



***MAJOR PROJECT ASSESSMENT:  
Bulahdelah  
Pacific Highway Upgrade***

Director-General's  
Environmental Assessment Report  
Section 75I of the  
*Environmental Planning and Assessment Act 1979*  
  
June 2007

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## EXECUTIVE SUMMARY

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The Bulahdelah Pacific Highway Upgrade is proposed by the NSW Roads and Traffic Authority (RTA), forming part of the Pacific Highway Upgrade Program, a government commitment to upgrade the existing highway between Hexham and the Queensland border. The proposal consists of approximately 8.5 kilometres of dual carriageway highway to the east of Bulahdelah as an alternative to the existing Pacific Highway through the town, commencing approximately 4.5 kilometres south of Bulahdelah with interchanges to the south and north of the town. The proposal would link to the Karuah to Bulahdelah section to the south (under construction) and the completed Bulahdelah to Coolongolook section to the north.

The key benefits of the proposal include an expected reduction in accident rates of approximately 78 percent, improvements to local and regional transport efficiency and traffic safety, reduction in safety risks to pedestrians and cyclists, reduction in traffic noise and vehicle emission levels for the majority of sensitive receivers in the area and significant improvement in connectivity within Bulahdelah.

The Department has identified a number of key issues in its environmental assessment of this proposal, including route selection, ecological impacts, cultural heritage, socio-economic, access, amenity and noise and vibration impacts.

Submissions have raised concerns regarding the validity and outcome of the route selection process, particularly with regard to potential ecological and amenity impact of the selected route. The 'bypassing' of Bulahdelah has also raised concerns amongst the local community that it would result in a reduction in trade from motorists using the Highway. The Department has reviewed the route selection process and is satisfied that it was adequate and appropriate. The Proponent has committed to a number of measures in order to mitigate direct economic impacts. The Department concludes that, notwithstanding the known negative impacts likely to result from the preferred option, the preferred route is likely to be of greatest overall benefit to the local and regional community on the basis of economic, social and environmental factors.

The proposed route passes through the foothill of Bulahdelah Mountain, an area that includes a population of the threatened species *Petaurus norfolcensis* (Squirrel Glider) and three rare or threatened orchid species, one of which is listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Proponent has committed to minimising impact through design, clearing methodology, replacement of lost habitat where feasible and the provision of aerial crossings for the purpose of Squirrel Glider populations. The Department has received expert technical advice regarding the potential impact of the proposal on the threatened orchid species. This advice indicates that, while the proposal is likely to have a significant impact on the local populations of these orchids, this impact is able to be mitigated to some extent and the populations are likely to remain viable in the longer term. The Proponent has committed to the preparation and implementation of an Orchid Management and Translocation Plan that would include trial cryogenic storage and translocation of individuals from the area to be impacted. The Department has recommended a number of conditions of approval in order to mitigate for the potential ecological impacts of the proposal and is satisfied that, with the implementation of these conditions and the Proponent's commitments, these impacts can be managed to an acceptable level.

The Department has also undertaken a thorough assessment of the other key issues and concludes that, with the implementation of the Proponent's commitments and the recommended conditions of approval, the proposal would be of overall benefit to the local and regional community and that any potential negative environmental impacts could be managed and mitigated to an acceptable level.

It is therefore recommended that the proposed Bulahdelah Pacific Highway Upgrade should be approved.

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# 1 BACKGROUND

## 1.1 Pacific Highway Upgrade Program

The Bulahdelah Upgrade is proposed by the NSW Roads and Traffic Authority (RTA) and forms part of the Pacific Highway Upgrade Program (see Figure 1). The Upgrade Program is a government commitment to upgrade the existing highway between Hexham and the Queensland border. The objectives of this Program are to:

- significantly reduce road accidents and injuries;
- reduce travel times;
- reduce freight transport costs;
- develop a route that involves the community and considers their interests;
- provide a route that supports economic development;
- manage the upgrading of the route in accordance with ecologically Sustainable Development (ESD) principles; and
- provide the best value for money.

The proposal links to the Karuah to Bulahdelah section to the south and the completed Bulahdelah to Coolongolook section to the north. Construction of the Karuah to Bulahdelah Section 1 was completed and opened to traffic in December 2006. Construction of Sections 2 and 3 (from approximately 1km north of Myall Way to just south of the Booral turn off approximately 3km south of Bulahdelah) commenced in February 2007.

## 1.2 Background Documents

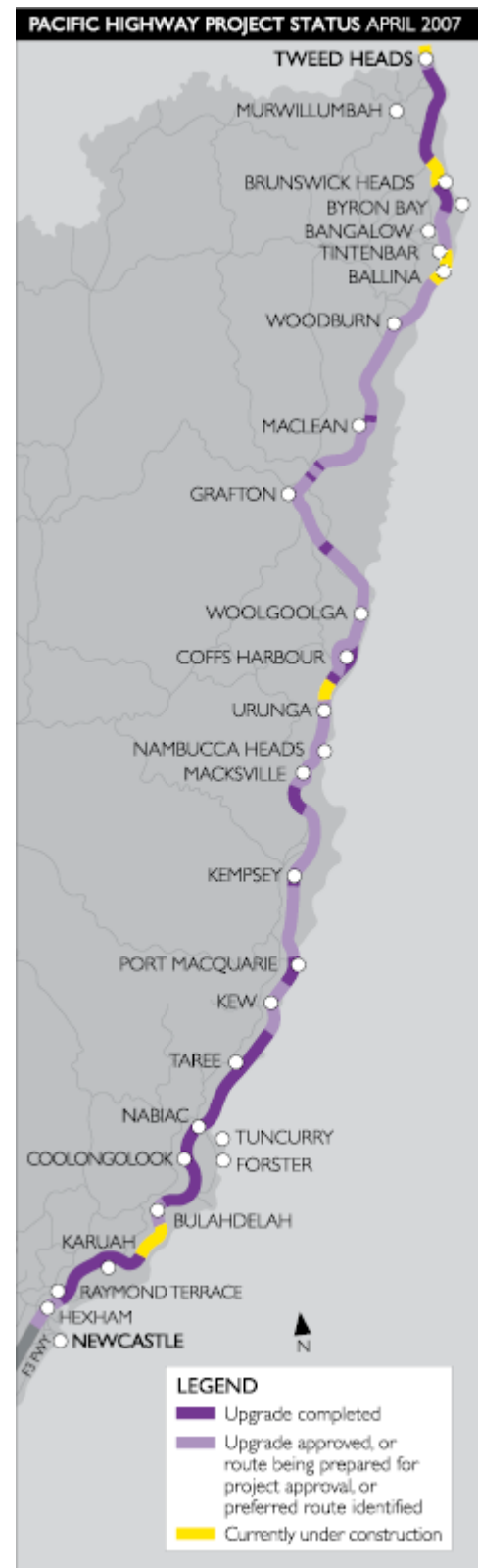
The proposal and its environmental assessment was originally submitted under Part 5 of the *Environmental Planning and Assessment Act 1979* (the Act) (see Section 3.1 of this report) but was brought under Part 3A on commencement of that Part. This assessment is based on information provided in the *Bulahdelah - Upgrading the Pacific Highway Environmental Impact Statement (EIS)* (RTA 2004) and the *Bulahdelah - Upgrading the Pacific Highway Submissions Report* (RTA 2006a).

## 1.3 Location and Land Use

Bulahdelah is located on the Pacific Highway approximately 44 kilometres north of Karuah and 75 kilometres south of Taree. The region immediately surrounding Bulahdelah contains a number of small villages. The traditional economic base for the region has been dairy farming, beef cattle production and forestry. Bulahdelah Mountain, a volcanic formation rising to 292 metres above sea level, dominates the landscape. The Mountain itself is designated State Forest, while surrounding areas include vegetated Crown land farms. The proposal passes predominantly through cleared agricultural land, crossing the Myall River to the south and Frys Creek to the north.

**Figure 1 Pacific Highway Upgrading Program Map April 2007 (RTA 2007)**

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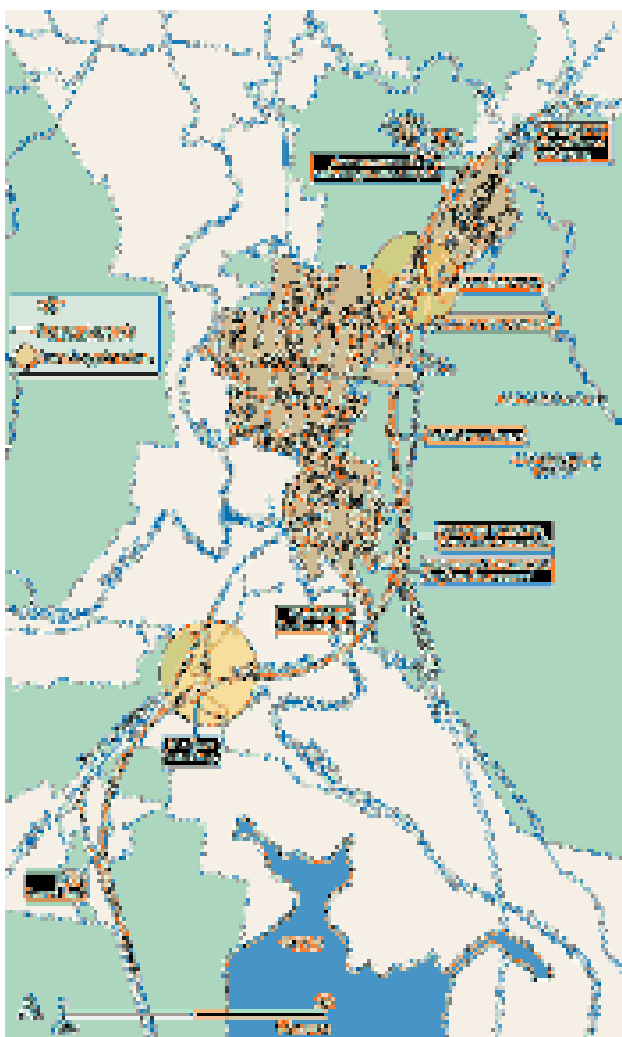
## 2 PROPOSED DEVELOPMENT

### 2.1 Project Description

The Proponent seeks approval to construct approximately 8.5 kilometres of dual carriageway highway to the east of Bulahdelah as an alternative to the existing Pacific Highway, which passes through Bulahdelah, as part of the Pacific Highway Upgrade Program. It would commence approximately 4.5 kilometres south of Bulahdelah with interchanges to the south and north of the town to provide easy access. The works would link to the Karuah to Bulahdelah Upgrade Sections 2 and 3 to the south for which construction commenced in March 2007 and to the already upgraded section of the highway approximately four kilometres north of the town. The estimated capital cost of the project is \$122.75 million (2005 dollar value).

Key components of the project are:

- a four lane divided carriageway highway, capable of widening to six lanes;
- a northbound slip lane to the Booral Road intersection;
- southern interchange with south-facing ramps between Booral Road and the Myall River;
- bridges over the Myall River and Frys Creek;
- an overbridge providing access from the town to Alum (Bulahdelah) Mountain;
- a northern interchange providing access to local streets and access points; and
- a service road from the northern interchange to access the golf course, waste facility and sewage treatment plant.



The road corridor would vary between 60 and 200 metres with the maximum width at the interchanges.

### 2.2 Project Objectives

The Proponent developed objectives for the Bulahdelah Upgrade to guide the proposal's development and address whether the proposal satisfied the identified need. The project objectives are to:

- improve efficiency of travel, safety and accessibility;
- improve environmental quality outcomes;
- achieve environmental sustainability outcomes;
- achieve acceptable socioeconomic and financial outcomes; and
- achieve acceptable design, engineering and constructability outcomes.

These project-specific objectives were based on the overall Pacific Highway Program objectives and followed consultation with community and stakeholders.

**Figure 2** Alignment of Proposed Bulahdelah Pacific Highway Upgrade

## 2.3 Need for Proposal

The EIS notes that the need for the proposal is based on a combination of factors relating to regional economic growth, travel efficiency and road safety, and environmental and social impacts.

### 2.3.1 Travel Efficiency and Road Safety

The EIS states that traffic volumes at Bulahdelah are forecast to double by 2028 due to increased regional population, tourism and freight movements, with traffic through Bulahdelah already comprising a relatively high proportion of heavy vehicles at 17.6 percent. Traffic delays are currently experienced around Bulahdelah during peak holiday periods largely due to restricted lane capacity, speed restrictions and pedestrian interaction. Congestion around Bulahdelah will continue until upgrade projects to the north and south, such as the Karuah to Bulahdelah upgrades, are opened to traffic. Upgrading to dual carriage way will result in improvements to transport efficiency and traffic safety. Without improvements, average peak hour delays are expected to double from three minutes in 2004 to six minutes in 2008 leading to driver frustration and greater potential for road accidents.

Accident rates at Bulahdelah between 1990 and 2001 averaged 99.6 accidents per 100 million vehicle kilometres travelled (VKT), which is twice as high as the State average for a rural two lane undivided road. The State-wide average accident rate for a freeway standard road is 21.9 accidents per 100 million VKT. The proposed upgrade would be expected to achieve a reduction in accident rates of approximately 78 percent.

### 2.3.2 Environmental and Social Impacts

The Proponent has suggested that the predicted increased traffic volumes through Bulahdelah without the Upgrade would result in:

- increased safety risk to pedestrians and cyclists due to conflicting local and regional roles of the highway;
- increased accident risk associated with hazardous material transport;
- ongoing traffic noise levels above planning goals;
- increased vehicle emissions particularly during delays;
- visual impacts of increased traffic volumes, particularly heavy vehicles within the town; and
- constraints on social interaction due to the highway barrier between residents to its east and west.

The proposal would reduce or remove these risks and hazards.

