



Transport
Roads & Maritime
Services

ROUTE OPTIONS DEVELOPMENT REPORT

Waterfall Way Upgrade

Pacific Highway to Connells Creek

APRIL 2013

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Glossary of terms and acronyms

Term	Description
Advisory speed signage	Signs used to inform motorists of changes in alignments (ie curves, bends, humps, dips) and of the appropriate speed to negotiate these road features. Advisory speed signs are used where the appropriate speed on a section of the roadway may be less than the posted speed limit. Although the sign provides a warning to approaching drivers, it is not legally enforceable.
Annual average daily traffic (AADT)	The total traffic in both directions at a specified location calculated from mechanically obtained axle counts.
Annual exceedance probability (AEP)	The probability of a rainfall or flood event exceeding a nominated level in a year. A 1% AEP is the probability of an event exceeding a nominated level in 100 years.
1% AEP flood event	Refers to the flood event that occurs, on average, once every 100 years. Also known as the 100-year Average Recurrence Interval of a flood or 1 in 100-year flood event. These events are of a random nature. It is possible to have 100-year floods in successive years. Similarly, a 100-year flood event may not occur for 200 years and may not be the largest flood in the last 100 years. This also applies to 5-year and 20-year ARI flood events.
Afflux	An increase in water level resulting from additional obstacles in the flow path.
Australian height datum (AHD)	The standard reference level used to express the relative height of various features. A height given in metres AHD is essentially the height above sea level.
Aboriginal Heritage Information Management System (AHIMS)	This holds information about Aboriginal objects, Aboriginal Places with special significance with respect to Aboriginal culture, and archaeological reports.
Amenity	The degree of pleasantness of an area or place.
Alignment	The general route (e.g. of a roadway) in plan and elevation.
Archaeological site	A site with any material evidence of past Aboriginal activity that remains within a context or place that can be reliably related to that activity.
Asphalt or asphaltic concrete (AC)	A dense, continuously graded mixture of coarse and fine aggregates, mineral filler and bitumen usually produced hot in a mixing plant.
Acid Sulphate soils (ASS)	Naturally acid clays, mud and other sediments usually found in swamps and estuaries. They may become extremely acidic when drained and exposed to oxygen, and may produce acidic leachate and runoff that can pollute receiving waters and liberate toxins. ASS are classified as materials which are above the groundwater, are undergoing oxidation and have a pH of less than 4.0.
Batter	The side slope of walls, embankments and cuttings or the degree of such slope, usually expressed as a ratio of horizontal distance to one vertical height.

Term	Description
Borehole	A hole produced in the ground by drilling for the investigation and assessment of soil and rock profiles.
BSC	Bellinghen Shire Council
Carriageway	The portion of a roadway devoted to vehicular traffic generally delineated by kerbs, a verge or a median.
Catchment	The area drained by a stream or body of water, or the area of land from which water is collected.
Concept design	Initial functional layout of a concept, such as a road or road system, to provide a level of understanding to later establish detailed design parameters.
Culvert	An enclosed channel for conveying a stream below a road.
Cutting	A formation resulting from the construction of the road below the existing ground level after material is cut out or excavated.
dBA	Decibels using the A-weighted scale. Decibels are used to measure sound levels. dBA measures loudness according to the human perception of sound.
OEH	Office of Environment and Heritage
Decibel	Decibels are used to measure sound levels.
Design speed	A nominal speed used in designing a road's geometric features (such as curves).
Earthworks	The process of extracting, moving and depositing earth during construction.
Earthwork balance	The relative volumes of materials excavated from cuttings and materials placed in fill embankments. A road design generally targets equal volumes of cut and fill materials, hence giving balanced earthworks.
Ecologically sustainable development (ESD)	Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future can be increased. ESD incorporates four key principles: <ul style="list-style-type: none"> • the precautionary principle • inter-generational equity • conservation of biological diversity and ecological integrity • improved valuation and pricing of environmental resources.
Endangered ecological community (EEC)	An ecological community identified by relevant legislation as having endangered status.
EIA	Environmental impact assessment.
Embankment	A mound or bank of earth or stone formed to support a roadway incorporating sloping/battered faces.

Term	Description
Endangered species	Those plant and animal species listed under Part I of Schedule I of the NSW <i>Threatened Species Conservation Act 1995</i> or listed as endangered under Subdivision A of Division I of Part 13 of the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW).
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth).
Flood immunity	Relates to the level at which a particular structure would be clear of a certain flood event. A project objective is to provide flood immunity on at least one carriageway between 1% AEP (target) and 20% AEP (absolute minimum).
Geological unit	A volume of rock of identifiable origin and age range that is readily mapped, such as a series of inter-bedded sandstone and claystone beds or a body of granite.
Geotech/ geotechnology	Application of the methods of engineering and science to construction that involves natural soil and rock materials.
Geographical information system (GIS)	A system designed to capture, store, manipulate, analyse, manage, and present all types of geographical data.
Grade/ gradient	Slope or steepness.
Habitat	The place where an organism lives. Habitats are measurable and can be described by their flora and physical components.
HV	Heavy vehicle.
Interchange	A grade-separated junction between roads where the local road passes above or beneath the highway via a bridge or underpass structure. Traffic joins and leaves the highway via exit and entry ramps. Traffic on both the local road and the highway can move freely without interrupting traffic on the other road.
Intersection	A junction between roads where the connection is made at the same level (grade). Traffic on the connecting road has to wait for a gap in the through road to join or cross that road.
LALC	Local Aboriginal Land Council.
LEP	Local environmental plan.
Level of Service	A measure of the quality of road operating conditions, including speed, travel time, freedom to manoeuvre, traffic interruptions, and comfort and convenience.
Longitudinal section or 'long section'	The section drawn along the length of the route showing vertical elevation.
Project area	The site and surrounding land that is potentially affected by the project.
The project	RMS proposal to rehabilitate, realign and widen about 3 km of the Waterfall Way east of Bellingen from the Pacific

Term	Description
	Highway to Connells Creek.
Relative level (RL)	The relative level is measured to Australian height datum (AHD). Zero metres AHD is about mean sea level.
Speed limit (posted)	The number shown on a regulatory speed limit sign which defines the maximum legal speed permitted along a specific section of road under good road and travel conditions.
Stopping sight distance	The distance required by an average driver (of a car or truck, depending on design requirements), travelling at a given speed, to react and stop before striking an object on the road.
Threatened species	Animals or plants listed as endangered or vulnerable under the NSW <i>Threatened Species Conservation Act 1995</i> or the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i> . This is an Act to conserve threatened species, populations and ecological communities of animals and plants.
Visual catchment	The area from which the road is viewed.

Executive summary

Introduction

The Waterfall Way is part of an important east–west route that connects the Coffs Coast region with the hinterland of the Bellingen area and the tablelands of Dorrigo, Armidale and beyond.

The road has poor surface conditions and a substandard alignment. With traffic volumes continuing to increase, Roads and Maritime Services (RMS) is investigating upgrading the Waterfall Way to maintain road safety and the current level of service in accordance with RMS' broad strategies for the roadway. RMS proposes to deliver the upgrade through a number of separate projects.

This report documents the preliminary investigations that have been undertaken for the upgrade of a three-kilometre section of the Waterfall Way east of Bellingen, between the Pacific Highway and Connells Creek. The upgrade would involve realigning and widening the road. This section of the road is two lanes wide (one lane in each direction). The upgrade would maintain this arrangement.

This report describes two route options for the upgrade and how they were developed. It also includes a summary of the technical and environmental investigations and the community consultation process that have been undertaken to date.

Project objectives

The objectives of the upgrade project are to:

- Upgrade the road pavement and improve surface conditions
- Improve the road alignment
- Enable a safer 80 kilometres per hour standard and provide a consistent travel speed and level of service
- Provide traffic lanes 3.5 metres wide
- Provide road shoulders two metres wide
- Upgrade the Short Cut Road intersection
- Minimise impacts on the environment, including avoiding construction through the wetland at Camerons Corner
- Reduce the risk of the road being affected by flooding.

The process to date

Initially, RMS investigated the realignment of Camerons Corner. However, this project did not proceed as a result of environmental and community considerations, particularly in relation to the Camerons Corner wetland.

In July 2010, RMS announced a revised approach to developing the upgrade. It has involved community consultation, field investigations and engineering design input. The key steps in the process have involved:

- Re-engaging with Bellingen Shire Council and the local community to develop route options for the proposed upgrade
- Holding a community workshop to advise the community that the Camerons Corner wetland would be avoided as part of any proposed route options, and to obtain feedback from the community on the potential social, environmental, technical and economic constraints and opportunities with the project

- Undertaking preliminary environmental investigations to help RMS develop the preliminary route options
- Holding project team workshops and site investigations
- Exhibiting the concept route options
- Preparing specialist environmental assessment reports to help RMS refine the route options (see below)
- Preparing route options based on project objectives, technical and environmental investigations and community and stakeholder feedback.

Environmental investigations

RMS commissioned a number of preliminary specialist studies to help it develop the two route options. (These studies will be finalised as part of the detailed design process.) The studies included:

- Preliminary environmental investigation (PEI): This was undertaken to determine the likely and potential environmental values within the project area, and to identify potential opportunities and constraints for the project. The findings of the PEI were used to help develop options that would avoid or reduce environmental impacts where possible
- Preliminary acid sulphate soils (ASS) investigation: This was prepared to assess the constraints that potential ASS could have on the project
- Preliminary ecological investigation: This was prepared to identify the ecological values of the project area and to address any relevant legislative requirements
- Preliminary sediment and erosion control investigations: These were undertaken to determine the size and location of sediment retention basins required for the construction of the project
- Preliminary noise and vibration assessment: This was undertaken to assess noise and vibration impacts of the project
- Preliminary landscape character and visual impact assessment: This was prepared to identify the landscape and visual amenity characteristics of the project area, assess the likely impacts of the route options, and recommend mitigation measures to reduce visual impacts.

Technical investigations were also undertaken focusing on:

- Traffic and transport
- Soils, hydrology and water quality
- Aboriginal and non-aboriginal heritage
- Socio-economic issues, land use and property
- Potential conflicts with services and public utilities.

Key issues

In developing the route options, RMS considered the following key issues:

- The extent of impacts on endangered ecological communities and areas of high or very high conservation value, including Camerons Corner wetland
- The need to adequately address the local road network and property access arrangements
- Topography and geology, particularly in relation to the need for cut and fill and the achievement of acceptable geotechnical risks
- Impacts on Raleigh Dam
- Impacts on landscape character and visual amenity

- Impacts on heritage, including Aboriginal and non-Aboriginal items
- Impacts on private property
- Engineering and design.

Options investigated

RMS has investigated and developed route options that would best meet the project objectives and design criteria. Initially, RMS considered four options:

- Rehabilitating the road as required: However, this option was not considered for the full length of the road section as it does not provide long-term value for money due to the ongoing need to continually undertake this work, and because it would not cater for the increasing traffic or the broad strategy for Waterfall Way
- A full northern deviation from the Raleigh Interchange to a point west of Connells Creek Bridge: However, this option was rejected for a number of reasons, including the high project costs and property impacts
- Route options A and B, which were developed in line with the project objectives. Both options would provide consistent travel speeds, involve the upgrading of Short Cut Road, and provide improved flood immunity at Camerons Corner.

Options A and B were identified for further assessment.

Key findings for options A and B

Options A and B are almost identical in the eastern and western sections of the project area. The eastern section is between the Pacific Highway and Raleigh Dam. The western section is between the crest west of Camerons Corner and Connells Creek. The options differ in the middle section, including at Raleigh Dam, Short Cut Road and Camerons Corner. Therefore, the assessment of the differences between options A and B focuses on the middle section of the project area.

The key differences between options A and B are as follows:

- The Short Cut Road intersection would remain in the same location for Option A; Option B would involve relocating the intersection about 45 metres to the west, and require more fill and vegetation removal
- Option A would be constructed closer to the current alignment; Option B would include more construction outside the current alignment and more fill and vegetation removal
- Option A would require one less temporary sedimentation basin than Option B
- Option A would cost about \$4 million less to construct than Option B
- Option A would result in the loss of less native vegetation than Option B (1.65 hectares (ha) compared with 2.95 ha)
- Option A would have a reduced disturbance footprint, and less earthworks than Option B, so would have less risk of environmental impacts during construction
- Option A would involve more work over the existing road near Short Cut Road
- Option A would require less private land to be acquired than Option B
- Option A and Option B would both require acquisition of the Raleigh Dam
- Option A would result in fewer residences being impacted upon by noise
- Option A would meet the 80 kilometres per hour design speed throughout, except in two locations where it would meet the 70 kilometres per hour design speed; Option A would require advisory speed signage at these two locations
- Option B would meet the 80 kilometres per hour design speed throughout the project length

- Both options would have 80 kilometres per hour posted speed limits.

Next steps

RMS will invite the public to comment on this route options development report. A one-month period for public comment will be provided.

With the release of this report the project enters the 'recommended preferred route selection' stage. This process aims to identify the route option that best meets the project objectives while balancing the technical constraints and potential environmental, social and economic opportunities and constraints.

RMS will select the recommended preferred route based on a consideration of community comments to date, technical data, and the findings of a formal value management workshop.

Acknowledgments

RMS wishes to acknowledge and thank the community and residents of the area for their assistance during this study.

I Introduction

I.1 Project overview

Roads and Maritime Services (RMS) proposes to upgrade about three kilometres of the Waterfall Way east of Bellingen, from the Pacific Highway to Connells Creek. The project aims to realign, widen and reconstruct the road formation to meet current standards and cater for future traffic growth in accordance with RMS' broad strategies for the Waterfall Way.

