Failford Road to Tritton Road

Upgrading the Pacific Highway

REVIEW OF ENVIRONMENTAL FACTORS
MAY 2008

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GLOSSARY AND ABBREVIATIONS

Term / abbreviation	Definition
AADT	Average annual daily traffic: the total volume of traffic passing a roadside observation point over a period of a year, divided by the number of days in the year.
Aboriginal scarred tree	Aboriginal scarred trees show evidence of bark or timber removal by Aboriginal people for traditional purposes. Scarred trees provide significant evidence of Aboriginal occupation in what is now a highly modified landscape. There are few developed agricultural areas remaining in the world with preserved signs of pre-modern Indigenous activity. This makes scarred trees in south-east Australia records of human activity of potential world importance (Department of Conservation 2005).
ARI	Annual recurrence interval: the long-term average number of years between the occurrence of a flood as big as or larger than the selected event. For example, floods with a discharge as great as or greater than a 100 year ARI flood event will occur, on average, once every 100 years.
CEMP	Construction Environmental Management Plan - a site specific plan developed for the construction phase of a project to ensure that all contractors and subcontractors comply with the environmental conditions of approval for the project and that the environmental risks are properly managed.
CO	Carbon monoxide
dB(A)	Decibel(s) (A-weighted) a unit used to measure noise levels that are adjusted by an electronic filter to approximate the response of a human ear.
DECC	NSW Department of Environment and Climate Change. This department contains sections of the former Department of Land and Water Conservation, Department of Natural Resources, Department of Environment and Conservation, and Department of Primary Industries
DPI	NSW Department of Primary Industries. This department contains sections of the former Department of Natural Resources, and NSW Fisheries.
DEWHA	Australian Government Department of the Environment, Water, Heritage and the Arts. This department contains sections of the former Department of Environment and Water Resources.
DOP	NSW Department of Planning. This department contains sections of the former Department of Infrastructure, Planning and Natural Resources.
ECRTN	Environmental Criteria for Road Traffic Noise - a document that sets out non-mandatory goals for road traffic noise, and recommended alternatives to meet these noise levels.
ENCM	Environmental Noise Control Manual, a document developed by the Environment Protection Authority (now Department of Environment and Climate Change) that provides guidelines for noise levels during construction.

EEC / endangered ecological community	As defined under the TSC Act, an ecological community that is likely to become extinct or is in immediate danger of extinction.
ENMM	Environmental Noise Management Manual, a NSW RTA document that provides guidelines for assessing maximum noise levels. The guidelines provide a tool to help prioritise and rank mitigation strategies.
EP&A Act	New South Wales Environmental Planning and Assessment Act 1979, an Act to institute a system of environmental planning and assessment for the State of New South Wales.
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999, protects the environment, particularly matters of National Environmental Significance (Protected matters). It streamlines national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places.
GLC	Great Lakes Council
GTCC	Greater Taree City Council
heavy vehicle	A heavy vehicle is classified as a Class 3 vehicle (a two axle truck) or larger in accordance with the Austroads Vehicle Classification System.
Infrastructure	Australian Government Department of Infrastructure, Transport, Regional Development and Local Government. This department contains sections of the former Department of Transport and Regional Services.
L_{10}	The noise level that is exceeded for 10% of the sample period.
L_{Aeq}	LAeq is the equivalent sound pressure level (i.e. the steady sound level that, over a specific period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring). LAeq(1h) is the LAeq noise level for a 1 hour period; correspondingly, LAeq(9h) and LAeq(15h) are the LAeq noise levels for 9 and 15 hour periods.
LEP	Local Environmental Plan
L_{max}	Predicted maximum noise level
LoS	Level of service: a fundamental performance measure used in the planning design and operation of roads. It provides the basis for determining the number of lanes to be provided in the road network.
NO_2	Nitrogen dioxide
PAD	Potential archaeological deposit - any location considered to have a moderate to high potential for subsurface archaeological material.
PASS	Potential acid sulfate soils - waterlogged soils that are rich in iron sulfides (pyrite).
PM_{10}	Particulate matter (such as airborne dust or silt) less than or equal to 10 microns in aerodynamic diameter.
REF	review of environmental factors
REP	Regional Environmental Plan
RTA	NSW Roads and Traffic Authority
SEPP	State environmental planning policy made under the EP&A Act. A SEPP is proposed by the Minister for Planning and approved by the Governor. They address matters of state significance.
proposal	The proposed upgrade constitutes the proposal under Part 5 of the EP&A Act
threatened	As defined under the TSC Act, a species, population or ecological community that is likely to become extinct or is in immediate danger of extinction.
TSC Act	NSW Threatened Species Conservation Act 1995, an Act to conserve threatened species, populations and ecological communities of animals and plants.
vulnerable	As defined under the TSC Act, a species that is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

1 EXECUTIVE SUMMARY

1.1 Introduction

This review of environmental factors (REF) has been prepared by HLA-Envirosciences Pty Limited (HLA) on behalf of the Roads and Traffic Authority of New South Wales (RTA) to take into account matters affecting, or likely to affect, the environment as a result of the upgrade of the Pacific Highway from Failford Road to Tritton Road, approximately 17 km south of Taree and 112 km north of Newcastle (the 'proposal').

The proposal is part of the RTA's broader plans and strategy to upgrade the Pacific Highway to a high standard dual carriageway for its entire length, from Hexham to the Queensland border. The upgrade of this section of the highway would provide a connection between existing high quality dual carriageways and would result in increased safety and improved traffic conditions on the carriageway.

1.2 The proposal

The proposal considered by this REF includes the provision of a new northbound carriageway, intersection upgrades, an interchange at Failford Road, service roads and culvert crossings for local drainage lines.

For the purpose of the proposal, the RTA is both the proponent and determining authority under Part 5 of the *Environmental Planning and Assessment Act*, 1979 (EP&A Act).

The section of the highway between Failford Road and Tritton Road is currently dual carriageway. The current northbound carriageway was previously a two-lane section of the highway and the horizontal and vertical alignment is below current standard. It became the northbound carriageway when the southbound carriageway was constructed in the early 1990s.

The proposal includes the construction of a new carriageway adjacent to the existing southbound carriageway on the eastern side. The existing southbound lanes would become the new northbound lanes. Much of the existing northbound carriageway would become a two-way service road, linking Possum Brush Road, Bullocky Way, St Peters Close and local properties to the Failford Road interchange. This proposal would raise the standard of this section to be consistent with adjoining sections of the highway. The proposal has been designed to allow for potential staging during construction. The total estimated cost of the upgraded highway to the ultimate (stage 1 plus stage 2) is $46 million.

1.3 Zoning of the proposed activity

The proposal passes through land zoned under the *Greater Taree Local Environmental Plan 1995* (LEP 1995) and *Great Lakes Local Environmental Plan 1996* (LEP 1996). The development is permitted without development consent from either council.

1.4 Community and stakeholder consultation

The community and stakeholder consultation program for the proposal began in February 2005. Community information meetings, individual landowner meetings and a planning focus meeting were held throughout the consultation program. The concept design for the proposal was put on display between 10 February 2006 and 17 March 2006. Following the concept design display, 44 submissions were received. Submissions were received from the Department of Natural Resources, Forests NSW, Department of Primary Industries, Department of Environment and Conservation, Great Lakes Council, Blue Pacific Metal and 38 individuals. The issues raised in submissions covered the areas of planning and land use, concept design issues, safety, property impacts, noise, community health, flora and fauna, Aboriginal heritage, air quality and water quality.

1.5 Need for the proposal

The proposal is needed as part of the RTA's broader plans and strategy to upgrade the Pacific Highway between Hexham and the Queensland border to a high standard dual carriageway. The need to upgrade the section of the Pacific Highway between Failford Road and Tritton Road is based on a number of factors which include regional and coastal population growth, road safety and economic issues.

1.6 Environmental factors

The REF includes an assessment of a wide range of environmental issues including: landform, geology and soils; air quality; water quality and hydrology; noise and vibration; biodiversity; visual and landscape; heritage; socio-economic; waste; hazards and risks; and cumulative impacts. This assessment was supported by specialist studies to identify the potential impacts in several of the key environmental issues. Details of the environmental assessment is contained in Section 9 of the REF and the reports from the investigations have been appended to the REF.

1.7 Outcome and conclusion

The REF has identified that the proposal is justified in that it would provide benefits to the local community and the broader region and State. These benefits outweigh the likely impacts, particularly considering the further investigation and refinement and the inclusion of mitigation measures and environmental management procedures identified in the REF. With these safeguard measures put in place, the construction and operation of the upgrade to the Pacific Highway would not constitute a significant adverse environmental impact.

2 INTRODUCTION

This review of environmental factors (REF) has been prepared by HLA Envirosciences Pty Ltd (HLA) on behalf of the Roads and Traffic Authority of NSW (RTA) to take into account all matters affecting, or likely to affect, the environment as a result of the upgrade of the Pacific Highway from Failford Road to Tritton Road (the 'proposal').

This REF has been prepared to satisfy the requirements of Section 111 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act). This REF describes the proposal and the associated environmental impacts in the context of Clause 228 of the *Environmental Planning a*nd *Assessment Regulations*, 2000. The factors identified in Clause 228 have been addressed in Section 12 of this document.

2.1 Proposal identification

The proposal is for the upgrade of the Pacific Highway between Failford Road and Tritton Road, approximately 17 km south of Taree and 112 km north of Newcastle.

The proposal is located on the border of the Great Lakes and Greater Taree local government areas (LGAs). The eastern boundary of the Pacific Highway, south of the intersection with Possum Brush Road, forms the boundary between the two LGAs, with Great Lakes Council to the east and Greater Taree City Council to the north and west.

2.2 Background

The proposal forms part of the RTA's Pacific Highway Upgrade Program. The scope of the proposal was determined to ensure the standard of this section of the highway would be consistent with the standard of adjoining sections. The proposal includes the provision of an interchange at Failford Road, an overbridge at Bullocky Way, service roads and culvert crossings for local drainage lines.

The *Pacific Highway Upgrade Failford Road to Tritton Road Preliminary Environmental Investigation* was prepared in March 2005 by the RTA to identify environmental constraints and issues to be considered in the development of the proposal. The investigation identified the environmental constraints associated with the construction and operation of the proposal. It also made a number of recommendations for the development of the preferred option in order to minimise potential impacts associated with the constraints that were identified. The preparation of this REF has included a review of the investigation and, where relevant, has included the recommendations made in that document.

The preferred option was developed by the RTA based on consultation with the community, stakeholders and preliminary assessment of alternative route options, which were detailed in a number of other reports that have been prepared. These include the *Failford Road to Tritton Road Project Development Proposal* (May 2004), *Preliminary Route Option Feasibility Study* (March 2005) and the *Failford Road to Tritton Road Concept Design Report* (February 2006). This REF is based on the concept design displayed for public comment in February 2006 and shown in the *Failford Road to Tritton Road Concept Design Report* (February 2006).

This document assesses the potential impacts relating to this concept design and does not consider future variations or modifications. Should an alternative route or modification of the route proposed within the *Failford Road to Tritton Road Concept Design Report* (February 2006) be selected during detailed design, an additional assessment would be undertaken to determine impacts outside the scope of this REF. Alternative route options are addressed in **Section 7.2.1** of this REF.

2.3 The proponent

For the purpose of the proposal, the RTA is both the proponent and determining authority under Part 5 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act).

3 PROPOSAL DESCRIPTION

3.1 Location

The proposal extends for approximately 3.3 km along the Pacific Highway between Failford Road, Failford and Tritton Road, Possum Brush. The proposal is part of the Pacific Highway Upgrade Program undertaken by the RTA's Pacific Highway Office, and is on the border of the Great Lakes and Greater Taree local government areas (LGAs). The southern extremity of the proposal is at the intersection of Failford Road and St Peters Close with the Pacific Highway. The northern extremity of the proposal is approximately 400 m north of Possum Brush Road towards Tritton Road. This section of the highway is located approximately 17 km south of Taree and approximately 112 km north of Newcastle. **Figure 1** shows the location of the proposal site.

For the purpose of this report, the study area is defined as the area of land that extends the length of the route (approximately 3.3 km) and extends 100 m west and east of the northbound and southbound carriageways of the Pacific Highway and includes the median between the carriageways. The study area is shown in **Figure 2 a – 2c**.

3.2 General features

3.2.1 General description

The section of the highway between Failford Road and Tritton Road is currently a dual carriageway road with a wide variable width median and right turn lanes at intersections. This section of the highway was upgraded in the early 1990s, with the construction of a new southbound carriageway and conversion of the existing highway to the northbound carriageway carriageway. The northbound lane however has relatively small radius horizontal and vertical curves, which leads to slower speeds and higher potential for accidents.

The proposal consists of the construction of a new carriageway adjacent to and on the eastern side of the existing southbound Pacific Highway carriageway. The existing southbound carriageway would then become the northbound carriageway. Much of the existing northbound carriageway would be retained as a two-way local service road linking Possum Brush Road, Bullocky Way, St Peters Close and local properties to the Failford Road interchange. The proposed development would raise the standard of this section to be consistent with adjoining sections of the highway.

The proposed development would require removal of a strip of vegetation approximately 15 ha in area. This would include approximately 7.1 ha of vegetation to the east of the existing southbound carriage to construct the new southbound carriageway between Bullocky Way and Failford Road, and approximately 2.4 ha required to construct the proposed Failford Interchange. Approximately 5.1 ha of additional clearing would be required to connect Bullocky Way with the existing northbound carriageway (ie: the future service road).

The proposal would require property access adjustment to seven properties within the study area. Property acquisition of two properties within the study has already been undertaken by the RTA (Refer to **Section 8.10**).

The concept design has been prepared for the ultimate motorway class proposal, and it is this proposal that has been assessed in this REF. Construction may be staged, with some sections initially constructed to arterial standard. An arterial standard road is designed as a controlled access road and is developed with a strategy for conversion to motorway class in the future. Future conversion should not require changes to the alignment. A motorway class road is designed to a 110 km/h standard, and requires an alternative route to be available for local traffic through the provision of service roads or local arterial road networks. .

The proposed alignment would be designed for 110 km/h travel speed and would provide a high standard four-lane dual carriageway. The carriageways would be separated by a median of width varying between 12 and 17 m. If the highway is ever developed to a six-lane dual carriageway, then the additional northbound lane would be constructed on the western side of the carriageway and the additional southbound lane would be constructed in the median, leaving a median width of up to 13.5 m. **Figure 2a – 2c**.provides an aerial photograph overlain with the proposal alignment and indicative works.

The stages for the construction, as outlined in the concept plan, are discussed below.

3.2.2 Stage 1

The features of stage 1 of the proposal are described in Figure 2a and Figure 2b and include:

- A grade-separated interchange for the intersection of the Pacific Highway and Failford Road.
- The Failford Road interchange would comprise a northbound off-load ramp and southbound on-load / off-load ramps. The northbound onload ramp for the interchange would be via the service road and a north facing on-load ramp immediately north of Possum Brush Road.
- A two-way service road between the Failford Road interchange to Possum Brush Road utilising the majority of the existing northbound carriageway
- The designs for both the Failford Road interchange and the Bullocky Way overpass allow for extension of service roads to the north and south.
- Bullocky Way, Possum Brush Road and Tritton Road would not have direct access to the highway and the existing cross median accesses would be closed.
- Highway access from Possum Brush Road would be via the two-way service road and Failford Road interchange.
- Access for Tritton Road would be via Possum Brush Road and access for Bullocky Way would be via Failford Road and the interchange.

3.2.3 Stage 2

The features of stage 2 of the proposal are described in Figure 2a and Figure 2c and include:

- An adjustment and construction of an overpass at Bullocky Way would link Failford and Bullocky Way to the service road, providing a connection across the highway between Possum Brush and Failford.

A discussion on other alternative routes and options for the proposal is provided in **Section 7.2** of this REF.

3.3 Costs

The estimated cost of the upgraded highway along the preferred route for stage 1 is approximately $38 million ($2006). The estimated cost of the upgraded highway along the preferred route to stage 2 is an additional cost of approximately $8 million, resulting in a total project cost of $46 million ($2006).

3.4 Timing

The exact timing for commencement of construction of the proposal has not been determined, but preliminary works are anticipated to commence within the next three to four years. As detailed above, it is expected that the proposal would be undertaken in two stages.

The construction of the first stage of the proposal is expected to take approximately 2½ years given favourable conditions.

AA3

Source: Regional Street & Travel Directory 1st Edition Mid-North Coast and New England

REGIONAL SITE LOCATION

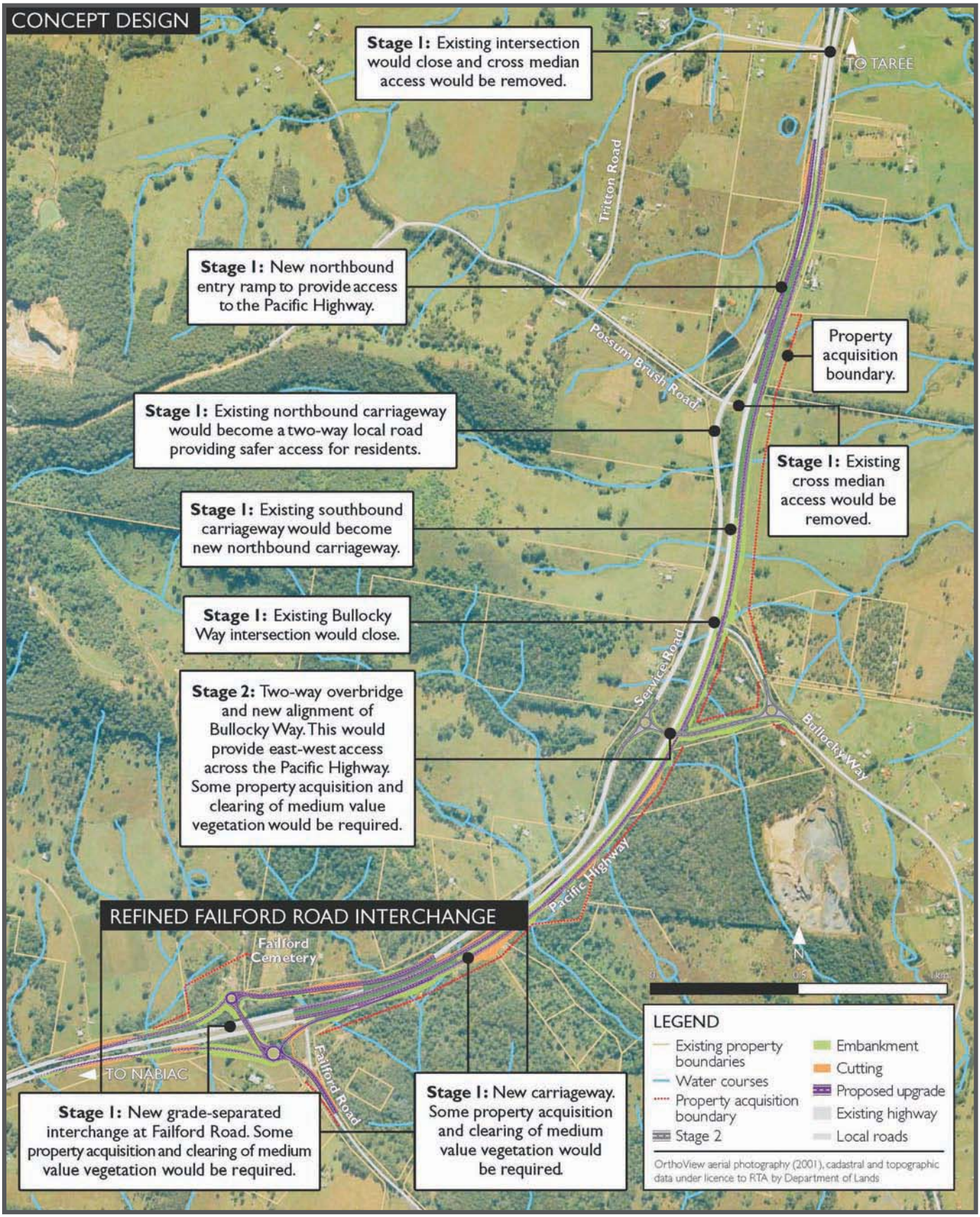
Roads & Traffic Authority

Review of Environmental Factors

Pacific Highway Upgrade, Failford Road to Tritton Road, Possum Brush, NSW

FIGURE

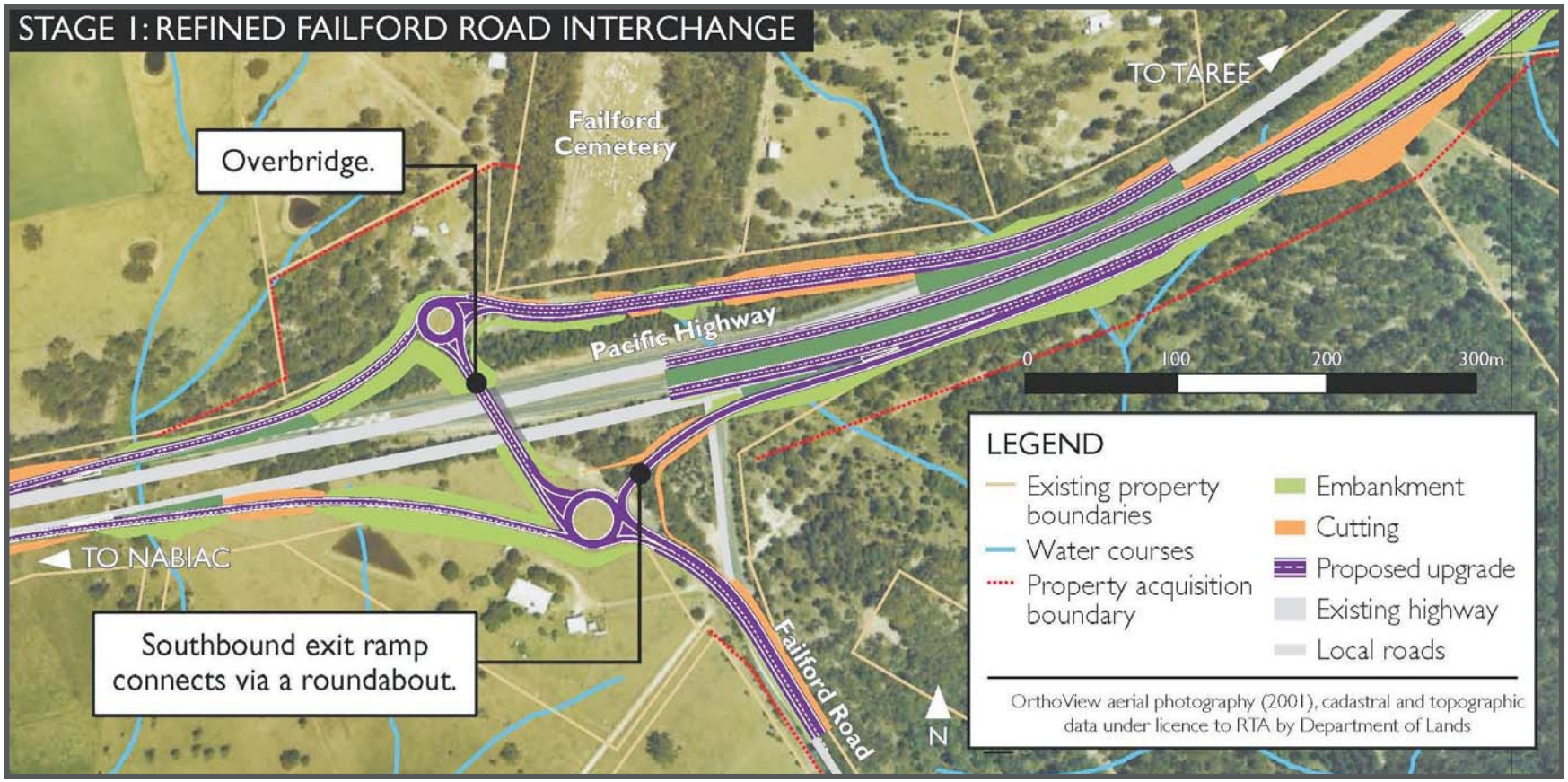
1



Proposed Concept Design
NSW Roads and Traffic Authority
Review of Environmental Factors
Pacific Highway Upgrade Failford Road to Tritton Road

FIGURE

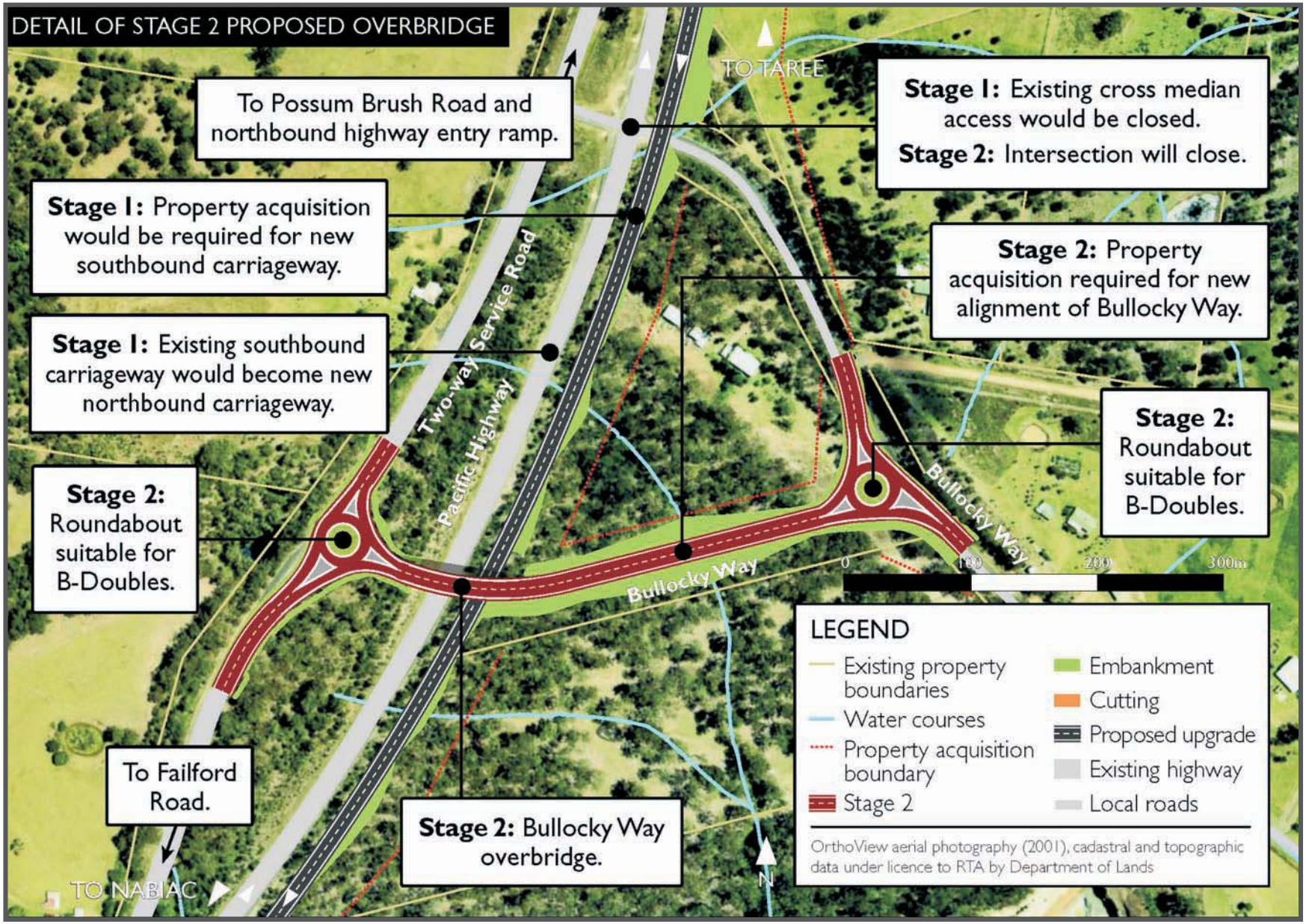
2a



Proposed Failford Road Interchange
NSW Roads and Traffic Authority
Review of Environmental Factors
Pacific Highway Upgrade Failford Road to Tritton Road

FIGURE
2b

Source: NSW Roads Traffic Authority (September 2007)



Proposed Bullocky Way Interchange
NSW Roads and Traffic Authority
Review of Environmental Factors
Pacific Highway Upgrade Failford Road to Tritton Road

FIGURE
2c

4 STATUTORY POSITION

4.1 Zoning of the proposed activity

4.1.1 Local Environmental Plan

The proposal is subject to two Local Environmental Plans, the *Greater Taree Local Environmental Plan 1995* (LEP 1995) and the *Great Lakes Local Environmental Plan 1996* (LEP 1996). The proposal passes through land zoned 1(a) Rural General and unzoned road reserve under the Greater Taree City Council LEP 1995 and 1(a) Rural, 1(d) Small Holdings and 7(b) Conservation under the Great Lakes Council LEP 1996.

Development for the purpose of roads is permissible with the consent of council in land zoned 1(a) Rural General under the Greater Taree City Council LEP 1995 and in 1(a) Rural and 7(b) Conservation zone in the Great Lakes Council LEP 1996. However development for the purposes of roads within land zoned 1(d) Small Holdings in the Great Lakes Council LEP 1996 is prohibited. A discussion on development consent requirements and the prohibition of development for the purposes of roads in land zoned 1(d) Small Holdings is provided below in **Section 4.1.**

Note: Greater Taree Local Plan 2005
Greater Taree City Council is currently reviewing its strategic plans and LEP. This review will lead to the development of the new "*Local Plan 2005*" which replaces the Greater Taree LEP 1995. This new plan is currently in draft form and has not yet been publicly exhibited or approved, therefore has not been consideration further during the preparation of this REF.