### 2.3.3 State Government Policies

The proposal is consistent with NSW State Government policy and strategies. These include:

- the NSW State Plan 2006, which includes the key priorities of safer roads and maintaining and investing in infrastructure, with travel times between Hexham and the Queensland border as a key measure of the latter;
- the NSW State Infrastructure Strategy 2006, which includes the Pacific Highway Upgrade Program; and
- the draft Mid North Coast Strategy 2006, which cites the Pacific Highway Upgrade Program as a key factor in improving regional accessibility.

### 3 STATUTORY CONTEXT

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#### 3.1 Major Project

The proposal was initially subject to the former Division 4, Part 5 of the EP&A Act. This was on the basis that:

- the NSW Roads and Traffic Authority (RTA) is both the Proponent and a determining authority for the proposal; and
- the Proponent determined that the proposal is likely to significantly affect the environment and therefore require an Environmental Impact Statement (EIS) in accordance with Section 112 of the EP&A Act.

Consequently, the approval of the Minister for Planning would have been required for the proposal.

Director-General's requirements for the preparation of the project EIS were issued on 4 April 2002.

When Part 3A of the EP&A Act commenced on 1 August 2005, Division 4 Part 5 was simultaneously repealed. A Ministerial Order under Section 75B(1) of the Act (gazetted on 29 July 2005) made *"development that is an activity for which the proponent (that is not a local council or county council) is also the determining authority and that, in the opinion of the proponent, would (but for this order) require an environment impact statement to be obtained under Part 5"* development to which Part 3A applies.

#### 3.2 Permissibility

The proposed upgrade is located in the Great Lakes local government area. The proposal is permissible without consent under *Great Lakes Local Environmental Plan 1996*.

#### 3.3 Relevant Environmental Planning Instruments

There are no Environmental Planning Instruments (EPIs) applying to the proposal that substantially govern the carrying out of the development.

#### 3.4 Objects of the EP&A Act

Section 5 of the EP&A Act details the objects of the Act, namely:

- (a) to encourage:
  - (i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment;
  - (ii) the promotion and co-ordination of the orderly and economic use and development of land;
  - (iii) the protection, provision and co-ordination of communication and utility services;
  - (iv) the provision of land for public purposes;
  - (v) the provision and co-ordination of community services and facilities;
  - (vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats;
  - (vii) ecologically sustainable development;
  - (viii) the provision and maintenance of affordable housing; and
- (b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State; and
- (c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

Of particular relevance to the environmental impact assessment and eventual determination of the proposal by the Minister are those objects stipulated under section 5(a) (i), (ii), (iv), (vi) and (vii). With respect to ecologically



sustainable development, the EP&A Act adopts the definition in the *Protection of the Environment Administration Act 1991*, including the precautionary principle, the principle of inter-generational equity, the principle of conservation of biological diversity and ecological integrity, and the principle of improved valuation, pricing and incentive mechanisms. The Department has considered the need to encourage the principles of ecologically sustainable development, in addition to the need for the proper management and conservation of natural resources such as natural areas and water resources, the promotion of orderly, economic use and development of land and the provision of land for public purposes in Section 5 of this report. The agency and community consultation undertaken as part of the assessment process addresses objects 5(b) and (c) of the Act.

### 3.5 Minister's Approval Power

On 1 October 2005 and in accordance with the transitional provisions under clause 8J of the *Environmental Planning and Assessment Regulation 2000*, the Director-General:

- adopted the Director-General's Requirements issued under Part 5 as Environmental Assessment (EA) requirements under Part 3A;
- accepted the EIS under Part 5 as an Environmental Assessment under Part 3A; and
- accepted the exhibition period of the EIS as exhibition for the purpose of Part 3A.

The EIS is compliant with the Director-General's Environmental Assessment Requirements for the purpose of Section 75I(2)(g) of the EP&A Act. The Department has met its statutory obligations so that the Minister can make a determination regarding the proposal.

### 3.6 Commonwealth Statutory Framework

The Commonwealth Minister for the Environment and Heritage (now Environment and Water Resources) determined that the proposal is a controlled action as defined under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The Minister has also approved the NSW environmental assessment process as an accredited process under Commonwealth legislation. Approval from the Commonwealth Minister for the Environment and Water Resources is required for the proposal to proceed.

## 4 CONSULTATION AND ISSUES RAISED

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### 4.1 EIS Exhibition

In November 2004, the Proponent submitted an Environmental Impact Statement (EIS), which included a Species Impact Statement (SIS), for exhibition. The EIS and SIS were exhibited by the RTA between 24 November 2004 and 28 January 2005 at the following locations:

- the Proponent's offices or motor registries in Surry Hills, Grafton and Forster;
- NSW Government Information Centre, Sydney;
- Nature Conservation Council (NSW Environment Centre), Sydney;
- Department of Infrastructure, Planning and Natural Resources (now Department of Planning) Planning Centre, Sydney and Grafton office;
- Great Lakes Council, Forster;
- Bulahdelah Information Centre, Bulahdelah; and
- Bulahdelah Rural Transaction Centre, Bulahdelah.

Notification of the exhibition was published in the following newspapers:

- Great Lakes Advocate on 24 November and 1 December 2004;
- Manning River Times on 24 and 26 November 2004;
- Myall Coast NOTA on 25 November and 2 December 2004;
- Port Stephens Examiner on 25 November and 2 December 2004;
- Newcastle Herald on 24 and 25 November 2004;
- Sydney Morning Herald on 24 and 25 November 2004; and
- The Australian on 24 and 25 November 2004.

The EIS and SIS were also made available from the Proponent's website ([www.rta.nsw.gov.au](http://www.rta.nsw.gov.au)) and for purchase in either hard copy or CD format.

### 4.2 Submissions Received on EIS and SIS

A total of 47 submissions were received in response to exhibition of EIS and SIS. These consisted of:

- 28 from individuals;
- three from businesses;
- eight from public authorities / Government agencies (including the Department of Planning);
- eight from community or business interest groups.

### 4.3 Overview of Issues Raised in Response to EIS

A breakdown of the issues raised in the submissions in response to the EIS and discussed in the Submissions Report is provided in Table 1 below. Approximately 62% of submissions (29) stated opposition to the project.

**Table 1: Issues Raised in Submissions to EIS and SIS**

Issues	Number of submissions which raised this issue	Department's Consideration
Route selection	26	Addressed in Section 4.1 of the Submissions Report and Section 5.1 of this report.
Community consultation	8	Addressed in Section 4.2 of the Submissions Report .
Social and Economic Issues (inc. accessibility, visual amenity, business impacts)	31	Addressed in Section 4.5 of the Submissions Report and Sections 5.6 and 5.7 of this report.
Biodiversity	27	Addressed in Section 4.8 of the Submissions Report and Sections 5.2 and 5.3 of this report.
Heritage (Indigenous and Non-indigenous)	17	Addressed in Section 4.9 of the Submissions Report and Sections 5.4 and 5.5 of this report.
Air quality	17	Addressed in Section 4.10 of the Submissions Report.
Safety (inc. geological stability)	10	Addressed in Section 4.11 of the Submissions Report.
Soils, water and hydrology	9	Addressed in Sections 4.12 and 4.13 of the Submissions Report.
Noise	16 construction (7) operation (16)	Addressed in Section 4.14 of the Submissions Report and Section 5.8 of this report.

#### 4.3.1 Public Authority Submissions

Matters of concern and potential impacts raised in submissions and other correspondence by public authorities are summarised below:

- **Department of Primary Industries (Fisheries)** – aquatic habitat and fish, waterway crossings and floodplain hydrology.
- **Department of Environment and Conservation** (now Department of Environment and Climate Change (DECC) – air quality, water quality (including sediment basins, acid sulfate soils and contaminated soils), ancillary activities (including concrete batching plants, chemical storage and handling and landscaping), flora and fauna (with particular reference to *Rhizanthella slateri* and *Cryptostylis hunteriana*) and indigenous heritage.
- **TransGrid** – relocation of the transmission line with particular concern in regard to cultural heritage, technical restrictions on the proximity of the transmission line to the highway and access tracks.
- **Mid Coast Water** – adjustment/relocation requirements of existing water supply and sewerage infrastructure, vibration impacts on infrastructure, access to reservoirs and the sewerage treatment plant, land acquisition, water supply, land contamination, noise and construction water supply.
- **Department of Primary Industries (Forests)** – visual, Mountain Park (recreational, barrier creation), forest management (loss of timber resource and access to Bulahdelah Mountain during construction for bushfire management), flora and fauna including threatened species.

- **Department of Primary Industries (Minerals)** – no objection to the proposal.
- **Heritage Office** (now part of Department of Planning) – Alunite Mine Site management (integrated approach to archaeological testing, salvage and future management and protection), remnant fence.

#### 4.4 Submissions Report

The Proponent prepared a Submissions Report responding to the issues raised during exhibition of the EIS and SIS, which was submitted to the Department 23 October 2006 (received 26 October 2006). The Submissions Report was placed on the Department's website ([www.planning.nsw.gov.au/asp/register.asp](http://www.planning.nsw.gov.au/asp/register.asp)).

##### 4.4.1 Submissions Received on Submissions Report

Subsequent to the Submissions Report being provided, the Department has received further submissions from Government agencies and a number of additional submissions from members of the public. These consist of:

- 58 from individuals;
- 12 from public authorities/government agencies (including Great Lakes Council);
- three from community interest groups.

All of the submissions from individuals and community interest groups objected to the proposal on a number of grounds. It is noted that the individual submissions came from a total of 14 people.

Key issues raised in submissions from Government agencies were:

- **Department of Primary Industries (Fisheries)** – aquatic habitat and fish, culvert design.
- **Commonwealth Department of Heritage** (now Department of Environment and Water Resources (DEW)) – orchid translocation processes, compensatory habitat.
- **Department of Environment and Conservation** – indigenous heritage, flora and fauna, orchid management, construction noise, soil and water management.
- **Heritage Office** – management of non-indigenous heritage, particularly the Alunite Mine Site.
- **Department of Natural Resources** (now abolished) – groundwater management.
- **Department of Primary Industries (Agriculture)** – agricultural impacts, weed management.
- **Great Lakes Council** – water quality, greenhouse gas emissions, threatened species management, mitigation for native vegetation loss, wildlife corridors.

The Department has reviewed the EIS, submissions to the proposal, the Submissions Report, correspondence from agencies and additional information provided by the Proponent and considers that the key issues associated with the proposal are route selection, biodiversity impacts, (particularly impacts on orchid populations), operational noise and vibration, social and economic impacts and heritage impacts. In some instances, specific conditions of approval are recommended.

The Department is generally satisfied that the mitigation measures proposed in the Proponent's EIS and Submissions Report (see Table 1) adequately address the remainder of the issues raised or provide a process for the management of residual issues during the detailed design, construction and operation of the project, in consultation with key stakeholders. The implementation of these measures and the recommended conditions of approval would result in a project for which environmental impacts are balanced by the benefits of the project as a whole and which is in the public interest.

## 5 ASSESSMENT OF ENVIRONMENTAL IMPACTS

The Department's assessment of the key issues associated with the proposal, namely route selection, biodiversity impacts, (particularly impacts on orchid populations), operational noise and vibration, social and economic impacts and heritage impacts, follows.

### 5.1 Route Selection

#### Issue

Routes following four broad corridors were assessed by the Proponent. These were:

- west of Bulahdelah township;
- through the town;
- to the east between the township and the Mountain; and
- to the east of Bulahdelah Mountain.

The Proponent established a Community Focus Group of local residents and business operators, recruited via a call for nominations placed in local papers. Through a process of assessment and consultation with the Group, five routes were short-listed for further assessment as shown in Figure 3. These included:

- Routes A and B – to the west of the township (route B travelling closest to the town);
- Routes C and D – through the township; and
- Route E – between the township and Bulahdelah Mountain.



Outcomes from the Community Focus Group and other interactions with the community were then used in the Value Management Workshop, a structured process used to consider and assess the remaining five route options. Workshop attendees included members of the wider community, representatives of Government agencies and Great Lakes Council, the Karuah Aboriginal Land Council and industry groups. The workshop developed and weighted evaluation criteria to rank the options against the project objectives, these being:

- improving the efficiency of travel, safety and accessibility;
- improving environmental quality outcomes;
- achieving environmental sustainability outcomes;
- achieving acceptable socioeconomic and financial outcomes; and
- achieving acceptable design, engineering and constructability outcomes.

Options E and A both performed equally well and better than other options when these evaluation criteria were applied. Option E was recommended for further consideration by the Value Management Workshop process and was selected as the preferred route (RTA 2001), due to a number of factors including:

- opportunities for providing a central town focus and urban design enhancement;
- closer proximity to the town, providing better opportunity to attract passing trade;
- highest (best) Benefit Cost Ratio;
- utilises pre-existing road infrastructure to the north;
- less impact on potential sites of Aboriginal cultural significance;
- less impact on prime agricultural land and rural enterprises; and
- minimised potential impact on surface drinking water sources.

This route was also supported by Great Lakes Council, Karuah Local Aboriginal Land Council and Worrimmi Nation Elders.

## Submissions

Submitters have raised concerns with respect to the veracity and rigour of the route selection process.

Issues raised in submissions to the project objecting to Option E as the preferred route include:

- not meeting the proposal objectives;
- not being the route preferred by the majority of the local community;
- having greater environmental impact than Option A, including on the threatened orchids;
- severing the landscape between the township and the Mountain; and
- not having economic benefits in comparison to other options.

