for fish passage outlined in *Guidelines and Policies for Aquatic Habitat Management and Fish Conservation* (NSW Fisheries 1999) and *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge 2003).
- Provision of biodiversity offsets for residual impacts.
-

5.4.5 Brief scope of studies for the environmental assessment

Biodiversity – including but not limited to:

- Assessment of threatened terrestrial and aquatic species, populations and ecological communities.
- Targeted surveys of threatened flora and fauna species including Black-chinned Honeyeater (*Melithreptus gularis gularis*), Brown Treecreeper (*Climacteris picumnus*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*), Grey-headed Flying-Fox (*Pteropus poliocephalus*), Little Bentwing-Bat (*Miniopterus australis*), Rufous Bettong (*Aepyprymnus rufescens*), and Square-fruited Ironbark (*Eucalyptus tetrapleura*).
- Terrestrial habitat including native vegetation loss, habitat fragmentation, loss of ecological connectivity, riparian habitat, impacts to groundwater dependent ecosystems and weed infestation.
- Aquatic habitat including Glenugie Creek and consideration of NSW Fisheries Policy and Guidelines for Aquatic Habitat Management and Fish Conservation.

5.5 Noise

5.5.1 Background

Preliminary investigations for noise were undertaken in 2006 for the preferred route of the Wells Crossing to Iluka Road Pacific Highway Upgrade project. These investigations, based on aerial photography and desktop modelling in the study area, identified approximately 10-15 residences on the western side of the proposal that experience road traffic noise from the existing Pacific Highway. The potential for these residences to be impacted by road traffic noise as a result of the proposal would be assessed in the environmental assessment.

The proposal would not result in the road moving closer to any residence in the area of the proposal and around half the residences identified would be further from the new alignment.

Where the proposal aligns with the existing road corridor "redevelopment of existing road criteria" would apply to assessing noise impacts on residences in the vicinity of the proposal. This is the case for the majority of identified residences. The remaining residences are located

in areas where the road moves outside the existing road corridor. For these residences it is likely that the "new road" criteria would apply.

Initial noise predictions calculated as part of noise investigations undertaken in 2006 indicate that the relevant noise criteria within Department of Environment and Climate Change's (DECC) *Environmental Criteria for Road Traffic Noise* would be likely to be met at all identified residences. Further site investigation will be required to confirm the number of residences including identification of schools, churches and hospitals.

5.5.2 Summary of potential issues identified

The following potential noise and vibration issues have been identified for the proposal:

- Noise impacts may occur during the construction phase.
- Location of u-turn bays and their effect on engine brake usage.

5.5.3 Further assessments

A further noise assessment would be carried out to assess the potential noise and vibration impacts and to identify appropriate measures to minimise and mitigate noise impacts. This assessment would include:

- Identification of residents and other noise sensitive locations along the proposed upgrade.
- Assessment of potential noise and vibration impacts from construction and operation on identified residences and other noise sensitive locations.
- Recommendation of noise and vibration mitigation measures if needed.

5.5.4 Brief scope of studies for the environmental assessment

Noise and vibration – including but not limited to:

- Construction noise and vibration, including construction traffic noise.
- Operational road traffic noise impacts.

Assessments would be conducted in accordance with the following guidelines as relevant:

- Environmental Criteria for Road Traffic Noise (DECC 1999).
- Environmental Noise Management Manual (RTA 2001).
- Environmental Noise Control Manual (EPA 1994).
- Assessing Vibration: A technical Guideline (DEC 2006).
- Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZECC 1990).

5.6 Traffic

5.6.1 Background

The section of the existing Pacific Highway which will be upgraded by the proposal is a two-lane single carriageway road with occasional overtaking lanes, and is typified by poor horizontal and vertical geometry, narrow shoulders and numerous traffic hazards in close proximity to the highway. Accident histories show unacceptably high levels of traffic incidents in many areas. Many crashes occur on sections with substandard curves. The combination of these factors contributes to unacceptable road conditions on the existing Pacific Highway within the study area.

AADT (Annual Average Daily Traffic) data from south of Grafton has shown that traffic has increased in the study area from 6700 vehicles/day in 2001 to 9200 vehicles/day in 2007 – a

rate of about 2.6 per cent per annum (base year 2004). Surveys of traffic show there is a relatively consistent volume of heavy vehicles throughout the day and night. Late at night and early in the morning, heavy vehicles outnumber light vehicles, but between 4am and 9pm there are significantly more light vehicles on the road. Heavy vehicles comprise approximately 20 per cent of the total traffic on the highway.

The crash record for this section of the Pacific Highway is approximately 23 crashes per 100 million vehicle kilometres travelled (MVKT), which is well above the target of 15 per 100MVKT for the Pacific Highway upgrade.

5.6.2 Potential issues

- Local traffic network and highway motorist disruptions during construction.
- Local and regional traffic network impacts.
- Changes to access.

Disruptions

Some temporary disruptions/delays to local and highway traffic would be experienced during construction of the proposal although these would be minimal as construction would be generally independent of the existing highway. It is expected that construction works would not impose significant delays on highway motorists or on people living nearby the proposal. Where there are tie-ins to the existing highway, it is standard practice that a 'construction speed zone' would be implemented, reducing travel speeds to provide a safe working environment. Through effective traffic management, delays to traffic could be minimised.

Traffic delays would be managed under the Pacific Highway strategy for managing the impact of delay.

Network impacts

The proposal would result in significant road safety benefits, minor travel efficiency benefits and minimal negative impacts on the road network. Impacts of the proposal on local traffic patterns would be limited as the proposed upgrade is located in an area with few intersections direct property accesses. Changed traffic patterns are expected to only cause short term negative impacts while road users adjust and become familiar with the changed traffic patterns.

Changes to Access

Under the initial staging scenario as identified in Figure 4.1, direct local access to the highway would be retained at Lookout Road and Franklin Road. The Pacific Highway would be used as a local access road to the west of the northern section of dual carriageway.