This section of the Waterfall Way is two lanes wide (one lane in each direction). The upgrade would maintain this arrangement.

RMS has developed two route options for the road upgrade, identified as Option A and Option B (these are shown in **Appendix A**).

Community consultation is being undertaken to ensure stakeholders' concerns are identified and considered throughout the route option development process.

I.2 Purpose of this report

The purpose of this report is to:

- Summarise the project objectives and background
- Document the process that has led to the identification of the route options
- Describe the options
- Outline the stakeholder consultation that has been undertaken by RMS to assist in the route option development process
- Provide details of the technical and environmental investigations that have been carried out to date.

This report builds on the previous environmental and technical investigations that have been carried out within the project area. It also explains how this information was used together with community input and technical and environmental considerations as the basis for identifying the feasible route options.

I.3 Project objectives

The project objectives are to:

- Upgrade the road pavement and improve surface conditions
- Improve the road alignment
- Enable a safer 80 kilometres per hour standard and provide a consistent travel speed and level of service
- Provide traffic lanes 3.5 metres wide
- Provide sealed road shoulders two metres wide
- Upgrade the Short Cut Road intersection
- Minimise impacts on the environment, including avoiding construction through the wetland at Camerons Corner
- Reduce the risk of the road being affected by flooding.

1.4 Strategic context

The need to upgrade the section of the Waterfall Way between the Pacific Highway and Connells Creek is consistent with State Government planning priorities and is part of a wider strategy to upgrade the Waterfall Way. The strategic context is outlined below.

1.4.1 NSW 2021

In September 2011, the NSW Government released NSW 2021, which is a 10-year strategic plan setting immediate priorities for action and guiding resource allocation through the NSW Budget. NSW 2021 has 32 goals. Those goals that are relevant to the proposed upgrade of the Waterfall Way are listed in **Table 1.1**.

Table 1.1 NSW 2021 goals relevant to the Waterfall Way upgrade

Strategy	Goal
Rebuild the economy	3. Drive economic growth in regional NSW
Transport	7. Reduce travel times 10. Improve road safety
Renovate infrastructure	19. Invest in critical infrastructure
Strengthen our local environment and communities	22. Protect our natural environment
Restore accountability to government	32. Involve the community in decision making on government policy, services and projects

The project objectives listed in **Section 1.3** are consistent with these goals.

1.4.2 RMS objectives for the Waterfall Way

The Waterfall Way is an important route connecting the seaboard and Coffs Harbour district with the coastal hinterland of the Bellingen area, the tablelands of Dorrigo, Armidale and beyond.

RMS is developing and undertaking a range of projects along the Waterfall Way to ensure it continues to function as an important regional route.

RMS' broad strategies for upgrading the Waterfall Way are summarised in **Table 1.2**.

Table 1.2 RMS' strategies for the Waterfall Way

Existing						Broad strategies
Section	Description	Type	Length km	Traffic 2004		
				AADT	%HV	
1	Pacific Hwy to Bellingen (including PH2CC)	2-lane rural / winding	10.2	5100	6	<ul style="list-style-type: none"> • Improve the alignment • Widen travel lanes and provide sealed shoulders and flood mitigation
2	Bellingen	Urban	2.3	6300	6	<ul style="list-style-type: none"> • Road safety and traffic management improvements
3	Bellingen to Thora Bridge	2-lane rural / winding / escarpment	13.2	2200	14	<ul style="list-style-type: none"> • Improve slope and wall stability • Widen travel lanes and provide sealed shoulders • Undertake minor alignment improvements
4	Thora Bridge Dorrigo	2-lane rural mountain range / steep winding alignment	13.5	2200	14	<ul style="list-style-type: none"> • Increase truck pull-over bays and increase overtaking opportunities • Improve slope and wall stability • Improve drainage to mitigate intense rainfall damage • Integrate development and maintenance activities to maximise road safety and traffic management improvements
5	Dorrigo	Urban	5.4	3200	8	<ul style="list-style-type: none"> • Improve road safety and traffic management
6	Dorrigo to MR74 intersection	2-lane rural / undulating	35.7	820	12	<ul style="list-style-type: none"> • Widen travel lanes and provide sealed shoulders • Provide consistent standard
7	MR74 intersection to Armidale	2-lane rural / undulating	85.3	1150	9	<ul style="list-style-type: none"> • Widen travel lanes and provide sealed shoulders • Provide consistent standard
8	Armidale	Urban	6.9	4300	3	<ul style="list-style-type: none"> • Improve road safety and traffic management

Source: Waterfall Way May 2011: Extract from RMS website http://www.rta.nsw.gov.au/roadprojects/projects/north_eastern_region/waterfall_way/documents/waterfall_way/waterfall_way.pdf

1.4.3 Community pressure for an upgrade

Since 1993, the councils of Dumaresq (now known as Armidale-Dumaresq), Nymboida (now known as Clarence Valley), Coffs Harbour City, Inverell Shire, and Bellingen Shire have lobbied RMS to improve the Waterfall Way. The councils have focused on the entire route and the need to improve the standard of road in relation to the commercial, economic and tourist value to their respective local government areas (LGAs). RMS received the following submissions from this group of councils between 1994 and 2003:

- In August 1994, an initial submission signed by the five councils was presented to the NSW Minister for Roads and Transport for the upgrading of the Waterfall Way, highlighting the

economic and social benefits of the suggested upgrade works and the required road safety considerations

- In 1998, these councils sent a second submission for the upgrading of the Waterfall Way. The submission identified that road use by private motorists, coaches and freight transport had increased substantially and called for urgent road improvements to be undertaken
- In March 2003, a third report was submitted to RMS by the councils of Armidale-Dumaresq, Pristine Waters (now known as Clarence Valley), Bellingen Shire and Coffs Harbour City. It requested that RMS provide information and participate in the development of an improvement strategy for the Waterfall Way.

In each of these submissions, the upgrading of the Waterfall Way between the Pacific Highway and Connells Creek was included as a priority project.

1.4.4 Planning for the upgrade

In 1998, the State Government developed Action for Transport 2010 which was a long-term strategy for transport requirements in NSW. In this report, the Waterfall Way was identified as an important east-west route in the region that requires a safer and consistent standard of road.

A preferred route for part of the Waterfall Way, known as Camerons Corner, was identified by RMS in consultation with Bellingen Shire Council. A Review of Environmental Factors (REF) was prepared for this preferred route (ERM, 2003). However, funding was not available to complete the project and it did not proceed.

In 2009, funding was again made available and an updated REF was prepared for the preferred route. However, due to environmental and community considerations the road upgrade did not proceed.

In 2010, RMS reopened investigations into upgrading the Waterfall Way, including Camerons Corner and established a new community consultation process. RMS recognises the importance of consulting with the community when examining route options, and that it is important to support genuine community input into the process.

1.5 Regional and local context

1.5.1 Regional context

The section of Waterfall Way proposed to be upgraded is located in the Coffs Coast region which consists of the Coffs Harbour City, Bellingen and Nambucca LGAs and is located midway between the capital cities of Brisbane and Sydney. The region has a resident population of over 70,000, which increases to about 100,000 during the peak tourist season.

The region includes the rainforest escarpments of the Dorrigo Plateau, the beaches from Nambucca to Woolgoolga and the Solitary Islands Marine Park. It has a very liveable subtropical climate that averages a maximum 24 degrees and minimum 13 degrees (Coffs Coast Marketing, 2012).

The region includes a campus of Southern Cross University, a TAFE campus, a regional airport, public and private hospitals, primary and high schools, major shopping centres and numerous national parks. There are multiple passenger flights each day to Sydney, Brisbane and Port Macquarie. Coffs Harbour is also accessible by road, CountryLink trains and regular bus services.

Waterfall Way connects the Coffs Coast Region and the Northern Tablelands of NSW. In the east, it connects at the Pacific Highway about 20 kilometres south of Coffs Harbour and in the west, it connects at the New England Highway in Armidale. It links various towns in between such as Bellingen, Dorrigo and Ebor. A locality plan is shown as **Figure 1.1**.

The importance of Waterfall Way as a key route for Northern NSW is highlighted by its key functions. These include:

- Tourist route: Waterfall Way is a popular tourist route which encompasses scenic landscapes, national parks, historic towns and numerous waterfalls that give the route its name. Day trippers from coastal areas also use it to visit the attractions offered in Bellingen and its hinterland
- Freight route: Given its links between the highly productive New England Tablelands and the more populated Coffs Coast, Waterfall Way plays an important role in the delivery of freight between the two regions, especially for key industries such as forestry and agriculture
- Commuter route: The section of the Waterfall Way between the Pacific Highway and Connells Creek is one of the busiest sections of the road. This is primarily due to traffic generated between Bellingen and Coffs Harbour from Bellingen residents who commute to Coffs Harbour to work, and to use the retail, medical, community, sport and recreational facilities.

1.5.2 Local context

RMS proposes to upgrade a 3 kilometre length of the Waterfall Way between the western roundabout at the Pacific Highway Raleigh interchange and Connells Creek. The project would generally follow the existing road corridor. The project area is shown in **Figure 1.2**.

The surrounding land use is predominantly rural. Various agricultural activities, particularly dairy farming occur on the floodplains and low-lying undulations within the greater valley. Rural dwellings are located near the Waterfall Way.

The topography is characterised by undulating hills and river plains. There are heavily vegetated undulating ranges in the distance.

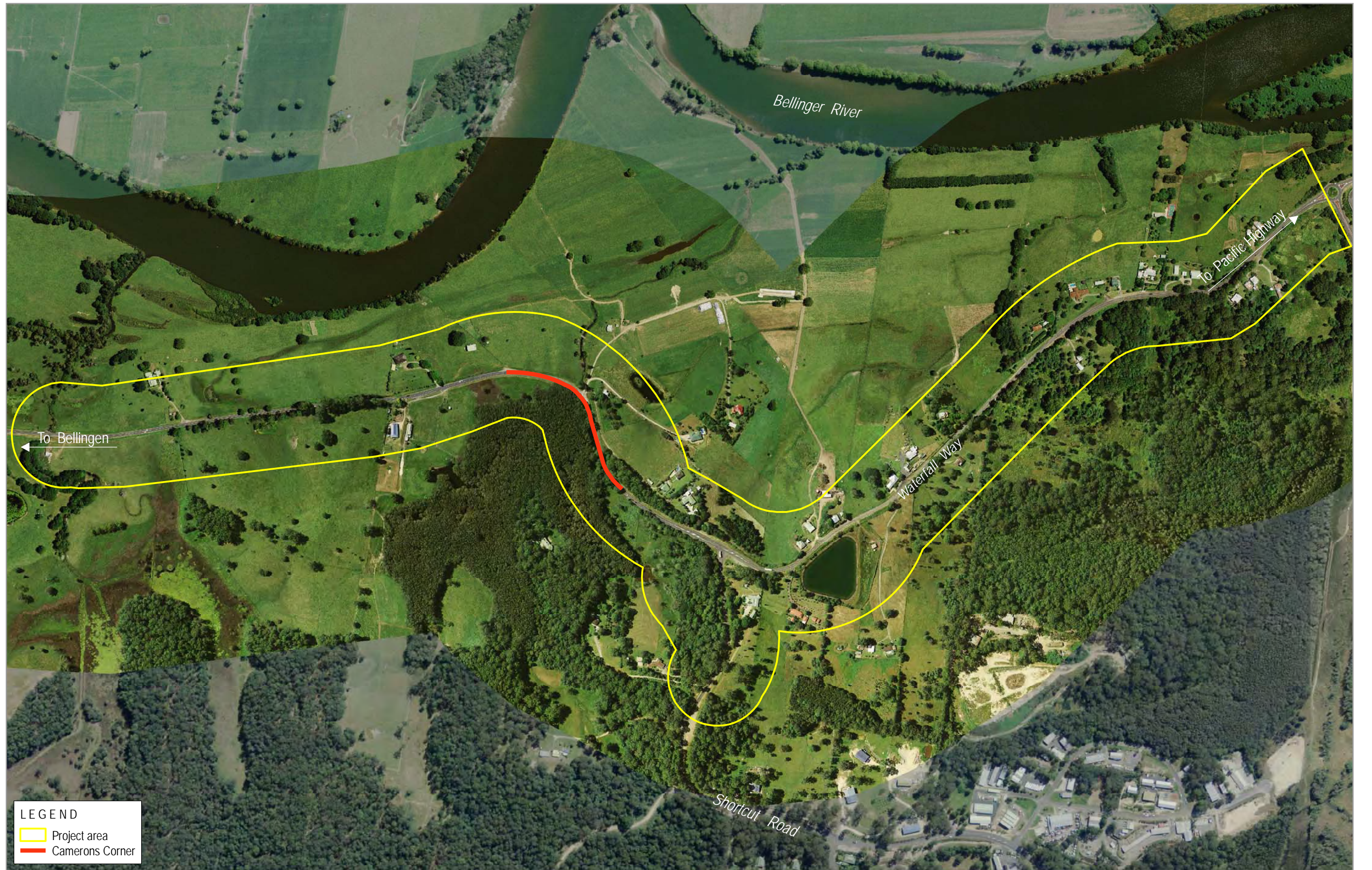


LEGEND
Project area



0 2 km

Figure 1.1 Regional context



0 150

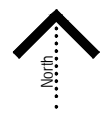


Figure 1.2 Project area

2 Road safety and traffic

This section of the Waterfall Way from the Pacific Highway to Connells Creek is one of the busiest sections of the road. This is primarily due to the traffic generated by commuter and road transport services travelling from Bellingen/Dorrigo to Coffs Harbour. The traffic volumes – coupled with the deteriorating pavement condition, narrow road width and substandard alignment – underline the need for improvements to the Waterfall Way in this area. These issues are discussed below.