## Department's Consideration

### Proposal objectives

One of the project objectives is to “improve environmental quality outcomes”. Environmental quality refers not only to flora and fauna, but also to a range of factors including heritage, noise amenity, air quality, water quality and visual amenity. Submissions regarding the project raised concerns about all of these issues, but particularly flora and fauna, heritage, air quality and noise. The community focus group were primarily concerned with impacts on local trade, town water supply, Mountain Park and local ecology. The proposal would impact the quality of flora, fauna and heritage particularly at the foot of Bulahdelah Mountain, with some impacts on matters of regional or state significance. However, the project would significantly improve noise amenity, air quality and visual amenity for the majority of the township. The proposal therefore improves environmental quality outcomes for residents at a local level, with some impact on environmental quality at a regional level. The Department has assessed these impacts elsewhere in this report.

Another objective is to “achieve environmental sustainability outcomes”. The principles of environmental sustainability have been applied by the Proponent in the course of the route selection and environmental impact assessment processes. It is acknowledged that, on the basis of ecological quality and sustainability as assessed by the Value Management Workshop process, Option A outperformed Option E. Option E was selected based on

its overall performance across a range of factors in comparison to the other options, including economic benefit, lesser impact on sites of Aboriginal cultural significance (compared to the western options), lesser impact on agricultural land and lesser potential impact on surface drinking water sources. Once selected, the design of the proposal was refined by the Proponent to further minimise impact. The impact of the proposal on key environmental issues such as flora and fauna and cultural heritage is further assessed in this section. The Department has concluded that this objective has been met.

The Department is satisfied that all other project objectives would be addressed by the proposal and that the long-term impacts of the project are acceptable provided the rigorous application of the Proponent's commitments and the recommended conditions of approval..

### Environmental Impacts

At the time of undertaking the assessment of the route options, the presence of threatened orchid species, specifically *Rhizanthella slateri*, in the Bulahdelah Mountain area had been raised in Community Focus Group meetings, but not confirmed through recent sightings. Therefore the presence of these species was not assessed as a known factor in the route option selection process.

In 2002, the first confirmed recent sighting of *R. slateri* was made by a local resident and reconfirmed by further detailed surveys in December 2002. The presence of *Cryptostylis hunteriana* was also discovered and confirmed in the same surveys. *Corybas dowlingii* was confirmed on the site mid-2003 and recognised as a separate species by the scientific community in 2004.

The Department understands that, after further surveys confirmed the presence of the threatened orchid species, the Proponent discussed the potential impact of the preferred route with the Department of Environment and Conservation (now Department of Environment and Climate Change (DECC)), which advised that the preferred route was likely to result in lesser direct environmental impacts than Option A. The Department understands this advice was based on factors such as Option A's fragmentation of high quality native habitat, potential impact on Aboriginal heritage, flooding and impacts on the town water supply.

The Proponent has stated in the Submissions Report that it considers the initial route evaluation and selection process to have been valid and that subsequent findings regarding environmental impact, such as the confirmation of the presence of the threatened orchid species, do not warrant the discarding of the preferred route and another route evaluation and selection process being initiated. Given the advice of the DECC, the Department accepts that the proposed route is likely to result in lesser environmental impact than Option A.

### Landscape Impacts on Mountain Park

Impacts of the route options on visual amenity, landscape and severance were assessed during the route selection process, which included an assessment of urban residential / community land uses such as Mountain Park. It is clear from the submissions received and from the EIS that for some residents who live near the Mountain Park and/or use the Mountain Park area regularly there would be a significant impact on visual amenity and an increase in noise levels above those currently experienced in that area. Connectivity between the Park and the Mountain would also be significantly altered, with access reduced from multiple, informal pathways in a natural setting to formalised roads and paths over and under a four-lane highway.

Issues of amenity and noise are further discussed in Sections 5.7 and 5.8 of this report respectively. Noise levels would be mitigated to an acceptable level by noise barriers. The Department is of the opinion that the change in amenity would be significant for regular users of the Mountain Park and that this would not be completely mitigated by the proposed upgrades to visitor facilities. However, the Department accepts that these issues were adequately considered by the Proponent and other stakeholders in assessment of the route options and that overall the community would benefit from improved public amenity in the centre of the township, improved traffic infrastructure and likely retention of maximum possible trade achievable from a bypass due to the route's close proximity to the township.

## Economic factors

Option E was found to have significant socio-economic advantages over the western route options in terms of being closer to the township, providing visual cues to motorists to encourage stopovers and providing easy access into the centre of the township for motorists.

Following the announcement of the preferred route in November 2001, residents and business owners expressed concerns regarding the bypass of the town and potential loss of trade from the Highway as a result. The Proponent commissioned an independent technical review of the merits of a through-town option in 2002 which found that the negative impacts of such an option, including severance of the township, noise wall impacts, restriction of traffic flow and construction impacts on the local community would be unacceptable. As a result, Option E was reaffirmed as the preferred route.

It is noted that the original proposal for Option E as evaluated in the route selection process included a central interchange in addition to the southern and northern interchanges currently proposed. The removal of the central interchange diminishes some of the access benefits on which Option E was assessed, but significantly reduces the impact of Option E on flora and fauna and on existing homes and schools.

The Department is of the opinion that since the interchanges for Option E are closer to the township than the western options, particularly Option A, Option E would have less economic impact on the community. Further assessment of the economic impact of the proposal on the Bulahdelah township is addressed in Section 5.6 of this report.

## **Conclusion**

The Department is satisfied that the Proponent has undertaken the necessary assessment and appropriate consultation to determine the preferred route for the proposal. The Department concludes that, notwithstanding the known negative impacts likely to result from the preferred option, the preferred route is likely to be of greatest overall benefit to the local and regional community on the basis of economic, social, heritage and ecological factors. In order to achieve this outcome it is essential that there be rigorous application of the Proponent's commitments and the recommended conditions of approval.

## **5.2 Flora and Fauna**

### **Issues**

The proposal would result in the removal of approximately 35 hectares of vegetation from 12 native vegetation communities, of which eight are considered regionally significant and one – wet meadow – is listed as the endangered ecological community Freshwater Wetlands on Coastal Floodplains under the NSW *Threatened Species Conservation Act 1995* (TSC Act). The proposal bisects two areas of this community to the south of the Bulahdelah township. Due to the already poor condition of the wetlands and the small area to be directly impacted, this has been assessed by the Proponent as unlikely to be significant. The majority of vegetation to be cleared is sparse and would be impacted along the edges only. However, the proposed route through the foothills of Bulahdelah Mountain would result in the bisection of some significant vegetation.

Three fauna habitat areas of high local conservation significance would be impacted, including creation of a 52-100 metre wide barrier to the movement of *Petaurus norfolcensis* (Squirrel Glider) between seasonal foraging habitats, loss of more than two thirds (7.7 hectares) of a small area of *Calyptorhynchus lathami* (Glossy Black Cockatoo) feeding habitat and 1.2% (1.1 hectares) of Swamp Forest within the study area, an important winter foraging resource for nectivorous mammals, birds and bats. A total of 63 hollow-bearing trees would be removed, reducing the availability of fauna nesting habitat. Two regionally significant wildlife corridors also traverse the proposal site.

Six flora species deemed to be of actual or potential state or national conservation significance would be significantly impacted by the proposal. Four of these are listed under the TSC Act or the Commonwealth



*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Three species are orchids which are discussed separately in Section 5.3 of this report due to their rarity and unusual characteristics. The other three species are *Angophora inopina* (Black Apple), which is listed as Vulnerable under both the TSC Act and the EPBC Act, *Macrozamia flexuosa*, listed as Endangered under the EPBC Act and *Eucalyptus fergusonii* subsp. *fergusonii* (Ferguson's Ironbark) which is not currently listed. The population of *A. inopina* is the northern-most population for this species and has a conservation target of 100% in north-eastern NSW. No individuals of this species would be removed by the proposal, but 25% of approximately 80 individuals may be indirectly impacted. Similarly, no individuals of *M. flexuosa* would be removed by the proposal, but five individuals or 21% may be indirectly impacted. An estimated 104 individuals or 11% of *E. fergusonii* would be removed by the proposed upgrade, with an additional 2% potentially impacted. The Proponent has assessed the possible impact of the proposal on these species, with mitigation measures, as being of possible local significance only.

A total of 23 terrestrial threatened fauna species and 18 migratory bird species have been identified as being near or likely to occur near the proposal site. No threatened aquatic species were identified. The proposal would likely have a significant local impact on one threatened fauna species, the Squirrel Glider, as a result of removal and fragmentation of both summer and winter foraging habitat and nesting habitat, creating a potential barrier to movement and isolating a small habitat remnant to the west of the proposal at the foot of Bulahdelah Mountain.

To mitigate and minimise impacts on native flora and fauna, the Proponent has committed to (Commitment 7):

- identify weed infestations two months prior to commencement of construction;
- protect existing vegetation during construction;
- maintain water quality and surface and sub-surface flows during construction;
- install sediment controls and scour protection on Myall River and Frys Creek embankments;
- erect fauna exclusion fencing at particular locations along the Upgrade;
- erect gliding poles or aerial crossings in known Squirrel Glider habitat;
- revegetate and landscape disturbed areas;
- provide logs and large rocks under the Stuart Street access bridge and Frys Creek bridge to encourage their use as a fauna underpass;
- collect seeds from and propagate seedlings of threatened species *A. inopina*, *E. fergusonii* subsp. *fergusonii* and Glossy Black Cockatoo feeding trees in revegetation areas around the proposal;
- conduct regular inspections of threatened plant species and communities during construction;
- prepare and implement a Flora and Fauna Management Sub Plan as part of the Construction Environmental Management Plan (CEMP) that would include methods to manage impacts on flora and fauna species, rehabilitation details and a weed management strategy; and
- undertake regular inspection and maintenance of fauna fencing, drainage structures and sediment basins during operation.

## Submissions

Issues raised in submissions to the project include:

- potential impacts on aquatic habitat from construction and permanent scour protection;
- potential need for rehabilitation of wetland areas south of Myall River after construction;
- water flows to swamp mahogany vegetation remaining on western side of proposal;
- need to minimise severance of wildlife habitat and corridors;
- need to provide and monitor adequate crossings for arboreal and ground-dwelling fauna;
- adequacy of mitigation measures for loss of native vegetation;
- assessment of Koala presence in the area;
- potential to monitor impact on Squirrel Gliders;
- need to mitigate for impact on Glossy Black Cockatoo; and
- need to adequately mitigate for impacts on *Angophora inopina* and other native flora, including early seed collection.

## Department's Consideration

### Aquatic habitat

The Proponent states that vegetation disturbed by the proposal would be revegetated and that this would include rehabilitation of wetland areas. DPI (Fisheries) (now part of DECC) has articulated a number of outcomes that should be achieved in the ongoing management of aquatic habitats for this project, including promotion of natural flow regimes and retention of connectivity of waters between wetlands. DPI (Fisheries) also raised concern that the type and width of culverts have not been identified to date by the Proponent and recommends the use of wide box culverts set at bed level for waterways under roads, in accordance with the NSW Fisheries Policy *Fish Passage Requirements for Waterway Crossings*.

The Proponent has committed to undertaking bridge and culvert design in accordance with relevant guidelines and liaising with relevant government agencies in the development of the Flora and Fauna Management Sub Plan as part of the CEMP for the project. The Department considers it to be appropriate for these matters to be resolved at the detailed design stage. However, the Department is of the opinion that some outcomes can be specified now and that, in order to achieve the best outcomes in the project design, the Proponent should consult with the DECC directly in addition to following guidelines. Therefore the Department recommends a condition requiring the Proponent to undertake the design of waterway or fauna crossings with the any relevant Government departments to ensure minimum negative impact on terrestrial and aquatic fauna and to design, construct and maintain known bridges to provide appropriate access and vegetation cover to permit fauna movements at these points.

Great Lakes Council stated that any wetland rehabilitation should include proactive remediation of existing damage to wetlands proximal to the road footprint in order to enable effective treatment of highway run-off prior to discharge to the Myall River. In order to require the Proponent to undertake any such remediation it is necessary to establish a nexus between the project and the impact being remedied, which is not possible with pre-existing damage. However, the Department notes that the Proponent has committed to further consultation with Great Lakes Council in the preparation of its Flora and Fauna Management Sub Plan (FFMSP), which would include methods for rehabilitation and ongoing management and maintenance of vegetation. The Department also recommends the preparation and implementation of a Construction Flora and Fauna Management Plan as part of the CEMP (it is expected that this would be the same document as the FFMSP). The Department is of the opinion that this mechanism is sufficient to ensure that the suggestions of Council are considered by the Proponent as part of the Plan preparation in terms of long term viability of rehabilitation efforts and broader management issues.

In order to protect aquatic ecosystems, there is a need to prevent erosion and sedimentation in construction and operation of the project, including minimisation of scouring or other forms of disturbance in waterways. The Department is satisfied that the commitments made by the Proponent to consult with DPI Fisheries and to follow the appropriate guidelines would adequately address these issues.

### Wildlife habitat and corridors

Great Lakes Council confirmed that two important wildlife corridors would be impacted by the proposal, one near the Booral Road/Pacific Highway intersection in the south which requires some restoration but links core wetland habitats and the wider Bulahdelah Plain to other habitats to the north-west and Myall River State Forest, and the other linking Bulahdelah State Forest with the newly created Bulahdelah Nature Reserve, a locally significant habitat for the Squirrel Glider. The Council questions whether the measures committed to by the Proponent would adequately mitigate for the loss of native vegetation as a result of the proposal and suggests that further compensatory habitat may be required in the form of rehabilitation of currently degraded land in the vicinity of existing wildlife corridors. The Proponent and the DECC have previously reached an agreement regarding 560 hectares of compensatory habitat at Mount Karuah for this and other Pacific Highway projects in the area. This land is not directly adjacent to the Bulahdelah project and therefore is primarily of value in terms of offset for lost vegetation rather than preservation of particular threatened species or connectivity. The Proponent is also undertaking ongoing consultation with DECC and the Federal Department of Environment and Water Resources (DEW) regarding possible protection of threatened orchid habitat. The Proponent has also undertaken to

revegetate and landscape disturbed areas in the vicinity of the proposal, and to provide fauna crossings where needed, although the exact extent of revegetation has not been defined beyond repair of damage sustained during construction.