For the future upgrade to Class M, the Franklins Road access would be replaced with grade separated access to the bypassed section of the existing highway, which would become a local access/service road.

5.6.3 Further assessments

A further assessment would be carried out during the environmental assessment stage of the project to assess the potential traffic impacts and to identify appropriate measures to minimise and mitigate these impacts. This would include:

- Description of the traffic impacts in relation to the objectives of the Pacific Highway Upgrade Program.
- Construction traffic impacts.

5.6.4 Management and mitigation measures

- Retention of the existing Pacific Highway alignment as a local access and service road on the western side of the proposal and provision of an access track on the eastern side of the proposal to enable full access on either side of the proposed new alignment.
- Modifications to local roads where they are crossed by the proposal so as to maintain the function of the local and forest network and in serving land use either side of the route.
- Effective traffic management during construction to provide a safe working environment and to minimise delays for the community and highway motorists.
- Property access would be maintained for the duration of the construction. Temporary access requirements (if necessary) would be assessed in consultation with affected landholders.
- Advance notification would be given to property owners and occupants on project schedules, construction works and access arrangements.

6 Other environmental issues

The environmental risk analysis process indicated that the following issues could be addressed by standard mitigation and management measures, and subsequently are not considered to be key environmental issues for the purpose of the environmental assessment.

6.1 Aboriginal heritage

An Aboriginal and non-Aboriginal cultural heritage assessment was undertaken as part of the concept design investigations for the Wells Crossing to Iluka Road Pacific Highway Upgrade project and presented in the Cultural Heritage Working Paper (RTA January 2009). The assessment covered the area potentially impacted on by the proposal. The Aboriginal cultural heritage assessment included:

- Background desktop assessment of the project corridor and surrounding areas.
- Aboriginal community consultation in accordance with DECC and RTA guidelines.
- A comprehensive site survey to identify Aboriginal objects, places and PADs within and adjacent to the project corridor.
- Preliminary mitigation measures for the management of cultural heritage items identified within the study corridor.

Background desktop assessment

Background desktop research was conducted to inform the site survey. DECC's Aboriginal Heritage Information Management System (AHIMS) database search was completed as part of this desktop assessment. The AHIMS search area was wider and longer than the proposed impact zone to inform predictive modelling and identifying unknown constraints prior to site survey.

In total there were nine AHIMS sites within the search area. Site types included artefact scatters carved trees, burials, ceremonial sites, and an Aboriginal historical site. None of these were located within the proposal area.

The AHIMS search, along with research on relevant archaeological heritage reports, academic books and regional cultural heritage studies revealed that *no known Aboriginal objects or places* were located in the project corridor prior to site survey.

Aboriginal community consultation

Aboriginal community consultation for the Wells Crossing to Iluka Road Pacific Highway Upgrade project extends back to May 2005. Aboriginal stakeholder identification and ongoing consultation was in accordance with *DECC Interim Community Consultation Guidelines for Applicants* and the then draft of the RTA *Procedure for Aboriginal Cultural Heritage Consultation & Investigation.*

Initial consultation included advertisement in print media for stakeholder registration. Ongoing consultation with identified stakeholders was through correspondence and multiple Aboriginal Focus Group (AFG) meetings. There were five AFGs held which gave registered stakeholders the opportunity to review and comment on survey methodologies and draft assessment reports. In addition the AFG forum allowed for the identification of appropriate cultural knowledge holders.

Registered Aboriginal stakeholders relevant to the current study area include:

- Grafton-Ngerrie Local Aboriginal Land Council (LALC).
- Yaegle LALC.

- Yaegl Native Title Group.
- Yarrawarra Aboriginal Corporation (including the Garby Elders).
- Burra:way Wa:jad Traditional Owners.

Comprehensive site survey

A detailed archaeological field survey was conducted over a two week period from 26 November to 7 December 2007, for the entire Wells Crossing to Iluka Road Pacific Highway Upgrade project. Site officers from Grafton-Ngerrie LALC and the Yarrawarra Aboriginal Corporation participated in the site survey with the archaeologist in the area impacted on by the proposed project. The Yaegl Native Title Group and Burra:way Wa:jad Traditional Owners did not nominate site officers and did not participate in the survey.

The proposal was inspected by the survey team using pedestrian survey techniques. The survey area ranged between 30 and 150m either side of the existing alignment. The ground cover was heavily vegetated leaving ground surface visibility at five per cent. Straight line transects (at approximately 10-50 metre intervals, depending on the landscape) were used to inspect any ground exposures for artefact sites and mature trees for scarring.

Survey results

Survey results showed that no newly identified Aboriginal objects or places were identified along the project corridor. Eight Potential Archaeological Deposits (PADs) were identified to the north in the additional upgrade sections of the Pacific Highway; however none are located in the proposal area.

These PADs were identified on the basis of known geographic predictive models for the area. The consultant provided a matrix to aid PAD identification (based on micro landforms which incorporating potential occurrence and likely significance). If an area did not meet the threshold for PAD identification it equated to background scatter.

As there are no PADs in the study area, this would mean that the potential archaeology is assessed as being background scatter and does no pose a major risk to the project during construction phase.

Area of cultural significance: Glenugie Peak

A review of documented stories and consultation with Aboriginal stakeholders revealed that Glenugie Peak (Mt Elaine) is a significant Dreamtime place. It is associated with the creation story of two hero-ancestors, Birrugan and Mindi. They were fighting over the collection of food and the stockpiling of yams created the mountain.

Glenugie Peak is located approximately one kilometre to the east of the proposal in the Glenugie State Forest. It has associated cultural areas to the north in Tyndale and Ulmarra (pathways to ceremonial sites, massacre sites, burials etc). None of these culturally significant areas are within the proposal area.

The Aboriginal stakeholders (in particular the Burra:way Wa:jad Traditional Owners Group) have stated that Glenugie Peak should be avoided during project works.