2.1 Road pavement

The pavement of the Waterfall Way between the Pacific Highway and Connells Creek has deteriorated over the years and needs reconstruction. Pavement analysis indicates that the existing pavement is of insufficient thickness for the current design traffic loading and requires an overlay of about 300 millimetres of new gravel pavement to achieve a pavement design life of 20 years.

The most deteriorated section (east of Raleigh Dam) has recently undergone maintenance in the form of asphaltic concrete patching and pavement resealing. However, sections remain within other parts of the project area with poor pavement conditions. These are subject to extensive deformation with potholes, cracks and patches providing a rough and unsafe surface for motorists. To maintain the road surface in a safe condition will require extensive ongoing routine maintenance.

2.2 Safety and traffic

2.2.1 Traffic volumes

Annual average growth rates for the highway have been determined through an analysis of historical annual average daily traffic (AADT) data. Traffic count data collected from 1992 to 2010 between Short Cut Road and Fernmount indicate an annual growth rate of 2.4 per cent. This growth rate was used to calculate the projections beyond 2010, as shown in **Table 2.1**.

Table 2.1 Traffic projections for the Waterfall Way

Year	AADT
2010	7306
<i>Future projections based on a 2.4% annual growth rate</i>	
2015	8170
2025	9890
2035	11,610

Source: RMS

Note: AADT volumes are collected during a 24-hour period and averaged over a year to provide the average amount of traffic that passes through the section each day. AADT volumes measure the total number of axle pairs that pass the traffic counter. A typical car is represented by one axle pair, a three-axle truck by one and a half axle pairs and a six-axle semi-trailer as three axle pairs. As this data provides a measure of the total number of axle pairs, the specific ratios of different vehicle types (such as heavy vehicles) are not provided.

2.2.2 Crash statistics

The project area has a consistent crash history. Between 1996 and 2011:

- 19 per cent of the crashes on the Waterfall Way between the Pacific Highway and Bellingen occurred at Camerons Corner and Raleigh Dam. This is second only to the recently upgraded Marks Hill section. The current crash rate on this section of the Waterfall Way is 35.16 per 100 million vehicle kilometres (100 mvk) travelled. The overall NSW crash rate is 32.8 per 100 mvk.
- There were 45 reported crashes
- About 49 per cent of crashes were injury crashes (no fatalities) and 51 per cent were non-casualty crashes, while over 50 per cent of the crashes were single-vehicle crashes
- Less than five per cent of crashes occurred at or near intersections.

The most common types of crash were:

- Vehicles running off the road on a curve and hitting an object (31 per cent of all crashes)
- Vehicles running off the road on a curve (15.6 per cent of all crashes)
- Vehicles being rear-ended (15.6 per cent of all crashes)
- Vehicles running off the road on a straight and hitting an object (13.3 per cent of all crashes).

The crash record comprises a low critical crash rate but a high frequency. With traffic expected to increase, road safety performance on this section of the Waterfall Way may worsen if the road is not upgraded or alternative road safety initiatives are not implemented.

2.2.3 Safety

The current geometric alignment of this section of the Waterfall Way has a number of deficiencies that affect road safety. These include:

- The horizontal alignment does not meet the standard for the speed environment. There are numerous compound and nonconforming curves ranging from a design speed of 55 to 100 kilometers per hour. These inconsistent conditions have necessitated the installation of a range of speed advisory signs along this section of the Waterfall Way
- The vertical alignment does not meet the stopping sight distance for 80 kilometers per hour in some locations. This impacts on a motorist's ability to see an object on the road or other vehicles far enough in advance and react without causing an unsafe maneuver
- The road shoulders do not meet the typical standards. The road shoulders are less than one metre wide. These narrow road shoulders restrict a motorist's opportunity to pull off the road clear of traffic in a safe manner, and do not provide adequate allowance for cyclists
- Multiple properties directly access Waterfall Way with sight distance and through traffic issues for exiting and entry movements.

2.3 Level of service

Level of service is a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety.

RMS has assessed the existing alignment as meeting level of service 'C' (stable traffic flow). The proposed upgrade would maintain this level of service into the future by accommodating the predicted increase in traffic volumes.

3 Environmental investigations

This chapter presents a summary of the preliminary environmental investigations undertaken to help RMS develop the two route options so that the upgrade would minimise impacts on the environment. Following the selection of the preferred route, RMS will prepare a review of environmental factors (REF), which will comprehensively assess all impacts of the project. The full reports of preliminary environmental and technical investigations are provided in Appendix B to G.

3.1 Soils and water quality

The soils investigations assessed the soils of the 78-hectare project area, including geology and geotechnical considerations, the likelihood of acid sulphate soils (ASS), the need for erosion and sediment control measures to protect water quality, and the likelihood of encountering contaminated land. These issues are outlined below.

3.1.1 Geology and geotechnical considerations

RMS prepared a preliminary geotechnical investigation report (RMS, 2011) to help develop the route options and identify geotechnical risks, costs, opportunities and constraints within the project area. The report used the findings of previous investigations carried out by RMS for previous projects. These investigations include:

- Pavement Rehabilitation at Raleigh Dam – 1.00 km to 1.70 km West of the Pacific Highway. Report No. 26079 (RMS, March 2007)
- Camerons Corner Realignment – 1.70 km to 2.20 km West of the Pacific Highway. Report No. H/43024 (RMS, October 2004)
- Proposed Pavement Reconstruction West of Short Cut Road – 1.70 km West to 3.16 km West of the Pacific Highway. Report No. 21112 (RMS, August 2001)
- Investigations into Pavement Failure in Segment 1030 and 1040 – 2.86 km to 4.64 km West of the Pacific Highway. Report No. NG-086 (RMS, July 2006).

The 1:100,000 Soil Landscape Sheet Map for Dorrigo identifies the soils of the project area as those derived from alluvial and swamp landscapes (Milford, 1996).

Alluvial soil landscapes are formed by deposition along rivers and streams. The alluvial landscape soils are described as deep (greater than two metres), moderately well drained to poorly drained alluvial clays, earthy sands, alluvial loams, yellow podzolic soils and gleyed podzolic soils. The limitations of these soils include strong acidity, low fertility, acid sulphate potential, low permeability, high water erosion hazard, flood hazard and seasonal waterlogging.

Swamp soil landscapes are dominated by ground surfaces and soils that are seasonally wet. The swamp landscape soils are described as deep (greater than two metres), poorly drained yellow podzolic soils, gleyed podzolic soils and structured plastic clays. The limitations of these soils include strong acidity, very low wet-bearing strength, low to very low fertility, high to very high organic matter, high aluminium toxicity potential, high salinity, high sodicity and high to extreme subsoil erodibility. Other limitations include very high flood hazard, seasonal to permanent waterlogging, permanent high water tables and high to severe foundation hazard (Milford, 1996).

Further detailed geotechnical investigations will be undertaken during the detailed design phase, as part of the REF for the preferred route.

3.1.2 Acid sulphate soils



RMS commissioned a preliminary Acid Sulphate Soil Management Plan (GeoLINK, 2012; see **Appendix F**). It involved a site inspection, review of previous reports, review of the ASS risk map (refer **Figure 3.1**), and site investigation and soil sampling.

The soil sampling and analysis indicate there is a high risk that excavation may disturb ASS within the project area. There is also a high risk associated with dewatering, if required for extending culverts and constructing sediment basins.

It would therefore be necessary to contain and treat ASS to reduce the risk of harm these materials may cause to the surrounding environment. A range of mitigation measures is included in the preliminary Acid Sulphate Soil Management Plan.



LEGEND

-  Project area
-  High probability of occurrence

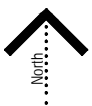


Figure 3.1 Review of acid sulphate soil risk map

3.1.3 Erosion and sediment control, and water quality

The likely impacts and management measures in terms of erosion, sedimentation and water quality are presented below for the construction and operation of the project.

3.1.4 Construction impacts

RMS commissioned a preliminary Erosion and Sediment Control Report (GeoLINK, 2012; see **Appendix G**). It took into consideration the existing topography, soil type and rainfall intensity and issues related to the constructability of the proposed route options.

The potential impacts of the project in terms of erosion and sedimentation include:

- The exposure of soils to erosion hazards through excavation work, vegetation removal, the extension of existing culverts within the drainage channels, construction of a large culvert at Camerons Corner, and the stockpiling and re-spreading of topsoil
- The pollution of nearby sensitive watercourses and wetlands
- The disturbance of soils near the existing drainage channel and near the Melaleuca wetland (Swamp Sclerophyll Forest EEC) at Camerons Corner, potentially causing sedimentation downstream
- The establishment of temporary sites, including side tracks, site compounds and stockpile sites.

The investigation found that temporary sediment retention basins would be required for the construction of the project. These basins would require the construction and maintenance of 'clean' and 'dirty' water diversion drains to ensure the success of the system and minimise any impacts associated with erosion and sedimentation. The proposed basins have been located and designed to minimise encroachment on private property and impacts on established vegetation and to ensure no impact on the Swamp Sclerophyll Forest EEC. However, they would need to be located outside the road reserve due to the topography, proposed road levels, restrictions of the narrow road reserve and the required size of the basins.

Detailed requirements for the erosion and sediment retention basins will be covered as part of the REF for the preferred route to ensure that construction work does not result in impacts on water quality. The REF will include details on the design of the basins and outlets, landscaping, vegetation specifications and maintenance.

3.1.5 Operational impacts

The investigation found that no permanent basins would be required once the Waterfall Way is upgraded and in operation. In addition, during operation, RMS would seek to ensure there is no additional impact on water quality.

Potential water quality impacts and mitigation measures will be assessed as part of the REF for the preferred route.

3.1.6 Contaminated land

The Preliminary Environmental Investigations Report (GeoLINK, 2011; see **Appendix B**) identified no contaminated land in the project area and no indications of past land uses likely to cause contaminated lands were identified during the site visit. However, contaminants resulting from current land uses may be present. Such contaminants may include hydrocarbons from roadwork, fuel/oil leaks and spills from vehicles, or chemicals from agricultural activities such as irrigation, chemical applications and stock dips.

A more detailed investigation of contaminated lands will be conducted as part of the REF for the preferred route.

3.2 Biodiversity

RMS commissioned a preliminary ('Part A') ecological assessment report (GeoLINK, 2012; see **Appendix C**). It included a systematic flora and fauna desktop assessment and field survey to update previous investigations and describe the biodiversity values of the project area. A second stage of the ecological assessment ('Part B') will be undertaken as part of the REF for the preferred route.

The project area is set in a rural/rural-residential landscape on the southern edge of the Bellinger River floodplain. It supports a mosaic of forest and wetland habitat amongst the cleared/developed land. While the entire project area shows signs of historic disturbances, it retains known and potential habitat values for a range of threatened species and communities. These are described below.

3.2.1 Vegetation communities

The project area supports six broad vegetation classes, comprising nine different vegetation communities:

- Exotic species dominated by open grassland (open grassland)
- Tallowood – Narrow-leaved White Mahogany – Turpentine open forest (moist sclerophyll forest)
- Blackbutt – Turpentine – Tallowood open forest (moist sclerophyll forest)
- Blackbutt open forest (moist sclerophyll forest)
- Freshwater wetland (freshwater wetland)
- Broad-leaved Melaleuca / Swamp Mahogany swamp forest (swamp sclerophyll forest)
- Camphor Laurel forest (exotic species dominated forest)
- Radiata Pine forest (exotic species dominated forest)
- Mangrove forest (saline wetland).

The location of these communities is shown in **Figure 3.2**.

3.2.2 Endangered and threatened communities

Two endangered ecological communities (EEC) listed under the *Threatened Species Conservation Act 1995* (TSC Act) were recorded during the survey:

- Swamp Sclerophyll Forest on Coastal Floodplain of the NSW North Coast, Sydney Basin and South East Corner Bioregions (this covers about 3.3 ha of the project area)
- Freshwater Wetlands on Coastal Floodplain of the NSW North Coast, Sydney Basin and South East Corner Bioregions (this covers about 1.25 ha of the project area).