4.1.2 Savings provisions

Greater Taree City Council LEP 1995 does not specify requirements relating to the development of unzoned land, as clause 7 of Greater Taree City Council LEP 1995 states that the consent of council is not required for

> "*the carrying out of a development or activity specified in Schedule 3, not being a development or activity excluded in that Schedule"*.

Clause 7 of Schedule 3 states that:

> *"the carrying out of any development required in connection with the construction, reconstruction, improvement, maintenance or repair of any road, within an existing road reservation designated by an environmental planning instrument, except major widening, realignment or relocation of such road involving the use of land outside of an existing road reservation designated by an environmental planning instrument".*

Therefore for works within the unzoned road reserve the consent of council is not required.

Clause 15 of the Great Lakes Council LEP 1996 states that

> *"Nothing in this plan restricts, prohibits or requires development consent for:*
>
> *(a) the use of existing buildings under the control of the Crown by the Crown, or*
>
> *(b) any activity listed in Schedule 1.*"

Item 8 of Schedule 1 states:

> *"The carrying out by the Council or the Roads and Traffic Authority of any development required in connection with the construction, reconstruction, improvement, widening, realignment, relocation, maintenance or repair of any road"*.

Therefore works within zone 1(d) Small Holdings of the Great Lakes Council LEP 1996 are permissible without development consent.

4.2 Regional Environmental Plans (REPs)

Hunter REP 1989

The *Hunter Regional Environmental Plan 1989* (REP) applies to land within the Great Lakes and Greater Taree LGAs. The aims of this plan are:

(a) *to promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man made features and so as to meet the needs and aspirations of the community;*
(b) *to co-ordinate activities related to development in the region so there is optimum social and economic benefit to the community, and*
(c) *to continue a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the Department and other agencies.*

The REP deals with social, economic, settlement, access, natural resources and ecological issues, particularly as they relate to land for public and private purposes. It guides councils in the preparation of LEPs and the Department of Planning in the processing of LEPs. It guides public authorities and the private sector on the likely future needs of the region and the community on the way in which the effects of regional growth and development are to be managed. The background report to the REP provides information on regional issues, population and employment distribution, planning problems and opportunities and describes a preferred settlement strategy. Clause 7 of the REP specifies that where an activity is proposed to be carried out without the requirement for development consent, determining authorities, such as the RTA, should consider the content of the background report and the objectives, policies and principles contained in the REP that are relevant to the matter.

The REP and background report are now over 15 years old and the region has experienced many changes in this period, particularly with respect to transport and traffic volumes using roads such as the Pacific Highway. It is considered that the proposal would assist in ameliorating some of the long standing issues experienced on the Pacific Highway, which are highlighted in the REP background report, such as conflicts between local and long distance traffic, accidents and travel times.

4.3 State Environmental Planning Policies (SEPPs)

SEPP Infrastructure 2007

State Environmental Planning Policy (Infrastructure) aims to clearly define the environmental assessment and approval process for public infrastructure. Clause 94 of the SEPP provides that:

> *(clause) 94 Development permitted without consent—general*
> *(1) Development for the purpose of a road or road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land.*

The proposal is appropriately characterised as development for the purposes of a road. Accordingly, the provisions of SEPP (Infrastructure) apply to the proposal and the works within zone 1(a) Rural General under the Greater Taree City Council LEP 1995 and 1(a) Rural and 7(b) Conservation under the Great Lakes Council LEP 1996, which would otherwise require development consent, can be undertaken without development consent.

SEPP 14 – Coastal Wetlands

State Environmental Planning Policy 14 – Coastal Wetlands (SEPP 14) aims to ensure coastal wetlands are preserved and protected for environmental and economic reasons. This SEPP applies to the Great Lakes and Greater Taree LGAs. The SEPP identifies over 1300 wetlands of high natural value within the State and requires that land clearing, levee construction, drainage work or filling may only be carried out within these wetlands with the consent of the local council and the agreement of the Director-General of the Department of Planning. Such development also requires an environmental impact statement to be lodged with a development application.

There are no SEPP 14 Coastal Wetlands located in proximity to the site that have the potential to be impacted by the works as the nearest gazetted wetlands are located approximately 3.5km downstream of the proposed works. As a result, the provisions of SEPP 14 do not apply to the proposal. Section 9.3.1 of this REF details mitigation measures that relate to any areas of SEPP 14 wetlands.

SEPP No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) encourages the conservation and management of natural vegetation areas that provide habitat for koalas to ensure that permanent populations will be maintained over their present range. The Great Lakes and Greater Taree LGAs are listed in Schedule 1 of SEPP 44 as LGAs in which koalas are known to occur. While the requirements of the SEPP do not technically apply to the proposal, as it is not subject to Council consent, it is the RTA's practice to consider potential impacts on koalas in its environmental impact assessment process. Therefore an investigation of core koala habitat has been undertaken as part of the flora and fauna assessment for this REF and the findings are detailed in **Section 9.6**.

4.4 Confirmation of Part 5 position

Land subject to the proposal is either within the unzoned road reserve or zoned 1(a) Rural General under the Greater Taree City Council LEP 1995 and zoned either 1(a) Rural, 1(d) Small Holdings or 7(b) Conservation under the Great Lakes Council LEP 1996.

Development for the purpose of roads is permitted without development consent in the unzoned road reserve.

In zone 1(a) Rural General in the Greater Taree City Council LEP 1995, 1(a) Rural and 7(b) Conservation in the Great Lakes Council LEP 1996 development is permissible with consent. As the proposal is a road, the SEPP (Infrastructure) applies to the proposal and allows the development to be carried out without development consent.

In zone 1(d) Rural Holdings, development for the purposes of roads is prohibited, but savings provisions within the Great Lakes Council LEP 1996 apply and allow the development to be undertaken without development consent.

Therefore Part 5 of the EP&A Act applies and the RTA is the determining authority for the proposal.

4.5 Licences and approvals

Works carried out as part of the construction and operation of the proposal must comply with relevant provisions of legislation and regulations. Approvals that may be required are:

- Preliminary Research Permit (section 87) and a Consent to Destroy Permit (section 90) if there is potential impact upon archaeological materials - *National Parks and Wildlife Act 1974*.
- Section 139 permit - *Heritage Act 1977*.
- Permit required under Section 219 if fish passage would be blocked, notification under section 199 is required to be given to the Minister for dredging or reclamation works - *Fisheries Management Act 1994.*
- Licence to extract water and to divert water courses, construct sediment basins - *Water Management Act, 2000*.
- The RTA is exempt from the requirement for a Part 3A permit, but contractors may be required to obtain a permit for works within 40 m of protected waters -*Rivers and Foreshores Improvement Act, 1948*.
- Licence for the keeping of certain chemicals (as notified by the DECC) *Environmentally Hazardous Chemicals Act, 1985*.
- Licences required for generating or storing certain hazardous wastes - *Waste Avoidance and Resource Recovery Act 2001*.

4.6 Commonwealth approvals

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires approval from the Commonwealth Minister for the Environment and Water Resources for actions which will or are likely to result in significant impacts on:

- Matters of national environmental significance, or
- Commonwealth land (or generally where the action is being undertaken on Commonwealth land).

The proposal would not be constructed on Commonwealth land nor will it have a significant environmental impact on Commonwealth land. Also the proposal would not impact any matters of national environmental significance. Therefore a referral to the Department of Environment and Water Resources (DEWR) under the EPBC Act is not required for the proposal.

5 STRATEGIC STAGE

5.1 Planning and environment background

5.1.1 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 and the proposed upgrade 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 ESD principles, and assisting in promoting economic growth and development.

5.1.2 Draft Sydney to Brisbane Transport Corridor Strategy (2007)

A key component of the AusLink process was the development of a strategy for each corridor of the AusLink National Network. The Sydney to Brisbane Transport Corridor Strategy is a statement of the shared strategic priorities of the Australian, NSW and Queensland Governments for the long-term (to 2030) development of the corridor. The strategy provides guidance to the NSW Government in formulating network initiatives, and informs development of the next and subsequent National Land Transport Plans, including the AusLink investment program. The Sydney-Brisbane Corridor Strategy has been jointly developed by the Australian Government Department of Transport and Regional Services (DOTARS) and relevant NSW and Queensland Government departments. The strategy builds on planning work already undertaken by the New South Wales and Queensland governments.

Within the Sydney – Brisbane corridor there are three major transport routes: a 940km rail route; and two road links, an 940km inland route; and an 890km coastal route. The corridor links the largest and currently third largest cities in Australia, carrying passenger, tourist and commercial freight traffic between Sydney, Brisbane and several major regional centres. Forty per cent of Australia's population lives along the corridor.

The Sydney – Brisbane corridor is experiencing significant population growth along the coastal route, especially the NSW Central Coast, NSW North Coast and South East Queensland. This population growth is expected to generate high levels of growth in local and regional passenger and freight movements, in addition to growth of freight traffic between Sydney and Brisbane.

The Pacific Highway forms part of the coastal route within the corridor and plays a vital role in linking local coastal regions with larger regional centres and the cities of Sydney and Brisbane.

5.1.3 Pacific Highway Safety Review, May 2004

In October 2003, following an increase in fatal crashes, the Minister for Roads instigated a review of road safety on the Pacific Highway between Hexham and the Queensland border. Experts in the areas of road safety, traffic management and road design undertook the review. The report reviewed the circumstances surrounding the fatal crashes that had occurred on the highway and identified some of the key safety issues. The main issues identified were heavy vehicles travelling too fast and the speed limits on the highway. The identification of these issues resulted in the development of a road safety strategy for the highway. The vision for the strategy is:

> *"a significant reduction in trauma, both injury and death, caused by road crashes on the Pacific Highway"*.

The vision is underpinned by six goals for the highway:

- Continue the upgrading of the highway to high standard dual carriageway from Hexham to the Queensland border.
- Facilitate safer operation of two-way single carriageway sections.
- Manage and enforce speed limits.
- Address long distance driver fatigue in both heavy and light vehicles.
- Respond to the road safety impacts of increased usage by heavy vehicles.
- Minimise the adverse impacts of traffic incidents.

Underpinning these goals are the following programs:

- **The Pacific Highway Upgrade Program** is part of the plan to meet the vision of the road safety strategy. The proposal for the upgrade between Failford Road and Tritton Road is part of the program to upgrade the highway to high standard dual carriageway, and is therefore part of the RTA's strategic plan to improve safety on the Pacific Highway in accordance with the recommendations made in the Pacific Highway Safety Review.
- **An Enhanced Road Safety Engineering Works Program** to address issues such as poor alignment; potential for head-on crashes; poor shoulders and roadside hazards; intersections and rest facilities.
- **A Behavioural Program** to address issues such as speeding and fatigued driving.
- **An Enforcement Program** to address speeding and compliance with transport regulations by both heavy and light vehicle drivers.
- **A Technology Program** including development of point to point speed camera technology using fixed digital speed cameras as well as the Safe-T-Cam system; and installation of variable message signs.

5.1.4 Draft Mid North Coast Regional Strategy (2006-31)

The primary purpose of the *Draft Mid North Coast Regional Strategy 2006-31* (Department of Planning 2006a) is to ensure that adequate land is available and appropriately located to accommodate the projected housing and employment needs of the Mid North Coast region's population over the subject 25 year period. The draft strategy puts some limitations on growth in areas where the value of environmental/cultural assets and natural resources is high.

The draft strategy incorporates the specific regional infrastructure requirements identified in the *State Infrastructure Strategy –New South Wales 2006-07 to 2015-16* (NSW Treasury 2006).

The proposed upgrade would complement the draft strategy by providing road transport infrastructure through the Greater Taree / Great Lakes region, connecting the local coastal areas to the major regional centres of Taree and Port Macquarie, presenting opportunities for employment growth. The Failford Road to Tritton Road Pacific Highway upgrade is listed in Appendix 3 of the draft strategy as being a project in the Mid North Coast Regional Strategy area under the *State Infrastructure Strategy – New South Wales 2006–07 to 2015–16* (NSW Treasury 2006).

5.2 Need for the proposal

The proposal is needed as part of the RTA's broader plans and strategy to upgrade the Pacific Highway to a high standard dual carriageway for its entire length, from Hexham to the Queensland border.

The need to upgrade the section of the Pacific Highway between Failford Road and Tritton Road is based on a number of factors which include regional and coastal population growth, road safety and economic issues. These are discussed in the sections below.

5.2.1 Population growth

Sustained growth in the Hunter and Mid North Coast Region and the coastal areas of NSW on the whole, and forecasts for continued growth in the region, have resulted in an increased pressure on the road transport system. Improvements in road infrastructure are required for safe and efficient transport up and down the coast in order to accommodate growth trends.

The proposal is also needed to ensure that the expected traffic growth on the highway would not increasingly expose the deficiencies of the existing road. In the long term, the proposal would result in increased safety and improved traffic conditions on this section of the Pacific Highway.

5.2.2 Road safety issues

The existing northbound carriageway of this section comprises relatively small radius horizontal and vertical curves which require a lower travel speed and have a higher potential for accidents. Road safety issues are also evident in the high number of recorded accidents in this section of the highway; 86 were recorded between 1999 and 2004 and, of these, three resulted in fatalities.

The upgrade of this section of the highway would provide a connection between existing high quality dual carriageways. The Failford Road to Tritton Road upgrade is needed to ensure that the standard of carriageway in this section of the Pacific Highway will be consistent with the standard of adjoining sections of the highway. This consistency should reduce the rate of road accidents and injuries associated with this section of the Pacific Highway.

5.2.3 Economic issues

A high standard, reliable road network which links large regional and metropolitan centres and small towns is necessary to provide improved access to markets and sources of goods and services. Transport cost is often a major component of production cost; therefore road improvements would have a direct and positive effect on economic efficiency.

6 COMMUNITY AND STAKEHOLDER INVOLVEMENT

6.1 Community and stakeholder involvement

The RTA began a community consultation program for the proposal in February 2005. This involved the distribution of a community update flyer that contained a brief description of the project, contact information and a dedicated 1800 phone number for any questions.

Advertisements were placed in local papers inviting members of the community to a community information session (CIS) to discuss the project. The CIS was held on 17 February 2005 and a community liaison group (CLG) was formed. The CLG was made aware that the aims for developing the group were to:

- Create a forum for discussion and exchange of information on topics related to the development phase of the project.
- Assist the project team to identify local issues related to the project that will be addressed into the development phase of the project.
- Act as a two-way communication link between the project team and the community and stakeholders.

The role of the CLG is to:

- Represent the broad range of local community and stakeholder interests.
- Identify and communicate community and stakeholder concerns about the project.
- Disseminate information on the project to the local community.
- Consider the range of community views, interests and issues related to the detailed design and construction of the project.

The initial CLG meeting was held on 14 April 2005 and the group was shown three alternatives being investigated by the RTA. The CLG was asked to comment on these alternatives. The main concerns raised by representatives at the CLG were:

- Restriction of access to St Peters Close.
- Requirement to close the right turn movement out of Bullocky Way.
- The need to develop a safe access to the highway from Failford Road.
- The need to develop safe access to the landowners with direct access to the highway.

Another meeting was held with the CLG on the 9th June 2005. This provided an update of the project and a workshop was also undertaken. Issues identified in the workshop included:

- Retaining existing northbound section of the highway as a service road.
- Suggestion of a grade separated intersection at the Failford Road intersection.
- Suggestion of a bridge over the highway at Bullocky Way.
- Suggestion of a southbound off ramp to Bullocky Way.

- Access issue to the properties.
- Noise impacts to properties was discussed.
- Preference to maintain access from Bullocky Way to Possum Brush Road.
- Suggestion to having northbound access from Failford Road and Bullocky Way, and access to the highway north of Possum Brush Road.

Individual meetings were held with the owners of a number of properties, the Lot and Deposited Plan (DP) numbers of which are listed in **Appendix D**. Comments from these meetings were an input to the development and refinement of the design and were a key factor in the decision to adopt the eastern alignment. Submissions on the preferred design were received during the public display period.

Throughout the process of selecting a preferred option and developing a preliminary concept design, the project team consulted with potentially affected landholders and other stakeholders with an interest in the proposal. The comments, requests, ideas and information gained from this consultation had significant influence on the selection of the preferred option and the preliminary concept design of the proposal.

Interviews with landholders were carried out in July 2005 and August 2005. The majority of these interviews involved a site visit by members of the project team and discussions with the landholder at each property. The project team also met with any additional stakeholders as needed when requests were received.

Issues raised at these landholder interviews covered the areas of:

- Road safety on the Pacific Highway.
- Concern about property acquisition.
- Safety concerns regarding existing at-grade accesses to the northbound carriageway.
- Potential noise impacts of the upgrade.
- Potential visual impacts of the upgrade.
- Construction impacts such as noise, vibration and air quality.
- Road safety on the local road network.
- Access between the Pacific Highway and the local road network.
- Impact on businesses in the area.

Issues raised in landholder interviews were a significant factor in selection of the preferred option 3 (eastern) route over the option 2 (central) route. Issues were primarily centred on access to properties, land acquisition needs and impacts from noise and amenity of the properties.

Interchange and overbridge locations and configurations were revised a number of times in response to issues raised by the community in landholder interviews. The final preferred configuration of interchanges and overbridges addresses all major issues uncovered via landholder interviews and the other community consultation methods employed by the project team, such as CLG meetings discussed above.

The public exhibition of the concept design was publicised in the following ways:

- Advertisements in The Great Lakes Advocate on 15 and 22 February 2006.
- Advertisements in the Manning River Times on 15 and 17 February 2006.
- Advertisements in the Manning Great Lakes Extra on 16 and 23 February 2006.
- A letter box drop of a community update on 10 February 2006.
- The concept design was displayed on the RTA website from 10 February 2006.

The concept design for the proposal was put on public display between 10 February 2006 and 17 March 2006 at the following locations:

- Nabiac Old Bank Centre.
- Greater Taree Council.
- Great Lakes Council..
- Forster RTA Motor Registry.
- Taree RTA Motor Registry.
- RTA Hunter Regional Office.
- RTA Pacific Highway Office.

In addition, RTA Project staff were in attendance at the following locations to discuss the concept design in more detail:

- Nabiac Old Bank Centre (21 February 2006);
- Forster RTA Motor Registry (22 February 2006); and
- Taree RTA Motor Registry (22 February 2006).

Forty-four submissions were received following the concept design display. Submissions were received from:

- Department of Natural Resources.
- Forests NSW.
- Department of Primary Industries.
- Department of Environment and Conservation.
- Great Lakes Council;
- Pacific Blue Metal.
- Thirty-eight individuals.

The issues raised in submissions covered the areas of:

- **Planning and land use**: including load limits to access roads, highway access, impact to businesses and installation of median strips restricting current access.
- **Concept design issues:** including projects costs, issues with Bullocky way intersection, exit ramps, overbridge design and locations and potential for use of roundabouts.

- **Safety**: speed limits, local traffic access, signage and emergency services access.
- **Property impacts**: Impacts on property values.
- **Noise:** vegetation clearance increase noise.
- **Community health:** increase in fumes and air pollution.
- **Flora and fauna**: impact to fish habitat.
- **Aboriginal heritage**.
- **Air quality**.
- **Water quality**.

The submissions made during the pubic exhibition of the concept design resulted in an extensive modification to the Failford Road interchange design and the decision to close Bullocky Way as part of stage 1 of the proposal. The *Concept Design Submissions Report* is included as **Appendix H** to this REF.

Additional consultation and landholder interviews were held during and following the concept design display held in February and March 2006. The feedback from these interviews was an important factor into further development of the concept design.

Additional CLG meetings will be held during the detailed design stages of the proposal and all concerns raised during these meetings would be considered where relevant.

6.2 Planning focus meeting

A planning focus meeting (PFM) involving representatives from government agencies and other stakeholders was held on 17 February 2005. Its purpose was to inform these stakeholders about the proposal and to provide an opportunity for the representatives to advise on the requirements of each agency.

Nineteen people, including representatives from the RTA, attended the PFM. Eleven representatives sent their apologies, with some sending alternative representatives in their place. Others had provided preliminary issues for inclusion in the planning process. All those who declined the invitation were offered the opportunity to be kept informed through minutes of the meeting and further information as it became available. Representatives from the following organisations attended the PFM:

- Port Macquarie - Hastings Council.
- Great Lakes Council.
- Greater Taree City Council.
- DIPNR (now the Department of Planning).
- NSW State Forests.
- Country Energy.
- Rural Fire Service.

Representatives from the following organisations were invited to attend, but declined:

- Department of Environment and Climate Change (DECC).
- Department of Primary Industries (DPI).

- Department of Education.

Representatives from the following organisations submitted comments rather than attending:

- DECC.
- NSW Fisheries.

Feedback from the members of the community, stakeholders and government agencies was used to develop and finalise the preferred route for the proposal and to select the option which was considered to best satisfy the objectives of the proposal and the needs of the stakeholders and the RTA.

6.3 Further consultation

The REF and refined concept design will be placed on public display to allow the community to provide comment on the proposal. Submissions received during this exhibition period would then be considered by the RTA prior to the proposal being considered for approval.

7 CONCEPT STAGE

7.1 Objectives

The proposal would comprise part of the Pacific Highway Upgrade Program and would be undertaken in order to achieve the objectives of this program, which are:

- Significantly reduced road accidents and injuries.
- Reduced travel times.
- Reduced freight transport costs.
- A community satisfied with physical development of the route.
- A route that supports economic development.
- Reconstruction of the route managed in accordance with Ecologically Sustainable Development principles.
- Maximum effectiveness of expenditure.

The specific objectives for the undertaking of the proposal are to:

- Develop a dual carriageway road with potential to reduce crash rates to 15 crashes per 100 million vehicle kilometres (MVK) over the proposal length.
- Develop a concept design that meets or exceeds B-Double requirements, including at intersections, where required.
- Maximise the use of the existing road reserve, where possible.
- Satisfy the technical and procedural requirements of the RTA with respect to design of the project.
- Allow for all connections, modifications and improvements necessary to upgrade the existing highway where it is retained as part of the project.
- Consider delay management strategies to minimise disruption to local and through traffic and maintain access to affected properties and land during construction.
- Provide flood immunity on at least one carriageway for a 1:100 year flood event with a minimum of at least a 1:20 year flood event.
- Provide intersections designed to provide at least Level of Service C[1] twenty years after opening for the 100th highest hourly volume.
- Develop solutions that address community expectations for the access to the new highway.
- Retain or replace existing rest areas within the study area.
- Develop a concept design generally meeting the criteria for a 100 km/h design speed for the vertical alignment and a 110 km/h design speed for the horizontal alignment.

[1] Level of Service C means a stable flow with drivers restricted to select desired speed and ability to manoeuvre (RoadNet, 2005).

- Ensure the proposal outcomes achieve value for money.
- Provide a strategy for future upgrades to be easily integrated into the proposal from both engineering and environmental perspectives.
- Minimise direct access to the highway in the motorway class state by the provision of service roads.
- Maximise the use of the existing road pavement.

7.2 Options

The development of the route for this proposal involved two levels of investigation. The first investigation was to determine where the highway would be located in relation to the existing southbound carriageway and considered the arterial standard and staging options as well as ultimate development of a motorway class road. The second level of investigation was to determine the appropriate interchange configuration and final connectivity for non-through highway use. The *Concept Design Report* (RTA, 2005b) provides further details on the different options and their development. A copy of the *Concept Design Report* (RTA, 2005b) is available on the RTA's project website. The options considered were all based on retaining the existing southbound carriageway as either the southbound or new northbound carriageway.

7.2.1 Alternative route options

Three alternative route options were considered for the proposal. All options involve providing one new through carriageway and retention of the existing southbound carriageway to accommodate either northbound or southbound traffic. The route options development process involved the consideration of a variety of factors, including effects on the environment, traffic requirements, engineering constraints and community expectations.

Option 1 (western option)
Option 1 (western option) would involve the retention of the existing dual lane northbound carriageway and reconstructing the sub-standard horizontal and vertical alignment where necessary. The current northbound carriageway is part of the previous two-way highway, which was converted to the dual carriageway northbound lanes in the early 1990s. The advantages of this option were:

- It provides improved safety for road users when compared to the "do nothing" option.
- It provides improved travel conditions when compared to the "do nothing" option.

The disadvantages of this option were considered to be:

- That 85% (approximately 2,460 m) of the existing northbound carriageway would require reconstruction in highway pavement to bring it up to the design speed for the through highway.
- The properties on the west side of the carriageway would still have an undesirable direct access to the highway.
- The provision of a future service road (approximately 2,100 m) to the properties on the western boundary would require excision of a strip of land from all properties to the west of the highway.
- The provision of a future third lane in the median area would be difficult and expensive to achieve due to split-level carriageways.

- There would be impacts on identified wildlife corridors as a result of clearing of vegetation required at cuttings 0.5 km and 1.4 km north of Failford Road and immediately south of Possum Brush Road.
- It directly affects eight properties, including direct impact on two houses on the west and one property to the east through property acquisitions and access.
- The construction may need to be undertaken under traffic or with the existing southbound carriageway closed down to one lane in each direction.

Option 2 (central option)

Option 2 (central option) would involve the construction of a new northbound carriageway parallel to the existing southbound carriageway, separated by a 12 m median. The advantages of this option were considered to be:

- That 55% of the existing northbound carriageway could be retained for use as a local service road, although some lengths (approximately 1,650 m) would need reconstruction.
- The new carriageway would be constructed adjacent to the existing traffic.
- It utilises much of the existing road corridor.
- It provides improved safety for road users when compared to the "do nothing" option.
- It provides improved travel conditions when compared to the "do nothing" option.

The disadvantages were considered to be:

- Elimination of direct access to the highway from properties on the west side of the carriageway.
- Future third lanes could be constructed in the median but would require regrading of parts of the existing northbound carriageway/service road and possible minor walling.
- Impact on identified potential wildlife corridors, as the existing median vegetation 0.5 km north of Failford Road would be removed and vegetation at 1.4 km north of Failford Road would be reduced.
- It directly affects seven properties on the west and one property on the east.

Option 3 (eastern option)

Option 3 (eastern option) would involve the construction of a new southbound carriageway to the east of, and parallel to, the existing southbound carriageway, separated by a 12 m median. The existing southbound carriageway would then become the northbound carriageway. The advantages of this option were considered to be:

- That 90% of the existing northbound carriageway could be retained for use as a local service road. The length that would need reconstruction is an old section of the highway which is common to all options in needing reconstruction (approximately 350 m).
- This option has a reduced negative impact on identified wildlife corridors compared to other options with a higher proportion of the vegetation previously modified. It has minimal impact on existing vegetation in properties adjoining the existing northbound carriageway. The existing median vegetation at 0.5 km and 1.4 km north of Failford Road and immediately south of Possum Brush Road would be retained.

- It provides improved safety for road users when compared to the “do nothing” option.
- It provides improved travel conditions when compared to the “do nothing” option.

The disadvantages of this option were considered to be:

- Crossovers would need to be constructed at either end of the new carriageway.
- Property acquisitions would be required on the eastern side.
- It does not fully utilise the existing road reserve.
- It directly affects one property on the west and eight properties, including direct impact on one house, on the east.
- It has increased impact on undeveloped properties and undisturbed vegetation on the eastern side.

7.2.2 Alternative level of access options

Based on the three alternative route options described above, different options were also considered relating to the level of access to the highway. Interchange options to suit both stage 1 and stage 2 were investigated. Interchange options to suit the motorway class road and also complement an arterial standard proposal were investigated.

All options include:

- A service road between the Failford Road interchange and Possum Brush Road. (except for Option A, as it was not part of the design brief for the proposal for which it was designed).
- Tritton Road closed off from the highway with access provided via Possum Brush Road.
- Failford Cemetery avoided.
- Land acquisition required.

The options considered were:

- Option A (“M1”) was previously prepared as part of the adjoining Bundacree Creek to Possum Brush project, however this option did not meet the requirements of the Pacific Highway Upgrade Program. This option was developed to asses the Bullocky Way and Possum Brush Road. It was not considered suitable for further development.
- Option B (“M2”) is based on Option 2 (central option) and would involve the construction of two half interchanges connected to the west with a bi-directional service road. The south-facing interchange would be located 200 m south of Failford Road and the north-facing interchange would be located midway between Bullocky Way and Possum Brush Road.
- Option C (“M3”) is based on Option 2 (central option) and would involve an interchange at Failford Road with ramps facing all directions.
- Option D (“M4”) is based on Option 2 (central option) and would involve an interchange at Failford Road with the north-facing ramp via the service road.

- Option E ("M5") is based on Option 2 (central option) and would involve an interchange at Failford Road and an overpass midway between Bullocky Way and Possum Brush Road.
- Option F ("M version 2") is based on Option 2 (central option) and would involve an interchange at Failford Road and an overpass at Possum Brush Road.
- Option G is based on Option 2 (central option) and would involve an interchange at Failford Road and an overpass at Bullocky Way.
- Option H is based on Option 3 (eastern option) and would involve an interchange at Failford Road and an overpass 350 m south of Bullocky Way. Option H was developed on Option 3, after a review of Options A to G revealed the advantages of Option 2 had diminished when combined with the development of satisfactory motorway class features such as interchanges and overpasses.