6.1.1 Potential issues

Assessment summary:

- No known Aboriginal cultural heritage objects, places or potential archaeological deposits were identified within the proposal area.
- Glenugie Peak, or other culturally significant areas, are not located within the study area.

Potential risks:

- Previously unidentified Aboriginal objects are uncovered during construction.

6.1.2 Management and mitigation measures

The management of Aboriginal cultural heritage would address the following measures:

- Clear guidance for the physical protection of cultural values of Glenugie Peak.
- Address unexpected finds during construction (including human remains).
- Site awareness induction for site staff.
- All measures would be in accordance with:
    - RTA *Procedure for Aboriginal Community Consultation and Investigation (2008).*
    - DECC's *Interim Community Consultation Requirements for Applicants (2004).*
    - Draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation: Part 3A, Environmental Planning and Assessment Act (2005).*

6.2 Non Aboriginal heritage

A non-Aboriginal cultural heritage assessment of the proposed Wells Crossing to Iluka Road Pacific Highway Upgrade project, is documented the Cultural Heritage Working Paper that supports the *Wells Crossing to Iluka Road Concept Design Report* (January 2009).

The non-Aboriginal heritage assessment included:

- A background desktop assessment of the project corridor and surrounding areas.
- A comprehensive site survey to identify and define historical features, sites and areas of archaeological significance.
- Preliminary mitigation measures for the management of heritage items identified within the study corridor.

Literature and Database Review

Searches were undertaken for the proposed Wells Crossing to Iluka Road Pacific Highway Upgrade project (a total distance of 71 km). Searches included the following statutory and non-statutory heritage registers and schedules:

Statutory listings:

- The National Heritage List (Australian Heritage Council).
- The Commonwealth Heritage List (Australian Heritage Council).
- The State Heritage Register (Heritage Branch Department of Planning).
- State Heritage Inventory (Heritage Branch Department of Planning).
- RTA Section 170 Heritage and Conservation Register.
- Grafton Local Environmental Plan 1998 Heritage Schedule.
- Maclean Local Environmental Plan 2001 Heritage Schedule.
- Ulmarra Local Environmental Plan 1992 Heritage Schedule.

Non-statutory listings:

- Maclean Shire Draft Community-Based Heritage Study (2006).
- Register of the National Estate (Australian Heritage Council).
- Register of the National Trust of Australia (NSW).
- Royal Australian Institute of Architects' Register.
- Institute of Engineers (NSW) Heritage Register.
- Professional Historians Association (NSW).

No heritage items were located within or in the vicinity of the proposal. Two items were identified at Harwood (a nineteenth century residence and the Harwood bridge) which are both to the north of the upgrade and would not be impacted by the proposed upgrade at Glenugie.

The potential for heritage items to occur within the proposal area would be further verified in the environmental assessment phase. Additional searches of Department of Land's records, parish maps, historical aerial photography and historic plans would assist in this process. Chronological mapping of settlement activities would enable prediction of archaeological risk.

Site Survey

The field survey was conducted to ground truth heritage items identified through the searches, and to identify previously unknown heritage features.

No additional heritage items were identified along the proposal area.

6.2.1 Potential issues

There are no impacts to non-Aboriginal heritage items.

6.2.2 Management and mitigation measures

If a relic or potential heritage item is discovered in the course of construction, a heritage consultant would be notified to assess the significance of the find, and determine whether further mitigation measures are required.

6.3 Hydrology and flooding

The proposal is located outside of the Clarence Valley floodplain and is relatively flood free. The main waterway occurring within the study area is Glenugie Creek, which is crossed by the proposal approximately 1.5 km north of Franklins Road. There are also a number of other minor unnamed intermittent streams.

Glenugie Creek is an intermittent watercourse and is generally characterised by sandstone rock bars separating pools. It flows into the Coldstream River, and in turn flows to the Clarence River. Glenugie Creek is situated generally parallels the western side of the existing Pacific Highway alignment on the boundary of Glenugie State Forest.

The proposal crosses the upper reaches of Glenugie Creek approximately 1.5 km north of Franklins Road and a number of other intermittent unnamed waterways.

There are no long term flooding issues associated with the Glenugie Creek or other waterways in the study area, however, there is potential for occasional short duration, high velocity flood

events and climate change is predicted to increase intensities in the Mid North Coast region.

6.3.1 Potential issues

- Flood risks associated with the operation of the upgraded highway.

There are also potential water quality impacts associated with the proposal that are discussed in Section 5.6.

Flood Risks

Although the waterways crossed by the proposal are not subject to the long term flooding that occurs downstream in the Coldstream River basin, design of the proposal will consider the potential for rapid flows and rapid changes in water height during high rainfall events. Flood flows create risks for the structural stability of the road, including the potential for scouring of embankments and stresses on bridges and other structures. Inundation may cause traffic delays and damage to the road pavement. High velocity flow also presents risks such as damage from debris carried by flood flows.

6.3.2 Management and mitigation measures

- Best practice management measures would be implemented during construction of the project and the desired outcomes of these measures would be incorporated into the statement of commitments. These measures would be in accordance with applicable RTA QA specifications and Managing Urban Stormwater: Soils and Construction, Volume 2, Book 4, Main Road Construction (Landcom 2006).
- Culvert design should accommodate at least 20 year ARI peak flows and consider increased storm intensity due to climate change.

6.4 Land use and socioeconomic

Glenugie State Forest lies immediately to the east of the section of the existing highway that will be upgraded by the proposal. Scattered rural and rural residential developments occur north west and south east of the proposal.

The economy of the Clarence Valley area generally is based on agriculture, tourism and transport. Grafton is located approximately 15 km north of the proposal and is an important retail, services and employment centre in the region. Grafton is also a transport hub, being serviced by the Pacific and Gwydir Highways, the Summerland Way and the North Coast Railway and Grafton Airport.