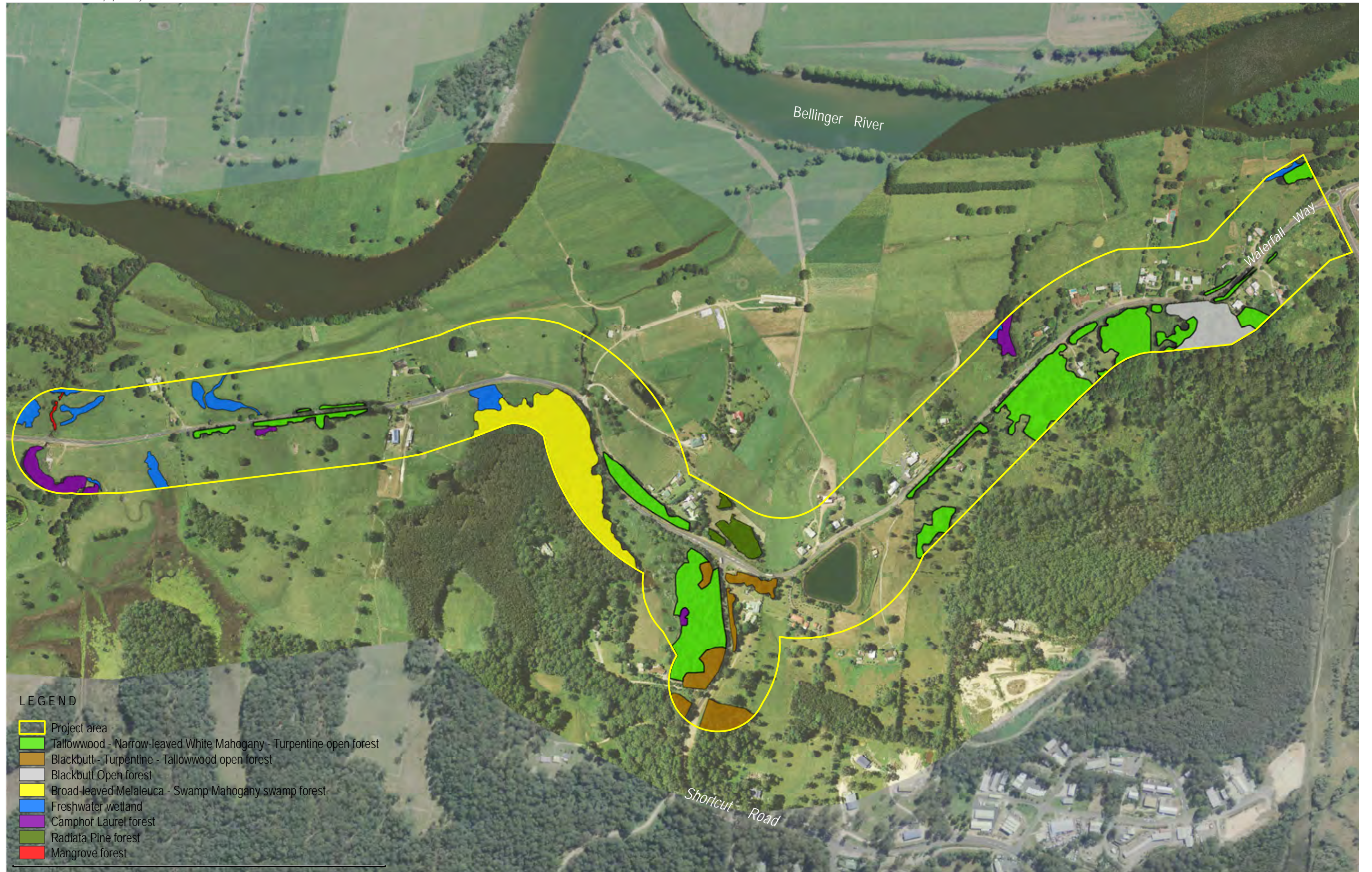
The locations of these communities are shown in **Figure 3.3**. No other EEC listed under the TSC Act or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was recorded. The mangroves within the Mangrove forest are protected under the *Fisheries Management Act 1994* (FM Act) and are also shown in **Figure 3.3**.

3.2.3 Threatened flora and fauna species










The only threatened flora species recorded during the survey was Rough-shelled Bush Nut (*Macadamia tetraphylla*), which exist as ornamental plantings near a driveway entrance opposite Shortcut Road. There is also potential habitat for six other threatened flora species. In addition, one

species listed as a Rare or Threatened Australian Plant (RoTAP) was recorded, namely, Nambucca Ironbark (*Eucalyptus ancophila*), which was found primarily within the Tallowwood – Narrow-leaved White Mahogany – Turpentine forest.

Six threatened fauna species have been recorded within the project area: Black-necked Stork, Koala (identified via scats below two trees), Grey-headed Flying-fox, Little Bentwing Bat, Eastern Bentwing Bat and Large-footed Myotis. The project area provides potential habitat for a further 25 threatened fauna species, which have been recorded locally. Four EPBC Act listed migratory species were recorded within the project area, while an additional nine species were considered potential occurrences.



LEGEND

-  Project area
-  Tallowwood - Narrow-leaved White Mahogany - Turpentine open forest
-  Blackbutt - Turpentine - Tallowwood open forest
-  Blackbutt Open forest
-  Broad-leaved Melaleuca - Swamp Mahogany swamp forest
-  Freshwater wetland
-  Camphor Laurel forest
-  Radiata Pine forest
-  Mangrove forest



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Figure 3.2 Vegetation communities

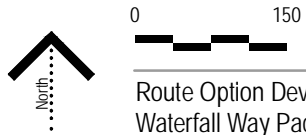


Figure 3.3 Legislative listed vegetation

3.3 Hydrology

The main hydrological features of the project area are:

- The Bellinger River floodplain
- Camerons Corner wetland
- Raleigh Dam
- Connells Creek, which flows into the Bellinger River
- Numerous unnamed watercourses and drainage lines.

Current flooding on the Waterfall Way, and the drainage regime, are presented below.

3.3.1 Flooding

Part of the project area is located on the Bellinger River floodplain and is therefore subject to flooding to varying degrees through a range of flood events. Areas affected by flooding in a one per cent annual exceedance probability flood (1% AEP flood) are shown in **Figure 3.4**.

As shown in **Figure 3.4**, the project area is affected by flooding in the western area near Connells Creek and at Camerons Corner. About 450 metres of the Waterfall Way at Camerons Corner is inundated by floodwater during a one in 100-year flood event for the Bellinger River.

3.3.2 Drainage

The Camerons Corner section of the project area is low-lying. Water on the road pavement drains directly into the adjacent Swamp Sclerophyll Forest and Freshwater Wetland EEC wetlands, and into informal table drains lining the roadside. Cross-drainage is provided by three culverts located at either end of the project area and at the Swamp Sclerophyll Forest EEC. These culverts flow to the unnamed creek, which flows into the Bellinger River to the north of the project area. The Bellinger River then flows to the ocean at Urunga, about six kilometres south-east of the project area.

The hydrology of the Swamp Sclerophyll Forest and Freshwater Wetland EEC at Camerons Corner is relatively complex and is a result of natural and anthropogenic processes. The wetland has formed in a natural depression, caused in part by a small creek that flows across the project area to join the Bellinger River about 600 metres north of the road. This creek is drained by a single box culvert beneath the road. It would appear from the topography of the area that the wetland existed prior to construction of the road, however, it is unclear whether construction of the road has restricted drainage of the wetland and in doing so, modified the hydrology of the area to increase the depth and area of the wetland.

Drainage of the wetland is limited by the level of the invert of the culvert as well as the drainage invert levels downstream of the culvert under the Waterfall Way. When water levels in the wetland exceed this level, drainage through the culvert occurs. If water flow, upstream of the culvert, increases beyond the capacity of the culvert, water backs up on the southern side of the road and can result in overtopping of the Waterfall Way.

When main river flooding occurs, the creek north of the culvert would also be expected to back up from the Bellinger River and the wetland would fill above the height of the road culvert. It would then either continue to fill until the road surface was overtopped, or eventually drain down via the culvert, to the invert level of the culvert.

3.3.3 The need to improve flood immunity



RMS proposes to improve the flood immunity of the Waterfall Way by raising the carriageway to a minimum immunity level of a one in five-year flood frequency. This level of flood immunity would balance community, environmental and technical considerations. The two route options described in this report will be designed so that the hydrological characteristics of Camerons Corner wetland remain unchanged, ensuring no environmental impact on the wetland.

The detailed design will also ensure that an appropriate drainage system is incorporated into the preferred route.

A more detailed assessment of the impact on drainage lines and all watercourses will be conducted as part of the REF for the preferred route.



LEGEND

-  Project area
-  Indicative 1% AEP flood extents

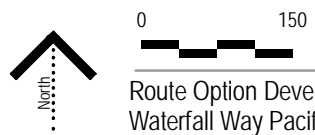


Figure 3.4 Flood map

3.4 Aboriginal heritage

Aboriginal cultural heritage investigations have identified that it is likely that the paperbark swamp at the western foot of the hill slope (Camerons Corner wetland) would have provided traditional water, food, cultural material and resources to the indigenous population. Therefore, it is considered to be of Aboriginal cultural heritage value.

It is recommended that this feature be avoided or, at the least, that construction impacts be minimised. Options A and B would both avoid this area.

However, both options would impact on another culturally sensitive area. RMS will undertake further consultation with the Aboriginal community concerning this area.

3.5 Non-Aboriginal heritage

A number of heritage registers and listings were reviewed for the Preliminary Environmental Investigation to identify whether any known heritage items are present within the project area (GeoLINK, 2011; see **Appendix B**). These registers and listings include:

- Roads and Traffic Authority Section 170 Heritage and Conservation Register
- NSW Heritage Office State Heritage Register/Inventory
- Bellingen Local Environmental Plan 2010 (LEP)
- Australian Heritage Database Register.

It was found that three items/places are within the project area. Two are listed as I187 and I230 under the Bellingen LEP 2010 (see **Table 3.1**). The other item – Bellinger River (North Arm) Valley – is identified under the Australian Heritage Database as being near the project. The majority of other heritage items and places that are listed are located within and surrounding the towns of Bellingen and Dorrigo, outside the project area.

Table 3.1 Heritage items on the Bellingen LEP 2010

Item No.	Suburb	Item Name	Address	Property Description	Significance
I187	Fernmount	Cultural Planting	338 Waterfall Way	Lot I DP 415749	Local
I230	Raleigh	Cultural Planting	254 Waterfall Way	Lot I DP 855011	Local

Heritage item I187 is a mature Moreton Bay fig tree characteristic of cultural planting around dairy farms in the Shire from around 1930. The tree is seen as a prominent landscape feature from the Waterfall Way.

Heritage item I230 is a mature Port Jackson Fig tree characteristic of cultural planting around dairy farms. The tree is situated adjacent to the Waterfall Way.

Item I187 is about 75 metres from the closest route option while Item I230 is about 50 metres from the closest route option. As such it is unlikely that either option would be impacted by the project. The third heritage item, Bellinger River (North Arm) Valley, is classed as an 'indicative place' on the Register of the National Estate (RNE), and comprises much of the surrounding area. The

Australian Heritage Council no longer adds places to the RNE, and no legislative restrictions related to the project apply as a result of the area being classed as an indicative place.

3.6 Noise and vibration

RMS commissioned a preliminary noise and vibration assessment to help identify and manage any impacts resulting from the noise and vibration associated with the construction and operation of the project (Wilkinson Murray, 2012; see **Appendix D**). The investigation identified the existing noise profile, potential noise-sensitive receivers, and noise guidelines. ‘Noise-sensitive receivers’ are, in this case, the residents who would experience noise from the upgraded Waterfall Way.

3.6.1 Existing noise profile and noise-sensitive receivers

The noise profile of the project area is mostly made up of traffic noise from the Waterfall Way.

The investigation identified 31 individual noise-sensitive receivers within the project area, all of which were residential. **Figure 3.5** shows the location of these receivers.

3.6.2 Noise guidelines and mitigation

The NSW Government’s Road Noise Policy classifies the proposed upgrade as a ‘redevelopment of existing freeway/arterial road’, and provides guideline/criteria for base operational traffic noise when assessing noise impacts on residential receivers. These criteria are presented in **Table 3.2**.

Table 3.2 Guideline/criteria for base operational traffic noise

Road category	Daytime levels (7am 10pm)	Night-time levels (10pm 7am)
Redevelopment of existing freeway/arterial road	LAeq (15 hour) 60 dBA (external)	LAeq (9 hour) 55 dBA (external)

LAeq: represents the equivalent continuous A-weighted noise level for the measurement period.

dBA: Decibels using the ‘A’ weighted scale, measured according to the frequency of the human ear.

RMS would consider noise mitigation measures for residential receivers where the road noise exceeds the base operational traffic noise criteria and the 2dBA allowance and/or where they are exposed to acute noise levels. Overall noise mitigation measures that could be considered for the project are: roadside noise barriers, low-noise road pavement, and architectural treatment of exposed residences.

The most appropriate mitigation measure will be determined during the detailed design phase after the preferred route has been announced. Further detailed noise modelling will also be carried out during the detailed design phase.

3.6.3 Construction noise and vibration

Noise from construction is expected to result in impacts at some receiver locations, for at least some of the time. It is likely that the noise management levels would be exceeded during project construction. Vibration would generally be within comfort levels, and well within damage thresholds, although it would be perceptible at times. The most significant vibration is expected to occur during the use of vibratory rollers, particularly in limited areas where some widening outside the existing lanes is carried out. A review of impacts and identification of mitigation measures will be identified in the detailed design phase.



Figure 3.5 Identified residential receiver locations

3.7 Socio-economic considerations

The assessment of socio-economic factors considered population and demography, social infrastructure and the economy.

3.7.1 Population and demography

Information on key population and demographic characteristics is based on data collected from the Australian Bureau of Statistics (ABS) 2006 Census. The project area is located within the Bellingen Shire LGA, however information is presented for the following areas, which represent the key regional hubs that the Waterfall Way services:

- Bellingen (located to the west of the project area)
- Urunga (located to the south-east of the project area)
- Coffs Harbour (located to the north-east of the project area).

At the 2006 Census, the Coffs Coast subregion in which the project area is located (namely, Bellingen, Urunga and Coffs Harbour) had a combined population of 71,480. This was made up of 3554 people in Bellingen, 3015 in Urunga, and 64,911 in Coffs Harbour. The regional population grew by 5040 since 2001, with most of this growth in the city of Coffs Harbour (Urunga and Bellingen only grew by between 100–200 people, respectively).

The region also has a larger proportion of people over 50 years of age than the NSW average and is trending upward. More than 2000 people aged 50–59 moved to Coffs Harbour between 2001 and 2006, compared to only 468 people aged 18–24.

The subregion is also characterised by communities that:

- Rely heavily on private transport to work (a maximum of 1.5 per cent of the population uses public transport)
- Live and work within their local area (92 per cent of Coffs Harbour residents stay within Coffs Harbour to work).