7.2.3 The "do nothing" option

The "do nothing" option would maintain the existing situation and would not involve any upgrading works. If the proposal is not undertaken it would result in deteriorating traffic and safety conditions on the existing carriageway of this section of the Pacific Highway. In particular, the following aspects would be likely to occur:

- The existing accident rate would increase with increasing traffic volumes.
- Increasing traffic volumes would result in the gradual increase in travel time for the route over the forecast period, particularly in holiday periods.
- Worsening road and traffic conditions with greater potential for intersection delays and a consequent deterioration in road safety and property accessibility.
- A general decline in the highway's level of service.

7.2.4 The preferred option

Option 3 (eastern option) for the through highway, presented as Option H in **Section 4** above, was considered the preferred option to address the project objectives and satisfy the community expectations. This option was considered to have a number of advantages over the other options. It should provide a lower accident rate than Option 1 (western option) due to no direct access to the highway from adjoining properties and fewer curves to negotiate. It would also maximise the use of the existing road carriageway asset as it would leave 90% of the existing northbound carriage pavement unaffected and able to be used as an alternative route service road. The other through highway options would require up to 85% (Option 1, western option) and 45% (Option 2, central option) of the existing carriageway to be reconstructed. When the motorway class options were developed, the amount of existing carriageway that would need reconstructing increased by up to 95%. As well as building a new carriageway, the service road would need to be reconstructed for the majority of the route.

The preferred option would require a similar amount of vegetation to be removed as the other alternatives. Much of the area of vegetation to be removed is in a strip of land to the east of and parallel to the highway. Approximately 50% of this strip of land has been affected recently by the laying of a sewer main, or is in a cleared residential property. Most of the vegetation to the west of the existing northbound carriageway would be maintained in the preferred option, while much of this vegetation would require removal in the other options and potentially impact on fauna corridors.

The preferred option would require similar amounts of land to be acquired as for the other options. However, the land to be acquired is generally undeveloped. Option H is also expected to have the least impact on traffic during the construction phase, as the majority of the southbound carriageway can be built without interrupting traffic flow. Some work would be required in the median in order to realign the northbound carriageway traffic to the old southbound carriageway. Compared to the other options, Option H would also be easier to construct and would have a lower cost.

Option H would also be easily adaptable to a 6-lane road if required in the future. The proposed carriageways would be positioned so the drainage infrastructure would also suit a future 6-lane upgrade. Other options are more constrained for any future widening.

The other routes have constraints by either having to fit between the existing carriageways (Option 2 central option) or fit between the existing southbound carriageway and developed properties with provision of a service road (Option 1 western option). By locating the alignment to the east of the existing southbound carriageway, as in the preferred option, there is only a restriction on one side. Therefore the carriageways can be independently graded, resulting in a reduction in fill required on the through road and an increase in the amount of fill material which could be won on site, reducing the amount of earthworks required for this option.

The majority of property owners live on the western side of the highway. Therefore the preferred option would have the least effect on residents. The preferred option was developed in consultation with landowners and the potential impacts on properties were discussed with owners. This option would impact on two properties, one of which is located in St Peters Close and is currently used as a transport office and residence. This property would be affected by the construction of the Failford Road interchange. The other house requiring acquisition has direct access to the southbound carriageway and is on residual land from previous road works. Both properties have been acquired by the RTA.

8 DESIGN CONSIDERATIONS

This REF is based on the concept design developed for the proposal. If the proposal is approved, detailed design would further develop all aspects of the concept design as outlined in this REF. The detailed design phase of the project would involve:

- Further detailed survey and geotechnical investigations and may include further environmental investigations.
- Incorporating any necessary mitigation measures identified during the further investigations.
- Refinement of the alignment of the proposal within the road corridor.
- Negotiations with affected landholders with regard to property access adjustments and acquisitions (refer to **Section 8.11**).

It is possible that the detailed design may vary from the description provided in this section provided the design remains consistent with the limits of any conditions imposed and the design constraints, principles and standards detailed in this section.

8.1 Design considerations for potential staging options

As previously discussed in **Section 7.2** of this REF there is the potential to stage the construction of the proposal. The design considerations of the two stages investigated as part of this REF are:

8.1.1 Stage 1

The features of stage 1 of the proposal are shown in Figures 2a and 2b.

A grade separated interchange would be provided for the intersection of the Pacific Highway and Failford Road, located approximately 250 m south of the current intersection. A two-way service road would be provided from the Failford Road interchange to Possum Brush Road utilising the majority of the existing northbound carriageway corridor. Access to the north from the Failford Road interchange would be via the service road and a north-facing on-load ramp immediately north of Possum Brush Road. The designs for both the Failford Road interchange and the Bullocky Way overpass allow for extension of service roads to the north and south.

Bullocky Way, Possum Brush Road and Tritton Road would not have direct access to the highway and the existing cross median accesses would be closed. Highway access from Possum Brush Road would be via the two-way service road and Failford Road interchange, access for Tritton Road would be via Possum Brush Road and access for Bullocky Way would be via Failford Road and the interchange.

8.1.2 Stage 2

The features of stage 2 of the proposal are shown in Figure 2a and 2c. The Bullocky Way overbridge would be built to link Failford and Bullocky Way to the service road, providing a connection across the highway between Possum Brush and Failford. The overbridge would include two roundabouts suitable for B-doubles.

8.2 Existing road

The section of the highway between Failford Road and Tritton Road is currently a dual carriageway with a wide variable width median and right turn lanes at intersections. This section was improved to dual carriageway in the early 1990s by the construction of a southbound carriageway and utilising the existing two-way two lane section of the highway as the northbound carriageway. The southbound carriageway is suitable for high speed travel, but the existing northbound carriageway comprises relatively small radius horizontal and vertical curves which require a lower travel speed and have a higher potential for accidents (RTA, 2005 b).

To the south of this section is the recently upgraded section of highway within the Bundacree Creek to Possum Brush project. This upgrade involved the construction of two new carriageways with two lanes in either direction with a 16 m landscaped central median. This design has a 110 km/h design speed but will be posted at 100 km/h until at-grade accesses are removed. To the north, the highway is a dual carriageway road built in the 1990s. This section of road extends north past Taree/Cundletown and has a posted speed of 110 km/h. The subject section would be one of the few remaining sections between Port Macquarie and Sydney that does not meet the motorway standard.

The existing speed limits between Failford Road and Tritton Road vary, as detailed in **Table 1** below.

Table 1: Existing speed limits

Section of highway	Carriageway	Existing limit (km/h)
South of Failford Road	North and south	100
1 km south of Possum Brush Road	North	90
500 m north of Possum Brush Road and north	North	110
North of Possum Brush Road	South	110
South of Possum Brush Road	South	100

The characteristics of the existing section of the Pacific Highway are detailed in **Table 2** below.

Table 2: Existing highway characteristics

Item	Details
Number of lanes	2 northbound, 2 southbound
Lane width	3.5 m
Median details	Variable to 70 m
Width of shoulder	Left: 2 – 3 m, Right: 0.5 – 1.2 m
Drainage	17 transverse drainage lines
Bridges	None
Pavement condition	Both carriageways are currently good

8.3 Existing and forecast traffic

A traffic study was undertaken for the proposal and the findings of that study have been summarised in this section. A copy of the traffic study is provided in **Appendix E**.

8.3.1 Existing traffic

In 2004, the Pacific Highway near Failford Road had an Average Annual Daily Traffic (AADT) volume of approximately 14,000 vehicles.

The most heavily trafficked local road in the area of the proposal is Failford Road which connects the highway to the coastal towns of Tuncurry, Forster and Black Head. Failford Road had an AADT in 2001 of 3,200 vehicles per day (RTA, 2005b).

Bullocky Way has relatively low traffic volumes which are assessed to be 800 vehicles per day (RTA, 2005b). An origin and destination study undertaken by the RTA (RTA, 2005b) reveals that 60% of these vehicles are through traffic using Bullocky Way as the route north rather than Failford Road. Possum Brush Road has light traffic use but volumes are expected to grow as a result of planned subdivisions. Tritton Road is a small loop road through a small hobby farm type community, connecting the highway to Possum Brush Road, and carries minimal traffic.

8.3.2 Traffic peaks

The section of the highway between Failford Road and Tritton Road has no clear morning and afternoon peaks as such but, rather, has its highest volumes occurring consistently throughout the day from 10 am to 5 pm. The weekly traffic peaks on Friday and Sunday, which coincides with the increase in population of the coastal towns over the weekends (RTA, 2005b).

The holiday periods at Easter and Christmas result in the largest traffic volumes of the year. The average daily traffic volume on the Pacific Highway over the three weeks before and after the new year is 30% higher than the AADT. The peak day of the year is generally twice the normal AADT. Peaks also occur during the April and September school holiday periods (RTA, 2005b).

8.3.3 Vehicle types

Heavy vehicles generally account for 20 to 25% of total traffic on the highway within this section (RoadNet, 2005).

8.3.4 Forecast traffic volumes

Projected AADT volumes were extrapolated from traffic counting stations at 80m north of Tritton Road and 300m south of Failford Road. **Table 3 and 4** shows the projected AADT calculated by Roadnet (2005).

Table 3: Projected AADTs south of Failford Road

Year	AADT
2005	14,850
2010	17,736
2020	23,507
2030	29,278

Table 4: Projected AADT at Tritton Road

Year	AADT
2005	11,974
2010	14,399
2020	19,248
2030	24,098

Failford Road has experienced a significant increase in traffic over the past few years, generated by the growth of coastal towns and, more importantly, the improvement of the highway north of Bulahdelah. This resulted in a significant swing of traffic from the Lakes Way to Failford Road. From 1990 to 2001 the compound growth rate was 8%.

8.3.5 Truck traffic growth

It is assumed that the percentage of trucks on the highway would remain constant and grow in accordance with the traffic growth.

8.3.6 Forecast daily volumes

Data from permanent traffic counting stations to the north and south were used and extrapolated to provide traffic projections. The closest site at Nabiac with 4.05% growth was used for the traffic projections. The calculated 2005 AADT of 14,850 gives a hourly design volume of 1,348 vehicles per hour. This was extrapolated with the growth rate to the year 2030 to give a design volume of 2,660 vehicles per hour (100^{th} highest hour).

8.3.7 Traffic accidents

From 1 January 1999 to 31 December 2004, there were 86 recorded crashes between Failford Road and Tritton Road. These accidents resulted in three deaths, 51 injuries in 31 accidents and 52 tow-aways.

The deaths were as a result of accidents at the Bullocky Way intersection with the southbound carriageway of the highway. Of the total accidents in the area, 66% were in wet conditions and 75% were vehicles running off the road and involving no second vehicle.

8.3.8 Level of service

The ability of a road to accommodate traffic flows is measured by a Level of Service (LOS). For a through route the LOS can be described as one of the following:

A Free flow whereby drivers are virtually unaffected by others in the traffic stream and can choose their own travel speeds.
B Stable flow with slight inconvenience from others in the traffic stream. Drivers have reasonable freedom to choose their own travel speeds.
C Stable flow with drivers restricted to select desired speed and ability to manoeuvre.
D Approaching unstable flow with drivers being severely restricted in travel speeds and freedom to manoeuvre.
E Unstable flow close to capacity. Minor disturbances in the traffic stream cause breakdown.
F Forced flow with more vehicles approaching than can fit. Queuing and delays result.

Traffic modelling of the roads and intersections on this section of highway, using traffic figures counted in February 2005, found the following:

- Pacific Highway/Failford Road – the existing cross intersection is controlled with a recently constructed seagull intersection. The intersection operates at a LOS of C .
- Failford Road had an overall LOS of C but did have a consistent LOS of E for the traffic right turning northward (RTA, 2005b).
- St Peters Close traffic volumes are extremely low but did show long delays and a LOS of F in the morning (RTA, 2005b).
- The Bullocky Way/Pacific Highway junction has a LOS of A, dropping to LOS B for the traffic turning off the highway (RTA, 2005b).
- Bullocky Way has a LOS of B in the morning and C in the afternoon (RTA, 2005b) for traffic turning right from Bullocky Way (RoadNet, 2005).
- The Possum Brush Road/Pacific Highway junction has a LOS of A, dropping to LOS B for the traffic turning off the highway (RTA, 2005b).
- Possum Brush Road has a LOS of C (RTA, 2005b).

This modelling was undertaken on traffic volumes which represent the AADT volumes and not the holiday period volumes that occur for 10 weeks of the year. The delays in the holiday periods would be significantly higher and therefore the LOS would be lower.

The objectives for the proposal include an aim for a LOS no worse than C for the 100th highest hourly volume 20 years after opening. Based on the traffic analysis prepared for the REF the proposal will meet this objective.

8.4 Urban and regional design

The design principles adopted for the Pacific Highway upgrade are:

- To provide a cost effective design.
- To cater for the required traffic volumes.
- To be safe to travel at the proposed design speed.
- To have minimal adverse environmental effect.
- To be compatible with the community needs.

These design principles were used to develop a framework which attempts to achieve a design that is integrated into the surrounding environment. The design principles adopted for the Pacific Highway are described in the RTA's *Pacific Highway Urban Design Framework* (March 2005).

Landscaping and urban design principles have been used to assist in the development of the concept design. The urban design objectives and road users' expectations would be satisfied by:

- A geometric alignment which would fit into the surrounding landform; achieved by adopting large flowing curves which complement the existing carriageway and existing landforms.
- A co-ordinated alignment which is predictable; achieved by using large vertical and horizontal curves which allow for good forward sight of the road, resulting in no sudden alignment changes.
- An interesting section of highway; where the carriageways will provide a view of the highway which is visually different to the adjoining sections of road.
- A road that complements the adjoining sections of highway; achieved by using similar curve sizes and the same roadway widths.
- Clear and concise road signs and pavement delineation, achieved by having minimal intersections; therefore the only direction signs required are for the next interchange.
- The use of safety barriers to best practice; achieved by using the appropriate barrier and only where the hazard cannot be designed out.
- Providing visually pleasing overbridges; achieved by engaging qualified urban designers to work closely with the bridge designers from the beginning.
- Eliminating at-grade intersection and turning conflicts; achieved by providing a service road and grade separated intersections, thus leaving the highway free of conflicting traffic.

8.5 Road design parameters

The design standards to be adopted for the proposal are based on the *Pacific Highway Design Guidelines* (March 2006), *RTA Road Design Guide, 2005* and Austroads publications.

Incorporation of a rest area or truck stop facility is not proposed within this project, although the need for a truck-stopping bay in each direction was considered.

Five cuttings would be required for the alignment (Refer to **Figure 2**) and details are provided in **Table 5**.

Table 5: Proposed cutting details

No.	Location	Approximate length of cutting (m)	Approximate maximum height (m)
C1	500m north of Failford Road	910	10
C2	920m north of Failford Road	100	3.5
C3	1180m north of Failford Road	160	6.5
C4	1410m north of Failford Road	170	5
C5	1640m north of Failford Road	120	5

8.5.1 Alignment

Detailed design would be completed by the design contractor if the proposal is approved, further developing all aspects of the concept design as outlined. This final design would take into account concept design and general issues raised within the REF during the display period and relevant issues raised by approval authorities, as well as the results of further investigations. Consequently, it is possible that the details of the final proposal may vary from the description provided in this chapter. The concept design and construction methods proposed in this and the following section as a solution to the project objectives and constraints may also be varied by the design contractor within the limits of any conditions imposed and the design constraints, principles and standards detailed in this section.

The proposal would provide a high-standard alignment suitable for 110 km/h travel, with horizontal curves with radii between 1,200 metres and 1,700 metres. The vertical alignment would be gentle with gradients of up to 4%. The grading proposed would provide for flood-free travel during a 1 in 100-year flood for both carriageways in the area and ensure that heavy vehicles would be able to maintain their speed.

The concept design for the proposal provides for a new southbound carriageway which would be graded at a lower level than the existing southbound carriageway.

8.5.2 Typical cross section

Divided dual carriageways are proposed with two lanes in each direction. The existing southbound carriageway would become the northbound carriageway and the new southbound carriageway would be built to the east and parallel to it. A typical cross section is provided in **Figure 3.**

The carriageways proposed would be 10 m wide and conform to current Pacific Highway standards. Typically, and subject to detailed design, the carriageways would comprise a 2.5 m

wide outer shoulder, two 3.5 m wide travel lanes and a 0.5 m wide inner shoulder. The outer shoulder would be widened to 3 m where adjacent to a safety barrier. There would also be additional widening for the provision of verges, shoulder rounding and open drains. The carriageway crossfall would generally be 3%.

The width of the proposed median between the carriageways would vary between about 12 and 17 m. The designed median cross section would take into account the current and future drainage requirements and has allowed for a median safety barrier if the highway is updated to six lanes in the future. The median widening would not result in a large increase in the road footprint as the combination of the carriageway widening and lowering means that the length of embankment reduces at a similar ratio to the lowering of the height. The median would have gentle slopes and would be landscaped in accordance with RTA specifications.

The outer batter slopes would vary depending on stability of cut and fill materials. A slope of 2 to 1 (horizontal to vertical) has been adopted for design purposes.

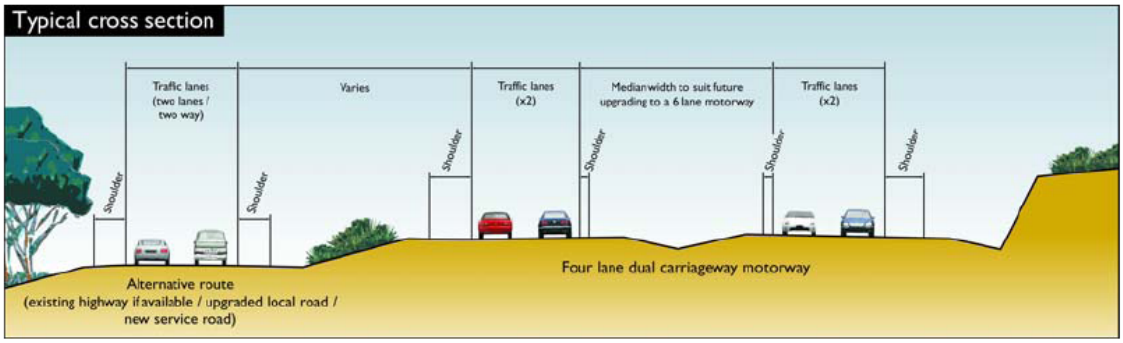


Figure 3: Typical cross section

8.5.3 Cross section – service road

The service road would be a dual lane, bi-directional road, comprising variable shoulders (2.5 m where possible) and two 3.5 m lanes. Additional bays may be provided adjacent to property accesses to allow the property owner to pull off the road clear of any through traffic, school buses to stop and garbage services to operate in a safe manner. Batter slopes would generally be the same as the highway carriageways.

8.5.4 Interchanges and intersections

Failford Road

A grade-separated interchange constructed in stage 1 is proposed near the Failford Road, St Peters Close intersection with the highway in both stage 1 and stage 2. The interchange is a multi-directional interchange that would remain during stage 2, allowing turning movements from all possible directions at this location and would provide the southern access point for the proposed service road. The interchange consists of a bridge over the highway for Failford Road and is located to complement the existing land fall. An elevated Failford Road bridge would provide offloading ramps on an upgrade to assist with deceleration and on-load ramps would be on a downgrade to assist with acceleration.

Bullocky Way

In stage 2, an overpass is proposed approximately 350 m south of the current junction of Bullocky Way with the highway. This overpass would connect Bullocky Way to the service road and would allow connectivity between Bullocky Way, the properties adjoining the service road and Possum Brush Road. Direct access to the highway is not proposed at this location and would be available via the service road and interchange.

In stages 1 and 2 both the Bullocky Way intersection and cross median access would be closed and access would be via Failford Road and the interchange and service road.

Possum Brush Road
In both stages 1 and 2, Possum Brush Road would connect directly to the service road and to the northbound on-load ramp to the highway. All Possum Brush Road traffic movements to and from the south would be via the service road and the Failford Road interchange.

Access to Possum Brush Road from the north would be via the Failford Road interchange and the service road.

Tritton Road
The proposal would close the access to Tritton Road from the highway and access to the properties along Tritton Road would be via Possum Brush Road in stage 1 and stage 2.

8.5.5 Local access

The proposal would have controlled access boundaries for the full length of the route with proclaimed access points at interchanges. There is one land-locked property adjacent to the existing southbound carriageway which has been acquired as part of the project. Local road connections would be maintained by the provision of the Failford Road to Possum Brush Road service road and the provision of an overpass from Bullocky Way to the service road in stage 2. Access to all properties would be provided, although adjustments to the existing accesses within the adjoining property may be required. Property adjustments would be negotiated during the detailed concept design phase. The majority of property accesses along the existing northbound carriageway would be retained. Temporary access would be required to some properties during the construction phase.

8.5.6 Bridges and structures

There are no major creek crossings in this section of the highway, so any drainage structures required would be either box culverts or pipe culverts. Consideration of culvert design or access ways to provide crossing points for fauna, both terrestrial and aquatic, would be undertaken during detailed design. Crossing points would be identified in accordance with wildlife corridors along the route. Two bridges are proposed for road overpasses; the design of these bridges would be finalised during the detailed design stage and may include spill through abutments and a central pier.

8.5.7 Drainage and flooding

Longitudinal drainage would be provided to drain the median and outer carriageway open drains. The drainage system would be designed to accommodate a 1 in 10 year storm event with a review of the outcome of a 1 in 100 year event. Longitudinal drainage would generally be in the form of open concrete drains with a pit and pipe network to evacuate the water.

8.5.8 Earthworks

The proposed vertical alignment would result in the minimisation of earthworks required. Both Stage 1 and Stage 2 would require the importation of some fill material. At this stage of the design the preliminary earthworks requirements are as detailed in Table 6..

Table 6: Earthworks requirements

Requirement	Stage 1 - m^3 of material	Stage 2 - m^3 of material
Excavation from site to fill	113,400	117,000
Excavation from site to unsuitable	9,300	15,000
Imported material to fill	74,100	105,000

Excavated material that is not suitable for on-site reuse or recycling would be disposed of at a licensed landfill facility.

Earthworks requirements were calculated by the RTA based on the concept design and previous history of the road. A geological investigation would be conducted in unison with the bridge foundation investigation, and would provide a more accurate indication of earthworks and the method of construction required.

8.5.9 Pavements

A total pavement thickness of approximately 700 mm would be required above the earthworks layers. The pavement would be supported on a layer of select subgrade. The select subgrade is a natural granular earthwork material with specified properties superior to general earthworks material. The select material would be won from the cuttings on site or imported from nearby quarries. The select layer may require additives to stabilise the material and bring it up to specification. This would either occur in place or be pre-mixed in a pug mill adjoining the site.

The top levels of the pavement are the structural layers and comprise either a rigid or flexible pavement. A rigid pavement consists of a sub-base and a base of concrete (either reinforced or not reinforced) and a flexible pavement has a sub-base of either cemented gravels or lean mix concrete with a base of deep lift asphalt. If appropriate and feasible, other pavement solutions may be considered in order to minimise potential noise impacts on adjacent noise receivers, therefore reducing any predicted operational noise impacts. These alternative pavement surfaces may include open-grade asphalt and exposed aggregate or porous concrete pavements. The type and design of the structural pavement to be used for the proposal would be determined during the detailed design phase. For the pavements off the highway, such as interchange ramps, service roads and connecting local roads, conventional flexible pavements are likely to be used. These pavements would consist of gravel pavements with a surface of stone-mastic asphalt, dense-grade asphalt or bitumen seal.

8.6 Additional borrow material

As described previously in **Section 8.5.8**, additional fill material would be required for the proposal and all material for the interchange and overbridge would need to be imported. There are two quarries in close proximity to the study area, one to the west with access off Possum Brush Road operated by Pacific Blue Metal and one to the east with access via Bullocky Way/Failford Road. The operators of these two quarries have indicated they could provide general fill material to the quantities required. High quality pavement material could also be sourced from either of the quarries. Jandra Quarry, located approximately 3 km to the north of the site, could also supply material if required.

Based on the current estimates, stage 2 would require approximately 105,000 m^3 (solid volume) of imported fill material to be transported to the site. If a bulking factor of 1.3 is applied to the fill material, up to 136,500 m^3 would need to be imported for the proposal. Material would be

transported on a regular basis during earthworks and generally placed directly into the embankments. Only small quantities would be stockpiled on site at one time.

8.7 Batch plants, stockpile and compound sites

If concrete pavement is to be provided, a temporary concrete batching plant would be required during construction. The location of the temporary concrete batching plant would be determined using appropriate site selection criteria developed to reduce potential impacts on the environment and sensitive receivers. These locations would be identified in detailed design plans and the construction environmental management plan (CEMP).

The exact location of stockpiles is unknown at this time. Locations that may be used as stockpile sites are shown in **Figure 5**. The RTA's *Stockpile Site Management Procedures, 2001* have been referred to in determining the locations of the potential stockpile sites.

These sites would be located in suitably cleared areas more than 4 m from existing vegetation, concentrated water flows, roads and hazard areas where possible. Final locations of stockpiles would be detailed in the CEMP and soil and water management plan to be prepared for the proposal, but are likely to be near the Failford Road intersection and on cleared land between Bullocky Way and Possum Brush Road. The location of the site office compound would also be identified in the CEMP.

When the exact locations for stockpiles, batch plants and compounds are finalised, these would be subject to their own environmental impact assessment as required, through consultation with the RTA. All stockpiles would be managed according to the RTA's *Stockpile Site Management Procedures* (RTA 2001a).

8.8 Construction activities

The construction of the proposal is expected to take approximately 2½ years. Construction activities would normally be undertaken during the following times:

- Monday to Friday – 7am to 6pm.
- Saturday – 8am to 1pm.

No construction work would take place on Sundays or public holidays. Should work be required to be undertaken outside the hours described above, the procedure contained in the RTA's *Environmental Noise Management Manual 2001, "Practice Note vii – Roadworks Outside of Normal Working Hours"* would be followed Extended hours would be addressed in the noise and vibration management plan. It is expected that hours may be extended, in consultation with the community and the Department of Environment and Climate Change.

The proposal would be undertaken using standard road building techniques. These techniques change slightly for individual projects, but would include:

- Site establishment works including the establishment of construction compounds, batch plants, machinery access roads and material storage areas.
- Site vegetation clearing works.
- Ripping would be undertaken with bulldozers and material haulage, spreading and compaction would be undertaken by scrapers or trucks. The need for rock blasting would be avoided as much us possible due to the proximity of houses.

- Bridge construction would be undertaken with precast piles and deck units.
- Drainage construction using precast pipe culverts, reinforced concrete box sections and cast in situ concrete drains.
- Select subgrade placement and compaction using graders and rollers. The upper material layers could be improved with stabilising materials if required.
- Heavy-duty pavement construction is expected to be two-layer concrete or deep-lift asphalt. On-site batching with haulage to the paver is the expected method.
- The majority of the works would be undertaken clear of traffic. Construction staging would be necessary at the crossover from the existing northbound carriageway at either end of the project to the existing southbound (to become northbound) carriageway through the central section of the proposal.
- Construction of roadside furniture including guideposts and safety barriers.
- Installation in consultation with provider of services ducts, across and along the route, for power, telecommunications, water, sewer and variable message signs.
- Possible installation of lighting at interchange ramp entries, exits and intersections.
- Installation of signs and line marking throughout the project.
- Refurbishment of the service road (existing northbound carriageway of the highway).

8.9 Construction traffic management

A traffic management plan (TMP) would be prepared for the proposal by the contractor. The TMP would be developed in accordance with the RTA's *Traffic Control at Work Sites Manual* (RTA 2003) and would outline the construction vehicle movement plan(s) to minimise obstruction to road users for the full duration of the construction works.

The requirement for fill material on the site is expected to generate 253 laden truck movements per day (or 506 two-way truck movements) on the basis of 12 weeks' construction time for earthworks. A 12-week construction period is considered to represent the minimum construction time for earthworks, and therefore a worse case scenario with respect to truck movements per day. This number of truck movements would require a positive traffic control at the access points to the section.

While the source of additional fill material has not yet been determined, it is possible that local quarries could be used. Should the Possum Brush Road quarry be used for additional fill, trucks would be able to access the construction site via Possum Brush Road and the highway directly. Should the Bullocky Way quarry be used for additional fill, trucks would have to access the construction site by heading south via Bullocky Way and Failford Road to access the highway, a distance of approximately 4.7 km.

The truck movements in and out of the construction site would be in the vicinity of 64 per hour during the earthworks phase, as shown in Table 7. The peak hour traffic on the highway would be over 1,000 vehicles in either direction. Traffic controls would be required at the site access points in order to ensure safety.

Table 7: Haulage movements during bulk earthworks

Time in weeks	Operating days per week	Laden trips per day	Total trucks per day (2-way)	Hours per day	Trucks per hour (2-way)
12	5.5	253	506	8	64

The TMP would also include appropriate traffic controls such as temporary traffic signals or other forms of controls such as manual traffic control, warning signs or speed reduction. Temporary sidetracks and crossovers may also be utilised in the TMP to ensure safe working conditions are maintained adjacent to traffic. The TMP would also detail access arrangements to neighbouring properties affected by the construction works.

8.10 Property acquisition

Property acquisition of two properties related to the project has been undertaken by the RTA. The finalisation of acquisition and adjustment to boundaries would be undertaken prior to construction. Property acquisition and the terms of agreement would be negotiated between the RTA and the individual landowners. Details of properties acquired are given in **Figure 4.**

Property access adjustment, to reconnect access to the service road, would be required to seven properties. Property access adjustment plans would be instigated in the detailed design stage. The detail design would be shown to the relevant landowner for comment, alteration and agreement in principle, before the final design stage. **Table 8** shows the property location and access adjustment details.