Given that the quantity of vegetation likely to be directly lost as a result of the proposal is relatively minor and the proposal bisects corridors at points that are already disrupted by the present Highway alignment, the Department accepts that the agreement previously reached between the Proponent and the DECC regarding compensatory habitat is adequate for the purpose of general offset for vegetation loss. The Department also understands that DECC and DEW are seeking further measures through continuing discussions regarding potential offsets for loss of orchid individuals and habitat continuing. However, as the Proponent would be responsible for the ongoing maintenance and management of all land within the proposal footprint, the Operation Environmental Management Plan (OEMP) should include management of flora and fauna in these areas. The Department therefore recommends the Proponent include measures to monitor and manage ecological factors as part of the OEMP.

The Department agrees with Council and the DECC that maintaining safe crossing options for wildlife is an essential mitigation measure for the Highway. The Council recommends fauna exclusion fencing and underpasses at the points where the proposal passes through wildlife corridors. The Proponent has committed to providing fauna exclusion fencing along the proposed upgrade at these corridor locations, on the side of the road nearest the key areas of habitat, but no fauna underpasses are proposed. The DECC has advised that the proposed fencing appears adequate, provided that the fencing in the northern section extends beyond Frys Creek as described in the EIS. The Proponent has confirmed that this is the case. The Proponent has also committed to aerial crossings in known Squirrel Glider habitat at the foot of Bulahdelah Mountain, which the DECC has confirmed as adequate. Given the known locations of the Squirrel Glider population and wildlife corridors, the Department is satisfied with these proposed measures. The DECC has also advised the Department that the Mountain Access overpass is unlikely to be used by fauna as suggested in the EIS, but that the provisions for fauna to cross the proposed Highway are acceptable provided that adequate clearance and vegetation for fauna is provided under the Myall River and Frys Creek bridges and the Stuart Street access underpass. The Department concurs with the DECC on these points and recommends the Proponent provide appropriate access and vegetation cover to permit fauna movements under the proposal at these points.

The Proponent has committed to replacement of any hollows lost through either relocation of hollows or installation of nest boxes. The placement of these hollows and boxes would be examined in detail in the CEMP in consultation with relevant landowners and the DECC. The DECC has raised general concerns regarding the monitoring of the effectiveness of such mitigation measures. The Department is of the opinion that replacement hollows and installed crossings should be monitored to determine effectiveness during operation of the project. In addition, nest boxes should be installed and hollows relocated in the early stages of clearing to ensure maximum possible uptake by displaced species. Therefore the Department recommends that the Proponent install nestboxes and relocated hollows prior to or during the early stages of clearing, and monitor these structures for maintenance and effectiveness, during both construction and operation.

There is potential for cumulative impact on threatened species in the area with possible further vegetation loss in the areas immediately surrounding the proposal as a result of other developments. As discussed in Section 5.3, the Proponent has committed to long term conservation of Crown Land within which much of the known orchid populations exist. However, if development were to proceed in areas currently zoned to permit such development, to the west of the proposal route, additional vegetation of up to 25 hectares could be removed. These areas are currently primarily in the township itself, although they do abut the proposal route in the vicinity of known orchid and Squirrel Glider populations. Such development in addition to the proposal would result in the cumulative loss of significant proportions of potential threatened orchid and Squirrel Glider habitat, adding to the existing stress on these threatened species. However, the construction of the proposal would result in these areas being geographically isolated from the remainder of the Mountain, rendering them of limited conservation value. The Department has been advised by the Proponent that acquisition of these areas is not possible at this time due to a reluctance on the part of the current landowners to make the land available. An application has also been lodged with Great Lakes Council for land on the northern slopes of Bulahdelah Mountain to be rezoned from current rural residential designations to permit subdivision for rural residential or residential purposes. The proposed development for which this application has been sought would require some clearing of native vegetation, although this would focus on areas of regrowth and not extensively impact mature vegetation.

Again, there is the potential for cumulative impact on the native flora and fauna in the area. The Department understands that this application remains under consideration by Council. The Department is satisfied that the mitigation measures committed to by the Proponent and required by the recommended conditions of approval are appropriate to the assessed impact of the proposal, including known cumulative impact.

### Threatened species

The potential impact of the proposal on the local populations of the Squirrel Glider are of concern to the Department, particularly as the EIS states that there is a risk that the population situated to the east of Bulahdelah may become extinct as a result of the proposal. Maintenance of connectivity between fragmented sections of habitat is vital in minimising this impact. The Proponent has committed to providing appropriate aerial crossings for the purpose of the Glider at this location, a mitigation measure that the Proponent has previously reported to the Department as effective on other Pacific Highway projects. In order to ensure adequate consultation and confirm this commitment, the Department recommends the Proponent be required to install such crossings at locations to be agreed with the DECC.

The Proponent has canvassed the possibility of undertaking radio-tracking of gliders during operation of the proposal in order to determine whether the installed road crossings are being used. The DECC has suggested tagging Squirrel Gliders prior to construction in order to monitor the impact of the proposal on the local population. While the Department does not have a position regarding the best methodology to be used, it believes that, even with proposed mitigation measures such as aerial crossings, the potential impact of the proposal is significant enough to warrant monitoring of the local population to determine not only its usage of crossings, but also its ongoing health after the proposal has been built. Therefore the Department recommends requiring the Proponent to devise in consultation with the DECC a Squirrel Glider Monitoring Program to monitor the health of the Squirrel Glider populations in and around the footprint of the project during construction and for at least five years after commencement of operation of the project, including contingency measures in the event of an identified decline in population health or numbers and provision for annual reporting of results.

In implementing mitigation measures during construction, it is important that the Proponent undertake consistent monitoring to ensure effective management of the residual risks of the project to flora and fauna and employ a mechanism for proactive identification and application of additional ameliorative measures if changes to ecological health as a result of the project are detected. This issue is particularly important in the vicinity of Bulahdelah Mountain, where there exists a high density of rare and threatened native species. As such monitoring ought to be under the guidance of an expert, the Department recommends requiring the employment of a qualified ecologist for the duration of construction works in this area. Apart from these recommended conditions, the Department is satisfied with the Proponent's commitments regarding mitigation measures during and after construction to protect and rehabilitate threatened species and other flora and fauna impacted by the proposal.

### **Conclusion**

The Department recommends the following conditions of approval in order to address the potential impact of the proposal on flora and fauna:

- Condition 2.1: Ecologist to be employed for the duration of construction works in Bulahdelah Mountain area;
- Condition 2.2: Undertake design of waterway and fauna crossings in consultation with DECC and DPI and ensure that bridges permit fauna movements;
- Condition 2.6: Proponent to install nestboxes and relocated hollows during the early stages of clearing;
- Condition 2.7: Proponent to supply aerial crossings at locations agreed with the DECC;
- Condition 3.2: Proponent to undertake a Squirrel Glider Monitoring Program;
- Condition 6.4: Construction Flora and Fauna Management Plan as part of the CEMP; and
- Condition 6.5: Monitor and manage ecological factors as part of the OEMP, including monitoring and management of ecological factors.

The Department acknowledges that the proposal has the potential to result in significant impact on some threatened species, including the Squirrel Glider. The Department is satisfied that the Proponent has committed

to adequate provision of aerial crossings for this species, a measure that has been demonstrated to work on previous Pacific Highway projects. As there remains some risk of medium-term detrimental impact on this species, the Department recommends that a monitoring program be undertaken to determine whether any such impact occurs and to take further action to halt such impact if required. The Department is satisfied that, with the recommended conditions of approval and the Proponent's commitments, the impacts on aquatic ecosystems, wildlife habitat and other flora and fauna aspects would be minimised and mitigated to an acceptable level. Impacts on threatened orchid species are discussed further in Section 5.3.

### 5.3 Threatened Orchids

#### Issue

The proposal passes through populations of three threatened orchid species on the footslopes of Bulahdelah Mountain:

- *Cryptostylis hunteriana* – Leafless Tongue Orchid
- *Rhizanthella slateri* – Eastern Australian Underground Orchid
- *Corybas dowlingii* – Red Helmet Orchid (referred to in the EIS as *Corybas* sp. aff. *aconitiflorus*)

#### *Cryptostylis hunteriana*

This species is listed as Vulnerable under both the TSC Act and the EPBC Act. The population is the largest known of this species in Australia and is therefore of national significance. The species would be affected through a loss of individual plants, fragmentation, edge effects, disruption to surface water flows and possible disruption to pollinators and seed dispersal mechanisms. As the proposal would have a significant effect on this species, Controlled Action approval is also required from the Commonwealth Minister for the Environment and Water Resources under the EPBC Act.

The Proponent has provided the Department with survey data for the orchid species up to 2006, updated from the EIS and Submissions Report. Yearly population numbers for all *C. hunteriana* and *R. slateri* have been found to be extremely variable from the first year of recording, 2002, to the most recent, 2006.

#### *Rhizanthella slateri*

This species is listed as Vulnerable under the TSC Act and has been nominated for listing under the EPBC Act. The population is the largest known of this species in Australia and is therefore of national significance; it has been preliminarily listed as Endangered under the TSC Act. It also appears to be the scarcest of the three rare orchid species on Bulahdelah Mountain. The species would suffer similar types of impacts from the proposal as *C. hunteriana*.

It is noted that, since publication of the EIS, the population of *R. slateri* in Lamington National Park has been determined to be a separate species. However, the Proponent has stated that this information does not alter the outcomes of the significance assessments undertaken for the EIS.

#### *Corybas dowlingii*

This species has only recently been described and therefore has not yet been listed. It is currently preliminarily listed as Endangered under the TSC Act. It is only known from three sites in NSW. This species would be affected by the proposal through a loss of individuals and possible edge effects.

No detailed counts of this species have been undertaken during flowering; a population estimate has been derived based upon flowering during 2003-4 and an estimate of leaf numbers. It is noted that this species is only distinguishable from more common species when flowering.

It is estimated that about 75% of the Bulahdelah population of this species occurs 70-140 metres uphill of the proposed alignment and is unlikely to be affected by the proposal. This information is summarised in Table 2.

**Table 2: Threatened Orchids Affected by Proposal**

Species	<i>Cryptostylis hunteriana</i>	<i>Rhizanthella slateri</i>	<i>Corybas dowlingii</i>
Common name	Leafless Tongue Orchid	Eastern Australian Underground Orchid	Red Helmet Orchid
Local / regional status	<ul style="list-style-type: none"> <li>– High local conservation significance</li> <li>– Critically threatened under <i>Response to Disturbance of Forest Species</i> report (Environment Australia 1999)</li> <li>– Conservation target of 80%</li> </ul>	<ul style="list-style-type: none"> <li>– High local conservation significance</li> <li>– Critically threatened</li> <li>– Conservation target of 100%</li> </ul>	<ul style="list-style-type: none"> <li>– High local conservation significance</li> <li>– Likely to be of regional conservation significance</li> </ul>
State listing (TSC Act)	Vulnerable	Vulnerable	Preliminary determination to be listed as Endangered
National listing (EPBC Act)	Has been nominated for listing	Vulnerable	Not currently listed

To mitigate and minimise impacts on threatened orchids, the Proponent has committed to (Commitment 7):

- form an inter-agency advisory group to address orchid management and translocation issues;
- develop and implement an Orchid Management and Translocation Plan in consultation with DECC, DEW and DPI (Forests), incorporating pre-construction, construction and post-construction measures, to be approved by the Director-General;
- undertake research into orchid pollination, seed collection, propagation and translocation;
- undertake orchid propagation and translocation trials;
- store orchid seed for the longer term for future research and propagation;
- undertake additional targeted orchid habitat surveys in the Bulahdelah area; and
- consider options to protect suitable existing orchid habitat in the Bulahdelah area.

## Submissions

Issues raised in submissions to the project include:

- lack of sufficient information about the species and populations to be impacted;
- the difficulty of predicting the long-term impact of the proposal on the long-term viability of the orchid populations;
- the lack of evidence that translocation could be successful;
- potential national significance of *R. slateri* and the Bulahdelah population;
- potential impact on soil moisture and drainage surrounding the orchids;
- isolation and bisection of orchid populations resulting from proposal;
- potential inhibition of movement of seed dispersers and fertilising insects;
- loss of potential orchid habitat;
- lack of viable mitigation measures proposed for impact to orchids;
- possible impact of airborne pollutants;
- need for procedures if further orchids exposed during construction; and
- need for long-term protection plan for impacted orchid species.

## Department's Consideration

In assessing the impact of the proposal on the threatened orchid species, the Department sought expert technical advice from Dr Andrew Batty of Western Australia, who has experience with orchid species of this nature. Dr Batty's report is attached to this Report in Appendix F. In addition, the Department has used information supplied by the Proponent beyond that contained in the Submissions Report, including the results of orchid surveys undertaken in 2006. Given the critically threatened status of the orchids in question, although the Department has taken these survey results into account in assessing the proposal, the results have not been made publicly available and are not explicitly restated in this report.

### Impact of proposal

The impact of the proposal on these species cannot be fully ascertained due to a lack of comprehensive information about their habits, physiology and distribution at the site. A number of scenarios and impacts on the populations were assessed as part of the SIS in an attempt to adequately cater for possible fragmentation and edge effects.

Once the preferred route was selected, a number of variations on that route were assessed by the Proponent to determine which would minimise environmental impact, particularly on the threatened orchid species. The Proponent states that it was not possible to align the bypass so that no impact on the orchids occurred, but these impacts were minimised as much as possible through both the placement of the road and the design to reduce the footprint of the proposal. After refinement of the alignment, the Proponent states in the Submissions Report that the impact on all three species has been minimised to the extent outlined in Table 3.