3.7.2 Social infrastructure

Social infrastructure refers to community facilities, services and networks that individuals, families, groups and communities rely on to meet their day-to-day living, education, health and social needs and to enhance community wellbeing. It includes facilities and services for community support, education and training, sport and recreation, cultural, health, and emergency.

Coffs Harbour provides an extensive range of community, commercial, retail and social services and facilities. Both Bellingen and Urunga also offer a variety of social services and facilities, but they are not as comprehensive as those offered in Coffs Harbour.

3.7.3 Local business and industry

The gross regional product of Coffs Harbour was estimated at about \$2659 million in 2008–09. The gross regional product of Bellingen Shire was estimated at about \$347 million in 2009–10. Coffs Harbour contributes about 25 per cent to the Mid North Coast gross regional product.

The most recent local business and industry data show that the region's three major employment industries are retail trade, healthcare and social assistance, and accommodation and food services. The proportion of people employed in these industries in each of the LGAs is significantly higher

than the NSW average. Coffs Harbour had an estimated 5568 businesses in June 2007, while Bellingen Shire had 1276 businesses in June 2009.

3.8 Landscape character and visual considerations

RMS commissioned a preliminary Landscape and Visual Impact Assessment to identify potential impacts of the route options as well as mitigation measures that would reduce the potential impacts of either option (GeoLINK, 2011; see **Appendix E**). Key findings are presented below.

3.8.1 Landscape and visual character

For assessment purposes the landscape and visual character of the project area may be divided into four distinct landscape character zones: vegetated hills, Bellinger River northern floodplain, rural residential ridgeline, and floodplain. These are shown in **Figure 3.6**. The assessment determined that the project would not result in significant adverse landscape character impacts for either option.

3.8.2 Visual assessment

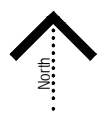
Visual assessment is undertaken in terms of the 'visual receivers' (in this case, the residents and other people who would experience the view of the upgraded Waterfall Way). It was found that:

- Realignment and vegetation removal would have the greatest influence upon the project's level of visibility and the impacts experienced
- The scale and visibility of the upgrade (under either option A or B) would be moderate as it would mainly involve a relatively minor realignment, generally parallel to the existing carriageway. Visual receivers south of the Waterfall Way, who overlook Raleigh Dam and are located close to the proposed upgrade, are elevated and would be likely to experience the greatest visual impacts
- The overall visibility of the upgrade would be localised, as there would be minimal opportunities for distant views to the road due to topography and vegetation.

Both route options would require various levels of cut and fill and vegetation removal. Selecting a design option that would minimise and balance cut and fill would be an effective means of reducing potential impacts.



Figure 3.6 Landscape character zones



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3.9 Services and public utilities

Consultation with utility companies indicates that the main public utilities known within the project area are:

- An underground council water main which services the seaboard areas from the Bellingen water treatment plant
- An underground Telstra cable
- Overhead electricity mains
- Optus fibre optic cable.

Any requirements for the relocation of infrastructure – such as public utilities, water, sewerage and fibre optics – will be determined as part of the detailed design of the preferred route.

3.10 Planning issues

Current zoning and the requirements of the State Environmental Planning Policy, Infrastructure (ISEPP) are presented below.

3.10.1 Zoning

The project area is located within the Bellingen Shire LGA and is located on land that is affected by the Bellingen LEP 2010. The zoning map for the project area is shown as **Figure 3.7**. The objectives of each zone are outlined in **Table 3.3**.

Table 3.3 Land use zones and objectives

Zone	Objectives
RU1 Primary Production	<ul style="list-style-type: none"> • To encourage sustainable primary industry production by maintaining and enhancing the natural resource base • To encourage diversity in primary industry enterprises and systems appropriate for the area • To minimise the fragmentation and alienation of resource lands • To minimise conflict between land uses within the zone and land uses within adjoining zones.
RU4 Rural Small Holding	<ul style="list-style-type: none"> • To enable sustainable primary industry and other compatible land uses • To maintain the rural and scenic character of the land • To ensure that development does not unreasonably increase the demand for public services or public facilities • To minimise conflict between land uses within the zone and land uses within adjoining zones.
R5 Large Lot Residential	<ul style="list-style-type: none"> • To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality • To ensure that large residential allotments do not hinder the proper and orderly development of urban areas in the future • To ensure that development in the area does not unreasonably

Zone	Objectives
	increase the demand for public services or public facilities <ul style="list-style-type: none"> • To minimise conflict between land uses within the zone and land uses within adjoining zones • To ensure that large residential lots are appropriately linked to the nearest urban centre.
E2 Environmental Conservation	<ul style="list-style-type: none"> • To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values • To prevent development that could destroy, damage or otherwise have an adverse effect on those values.
E3 Environmental Management	<ul style="list-style-type: none"> • To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values • To provide for a limited range of development that does not have an adverse effect on those values.

Source: Bellingen LEP 2010

The upgrade would be generally consistent with the objectives of the RUI Primary Production, RU4 Rural Small Holding, R5 Large Lot Residential E2 Environmental Conservation and E3 Environmental Management zones. The project would not encroach on any land zoned E2 Environmental Conservation or E3 Environmental Management.

3.10.2 State Environmental Planning Policy, Infrastructure

Clause 94 of the ISEPP states that: ‘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 project would therefore be approved under Part 5 of the EP&A Act 1979 and would be subject to a comprehensive environmental assessment. Any such environmental assessment is required to include mitigation measures and safeguards that would be effectively implemented to minimise both direct and indirect impacts on the surrounding environment, agricultural/rural land, residential land and overall environmental values.

3.1 Property acquisition

3.1.1 The need for acquisition

To provide a safer and more efficient road transport system in NSW, RMS may need to acquire private land to undertake road projects. The land may be the property of residents, business owners, or various other legal interests such as lessees or councils. For property acquisition, a property is said to be directly affected by a road project when RMS needs to acquire part or all of the property, in order to construct a particular project.

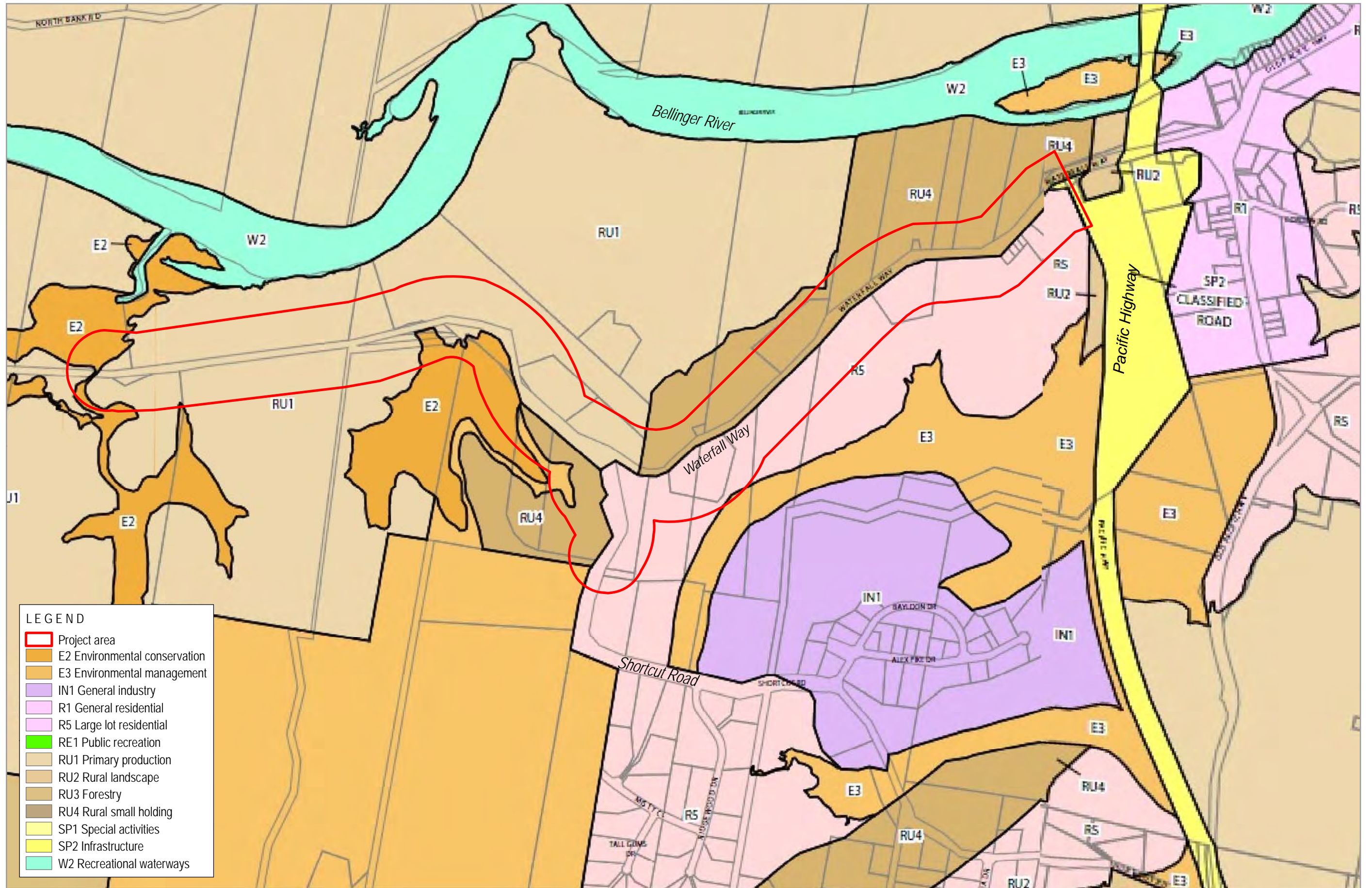
Both options A and B would require partial acquisition of property from private landowners. RMS has held preliminary meetings with all potentially affected landowners and discussed any potential partial acquisition with each owner.

3.1.2 The acquisition process

When RMS needs to acquire property, it contacts the relevant landowners and initiates a process of consultation and negotiation. RMS strives to work with landowners and prefers to achieve a mutually

acceptable agreement for purchase. Reaching an agreement with landowners is central to RMS' land acquisition procedures. However, if agreement is not reached, the property may be acquired by compulsory acquisition. Entitlement to compensation is identical whether the property is purchased by agreement or compulsorily acquired.

Once a preferred route is selected for this section of the Waterfall Way, RMS will hold further discussions with affected landowners as part of the acquisition process. Property acquisition and negotiations will be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. The aims of the Act include 'to guarantee that, when land affected by a proposal for acquisition by an authority of the State is eventually acquired, the amount of compensation would be not less than the market value of the land (unaffected by the Proposal) at the date of acquisition'. Factors such as existing land use, building assets and other improvements are taken into consideration when assessing compensation.



LEGEND

- Project area
- E2 Environmental conservation
- E3 Environmental management
- IN1 General industry
- R1 General residential
- R5 Large lot residential
- RE1 Public recreation
- RU1 Primary production
- RU2 Rural landscape
- RU3 Forestry
- RU4 Rural small holding
- SP1 Special activities
- SP2 Infrastructure
- W2 Recreational waterways

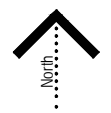


Figure 3.7 Land use zones in the project area

4 Community and stakeholder consultation

The Waterfall Way upgrade is an important project that must be carefully planned and assessed to ensure all issues raised by the community are considered. This consultation, combined with environmental and technical considerations, is essential to assist the RMS project team to identify the route options and a preferred route for the project.

In addition, the project needs to respond to community expectations for road safety, traffic efficiency, infrastructure performance and cost-effectiveness.

This chapter outlines the consultation strategy, and the activities undertaken since RMS commenced the community consultation process in July 2010.

4.1 Overview of the consultation process

Development of the route options has involved consultation with the community and stakeholders including adjacent property owners and local residents, environmental and business groups, Bellingen Shire Council and the wider community.

Consultation was carried out in accordance with RMS' Community Participation and Communications Resource Manual (2008) in a manner to ensure an appropriate level of community engagement.

4.2 Consultation objectives and strategy

A community liaison plan (CLP) was prepared for the project in January 2010. The CLP describes how RMS proposes to engage with the community to assist with the identification of route options and, ultimately, a preferred route for upgrading this section of the Waterfall Way. The CLP outlines:

- Strategies for and the process of community engagement and stakeholder consultation
- Activities that support the implementation of community engagement strategies
- How the community engagement process contributes to the development of the project
- How the community engagement process will be monitored and evaluated.

As outlined in the CLP, the objectives of the consultation strategy for the project are to:

- Engage with the local council, business community, potentially affected landowners, road users and other key stakeholders
- Clearly explain the need for and purpose of upgrading the subject section of the Waterfall Way
- Engage the community to consider and develop route options, thereby providing the project team with valuable information to assist in determining preferred route option
- Engage the community and key stakeholders to better understand their concerns and provide opportunities for feedback
- Keep the community and stakeholders up to date with the progress of the project.

The CLP has been used as a guide for all aspects of community consultation for the project.

4.3 Consultation activities

The consultation process has provided opportunities for community input, has been transparent and has been refined according to community feedback, the type of project and the needs of the community. The community and key stakeholders have also been kept informed throughout the process. Consultation activities and a timeline of community consultation carried out to date are listed in **Table 4.1**.