Table 8: Property adjustments

Location	Property	Proposed adjustment concept
14687 Pacific Highway	DP869485 Lot 10	Construct access approximately 400 m long, close to ground level, to connect to the Failford interchange western roundabout.
3 St. Peters Close	DP869485 Lot 13	Construct access approximately 50 m long, close to ground level, to connect to the Failford interchange western roundabout.
Failford Cemetery		Construct access on a 10% upgrade approximate 25 m long from the service road to the boundary.
21 St Peters Close	DP246909 Lot 4	Construct access on a 10% upgrade approximately 20 m long from the service road to the boundary.
41 St Peters Close	DP246909 Lot 3	Construct access on a 6% downgrade, approximately 80 m long from the service road to the boundary.
15046 Pacific Highway	DP790057 Lot 8	Minor adjustment to levels at the edge of road shoulder.
543 Failford Road	DP1060463 Lot 19	Minor adjustment to levels at the edge of road shoulder.

8.11 Utilities

A sewer rising main has been identified running north-south in private property on the eastern side of the Pacific Highway from Failford Road to Bullocky Way. The sewer rising main crosses Failford Road approximately 200 m east of the Pacific Highway/Failford Road intersection. This sewer main would require relocation as part of the proposal and consultation with MidCoast Water regarding this has already commenced.

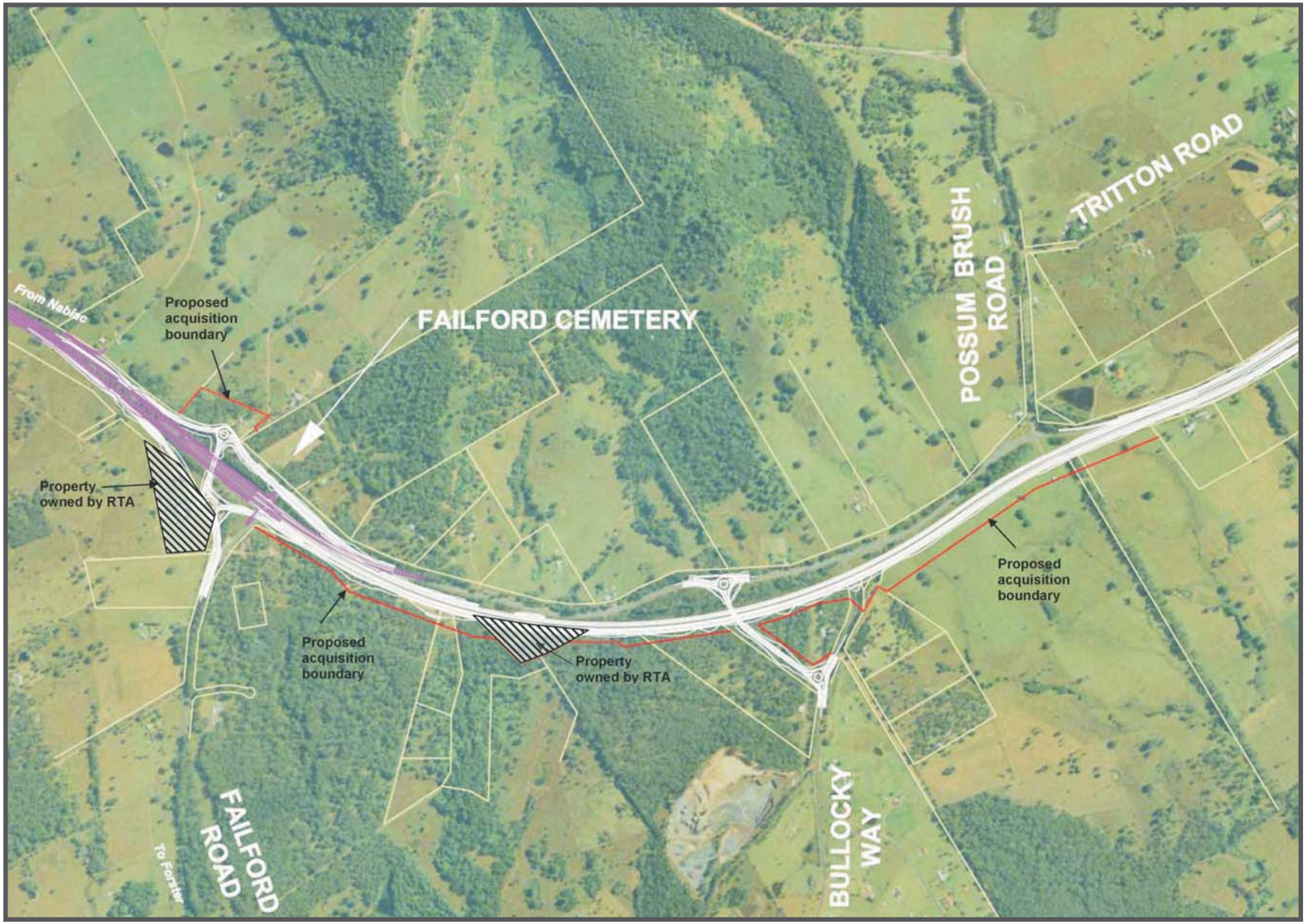
Telstra mains and optic fibre cables have been identified in the area. The Telstra cables generally run outside the road reserve and would not be affected by upgrade works. The cables cross the Pacific Highway at the following four locations:

- Telstra main crossing at approximately 750 m north of Failford Road crossing to service Lot 11 DP774514.
- Telstra main and optic fibre crossing at approximately 160 m north of Bullocky Way.
- Telstra main crossing on the northern side of the Possum Brush Road intersection.
- Telstra main crossing on the northern side of the Tritton Road intersection.

These cable crossings would require work to suit the new carriageway levels.

Domestic supply power lines would need to be relocated as a result of the proposal and main feeder lines near Bullocky Way may also need to be adjusted.

All required adjustment to utilities is likely to be undertaken prior to the commencement of construction works and in consultation with the appropriate utility provider. Details of this would be included within contract documentation.

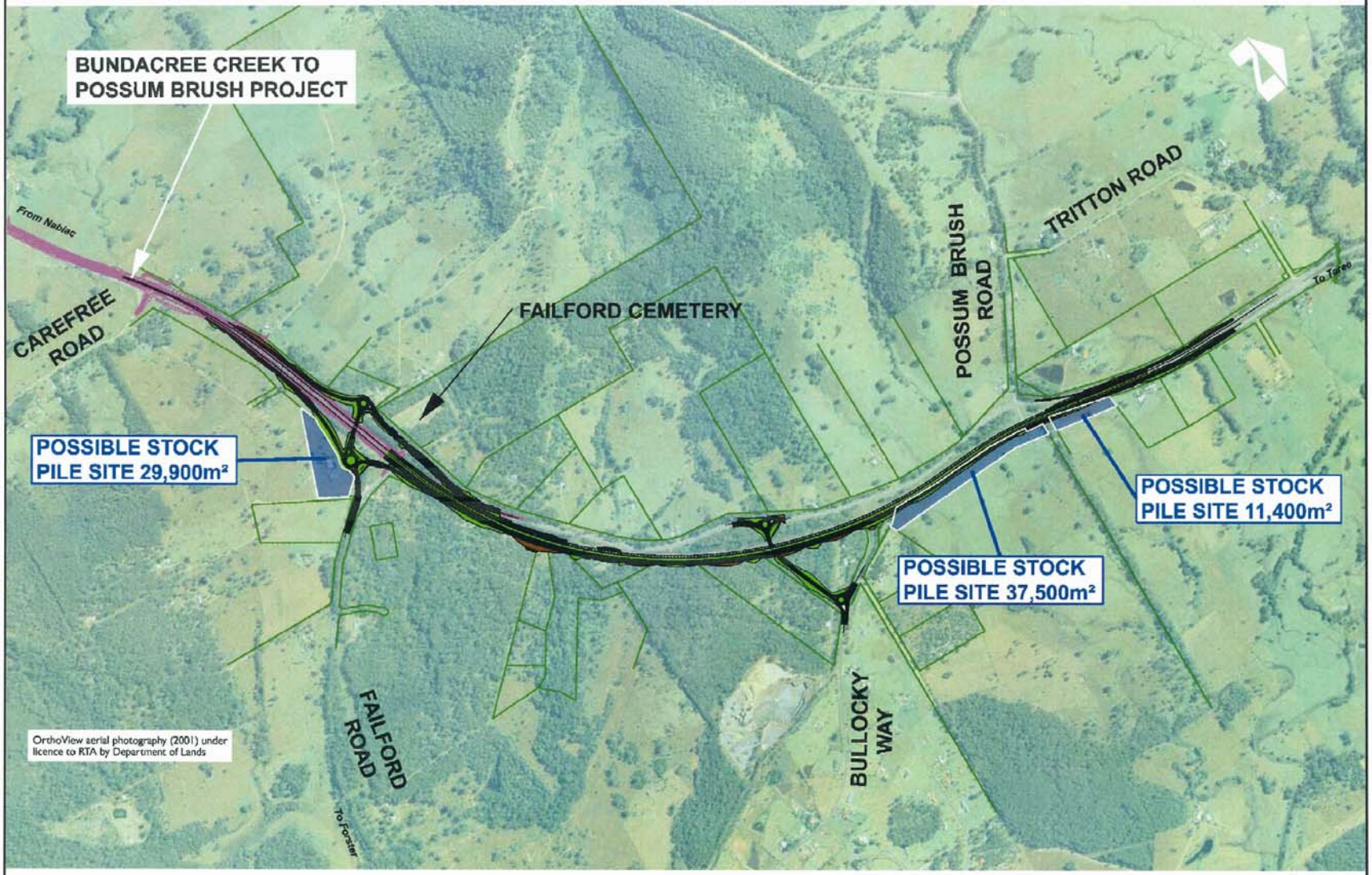


Property Acquistions
NSW Roads and Traffic Authority
Review of Environmental Factors
Pacific Highway Upgrade Failford Road to Tritton Road

FIGURE

4

A3



0 100 200 300 400 500
Metres

POSSIBLE **STOCKPILE LOCATIONS**
Roads & Traffic Authority
Review of Environmental Factors
Pacific Highway Upgrade
Failford Road to Tritton Road
Possum Brush, NSW

FIGURE

5

9 ENVIRONMENTAL IMPACTS

9.1 Specialist studies

The following specialist studies were undertaken as part of this REF:

- Review of flora and fauna (**Appendix A**).
- Aboriginal and historic heritage assessment (**Appendix B**).
- Noise and vibration impact assessment (**Appendix C**).
- Traffic study (**Appendix E**).
- Hydraulic investigation of transverse drainage structures (**Appendix F**).
- Supplementary flora and fauna investigations (**Appendix G**).

9.1.1 Flora and fauna

The flora and fauna investigations undertaken for the proposal involved:

- A review of information currently available, including searches of the Department of Environment and Climate Change Wildlife Atlas, Royal Botanic Gardens database and an on-line search for matters of national environmental significance to identify significant plants and communities that occur within the study area.
- A field assessment of plants, animals, and ecological communities, present within the study area, undertaken during spring.
- Preparation of a list of species found in, and those potentially occurring in, the area.
- A review of the significant species and ecological communities listed under the *Threatened Species Conservation Act* and an impact assessment in accordance with Section 5A of the EP&A Act.
- An assessment of the impact to species protected by the provisions of the *Environmental Protection Biodiversity Conservation Act.*
- Preparation of a list of suggested amelioration measures to mitigate potential effects on plant vegetation and fauna habitat.

The findings of this assessment are summarised in **Section 9.6** of this REF and the reports are found in full in **Appendix A** and **G.**

9.1.2 Aboriginal and historic heritage

The Aboriginal and historic heritage assessment involved:

- Background research, including a search of the Aboriginal Heritage Information Management databases and background archaeological information, a search of a wide variety of historic databases including the NSW Heritage Office State Heritage listing and register, the Register of National Estate, and relevant LEPs.

- Aboriginal community consultation in accordance with DECC's consultation guidelines, including communication with a number of State Government Agencies and advertising in the local newspaper, to allow registrations of interest from relevant Aboriginal stakeholders in the area.
- A detailed field survey of the proposal area, involving representatives of the Aboriginal community groups.
- Definition of the archaeological potential of the proposal area, based on information collated during this research and taking previous landscape use and disturbance into account.
- Reporting of the archaeological survey documenting the methodology and results of the survey and assessment, incorporating previous results undertaken in the study area.
- Assessment of the potential impact on both Aboriginal and non-Aboriginal heritage.
- Identification of heritage issues, including appropriate mitigation strategies.

The findings of this assessment are summarised in **Section 9.8** and **9.9** of this REF and the assessment report is found in full in **Appendix B.**

9.1.3 Noise and vibration

The noise and vibration impact assessment involved:

- Determination of the current background noise levels on the site, having due regard for the location of the nearest noise sensitive locations.
- Identification of the relevant noise and vibration criteria.
- Prediction of expected noise and vibration levels from the proposal.
- Assessment of noise and vibration impacts during construction and operation in accordance with the EPA's "*Environmental Criteria for Road Traffic Noise*" (ECRTN), EPA's "*Environmental Noise Control Manual*" (ENCM) and RTA's Environmental Noise Management Manual (ENMM) (RTA, 2001b).
- Making of recommendations on the requirements for mitigation measures and further assessment.

The findings of this assessment are summarised in **Section 9.5** of this REF and the assessment report is found in full in **Appendix C.**

9.1.4 Traffic study

The traffic study involved:

- An assessment of traffic data, traffic modelling and economic analysis in order to justify the proposal and to assist in the design of the road and intersections.
- Reviews and projections of traffic volumes.
- Assessment of road and intersection capacity.
- Analysis of accident data.

- Provisions for cyclists, pedestrians and buses.
- Assessment of the cumulative impacts of the proposal on the road network.

The traffic study is found in full in **Appendix E**.

9.1.5 Hydraulic investigation

The hydraulic investigation of the transverse drainage structures for the proposal involved:

- Concept checking and analysis of the 14 existing transverse drainage structures along the section of the Pacific Highway and of the five proposed new culverts.
- Analysis of the performance of the existing and proposed structures in 1 in 50 year average recurrence interval (ARI) and 1 in 100 year ARI flood events.

The full report is found in **Appendix F.**

9.2 Landforms, geology and soils

9.2.1 Existing environment

Landforms

The proposal is located within an area of natural moderate to gentle slopes with the main slope rising from the east to the west, which is associated with the floodplain of the Wallamba River in the east and Mount Talawahl in the west. Two distinct ridges, one located immediately north of the Failford Road intersection and the other located a further 800 m north towards the Bullocky Way intersection, are located within the surrounding locality (RTA, 2005b).

The existing northbound carriageway was constructed on top of the ridges, which has resulted in a variable vertical alignment. The construction of the newer southbound carriageway involved major earthworks to reduce the variable vertical alignment. As a result, the difference in height between the two carriageways has provided a number of steep slopes within the median between the carriageways towards the southern end of the study area. Towards the north of the study area, the topography is characterised by a broad low-lying floodplain with gentle slopes (RTA, 2005b).

Geology

The geology of the southern end of the proposal site is characterised by sedimentary rocks laid down 400 million years ago during the Devonian period. This formation is made up of layers of mudstone, sandstone, greywacke, tuff and chert. The geology of the northern end of the area associated with the floodplain, is composed of more recent Quaternary sediments including a combination of gravel, sand, silts and clays (Great Lakes Council 2004 in RTA, 2005b).

Soils

The soils of the area are generally of low fertility, having developed from sedimentary rocks. Shallow loamy yellow earths with uniform texture profiles have developed on the ridges. These are generally of low fertility and are moderately erodible. These areas are generally covered with vegetation and as such are moderately resistant to erosion. Podsolic soils with strong texture contrast have developed on the slopes. These soils are poorly aggregated and easily detached when wet. In these soil types, sheet erosion is a severe problem when these soils are exposed but moderate where vegetated. The soils associated with the floodplain are mainly alluvial soils with podsols and peaty podsols being widespread. Peats have also formed in

swampy areas. These soils are highly permeable but highly erodible when vegetation is removed (Great Lakes Council 2004 in RTA, 2005b).

Acid Sulfate Soils

There are no potential acid sulfate soils (as mapped on acid sulfate soil risk maps by the former Department of Land and Water Conservation) in the area to be disturbed by the proposal. . **Figure 7** identifies the areas of potential acid sulfate soils within the vicinity of the study area. However, anecdotal information suggests that there may be potential for acid water to be present within one of the drainage lines that is crossed by the proposal, as very clear water was observed during previous construction works associated with the existing southbound carriageway. A possible reason for this could be the exposure of sediments upstream of the proposal site or the presence of exposed outcrops of acid sulphate rock which has resulted in acid leachate. Potential impacts regarding acid water are discussed in **Section 9.4** of this REF.

Contamination

There is no known contamination in the area to be disturbed by the proposal.

9.2.2 Potential impacts

The proposal would result in changes to the landforms as a result of the earthworks required in the construction of the new southbound carriageway. Five cuttings are proposed for the new carriageway (as detailed in **Section 8.3**), up to a maximum height of approximately 10 m and varying in length from approximately 100 m to approximately 910 m. Piling would be required for the overpass construction at the Failford Road interchange in stage 1 and at Bullocky Way in stage 2. Geological investigation during detailed design of the proposal will provide more accurate details on the requirements for earthworks and construction.

There is potential for soil erosion to occur during construction works as approximately 15 hectares of vegetation, comprising approximately 60% native forest and woodland communities and 40% landscaping or modified shrublands, may be cleared. Substantial earthworks are also required for the construction of the new carriageway. The specific area to be cleared would be confirmed during detailed design, However, for the purpose of this assessment an area of 15 hectares has been assumed for clearing. (Should this area increase during the detailed design stage, an additional assessment would be undertaken to address the modified clearing area) Impacts of erosion are most likely to occur as a result of runoff from exposed surfaces and stockpiles, which could result in contamination of downstream waterways.

It has been estimated that approximately 105,000 m^3 of fill would be required for the stage 2 earthworks. If a bulking factor of 1.3 is applied, this equates to a volume of 136,500 m^3 of material that would need to be imported for the proposal throughout the works. It is anticipated that material would be transported on a regular basis during earthworks and not all the material would be stockpiled on site at any one time. Stockpiles would be located in cleared areas as nominated in the CEMP. Safeguards outlined in **Section 10.1** would be implemented to minimise and manage the potential for erosion from the site.

There is also potential for soil contamination associated with the storage, handling and use of fuels and oil on site during construction works. Fuel and oil would be stored and secured in a bunded area within the site compound, and measures outlined in **Section 10.1** would be put in place to minimise potential risks.

There is the potential that earthworks may uncover unknown contaminated materials from past land use activities, such as previous civil works for the construction of the southbound carriageway and past agricultural land uses.

9.2.3 Safeguards

The following safeguards are proposed to minimise the potential for impacts to landforms, geology and soils.

- Undertake a geological investigation in conjunction with the bridge foundation investigation, to provide a more accurate indication of earthworks and the method of construction required.
- Undertake additional targeted geotechnical investigations to identify any areas potentially containing acid rocks during detailed design stage.
- Develop a soil and water management plan as part of the CEMP for the proposal. The plan would include:
  - Appropriate erosion and sediment control measures to be implemented prior to and during earthworks. The control measures may include erosion and sediment controls, sediment basins, exclusion zones, diversion bunds, catch drains, energy dissipaters, sediment traps etc.
  - Typical control measures have been included in the concept design and are contained within the proposed road boundaries.
  - Use of revegetation measures such as hydromulching to minimise potential for erosion of exposed surfaces and batters.
  - Undertaking revegetation as soon as practicable after the disturbance.
  - Requirements for routine inspection and testing to ensure that controls and procedures are effective.
  - Minimising the extent of clearing where possible to minimise erosion potential.
  - Staging of clearing where possible.
  - Maintaining vegetation in drainage lines until the latest possible time to reduce erosion risk and retain filtering capacity.
- Maintain plant and equipment used on site in good order to ensure potential for leaks and spills is minimised.
- Maintain spill kits on site to manage spills of fuel or oils.
- Fuel and oil would be stored in bunded areas that are designed to meet relevant EPA guidelines. The bunded areas would be located at least 50 m away from drainage lines.
- If contaminated or potentially contaminated material is exposed during earthworks then work in the area would cease and a qualified consultant engaged to investigate the extent of contamination and recommend measures to dispose of contaminated material.

9.3 Air quality

The proposal has the potential to affect ambient air quality during both the construction and operational phases, with the primary air quality impacts being dust during the construction phase and vehicle exhaust emissions during the operational phase.

The disturbance of soils and removal of vegetation has the potential to increase air borne particle matter with the use of heavy vehicles, such as excavators and trucks, increasing potential for dust to leave the proposal site.

Although vehicles currently operate on the roadway in the locality the potential for increased traffic exists during the operational phase of the project. Pollutants of concern in vehicle exhaust are carbon monoxide, nitrogen oxides and particulates.

9.3.1 Meteorology and existing air quality

Climate

The study area has a warm temperate climate with a strong sub-tropical marine influence. The closest Bureau of Meteorology Station is located at Taree and the climate at this station is considered indicative of the project site. Summer has warm to hot days with average minimum and maximum temperatures for January being 17.5°C and 29°C respectively. Winters are mild to cold with average minimum and maximum temperatures for July being 5.9°C and 18.5°C respectively. Annual rainfall at Taree is approximately 1,175 mm and is generally higher in late summer and autumn, with March having the highest monthly average of 152 mm. Rainfall is lowest in late winter and early spring (RTA 2005a).

Significant weather events have been documented for the Bureau of Meteorology's Mid North Coast Region and include storms involving wind gusts of up to 93 km/hour (January 2000), heavy rain and 2 to 3 cm hail (December 2001 and August 2003), power blackouts and winds greater than 91 km/h (January 2004) (RTA, 2005a).

There is greater potential for erosion during late summer and autumn due to higher rainfall and the potential for significant weather events.

Winds

North-easterly and south-easterly winds prevail in the Taree area during summer with winter, winds predominantly from the west and south-west. Higher wind speeds generally occur in the afternoon in late winter and early spring (RTA, 2005a).

Air quality

The air quality within the area is considered to be good as it is predominantly a rural area with no significant industrial developments to contribute to ambient air pollution. Existing sources that contribute to air pollution are:

- Emissions from motor vehicles travelling on the highway and local road network.
- Residential sources such as home heating.
- Agricultural sources, such as livestock and burning of cleared vegetation.

9.3.2 Potential impacts

The proposed works have the potential to affect the local air quality temporarily by increasing particulate matter and dust as a result of construction works and by increased emissions from vehicle exhausts. Following construction, the only source of pollution is the passage of traffic through the upgraded roadway.

Construction impacts
The creation of higher dust composition in the vicinity of the proposal site is the greatest impacts predicted to occur from a result of the construction works. Potential dust sources from construction activities include:

- Earthmoving equipment, such as bulldozers, trucks and compactors operating on site.
- Trucks and vehicles travelling on unsealed road surfaces.
- Unloading fill material.
- Wind erosion from stockpiles and exposed surfaces.
- Batching plant.

Dust has the potential to cause impacts both within and surrounding the proposal site through visual appearance as well as impacts to operational activities of surrounding land uses practices including residential properties and agricultural businesses and to impact human and livestock health via increased dust and particle matter. Safeguards, identified in **Section 9.3.3**, to minimise potential impacts to surrounding properties would be implemented reducing the likelihood of residential and agricultural properties being inconvenienced through increased dust levels.

Emissions during the construction phase would be associated with diesel and petroleum-fuelled construction machinery, equipment and vehicles travelling to and from the site. However, the number of units of construction equipment would be relatively low when compared to the vehicles using the highway both during and following construction of the new carriageway. As a result the odour impacts of these emissions would be minimal. The exhaust emissions emitted by equipment and vehicles during construction would generate carbon monoxide, carbon dioxide, oxides of nitrogen, sulfides and trace amounts of non-combustible hydrocarbons. Air quality impacts associated with these emissions are considered unlikely provided that the construction contractor meets the requirements of the relevant legislation / policies. Plant and equipment would be well maintained and regularly serviced.

The removal of approximately 15 hectares of vegetation (comprising approximately 60% native forest and woodland communities and 40% landscaping or modified shrublands) as part of the proposal would also reduce the capacity of the existing environment to remove carbon dioxide from the atmosphere. However, the impact of this activity on ambient air quality is considered to be negligible.

Operational impacts
Vehicle emissions from the existing traffic on the Pacific Highway already affect the air environment. The proposal itself is not expected to increase the volume of traffic using the highway, but anticipated general growth in population and coastal development would increase the number of vehicles using the highway in the future.

A detailed traffic study was conducted for the proposal and is contained in **Appendix E**. RoadNet (2005) predicted Average Annual Daily Traffic (AADT) counts based on 4.05 % linear

growth for the period between 2005 and 2030. These results were summarised previously in **Table 3**.

Dispersion modelling was undertaken for the proposal of the Pacific Highway from Bundacree Creek to Possum Brush (which is within 30 km of the current study area). The results of this work were used as the basis for estimations of the impacts from the current proposal. Ground level concentrations of pollutants 30 m from the road (location of the closest residence) were extrapolated from the modelling results using the predicted 4.05% linear growth predicted in the RoadNet (2005) study. The predicted ground level concentrations are shown in **Table 9**, where they are compared to the DECC air quality criteria specified in *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC 2005).

Table 9: Predicted ground level concentrations of pollutants at 30 m from the highway

Year	CO 1-hour average (mg/m^3)	NO_2 1-hour average ($\mu g/m^3$)
2000	4	28
2005	4	34
2010	5	39
2020	7	51
2030	8	62
DECC Air Quality Goal	**30**	**246**

It should be noted that the results shown in **Table 9** are a conservative estimate and do not account for future improvements in pollution control in cars and reduced fuel emissions. The proposal by itself will not generate additional traffic volumes and these impacts are likely to occur regardless of whether or not the proposal proceeds.

Experience suggests that for an area such as the study area, which is primarily rural with a highway, the predominant source of particulates would be agricultural activities, with the movement of traffic on roads not associated with the proposal also contributing to particulate levels.

As a result of this uncertainty, PM_{10} values are not presented here as they may significantly overestimate particulate levels for the proposal. However, exceedances of the PM_{10} criteria are unlikely to occur based on the location and nature of the proposal.

The improvements made to the highway and the intersections along the route would improve the line of sight, allowing for smoother traffic flows and reduce congestion during peak times. This would result in a reduction of emissions compared to the existing situation.

9.3.3 Safeguards

The following safeguards are proposed to minimise the potential impacts relating to climate and air quality:

- Preparation of an air quality management plan as part of the CEMP for the proposal. This management plan would include mitigation measures to::
  - Identify potential sources of dust.
  - Ensure all machinery and equipment operated on site is well maintained and operated in a proper and efficient manner.
  - Minimise the amount of exposed surfaces on site.

- Implement during weather conditions where high level dust episodes are probable (such as strong winds in dry weather).

9.4 Water quality and hydrology

9.4.1 Existing environment

Surface water

There are no major creeks, rivers or wetlands within the study area. However there are approximately 17 unnamed natural and artificial drainage lines that flow west to east along the length of the proposed alignment. The location of SEPP 14 wetlands in the vicinity are provided in **Figure 8**. Fourteen transverse drainage structures varying in size are present along the existing highway alignment. The highway and rural activities undertaken in the area influence water quality within the drainage lines along the alignment.

The northern end of the section of the highway lies within a broad low-lying floodplain and there is potential that this area could be susceptible to backwater flooding when Bungwahl Creek and/or Wallamba River experience high flow conditions. However, it is unlikely that the southern end of the proposal area would experience issues associated with flooding. A hydraulic investigation of pavement runoff was undertaken by the RTA Bridge Engineering Branch in March 2006; the main findings of this investigation are discussed in **Section 9.4.2** and a full copy of the report is attached as **Appendix F**.

On a broader scale, the site is located within the Bungwahl Creek catchment, which is a sub-catchment of the larger Wallamba River. The Wallamba River forms the largest sub-catchment of the Wallis Lake catchment, draining approximately 41% of the northern-most part of the catchment (RTA 2005a). Some wetlands are located approximately 3.5 km east of the study area, where Bungwahl Creek drains into the Wallamba River. These wetlands are classified as SEPP 14 Coastal Wetlands; however, because of their distance from the proposal area (approximately 3.5 km to the east), they are unlikely to be affected as a result of the proposal.

As discussed in **Section 9.2.1** of this REF, there is anecdotal information that one of the unnamed drainage lines (located approximately 1 km north of the intersection of Failford Road and the Pacific Highway) may have potential acid water present due to very clear water being observed during previous construction works. Acid water is known to affect aquatic habitats as well as fish and other aquatic animals. Refer to **Section 9.1** for mitigation measures to address the potential acid rock located within the vicinity of the study area.

No information on groundwater was available for this assessment.

9.4.2 Potential impacts

Construction

There is potential for sediment runoff as a result of soil erosion from disturbed areas to affect the quality of water and biota in drainage lines downstream of the proposal. Sediment can affect water quality by increasing turbidity and reducing light penetration and visibility, which in turn can limit plant growth and movement of aquatic biota.