Forestry is the predominant economic activity in the vicinity of the project, owing to the presence of the State Forest. Forestry management zones indicate that the State Forest includes 'general management', 'special protection' and 'harvesting exclusion' zones. Parts of Glenugie State Forest are also gazetted as 'National Forest' under the *Forestry Act 1916.*

Beef cattle grazing and dairying are the predominant uses of agricultural land in the vicinity of the proposal. Active quarry areas are located to the east of the proposal, in the hilly areas to the south of Pillar Valley. There are no shop-front businesses fronting the highway in the section traversed by the proposed proposal.

The *Mid North Coast Regional Strategy* (Department of Planning 2009) does not identify any regionally significant farmland, proposed urban areas or proposed employment lands within the study area.

There is a Telstra mobile phone tower within Glenugie State Forest to the eastern side of the study area. An optical fibre cable runs through the study area from this tower to Eight Mile Lane

to the north.

6.4.1 Potential issues

The following potential land use and socioeconomic issues have been identified for the project:

- Acquisition.
- Economic productivity.
- Changes to the character and amenity of the local area.
- Land connectivity and contiguity.
- Planned development.
- Construction stage impacts.

Traffic and access are further discussed in Section 5.6.

Acquisition

All land required for the proposal is located within Glenugie State Forest. It is expected that approximately 110 ha of land would be required for the proposal, which includes approximately 80 ha of National Forest. In acquiring the land for the construction of the proposal, the area would be based on the largest land take from the class M acquisitions so that all property ultimately required for the upgrade and other associated infrastructure is provided.

Section 19 of the *Forestry Act 1916* enables the Governor to revoke declarations of State forest following passing of resolutions by both houses of the NSW Parliament. Section 19B of the Act enables the Minister for Primary Industries to revoke the declaration of an area of State Forest of less than 20 ha where that land is required for a public purpose. However, as the area of State Forest land to be acquired within Glenugie State Forest is greater than 20 ha, an Act of Parliament would be required to revoke the State Forest declaration prior to the commencement of the upgrade works. There is also an alternative provision at section 16A of the *Forestry Act 1916* to enable the Minister for Primary Industries to enter into an agreement for the sale or other disposal of State forest that could be utilised for the acquisition process.

Economic productivity

The area of land within Glenugie State Forest affected by the proposal is approximately 110 ha, which equates too less than two per cent of the total forest area. In addition, a long and relatively narrow corridor of the forest would become potentially isolated between the proposal and the current highway alignment. However, based on the small proportion of Glenugie State Forest land affected by the proposal it is not anticipated that there would be any substantial impact on timber production activities or the viability of forestry businesses.

No businesses front the existing highway over this section so no loss of passing trade would result from the project. Acquisition of privately owned land would not be required. Rural land to the north-west of the proposal may generate local agricultural and horticultural produce. The efficiency of transporting local produce would not be compromised by the project.

Construction of the proposal would require the import of some materials. Locally sourced materials are often preferred to limit haulage distances and minimise heavy vehicle use of the road network. Sourcing materials from local quarries has the potential to deplete sand and gravel supplies for the region.

Local amenity

There would be minimal change to the amenity of the surrounding areas due to the proposal. From the perspective of vehicle noise, vehicle emissions and visual amenity, the majority of residents would be further removed from the traffic source. There is increased potential for impacts of this nature during the construction stage. It is expected that, the existing highway and vegetation would assist in mitigating these potential impacts for nearby residents.

Land connectivity and contiguity

The improvement of road safety as a result of the proposal improve connectivity by removing the safety risks associated with east-west movement across the highway. The existing Pacific Highway would generally be maintained for local access and use by cyclists with connections at key points to the proposal, dependent on the staging option selected. Section 5.6.4 of this preliminary environmental assessment describes measures that the RTA would use to mitigate potential construction traffic impacts occurring as a result of the proposal.

As the proposal is located near to the existing Pacific Highway no part of the community would be subject to isolation. Access and proximity of residents to the major centre of Grafton would remain unchanged.

Planned development

Land use change in the vicinity of the proposal is subject to strategic planning initiatives and statutory controls prepared by Clarence Valley Council, the Department of Planning, the Department of Primary Industries and other agencies. However, the proposal would assist in providing key transport infrastructure which supports local and regional economic development in the future. The proposal has been developed with consideration of existing strategic planning documents such as:

- Mid North Coast Regional Strategy 2006-2031.
- Mid North Coast Farmland Mapping Project 2009.
- Clarence Valley Settlement Strategy 1999.

The proposal would not hinder nor prohibit the achievement of the strategic goals or objectives outlined in these documents.

Construction stage impacts

The main impacts that may occur during the construction phase of the proposal would relate to property and local access and the establishment of construction compounds. Some land may also be acquired outside the operational road corridor for temporary construction access and for construction compounds. Preliminary locations for major work sites and ancillary construction facilities would be detailed in the environmental assessment. The establishment of these facilities would temporarily affect the land use of the chosen sites, although these impacts would be short term.

6.4.2 Management and mitigation measures

- Land acquisition within Glenugie State Forest for the proposal would be in accordance with the provisions of the *Forestry Act 1916*.
- Remove any harvestable timber within the footprint of the proposal prior to commencement of construction.
- In consultation with the Department of Primary Industries, access to and within state forest land adjacent to the proposal would be retained for forestry management purposes.

- Traffic connectivity would be maintained wherever possible during construction.
- Advance notification would be given to property owners and occupants on project schedules, construction works and access arrangements.
- Protection of existing public utilities as required.

6.5 Air quality

There is limited information about air quality in the the vicinity of the proposal. Long-term monitoring is not usually undertaken outside metropolitan and/or industrial areas, because pollutants typically do not exist in concentrations that would cause adverse environmental or health impacts.

Given the characteristics of the surrounding environment (predominately state forest), air quality in the vicinity of the proposal is considered to be generally good.

6.5.1 Potential issues

Construction

Construction activities have the potential to result in dust emissions which may impact on any nearby sensitive receivers, in particular residences. There are several residences located on the western side of the proposal, but they would be separated from the construction works by the existing Pacific Highway and a well vegetated buffer comprising section of the Glenugie State Forest. Construction dust impacts are expected to be minor in proximity to these resicences and negligible for the remainder.