It is noted that the calculations of impact are based on the highest number of flowerheads observed over several years of surveying, rather than the most contemporary survey data. The expert advice received by the Department indicates that it is normal for the orchid plants to go several years without flowering and that there is a high probability that the majority of individuals recorded over that survey period still persist at the site. It is also likely that there are individuals of all species in the area that have not been recorded in surveys to date as they have not flowered during this period. Therefore the Proponent's methodology of using data accumulated over several years seems appropriate.

The proposal will fragment the existing populations of *C. hunteriana* and *R. slateri* and may have an additional impact through the formation of a barrier for pollinators and seed dispersers. These include termites, fungus gnats, wasps, small fossorial marsupials and birds. The Proponent states that the proposal would form a 55-100 metre wide barrier to such dispersers. Over the length of the alignment where orchids are found on either side of the road, encompassing possible orchid habitat, the longest gap between culverts that the EIS indicates could be potentially used by pollinators is 250 metres. The culverts in question are 73 metres and 84 metres in length, which may be too long for fauna to comfortably use. Therefore the barrier impacts of the proposal are likely to be significant.

Of the three species, the impact in terms of a percentage of known population is likely to be most significant for *C. hunteriana*. It is possible that the direct impact on the other two species could be minimised substantially as the majority of predicted impacts are indirect. However, the significance of the impact is based on the total predicted potential impact, including that which is indirect.

The proposal also has the potential to change the hydrology of the area. Four plants of *C. hunteriana* and *R. slateri* have been identified as likely to be significantly impacted by reduced soil moisture as a result of the proposal. Further individuals could be affected, either due to unforeseen impacts or because the individuals have not yet been found in surveys. As hydrological impacts are a concern, the existence of the majority of *R. slateri* and *C. downlingii* populations uphill is of benefit to the long-term survival of those species at the site.

The potential for spills or contaminated runoff from the road has been addressed in the project design through the installation of drainage and water quality structures such as spill basins.

**Table 3: Potential Impacts on Threatened Orchid Species and Populations as Stated in EIS**

	<i>Cryptostylis hunteriana</i>	<i>Rhizanthella slateri</i>	<i>Corybas dowlingii</i>
Direct impact (% of observed population)	27%	4%	10%
Indirect impact (% of observed population)	25.5%	21%	15.5%
Total predicted impact (% of observed population)	52.5%	25%	25.5%
	Significant on regional and possibly state level.	Significant on state level.	Significant on regional and possibly state level.
Types of potential impacts	<ul style="list-style-type: none"> <li>– Removal of individuals and habitat through construction.</li> <li>– Fragmentation</li> <li>– Change in soil hydrology</li> </ul>	<ul style="list-style-type: none"> <li>– Removal of individuals and habitat through construction.</li> <li>– Fragmentation</li> <li>– Change in soil hydrology</li> </ul>	<ul style="list-style-type: none"> <li>– Removal of individuals and habitat through construction.</li> </ul>
Other information		Majority of population located uphill of alignment.	Majority of population located uphill of alignment.

#### Viability of remaining orchid populations

Given the rarity of the three orchid species and the proposed route of the Upgrade, it is important that the design, construction and operation of the proposal maximise the potential for the long term survival of the Bulahdelah populations of these species. The expert advice received by the Department indicates that at least some local populations of all three threatened species are likely to persist in the longer term beyond construction, provided further disturbance or alteration of ecological conditions at the site does not occur. The populations remaining uphill of the proposal site are likely to be more viable than those remaining downhill, due to lesser potential impact on surface groundwater conditions.

The Department is not aware of any development proposals that may result in further disturbance of the orchid populations and understands that the land uphill of the proposal is likely to be retained as Crown Land for conservation purposes. Based on the research undertaken to date and the expert advice received (see Appendix F), the Department is satisfied that the proposal is unlikely to result in the total loss of the three threatened orchid species, either locally or at the regional level, and that knowledge of the distribution, morphology, growth habit and ecological relationships of each of the three species is likely to be obtained that would be beneficial to their long-term management.

#### Mitigation measures

##### *Design*

The Proponent has committed to minimising impact on known threatened flora through the detailed design process. Measures adopted to date include some culverts to assist hydrological flow, a pedestrian underpass that would also provide connectivity for pollinators and reduction of the lateral footprint of the road through the Bulahdelah mountain area. Soil and rock batters have been replaced with vertical walls in some sections of the road to the north of Mountain Park adjacent to known orchid sites, reducing the approximate width of the construction footprint by up to 25 metres at those points. It is noted that these walls are proposed to cease and be replaced by deep soil batters immediately north of the known orchid sites, with shallower batters to the south.



The Department is concerned that the presence of these batters would:

- indicate the approximate location of the known orchids to the general public, presenting a security risk; and
- preclude the possibility of the survival of existing orchid individuals or germination of new individuals in these areas in the future.

Installing walls instead of batters along the full length of the proposal on both sides, between the point where the roadway is elevated above ground level to the south opposite Blanch Street and the Stuart Street access track to the north, would rectify this problem. In addition, it would further reduce the construction footprint and consequent impact on native flora and fauna and on surface water flows. The Department understands that there may be geotechnical concerns with implementing such a design which could increase risks to motorists from destabilisation of the road. Therefore the Department recommends that the Proponent certify that the project within the vicinity of Bulahdelah Mountain is designed to minimise the lateral extent of the project footprint, maximise the use of retaining walls, minimise alteration to natural surface hydrology, maximise connectivity and minimise geotechnical risks. It is also recommended that the Proponent consider options for utilising bridging to achieve these aims (discussed further below).

### *Hydrology and Bridging Options*

The Proponent undertook a detailed review of the length of surface water flows depended upon by individual threatened orchid populations. This review found that the alignment would not impact the surface and sub-surface water flow paths to the majority of threatened orchids downhill of the proposed alignment, but that it would significantly impact the surface water flow paths of three *C. hunteriana* plants and one *R. slateri* plant. This in turn could dry the soil around the orchids, potentially rendering it unsuitable for the survival either of individual orchids or the mycorrhizal fungus upon which they depend. The review considered four bridging options that could replace the solid earth embankment planned to elevate the road through the area where the orchids are located. One constitutes a 10 metre span, one a 36 metre span and two constitute 15 metre wide archways. The archway options were found to be potentially suitable as they would not significantly disrupt construction timing and staging, while lowering impacts on the threatened orchid species. The Proponent has estimated that these options would cost between \$1.44 million and \$1.66 million against current estimated capital investment in the project of \$127.75 million, i.e. a 1.5% increase in the cost of the project. The assessment undertaken by the Proponent was based on one archway only being installed.

In addition to reducing impact on water flows, the advantages of the bridging options include:

- improved passage for most terrestrial fauna species in the area;
- improved passage and visual cues for potential orchid seed dispersers such as the bandicoot and ichneumon wasp, leading to improved seed dispersal and improved cross-fertilisation;
- maintained soil moisture regimes for a swamp mahogany population; and
- increasing visual connectivity for users of the Mountain Park and surrounding area.

There is a high risk of damage to at least three of the four orchids that would benefit from the bridging options due to the very close proximity of the construction works. There is also a high risk that a bridge could generate pedestrian and trail bike traffic that could threaten the survival of these and other orchid plants also. The Proponent has concluded that the construction costs and risks of these options would outweigh any benefits to the threatened orchid plants.

The Department has received expert advice that maintaining the soil moisture in the area is likely to be essential to the long term survival of the orchids. If altered significantly, soil moisture is a factor that would be difficult to rectify later by artificial management options. In addition, although only four plants have been identified that would directly benefit from the construction of a bridge, there is a reasonable chance that further plants exist in the vicinity that have not yet been discovered and that the area that would be directly impacted by reduced water flow could be potential habitat for the orchids to grow in the future. The Proponent's survey methodology for orchids to date, while appropriate, leaves significant scope for further plants to be discovered. If of sufficient size, a large culvert or bridge would also provide connectivity for other fauna in the area.

The barrier created by the road in this area significantly bisects the populations of the two species also affected by water flows. The nearest underpass that could be potentially used by *R. slateri* pollinators, if these were found

to be a small marsupial such as the bandicoot, is the Stuart Street Underpass approximately 200 metres to the north of the northernmost known individuals of both species. This is a reasonable distance for such an animal, but does not provide any real connection between the known plants and habitat uphill from the road. The expert advice received by the Department indicates that such an underpass and the archways examined by the Proponent would be unlikely to be used by invertebrate pollinators due to the width of the roadway.

Dr Batty has advised the Department that the construction of a section of continuous raised bridge would be of greatest benefit in reducing impacts of the proposal on natural drainage, wind movement, pollination and seed dispersals, particularly if vegetation is retained or restored beneath the bridge. However, the archways examined by the Proponent in the Submissions Report would still be of benefit in reducing these impacts, provided that pedestrian usage could be managed in all cases. Therefore the Department is of the opinion that building a bridge, span or archway rather than a solid earth embankment in the vicinity of the orchids should be examined further during detailed design, both in terms of bridge options 3 and 4 near the known affected orchids and in terms of other bridge, span or archway styles employed at regular intervals through the area where the road is elevated above the surrounding landscape. The Department therefore recommends that the Proponent further consider options for utilising bridging, with this consideration to be certified as required for other options.

#### *Orchid Management and Translocation Plan*

The Submissions Report includes a proposed timeline for mitigation measures, including research, seed collection, propagation and translocation trials. Some of these activities, including seed collection, have already commenced. Most measures would be completed by mid-2009, as construction is due to be completed at the end of 2009, but propagation and translocation trials would continue beyond this date. The Proponent has stated that the timing and duration of specific actions would be further discussed with DECC and DEW and that the extent and nature of the propagation and translocation trials would be subject to the outcomes of initial propagation trials. The detail of these would be developed as part of the Orchid Management and Translocation Plan committed to by the Proponent.

The Proponent has stated that this Plan will:

- detail plans for research into orchid pollination, seed collection, propagation and translocation;
- detail additional targeted orchid habitat surveys in the Bulahdelah area;
- detail procedures for managing individual orchids during clearing and excavation works;
- determine the location, land ownership and security of suitable translocation test sites; and
- consider options to protect suitable existing orchid habitat in the Bulahdelah area.

A Draft Discussion Paper (*Draft Orchid Management and Translocation Plan – Part A – Discussion Paper* RTA 2007) has already been prepared as part of this Plan and used by the Department for the purpose of this assessment.

The Proponent has commenced discussions with relevant agencies, including DECC and DEW, regarding management of the orchids if the proposal were approved. The Department understands that this discussion has informed the initial preparation of the Orchid Management and Translocation Plan to date. The Department is satisfied that the Plan is an appropriate framework with which to address management of the threatened orchids in conjunction with the proposal and acknowledges the Proponent's commitment to continuation of this process. The Department has received expert advice which recommends a number of technical procedures to be incorporated into the Plan; these are discussed below.

The DECC has advised the Department that it wishes to remain involved in the process of managing the threatened orchid species through construction and implementation of the translocation plan. The Proponent has committed to forming an inter-agency advisory group to coordinate communication between agencies involved in orchid management and translocation issues on this project, including the DECC. However, it is not clear whether this group would continue to function throughout the implementation of the translocation plan, which would continue beyond completion of construction. Due to the complex technical nature of the issue and the sensitivity of the orchids, the Department believes ongoing involvement of the DECC and DEW, where possible, to be important and has therefore recommended the development of an Orchid Monitoring Program (discussed further below) which requires annual reporting of monitoring results to the DECC and DEW.

### *Cryostorage and Propagation*

The location and detailed process of cryostorage have not yet been determined; this will be investigated in the preparation of the Orchid Management and Translocation Plan. Seeds of the threatened orchids would be stored to ensure long term maintenance of genetic material. Propagation trials would also be undertaken.

The expert technical advice received by the Department from Dr Batty included a number of recommendations regarding storage and propagation. The Department recommends that the Proponent note this advice and incorporate it where appropriate into the Orchid Management and Translocation Plan.

### *Translocation*

Translocation is proposed for all three orchid species. As a potentially ameliorative measure, it is proposed to include salvage of mature plants or soil stored seed bank to an area not affected by the development and increasing the population size by adding individuals arising from propagation to an existing population. This procedure would be experimental as none of the species in question have been successfully translocated to date and no orchid species dependent upon a mycorrhizal fungus for survival has been successfully transplanted anywhere in the world. The DECC has stated that it does not consider translocation to be a mitigation measure, a point acknowledged by the Proponent. Rather, it would be attempted if construction were approved in an effort to enhance collective knowledge of the threatened species and in the hope that a technique may be found to enhance their long-term viability.

The Proponent has stated that DPI (Forests) would be involved in identifying the most appropriate site for plants to be translocated to, and that the process would be undertaken in accordance with DECC translocation policy and current Australian guidelines. The work would be undertaken under a separate contract from construction and would be initiated immediately following approval to maximise the available timeframe. In order to clearly define responsibility, the Department recommends that the Proponent undertake translocation prior to the commencement of relevant construction works.

The expert technical advice received by the Department from Dr Batty included a number of recommendations regarding the proposed translocation methodology, as detailed in the Draft Discussion Paper for the Translocation Plan. The Draft Discussion Paper states that, following project approval, discussions would be held with relevant Government agencies such as DECC to determine the most appropriate course of action given timing and other constraints, resulting in details of proposed actions for the translocation, management and monitoring of all three orchid species being provided in Part B of the Orchid Management and Translocation Plan. The Proponent has committed to the preparation of this Plan in consultation with a number of agencies and to seek approval from the Director-General for the Plan. Given the expert advice received regarding the Translocation Plan, the Department recommends that the Proponent note that advice and incorporate it where appropriate into the Plan.