Based on the preliminary calculations for the earthworks (refer to **Section 8.5.8**) large amounts of material would be required to be excavated and filled on the site. Further calculations on the extent of the earthworks would be undertaken during detailed design. Calculations for potential soil loss would be undertaken as part of the soil and water management plan. Initial locations and sizings for the sediment basins required for the works are found in **Figure 6.**

There is also potential for leaks and spills of fuel or oil to affect surface or ground water quality or effluent from facilities such as a temporary batching plant to runoff into drainage lines if not appropriately managed. Safeguards detailed in **Sections 9.4.3** and **10.2** would be established to minimise the potential for construction activities to affect surface or ground waters.

Pre-existing acid water in drainage lines may impact upon construction equipment and runoff from construction activities and, if not appropriately managed, may exacerbate the quality of water downstream of the construction site.

Operation

The operation of the highway would result in the accumulation of contaminants on the road surface, in the median area and in the roadside corridors. During rain events these contaminants may be transported via runoff into local drainage lines. Although the proposal would increase the total area of road surfaces, the amount of traffic using the highway and service roads is not expected to increase as a result of the proposal and therefore the potential contaminant load would not increase over that of the existing highway.

However, in order to minimise the impacts of contaminants, safeguard measures to capture pollutants would be incorporated in the detailed design, thereby reducing the potential for downstream pollution. Proposed safeguards are detailed below.

The fourteen transverse drainage structures along this section of the Pacific Highway were investigated in the *Hydraulic Investigation of Transverse Drainage Structures* (RTA, 2006a) (see **Appendix F**). As part of the proposal all of these drainage structures would be extended and five new culverts would be constructed. The existing and proposed structures were analysed for the 1 in 50 year ARI and 1 in 100 year ARI flood events. It was found that in a 1 in 100 year flood only one of the culverts would result in floodwaters encroaching upon and overtopping the road. This occurred on culvert T18 which is located on the service road.

The hydraulic investigation also identified that ten of the culverts may require energy dissipaters to prevent scouring at the outlet structures. This requirement would be reviewed during the detailed design of the proposal and energy dissipaters would be constructed where required.

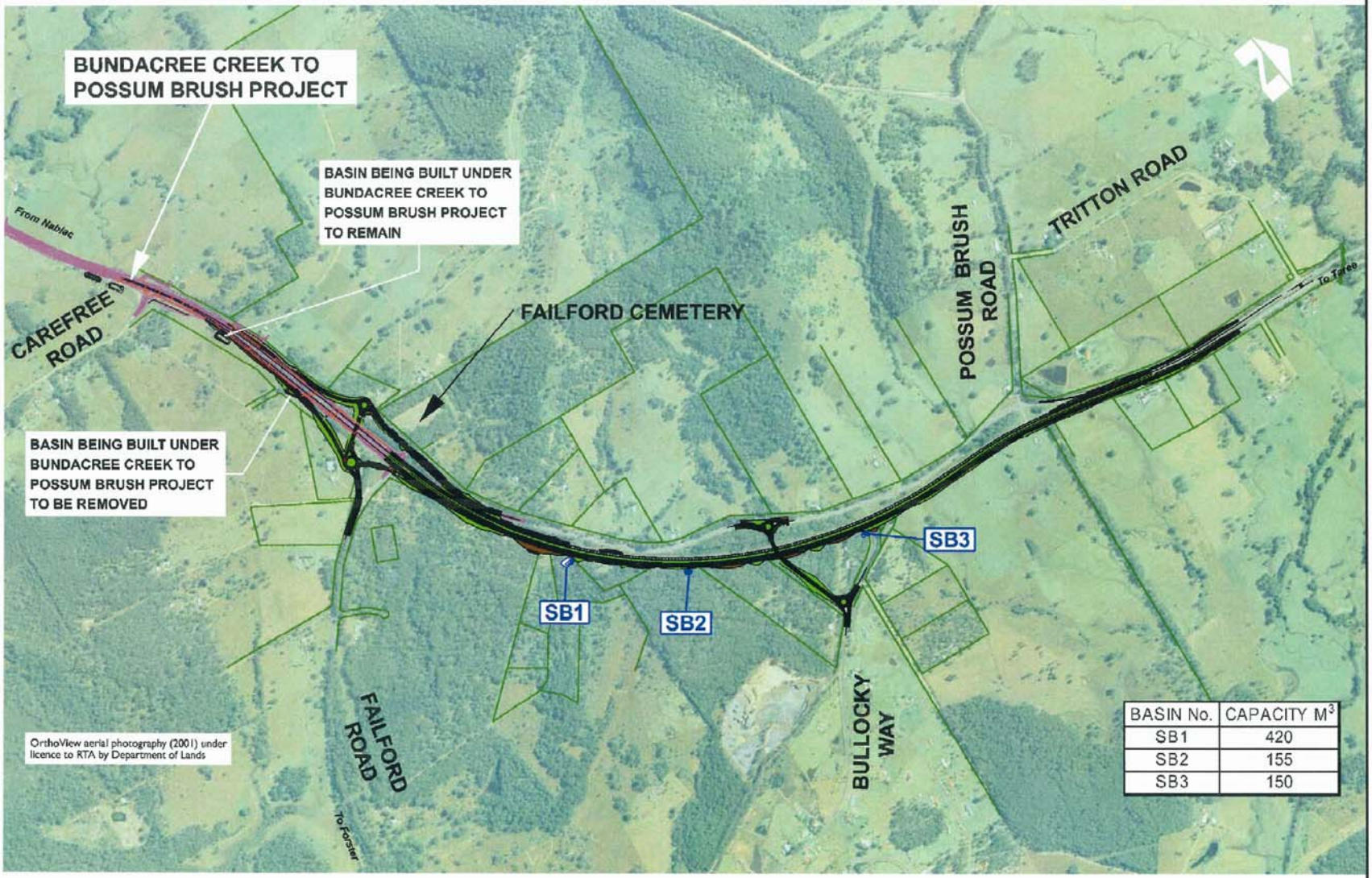
Acid leachate and salts released from oxidised acid sulphate materials can cause corrosion of concrete and steel used in pipelines, cables, pylons and roads (Atkinson, 2000). This may result in the weakening of culverts and the carriageways to be constructed for the proposal.

9.4.3 Safeguards

The following safeguards would be implemented:

- Develop a soil and water management plan as part of the CEMP for the proposal. The soil and water management plan would include measures to:
  - Identify the construction activities that could cause soil erosion or discharge of sediment or water pollution from site.
  - Minimise the soil erosion or discharge of sediment or water pollutants from the site.
  - Minimise the amount of bare surfaces during construction.
  - Maintain flow paths in drainage lines to reduce the potential for flooding during construction.
  - Incorporate water sensitive road design techniques such as grass swales, sediment basins and anti-pollution ponds where required.

A3



BASIN No.	CAPACITY M^3
SB1	420
SB2	155
SB3	150

0 100 200 300 400 500
Metres

PROPOSED SEDIMENT BASIN LOCATIONS
Roads & Traffic Authority
Review of Environmental Factors
Pacific Highway Upgrade
Failford Road to Tritton Road
Possum Brush, NSW

FIGURE

6

- Provide a bunded area for washing plant and equipment with appropriate collection and treatment systems.
- Inspect the erosion and sediment control measures on a weekly basis.
- Conduct wash down and refuelling activities and activities involving other potentially hazardous materials in areas isolated from stormwater and/or drainage lines and in accordance with best management practices.

- Water within the drainage line located approximately 1 km north of the intersection of Failford Road and the Pacific Highway would be tested for pH. Should the presence of acid water be confirmed (pH values of less than 6.5), management strategies would be developed with consideration to the RTA's *Guidelines for the Management of Acid Sulfate Materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze* (RTA 2005e). The management strategies would aim to minimise the disturbance of the acid water, decrease the risk of downstream impacts and provide long-term protection to culvert structures required for crossing the drainage line.
- Stockpiles and ancillary equipment would be removed from the identified floodplain areas (northern section of the proposal site in the vicinity of Bungwahl Creek and Wallamba River) during a flood event or high potential of a flood event to minimise the potential for materials to enter the creek system.

9.5 Noise and vibration effects

A noise and vibration assessment of the proposal is summarised in the sections below and found in **Appendix C** in full.

9.5.1 Existing environment

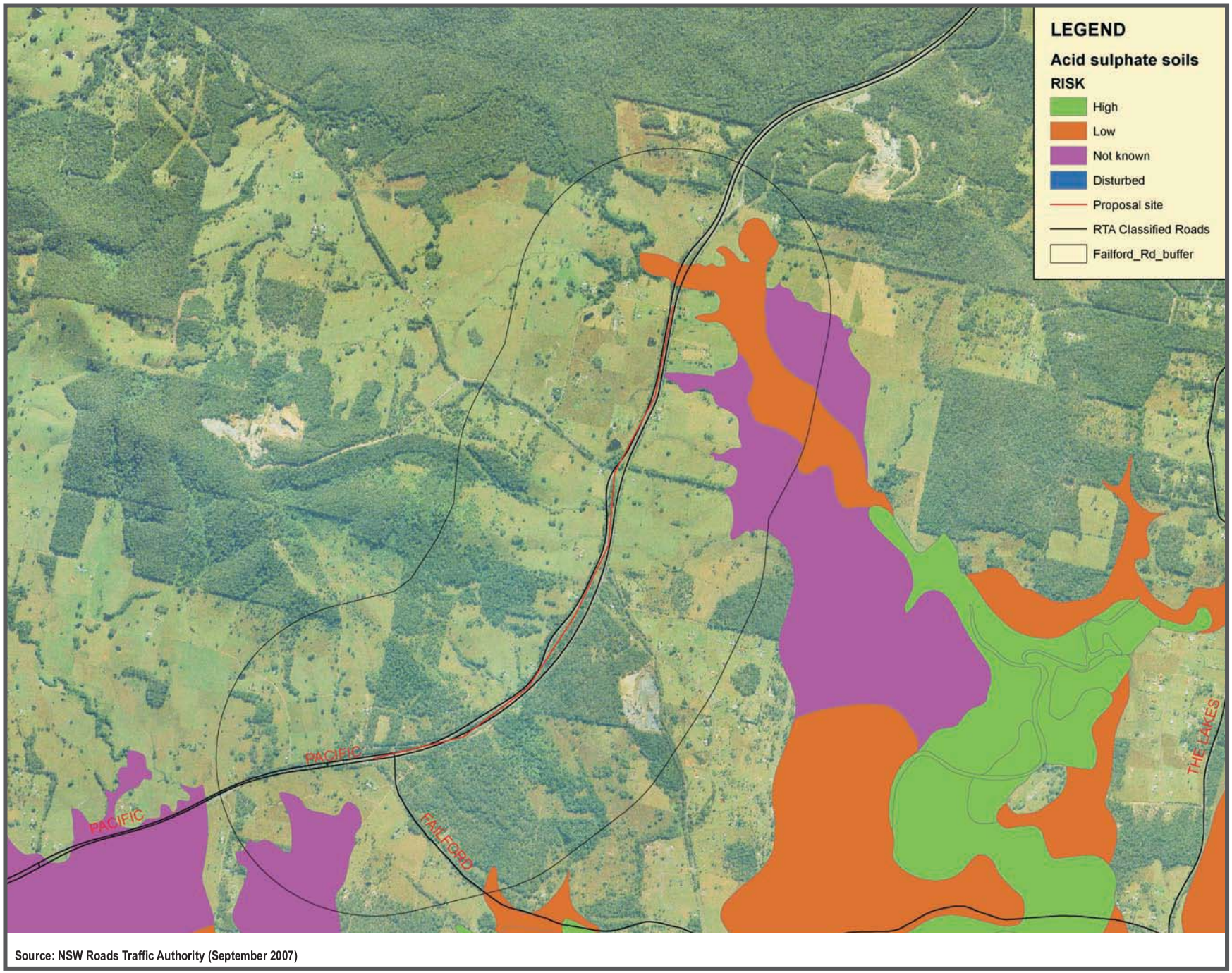
The existing ambient noise levels are low to moderate. Dominant noise sources include noise from road traffic on the Pacific Highway and noise from rural properties. Measured background noise levels at two monitoring locations (L_{A90} 0700 – 1800 Monday to Saturday and L_{A90} 0800 - 1800 Sunday and public holidays) were 40dB(A) and 43dB(A), based on a low density transportation level for the Pacific Highway in this area.

Existing vibration levels in the area are associated with the intermittent passing of heavy vehicles on the highway and local roads.

A number of rural residential receivers are located on both sides of the highway over the full length of the proposal. Most residences are between 50 m and 100 m from the existing road pavement. There are no sensitive land uses within the study area. A new residential estate, known as the Highland Estate, is located to the east of the highway, with the closest lot approximately 240 m from the existing carriageway.

To ascertain ambient noise levels, monitoring was undertaken at two residences on the western side of the highway. The logger at Location 1 (No. 14841 Pacific Highway) was in the free field in front of the residence, approximately 150 m uphill from the Pacific Highway and had partial view of the highway. The logger at Location 2 (No. 14991 Pacific Highway) was also in the free field, attached to the front fence of the residence, approximately 50 m from the highway and

Figure 6

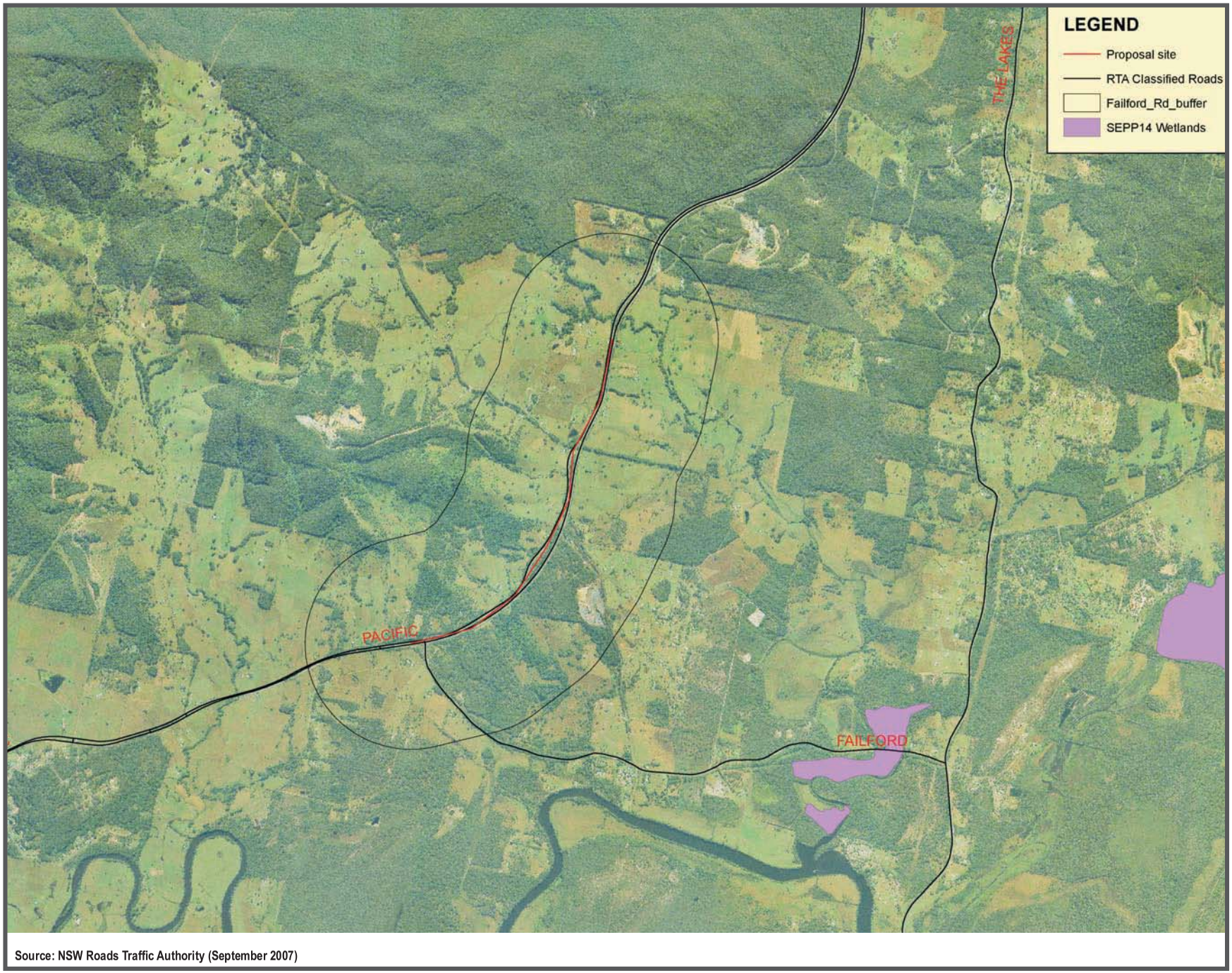


Source: NSW Roads Traffic Authority (September 2007)

0 1km

Acid Sulphate Soil Regions
NSW Roads and Traffic Authority
Review of Environmental Factors
Pacific Highway Upgrade Failford Road to Tritton Road

FIGURE
7



Source: NSW Roads Traffic Authority (September 2007)

SEPP 14 Wetland Regions
NSW Roads and Traffic Authority
Review of Environmental Factors
Pacific Highway Upgrade Failford Road to Tritton Road

FIGURE
8

15 m from Possum Brush Road in full line of sight of the highway. The results are summarised in **Table 10** below.

Table 10: Ambient noise levels

Location	$L_{Aeq(15\ hour)}$ dB(A)	$L_{Aeq(9\ hour)}$ dB(A)	Range L_{max} dB(A)	Avg L_{max} dB(A)
1	56.6	54.8	57 - 85	67
2	58.9	57.9	62 - 89	74

The data from the loggers showed a relatively uniform L_{eq} noise level over each 24-hour period of the monitoring. This is considered typical of locations near the Pacific Highway where the traffic mix alters between night and day. That is, during the night traffic volumes decrease but relative and actual numbers of heavy vehicles increase, resulting in a similar overall L_{eq} noise level.

Construction noise criteria are calculated based on background (L_{90}) noise levels. Measured background noise levels for each monitored location are shown in **Table 11**. As construction activities would be limited to day time hours, only this period is shown.

Table 11: Background Noise Levels

Location	L_{90} (Day)* dB(A) L_{90}
1	40
2	43

* 7.00 a.m. to 6.00 p.m. Monday to Saturday – 8.00 a.m. to 6.00 p.m. Sunday and Public Holidays.

9.5.2 Noise and vibration criteria

Construction noise

Noise emanating from construction sites in NSW is subject to conditions detailed in the Environmental Noise Control Manual (ENCM). Section 171 of the ENCM specifies construction noise limits at the worst affected receivers as follows:

Level Restrictions

(i) *Construction period of 4 weeks and under*;

The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 20 dB(A).

(ii) *Construction period greater than 4 weeks and not exceeding 26 weeks*;

The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 10 dB(A).

Construction of the entire road upgrade would take longer than 26 weeks to complete. Works would be carried out in stages, however, with noise impacts in effect “moving” with the work. That is, individual houses, or groups of houses, will only experience elevated noise levels for that period of time when construction work is in their vicinity. This does not apply to the construction of overpasses, which is confined to specific locations.

Based on the background noise levels, construction noise criteria for the various monitored locations are shown below in **Table 12** for durations of less than 4 and between 4 and 26 weeks and greater than 26 weeks.

Table 12: Construction noise criteria dB(A) L_{10}

Location	4 wks L10	4 – 26 wks L10	> 26 wks L10
1	60	50	45
2	63	53	48

Operational noise

Noise emissions from vehicles travelling on public roads in NSW are assessed according to conditions outlined in the EPA's *Environmental Criteria for Road Traffic Noise* (ECRTN). Under the definitions in the ECRTN, the Pacific Highway is classed as an arterial road. The criterion applicable to the proposal is *"redevelopment of existing freeway/arterial road"*. The recommended criteria for such works are set at 60 dB(A) $L_{Aeq(15\ hour)}$ (i.e. day) and 55 $L_{Aeq(9\ hour)}$ (night). The ECRTN also contains the proviso that, where noise criteria are already exceeded, in all cases the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB.

Vibration

Vibration associated with passing heavy vehicles, or construction machinery, is considered to be intermittent in nature. The Department of Environment and Climate Change (DECC) sets out limits for vibration in buildings in its *Environmental Noise Control Manual* (ENCM) (EPA, 2004). These limits are directed at personal comfort for continuous and intermittent vibrations. Various vibration criteria were evaluated and the most stringent was 2.8 mm/s. This criterion was adopted for the assessment of potential impacts from the proposal.

9.5.3 Potential impacts

Potential impacts for the construction phase of the proposal have been based on the general type of construction activity likely to occur. This is because a specific construction methodology would be determined by the contractor during detailed design. Future noise levels were predicted by undertaking detailed modelling of the existing and proposed road configuration using the Environmental Noise Model (ENM) version 3.1 developed by Renzo Tonin and Associates Pty Ltd. This model is accepted by the DECC and the RTA for use in noise assessments.

Construction noise

The construction of the project would involve several phases, namely:

- The initial earthworks and drainage.
- The construction of overpasses.
- The pavement laying and landscaping phase.

The earthworks and drainage phase of construction works is expected to have the longest duration and generate the highest construction noise levels. Noise is associated with plant and equipment such as concrete trucks, pumps, pneumatic and hydraulic hammers and mobile cranes.

For modelling purposes, it was assumed that up to four plant items (e.g. a roller, dozer, grader and water cart) would be working in close proximity during the initial earthworks phase of construction. Such a configuration of machinery would result in sound pressure levels of approximately 93 dB(A) at 7 m (i.e. a combined sound power level of 118 dB(A)). Due to of the relatively short distance between the noise sources and receivers, the influence of variable meteorological conditions was not considered in the modelling. The calculations also did not take into account the variable screening effects of topography or intervening structures (e.g.

sheds, etc.) between the noise sources and the receiver. The results of the calculations of noise from earthworks are shown in **Table 13**.

Table 13: Predicted noise levels from earthworks during the construction phase

Distance from centre of works	Predicted noise dB(A) L_{10}
50 m	76
100 m	70
200 m	64
400 m	58
800 m	52

Noise from paving activities would generally be significantly lower than that for general earthworks. In addition, the paving works move along the route at a faster rate and typically would have an impact on individual receivers for up to two weeks only. The predicted paving noise levels are shown in **Table 14**.

Table 14: Predicted noise levels - paving phase

Distance from centre of works	Predicted noise dB(A) L_{10}
50 m	68
100 m	62
200 m	56
400 m	50

The residences closest to the construction of the overpasses that are not RTA owned or are to be acquired by the RTA are approximately 250 m away at No. 3 St. Peters Close and No. 249 Bullocky Way. A conservative sound power level of 117 dB(A) (or 92 dB(A) at 7 m) was adopted for a scenario where a concrete truck, concrete pump, concrete vibrator, generator, compressor and pneumatic hammer were all operating, and producing maximum noise emissions, in close proximity. Results of these calculations are shown in
Table 15**.**

Table 15: Predicted noise levels from overpass construction

Distance from centre of works	Predicted noise dB(A) L_{10}
250 m	61
300 m	59
500 m	55
1000 m	49
1500 m	45

The main source of noise from a batching plant comes from agitator trucks operating at high revolutions while being loaded and preparing to depart. Noise from the batching plant itself is relatively insignificant. A scenario of three trucks using the batching plant at the one time was assessed by Spectrum Acoustics. This scenario does not take into account any screening effects of the batching plant or buildings associated with it. Predicted noise levels are shown in **Table 16**.

Table 16: Predicted noise levels from batch plant operation

Distance from centre of works	Predicted noise dB(A) L_{10}
100 m	74
200 m	68
500 m	60
2000 m	48

Noise levels from earthworks and paving activities during construction were assessed against the four to 26 week construction noise criteria adopted for the proposal. The modelling showed that the predicted noise levels would exceed the criteria at a distance of greater than about 800 m from the modelled earthworks scenario and greater than 400 m from paving activities.

The greater than 26 week (>26 week) construction noise criterion was adopted for construction of the overpasses and operation of the batching plant because of their longer-term nature. Modelling showed that this criterion would be exceeded at distances of up to 1,500 m from the site during overpass construction. Noise from the batching plant would exceed the noise criterion at distances up to about 2 km under the assessed conditions.

Construction activities, therefore, have the potential to cause some short-term impacts as works approach or recede from individual residences.

Due to the nature of construction work, noise exceedances would likely be sporadic in nature. That is, received noise levels would be dependent upon factors such as:

- The location and proximity to each other of various plant items.
- What work is being undertaken at any given time and whether it involves all machinery operating at the maximum sound power levels modelled.

In addition, any impacts on individual residences are likely to be short-term only as the construction works are carried out along the road corridor.

Construction vibration

As there are no residences within 10 m of the construction area, the only potential vibration impacts would arise from piling activities. It can be assumed that the vibration level is inversely proportional to distance. That is, at double the distance from the source the vibration level will be halved.

This indicates that, even at the maximum vibration level for piling of 30 mm/s at 10 m, received vibration levels would likely be below the criterion at all distances greater than 35 m from the piling activity.

Traffic noise

For the purpose of the assessment it is assumed that works on the proposal would open in 2010. Noise levels at sites affected by existing road traffic noise will often increase due to an increase in traffic flow between the time of the original monitoring and the opening date. To address this situation, the RTA's *Environmental Noise Management Manual* details the concept of the *"future existing"* noise level. This is the noise level from existing sources of road traffic predicted for the time of project opening.

A comparison of noise levels for before and after road works at the noise logging locations is found in **Table 17**. Details of other locations are provided in **Table 10** of **Appendix C**.

Table 17: Predicted noise levels from road traffic

Location	$L_{Aeq(15\ hr)}$ Future Existing (2010)	$L_{Aeq(9\ hr)}$ Future Existing (2010)	$L_{Aeq(15\ hr)}$ Predicted (2020)	$L_{Aeq(9\ hr)}$ Predicted (2020)
2 – 3 St. Peters Close	55.6	53.8	56.1	54.3
4 – 21 St. Peters Close	57.1	55.3	56.7	54.9
5 – 41 St. Peters Close	58.2	56.4	58.3	56.5
6 – 14841 Pacific Highway (logger location)	57.4	55.6	56.6	54.8
7 – 14861 Pacific Hwy	56.8	55.0	57.1	55.3
8 – 14863 Pacific Hwy	62.9	61.1	59.7	57.9
9 – 14913 pacific Hwy	64.4	62.6	60.3	58.5
10 – 14945 Pacific Hwy	61.9	60.1	62.5	60.7
12 – 14991 Pacific Hwy (logger location)	59.7	57.9	55.6	53.8
14 – 4 Possum Brush Road	59.4	57.6	59.8	58.0
19 – 249 Bullocky Way	62.5	60.7	65.7	63.9
20 – 235 Bullocky Way	56.2	54.4	56.3	54.5
29 – 3 Greys Road	56.7	54.9	57.9	56.1
32 - Shady Valley Pet Motel	59.9	58.1	62.6	60.8
45 - Highland Estate	53.0	51.2	53.5	51.7
47 - Highland Estate	54.1	52.3	54.7	52.9
48 - Highland Estate	53.0	51.2	53.5	51.7

The analysis of traffic noise for the year 2020 (with road works completed) and 2010 (future existing) showed that:

- For residences 2, 20, 45, 47 and 48 the received noise level for 2020 would be less than the applicable day and night criteria and no further assessment is necessary.
- For residence 29 the resultant noise would be above the night time criterion. The level would be within 2 dB(A) of future existing and no more than 2 dB(A) above the ECRTN target and, therefore, no further assessment is necessary.
- For residences 4, 5, 6, 7 8, 9, 12 and 14 the existing night time noise level already exceeds the ECRTN target level. The 2020 noise level would not exceed the 2 dB(A) allowance in the ECRTN and would not be acute and, therefore, no further investigation of noise controls is required (in many cases the noise level would decrease).
- For residence 10 the existing noise level already exceeds the day and night time ECRTN target level. The resultant received noise level would only be 0.6 dB(A) and, therefore, would not exceed the ECRTN allowances over future existing levels. As such, no further investigation of noise controls is required.
- For residences 19 and 32 the 2020 noise level would be acute at night and would be greater than 2 dB(A) above the future existing noise level.

It is apparent that noise control options would need to be considered for residences 19 (249 Bullocky Way) and 32 (Shady Valley Pet Motel). The required traffic noise reduction would need to be in the vicinity of about 7dB(A) to achieve compliance with the criterion.

The options available for noise control include construction of an acoustic barrier, architectural modification to the residences or the use of relatively quiet road surfaces.

Traffic vibration

Vibration arising from vehicular movements along road corridors can be divided into the following two broad sources:

- The roughness of the road surface.
- Potholes, bumps or other surface discontinuities.

Conservative calculations to determine the vibration arising from a continuous stream of heavy vehicles to residential receivers (10 m from the traffic stream) result in mid-span levels of less than 0.1 mm/s, readily complying with the criterion for residential receivers. Therefore it is not anticipated that the works would result in vibration impacts. Standard safeguards for vibration will be undertaken to further reduce the potential for vibration related impacts to occur.

The presence of potholes can result in vibration levels that approach or possibly exceed the criterion, depending upon local parameters. A regular maintenance schedule program readily solves this potential aspect of vibration impact.

Measures to address the potential noise and vibration impacts have been identified and are listed in **Section 9.5.4**.