Operation

Once operational, emissions from the proposal would comprise mainly hydrocarbons, carbon monoxide, nitrous oxide and particulate matter. The level of concentration of vehicle emissions and their subsequent impacts in the immediate vicinity of the proposal depends on the traffic volume, vehicle speed and make-up (eg percentage of heavy vehicles) as well as the ability of the local environment to disperse emissions.

Short-term air quality monitoring was undertaken at Korora, which is located in an urban area approximately 70 km south of the proposal from October 2005 to January 2007. The AADT at Korora was approximately 19,700 over the monitoring period, which is over double the current AADT for the proposal. The key outcomes of the Korora monitoring was that the peak readings, and the commonly used 90th percentile readings for the measured parameters were all considerably less than the air quality goals specified by the National Environmental Protection Measures, the air quality standards adopted by DECC. Based on the monitoring undertaken at Korora, it is expected that potential changes to air quality occurring as a result of the proposed project would be well within the DECC criteria.

CO concentrations measured close to the Pacific Highway are well below the relevant DECC eight hour criteria of nine parts per million. It is considered that, given the comparatively low traffic volume on the proposal, air quality could also be expected to meet the DECC guidelines. CO Concentrations would further diminish with distance from the proposal, resulting in negligible operational impacts.

6.5.2 Management and mitigation measures

Best practice management measures (particularly dust suppression measures) would be

implemented during construction of the project and would be detailed in the statement of commitments. These measures would be in accordance with applicable RTA QA Specifications.

6.6 Climate Change

Solar radiation passes through the atmosphere, warming both the earth and the atmosphere. Some of the radiation is reflected by the earth, but some is trapped by atmospheric greenhouse gases. This is known as the "greenhouse effect", keeping temperatures higher than they otherwise would be, like a glass greenhouse keeping plants warm. The principal greenhouse gases are water vapour, carbon dioxide, methane, and nitrous oxide.

There has been an increase of greenhouse gases in the atmosphere, which is causing climate change. The increase is due to human actions, particularly burning fossil fuels, affecting the balance between the incoming solar energy and losses from the earth and atmosphere. One of the important factors in determining the amount of radiant energy absorbed in the atmosphere is the concentration of carbon dioxide. Changes in this concentration are likely to cause changes in the temperature of the atmosphere near the earth's surface. Increases in carbon dioxide concentrations are expected to cause increases in temperature.

The proposal is located in the Northern Rivers catchment, specifically the catchment of the Clarence River. In a 2007 report prepared for DECC by the CSIRO, projections are provided for climate change in the Northern Rivers area. By 2030 average temperatures are expected to increase by +0.2 to +1.8°C. Projections suggest that there will be more hot days, bushfires, droughts and intense storms.

Greenhouse gases attributable to the project can be assigned as Scope 1, Scope 2, or Scope 3. Scope 1 emissions are direct emissions generated on site, such as those from plant and equipment and land clearing. Scope 2 includes use of energy where emissions are generated off site, such as electricity. Scope 3 are emissions in the supply chain, or those from the use of a product. These include embodied energy in construction materials, and vehicles travelling on the proposal.

6.6.1 Potential issues

Construction

The total volume of greenhouse gases emitted during the construction process would depend largely on the quantity of energy consumed during construction, in particular fuel consumption for both construction plant and also light vehicles. Another source of energy that would be used is electricity for site compounds (computers, lights etc.).

The main sources of greenhouse gas emissions are likely to include fuel use, embodied energy in materials (bitumen, concrete and steel), and land clearing.

The principal climate change impact affecting the project during construction would be the potential for more intense storms. These could cause impacts such as more severe erosion and sedimentation.

Operation phase

Greenhouse gases emissions during operation of the project include fuel use in road maintenance, embodied energy in maintenance materials, and any electricity use for lighting. Vehicles travelling on the proposal will also use fuels.

The principal climate change impact affecting the proposal during operation would be the potential for more intense storms. This could cause local flooding and damage road infrastructure which is addressed further in Section 6.3.

6.6.2 Management and mitigation measures

- The construction contractor, where reasonable and feasible, would use electrical energy derived from a renewable energy source accredited by the National Green Power Accreditation Steering Group (or equivalent) for the supply of at least 50 per cent of the on-site electrical energy required during construction.
- Construction plant and equipment would be serviced regularly and maintained in optimum condition to ensure exhaust emissions meet or surpass existing air quality standards.
- The use of secondary waste materials, such as fly ash and steel slag in construction materials would be considered to reduce indirect greenhouse emissions.
- The reduction of greenhouse gases by adopting energy efficient work practices would be promoted.
- Increased storm intensity (such as the design of culverts and pavements) would be considered in the environmental assessment and detailed design of the project.
- Initiatives to minimise greenhouse gas emissions from road transport would be promoted.

6.7 Hazards and risks

Hazards and corresponding risks to human health and the environment could arise as a result of incidents during construction or operation of the proposal.

The main potential incident of concern for the proposal is the accidental release of toxic, flammable or explosive material during storage, use or transport of hazardous substances.

The proposal is located along a sparsely populated section of the Pacific Highway, so any incident would have a limited potential to impact those not directly involved in a crash or incident.

6.7.1 Potential issues

The following potential hazards and risks issues have been identified for the project.

Construction stage

During the construction period, hazardous substances such as fuels and explosives (if required), would be transported to and from work sites. This activity poses a potential risk to people and the environment in the event of a traffic accident resulting in the release of hazardous material. The transportation and unloading of hazardous substances would be undertaken in accordance with the *Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998* and the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (National Transport Commission 2008).

The likelihood of a traffic accident occurring and leading to the release of hazardous substances as a result of construction of the proposal is considered to be very low. Additionally, as the volumes of fuels and explosives to be transported would be relatively low and all hazardous substance transport would be undertaken in accordance with relevant legislation and codes, the overall risk associated with hazardous substances transport during construction would be minimal.