### *Monitoring*

Monitoring of affected threatened species during and after construction is essential in order to adequately assess the impact of the project on those species in the short and longer term. The Proponent has stated that full details of proposed monitoring of orchids before and after construction would be provided in the Orchid Management and Translocation Plan. The Draft Discussion Paper proposes a minimum of five years of monitoring of the results of translocation. Expert advice received by the Department confirms that this would be the minimum required, with ten years being more appropriate to gain adequate information, while five years would be suitable for monitoring remaining in situ plants. In order to define the monitoring required and ensure that it is undertaken consistently and reported upon, the Department recommends the Proponent develop an Orchid Monitoring Program in consultation with the DECC, DPI and DEW as part of the Translocation Plan, including provisions for monitoring rainfall, contingency measures in the event of an identified decline in the health or numbers of the orchids over time and provision for annual reporting of monitoring results. The Program must include provision for monitoring remaining in situ populations for at least five years after the commencement of operation of the project and of translocated orchids for at least ten years after commencement of operation.

### Land offsets

The DEW has advised that compensatory habitat should be offered by the Proponent to offset the direct impacts on the threatened orchid species, particularly *C. hunteriana* and *R. slateri*. The Proponent has committed to investigating options for the protection of populations of the threatened orchid species in close proximity to the proposal site, if found and if not already protected.

The Proponent and the DECC have reached an agreement regarding 560 hectares of compensatory habitat at Mount Karuah that has previously been transferred to the DECC for the Bulahdelah Upgrade and other Pacific Highway projects. The Proponent proposes to survey these areas for orchids in 2007 to ascertain if further orchid populations exist there.

The Proponent has advised the Department that:

- *C. hunteriana* populations of a total of 143 plants to the north of Bulahdelah township that were recently discovered as a result of RTA surveys for the purpose of the proposal have now been protected by the transferral of crown land to National Parks and Wildlife Service (DECC) ownership;
- the majority of known *R. slateri* and all known *C. dowlingii* plants to be retained *in situ* after the proposal are situated on State Forest owned land, under a management zone type that secures this area of forest from any future harvesting activities and are therefore protected unless an Act of Parliament were to change the zone type or boundaries; and
- the remainder of the known *R. slateri* population and the *C. hunteriana* plants to be retained *in situ* to the east of Bulahdelah occur on Crown Land.

The Proponent is currently investigating possibilities to ensure the long term conservation of the Crown Land and has commenced preliminary discussions with the Department of Lands on this issue. Conservation of this land would include preservation of at least 93 known *C. hunteriana* plants located uphill of the proposed highway and at least 37 plants located downhill, all greater than 20 metres from the edge of construction. This would constitute one of the largest populations of this species in a conservation area in NSW. The conserved Crown Land would also contain at least 26 *R. slateri* flower heads uphill and downhill of the alignment.

The Department understands that DEW is satisfied with these proposed offsets as mitigation for the loss of some *C. hunteriana* and *R. slateri* that would occur as a result of the proposal. The Department accepts that further unprotected populations of the orchids could not be found without extensive survey work that would be undertaken with a high risk of failure. The Department is of the opinion that the protection afforded to the orchids remaining after construction in the Bulahdelah area is adequate, on the provision that the land is able to be purchased from the Crown or reserved for environmental protection while remaining under Crown management. The Proponent has committed to considering options to protect existing orchid habitat in the Bulahdelah Area as part of the Orchid Management Translocation Plan, which will be prepared in consultation with the DECC, DEW and DPI (Forests). The Department is satisfied with this commitment and understands that any agreements regarding land offsets will be made in conjunction with those regarding potential funding for recovery plans.

### Recovery Plans

Recovery Plans do not yet exist for any of the three threatened orchid species. The Proponent has advised the Department that it has proposed to provide funds for the preparation of Recovery Plans for all three species. These Plans would be prepared by the DECC. The Department understands from DEW and DECC that there remains some room for negotiation as to whether funding of Recovery Plans is the most appropriate mitigation measure for the impact on the orchids. Given that there remains some scope for negotiation on these matters, the Department recommends the Proponent negotiate a package to offset impact on threatened orchid species in consultation with and to the satisfaction of DEW and DECC, that may include provisions for land offsets, recovery plans, funding for further research or other mitigation measures as agreed.

### Construction

The Proponent has committed to fencing all sensitive flora near the alignment to ensure minimisation of impact during construction and to preparing a Flora and Fauna Management Sub Plan as part of the CEMP which would

include methods to protect vegetation to be retained within and adjoining the activity during construction. The Department considers it appropriate and necessary to require physical exclusion measures as well as comprehensive management given the significance of the orchid species in particular. As this Plan would be prepared in consultation with relevant Government departments such as the DECC and be approved by the Director-General, the Department is satisfied that this commitment is sufficient to ensure that damage from construction is minimised.

Expert advice received by the Department states that top soil should be stored and used for restoration of the site after construction, by collecting and stockpiling the top 50 mm of soil in area considered to contain diverse vegetation with limited weed species. The Department understands that it is the Proponent's standard practice to do so and that this would be detailed in the Construction Environmental Management Plan committed to by the Proponent.

Measures should also be taken to limit the introduction of soil pathogens to the sensitive Bulahdelah Mountain area during construction. Wash-down areas should be used at either end of environmentally sensitive areas and construction staff educated regarding this issue. The Department recommends requiring the Proponent to include measures limiting the introduction of soil pathogens during construction to the Bulahdelah Mountain area in the Construction Ecological Management Plan.

## Conclusion

The Department recommends the following conditions of approval in order to address this issue:

- Condition 2.3: Certification that design near Bulahdelah Mountain has been undertaken to minimise the lateral project footprint, maximised the use of retaining walls, minimised alteration to natural surface hydrology, maximised connectivity and minimised geotechnical risks;
- Condition 2.4: Bridging options to be considered in design;
- Condition 2.5: Proponent to bear cost of translocation of orchids;
- Condition 2.8: Offset package to be negotiated with DECC and DEW;
- Condition 3.1: Orchid Monitoring Program; and
- Condition 6.4: Introduction of soil pathogens to be limited.

The three rare and threatened orchid species identified at the Bulahdelah Mountain site are of high local, State and in some cases, national significance. There is a high risk of significant loss if the project is not designed and constructed to manage this risk. This impact is not able to be fully mitigated, but the Proponent has committed to design modifications and extensive research to minimise this impact and improve the long-term viability of these species. The Proponent considers that bridging is not an economically viable option, but the Department is of the opinion that, at less than 1.5% increase in total project cost for an archway that may provide some benefit, the option should remain under consideration during detailed design.

Notwithstanding the above, the Department is satisfied that, with the recommended conditions of approval and the Proponent's commitments, the three threatened orchid species impacted by the proposal would be likely to survive in the local area in the longer term and that the impacts would be minimised and mitigated to an acceptable level.

## 5.4 Non-Indigenous Heritage

### Issue

Bulahdelah Mountain is listed on the Register of the National Estate for its geological values starting from 180 metres above sea level; the EIS states that the listed area therefore does not include land impacted by the proposal. The Draft Great Lakes Heritage Study, commissioned by Great Lakes Council, concludes that the Mountain is of national significance based on its geological, natural and cultural heritage values and proposes a

'Bulahdelah Mountain Heritage Conservation Area' that encompasses the area traversed by the proposal. The significance of the Mountain has not been confirmed by state or Federal government agencies.

Fifteen historic sites or features have been identified within or immediately adjacent to the proposed Upgrade. The Alunite Mine Site (identified as item BH12 – Alunite Mine Historic Precinct – in the EIS) is the most significant of the non-indigenous heritage sites recorded in the area; it is listed in the Great Lakes LEP 1996 as an item of regional significance, while the EIS concludes that it is of State and national heritage significance. The Heritage Office also notes that it may be appropriate to include the site on the State Heritage Register in the future. The proposal would directly impact this site.

Another significant site is that of the former home of Rachel Henning, an Australian literary figure of the 19<sup>th</sup> century, which has been classified as being of high local and possibly State significance. The proposal would be designed so as to avoid impacting this site.

Other sites or features, which include a range of farming remnants, sections of the former Pacific Highway and quarrying remnants, are of local heritage significance; eight of these are either partly or completely within the area of construction and would be impacted.

In order to mitigate and manage impacts on Non-Indigenous Heritage, the Proponent has committed to (Commitment 9):

- implement the mitigation measures for specific heritage items recommended in the EIS Technical Paper 16;
- provide long-term pedestrian access to the Bulahdelah Mountain historic precinct;
- prepare and implement a Non-Indigenous Heritage Management Sub Plan (NIHMSP) as part of the CEMP;
- brief construction workforce in regard to legal obligations with respect to heritage items and areas; and
- should relics be found during construction, cease all works that may impact on the find, inform the NSW Heritage Office and commission an archaeologist to assess the significance of the items and advise on further action.

## Submissions

Issues raised in submissions to the project include:

- concern over the impact on ten historic sites or features in one small area and the destruction and loss of heritage and proposed heritage items, in particular elements of the alunite mine site
- that the proposal would result in a loss of cohesion for the Alunite Mine site complex;
- potential for disturbance of the private burial ground of Ada King, a local midwife in the early 1900s;
- the need for safeguards to minimise impact on the site of Rachel Henning's house;
- potential for negative impacts on the Mountain itself, as a potential Heritage site;
- the implications of listing of items under the draft Great Lakes Heritage Study;
- the need for a Plan of Management for the Alunite Mine site; and
- the need for ongoing consultation with the NSW Heritage Office regarding management of the Mine site.

## Department's Consideration

### Alunite Mine Site

The proposal would pass through the Alunite Mine Site with direct disturbance of some historic surface features on the western side of the corridor, particularly affecting a portion of the 'waste' dumps and probably also foundation remains, masonry fragments and an associated ground platform at the far upslope end of the playground area. The Proponent states that the design has been modified to minimise impacts on identified surface features, by being largely located within an area already disturbed by the existing powerline easement and associated track, but acknowledges that the landscape setting would be altered with the proposal creating a visual barrier through the area. Subsurface remains to be impacted would be salvaged through excavation and recording. The majority of the former processing works and the former mine manager's residence would be conserved and retained as part of the re-shaped Mountain Park. Some features would also be retained to the east of the proposal. The Proponent has also committed to the installation of interpretive signage and designing the pedestrian and emergency vehicle overbridge to mirror the location and function of the mine's now removed

tramway. In order to ensure these outcomes, the Department recommends requiring the Proponent to implement the project in such a way as to minimise the extent of physical disruption or modification of the Alunite Historic Precinct.

The EIS recommends a Plan of Management be prepared for the Alunite Mine Site, including the installation of interpretive paths and signage as appropriate and potentially including a comprehensive archaeological salvage excavation of the areas to be directly impacted. This recommendation is strongly supported by the Heritage Office. The Submissions Report refers to such a plan being developed in consultation with DPI (Forests) and the DECC prior to construction activities, but it is not referred to in the Statement of Commitments.

Given the significance of the site, the Department is of the opinion that a Plan of Management is essential in order to ensure the best possible outcome for this area and its various historic features if the proposal proceeds. The Department therefore recommends requiring the Proponent to prepare and implement an Alunite Mine Site Management Plan to be maintained and updated as necessary for the life of the project, including operation, and to be applied to all works by the Proponent within the vicinity of the site.

#### Impacts on other sites

The site of Rachel Henning's house (identified as item BH4 in the EIS) is located approximately 60 metres outside the area of construction near Bombah Point Road, with the proposed highway passing to the north of the site and works also to be undertaken on Bombah Point Road to the east. The EIS recommends that all direct impact to the site should be avoided and the area actively conserved for its heritage values, with temporary fencing used to define an exclusion zone during construction. Similarly, a wood top rail and post fenceline (identified as item BH3 in the EIS), adjacent to the proposed area of construction, would be unlikely to be impacted during construction. To ensure this outcome, the Department recommends requiring the Proponent to ensure that these items are neither impacted nor modified in the construction of the proposal.

The Proponent has committed to installing interpretive signage and a footpath on the Bombah Point Road Overbridge to enhance public accessibility to the Rachel Henning site and appreciation of the area's heritage significance. A large portion of the property would be acquired by the RTA from MidCoast Water for the purpose of the proposal; future management of the site would be negotiated between MidCoast Water, Great Lakes Council and the RTA. The Proponent has not committed to producing a specific operational management plan for this issue. In order to ensure that heritage items within the road corridor are adequately managed by the Proponent in the ongoing maintenance of the proposal, the Department recommends the Proponent implement measures to monitor and manage heritage sites and objects as part of the Operation Environmental Management Plan (OEMP).

A private burial ground for still born babies was established by Ada King, a local midwife in the early 1900s, at the back of her family's house in Bulahdelah. The reported location for this burial ground is within one area of the Alunite Mine complex, but is outside the area of construction impact. The location of this site has not been verified.

The Proponent has committed to the preparation and implementation of a Non-Indigenous Heritage Management Sub Plan (NIHMSP) as part of the CEMP, which would include measures to minimise or prevent impact to identified sites. The NSW Heritage Office recommends that the NIHMSP include work method details and research design for any planned archaeological testing and salvage in order to ensure that the project practice accords with standard heritage and conservation practice. In order to confirm this commitment, the Department recommends the Proponent prepare a Construction Heritage Management Plan (which would be the equivalent of an NIHMSP and would also incorporate indigenous heritage issues) as part of the CEMP, in consultation with the NSW Heritage Office and other relevant stakeholders.

#### **Conclusion**

In order to ensure adequate management of non-indigenous heritage matters, the Department has recommended the following conditions:

- Condition 2.15: Items BH3 and BH4 to neither be impacted nor modified in the construction of the proposal;
- Condition 2.16: Minimisation of physical disruption to or modification of the Alunite Historic Precinct;
- Condition 6.2: Proponent to prepare and implement an Alunite Mine Site Management Plan;
- Condition 6.4: Construction Heritage Management Plan; and
- Condition 6.5: Measures to monitor and manage heritage sites as part of the OEMP.