Table 4.1 Consultation activities and timeline

Consultation	Date
First meeting with Bellingen Shire Council	7 July 2010
First public workshop	4 August 2010
Second meeting with Bellingen Shire Council	3 May 2011
Workshop with adjoining landowners and residents	4 May 2011
Public exhibition of concept route options	6 May to 4 June 2011
Second public workshop	12 May 2011
RMS presentation to Dorrigo Chamber of Commerce	25 May 2011
First staffed display session	18 May 2011
Second public display session	1 June 2011
Third meeting with Bellingen Shire Council	28 February 2012
Face-to-face meetings with individual property owners	28 February to 13 March 2012
Project web page on RMS website	Ongoing throughout the project
Project Facebook page	Ongoing throughout the project
Public Submissions Report (issued)	19 October 2012

These activities are outlined below.

4.3.1 Meetings with Bellingen Shire Council

Representatives from RMS met with Bellingen Shire Council on three occasions.

Meeting 1: 7 July 2010

Representatives from RMS met with Bellingen Shire councillors and senior staff to discuss the project. The main purpose of this meeting was for RMS to advise Council that it would be recommending the previous Camerons Corner project and to advise that a full consultation process would be undertaken with Council, property owners and the community. RMS also advised Council of the extent of the revised project scope.

Meeting 2: 3 May 2011

At the second meeting with Bellingen Shire Council, RMS provided councillors and senior staff with a brief project update, and outlined future consultation that would occur as part of the project including a workshop restricted to property owners, a second public meeting, a static project display at Bellingen Council Chambers and two public information sessions during this exhibition period. RMS also outlined the two proposed options, the project schedule, and funding of the project.

Meeting 3: 28 February 2012

At the third meeting with Bellingen Shire Council, RMS presented councillors and senior staff with a brief project update outlining the refined strategic concept designs for both options A and B and specific details of the potential impacts on individual properties. This included the Council-owned Raleigh Dam. RMS also outlined the upcoming process, including meetings with individual property owners, preparation of a Route Options Development Report, further community consultation and a value management workshop.

4.3.2 Community workshops

RMS organised three workshops for the community in the project area.

First public workshop

RMS held a public workshop at the Bellingden Showground on 4 August 2010. The meeting was advertised and key stakeholders were invited to participate in the workshop. The objectives of the workshop were to:

- Commence an ongoing community consultation process for the project
- Advise the community that the Camerons Corner wetland would be avoided as part of any proposed route options
- Obtain feedback from the community on the potential social, environmental, technical and economic issues with the project
- Identify constraints and opportunities within the project area.

The workshop also gave the community and stakeholders an opportunity to provide feedback about the project and to offer any suggestions to improve the previous proposal. The participants separated into smaller groups and were asked to discuss and document opportunities and constraints and present desired outcomes for the project. The minutes of the meeting were included on the project website.

Workshop for adjoining landowners and residents

RMS held a forum for landowners and residents within the project area at the Urunga Senior Citizens Hall on 4 May 2011, which was attended by 21 residents. The purpose of the forum was to:

- Inform residents of the project objectives and development process
- Inform residents of the objectives of the concept route options stage
- Identify and discuss potential property impacts
- Identify and discuss issues and concerns specific to these particular stakeholders
- Help develop solutions to these concerns by listening to suggestions from residents on how the effects of the proposed upgrade on their property/residence could be lessened
- Advise what the next phase of the project will be, and what will be involved.

After the presentation by RMS, residents were able to ask the project team questions on any aspect of the project.

Second public workshop

RMS held a second public workshop in Bellingden on 12 May 2011, which was attended by 12 residents. The purpose of this meeting was to:

- Recap the initial workshop
- Allow the community to raise any new concerns they had with the project since the initial community workshop
- Inform residents of the objectives of the concept route options stage
- Continue to provide meaningful and ongoing community consultation.

After the presentation by RMS, attendees were able to discuss the project with the project team, ask questions and provide feedback.

4.3.3 Public exhibition of concept route options

The concept route options were displayed at the Bellingen Shire Council administration centre from 6 May to 3 June 2011. Interested parties were invited to review the concept route options and provide written submissions to RMS. A summary of all submissions was included in a submissions report for the project (see **Appendix H**). The submissions report also provides responses from RMS to all submissions received during the project development period.

4.3.4 Staffed displays

During the exhibition period, two information sessions were held to help community members and stakeholders understand the project and provide an opportunity for face-to-face interaction with the project team. These sessions also provided an opportunity for residents who could not attend the two public workshops to ask questions and discuss the project with the project team.

4.3.5 Meetings with individual property owners

RMS held face-to-face meetings with 24 property owners between 28 February and 13 March 2012. These meetings were attended by the RMS project manager, a community relations consultant and an RMS property acquisition officer. Strategic concept design information on the potential property impacts of the route options was presented to owners. Face-to-face meetings were undertaken at each property owner's residence. The purpose of these meetings was to enable property owners to:

- Review further detail on the options and how they relate to their property
- Raise any concerns or issues they had with the project in relation to their property
- Ask any questions they had regarding the proposed options
- Make suggestions on how the route options could be refined
- Assist RMS to gain a greater understanding of the concerns of adjoining property owners.

Owners who elected not to meet with RMS were sent letters with information relevant to their property and invited to contact RMS if they had any queries or required additional information.

All property owners were invited to make a further written submission to RMS after they had reviewed the documentation provided to them (see Section 4.2.9). All written submissions received were summarised in a submissions report (see **Appendix H**).

4.3.6 Project webpage

RMS' website features a webpage with project information specific to the Waterfall Way and the Pacific Highway to Connells Creek upgrade project. It includes information on the community consultation process, media releases, project documents and plans as well as contact details for people requiring further information. This webpage will continue to be updated throughout the life of the project.

4.3.7 Project Facebook page

A Facebook page was established for the project in July 2011 to facilitate and encourage a greater level of community engagement in the overall consultation process. The Facebook page advises the

public of the current project status, consultation processes, project milestones, and upcoming workshops and meetings. It also allows feedback or questions from the community to be posted, and for RMS' responses to be shared with all interested followers.

4.3.8 Public submissions

RMS received 23 submissions from 20 individuals (three respondents lodged two separate submissions) during the public exhibition of concept route options. Of the 20 respondents, 11 supported the proposed upgrade, seven were opposed and two did not specify support or opposition. One submission also included a petition containing 50 signatures. The main issues raised in the submissions related to:

- Traffic and road safety
- Need for the upgrade
- Property impacts
- Flora and fauna
- Amenity
- Raleigh Dam
- Economy and tourism.

4.3.9 Property owners' submissions

All property owners were invited to submit a written submission after their face-to-face meetings with RMS (see Section 4.3.5). Nine submissions were received from eight property owners. The main issues raised in the submissions related to:

- Flooding
- General / existing maintenance
- Project objectives
- Noise impact
- Property access
- Property acquisition
- Amenity
- Raleigh Dam
- Road safety
- Route options design
- Road design.

Of the eight property owners that lodged a submission, two expressed support for the project, two opposed it, and four did not state whether or not they supported the project. Only one property owner stated support for a particular option (Option A). The remaining submissions did not advise a preference for a particular option.

4.3.10 Release of Public Submission Summary Report

A public submissions report has been prepared that documents the results of all phases of community consultation undertaken for the project so far. This includes the public exhibition of the concept route options during 2011 as well as individual meetings with property owners within the

project area. This report identifies, summarises and discusses the submissions received by RMS both during the exhibition period and after additional individual meetings with property owners. It also documents how each of the issues raised in the submissions were considered by RMS.

4.3.11 Consultation with the Aboriginal community

Aboriginal cultural heritage investigations have identified that it is likely that the paperbark swamp at the western foot of the hillslope (known as Camerons Corner wetland) would have provided water, food, cultural material and resources for the local Aboriginal people. Therefore, it is considered to be of Aboriginal cultural heritage value, and it is recommended that construction impacts on this feature be avoided or at least minimised. Options A and B would both avoid this area.

However, another culturally sensitive area has been identified within the project area that would be impacted by both options. RMS will undertake further consultation with the Aboriginal community concerning this area.

4.4 Ongoing consultation

4.4.1 Consultation during exhibition of the Route Option Development Report

This report will be placed on public exhibition for a four-week period and will be published on the project website. During this period, stakeholders and the community will be invited to make submissions, which will be considered by the project team. The exhibition period will also include:

- A staffed public information session to give the community an opportunity to discuss the project and each route option with the RMS project team, and to seek assistance in preparing any submission they may wish to make
- A community update (Community Update – Route Options Development Report) detailing the route options, explaining the project process and future steps, and asking for community feedback.

4.4.2 Ongoing consultation

The community consultation process from this point on is summarised in **Table 4.2**.

Table 4.2 Ongoing community consultation process



5 Development of the route options

RMS has investigated and developed route options that would best meet the project objectives and design criteria. This chapter outlines the design criteria, standards and guidelines that have guided the selection of route options.

5.1 Design criteria

The design criteria considered during the development of the route options are listed in **Table 5.1**.

Table 5.1 Design criteria for the Waterfall Way upgrade

Criteria	Description
Expected pavement design life	20 years
Flood immunity	1 in 5-year minimum flood immunity to be provided at Cameron's Corner
Safety	Improved levels of safety for all road users
Intersections and property access points	Intersections and property access points that are appropriate for the speed limit
Grades and alignment	Grades and an alignment that increase the efficiency of all vehicles
Vertical grades	Between 6% (desirable) and 8% (maximum)
Design speed	80 km/h
Driver reaction time	1.5 seconds
Design curve radius	229 metres minimum for 80 km/h and, 154 metres minimum for 70 km/h Speed advisory signs to be located at below 80 km/h design speed curves
Safety barrier	A W-beam safety barrier to be used due to horizontal alignment constraints and the need to minimise the formation width compared with other barrier types
Travel lanes	3.5 metres wide
Road shoulders	2 metres wide, widened further at property accesses as required
Safety-by-design	Provision for safety-by-design (the RMS 'safe systems' approach to road design and management), which provides for personnel engaged in construction and maintenance and road users
Impact minimisation	A feasible, practical and cost-effective design that reduces environmental, heritage, property and community impacts

5.2 Design standards and guidelines

The standards and guidelines for the design of this project are listed below:

- Austroads Guides (2009)
- New South Wales supplements to Austroads Guides (2012)
- RMS Road Design Guide (as applicable)
- Australian Standards.

Typical sections of the proposed upgrade are shown in **Figure 5.1** and **Appendix A**.

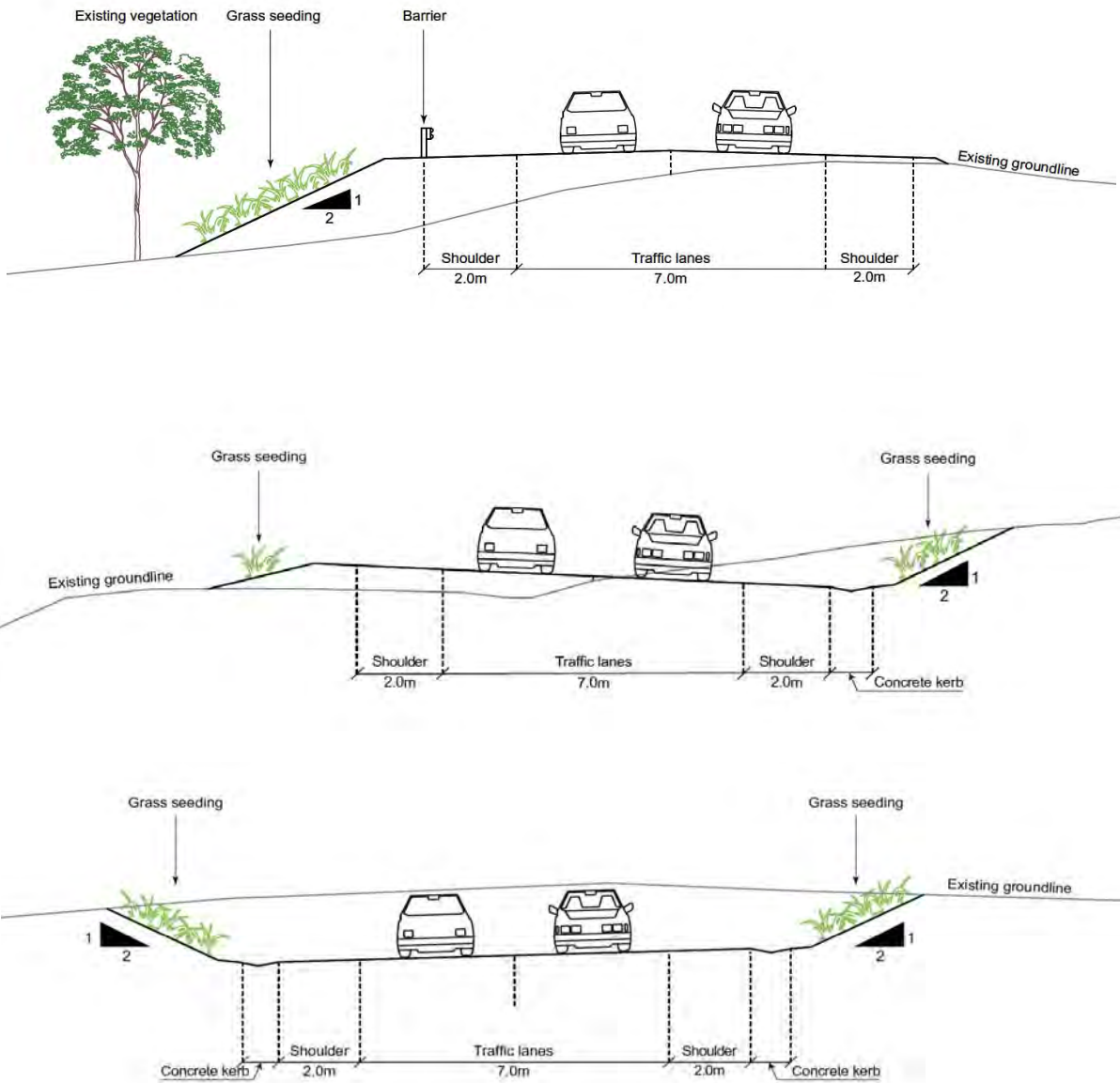


Figure 5.1 Typical sections of the road upgrade

5.3 Options considered by RMS

RMS has investigated and developed route options that would best meet the project objectives. The following presents the process followed by RMS in selecting the route options. The preferred route will be selected by assessing and considering the balance between social, environmental, technical and cost factors.