9.5.4 Safeguards

The following safeguards are proposed to minimise noise and vibration impacts:

- Develop a noise and vibration management plan as part of the CEMP for the proposal, adopting best management practices consistent with the RTA's Environmental Noise Management Manual (RTA, 2001b). Mitigation measures would include:
  - Establish close liaison with potentially affected receivers as soon as possible and provide a contact name and phone number for a project representative to which any questions or complaints can be directed.
  - Investigate the type and effectiveness of architectural modifications for residences 19 and 32 in order to reduce potential future traffic noise impacts. This assessment would require detailed analysis of the existing construction and internal layout of each residence.
  - Undertake compliance monitoring in areas where piling may occur within 50 m of any residence.
  - Undertake pre-construction surveys of heritage buildings or vibration sensitive structures occurring within 50 m of proposed driven piling works.
  - Monitor vibration from construction machinery that is to be operated within 15 m of an existing building.
  - Where construction machinery is to be operated within 15 m of an existing building, undertake a building condition survey.
  - Inform all personnel of their obligations and responsibilities with regard to minimising noise emissions.
  - Familiarise contractors with methods of controlling noisy machines and alternative construction procedures.
  - Schedule noisy activities to occur at times to cause least annoyance to the community.
  - Conduct regular maintenance on all equipment.
  - Employ noise suppression devices for all mechanical plant.
  - Employ contractors and equipment that are best suited to the required task (i.e. construction personnel, specialist staff, etc)
  - Shut down or throttle down to a minimum machines that are used intermittently.
  - Investigate the use of smart reversing alarms.
  - Any portable equipment used would incorporate noise controls.
  - Locate portable equipment in locations where topography or site sheds etc. provide barriers between the equipment and nearest potentially affected residences.
  - Locate batching plants as far from any sensitive receivers as is practicable.
  - Undertaken detailed noise impact assessment of final location and design of batching plants.

9.6 Biodiversity

An ecological assessment was undertaken to investigate the potential effect the proposal would have on terrestrial flora and fauna. The assessment included a field survey undertaken between 5 and 7 October 2005. The assessment in full can be found in **Appendix A**, and a summary of the key elements is found below. An update was undertaken on 5 July 2007, to provide assessment based on updated species and community listings and search results. A copy of the report is provided in **Appendix G**.

Review of previous studies and databases
Previous ecological investigations for the locality were reviewed as part of background to the assessments. These were broad-scale vegetation mapping completed by the Greater Taree City Council (GTCC) and vegetation mapping held by the Great Lakes Council (GLC) in the vicinity of the study area. Studies undertaken by Ecotone in 2001 and the RTA in 2005 were also reviewed.

The records of terrestrial flora species held within the DECC Atlas of NSW Wildlife (ANSWW) were extracted in September 2005 and July 2007, for listings within a search area generated by establishing a 10 km buffer zone around the study area. The DECC PlantNET on-line database was also reviewed (September 2005) to identify additional records of significant species in the local area. Records for species that are protected by the provisions of the *Threatened Species Conservation Act* (TSC Act) and/or are considered a rare or threatened australian plant species were also extracted from the database using a search area extending approximately 10 km from the extremities of the study area.

The NSW Scientific Committee's Final Determinations were reviewed to identify Endangered Ecological Communities (EEC) and endangered populations (EP) protected by the *Threatened Species Conservation Act* that occur in the north coast. Reviewing online databases maintained by the DECC identified the critical habitat within in the local area. Eight threatened vascular plant species are recorded in the local area. The review of the on-line final determinations by the NSW Scientific Committee identified 11 EEC that occur within the North Coast Bioregion and one endangered population that potentially occurs within the local area. This is the *Eucalyptus seeana* population in the Greater Taree LGA.

A review of the on-line critical habitat register and recovery plans did not identify the presence of critical habitat for any flora species or community in the local area. The records of terrestrial species held within the atlas were extracted from within a search area generated by establishing a 10 km buffer zone around the study area. Within the search area, there were records for 278 vertebrate species, with a further nine additional taxa that could be identified to genus level only. Twenty-four of these species are threatened in NSW.

The review of the on-line Final Determinations by the NSW Scientific Committee found one endangered population that potentially occurs within the region. This is the Emu, *Dromaius novaehollandiae*, population in the NSW North Coast Bioregion.

A review of the on-line critical habitat register and recovery plans did not identify the presence of critical habitat for any fauna species in the local area.

9.6.1 Flora

Methodology

The flora of the study area was investigated by undertaking two limited field surveys involving walked transects along the whole length, either side of the existing roadway and within the proposed works footprint, to verify existing vegetation community mapping, with the aid of recent aerial photography. The study area was extensively walked over up to 50 m away from the footprint of the proposal. The survey effort focused on potential habitat for threatened species, with less time spent in highly modified habitats such as cuttings and bunds. Significant weed species were recorded when observed and species used in garden landscaping were not recorded, except where these had established within the road reserve. **Figure 2** of **Appendix A** shows mapping of remnant vegetation in the area and **Figure 3** of **Appendix A** shows the vegetation communities located around the study area.

Vegetation description

No threatened species were observed within the study area; however four of the species recorded within the study area are listed under Schedule 13 of the *National Parks and Wildlife Act 1975* (NPW Act). This Schedule regulates the trade of listed species that are at risk of over-collection for the cut-flower and nursery industries. The four species within the study area were:

- Rough maidenhair (*Adiantum hispidulum*).
- Elkhorn (*Platycerium bifurcatum*).
- Cabbage palm (*Livistona australis*).
- Snake orchid (*Cymbidium suave*).

Three noxious species were recorded within the study area. These were *Lantana camara*, crofton weed and blackberry. Several environmental weeds also occur in the area; these were camphor laurel, bracken and small-leaved privet.

Woodland and forest is mostly present between Bullocky Way and Failford Road, particularly to the east of the southbound carriageway of the highway. The woodland and forest vegetation is less continuous west of the northbound carriageway of the highway, with narrow remnants present north of the intersection with Bullocky Way and also to the south of Failford Cemetery. There are two forest remnant units between the northbound and southbound carriageways of the highway, with the largest located between the intersections of Bullocky Way and Failford Road and the highway.

Aquatic habitat between Tritton Road and Failford Road is limited to seepages and pools created from drainage works for the existing road infrastructure. Farm dams are also located north of Possum Brush Road and south of Failford Road. Aquatic habitat in the study area is limited, with most creek / drainage lines ephemeral, limited overhanging vegetation, rocky areas and snags and poor water quality. A moist habitat dominated by *Melaleuca quinquinerva* and swamp oak (*Casuarina glauca*), with some brush-box (*Lophostemon confertus*), is present in the extreme south west of the study area. This areas has the potential to be indicative of the EEC *Sydney oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner Bioregion*, however AHA Ecology (2007) concludes, due to the specific elevation and small number of listed characteristic species the paperbark / brush box / swamp oak community is unlikely to represent a stand of the EEC.

The remnant vegetation communities within the study area have had a history of disturbance, ranging from selective logging, the clearing of the understorey, woody weed invasion or species

alteration due to changed physical conditions, such as increased light or an altered hydrological regime.
Six vegetation communities are recognised within the study area. Descriptions of these six communities follow below. Maps showing the locations of these communities are located in **Appendix A**.

Grey gum/grey ironbark/white mahogany community
The dominant vegetation community observed was dry sclerophyll woodland, dominated by tallowwood and white mahogany, with patches of grey gum and grey ironbark dominating small areas or scattered in low densities throughout the community. The understorey varied from absent with a sparse groundcover in places where bushfire fuel management has taken place, to dense woody weed infestation. The shrub diversity, in terms of species present and structure, was greatest from Failford Road to approximately 500 m north of the road intersection with the highway. The upper understorey was dominated by eucalypt regeneration, scattered black oak (*Allocasuarina littoralis*) and *Jacksonia scoparia*. The lower understorey was dominated by fabaceous species, including *Pultenaea villosa*, and *Acacia falcata*. The ground cover was generally sparse, dominated in less disturbed habitats by blady grass (*Imperata cylindrica var. major*) or whiskey grass (*Andropogon virginicus*). However the majority of the community had sparse a sparse grass cover that included kangaroo grass (*Themeda australis*), wire grass (*Aristida* sp.) and wallaby grass (*Austrodanthonia* sp.). Small patches of forest oak (*Allocasuarina torulosa*) and pink bloodwood (*Corymbia intermedia*) occur within this community. The understorey is very sparse and ground cover is dominated by black oak cladodes.

This community dominates the remnant vegetation west of the Pacific Highway and has moderate significance with regard to flora biodiversity, particularly east of the existing southbound carriageway. The low diversity of exotic species and simplified shrub understorey in most sections of this community reduced the overall conservation significance to moderate. This is despite the relatively high diversity of native species and better understorey structure in this community for a section, approximately 500 m long, to the north of Failford Road.

Mahogany/ironbark/grey gum/blackbutt
This community occurs in the southern part of the study area, around Failford Cemetery and adjacent to the study area north of Failford Road. blackbutt (*E. pilularis*) dominates small areas; however most of the community within the study area near Failford Cemetery is dominated by ironbarks (*E. siderophloia*) and, to a lesser extent, grey gum. The shrub understorey of the community is low and sparse. Species present include *Pittosporum undulatum*, white dogwood (*Ozothamnus diosmifolius*), lantana, coffee bush (*Breynia oblongifolia*) and *Leucopogon juniperinus*. Leaf litter and fallen timber result in a ground cover that is dominated by grasses and forbs with a patchy distribution. The ground cover species include spiny-headed mat-rush (*Lomandra longifolia*), kangaroo grass (*Themeda australis*) and *Dianella caerulea* var*. producta*. Also present are scrambling species, for example appleberry (*Billardiera scandens*), slender tickfoil (*Desmodium varians*) and red running pea (*Kennedia rubicunda*). The community is considered to be of moderate conservation significance due to the higher diversity of exotic species in the understorey, particularly in moister areas, and reduced shrub understorey structure.

Tallowwood/Sydney blue gum
The largest remnant of this community occurs between the present north and southbound highway carriageways immediately south of Possum Brush Road. The remnant is dominated by Sydney blue gum (*Eucalyptus saligna*) and turpentine (*Syncarpia glomulifera* subsp*. glomulifera*), with an understorey dominated by mesic low tree and tall shrub species, for example red ash (*Alphitonia excelsa*) and blue lilly pilly (*Syzygium oleosum*). The lower understorey has species such as narrow-leaved palm lily (*Cordyline stricta*) and *Indigofera australis*. Vines, including sarsaparilla (*Smilax australis*), headache vine (*Clematis glycinoides*

var. glycinoides), snake vine (*Stephania japonica* var*. discolor*) and climbing guinea flower (*Hibbertia scandens*) are very common in this community. Roadside vegetation to the west of the remnant is similar to the island vegetation; however there is more evidence of a change in floristic composition caused by the narrower nature and proximity to grazed pasture.

The riparian vegetation in the southern part of study area is similar to this community, however blackbutt (*Eucalyptus pilularis*) is a more common canopy species and cheese tree (*Glochidion ferdinandi* var*. ferdinandi*) is a common understorey species. All remnants have woody weeds, for example lantana, with small-leaved privet (*Ligustrum sinense*) common in the southern riparian vegetation.

This community shows edge effect changes in floristic composition, primarily a proliferation of vines and woody weeds, for example wild tobacco bush (*Solanum mauritianum*) and lantana, at the interface with cleared areas. The presence of exotic species and linear nature of the remnants within the study area reduces the conservation significance in terms of flora to moderate.

Landscaping/modified shrublands
This community is highly modified, resulting from revegetation or regeneration following the clearing of the original vegetation for road works. Some areas, for example west of the intersection between the Pacific Highway and Failford Road, have been planted with native species, including spotted gum (*Corymbia maculata*), forest oak (*Allocasuarina littoralis*) and western golden wattle (*Acacia decora*). While the vegetation is dense, the ground cover is sparse.

Other areas, for example the Pacific Highway reserve south of the present sealed limit of the old highway, have regenerated from the original vegetation community and are presently dominated by shrubs, for example *Acacia falcata*, *Zieria smithii* and *Jacksonia scoparia*, and eucalypt regeneration, with isolated remnant emergent trees and dead trees present.

Much of the present reserve is dominated by young eucalypt regeneration, *Acacia falcata* and lantana. *Acacia falcata* and lantana dominate highly disturbed areas, particularly on steeper cuttings, for example on the south east of the Failford Road-Pacific Highway intersection. The community has low flora conservation significance.

Forest red gum/black oak
To the north of Bullocky Way there is a small stand of forest red gum (*E. tereticornis*) with the groundcover dominated in part by spiny-headed mat-rush. The remnant is located in the road reserve for the former Bullocky Way route and is bound by the bund for the present day Bullocky Way to the south and cleared pasture to the north. While the trees are of a moderate size, no hollow development was observed. black oak (*Allocasuarina litoralis*) forms a remnant woodland to the north east of the stand of forest red gum. Forest red gum and black oak are mapped together based on proximity, topographic position and reduced diversity of the understorey. The significance of this community, in terms of flora conservation, is moderate for the areas dominated by forest red gum and low for areas dominated by black oak.

Paperbark/brush box/swamp oak
This community is present in the south-western part of the study area and is dominated by broad-leaved paperbark (*Melaleuca quinquinerva*) to the east and swamp oak (*Casuarina glauca*) to the west. The eastern part of the community has a greater diversity of trees and shrubs, including forest red gum and flax-leaved paperbark (*Melaleuca linariifolia*), often supporting common silkpod (*Parsonsia straminea*). brush box (*Lophostemon confertus*) occurs along the fringes of the wetter part of the habitat. As noted above, this community has the potential to be indicative of the EEC *Sydney oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner Bioregion*. However, AHA Ecology (2007) concludes, due

to the specific elevation and small number of listed characteristic species the paperbark / brush box / swamp oak community is unlikely to represent a stand of the EEC.

The conservation significance of this community is moderate, based on the presence of species otherwise absent from within the study area, relatively small size of the remnant and general degradation of the groundcover due to stock movement.

Pasture/cleared land
Cleared land to either side of the highway is highly modified from clearing, pasture improvement and grazing. It is dominated by exotic species, including kikuyu (*Pennisetum clandestinum*), pigeon grass (*Setaria* sp.) and fireweed (*Senecio madagascariensis*). Isolated trees or stands of trees have been retained as windbreaks and shade for stock. These are presumed to be remnants of the former vegetation cover and occur on moist soils. The pasture/cleared land community affected by the proposal is located mostly to the east of the southbound carriageway, between the northern limit of the study area and Bullocky Way. The community has low flora conservation significance.

9.6.2 Fauna

Methodology
The fauna investigations included:

- Review of background information and relevant database searches.
- Incidental observations during targeted flora survey.
- Call playback of owl territorial calls.
- Searches of potential shelters, by turning rocks, logs and debris such as sheets of roofing iron.
- Identification of potentially significant habitats such as trees with hollow development.

The fauna survey focused on the identification of habitat features and indirect evidence of significant species.

Fauna description
Thirty-eight species of vertebrate were identified either directly or through evidence such as characteristic skeletal material, scats or scratch marks. The species are listed in Appendix 1 of **Appendix A**. Many of the 27 bird species observed were nectivorous and feeding on the tallowwood blossoms or insectivorous species attracted to insects that were attracted to the blossom.

Most bird species are typical of those found in fragmented rural landscapes, with a few species, for example the yellow robin (*Eopsaltria australis*), common bronze wing (*Phaps chalcoptera*) and Lewin's honeyeater (*Meliphaga lewinii*), observed that are usually associated with larger woodland or forested areas.

Mammal species were not targeted using trapping techniques, due to the spatial constraint of the study area and proximity to the Pacific Highway. Evidence of mammal use in the study area, such as faecal material and foraging, was observed. Characteristic evidence of foraging included that of echidnas, gliders and many digging marks typical of a bandicoot species. Feeding scars were observed on a tree located to the west of the northbound carriageway of the highway, south of the intersection with Possum Brush Road. Two macropod species were observed and a large arboreal antechinus, likely to be the yellow-footed antechinus (*Antechinus flavipes*), were also observed within the study area.

There was little evidence of breeding activity within the study area, with the exception of a likely kookaburra nest site within a termite nest and the remains of a large egg. The egg was found at the base of a tree with a large hollow, located between the north and southbound lanes of the highway, suggesting recent breeding activity. The dimensions and colour of the egg were compared to egg descriptions in Simpson and Day (1999) and Higgins (1999) for large raptors and cockatoo species. The possibility that the egg was from a lace monitor (*Varanus varius*) was also considered. Information regarding lace monitor egg dimensions was sourced from Greer (2004). The conclusion reached was that the egg was most likely that of a powerful owl. The powerful owl is a threatened species protected by the provisions of the TSC Act.

There is very little aquatic habitat within the study area between Possum Brush Road and Failford Road. Stock, including horses and cattle, affect the stock dams and moist habitats within pastures. Overhanging vegetation, rocks and snags, are largely absent from the watercourses with water quality generally poor due to agricultural and grazing practices. All aquatic habitats that were inspected and that permanently contain water have mosquito fish (*Gambusia holbrooki*) present. Mosquito fish are a threat to the green and golden bell frog (NPWS 2003a). Frog species that were observed in all habitats were typical of stock dams or ephemeral drainage lines; however, no green and golden bell frogs were heard or observed.

The most significant habitat, in terms of shelter, is hollows within trees. There are several larger trees that contain hollows and dead trees that are hollow, within the Bullocky Way road reserve. These would provide habitat for many species of arboreal mammal, including insectivorous bat species, possums and gliders. In addition, hollows provide denning opportunity for arboreal snake species and breeding opportunities for many species of parrot and cockatoos.

The shrub understorey and fallen timber has been cleared in most areas for agricultural and fire hazard reduction purposes. This has limited severely the availability of shelter for larger terrestrial reptile and small mammal species. No exfoliated rock habitat or other rocky areas, with the exception of rock exposed by road construction, is present within the study area.

The significance of the communities in terms of fauna conservation varies between low and high within the proposal study area. Areas of low significance include the pasture/cleared land community and landscaping/modified shrublands as they afford few sheltering, nesting or foraging opportunities for native fauna, particularly threatened species. All other areas have moderate conservation significance.

The majority of the grey gum/grey ironbark/white mahogany community, mahogany/ironbark/grey gum/blackbutt community and paperbark/brush box/swamp oak forest red gum/black oak community provide foraging opportunities for nectivorous species, such as honeyeaters, and some foraging value to koalas and other species that browse on eucalyptus foliage. The tallowwood/Sydney blue gum and forest red gum/black oak communities both provide foraging opportunities for sap consuming species, such as the yellow-bellied glider, squirrel glider and sugar glider.

In terms of wildlife movement, woodland remnants with taller trees that occur on either side of the existing carriageways provide dispersal opportunities for glider species such as the yellow-bellied glider, the squirrel glider and the sugar glider. The areas with larger trees also tend to have tree hollows present.

9.6.3 Existing impacts

Activities that have affected the study area include clearing for agriculture, stock agistment, bushfire fuel hazard reduction activities and road construction. Most trees are relatively young and have not developed hollows. The construction of the existing highway has resulted in the clearing of taller vegetation from the roadside and the steep cuttings. Other existing impacts on the area include vehicular movement. The existing road is likely to reduce the ability for species to move through the local area due to the absence of vegetation cover increasing the likelihood of smaller species being killed by larger carnivores, the increased potential for collision with wildlife and alteration of animal behaviour adjacent to roads in the presence of noise, light and movement.

9.6.4 Potential impacts

The removal of approximately 15 hectares of vegetation (comprising approximately 60% native forest and woodland communities and 40% landscaping or modified shrublands) as part of the proposal would also reduce the capacity of the existing environment to remove carbon dioxide from the atmosphere. However, the impact of this activity on ambient air quality is considered to be negligible.

The proposed development would require removal of a strip of vegetation approximately 15 ha in area.

Potential impacts from the proposed road upgrade include the clearing of approximately 15 ha of vegetation (comprising approximately 60% native forest and woodland communities and 40% landscaping or modified shrublands), located mostly east of the existing southbound carriageway between the Failford Road intersection and the Bullocky Way intersection. This would include approximately 7.1 ha of vegetation to the south of the existing southbound carriage to construct the new southbound carriageway between Bullocky Way and Failford Road, and approximately 2.4 ha required to construct the proposed Failford Interchange. Approximately 5.1 ha of additional clearing would be required to connect Bullocky Way with the existing northbound carriageway. Clearing of remnant vegetation would result in the loss of roosting and foraging opportunities for birds and arboreal mammals. Approximately 1 ha of cleared or partially cleared pasture or landscape plantations, in addition to the remnant vegetation, would be removed. This is located mostly east of the existing southbound carriageway, north from the Bullocky Way intersection to 300 m north of the Possum Brush Road intersection. Indirect impacts that may result from the proposal include increased difficulty, particularly for arboreal mammals such as gliders, in traversing the highway after widening. There may be some increase in the potential for collision between wildlife and vehicles as a result of increased vehicle speeds.

There is an increased potential for the spread of weed species through the movement of soil containing seed, stem and root material if areas where weeds are present are not treated prior to earth moving activities. There is also the potential for the spread of plant pathogens, for example *Phytophora* sp. fungi, into the area on equipment used during the construction of the proposed road works. At present there is no evidence within the study area of dieback resulting from *Phytophora* sp. infection.

9.6.5 Threatened and endangered species, populations and communities

No threatened species were identified within the study area during the field surveys. The following tables summarise the threatened species identified as having potential to occur within 10 km of the proposal, excluding species that utilise marine or estuarine habitats. No marine or estuarine habitat will be affected by the proposal.

A detailed assessment of impact has not been prepared for any of the flora species listed in **Table 18**.

Table 18: Threatened flora recorded within 10 km of the study area

Species	Status TSC Act	Status EPBC Act
Asclepiadaceae - Cynanchum elegans	Endangered	Endangered
Casuarinaceae - Allocasuarina defungens	Endangered	Endangered
Casuarinaceae - Allocasuarina simulans	Vulnerable	Vulnerable
Cryptostylis hunteriana (Leafless Toungue Orchid)	Vulnerable	Vulnerable
Fabaceae (Caesalpinioideae) - Senna acclinis	Endangered	
Juncaginaceae - Maundia triglochinoide	Vulnerable	
Myrtaceae - Syzygium paniculatum	Vulnerable	
Rubiaceae - Asperula asthenes	Vulnerable	Vulnerable
Scrophulariaceae - Lindernia alsinoides	Endangered	

A detailed assessment of impact was provided for a number of the fauna species listed in **Table 19** and this can be found in Appendix 3 to the Flora and fauna assessment (**Appendix A**).

Table 19: Threatened fauna recorded within 10 km of the study area

Species	Status TSC Act	Status EPBC Act
Australasian bittern (*Botaurus poiciloptilus*)	Vulnerable	
Glossy black-cockatoo (*Calyptorhynchus lathami*)	Vulnerable	Vulnerable
Wallum froglet (*Crinia tinnula*)	Vulnerable	
Spotted-tailed quoll (*Dasyurus maculatus*)	Vulnerable	Endangered
Black-necked stork (*Ephippiorhynchus asiaticus*)	Endangered	
Sooty oystercatcher (*Haematopus fuliginosus*)	Vulnerable	
Pied oystercatcher (*Haematopus longirostris*)	Vulnerable	
Black bittern (*Ixobrychus flavicollis*)	Vulnerable	
Swift parrot (*Lathamus discolour*)	Endangered	Endangered
Square-tailed kite (*Lophoictinia isura*)	Vulnerable	
Green and gold bell frog (*Litoria aurea*)	Endangered	Vulnerable
Little bentwing-bat (*Miniopterus australis*)	Vulnerable	
Eastern bentwing-bat (*Miniopterus schreibersii oceanensis*)	Vulnerable	
Eastern freetail-bat (*Mormopterus norfolkensis*)	Vulnerable	

Species	Status TSC Act	Status EPBC Act
Large-footed myotis (*Myotis adversus*)	Vulnerable	
Barking owl (*Ninox connivens*)	Vulnerable	
Powerful owl (*Ninox strenua*)	Vulnerable	
Osprey (*Pandion haliaetus*)	Vulnerable	
Yellow-bellied glider (*Petaurus australis*)	Vulnerable	
Squirrel glider (*Petaurus norfolcensis*)	Vulnerable	
Brush-tailed phascogale (*Phascogale tapoatafa*)	Vulnerable	
Koala (*Phascolarctos cinereus*)	Vulnerable	
Grey-headed flying-fox (*Pteropus poliocephalus*)	Vulnerable	Vulnerable
Common blossom-bat (*Syconycteris australis*)	Vulnerable	
Little tern (*Sterna albifrons*)	Endangered	
Grass owl (*Tyto capensis*)	Vulnerable	
Masked owl (*Tyto novaehollandiae*)	Vulnerable	
Sooty owl (*Tyto tenebricosa*)	Vulnerable	

Source: DECC Atlas of NSW Wildlife

No endangered ecological communities were recorded within the study area. No endangered populations listed under Schedule 1, Part 2 of the TSC Act are present within the study area or would be affected by the proposal.

There is no critical habitat declared under the provisions of the TSC Act within the study area.

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44)

The study area is located within the Greater Taree City Council and Great Lakes LGAs, both of which are listed in Schedule 1 of SEPP No.44. The study area also contains tallowwood (*E. microcorys*) and forest red gum (*E. tereticornis*), which are listed in Schedule 2 of SEPP 44 as species that are a known food resource for koalas. As tallowwood and forest red gum constitute more than 15 per cent of the canopy cover, it is considered that potential koala habitat, as defined in SEPP No.44, is present.

Core koala habitat is defined as an area with a resident koala population, including recent sightings, especially where females and young are present. No koalas or evidence of koalas were observed within the study area. There are 49 records within the NSW DECC Atlas of NSW Wildlife within a 20 km x 20 km grid centred on the study area. The nearest recorded locations are approximately 3 km to the south east, 5 km to the north east and 5 km to the south west.

While it is possible that koalas would pass through the site occasionally, it is unlikely there is a resident population due to the proximity of the highway. The study area is therefore not considered to be core koala habitat as defined by clause 4 of SEPP 44. The provisions for the protection of core koala habitat under SEPP No.44 do not therefore require further consideration.

Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act)

Under the EPBC Act, an action requires approval from the Commonwealth Environment Minister if:

- The action has, will have, or is likely to have a significant impact on a matter of national environmental significance (NES); or on Commonwealth Land; and
- The action is not the subject of one of a list of exceptions.

Administrative guidelines of significance have been developed to assist in determining whether an action should be referred to the Minister for the Environment for a decision on whether approval is required.

A search of the EPBC database was also conducted for the area in 2005, and the proposal assessed for the potential to impact upon matters of NES. A referral to the Department of Environment and Water Resources (DEWR) under the EPBC Act was not prepared as it is considered that there would be no significant affect on any migratory species, threatened species, endangered populations, threatened ecological communities or critical habitat protected by the provisions of the EPBC Act.

9.6.6 Key threatening processes

A key threatening process is defined in the TSC Act as a process that:

(a) Adversely affects two or more threatened species, populations or ecological communities; or

(b) Could cause species, populations or ecological communities that are not currently threatened to become threatened.

The proposal would involve the following key threatening processes:

- Clearing of native vegetation.
- Invasion of native plant communities by exotic perennial grasses.
- Removal of dead wood and dead trees.
- Alteration of natural flow regimes through culverts and vegetation clearing.
- Predation by *Gambusia holbrookii.*
- Loss of hollow bearing trees.

In addition the *'Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat)'* is proposed for listing as a key threatening process. While the proposal would not involve the planting of lantana, there is potential for the spread of the species in disturbed areas through the movement of soil containing stem and seed material.

A number of recovery plans are relevant to the project that have the potential to minimise key threatening processes and potential impacts to species identified in the study area. These recovery plans include:

- Large forest owls;
- Yellow-bellied gliders;

- Barking owl (draft);
- Koala (draft); and
- Green and gold bell frog (draft).

A threat abatement plan for the predation by plague minnow has been created to minimise potential impacts of this species. The green and gold bell frog Tadpoles and other native frog species are known to be susceptible to predation by the plague minnow. The recommendations of the plague minnow threat abatement plan would be implemented to minimise the potential impacts to the green and gold bell frog and other susceptible species.

The plan seeks to minimise ongoing human dispersal of gambusia through a program of education and awareness of the risks associated with introducing the species into the environment, particularly habitats of key threatened frog species. In addition, the plan seeks to reduce the impacts of gambusia at sites where control is most critical. The plan proposes to achieve this by undertaking a program of gambusia control at key habitats for high priority threatened frog species.

9.6.7 Safeguards

While it was considered unlikely that there would be a significant impact on threatened species potentially occurring within the study area, the proposed highway upgrade has the potential for affecting the local biodiversity through impeding species movement, increased risk of collision with vehicles and weed invasion. In order to mitigate these impacts, the following measures are proposed:

- Investigate the potential for fauna mitigation measures within the study area. The exact number and nature of the mitigation measures would be subject to further investigation and expert advice, in addition to consultation with DECC and DPI (Fisheries), during the detailed design stage.
- Undertake additional investigations during the detailed design phase to assess the potential use of tree hollows within the study area, and identify potential mitigation measures to implement during construction activities and operation.
- Where possible, commence construction activities, such as vegetation clearing and earthmoving, prior to the time of owl breeding (late autumn to mid-winter), so that owls are less likely to lay eggs in nearby tree hollows, thereby reducing the risk of abandonment of eggs or chicks if adult birds are disturbed.
- Where possible, commence construction activities, such as vegetation clearing and earthmoving, to avoid clearing hollow bearing trees during breeding season of the eastern free-tail bat and other microchiropteran bats
- Develop measures to avoid the importation and transportation of weeds and soil borne pathogens.
- Develop and implement a weed and soil pathogen (including phytophthora) management strategy prior to the commencement of earth earthworks.
- Revegetate using seed sourced from local *Eucalyptus* sp. and shrubs, particularly species that have abundant nectar and pollen.
- Develop a map showing the sensitive areas in and adjacent to the construction site as part of the CEMP.
- Maintain tall trees, subject to road safety requirements, either side of the road to aid fauna road crossing.