The NSW Heritage Office has stated that it is satisfied with the adequacy of the assessment undertaken by the Proponent of the heritage impacts of the proposal. The proposal would significantly impact on the Alunite Mine Site, but have little impact on other non-indigenous heritage sites. Given the regional and probably State significance of this site, such impact is to be minimised and avoided where possible. The Department is satisfied that, given the constraints of the site, the Proponent has designed the alignment of the chosen route in order to minimise impact on this and other non-indigenous heritage items. With the Proponent's commitments and the recommended conditions of approval, the Department is of the opinion that the impacts on the Alunite Mine Site and other items can be minimised and managed to a satisfactory level.

## 5.5 Indigenous Heritage

### Issue

The area at the base of Bulahdelah Mountain includes a number of sites of actual or potential Aboriginal significance. Known sites include five scatters of stone artefacts, two scarred trees and two isolated finds. Eight potential archaeological deposits (PADs) have been identified. Two of the scatters are outside the identified area of construction, while the more significant of the two scarred trees, B13, is also outside the area of construction but needs to be protected. The other scarred tree, B2, would be directly impacted by a proposed new service and access track.

In addition, a tree known locally as the 'Guardian tree' and a small waterway identified as a 'healing stream' would be directly impacted by the proposal, with the Guardian tree being removed. There is some uncertainty as to the significance of these two items. There have also reportedly been Aboriginal burials in the area; these reports remain unconfirmed to date. The area is within the boundaries of the Karuah Local Aboriginal Land Council (KLALC). There are differing views amongst the Aboriginal community as to the cultural heritage significance of particular sites around the base of the Mountain.

The Mountain itself is currently under consideration as an Aboriginal Place under Section 84 of the *National Parks and Wildlife Act 1974*. Such a listing would entitle the Mountain to protection by the Director-General of the DECC.

In order to mitigate impacts on Indigenous Heritage, the Proponent has committed to (Commitment 8):

- conducting a program of archaeological subsurface testing and salvage where necessary;
- ensuring that the culvert at the 'healing stream' is designed to allow for the retention of as much of the natural stream bed as possible;
- preparing and implementing an Indigenous Heritage Management Sub Plan (IHMSPP) as part of the Construction Environmental Management Plan (CEMP);
- informing construction workforce in regard to legal obligations and Indigenous Heritage issues; and
- ceasing all works that may impact on any artefact find during construction and seeking immediate advice regarding appropriate actions from the Department of Environment and Conservation and Karuah Local Aboriginal Land Council.

### Submissions

Issues raised in submissions to the project include:

- assessment of significance of Aboriginal objects and whether KLALC is representative of all opinions of the local Aboriginal community;
- minimisation of impact on scarred trees B2, B13 and the 'Guardian tree';



- the need for specialist advice in the salvage of the Guardian tree;
- minimisation of impact on the 'healing stream' and maintenance of its character in negotiation with the KLALC;
- the possibility of Aboriginal burial sites being in the area and impacted by the proposal;
- the need to consider the potential status of the area as an Aboriginal Place;
- a request for signs to be erected acknowledging the Aboriginal cultural traditions and significance of the area;
- timing of PAD investigations in relation to commencement of construction;
- the need for representatives of the KLALC to be involved in all stripping of topsoil and salvage actions involving Aboriginal sites and to be consulted about any management decisions arising from the results of PAD excavations; and
- the need for a strategy for the salvage and curation of Aboriginal objects during the project, including the establishment of a Keeping Place.

## Department's Consideration

### Scarred Trees and Healing Stream

The 'Guardian tree' is an old growth eucalypt, situated within the approximate extent of construction to the north of the Mountain Park which would be removed in the course of construction. It features a burl which has been identified as having a resemblance to a human face by local Aboriginal community members and two scars near the base. The EIS found that the burl's resemblance to a face was likely to be recent and that this feature would be unlikely to render the tree an Aboriginal Object under the *National Parks and Wildlife Act*. The EIS also concluded that the two scars are likely to be of natural origin; this is strongly disputed by the heritage consultant for Great Lakes Council (co-author of the draft Great Lakes Heritage Study), who contends that one of the scars does appear to be of human origin. The EIS concluded that the Aboriginal cultural heritage significance could only be determined by the Aboriginal community. The DECC has not made any statements regarding the significance of the tree, but acknowledges that the issue is complex.

The KLALC has stated that it does not consider this tree to have significance according to the cultural traditions of its members, the Karuah Aboriginal community or the Bulahdelah Mountain. However, it acknowledges that some have a different view and therefore requests that a section of the tree trunk containing the burl be salvaged and set aside in an appropriate local area such as the Mountain Park or adjacent crown land, giving consideration to reducing the risk of fire and termite damage. Given the range of opinions on the issue and the inconclusive nature of previous assessments, the Department is of the opinion that the significance of the Guardian Tree is not likely to be finally determined.

The EIS indicates that the Tree is located directly in the line of the proposed carriageway; given this location, the Department understands that, if the carriageway were to be moved to avoid impact on the Tree, significantly greater numbers of threatened orchid plants would be impacted. Given the uncertain nature of the Tree's significance, the capacity to salvage the Tree and the importance of retaining the maximum number of orchid plants in situ possible to ensure long-term survival of these species (see Section 5.2 of this report), the Department is satisfied that the Guardian Tree must be removed for the purpose of the proposal and that this is an acceptable outcome. The DECC advises that removal and long-term storage and conservation of the tree may require specialist knowledge and should be undertaken in consultation with the KLALC and the DECC. The Department therefore recommends requiring the Proponent to salvage the tree under specialist guidance and in consultation with the DECC and the KLALC, ensuring that all relevant aspects of the tree, including the burl and potential scars, are preserved. It is also recommended that the tree to be preserved in an appropriate local area and the Proponent bear the reasonable costs of establishing an appropriate location if such did not already exist.

Two trees, B2 and B13, have been identified as likely scarred trees; B2 has been assessed as being of moderate to high local significance and B13 of high local and moderate regional significance. B2 would be directly impacted by a proposed new service and access track to the water reservoirs, while B13 would be left intact. The EIS recommends that the detailed design be re-examined to investigate the possibility of preserving B2 and commits the Proponent to doing so. This commitment has not been reiterated in the Statement of Commitments. The Department therefore recommends requiring the Proponent to not destroy, modify or otherwise impact tree B13 and to design the project so as to minimise impact on tree B2. The EIS Working Paper also recommends

that, following construction, B13 should be actively managed to ensure its ongoing health. The Proponent has made no commitment regarding operational management of Aboriginal heritage items. The Department therefore recommends requiring the Proponent to include measures to monitor and manage heritage sites, including objects that have been moved off-site as a result of the proposal, as part of the Operation Environmental Management Plan (OEMP).

A stream which drains the narrow catchment on the western slope of Bulahdelah Mountain has been identified as a 'healing stream' by several sources. This stream flows across the site of the proposal at the base of Bulahdelah Mountain. There are varying opinions amongst the community as to the stream's cultural significance. The KLALC supports the Proponent's proposal to direct the flow of the stream across the highway corridor (its current path) through a culvert, with the provision that the culvert design should have a minimal construction footprint and not result in erosion downstream. The DECC affirms this requirement, citing a number of factors that are important in maintaining the cultural integrity of the stream. The KLALC has also requested that the Aboriginal cultural tradition of healing associated with Bulahdelah Mountain and its waters be acknowledged with an appropriately worded sign erected close to the stream, and that the location, form and content of the sign be developed in consultation with the KLALC and subject to its final approval. The Department agrees that the matters raised by the DECC and KLALC should be taken into account and that some signage would be appropriate in order to retain as much connectivity with the original landscape and its uses as possible. It is recommended that the design of the healing stream crossing be undertaken with regard to specific outcomes and in consultation with the DECC and KLALC to ensure implementation of these measures, and that the Proponent to install signage at the healing stream at other locations around the Mountain Park area in order to highlight Aboriginal cultural tradition.

The Department agrees with the DECC's recommendations that a number of specific issues be addressed in the Construction Heritage Management Plan, including measures for the minimisation of impact on identified scarred trees and other Aboriginal objects. These measures would assist in ensuring effective management of and minimisation of impact on Aboriginal sites during construction. These have been adopted through recommended conditions.

### Aboriginal burials

Submissions from the public have raised concerns that such burials may have occurred and could be impacted by the proposal. The KLALC and DECC have not commented specifically on the possibility of Aboriginal burials on the site.

Based on the EIS, the Proponent states that:

- there is a strong basis for treating seriously the possibility that Aboriginal burials occurred on the mountain;
- in the absence of any surface archaeological indications or specific oral information regarding potential burial locations, only general impact mitigation strategies can be instigated in response to this possibility; and
- the project would include standard strategies with regard to potential burial remains, such as the adoption of standard 'stop work' protocols in the event of the discovery of any skeletal remains.

The Department is of the opinion that the possibility of burials on the site is an important matter, but that there is not sufficient evidence that remains from such burials would still be present. The Department is satisfied that the Proponent's commitments to educate on-site staff and, if any objects or remains are discovered, halt work and notify the DECC, are sufficient to manage this issue.

### Mountain Park

The KLALC has requested that the Aboriginal cultural significance of the Bulahdelah (Alum) Mountain be acknowledged in signs and visitor facilities at Mountain Park and that the location, form and content of these signs be developed in consultation with the KLALC and subject to its final approval. As the Mountain Park will be effectively severed from the remainder of the Mountain, the Department is of the opinion that such acknowledgement is crucial to retaining integrity to the site and its linkage to the Mountain. The Department understands that the RTA is already proposing improvements to the visitor facilities on the site, as discussed in Section 5.7 of this report. As previously discussed, it is recommended that the Proponent install and maintain

signage in consultation with the KLALC and the DECC, highlighting the Aboriginal significance of the area and the sites it contains.

### Management of Aboriginal objects

The Proponent has committed to 'conducting a program of archaeological subsurface testing and salvage where necessary' (Table F1 of EIS main volume). In order to clarify this responsibility, the Department recommends requiring the Proponent to undertake subsurface testing for sites BPAD1 to 8 inclusive, as recommended by the EIS. The KLALC has stated that its representatives must be included in all salvage and collection actions involving Aboriginal sites, in monitoring the stripping of top soil in the vicinity of recorded Aboriginal sites and PADs and be consulted with regarding any management decisions arising from PAD excavations. The Department supports involvement of Aboriginal community representatives as required by current DECC guidelines and the standard practices of the Proponent. The Proponent has committed to consulting with all relevant Aboriginal groups in the preparation of the Construction Indigenous Heritage Management Sub Plan (IHMS), which would detail the outcomes of PAD excavations. The Proponent has also advised the Department that it is committed to liaising with the KLALC throughout the project; the Department is satisfied that this commitment would ensure that the Aboriginal community is adequately consulted at the time that PAD excavations are undertaken.

With regard to the timing of PAD investigations, the Department agrees with the DECC's recommendation that they be undertaken prior to commencement of construction works in consultation with the Aboriginal community and the DECC, and the findings of those investigations incorporated into the IHMS. This process ensures that the maximum amount of information is gathered prior to construction, enabling changes in detailed design or planned construction processes to be incorporated if required. In order to ensure such timing, recommended conditions require the results of PAD investigations to be included in the Construction Heritage Management Plan, part of the CEMP.

In addition to the PADs, the EIS identifies a number of sites from which artefacts should be salvaged. The Proponent has committed to undertaking salvage in consultation with the DECC and the local Aboriginal community. In order to ensure that the recommendations of the EIS are carried out and that sufficient time is allowed for the salvage of artefacts the Department recommends requiring the Proponent to salvage artefacts from sites B1, B8, B10, B11, B14, B15 and B16, unless otherwise agreed by the DECC and the KLALC, prior to the commencement of construction that may impact on those sites.

The KLALC has requested funding from the Proponent to assist in the permanent storage and display of all salvaged artefacts at a community-controlled Keeping Place, currently proposed to be established at Karuah. The Proponent has stated that it would continue in ongoing discussions with the DECC and the local Aboriginal community regarding the storage of artefacts, but has not committed any funding. Given that it is currently unknown how many artefacts will require storage as a result of this project, the Department does not believe there is sufficient reason to require the Proponent to commit funding to a Keeping Place. The exception to this is the recommended requirement that the Proponent bear the reasonable costs of establishing a location for preservation of the Guardian Tree should such a location not already exist.

### **Conclusion**

In order to ensure adequate minimisation and mitigation of impact on indigenous heritage items, the Department recommends the following conditions of approval:

- Condition 2.9: Tree B2 not to be destroyed, modified or otherwise impacted and Proponent to investigate options for avoiding impact on tree B13;
- Condition 2.10: Artefacts to be salvaged from sites B1, B8, B10, B11, B14, B15 and B16 prior to commencement of construction that may impact on those sites;
- Condition 2.11: Subsurface testing to be undertaken for sites BPAD1 to 8 inclusive;
- Condition 2.12: Guardian Tree to be salvaged under specialist guidance and preserved;
- Condition 2.13: Design of healing stream crossing to be undertaken in consultation with the DECC and KLALC with regard to specific criteria;

- Condition 2.14: Signage to be installed at healing stream and other locations around Mountain Park in order to highlight Aboriginal cultural tradition;
- Condition 6.4: Construction Heritage Management Plan as part of the CEMP; and
- Condition 6.5: Monitor and manage heritage sites as part of the OEMP.

It is apparent that there are different views amongst the Aboriginal community and other members of the local community regarding the significance of particular sites and features near and around Bulahdelah Mountain. These differences of opinion have been acknowledged by the Proponent, the KLALC and DECC, but the DECC has confirmed that the KLALC is the appropriate representative body for the Aboriginal community for the geographical area in question. The Department has considered all submissions, advice from the DECC, the KLALC and Great Lakes Council's heritage consultant.