A number of hazardous substances required for construction would be stored and used within defined work areas for the proposal. The majority of these substances would be stored within the major construction site compound areas. The handling and storage of hazardous substances would be undertaken in accordance with relevant legislation and standards, including:

- Occupational Health and Safety Act 2000.

- Australian Standard (AS) 1940-2004 – The storage and handling of flammable and combustible liquids.
- Storage and Handling of Dangerous Goods: Code of Practice (WorkCover 2005).

The quantities of hazardous substances that would be stored at construction compounds and sites are anticipated to be relatively small and where applicable, less than the 'screening thresholds' set out in *Applying SEPP 33: Hazardous and Offensive Development Application Guidelines* (DUAP 1994) and *Draft Applying SEPP 33 Guidelines* (DoP 2008). This would be further assessed, if necessary, by the preparation of a preliminary hazard analysis (PHA) in accordance with the guidelines, should any hazardous substances exceed threshold levels.

In the event of an incident leading to a spill of a hazardous substance during construction, standard incident control measures would be deployed. Additionally, containment of spills would be achieved in a series of sediment control basins to be installed.

Operational stage

The potential for a spill of hazardous substances from a vehicle transporting dangerous goods along the proposal is considered to be very low in view of the following factors:

- Dangerous goods vehicle movements along the proposal are expected to account for a very minor proportion of total daily traffic movements, (estimated to be 0.2 per cent) hence the likelihood of an accident involving a truck containing dangerous goods is very low.
- The high road design standard of the proposal would reduce the potential for road accidents relative to the existing situation.
- The existing stringent legislative controls on the transport of dangerous goods.
- In the event of a traffic accident involving a vehicle carrying hazardous substances, any spills would typically be contained to the roadway area by the appropriate incident and emergency response teams.

A Preliminary Hazard Analysis (PHA) would be prepared during the preparation of the environmental assessment, if the quantities of hazardous substances exceed threshold levels. This would assess the transport and storage of hazardous materials during construction in accordance with *Applying SEPP 33: Hazardous and Offensive Development Application Guidelines* (DUAP 1994) and *Draft Applying SEPP 33 Guidelines* (DoP 2008).

6.7.2 Management and mitigation measures

Construction site hazards and risks would be managed through the implementation of a standard environmental management measures.

Occupational health and safety risks associated with construction would be managed through the implementation of an occupational health and safety plan.

Specific risks associated with the transport of hazardous substances to and from work sites, including the risks associated with temporary changes in local traffic conditions during the construction period, would be managed through the implementation of standard environmental management measures.

The risks associated with the use and storage of hazardous materials during construction would be mitigated through appropriate design and establishment of bunded areas within construction sites.

The final locations of construction site compounds where hazardous substances would be stored would be determined during detailed design based on specific environmental criteria.

Construction stormwater control basins and operational water quality control basins designed

to reduce the environmental effects of pollutant runoff from the road surface and to contain spills of chemicals and hazardous substances would be installed in strategic locations.

6.8 Waste management

Various waste streams would be generated during the construction of the proposal, including construction and demolition waste, vegetation waste, packaging materials and liquid wastes.

6.8.1 Potential issues

The following potential waste streams have been identified for the proposal:

- Demolition wastes from existing structures that require demolition, pipe work, and pavements.
- Excavation wastes, although the proposal would be designed with the aim of achieving a cut/fill balance. Some excavation material may be produced which would not be able to reused within the project.
- Vegetation from removal of shrubs and trees; however, where possible this would be mulched for re-use on site as part of the landscaping works.
- Packaging materials associated with items delivered to site such as pallets, crates, cartons, plastics and wrapping materials, all of which need to be disposed of once the product has been used. Minimisation of packaging of raw materials would be strongly encouraged. Components of this waste stream could be recycled or reused.
- Wastes produced from the maintenance of various heavy construction equipment including liquid wastes from cleaning, repairing and maintenance. Likewise leakage or spillage of fuels/oils during construction would need to be managed and disposed of appropriately. Sewage wastes would be generated through the use of worker's facilities such as toilets.
- General office wastes such as paper, cardboard, beverage containers and food wastes.

6.8.2 Management and mitigation measures

All wastes would be managed and disposed of in accordance with relevant state legislation and government policies including the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act), the *Waste Avoidance and Resource Recovery Strategy 2007* and the RTA's *Waste Reduction and Purchasing Policy* (WRAPP). The DECC's *Waste Classification Guidelines* (DECC 2008) would be used to classify the different types of waste, and the management, treatment and disposal of the wastes.

- Sites wastes would generally be managed using the following principles (moving from most desirable to least desirable):
    - Avoiding unnecessary resource consumption.
    - Recovering resources for reuse.
    - Recovering resources for recycling or reprocessing.
    - Disposing of residual waste (as a last resort).

Avoidance of waste can be accomplished for the proposal by providing realistic predictions on the quantities of resources such as construction materials. The potential to re-use waste materials either on-site or off-site including re-use of topsoil and fill material would be identified during detailed design. Trees and plant material could be mulched or chipped on-site and used for landscaping. Where possible, waste would be segregated and recycled and recycling facilities would be provided for paper, plastic, glass, aluminium cans and other recyclable materials.

Waste disposal would only occur where there are no other options for waste avoidance, reuse and recycling. All waste disposal would occur in accordance with the DECC's *Waste Classification Guidelines* (DECC 2008).

RTA's contractors are required to propose recycled content construction materials where they are cost competitive and performance competitive. The cost competitiveness of materials is assessed on a project life-cycle basis considering issues such as impacts on construction practices and disposal requirements. RTA's contractors are also required to report waste minimisation quantities, initiatives and barriers. In addition, the RTA has allowed for recycled and recovered materials procurement for road construction and maintenance works. The use of these products with recycled content and products that produce low waste quantities would reduce demand on resources. Opportunities to reduce the demand on resources, where reasonable and feasible, include using secondary waste materials such as fly ash, slag and silica within concrete mixes.