- Apply guidelines included in *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterways* (Fairfull and Wetheridge, 2003) when undertaking culvert and drainage works for the project.

9.7 Visual and landscape

9.7.1 Existing environment

The proposal is located in a rural environment, with the main visual feature being the existing northbound and southbound carriageways of the highway. The southern end of the area is more vegetated than the northern end. The vegetation in the area has been disturbed to some extent in the past by road construction and rural development. Large eucalypts tend to dominate the median, road edge and property boundaries and the area is considered to have a moderate level of scenic quality and value.

Views of the proposal site are limited to road users and people in residences in the vicinity of the proposal. Between Failford Road and Bullocky Way views are generally limited by the topography and vegetation within the area. They are more extensive to the north of Bullocky Way because of the broad low-lying floodplain, with reduced tall vegetative cover.

9.7.2 Potential impacts

The assessment of visual impact involves two components:

- Visibility – which is the assessment of the extent to which the various components of the proposal would be visible, the number of people who would see it, the distance from which it is visible and the context of the view.
- Visual prominence – which is an assessment of the degree of contrast (shape, colour, texture, size) between the proposal and the surrounding landscape.

Visibility

The most visible elements of the proposal during construction are likely to be the vehicles and machinery being used in the works and stockpiles. The construction of an overpass at the Failford Road intersection in Stage 1 and an overpass at Bullocky Way in Stage 2 would be the most visible features of the proposal once it is complete. The main viewers of the construction works and of the overpasses would be the motorists travelling along the section of the highway, who would have short-term views as they travel through the area.

The majority of residences are located to the west of the highway and between the southern section of the upgrade and near Bullocky Way. Residences in this area would be reasonably well screened from construction activities and overpasses by vegetation and distance, and would therefore have limited views of the proposal. In the northern section there is less vegetation and some residences would have clear views of the road construction works and the new carriageway at varied distances (between approximately 100 m to 300 m).

Visual Prominence

The site is an existing road corridor and therefore the proposal would not involve a significant change in the type of infrastructure in the area or its visual appearance. The introduction of an interchange in stage 1 and an overbridge in stage 2 and “bi-level” carriageways is likely to increase the visual prominence of the highway, but structures such as the overpasses would be located on cuttings to minimise their visual prominence and would be designed with spill-through batters so as not to restrict forward views.

The proposal would include a landscaping strategy to re-establish vegetation cleared during construction works, supplement the vegetation maintained and reduce the visual impact of the new sections of road upon adjacent properties. The proposal is considered to have a moderate impact on the visual environment but this would be limited primarily to the construction period and immediately after. However, given that the highway is the dominant existing visual feature at present and that measures would be incorporated to reduce impacts to residences and maintain the existing rural characteristics of the area, the impacts are not considered to be significant. **Sections 9.7.3** and **10.1** detail mitigation measures that would be implemented.

9.7.3 Safeguards

The following safeguards are proposed to minimise the visible impacts of the proposal:

- The potential crossing measures would be designed to try and limit the visual impacts of the structures as much as possible.
- Develop a landscape strategy as part of the CEMP for the proposal to include the following measures:
  - landscape disturbed areas with endemic plants.
  - landscape the median and verges with frangible plants.

9.8 Aboriginal heritage

An assessment of Aboriginal heritage was undertaken to assess the nature of any Aboriginal cultural heritage values and archaeological resources within the development area and identify the potential for impact on these resources. The assessment is found in full in **Appendix B** of this REF. The study was undertaken to the standards outlined in the following documents:

- The NSW Department of Environment and Climate Change (formerly National Parks and Wildlife Service) *Aboriginal Cultural Heritage Standards and Guidelines Kit* (1997).
- The DECC *Aboriginal Cultural Heritage and the Integrated Development Assessment Guidelines* (2000).
- The DECC *Interim Community Consultation Requirements for Applicants* (2005).

9.8.1 Aboriginal community consultation

The following steps were undertaken with regard to Aboriginal community consultation for this project:

- Contacted the Northeast Environment Protection and Regulations Division of DECC (Northeast EPRD) for advice on the relevant Aboriginal stakeholders.
- Contacted the Forster Tuncurry Local Aboriginal Land Council (LALC) to identify its interest in the project and any relevant Aboriginal groups.
- Searched the Native Title Tribunal to identify possible Native Title holders.
- Searched the Office of the Registrar of Aboriginal Corporations.
- Through the RTA, advertised in the National Indigenous Times, Koori Mail, Great Lakes Advocate, Manning River Times and Manning-Great Lakes Extra newspapers between the end of September and early November 2005, allowing 10 days for registrations of interest.

A letter was received from Northeast EPRD on 30 August 2005 identifying an additional group in the Great Lakes Area as the Guiwain Elder Group.

A search was undertaken of the AHIMS register for all sites within a 20 km radius on 18 August 2005.This revealed a total of 28 previously recorded archaeological sites within the study area (refer to **Appendix B**). Within the study area approximately 35% (14) of the recorded sites are defined as open camp sites comprising stone artefact scatters, middens or isolated finds. The remaining archaeological site types are recorded as shelter deposits with middens (18% - 7 sites), scar trees (8% - 3 sites), ceremonial sites (5% - 2 sites), stone arrangements (2.5% - 1 site) and one PAD (2.5%).

Within the search area for the proposal, no sites are located within the proposed impact zone with all sites located 700 m or more away.

The Native Title Search revealed no existing claims or land use agreements. However, the search did reveal one unregistered application being undertaken by Mrs Miranda Avery-Slater & Ors. This claim was being undertaken for Nine-mile Beach near Tuncurry which is some distance from the study area. No response was received from the Office of the Registrar of Aboriginal Corporations.

The newspaper advertisements led to a number of registrations of interest, specifically from Edward Moran (Ananawan Gundungarra Elders), Gordon Brown and Deirdre Alley. Each of these individuals, together with the Forster-Tuncurry LALC, was sent the proposed survey methodology for comment in early November 2005.

Following the expiration of the methodology comment period, each of the groups was contacted and advised of the proposed fieldwork dates. Only Forster LALC provided a response to the invitation to attend the fieldwork.

Following the survey, the Aboriginal communities involved in this consultation process were asked formally to provide a statement of cultural significance and a response to the management recommendations outlined in the draft copy of the report sent with the letter.

An initial response (prior to the distribution of this report) was received from Rob Yettica on 13 January 2006. His comments outlined his endorsement of the survey and identified no Aboriginal sites or objects within the study area. Hence, he had no comments to make regarding the cultural significance.

9.8.2 Field survey

Following the compilation of background archaeological, environmental and historical information on the area, an archaeological survey was conducted on 28 and 29 November 2005 by Alan Williams (HLA), Cornelia de Rochefort (HLA), Robert Yettica (Forster Tuncurry LALC) and Robbie Paulson (Forster Tuncurry LALC) to identify the cultural and archaeological sensitivity of the study area.

The proposed development area was split into seven transects and each transect was individually described for potential surface and subsurface archaeology. The start, end and any other relevant features were located with GPS, while multiple photographs were taken of each transect.

Overall the survey covered about 85 ha, which represents some 86% of the proposed development area[2]. Of this, some 11.7% or 11.8 ha had effective coverage. Survey results, summaries of the transects and the survey coverage is detailed in **Appendix B.**

Additional field work was undertaken on 21 June 2006 to assess part of Lot 10 DP 869485 where access from the upgraded highway to this property would need to be provided.

No Aboriginal sites were identified in the study area.

9.8.3 Potential impacts

The majority of the proposed development areas are within 50 m of the existing highway, which has had substantial effects on the surrounding area, most notably the modification of the surface drainage into single channels. Other impacts include the levelling and grading of the road, forming substantial easements and slopes leading to and from the road. In the Failford Road area, substantial clearing and farming has promoted soil erosion and vegetation removal.

The archaeological survey and assessment considered the survey area in terms of low, moderate or high archaeological potential. The assessment was based on three criteria: the presence of known surface archaeological materials, the probability of undetected surface archaeological materials, and the probability of subsurface archaeological materials. In short, the assessment was based on the results of the field survey within the broader framework of the archaeological understanding of site distribution within this region.

The assessment concluded there was a low to nil potential for *in situ* archaeological material to occur in the areas affected by previous development, i.e. roads, services, or buildings or areas where skeletal soils and/or etch surfaces dominate. These areas are considered to be the whole of the study area. No areas were considered to retain moderate or high Aboriginal archaeological significance.

9.8.4 Safeguards

The following safeguards are proposed with regard to Aboriginal heritage:

- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 (as amended), regardless of location. Should any objects be identified during the course of site works, all works would cease within the vicinity of the find and the DECC contacted in regard to appropriate permit requirements before any further impact is undertaken.
- Should **suspected** skeletal material be uncovered during the course of site works, all works would cease and the DECC, the NSW Police and the NSW Coroner's office contacted immediately, **regardless** of any existing DECC permits for the proposal.
- All contractors who work within the confines of the study area would be made aware of the National Parks and Wildlife Act 1974 (as amended) and the fact that it is an offence to move, disturb or destroy Aboriginal objects without the written permission of the Director General of the DECC. Should Aboriginal objects be located outside of the area covered by any S90 permit, or suspected skeletal material found, all works would cease and the DECC contacted immediately.

[2] Broadly, the length of the road sections (3.3 km) multiplied by the average width of the proposed development area (between 100 to 250 metres) provides an area of about 990,000 m^2 (or 99 ha) for the overall proposed development area.

9.9 Non-Aboriginal heritage

An assessment of non-Aboriginal heritage was undertaken to assess the nature of any European archaeological resources within the development area and identify the potential for impact on these resources. The assessment is found in **Appendix B** of this REF. The study was undertaken to the standards outlined in the Heritage Office *Heritage Manual* (1996) Guidelines.

Heritage registers at State and Commonwealth level were searched to ascertain whether known historic sites or landscapes were listed within the study area. The following registers and databases were searched, and the results of the searches are provided:

- Register of the National Estate - A search of the register was conducted for the Great Lakes and Greater Taree LGAs.
  - No heritage items are listed on the register within the proposed development area. Only one heritage item is listed on the register for the wider Nabiac region and this is the Wallamba District Showground on Nabiac Street, Nabiac.
- State Heritage Inventory –
  - The general cemetery adjacent to the Pacific Highway and opposite Failford Road is listed on the inventory**.** This site technically falls outside the study area but, given its close location to the development, may need some consideration during and after construction.
- National Trust Register –
  - No items within the proposed highway corridor are classified or listed on the National Trust Register.
- RTA Section 170 Register –
  - No items within the proposed highway corridor are classified or listed on the Section 170 Register.
- Greater Taree City Council Local Environmental Plan (LEP 1995) –
  - LEP 1995 identifies the general cemetery adjacent to the Pacific Highway and opposite the Failford Road junction. No further information is provided on the cemetery or reasons for its listing. The works are not expected to impact on any listings of the LEP 1995
- Great Lakes Council Local Environmental Plan (LEP 1996) –
  - LEP 1996 identifies a dwelling, known as the Old Brock House, located on the corner of Failford Road and Bullocky Way of local and regional significance.
  - It also identifies the general cemetery adjacent to the Pacific Highway and opposite the Failford Road junction.
  - Failford House on Failford Road and the former Failford School, including Buffalo Lodge, are two newly identified items in the Great Lakes Council Heritage Study (2004) recommended for entry onto the State Heritage Register. Neither of these sites is located within the proposed development area. The works are not expected to impact on any listings of the LEP 1996

9.9.1 Field survey

Following the compilation of background archaeological, environmental and historical information on the area, an archaeological survey was conducted on 28 and 29 November 2005 to identify the archaeological sensitivity of the study area. The survey covered approximately 85 ha and the area was split into transects as detailed in **Section 9.8.2** above.

Additional field work was undertaken on 21 June 2006 to part of Lot 10 DP 869485 where access from the upgraded highway to this property would need to be provided.

Survey results, summaries of the transects and the survey coverage is detailed in **Appendix B.** One historical site, the Failford Road Scarred Tree, was identified as part of this study and its location is shown in **Figure 4** of **Appendix B**. This site is to the south of Failford Road and opposite Carefree Road. The Failford Road Scarred Tree consists of the remains of a Eucalypt with switchboard/axe grooves to one side. These features clearly relate to logging activities in the region, but it is impossible to determine the date of the grooves and hence the site is considered to have little significance but high archaeological potential because of its age.

A dead tree that retains a number of springboard or axe notches was found in the south western corner of the study area opposite Carefree Road near Nabiac (444795E, 6449957N). The tree, in poor condition, is in the very southwest corner of the study area. Current road construction in the area and future development are not anticipated to affect this tree.

9.9.2 Potential impacts

The majority of the proposed development areas are within 50 m of the existing highway, which has had substantial effects on the surrounding area, most notably the modification of the surface drainage into single channels. Other impacts include the levelling and grading of the road, forming substantial easements and slopes leading to and from the road. In the Failford Road area, substantial clearing and farming has promoted soil erosion and vegetation removal.

An assessment of historical significance was undertaken in order to determine the significance of the particular site and to enable the appropriate site management strategies to be determined. Cultural significance is defined in the *Australian ICOMOS Charter for the Conservation of Places of Cultural Significance* (the *Burra Charter*) as *'aesthetic, historic, scientific or social value for past, present or future generations'* (Article 1.1).

The historic site identified as part of the archaeological assessment, while of technological significance, was considered to reveal little about the activities and culture of the area. Switchboard grooves identified in the tree stump reveal a particular logging technique common to the late 19th Century. These features are common across NSW and simply indicate that logging occurred in the study area, information which was previously known. This item was not considered to be able to provide additional information on the cultural heritage of the area.

The Failford Road Scarred Tree has been identified as being of local significance, since it is considered a historical relic, and as such is protected under the *Heritage Act 1977.* For this reason, the Failford Road Scarred Tree was delineated as a zone of high archaeological potential. Based on visual observations and GPS co-ordinates, it seems unlikely that the Failford Road Scarred Tree would be affected by the proposed development footprint. Hence, no further action is proposed in relation to this site.

Proposals for further actions to be taken in relation to historic sites are found in **Section 9.9.3**.

9.9.3 Safeguards

The following safeguards are proposed with regard to non-Aboriginal heritage:

- Historical relics are protected under the *Heritage Act 1977*, regardless of location. Should any relics be identified during the course of site works, all works would cease in the vicinity of the find, and the NSW Heritage Office contacted in regard to appropriate permit requirements before any further impact is undertaken.
- Should the Failford Road Scarred Tree likely to be affected or destroyed through the proposed development, the NSW Heritage Office would be notified regarding a determination as to whether the intended impact falls under an existing exemption or requires a Section 139 permit. Regardless of the NSW Heritage Office's decision, the preservation and archival recording of Failford Road Scarred Tree would be undertaken. Some of the preservation measures that may be used during construction should they be required would include:
  - webbing around the tree to restrict access.
  - education of personnel and works crew member of the location of the tree.
  - monitoring of activities in the location of the tree.

9.10 Socio-economic consideration

9.10.1 Existing environment

The population within the area generally resides on original farm properties. A number of properties in the locality graze cattle or horses and there is also hobby farming in the north, near Possum Brush Road. To the east of the area are relatively new rural residential subdivisions made up of large housing lots, known as the Highland Estate. The closest lot in this estate is approximately 210 m from the proposed new edge of the highway. These subdivisions gain access to the highway via Bullocky Way and Failford Road. Four residences are located adjacent to the eastern side of the section of the highway and ten residences are located adjacent to the western side. Failford Cemetery would have social significance for many of the families in the area and it also has historic significance. Within the cemetery there are commemorative markers for two local servicemen whose graves are located in war cemeteries in France[3].

The nearest major town is Taree with a population of 16,200 (2001 census) and the nearest small town is Nabiac, approximately 4.5 km south, with a population of approximately 570 (2001 census). The population growth in both these towns has been approximately 6% since 1991 (RTA, 2005b). Failford is considered as a part of the broader Nabiac-Failford-Darawank community and consists of mostly rural and residential properties with no true town centre.

The Pacific Highway is the principal transport corridor connecting Sydney to Brisbane along the NSW coastline. This section of the highway provides for both interstate traffic and a mix of regional and local traffic. There is one regional road (Failford Road) and three local roads (Bullocky Way, Possum Brush Road and Tritton Road) which form intersections with the highway in the area.

[3] Reference: http://www.warmemorialsnsw.asn.au/Details.cfm?MemNo=200)

Busways currently operates a public bus service in the Great Lakes region with routes to Newcastle and Sydney. Buses for this service travel on the highway through the proposal area but do not stop within the area. Busways also operates a school bus service in the morning and afternoon during school terms. School buses stop between Bullocky Way and Tritton Road on the southbound carriageway and between Failford Road and Bullocky Way on the northbound carriageway. Private coach services also pass through the section en route north and south, and vice versa, but it is unlikely that they would stop within this section.

The existing northbound carriageway on the highway is on a winding and undulating alignment with a narrow outside shoulder. The existing road is considered unsuitable for bicycle use.

9.10.2 Potential impacts

Construction

The construction of the proposal would potentially have impacts on the following social and economic aspects of the area:

- Land use.
- Amenity.
- Properties.
- Access.
- Employment opportunities.

In the short term, during construction the amenity of the area would be affected by increases in construction traffic, dust and noise. These issues have been addressed in **Sections 8.9**, **9.3** and **9.5** and measures such as the implementation of a traffic management plan, noise and vibration management plan and an air quality management plan would be undertaken to minimise these short-term impacts.

Two properties have been acquired as part of the project including, one house, located adjacent to the southern carriageway, and another house in St Peters Close, currently used as a trucking depot (refer to **Section 8.10**). The location of the property to be acquired is shown in **Figure 4.** The proposal would also require the acquisition of approximately 7.5 hectares of land along the eastern side of the road corridor for the new carriageway and approximately 2.5 hectares of land for the Failford interchange. All property acquisition would be negotiated in accordance with the RTA's *Land Acquisition Policy* and compensation would be in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.

No impact on the existing land use practices, such as existing agricultural practices or the use of Failford Cemetery, is expected as a result of the proposal. The acquisition of land would have a negligible impact to the existing uses and would not result in the reduction of land capabilities. Much of the land to be acquired is scrub land and is not capable of agricultural use.

Access to some properties may be affected during construction. Access arrangements would be negotiated with land owners and a traffic management plan would be prepared and implemented to manage traffic during construction.

The construction of the proposal would also provide positive economic benefits by providing employment opportunities and business for suppliers in the local region.

An economic analysis for the proposal, prepared in accordance with the RTA's *Economic Analysis Manual, 1999,* was carried out for various funding scenarios by RoadNet in its traffic study (provided in **Appendix E**) for the upgrade. The objective of the economic analysis was to

generate an economic model for the work that provided a strategic benefit/cost ratio to give an indication of the economic viability of the work. Both stage 1 and stage 2 have a benefit cost ratio greater than one.

Operation

The operation of the new road would provide a number of positive social and economic impacts for the local area, region and State, both by itself and cumulatively with other improvements under the Pacific Highway Upgrade Program. By improving the quality of this section of the hghway, a reduction in the number of accidents and a reduction in travel time along the highway are expected. This will therefore benefit the thousands of motorists who use the highway each year. The improved LOS on the road would also provide economic benefits to heavy vehicles and trucking companies using the highway. Estimates indicate that the upgraded northbound carriageway would represent a travel time saving of 30 seconds per vehicle and the upgraded southbound carriageway would offer travel time savings of 6 seconds per vehicle (RoadNet, 2005).

The new carriageway would provide greater capacity for cyclist use than the existing northbound carriageway. It would be designed to allow cyclists to travel safely along the road by way of a 2.5 m wide sealed shoulder. The detailed design would avoid squeeze points (for example at drainage structures or bridges) unless suitable alternative arrangements can be made for cyclists.

The Failford Road overpass would be designed to provide safe pedestrian and cycle access between west and east. The service roads would connect the surrounding areas to the overpass. The service roads and interchange at Failford Road would also enhance the ability for social interaction between residents in the area, as they would not need to travel on the highway to access other properties in the area. The interchange would also provide safer transport for local residents by car, bicycle or on foot. Service roads would carry little traffic and would be suitable for bicycle use. Pedestrian activity along the roads is currently low and is not expected to increase significantly. The proposal would, however, provide shoulders of between two and three metres to allow for pedestrian movement. Equestrians are not expected to use this section of highway into the future and no special facilities are proposed for equestrians.

Forster Bus and Coach Service operates a regional bus service between Coomba Park and Gloucester via Forster and Failford Road. This route will benefit from safer access to and from the highway via Failford Road interchange, but will otherwise be unaltered. Forster Bus and Coach Service also operate a number of school buses between Nabiac and Forster via Failford Road and Bullocky Way (routes 6, 7 & 8). These routes will benefit from safer access to and from the highway via Failford Road interchange, but will otherwise be unaltered.

Great Lakes Coaches operate buses in the area, servicing Bulahdelah, Taree, Forster and Nabiac. In general, buses access the highway at Failford Road, but some turn north onto the highway from Bullocky Way. While the closure of the Bullocky Way / Pacific Highway intersection will require some alteration to these routes, they will benefit from safer access to and from the highway via Failford Road interchange

9.10.3 Safeguards

The following measures are proposed to minimise potential social and economic impacts as a result of the proposal:

- Develop a traffic management plan and traffic control plans as part of the CEMP for the proposal in accordance with RTA standard procedures.

- All property acquisition would be negotiated in accordance with the RTA's *Land Acquisition Policy* and compensation would be in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.
- Community consultation would be continued throughout the development of the detailed design and construction to provide updated information on the proposal and to consider any relevant issued raised.

9.11 Waste minimisation and management

Waste generated during the construction works would include general construction waste such as concrete, rock, gravel, road base, waste oil, vegetation, general food and litter waste from construction workforce. Rubbish and recycling bins with lockable lids would be provided at site compounds. Where possible, waste materials would be sorted for recycling, reuse or disposal and transported off site to licensed facilities.

Trees required to be removed would be assessed for their value as millable timber and provided to timber mills as appropriate. Other vegetation would be chipped and used as mulch for revegetation works or made available as firewood. Weed species would not be used for mulch.

Waste management measures to be implemented are detailed in **Section 10.1**.

Safeguards
The following safeguards are recommended to minimise and manage waste:

- Develop a waste management plan as part of the CEMP for the proposal in accordance with RTA's Waste Minimisation and Management Guidelines and the *Principles of the Waste Avoidance and Resource Recovery Act, 2001*. The plan would include:
  - Consideration of the use of recycled products in the road construction during detailed design.
  - Provision of rubbish and recycling bins with lockable lids at site compounds.
  - Assessment of trees required to be removed for their value as millable timber and provide to timber mills as appropriate.
  - Chipping or cutting vegetation for use as mulch for revegetation works or for firewood. Do not use weed species for mulch.
  - Covering waste materials when they are transported to landfills or waste management facilities.
  - No waste to be buried on site, unless approved and suitable for its future use.
  - No dumping of waste in or near waterways.
  - At source separation of waste for recycling where practical.
  - Crushing and reusing hard, inert construction or demolition waste on site where possible.
  - Re-use of excavated soil on site where possible.
  - If portable toilets are to be used on site, they would be pumped out by a licensed waste contractor on a regular basis.

9.12 Demand on resources

Resources required for the construction works would include:

- Fill.
- Base and sub-base material.
- Pavement.
- Fuel.
- Oil.
- Cement.
- Sand.
- Workforce.

Resources required for the proposal are not considered to be in limited supply in the area. Three quarries, located close to the site, would be able to provide a local source of general fill and pavement material.

9.13 Associated infrastructure and activities

The types of infrastructure and activities that may be required in association with the proposal include additional borrow pit areas, stockpile and compound sites and utility installations, (**Section 8.8** to **Section 7.12** of this REF). Sites for ancillary infrastructure and activities are to be finalised during the detailed project development stage and would be subject to their own environmental impact assessment as required, through consultation with the RTA. However, the potential impacts from ancillary infrastructure and activities may include:

- Erosion – exposed surfaces, clearing, excavation, stockpiling.
- Impacts to surface water quality – sedimentation runoff, spills.
- Noise emissions – machinery, excavation, clearing.
- Dust – exposed surfaces, stockpiling, clearing.
- Waste generation – putrescible waste, additional material, vegetation.

Safeguard measures such as those detailed in other relevant sections of this REF and **Section 10.1** would be detailed in further impact assessments undertaken for the infrastructure / activities required in association with this project. In general, activities would be undertaken in accordance with erosion and sedimentation controls outlined in this REF as well as relevant RTA guidelines such as stockpile management, Environmental Noise Management Manual (ENMM) practise note 7, the waste avoidance and resource recovery principles and best management practices.

Specific safeguards relevant to the additional activities would be detailed in subsequent impact assessments.

9.14 Hazards and risks

This section identifies hazards that may arise from the construction and operation of the proposal. Hazards and risks have the potential to impact upon human health and safety and the natural and built environment.

The Pacific Highway had the highest fatality rate among major Australian highways. The Pacific Highway Upgrade Program, which includes this proposal, aims to:

- Significantly reduce road accidents and injuries.
- Reduce travel times.
- Reduce freight transport costs.
- Develop a route that involves the community and considers their 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.

A qualitative assessment has been undertaken to examine the risks associated with accidents involving hazardous goods during construction and once the proposal is operational, and the risk of accidents affecting the public during construction and operation.

9.14.1 Construction

The potential risks and hazards involved in the construction of the proposal relate to:

- Spillage of dangerous or hazardous materials or wastes, by way of leakages of stored materials or by vehicle or machinery accidents.
- Traffic accidents at construction access points.
- Contact with underground utilities.
- Uncovering of unidentified heritage items / skeletal remains.
- Workplace incidents / accidents.
- Bushfire.
- Flooding.

Materials to be used during construction would be determined by the final design of the proposal and by the construction contractor, however, dangerous or hazardous materials that are likely to be used may include those detailed in **Table 20**.

Table 20: Dangerous and hazardous materials likely to be used during construction

Dangerous goods	Hazardous materials
Distillate fuel	Cement
Petrol	Paints
Oils, grease and lubricants	Epoxies
Gases (such as oxygen and acetylene)	Solvents and thinners
Bitumen	Lime

These hazards and risks would be managed by the implementation of appropriate management procedures and controls. Construction work would be undertaken by a contractor and the potential for hazards and risks would be managed by the contractor in accordance with its environmental management system and CEMP that would contain procedures for the management of risks and hazards.

The contractor would be required to have a quality system that contains mechanisms for handling and storage of hazardous materials and for monitoring procedures to ensure compliance. Measures would include those outlined in **Section 10.1**. There would be no significant potential for dangerous goods or wastes likely to be involved in construction to affect the public or workforce if handled in accordance with good practice and regulatory requirements.

Traffic management measures would be required to control traffic and minimise the risk of accidents both on site and with public road users. The contractor would be required to prepare and have approved traffic management plan and traffic control plans for specific parts of the sites. These plans would include appropriate traffic control measures at the main access points from the construction areas to the existing highway.

9.14.2 Operation

The potential risks and hazards involved in the operation of the proposal relate to:

- Environmental risks such as:
  - Contaminants from normal operation of the highway carried by surface runoff.
  - Spills and leaks of dangerous of hazardous materials from vehicles.
- Risks to human health and safety such as:
  - Accidents affecting road users.
  - Accidents involving dangerous goods affecting road users and adjacent residents.

Environmental risks

A number of contaminants may be mobilised by surface runoff during normal operation of the highway; these may include litter or other waste and exhaust, discharges or wear products from vehicles. Measures to treat or mitigate these contaminants are discussed in **Section 9.4.3** of this REF.

Risks associated with dangerous goods or hazardous materials

The highway is the primary north-south route for trucks transporting dangerous goods. The most common dangerous goods that are transported on the highway are flammable and combustible liquids, liquefied petroleum gases, flammable gases, toxic materials and reactive materials.

Heavy vehicles account for approximately 20% of the total traffic on the highway (10% light commercial and 10% heavy commercial) and only a small percentage of these would carry dangerous goods. Previous research has found that the percentage of all heavy vehicles carrying dangerous goods in NSW is 1.15% (RoadNet, 2005). Therefore the likelihood of an incident involving dangerous goods is considered to be small. In addition, the resulting improvement in the quality of this section of the highway once the proposal is operational would also further reduce the likelihood of an incident. Vehicles carrying dangerous goods are required to comply with the provisions of the *Dangerous Goods Act 1997*.

Should an incident occur on this section of the highway, fire stations are located at Taree and Forster-Tuncurry. The NSW Fire Brigade is responsible for managing chemical and fuel spills and the DECC is responsible for offering advice on containment and cleanup. The RTA has existing procedures for assisting these authorities in the management and cleanup of such incidents.

Although 17 intermittent drainage lines and unnamed creeks occur along the length of the proposal, the section of highway does not pass through environmentally sensitive land (rivers, wetlands etc.) so any spillages would be likely to have only a relatively minor impact on natural ecosystems which can readily be managed through mitigation and rehabilitation. Measures to mitigate the spillage of dangerous goods and contaminants associated with runoff have been incorporated into the concept design of the proposal. These measures include the containment of spillage to minimise the risk of contaminants spreading and the inclusion of sediment basins which would capture contaminants as runoff occurs, and would be capable of containing emergency spillage.