RMS considered four options as part of the route options development process:

- Rehabilitating the existing road pavement.
- A new northern deviation
- Route options A and B, which were developed in line with the project objectives.

These options are presented below.

5.3.1 Rehabilitating the existing road

This option would involve rehabilitating the existing road pavement. This type of work was recently undertaken in the eastern section of the project area where the pavement had deteriorated and required immediate rectification. The work included replacing sections of pavement with asphaltic concrete and resealing the pavement surface. However, this option is not considered appropriate for the full length of the road section as:

- It would not improve the section to be consistent with State Government planning priorities and the wider strategy for the upgrade of the Waterfall Way
- It would not provide value for money, as the rehabilitated road pavement would have a shorter life and need to be rehabilitated more frequently
- It would not cater for a future increase in traffic
- It would not address the existing substandard design of accesses to private properties
- It would not address the currently deficient road width
- It would not address the design deficiencies in the vertical and horizontal alignment.

5.3.2 Northern deviation

This option would involve a new northern deviation from the Raleigh Interchange to a point west of Connells Creek Bridge, which would provide a design speed of 100 kilometres per hour. This option was not considered appropriate because:

- It would be entirely on a new alignment and involve substantial property acquisition and severance
- It would be close to the Bellinger River and would have hydrological impacts
- It would require significant fill to achieve flood immunity targets
- It would require high construction and overall project costs
- It would reduce the amount of viable agricultural land and also separate existing agricultural activities
- It would be in a highly visible location and would impact on the local landscape character and visual amenity.

5.3.3 Road reconstruction and realignment (route options A and B)

Two route options, known as Option A and Option B were developed in line with the project objectives (see **Section 1.3**).

Both options would involve reconstructing the existing road formation and realigning the road.

Options A and B are considered viable and are put forward for consideration. Section 6 of this report provides a detailed comparison of both options.

6 Comparison of route options A and B

The two route options A and B differ in the middle section (which includes Raleigh Dam, Shortcut Road and Camerons Corner). Therefore, this assessment of the differences between the two options focuses on the middle section of the project area.

This assessment differentiates the options in terms of the following criteria and constraints: technical (engineering and operational), economic, community, and environmental.

6.1 Technical

6.1.1 Travel lane, shoulder widths and accesses

Both options have the same typical cross-section: travel lanes 3.5 metres wide and shoulders two metres wide. This is a significant improvement on the current road (3.2-metre travel lanes and less than 0.5-metre shoulders). These improvements would provide:

- A more forgiving driving environment
- Opportunities for motorists to pull off the road clear of traffic
- A safer road environment for undertaking road maintenance.

In addition to widening the shoulders to two metres, both options would provide for additional widening to three metres at some property accesses, as required. This shoulder widening would provide for safer entry and exit for landowners, and allow buses to pull off the travel lane.

Option A would have more impact than Option B on a private access immediately west of the Raleigh Dam, and Option B would have more impact than Option A on a private access opposite the wetland at Camerons Corner.

6.1.2 Short Cut Road intersection

Both options would provide a wider intersection layout at Short Cut Road, a new westbound deceleration lane and compliance with sight distance requirements. While the intersection angles are different in the two options, both are within the 70 to 90 degrees angle requirement.

The key difference in the eastern approach to the intersection is that Option A has a 70 kilometres per hour design speed, and Option B has an 80 kilometres per hour design speed.

However, Option B requires the shifting of Short Cut Road intersection by about 45 metres to the west of its current location to ensure compliance with sight distance standards. This relocation would lengthen the section of straight alignment at Short Cut Road, with the resulting new intersection located on a straight rather than on the outside of the new curve, on the high side of the super-elevation.

The two smaller Waterfall Way horizontal curves on Option A would allow Short Cut Road intersection to remain at its current location, thereby avoiding most impacts and costs associated with the 45-metre relocation needed for Option B.

Both options A and B would involve widening 70 metres of the Short Cut Road formation. However, Option B would also involve realigning 340 metres of Short Cut Road to enable this widening to occur.

6.1.3 Horizontal curves

Option B has been developed to meet all design standards for an 80 kilometre per hour design speed alignment. However, this design speed would result in Option B having a greater impact on both property and the adjacent environment than Option A.

Option B has a resulting minimum horizontal radius of R240. These horizontal radii curves occur in two locations – at Raleigh Dam and at Camerons Corner. All other radii in the project area exceed this minimum.

Option A has been designed to maximise the use of the existing road corridor and would result in fewer impacts outside the existing corridor than Option B.

Option A is based on a minimum design speed of 70 kilometres per hour with a resulting minimum horizontal radius of R160. These horizontal radii curves are in two locations – Raleigh Dam and Camerons Corner. All other horizontal curves in the project area exceed an 80 kilometre per hour design speed. The two smaller horizontal curves for Option A would reduce land acquisitions and impacts on the environment. Both of these 70 kilometre per hour curves would be an improvement on the current curve geometry.

Whilst the Option A alignment at the Raleigh Dam and Camerons Corner would be at a 70 kilometre per hour design speed, the sight distance at these locations would meet or exceed the horizontal sight distance for the 80 kilometre per hour posted speed.

Both options are designed to provide a consistent speed environment with a posted speed limit of 80 kilometres per hour throughout the project length. With the adoption of AS1742 Australian Standards as the applicable standard for RMS:

- Option A would require speed advisory signage – at Raleigh Dam and Camerons Corner
- Option B would not require any advisory signage as its horizontal radii curves comply with the 80 kilometre per hour design requirements
- Option B would have a greater impact on both property and the adjacent environment than Option A.

6.1.4 Vertical curves

Both options A and B would achieve an 80 kilometre per hour vertical alignment at all but two vertical curves. These two curves are just east of the Raleigh Dam and west of Camerons Corner. The vertical curves at these locations achieve a stopping sight distance of between 75 and 80 kilometres per hour. However, this is deemed acceptable for a posted speed of 80 kilometres per hour for these sections of the road.

Mitigation adopted for the 75 kilometre per hour vertical curves include a wider cross-section, improved access, super-elevation and sight distances. These vertical curves are also on straights, with no overtaking allowed.

In both locations, to remove the minor difference in stopping sight distance between concept design (75km/h) and target design (80km/h) would require additional land acquisition and vegetation removal. It would also require a disproportionate increase in the width of the construction footprint.

6.1.5 Grade

Both options would have a similar grade. One difference is that Option A would have a slightly greater maximum grade (7.5 per cent) than Option B (7.0 per cent).

6.1.6 Pavement

Both options aim to maximise use of the existing pavement. This would increase the efficiency of construction under traffic and reduce disruption to motorists. It would also reduce land and foundation treatment requirements. However, option A utilises more of the existing pavement than option B.

6.1.7 Flood immunity

Both options are designed to achieve a minimum one in five-year flood event, which is an improvement on the current level of flood immunity at Camerons Corner. This increase in the level of flood immunity would reduce the frequency of nuisance flooding and ensure less disruption on this important tourist, freight and commuter route.

6.1.8 Opportunities for cyclists and pedestrians

Both options would provide a minimum two-metre wide sealed shoulder on both sides of the road. This would improve the environment for all road users, including cyclists and walkers and people who use the road to gain access to bus pick-up and put-down areas.

6.1.9 Bus operations

Both options would provide a similar improved environment for buses. School buses pick up and put down at various locations within the project area. These locations tend to change from year to year depending on demand from families who require school bus services. As part of the detailed design for the preferred route, the project team would consider the shoulder provisions in consultation with key stakeholders.

6.1.10 Constructability

The main difference in constructability between the two options is within the section from Raleigh Dam to Camerons Corner. In this section:

- Option B requires larger cuts and fills beyond the verge or safety barriers, mainly from the dam to east of the Camerons Corner culvert.
- Option B would also involve more offline work than Option A. Even though option B would still require access controls at each end of the work areas (where construction traffic would enter/exit Waterfall Way) there would be more opportunity than Option A to minimise contra-flow (one-way traffic under stop/go controls) requirements during the construction period.
- The Option B Short Cut Road intersection would also be largely constructed away from traffic.
- At Raleigh Dam, there would be no material difference in constructability issues between the options, but Option A would have greater impact than option B on access for immediate neighbours.
- Option B requires one more temporary sediment retention basins than Option A.
- Opposite the Camerons Corner Wetlands and west of the existing culvert, Option A would require some more construction off line (north) from the existing road than Option B.

A preliminary construction period staging plan was developed, which takes into account maintaining access for the neighbours, minimising impacts on all road users, and constructability aspects. The main factors influencing staging are the different Option A and Option B horizontal and vertical alignments as well as the property access locations. The staging plan will be further developed during the detail design phase of the preferred route.

6.1.11 Geotechnical considerations

RMS undertook a preliminary geotechnical investigation in 2011. It found that, overall, Option A would have marginally less geotechnical constraints than Option B. The main geotechnical constraints on the project and the differences (underlined) between the two options are as follows:

- Dewatering and embankment construction over Raleigh Dam: Similar for both options
- Widening the existing embankment between chainage 1760 and 1880 metres: More for Option B
- Settlement and stability of the realignment at Camerons Corner between chainage 2380 and 2680 metres: Greater for Option A as Option B utilises more of the existing alignment than Option A at this location
- Quantity of material to be obtained from the proposed cuttings: More for Option B
- Cut and fill batter stability: More for Option B
- Acid sulphate soils: Similar for both options
- Pavement designs: No material difference between both options
- Maximising the use of the existing alignment and pavement would reduce the possible foundation treatment required. – Overall Option A would use more of the existing pavement than Option B.

6.1.12 Public utilities

Public utilities likely to be affected by the project include:

- An underground council water main, which services the seaboard areas from the Bellingen water treatment plant
- An underground Telstra cable
- Overhead electricity mains
- An Optus fibre optic cable.

There are no services expected in the areas where the options differ, so both options would have similar impacts on public utilities.

6.1.13 Raleigh Dam

Both route options would traverse Raleigh Dam. Due to engineering and cost considerations, it is not considered feasible to retain any portion of the dam with either option. The embankment would have to be designed as a water retaining structure, and provide for the long-term risk of the water leaking through the dam lining. The additional cost to reinstate a smaller dam on the residual dam area for both options would be about \$3 million.

Options A and B would impact the whole Raleigh Dam site, which is about 2.10 ha. The area of the dam site remaining following construction of Option A would be about 0.95 ha, and for Option B would be about 1.15 ha.

RMS will consider opportunities to incorporate visual amenity treatments to the remaining area during the detailed design phase of the preferred route, in accordance with its Beyond the Pavement strategy.

6.1.14 Route length

Both options would start and finish in the same location along Waterfall Way. However, Option A would be about 25 metres longer than Option B due to the different alignment.

6.1.15 Hydrology: flood immunity and Camerons Corner wetland

There would be no difference between the two options in terms of flood immunity. Both options would raise the road to a minimum immunity level of a one in five-year flood frequency.

During the detailed design phase of the preferred option, further investigations would be undertaken to ensure any filling and structures within the floodplain would not significantly alter flood levels or velocities.

Also, both options are designed so that the water level of Camerons Corner wetland would remain unchanged, thereby ensuring no environmental impact on the wetland.

6.2 Economic

6.2.1 Cost to construct

The strategic estimates for construction are about \$30 million for Option A and about \$34 million for Option B.

This takes into consideration different pavement designs, and also includes contingencies that are expected to be reduced as the detail design is developed for the preferred route.

6.2.2 Economic benefits

Both options would provide similar economic benefits for the local communities and businesses of Urunga and Bellingen during the construction period. These benefits would include creation of jobs and demand for services, materials and equipment. There would also be spinoff benefits from the project in the local communities through demand for other services such as residential accommodation, hospitality and other retail services.

6.2.3 Adverse economic impacts

There would be no discernible difference between the two options in terms of economic impact. There is unlikely to be any significant negative economic impact from either option.

There are a small number of businesses within the project area, including a dairy farm and a dairy farm parts and materials supplier. Both businesses need access for the delivery and pick-up of goods and materials at varying hours throughout the day. RMS has consulted with these businesses to ensure that their access requirements are understood.

6.3 Community

6.3.1 Community severance

Neither option would result in community severance.

6.3.2 Noise and vibration

Preliminary noise investigations indicate the existing noise levels along the Waterfall Way generally comply with the allowance goal at all noise receiver locations. This assessment indicates that more residences are expected to require noise mitigation for Option B.

Noise mitigation would be considered for all residential noise receivers where noise exceeds the allowance goal and/or where there are acute noise levels. For a standard chip seal pavement five residences would require architectural treatment with Option A, and seven with Option B.

Vibration from construction for both options is expected to result in similar impacts at some receiver locations, for at least some of the time. Vibration for both options would generally be within comfort levels, and well within damage thresholds, although it would be perceptible at times.