Standard site specific waste management measures would therefore include requirements for:

- The application of the waste minimisation hierarchy principles of avoid/reduce /re-use/recycle/dispose.
- Waste handling, storage and disposal.
- Any waste material that is unable to be re-used, re-processed or recycled would be disposed at a facility approved to receive that type of waste.
- Secondary waste materials, such as fly ash and steel slags would be used in construction materials where reasonable and feasible.
- Waste management impacts during construction are expected to be low, given the management and disposal activities outlined above.

6.9 Water and soil

The receiving waters for the proposal are ephemeral streams which have lowland river characteristics according to ANZECC/ARMCANZ (2000) Guidelines. A water quality assessment of Glenugie Creek was undertaken on surface water quality under both wet and dry conditions and presented in the Water Quality Working Paper prepared for the *Wells Crossing to Iluka Road Concept Design Report (January 2009).* Glenugie Creek, which was not identified as either an at-risk or sensitive ecosystem.

Glenugie Creek has moderately sloping banks stabilised by native riparian vegetation. It has intermittent flow with sandstone rockbars separating pools. The riparian vegetation community in the vicinity of the project has been mapped as an endangered ecological community (mixed floodplain forest) listed under the TSC Act.

Glenugie Creek is classified by NSW Fisheries as Class 2-3 for fish habitat (moderate to minimal fish habitat). Current barriers to fish passage include sandstone rockbars and disconnecting pools. There are no threatened fish species recorded in Glenugie Creek.

During dry weather, water quality did not comply with the ANZECC/ARMCANZ (2000) Guideline for the Protection of Lowland River Aquatic Ecosystems for pH, turbidity or dissolved oxygen. This is likely to be due to the low flow and stagnant nature of the waterway.

Water quality improved with wet weather, and all parameters measured met the ANZECC/ARMCANZ Guideline. Heavy rainfall prior to and during the wet weather sampling event appears to have flushed the system, resulting in improved water quality.

The proposal would not impact on any area identified as having known or potential acid sulphate soils. There are no SEPP 14 wetlands identified as receiving environments in the immediate vicinity of the proposal.

Groundwater seepage is likely to be encountered within cuttings at the interface between residual soils and weathered rock, and within bedrock defects at depths of 4 – 14m below existing surface levels.

A Preliminary Phase 1 environmental site assessment was undertaken for the length Wells Crossing to Iluka Road Pacific Highway Upgrade project to identify areas of environmental concern. The results of these investigations are presented in the *Wells Crossing to Iluka Road Concept Design Report* (January 2009). There are no known occurrences of contaminated land within the proposal area.

Soils in study area are underlain by Grafton formation rock consisting of siltstone, claystone, mudstone and sandstone. Residual soil developed from Grafton formation rocks are generally sandy clays and silty clays of medium to high plasticity.

6.9.1 Potential issues

- Construction and operation of the proposal may impact on the physical and chemical nature of surrounding creeks and presents a potential moderate risk to water quality from:
    - Exposure of soils during earthworks.
    - Increased sediment loads — which can reduce light penetration through the water column, impacting on aquatic flora and fauna.
    - Silting of waterways — this can smother aquatic flora and fauna.
    - Decay of organic matter and some hydrocarbons — these can decrease dissolved oxygen levels.
    - Increased nutrients (nitrogen and phosphorus) — these can stimulate the growth of algae and aquatic plants.
    - Heavy metals (including copper, zinc, lead, aluminium and iron) from vehicle and tyre wear — these may be toxic to aquatic biota and fish.
    - Accidental spills of chemicals — these can impact aquatic (and terrestrial) ecosystems.
    - Litter, oil and grease — these can pollute waterways and are unsightly and can cause water quality problems.
- Soils exposed during excavation and vegetation removal have the potential to erode and result in sedimentation of receiving environments and discharge of turbid water. During construction, work may be required in the main flow paths of ephemeral creeks, including Glenugie Creek. This would potentially result in increased turbidity and sediment loads.
- Roads and waterway crossings have implications for long-term water quality and may facilitate surface run-off of contaminants or sediment into aquatic habitats. The proposal may also impact on habitat loss and changes in sediment transport. The proposal may also impact on the erosion of beds, banks and channels of receiving waterways.
- The construction and operation of the proposal may impact on groundwater resources, and groundwater dependant ecosystems. Construction cuts may impact on groundwater seepage and have the potential for aquifer interference. The proposal may impact on groundwater recharge and discharge. However, given the potential depth of cuts required for the proposal, impacts on groundwater are likely to be minimal.

6.9.2 Management and mitigation measures

- Best practice measures would be implemented in the construction phase of the project to manage erosion and sedimentation control in accordance with *Managing Urban Stormwater: Soils and Construction, Volume 2D – Main Road Construction* (Blue Book 2 -

NSW DECC 2008). The design of the project would follow the RTA draft Procedure for Erosion and Sedimentation Management, including assessment of sedimentation basin sizing criteria.

- An appropriately qualified officer would be appointed to the project during detailed design and construction to advise on the appropriate treatments to minimise erosion and sedimentation.
- The operational stormwater quality objectives would be further defined in the environmental assessment with consideration given to relevant guidelines. The operational stormwater design would incorporate a treatment train approach to manage potential water quality impacts. Consideration would be given to the potential impact of spills on the receiving environment.
- Where feasible, operational runoff should be treated using non point source or dispersed techniques. For example the use of table drains, grass buffer strips, grass swales, edge drains and grassed median strips. In sensitive environmental locations and where required, sedimentation basins installed for the construction phase would be converted to water quality treatment basins for the operation phase.
- Energy dissipaters or scour protection methods would be used to prevent erosion at all outlets and to protect natural water courses.
- The environmental assessment would describe how construction activities would be managed and monitored to minimise and mitigate impacts on groundwater and include a description and identification of groundwater resources affected by the proposal; groundwater dependant ecosystems and proposed groundwater management and monitoring measures. This would include issues related to groundwater seepage and potential aquifer severance through major bedrock cuttings.