In the event of an incident, traffic would be diverted and traffic flow maintained with only minor inconvenience on road users due to flexible traffic arrangements available with dual carriageways.

Risks to human health and safety

The proposal would result in the construction of a new high standard dual carriageway that would provide a safer transport corridor than the existing, winding northbound carriageway. Therefore the incidence of vehicle accidents is expected to reduce as a result of the proposal. Notwithstanding this, vehicle accidents may still occur and therefore the detailed design of the proposal would include the provision of turning bays and widened shoulders to allow space for vehicles to stand clear of passing traffic (RoadNet 2005).

Risks that could affect local residents are likely to be accidents involving dangerous goods or hazardous materials, which have been discussed above.

9.14.3 Safeguards

The following safeguards are proposed to minimise hazards and risks:

- Develop a traffic management plan or traffic control plan(s) as part of the CEMP for the proposal to include procedures to manage vehicle accidents and emergencies.
- Engage appropriately licensed contractors to transport waste materials, and ensure transport in accordance with relevant guidelines and standards.
- Induct all site personnel and inform them of site environmental requirements, liabilities and responsibilities.

9.15 Cumulative environmental effects

Cumulative impacts can result from a number of different elements within a project as well as from a number of different projects with interacting impacts in the same locality. Cumulative impact assessment requires an assessment of the combined effects of a proposal with the effects of other activities in the region or beyond. These combined effects may be associated with:

- The impact of multiple construction projects undertaken at the same time, including impacts on traffic and road users and construction fatigue for road users and residents of the region.
- Social and economic effects, including impacts on employment and businesses.
- Amenity impacts including noise and vibration, visual quality and air quality.
- Environmental changes including effects on water quality, hydrology, biodiversity, land use and landscape values.
- Transport, including mode of transport, accessibility and traffic.

The draft *Pacific Highway Upgrading Program Strategic Assessment* (Sinclair Knight Merz 2000) concluded that cumulative or strategic assessment was limited at a project level due to the wide scope and to the limited availability of regional baseline information. The cumulative impacts of the proposal have been considered in terms of other components of the Pacific Highway Upgrade Program.

9.15.1 Cumulative impacts with other projects

The proposal is not being undertaken in isolation as it is part of the Pacific Highway Upgrading Program. The Pacific Highway Upgrade Program is an ongoing program to improve the standard of the highway between Hexham and the Queensland border mainly through the construction of dual carriageway. Past and proposed projects identified under the Pacific Highway Upgrade Program (NSW Roads and Traffic Authority 1997) are shown on the RTA website (www.rta.nsw.gov.au)

The components of the Pacific Highway Upgrade Program that are considered to be contributors to potential cumulative construction impacts with the proposal comprise those that would be under construction at the same time as the proposal. However, as several of these are still in the development or approval phases it is difficult to determine timing with any certainty. As such, consideration has been given to those currently under construction, these include:

- Karuah to Bulahdelah – Stage 2 and 3.
- Bonville upgrade
- Tugun Bypass

The individual components of the Pacific Highway Upgrade Program that are still under development that would be located the closest to the proposal comprise:

- Coopernook to Herons Creek upgrade, incorporating the Coopernook to Moorland and Moorland to Herons Creek projects.
- Herons Creek to Stills Road upgrade.
- Bulahdelah upgrade.
- Kempsey to Eungai upgrade.

The construction of these projects may coincide or overlap with the construction of the Failford Road to Tritton Road Pacific Highway Upgrade. Cumulative construction impacts would relate to the concept of construction fatigue for residents of the region and for users of the Pacific Highway. Impacts would include traffic delays, including increased travel time, and amenity impacts such as noise, air quality and visual impacts.

The cumulative impacts of the proposal in the context of the entire Pacific Highway Upgrade include significant positive strategic benefits. These benefits would relate predominantly to:

- Increased infrastructure handling capacity and efficiency.
- Improved safety on the Pacific Highway, through the provision of motorway standard dual carriageway road, and grade separated interchanges to provide safe access to the adjacent local roads.
- Travel time savings would also benefit local and regional businesses.
- Improved accessibility to local and regional centres and between Sydney/Newcastle and Brisbane, resulting in improved freight efficiency and reliability on a nationally strategic freight corridor.

In addition, the proposal would contribute to the increased attractiveness of the Pacific Highway as a whole, encouraging motor vehicle use and possible shifts from other routes (eg. the New England Highway) and modes (eg. Rail). The project would cater for and contribute to urban growth of the north coast of NSW.

Negative impacts of the proposal, would include:

- Loss of low quality vegetated land and potential fauna habitat that does not include any vegetation communities listed on the *Threatened Species Conservation Act*.
- Changes to property access.

These impacts would be substantially offset by the identified strategic benefits and the implementation of the mitigation and management measures detailed in this REF. The completion of the proposal would improve the consistency of road standard on the Pacific Highway, one of the key objectives of the Pacific Highway Upgrade Program.

9.15.2 Cumulative impacts from the proposal

The principles of Ecologically Sustainable Development (ESD) have been applied to the proposal. This includes consideration of the cumulative impacts of the proposal. The potential impacts of the proposal on the biophysical, social and economic environment have been assessed and addressed in this REF. The potential impacts of the proposal on their own are not considered to result in substantial cumulative impacts, nor are their any relationships between the impacts that are considered to result in substantial cumulative impacts.

9.16 Principles of ecologically sustainable development

The Principles of ESD have been considered throughout the development of the proposal in the concept design and development of safeguards, and will continue to be considered in the detailed design and management of the proposal. These principles, and how they have been considered, are outlined below.

The Precautionary Principle – *that is to say, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

The Precautionary Principle has been applied throughout the development of this route alignment option. The proposal, together with the implementation of appropriate safeguard measures, does not present a significant risk of serious or irreversible environmental damage.

Intergenerational equity – *that is to say, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.*

The proposal would benefit future generations by improving access to areas on the NSW coast and improving road safety. The proposal is consistent with long-term planning aims and would help to benefit the productivity of the region in the future. The decision on the proposed alignment was made with the consideration of the local community and other stakeholders in order to ensure a satisfactory outcome was made for both the present and future generations.

Conservation of biological diversity and ecological integrity – *that is, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*

Biological diversity and ecological integrity have been considered in this REF in the form of a detailed flora and fauna impact assessment. This assessment found that the proposal could be undertaken without significant impacts upon the ecological environment. Reduction of impacts on biological areas has been a consideration in the development of the proposal. Safeguards have been included in the proposal to assist in the conservation of biological diversity and ecological integrity.

Improved valuation and pricing of environmental resources – *that is to say, that environmental factors should be included in the valuation of assets and services, such as polluter pays, full life cycle costing, and utilising incentive structures/market mechanisms to meet environmental goals.*

By managing environmental impacts by identifying site specific safeguard measures to mitigate against adverse environmental effects and including the cost of these measures in the overall cost of the proposal, the value of environmental resources has been considered as part of the proposal.

The proposed alignment for the upgrade was chosen not only on cost but also on a consideration of environmental and biological factors as well as engineering, social and economic aspects.

10 IMPLEMENTATION STAGE

10.1 Environmental management

The safeguards proposed in this REF would be included in the detailed design of the proposal and in the CEMP. The CEMP would provide a guide and tool for the management of the construction activities and would be a dynamic document that would be regularly updated and reviewed and audited as the proposal advances. The CEMP would also include safeguards developed in the detailed design stage and any conditions issued in the determination of the proposal.

The CEMP would incorporate a number of sub-plans for the management of particular environmental issues. These would be:

- Soil and water management plan in accordance with the *RTA QA Specification G38 Soil and Water Management* and *Managing Urban Stormwater Soils and Construction Vol. 1 4th Ed* (March 2004), commonly called the blue book.
- A construction air quality management plan.
- A traffic management plan and traffic control plans to manage traffic arrangements during the construction works.
- A landscape strategy which would detail requirements to revegetate areas of the road corridor following construction of the upgrade and would provide measures to manage weeds in the road corridor.
- A noise and vibration management plan.
- A waste management plan.

10.2 Summary of proposed safeguards

Environmental safeguards outlined in this document and listed in **Table 21** would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal. These safeguards would minimise any potential adverse impacts on the surrounding environment arising from the proposed works. All safeguards described in this REF and the decision report/conditions of approval would be incorporated into the Construction Environmental Management Plan (CEMP). The CEMP would be developed in accordance with the specifications set out in the RTA's *QA Specification G36 – Environmental Protection (Management Plan)*. In common with other Pacific Highway projects, a database of all proposed commitments would be prepared and monitored in construction and operation.

Table 21: Proposed safeguards

Issue	Safeguard	Implementation phase
Landforms, geology and soils	Undertake a geological investigation in conjunction with the bridge foundation investigation, to provide a more accurate indication of earthworks and the method of construction required.	Pre-construction
Landforms, geology and soils	Undertake additional targeted geotechnical investigations to identify any areas potentially containing acid rocks during detailed design stage.	Pre-construction
Landforms, geology and soils	Develop a soil and water management plan as part of the CEMP for the proposal. The soil and water management plan would include: • Appropriate erosion and sediment control measures to be implemented prior to and during earthworks. The control measures should include erosion and sediment controls, sediment basins, exclusion zones, diversion bunds, catch drains, energy dissipaters, sediment traps etc. • Use revegetation measures, such as hydromulching, to minimise potential for erosion of exposed surfaces and batters. • Undertaking revegetation as soon as practicable after the disturbance. • Requirements for routine inspection and testing to ensure that controls and procedures are effective. • Minimising the extent of clearing where possible to minimise erosion potential. • Staging of clearing where possible. • Maintaining vegetation in drainage lines until latest possible time to reduce erosion risk and retain filtering capacity.	Pre-construction Construction
Landforms, geology and soils	Maintain plant and equipment used on site in good order to ensure potential for leaks and spills is minimised.	Construction
Landforms, geology and soils	Maintain spill kits on site to manage spills of fuel or oils.	Construction
Landforms, geology and soils	Store fuel or oil in bunded areas able to contain 110% of the maximum capacity of the largest storage tank or container.	Construction
Landforms, geology and soils	If contaminated or potentially contaminated material is exposed during earthworks then work in the area should cease and a qualified consultant engaged to investigate the extent of contamination and recommend measures to dispose of contaminated material.	Construction

Issue	Safeguard	Implementation phase
Climate and air quality	Preparation of a construction air quality management plan as part of the CEMP for the proposal. This management plan would include mitigation measures to: • Identify potential sources of dust • Ensure all machinery and equipment operated on site is well maintained and operated in a proper and efficient manner • Minimise the amount of exposed surfaces on site • Implement during weather conditions where high level dust episodes are probable (such as strong winds in dry weather).	Pre-construction Construction
Water quality	Develop a soil and water management plan as part of the CEMP for the proposal. The soil and water management plan would include: • Development of a drainage strategy for the proposal, incorporating water sensitive road design techniques such as grass swales, sediment basins and pollution ponds where required. • Provision of a bunded area for washing plant and equipment with appropriate collection and treatment systems. • Inspection and maintenance of erosion and sediment control measures on a weekly basis and immediately following rainfall events. • Conducting wash down and refuelling activities and activities involving other potentially hazardous materials in areas isolated from stormwater and/or drainage lines and in accordance with best management practices.	Pre-construction Construction

Issue	Safeguard	Implementation phase
Water quality	Water within the drainage line located approximately 1 km north of the intersection of Failford Road and the Pacific Highway would be tested for pH. Should the presence of acid water be confirmed (pH values of less than 6.5), management strategies would be developed with consideration to the RTA's *Guidelines for the Management of Acid Sulfate Materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze* (RTA 2005e). The management strategies would aim to minimise the disturbance of the acid water, decrease the risk of downstream impacts and provide long-term protection to culvert structures required for crossing the drainage line.	Pre-construction
Water quality	Stockpiles and ancillary equipment would be removed from the identified floodplain areas (northern section of the proposal site in the vicinity of Bungwahl Creek and Wallamba River) during a flood event or high potential of a flood event to minimise the potential for materials to enter the creek system.	Pre-construction Construction
Noise and vibration	Develop a noise and vibration management plan as part of the CEMP for the proposal adopting best management practices consistent with the RTA's Environmental Noise Management Manual. Measures would include the following: • Establish close liaison with potentially affected receivers as soon as possible and provide a contact name and phone number for a project representative to which any questions or complaints can be directed. • Investigate the type and effectiveness of architectural modifications for residences 19 and 32 in order to reduce potential future traffic noise impacts. This assessment would require detailed analysis of the existing construction and internal layout of each residence. • Undertake compliance monitoring of noise or vibration levels in areas where piling may occur within 50 m of any residence. • Undertake pre-construction surveys of heritage buildings or vibration sensitive structures occurring within 50 m of proposed driven piling works if required. • Monitor vibration from construction machinery that is to be operated within 15 m of an existing building.	Pre-construction Construction Post-construction Operation

Issue	Safeguard	Implementation phase
	• Where construction machinery is to be operated within 15 m of an existing building, undertake a building condition survey • Inform all personnel of their obligations and responsibilities with regard to minimising noise emissions. • Schedule excessively noisy activities such as blasting or rock hammering, to occur at times to cause least annoyance to the community. • Conduct regular maintenance on all equipment. • Employ noise suppression devices for all mechanical plant • Employ contractors and equipment that are best suited to the required task (i.e. construction personnel, specialist staff, etc) • Shut down or throttle down to a minimum machines that are used intermittently. • Investigate the use of smart reversing alarms • Any portable equipment used should incorporate noise controls.	
Noise and vibration	• Locate portable equipment in locations where topography or site sheds etc. provide barriers between the equipment and nearest potentially affected residences. • Locate batching plants as far from any residences as is practicable. • Undertaken detailed noise impact assessment of final location and design of batching plants.	Pre-construction Construction Post-construction Operation
Biodiversity	Investigate the potential for fauna mitigation measures within the study area. The exact number and nature of the mitigation measures would be subject to further investigation and expert advice, in addition to consultation with DECC, during the detailed design stage	Construction
Biodiversity	Undertake additional investigations during the detailed design phase to assess the potential use of tree hollows within the study area, and identify potential mitigation measures to implement during construction activities and operation.	Pre-construction

Issue	Safeguard	Implementation phase
Biodiversity	Where possible, commence construction activities, such as vegetation clearing and earthmoving, prior to the time of owl breeding (late autumn to mid-winter), so that owls are less likely to lay eggs in nearby tree hollows, thereby reducing the risk of abandonment of eggs or chicks if adult birds are disturbed.	Construction
Biodiversity	Develop measures to avoid the importation and transportation of weeds and soil borne pathogens.	Construction
Biodiversity	Revegetate using seed sourced from local Eucalyptus sp. and shrubs, particularly species that have abundant nectar and pollen.	Post-construction
Biodiversity	Maintain tall trees, subject to road safety requirements, either side of the road to aid fauna road crossing.	Construction
Biodiversity	Develop and implement a weed and soil pathogen (including Phytophthora) management strategy prior to the commencement of earth works.	Pre-construction Construction
Biodiversity	Apply guidelines included in *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterways* (Fairfull and Wetheridge, 2003) when undertaking culvert and drainage works for the project.	Pre-construction Construction
Visual/landscape	Develop a landscape strategy as part of the CEMP for the proposal to include the following measures: • Landscape disturbed areas with endemic plants. • Landscape the median and verges with frangible plants.	Pre-construction Post-construction
Aboriginal heritage	Aboriginal objects are protected under the NPW Act (as amended), regardless of location. Should any objects be identified during the course of site works, all works would cease within the vicinity of the find and the DECC (Northeastern Branch, EPRD, Regional Archaeologist) contacted in regard to appropriate permit requirements before any further impact is undertaken	Construction
Aboriginal heritage	All contractors who work within the confines of the study area would be made aware of the NPW Act 1974 (as amended) and the fact that it is an offence to move, disturb or destroy Aboriginal objects without the written permission of the Director General of the DECC. Should Aboriginal objects be located outside of the area covered by any S90 permit, or suspected skeletal material found, all works would cease and the DECC Regional archaeologist for Northeastern Branch, EPRD contacted immediately.	Construction

Issue	Safeguard	Implementation phase
Aboriginal heritage	Should **suspected** skeletal material be uncovered during the course of site works, all works would cease and the DECC, the NSW Police and the NSW Coroner's office contacted immediately, **regardless** of any existing DECC permits for the proposal.	Construction
Non-Aboriginal heritage	Historical relics are protected under the *Heritage Act 1977*, regardless of location. Should any relics be identified during the course of site works, all works would cease in the vicinity of the find, and the NSW Heritage Office contacted in regard to appropriate permit requirements before any further impact is undertaken.	Construction
Non-Aboriginal heritage	Based on visual observations and GPS co-ordinates, it seems unlikely that the Failford Scarred Tree would be affected by the proposed development footprint. Hence, no further action is proposed in relation to this site. However, should the Failford Road Scarred Tree be affected or destroyed through the proposed development, the NSW Heritage Office would be notified regarding a determination as to whether the intended impact falls under an existing exemption or requires a Section 139 permit. Regardless of the NSW Heritage Office's decision, the preservation and archival recording of Failford Road Scarred Tree would be undertaken. Some of the preservation measures that may be used during construction should they be required would include: • Webbing around the tree to restrict access. • Education of personnel and works crew member of the location of the tree. • Monitoring of activities in the location of the tree.	Construction
Socio-economic	Develop a traffic management plan and traffic control plans as part of the CEMP for the proposal in accordance with RTA standard procedures.	Pre-construction
Socio-economic	All property acquisition would be negotiated in accordance with the RTA's *Land Acquisition Policy* and compensation would be in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.	Pre-construction
Socio-economic	Community consultation would be continued via the CLG throughout the development of the detailed design and construction to provide updated information on the proposal and to consider any relevant issued raised.	Detailed design Pre-construction Construction

Issue	Safeguard	Implementation phase
Waste minimisation and management	Develop a waste management plan as part of the CEMP for the proposal in accordance with RTA's Waste Minimisation and Management Guidelines and the Principles of the *Waste Avoidance and Resource Recovery Act, 2001*. The plan would include: • Consideration of the use of recycled products in the road construction during detailed design. • Provision of rubbish and recycling bins with lockable lids at site compounds. • Assess trees required to be removed for their value as millable timber and provide to timber mills as appropriate. • Chip or cut vegetation for use as mulch for revegetation works or for firewood. Do not use weed species for mulch. • Cover waste materials when they are transported to landfills or waste management facilities. • No waste to be buried on site, unless approved and suitable for the site's future use. • No dumping of waste in or near waterways. • At source separation of waste for recycling where practical. • Crush and reuse hard, inert construction or demolition waste on site where possible. • Re-use excavated soil on site where possible. • If portable toilets are to be used on site, they would be pumped out by a licensed waste contractor on a regular basis	Detailed design Pre-construction Construction
Hazards and risk	Develop a traffic management plan or traffic control plan(s) as part of the CEMP for the proposal to include procedures to manage vehicle accidents and emergencies.	Construction and operation
Hazards and risk	Engage appropriately licensed contractors to transport waste materials, and ensure transport in accordance with relevant guidelines and standards.	Construction
Hazards and risk	Induct all site personnel and inform them of site environmental requirements, liabilities and responsibilities.	Construction

11 CLAUSE 228 CHECKLIST

Clause 228 of the EP&A Regulation states that, for the purposes of Part 5 of the Act, a list of factors is required to be taken into account concerning the impact of an activity on the environment. These factors and the findings following environmental assessment are detailed in **Table 22**.

Table 22: Clause 228 Checklist

Factor	Impact	Reference in REF
Any environmental impact on a community.		
The proposal would improve this section of the Pacific Highway, providing benefits to the local and wider community, in particularly the level of interaction and safety provided by the local service road.	Long- term positive	Section 9.10
Minor short term impacts such as noise and dust and changes in access and traffic would be experienced during construction. Safeguards proposed would minimise these impacts.	Short-term negative	Sections 9.3, 9.5
Any transformation of a locality.		
The proposal would result in the expansion of the transport infrastructure in the area with the addition of a new interchange and overpass and therefore would affect the visual landscape in the long-term through a widened carriageway and loss of some areas of vegetation. The use of the location would not be significantly altered with the existing roadway being upgraded. Minor changes to the landscape and vegetation would occur to accommodate the works.	Long-term negative	Sections 9.7, 9.10
Any environmental impact on the ecosystems of the locality.		
The potential exists for short-term negative impacts during construction of the proposal, but these would be effectively managed through the implementation of a CEMP and other safeguards proposed.	Short-term negative	Sections 9.1, 9.3, 9.4, 9.5, 9.6
Any reduction of the aesthetic, recreational, scientific, or other environmental quality or value of a locality.		
During construction there may be a reduction in these values because of major earthworks, stockpiling and plant etc affecting the visual amenity.	Short-term negative	Section 9.7,
Additional landscaping provided as part of the proposal would result in additional screening and amenity in the future.	Long-term positive	Sections 9.6, 9.7

Factor	Impact	Reference in REF
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.		
No sites of Aboriginal archaeological significance were identified in the archaeology assessment.	Nil	Section 9.8
One historical site, the Failford Road Scarred Tree was identified as part of the assessment. It is unlikely that this site would be impacted by the proposal.	Nil	Section 9.9
Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act, 1974).		
The flora and fauna assessments undertaken for the REF concluded that habitat for protected fauna within the proposal site is limited and the proposed works would not affect any such habitat.	Long-term nil	Section 9.6
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air.		
The flora and fauna assessments undertaken for the REF conclude that potential habitat and occurrence of threatened or endangered species within the proposal site is limited. It is not anticipated that these species would utilise the area as a source of primary habitat and that the proposed works would not result in endangering of any species. Safeguard measures are detailed in this REF.	Long-term nil	Section 9.6
Any long-term effects on the environment.		
The proposal would have positive long-term effects on the socio-economic environment with improved safety and travel times on the Highway.	Long term Positive	Section 9.10, 9.15
Degradation of the quality of the environment.		
There is potential for minor short term environmental degradation due to noise, dust, impacts to traffic and water quality during construction.	Short-term negative	Sections 9.1, 9.3, 9.4, 9.5
There would also be improvements to the water quality of surrounding waterways as a result of the installation of measures associated with the proposal.	Long-term positive	Section 9.4

Factor	Impact	Reference in REF
Any risk to the safety of the environment.		
The construction of the proposal may result in short-term potential risks to the safety of the environment because of accidents and spills. Management measures would be put in place to reduce these risks.	Nil impact	Section 9.14
In the long-term the proposal would contribute to reducing the risk to the safety of the environment, by improving the road conditions on this section of the highway.	Long-term positive	Section 9.14
Any reduction in the range of beneficial uses of the environment.		
The proposal would result in a change in land use for two properties that have been acquired as a result of the proposal. Construction of the improved highway could be considered to be a beneficial use for the relatively small areas to be acquired. The highway construction would improve road conditions of the locality.	Nil	Section 9.10
Any pollution of the environment.		
There is minor potential for short-term negative impacts during construction. However safeguards documented in Section 10 would minimise the potential for impacts.	Nil with safeguards in place	Sections 9.1, 9.3, 9.4, 9.5, 10.1
Improvements in road drainage and water management structures such as sediment basins would result in improved quality of runoff from the highway.	Long-term positive	Section 9.4
Any environmental problems associated with the disposal of waste.		
A waste management plan would be prepared as part of the CEMP which would detail measures to manage waste. There are not expected to be problems associated with the disposal of waste.	Long-term nil	Section 9.11
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply.		
Resources required for the proposal are not in limited supply in the area.	Long-term nil	Section 9.12
Any cumulative environmental effect with other existing or likely future activities.		
There are not expected to be cumulative local impacts with other projects occurring in the area at the same time as this proposal would be undertaken.	Short-term nil	Section 9.15
The proposal would result in a positive long-term impact in association with other sections of the Pacific Highway being upgraded, providing a safer, more efficient transport route.	Long-term positive	Section 9.15

12 MATTERS PROTECTED BY THE EPBC ACT

The requirement for approval under the EPBC Act is triggered by a proposal which has the potential to have a significant impact on a matter of National Environmental Significance (NES) or a proposal which has the potential to have a significant impact on the environment on Commonwealth land. The EPBC Act also requires Commonwealth involvement in actions undertaken by, or on behalf of, a Commonwealth agency. The following sections provide an assessment of whether the proposal may affect any of these matters.

A search of the EPBC Act Database was conducted on 21 September 2005 and again in June 2007 for matters of NES and other matters protected by the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) within 2 km of the proposal site. Results are provided in **Table 23** below. A copy of the search results in available in **Appendix A**.

Table 23: EBPC Matters of NES

Factor	Impact	Comment
Any environmental impact on World Heritage property?	**Nil**	There would be no environmental impact on World Heritage property as a result of the proposal. No World Heritage Properties occur within the vicinity of the site.
Any environmental impact on National heritage places?	**Nil**	There would be no environmental impact on National heritage places as a result of the proposal. No National heritage places occur within the vicinity of the site.
Any environmental impact on wetlands of international importance?	**Nil**	There would be no environmental impact on wetlands of international importance as a result of the proposal.
Any environmental impact on Commonwealth listed threatened species or ecological communities?	**Nil**	Although 15 threatened species were recorded as potentially occurring in the area, the nature of the works and the proposed safeguards ensure that there would be no environmental impact on Commonwealth listed threatened species or ecological communities as a result of the proposal.
Any environmental impact on Commonwealth listed migratory species?	**Nil**	Although nine migratory species were recorded as potentially occurring in the area, the nature of the works and the proposed safeguards ensure that there would be no environmental impact on Commonwealth listed migratory species as a result of the proposal.
Does any part of the Proposal involve nuclear action?	**Nil**	The proposal does not involve nuclear action.
Any environmental impact on a Commonwealth marine area?	**Nil**	There would be no environmental impact on a Commonwealth marine area as a result of the proposal.
In addition: Any impact on Commonwealth land?	**Nil**	Land owned by Telstra Corporation Limited was found to be within the search area, however given the nature of the works and the proposed safeguards there would be no impact on Commonwealth land as a result of the proposal.

13 OUTCOMES AND CONCLUSION

A consideration of the main beneficial and adverse effects of the proposal in relation to the biophysical, social and economic environments is presented in this section.

13.1 Biophysical

The proposal is expected to have the following beneficial effects on the biophysical environment:

- Expanded landscaping in previously cleared areas.
- Improved measures to manage and minimise weeds.
- Improved measures to protect flora and fauna such as fencing and use of drainage structures.
- Improved pollution controls.
- Improved design and visual amenity with landscaping.

Adverse residual effects on the biophysical environment as a result of the project construction, after implementation of the safeguards for the proposal outlined in this REF, will be:

- Potential water pollution as a result of erosion or spills, but controls are likely to be effective.
- Vegetation removal, including removal of habitat for fauna.

13.2 Social / community

The proposal is expected to have the following beneficial effects on the social environment:

- Improved road safety.
- Employment opportunities during construction.
- Reduced travel time on the highway.
- Improved community access to the local area by the provision of a local service road and the Failford interchange for cars, cyclists and pedestrians.

The proposal, with the implementation of safeguards proposed, may have the following adverse effects on the social environment:

- Short-term decrease in visual amenity, until vegetation regrowth occurs.
- Changes to property access during construction.

13.3 Economic

The proposal is expected to have the following beneficial effects on the economic environment:

- Direct and indirect income benefits to the local and wider community as a result of the construction activities and improvements to the road infrastructure.
- Creation of employment opportunities during construction.
- A return to the community of at least twice the investment.

The proposal would result in the acquisition of two houses required for the project, however, property acquisition was negotiated in accordance with the RTA's *Land Acquisition Policy* with landowners appropriately compensated in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. As such adverse effects to property owners were negated through appropriate consultation and property acquisition procedures.

13.4 Conclusion

The proposal is part of the RTA's broader plans and strategy to upgrade the Pacific Highway to a high standard dual carriageway for its entire length, from Hexham to the Queensland border. Hence, it is needed as part of the RTA and Government's strategic plans for improvement for the highway.

The upgrade of this section of the highway would provide a connection between existing high quality dual carriageways and would result in increased safety and improved traffic conditions on the carriageway.

The proposal is justified in that it would provide benefits to the local community and the broader region and State, that out weigh the likely impacts, particularly with the inclusion of mitigation measures and environmental management procedures.

This REF has considered both stage 1 and stage 2 of the proposal. The ultimate proposal including stage 2 would have a greater impact upon the environment than stage 1 alone, as it would require additional earthworks and construction elements, including an overpass at Bullocky Way, and increased clearing of vegetation to facilitate this. Notwithstanding this, both stages are considered to be justifiable in that they would provide benefits to the local community and the broader region and State, and the adverse impacts would be able to be managed.

With the further assessment that would be undertaken during the detailed design of the proposal, and with safeguard measures put in place, the construction and operation of the upgrade to the Pacific Highway would not constitute a significant adverse environmental impact.

14 CERTIFICATION

This review of environmental factors provides a true and fair review of the proposed activity in relation to its likely effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activity.

Name: Renae Gifford.

Signed:

Designation: Associate Environmental Scientist

Date: 7th April 2008

I have examined this review of environmental factors and the certification by Renae Gifford and accept the review of environmental factors on behalf of the RTA.

Name (print): Roger FENNER

Signed: Roger Fenner

Designation: Project Development Manager

Date: 12 May 2008

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[4] In RTA documentation this road has been referred to as Tritons, Tritton and Triton Road. HLA understands that the correct spelling is Tritton and this spelling is used throughout this REF.

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