6.3.3 Property

Both options would require partial acquisition of property from private landowners. While Option B would require more land overall, the impact of Option A on some individual properties would be greater than Option B. These impacts would be as follows:

- Option A would involve partial acquisition of private land from 14 properties. The total acquisition area would be about 2.9 ha of private land
- Option B would involve partial acquisition of private land from 15 properties. The total acquisition area would be about 3.6 ha of private land
- Both Options A and B would involve acquisition of the 2.1 ha Raleigh Dam site from Bellingen Shire Council.

RMS has undertaken preliminary meetings with all potentially affected property owners and discussed any potential acquisition with each of these owners. Information on the project was sent to all owners who did not require a meeting.

Once a preferred route is selected, further discussions will be held with affected property owners as part of any acquisition process. Property acquisition under either option would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and RMS policy.

6.3.4 Landscape character

The project would not result in significant adverse landscape character impacts, and neither option would have a discernible difference in terms of impact on landscape character, as they would follow similar alignments, with the only differences occurring in the middle section.

6.3.5 Visual amenity

The scale and visibility of both options would be moderate as the majority of the upgrade would involve a relatively minor realignment. There would be minimal opportunities to see the road from distant viewpoints due to topography and vegetation. In addition, both options would be visible from many dwellings and local viewpoints, but the level of visual modification in most cases would be low to moderate as many visual receivers have views toward the existing carriageway.

The main differences between the options are at the Short Cut Road intersection and the area between Short Cut Road and Camerons Corner. These differences are:

- Short Cut Road Intersection: Option B would involve the realignment of the Short Cut Road intersection and associated vegetation removal and earthworks and would have a greater visual impact than Option A in this area
- Short Cut Road intersection to Camerons Corner: With Option B, the realignment of Waterfall Way would diverge from the existing carriageway and result in higher levels of vegetation removal. Option B would therefore result in higher visual impacts in this location. Option B also has the potential to expose the carriageway to nearby dwellings that do not currently have direct views of the carriageway.

6.3.6 Aboriginal heritage

There would be no difference between the two options in terms of impacts on Aboriginal heritage because:

- Both options would avoid impacts on the culturally sensitive paperbark swamp at the western foot of the hillslope
- Both options would impact on an unnamed culturally sensitive area. (RMS will undertake further consultation with the Aboriginal community concerning this area and ensure the necessary assessment of the impacts on this site is undertaken.)

6.3.7 Non-Aboriginal heritage

There would be no difference between the two options in terms of impacts on non-Aboriginal heritage because:

- Neither option would impact on the identified heritage items in the project area (namely, a mature Moreton Bay fig tree and a mature Port Jackson Fig tree)
- Neither option would impact on Bellinger River (North Arm) Valley, which is classed as an Indicative Place on the Register of the National Estate (RNE) and comprises much of the surrounding area.

6.3.8 Land use – statutory planning

There is no difference in the statutory planning requirements for either option. Both options would pass through or be adjacent to land zoned RUI Primary Production, RU4 Rural Small Holding, R5 Large Lot Residential, E2 Environmental Conservation and E3 Environmental Management under the provisions of Bellingen Local Environmental Plan 2010. Also, neither option would encroach on any land zoned E2 Environmental Conservation or E3 Environmental Management.

Both options would be permissible without consent under the provisions of SEPP (Infrastructure) 2007.

6.3.9 Land use – residential

The eastern section of both options would impact on land zoned R5 Large Lot Residential, which is permissible to be subdivided into lots with a minimum of one hectare under the provisions of Bellingen Local Environmental Plan 2010. This land is located on the southern side of Waterfall Way. Option A would require slightly more land acquisition (about 1.1 ha) than Option B (about 0.95 ha).

6.3.10 Land use – productive land

Option A would involve acquisition of about 2.9 ha of land while Option B would involve acquisition of about 3.6 ha of land. However, not all of this land is currently being used for agricultural purposes. The difference between the options varies for each property.

6.4 Environmental

6.4.1 Wetlands and water quality

Both options would avoid all identified wetlands within the project area, including Camerons Corner wetland, and no adverse water quality impacts are anticipated for either option. Both options would be near Camerons Corner wetland. The edge of Option A would be about 2.5 metres from the wetland at its nearest point, while Option B would be about 4.5 metres from the wetland at its nearest point. (It should be noted that the existing road is closer to the wetland.)

Regardless of the recommended preferred option, careful consideration would be applied in detailed design and during construction to identify and implement mitigation measures to avoid impacts on wetlands, the Bellinger River and its tributaries.

Both Options would require temporary sediment retention basins for the construction of the project to reduce risks associated with exposure of soils from vegetation removal and construction work. Option B requires one more temporary sediment retention basin than Option A.

As Option A would have a smaller disturbance footprint and require removal of less vegetation than Option B, it would have less risk of impacting on water quality during construction.

6.4.2 Native flora

Neither option would impact on any endemic threatened flora species or any endangered ecological communities.

However, Option B would result in the removal of more native vegetation than Option A. Option B would result in the loss of about 2.95 ha of native vegetation, whereas Option A would result in the loss of about 1.65 ha of native vegetation. Option B would therefore have a greater ecological impact than Option A.

The difference in the quantity of vegetation removal would primarily occur in the centre of the project area west of the Short Cut Road intersection. Option B would require removal of part of a Tallowwood/Narrow-leaved White Mahogany/Turpentine open forest and a Blackbutt/Turpentine/Tallowwood open forest. Option A would require less removal of vegetation at this location as it would utilise the existing road alignment.

6.4.3 Fauna, including threatened species

While the project area shows signs of historic disturbances, it retains known and potential habitat values for a range of common and threatened fauna species, and also migratory species.

Option B would have a greater ecological impact than Option A. Option B would result in removal of more native vegetation than Option A (refer to Section 6.4.2), including removal of 22 hollow-bearing trees; Option A would result in the loss of 20 hollow-bearing trees.

6.4.4 Aquatic habitats

Neither option is expected to have adverse impacts on the aquatic habitats of Camerons Corner wetland, other wetlands, the Bellinger River and its tributaries. In terms of potential effects, Option A would have a lower likelihood of impacting aquatic environments than option B, even though it would be slightly closer to Camerons Corner wetland at one location. This is because:

- Option A would involve more online construction work overall (that is, work on the existing road), which would result in less disturbance of groundcovers and soils, and therefore less risks associated with erosion and sedimentation
- Option A would have a reduced overall disturbance footprint so there would be less risk with regard to environmental protection issues during construction.

Comparison of Option A and Option B

The above comparison is summarised in **Table 6.1**.

Table 6.1 Comparison of Option A and Option B

Assessment criteria and performance measures	Option A	Option B
Technical		
Cross-sections (travel lanes and shoulder widths)	No discernible difference between the options	
Access treatment	Generally no material difference between the options. However, Option A would have more impact than Option B on a private access immediately west of the Raleigh Dam, and Option B would have more impact on a private access opposite the wetland at Camerons Corner.	
Short Cut Road intersection	Both options would provide a complying, improved widened layout, but with different intersection locations	
	While the intersection angles are different in the two options, both are within the 70 to 90 degrees angle requirement	
	Has a 70 km/hr design speed on the eastern approach to the intersection	Has an 80 km/hr design speed on the eastern approach to the intersection
	Intersection to remain at its current location	Requires intersection to be shifted about 45 metres to the west of the current intersection
	Both options A and B would involve widening 70 metres of the Short Cut Road formation. However, Option B would also involve realigning 340 metres of Short Cut Road to enable this widening to occur	
Design speed – horizontal curves	Minimum 70 km/h design speed radius (R) of 154 m at two curves	Minimum 80 km/h design speed radius (R) of 240 at two curves
Design speed – vertical curves	Minimum 75 km/h design speed at two curves	Minimum 75 km/h design speed at two curves,
Grade of road	Maximum grade of 7.5%	Maximum grade of 7%
Pavement	Option A utilises more of the existing pavement than option B	Option B utilises less of the existing pavement than Option A
Flood immunity	Both options designed for a minimum 1 in 5-year flood immunity	
All road users	No discernible difference between the options	
Bus operation	No discernible difference between the options	
Constructability	Short Cut Road intersection would remain at the same location	Short Cut Road intersection would move 45 m to the west, requiring significant fill and tree removal
	Constructed more within the current alignment	Constructed more outside the current alignment
	Option B would have more construction areas separate from existing road and traffic; this provides a safer environment for workers during construction and simpler temporary traffic control	
	Option B would have larger cuts and fills beyond the verge or safety barriers, mainly from the dam to Camerons Corner.	
	Option B would require one more temporary construction period sedimentation basin than Option A	

Assessment criteria and performance measures	Option A	Option B
Geotechnical	Option A has marginally less geotechnical constraints than Option B	
Public utilities	No discernible difference between the options	
Raleigh Dam	Due to engineering and cost considerations no portion of the Raleigh Dam would be retained with either option	
	Disturbance footprint would be about 2.10 ha	
	Area of land remaining outside of road footprint would be about 0.95 ha	Area of land remaining outside of road footprint would be about 1.15 ha
Route length	3.070 km	3.045 km
Hydrology; flood immunity & Camerons Corner wetland	No discernible difference between the options	
Economic		
Strategic estimate of construction costs	About \$30M	About \$34M
Economic benefits	No discernible difference between the options	
Economic impact (adverse)	No discernible difference between the options	
Community		
Community severance and consolidation	No discernible difference between the options	
Noise	Standard chip seal pavement: Preliminary assessment indicates that architectural treatment would be considered for five residences	Standard chip seal pavement: Preliminary assessment indicates that architectural treatment would be considered for seven residences
Vibration	No discernible difference between the options	
Property	14 properties would be affected by partial acquisition	15 properties would be affected by partial acquisition
	About 2.9 ha of private land would be required for acquisition	About 3.6 ha of private land would be required for acquisition
	While Option B would require more land overall, the impact of Option A on some individual properties would be greater than Option B	
	Both options require acquisition of about 2.1 ha of the Raleigh Dam site from Bellingen Shire Council	
Landscape character	No discernible difference between the options	
Visual amenity	The main difference would occur at Short Cut Road Intersection and between Short Cut Road intersection and the east approach to Camerons Corner. Option B would result in higher visual impacts in both locations	
Aboriginal heritage	No discernible difference between the options	
Non-Aboriginal heritage	No discernible difference between the options	
Land use – statutory planning	No discernible difference between the options	

Assessment criteria and performance measures	Option A	Option B
Land use – residential	Option A would require slightly more land acquisition overall (about 1.1 ha) than Option B (about 0.95 ha) on land zoned R5 Large Lot Residential	
Land use – productive land	Option A would involve acquisition of about 2.9 ha of land while Option B would involve acquisition of about 3.6 ha of land. However, not all of this land is currently being used for agricultural purposes. The difference between the options varies for each property.	
Environmental		
Wetlands	Both options avoid the Camerons Corner wetland, however, Option A is slightly closer to this wetland	
Water quality	Option A would have a smaller disturbance footprint and require removal of less vegetation and would have less risk of impacting on water quality during construction	Option B would have a larger disturbance footprint and require removal of more vegetation and would have a greater risk of impacting on water quality during construction
Native flora and fauna, including threatened species	Less habitat removed than Option B Loss of about 1.65 ha of native vegetation Loss of 20 hollow-bearing trees	More habitat removed than Option A Loss of about 2.95 ha of native vegetation Loss of 22 hollow-bearing trees
Aquatic habitats	Option A slightly closer to Camerons Corner wetland	
	Option A would have more online work (ie, work on the existing road), so less disturbance of groundcovers and soils and lower erosion and sedimentation risks Option A would have a reduced disturbance footprint so less risk with regard to environmental protection during construction	

7 What happens next

7.1 Selection of a preferred route

The project is currently at the 'development of route options' stage. This includes:

- Preliminary investigations to determine the opportunities and constraints for route options
- Community and stakeholder consultation to obtain input from interested parties
- Development of route options (summarised in this report).

RMS will invite the public to comment on this route options development report. A one-month period for public comment will be provided.

With the release of this report the project enters the 'recommended preferred route selection' stage. This process aims to identify the route option that best meets the project objectives while balancing the technical constraints and potential environmental, community and economic opportunities and constraints.

RMS will select the recommended preferred route based on a consideration of community comments to date, technical data, and the findings of a formal value management workshop.

Table 4.2 (see **Section 4.4.2**) identifies the next steps in the selection of a preferred route. Extensive and interactive community consultation has been an important component of the project to date and this will continue during the remaining stages of the project development.

7.2 Detail design and implementation

Subject to funding approval, the preferred route would progress through to detailed design, property acquisition and construction. The detailed design phase includes preparation of an environmental assessment in accordance with the requirements of the *Environmental Planning and Assessment Act 1979*.

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9 Certification

This Route Options Development Report provides a true and fair review of the proposed activity/design refinement for the Waterfall Way (Pacific Highway to Connells Creek) Upgrade.

Signed

Name

Position

Date

Appendix A

Route Options

Appendix B

Preliminary Environmental Investigation (GeoLINK, 2011)

Appendix C

Preliminary Ecological Assessment (Part A) Flora and Fauna Investigations (GeoLINK, 2012)

Appendix D

Preliminary Noise and Vibration Assessment (Wilkinson Murray, 2012)

Appendix E

Preliminary Landscape and Visual Impact Assessment (GeoLINK, 2011)

Appendix F

Preliminary Acid Sulphate Soil Management Plan (GeoLINK, 2012)

Appendix G

Preliminary Sediment Basin Design Options A and B -- The Waterfall Way Upgrade: Erosion and Sediment Control (GeoLINK, 2012)

Appendix H

Submissions Report (GeoLINK, 2012)