6.10 Landscape character and visual impact

The landscape type within the proposal area is defined as 'undulating lands'. Undulating lands are transitional areas between the ridges and plains of the region and are characterised by rolling hills of gentle gradients. The undulating landscape in the vicinity of the proposal is vegetated largely by forest, which is composed of groundcover, understorey and canopy vegetation layers, creating a strong sense of enclosure. State forests further create a distinct feeling of their own, with more regimented planting and structure, and the dominance of one canopy species.

6.10.1 Potential issues

Landscape character impacts

The proposal would represent a new element in the landscape. In accordance with the objectives of the Pacific Highway Upgrade Design Framework, the proposal would be closely integrated with the natural topography and natural vegetation. Landscape patterns have been considered and preserved where possible; views of the landscape and area have been identified for retention; visual impacts have been avoided and minimised as far as possible and road elements such as overbridges considered and designed in terms of their visual presence and continuity with other structures on the highway.

Landscape character impacts are calculated by combining an assessment of landscape sensitivity with an assessment of the magnitude of the proposal. The sensitivity of this landscape is considered relatively low with the rolling (concealing) landform, dense forest and the presence of the existing highway combining to provide a good capacity to absorb change. The magnitude of the proposal is considered medium and is considered to be a topographically responsive alignment. There is one cut of significance near the intersection of Lookout Road and the

existing Pacific Highway. This cut would be approximately 14 m deep. The remainder of the cuts are generally less than five metres deep. It is expected that revegetation of all cuttings is possible. Opportunities to reduce the depth of cuttings would be explored as part of the development of the concept design and detailed design.

The combination of sensitivity and magnitude results in a medium low landscape character impact.

There would be additional landscape and visual impacts associated with the proposed overpass across the highway at Franklins Road, which would be constructed only as part of the motorway style (class M) upgrade.

Visual impacts

The proposal achieves the design principles of the Pacific Highway Urban Design Framework. The new alignment has been located very close to the existing highway, in a densely forested and undulating topography. The proposal results in the highway being moved further away from existing residences into the adjoining state forest. The magnitude of the impact of the proposal on nearby residences is therefore considered low.

Visual impacts are calculated by combining an assessment of sensitivity of the view with an assessment of the magnitude of the proposal in that view. The population density in proximity to the proposal, with the sensitivity of the view to the proposal from these properties is considered medium. The views into the State forest from the proposal, although of an attractive, rural character are made less pristine due to the presence of the existing highway and the traffic using it being in the view.

6.10.2 Management and mitigation measures

- The proposal would continue to be designed in accordance with the RTA's Pacific Highway Urban Design Framework. This would ensure that impacts are avoided and minimised as the concept design is developed further.
- Residual impacts that cannot be avoided such as removal of native vegetation, visual and noise impacts would need to be mitigated in the urban design process through the use of false cuttings, mounds and screen planting and landscape designs comprising local native species. Should noise barriers be required, vegetated noise mounds will be used in preference to noise walls should excess fill and sufficient land be available. These measures would be integrated into the development of the concept design and detailed design.

7 Proposed scope of environmental assessment

Table 7.1 outlines the proposed scope of the environmental assessment for the proposal. The proposed scope of the environmental assessment is based on the preliminary assessment of key issues discussed in Sections 6.2 to 6.5. On the basis of information gathered to date, the RTA considers that all other issues can be managed through the detailed design stage and with the application of standard environmental management measures and site-specific safeguards.

Table 7.1: Scope of the environmental assessment

Issue	Scope of the environmental assessment
General	▪ Consideration of planning and statutory requirements. ▪ Strategic justification for the project. ▪ Description of the project. ▪ Discussion of project options. ▪ Outline of construction activities. ▪ Consideration of the principles of ecologically sustainable development in the context of the project.
Stakeholder consultation	• Description of consultation activities conducted to date and issues identified. • Outline of stakeholder consultation and communication strategy.
Environmental risk analysis	▪ Identification of potential environmental impacts associated with the project, proposed mitigation measures and potentially significant residual impacts after the application of proposed mitigation measures. ▪ Should any additional key environmental impacts be identified, an appropriately detailed impact assessment would be included in the environmental assessment.
Biodiversity	▪ Assessment of threatened terrestrial and aquatic species, populations and ecological communities. ▪ Targeted surveys of threatened flora and fauna species including Black-chinned Honeyeater (Melithreptus gularis gularis), Brown Treecreeper (Climacteris picumnus), Grey-crowned Babbler (Pomatostomus temporalis temporalis), Grey-headed Flying-Fox (Pteropus poliocephalus), Little Bentwing-Bat (Miniopterus australis), Rufous Bettong (Aepyprymnus rufescens), and Eucalyptus tetrapleura (Square-fruited Ironbark). ▪ Terrestrial habitat including native vegetation loss, habitat fragmentation, loss of ecological connectivity, riparian habitat, impacts to groundwater dependent ecosystems and weed infestation. ▪ Aquatic habitat including Glenugie Creek and consideration of NSW Fisheries Policy and Guidelines for Aquatic Habitat Management and Fish Conservation.
Noise	▪ Identification of residents and other noise sensitive locations along the proposed upgrade. ▪ Assessment of potential noise and vibration impacts from construction and operation on identified residences and other noise sensitive locations. ▪ Recommendation of noise and vibration mitigation measures if needed.
Traffic	▪ Description of the traffic impacts in relation to the objectives of the Pacific Highway Upgrade Program.

Issue	Scope of the environmental assessment
	▪ Construction traffic impacts.
Other environmental issues	▪ Cultural heritage impacts would be outlined. ▪ Land use and socio economic impacts would be described. ▪ Climate change – greenhouse gas emissions would be calculated. ▪ Soil and water construction and operation impacts and management would be outlined. ▪ Landscape character and visual assessment would be prepared.
Draft statement of commitments	▪ A draft list of the measures to avoid, minimise, manage, mitigate, offset and/or monitor impacts.

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