The Department notes that the nomination of Bulahdelah Mountain as an Aboriginal Place under the *National Parks and Wildlife Act 1974* is ongoing. The Department has recommended conditions of approval that would ensure adoption of measures recommended by the DECC for minimisation and mitigation of the proposal's potential impact on Aboriginal objects and sites in the area. The Department understands from the DECC that, if these measures are implemented, the proposal is unlikely to significantly diminish the integrity of the area as a potential Aboriginal Place.

The Department is satisfied that, with the implementation of the Proponent's commitments and the recommended conditions of approval, the impacts of the proposal on indigenous heritage would be minimised and managed to an acceptable level.

## 5.6 Socio-Economic Impact

### Issue

Bulahdelah is a small township of approximately 1,550 people (2001 Australian Census). Unemployment has been identified by Great Lakes Council as a major concern for the area, both economically and socially. Approximately 35% of those employed in Bulahdelah work for businesses that provide services to travellers using the Pacific Highway. Many travellers currently use Bulahdelah, situated approximately 2.5 hours drive from Sydney, as a rest and service stop and approximately 30 tourist-related businesses are located adjacent to the current highway. An average of 1200 vehicles currently stop at Bulahdelah each day to use local services.

The proposal would move the Pacific Highway from its current route through the centre of Bulahdelah, to the east between the township and Bulahdelah Mountain. This 'bypassing' of Bulahdelah has raised concerns amongst the local community that it would result in a reduction in trade from motorists using the Highway. Through-town options have been re-visited as a result of this concern, but it has been concluded by the Proponent that the negative impacts of such an option, including increased severance of the township and the need for noise barriers that would block motorists from using roadside services, would outweigh any benefits to the community. The EIS states that the proposed upgrade is expected to make a significant contribution to regional growth and the regional economy due to an improvement in travel times.

To mitigate for negative economic impacts, the Proponent has undertaken to:

- install advance signage to both the north and south of Bulahdelah to inform motorists of Bulahdelah's location and services;
- implement a landscape design that would give a gateway effect for motorists nearing Bulahdelah with the aim of attracting them into the township; and
- develop a package of in-town improvements in consultation with Great Lakes Council in conjunction with the proposal to encourage continued usage of Bulahdelah as a service town.

## Submissions

Issues raised in submissions to the project include:

- whether the proposal would benefit or disadvantage the local economy;
- to provide a distinctive entrance to the township by replicating northern entrance signage at southern approach;
- the potential for the distance from the proposed southern exit and the cutting to block the view of motorists of the township and therefore discourage passing trade;
- the potential need for a southbound exit to be available at the southern interchange or for a central interchange to facilitate motorist entry into the township from the Highway
- discouraging service centres near Bulahdelah to encourage use of existing services in the township;
- the potential for increased highway noise and fumes reducing the amenity of the town and therefore its tourist potential; and
- the potential for the proposal to diminish the tourist-attraction value of the Mountain, Mountain Park and Alunite Mine Site.

## Department's Consideration

### Highway Passing Trade

The town is not currently considered to be a major tourist destination, although its strong local features and geographical location indicate that it could become such with the right facilities and tourism development strategies. The local economy is heavily dependent on trade from motorists using the Highway. Driver surveys undertaken in 2000 determined that approximately 8-10% of total highway traffic consists of regional Pacific Highway drivers who stop at Bulahdelah, primarily for fuel and rest. In addition 75% of weekday drivers and 65% of weekend drivers stop regularly at Bulahdelah for goods and services. There is clearly a substantial reliance by a number of businesses upon Highway trade and a high overall level of economic and employment dependence on the existing Highway by the township, with approximately one third of total employment in industries that provide services to travellers. This dependence reduces the township's ability to withstand any loss of trade that may result from the Highway upgrade.

A Highway Service Town (HST) is a town located on or in close proximity to an existing highway corridor and which has developed to provide a range of services and facilities to cater to the needs of highway users and the local community. The draft Great Lakes Highway Service Centre Strategy (May 2004), developed by Great Lakes Council, considers the role of Bulahdelah as a potential HST in light of this upgrade proposal. This document states that similar projects elsewhere have shown that:

- the economic impacts of such bypasses can be significant on local economic and community factors; and
- sound planning and other measures developed and implemented in advance, concurrent with and after the implementation of highway bypasses can aid in the reduction of potential economic impacts subject to prevailing circumstances.

The draft Strategy concludes that any proposals to develop an 'out-of-town' Highway Service Centre at Bulahdelah requiring direct access or use of a connector road to the Highway should be refused, including at O'Sullivan's Gap, the site of an existing service station, four kilometres to the north of Bulahdelah. The Strategy also recommends that Great Lakes Council develop and implement a Town Centre Management Plan for Bulahdelah. Great Lakes Council has resolved to commence actions to implement the key recommendations of the Strategy. If adopted, this Strategy would ensure that Bulahdelah remains a designated service stop for that particular stretch of the Pacific Highway, enhancing the long-term prospects for the local economy.

The EIS acknowledges that some passing trade is likely to be lost due to the Highway bypassing the town, but concludes that original numbers would be regained in the long term due to the increase in traffic volume predicted for the Highway over time. The Proponent states that the proposed alignment has been designed in order to maximise the opportunities for Highway motorists to see Bulahdelah and decide to divert into the town, particularly for northbound travellers. This decision would be made by northbound motorists prior to reaching the

southern interchange, potentially having recognised the mountain as a landmark prior to entering the cutting at the foot of Bulahdelah Mountain.

The Proponent has committed to providing clear signposting and is of the opinion that this, in combination with the Bulahdelah Golf Course, would provide southbound drivers with adequate cues to exit to Bulahdelah at the northern interchange and that the addition of a southbound exit at the southern interchange is therefore not justified. The Proponent also states that a central interchange is not feasible due to the significant environmental and social impacts that would result. However, U-turns would be provided at approximately three to five kilometre intervals, providing an opportunity for southbound travellers who may have missed the southbound exit at the northern interchange.

The Department is satisfied that adequate provision has been made in the proposal design for motorists to be encouraged to access Bulahdelah and use its services. The proposal would provide a clear visual link for motorists approaching the town, although once driving through the Bulahdelah Mountain foothills this visual link would be lost. Once the Highway is complete, the current Highway would be returned to Great Lakes Council for management. Given the findings of the draft Great Lakes Highway Service Centre Strategy, planning for the future of the township by Council has the potential to minimise further loss of trade.

The Proponent has committed to preparing an Urban Design and Landscape Plan for the activity in consultation with Great Lakes Council and the community liaison group and to maintaining for three years after completion landscape works which, following construction, are not the responsibility of the RTA. The Proponent has also committed to developing options for landscaping improvements within the town in consultation with Great Lakes Council. The Department is satisfied that these commitments would provide Great Lakes Council with adequate support in improvement of the township in order to mitigate for potential loss of trade as a result of the proposal.

#### Town Amenity

The EIS demonstrates that local air quality and noise levels would improve overall as a result of the proposal. The points of key impact would shift from the areas nearest the current Highway to areas to the east of the township. The reduction in congestion at peak travel times and the installation of noise mitigation measures are predicted to result in air pollutant and noise levels well below current standards and goals, so these issues are unlikely to reduce amenity for visitors to Bulahdelah or to have any negative economic impact on the township. The significant improvement in air quality, noise levels and reduced congestion and heavy vehicle traffic in the central part of the township could encourage motorists to stop in the township more frequently and for greater time periods than they may otherwise have done, resulting in a positive economic impact.

#### Tourist Amenity of Mountain Park

This impact of the proposal on the amenity of the Mountain Park area has been discussed further in Section 5.7 of this Report. The Proponent has stated that tourism in Bulahdelah depends largely on boating and recreational activities associated with the Myall River and that changes to the amenity of and access to Mountain Park and the Mountain are therefore not expected to reduce tourism activity in Bulahdelah. The Department accepts that this is currently the case and understands that there are not currently any plans by any other parties, including Great Lakes Council, to develop the Mountain Park visitor facilities. The Department does not consider the proposal will have a negative impact on current tourist usage and therefore economic benefit of Mountain Park.

### **Conclusion**

The Department is satisfied that the proposal has been designed with the intention of providing maximum possible incentive to Pacific Highway motorists to continue to stop at Bulahdelah and purchase services there. While there is likely to be some loss of trade resulting from the bypass, the Department concludes that, with the implementation of the Proponent's commitments to provide visitor facilities, landscaping and signage, this impact would be mitigated to an acceptable level and offset by regional economic benefits.

## 5.7 Access and Amenity

### Issue

The Bulahdelah Upgrade is expected to have impacts on the access and amenity of Bulahdelah from several perspectives. The existing highway, with high traffic volumes and heavy vehicles, creates a significant barrier through the town, segregating the east from the west and increasing safety risks due to the location of the primary school on the eastern side of the highway and away from the major residential area of the town. Relocation of the highway to the east of the town is expected to reduce existing impacts of town severance but may result in different impacts, namely:

- loss of connection between the town and the Bulahdelah Mountain; and
- termination of Meade Street access to the mountain at Mountain Park.

Further, the upgrade will directly impact on the Mountain Park recreational area which is used by local residents and tourists alike as well as creating potential visual impacts as a result of the 24 metre cutting required through the base of the mountain.

The RTA has made the following key commitments to mitigate and manage impacts of the proposed upgrade:

- access road from Meade Street to be terminated at Mountain Park and alternative access provided via Mackenzie Street;
- car parking facilities at Mountain Park to be upgraded;
- reinstatement of Mountain Park including new playground on western side of park;
- new trail construction to join new mountain access overbridge with interpretive signage to replace removal of part of Twin Dams Walking Track; and
- urban improvement works including:
  - pavement rehabilitation
  - median barrier removal near Meade St
  - relocate rest area toilet facilities from golf course to location in town
  - improved vehicular and pedestrian access to reserve south west of existing bridge
  - provide on-street heavy vehicle parking facilities on existing highway near central service stations
  - streetscape scheme for existing highway

### Submissions

Issues raised in submissions to the EIS and Submissions Report include:

- visual impact on Bulahdelah township including scarring of town's mountain backdrop;
- loss of connection between mountain and township, both physical and spiritual;
- impact on rural nature of town;
- view of mountain for motorists;
- loss of recreation site (Mountain Park) and reduction in tourism;
- impact of increased noise, vibration and air pollution on remaining recreational amenities; and
- impacts on public safety after completion.

### Department's Consideration

#### Visual Impacts

The Department recognises that Bulahdelah Mountain provides a significant backdrop to Bulahdelah and is used as a landmark in identifying the town. In considering the route options, it is clear that this issue was considered by both the community and the Proponent in terms of maximising opportunities for advance warning of the town's approach to enable travellers to make a decision to stop and take advantage of services available in the town. Consideration of alternative route options suggests that the mountain would not become visible until after access to the town interchange had passed and therefore the opportunity to stop in town would be lost. The Proponent

states that the design has been developed to optimise direct views of Bulahdelah Mountain in advance of the southern interchange for northbound travellers, allowing them time to decide to stop. There is little opportunity to provide southbound travellers with direct views of the town and mountain. This issue is discussed in more detail in Section 5.1 regarding route option selection, including the community's desire that the route be located as close to the town as possible.

Construction activities on the Myall River floodplain would be visible from both the existing Pacific Highway and a number of private properties on the floodplain. Two residences would be particularly impacted by the proposal, one located on the floodplain with views of the new link road to the highway and the new interchange and elevated highway, the other on an exposed rise between Ann Street and the river with views of the new bridge and elevated southern interchange. The Department is of the opinion that the residences that would be particularly impacted by the proposal should be offered some form of landscaping in order to screen these views, if desired by the landowners. The Department therefore recommends requiring the Proponent to offer reasonable and feasible landscaping for the purpose of visual screening to the owners of these residences.

The Proponent states that views of the proposal from the town, including construction, would be largely limited to the northern end of town where the alignment emerges from existing native forest; landscaping would be employed to screen the road from view at this point. There would also be some loss in scenic amenity from the golf course. The Proponent has undertaken to mitigate the large cuttings required through the foot of Bulahdelah Mountain by minimising cutting heights and widths where possible and landscaping on more moderate slopes, resulting in visual impacts being limited to transient views experienced by motorists using the upgrade and negligible views from the town. Visual impacts of the upgrade for residents are likely to be restricted to noise barriers installed as part of the proposal to mitigate noise impacts. The Proponent has undertaken to provide screening of views from the township through the use of landscaping.

Visual impacts of the upgrade where it passes through Bulahdelah Mountain would be most visible from within the Mountain Park area itself rather than from residences. Given that the proposed route largely avoids rural areas surrounding Bulahdelah, it is not expected that the rural nature of the town would be significantly affected. There would also be views of the upgrade from vantage points on the mountain itself though it is expected that these would be obscured to some degree by intervening vegetation.

Within town, proposed urban improvement works will have significant benefits in terms of access as well as visual amenity.

The Department considers that the visual impacts of the proposal are manageable but that mitigation should be developed in consultation with the local community including those specific to the proposal design as well as the urban improvement works. In particular, measures to minimise cutting requirements, noise barrier design and landscaping requirements should be developed in consultation with directly affected residents and the Community Liaison Group.

### Severance

The proposal results in both positive and negative severance impacts. The existing highway creates a significant barrier between the eastern and western sections of the town due to high traffic volumes, a high proportion of heavy vehicles and the physical barriers created by jersey kerbs installed for safety reasons. This barrier separates the western residential area from that on the eastern side of the highway which also includes the primary and secondary schools. Investigations undertaken as part of the EIS found that the existing severance issues would likely increase without the proposal due to projected increases in traffic volume. Relocation of the upgrade to the town boundary is expected to have significant positive effects for the community with respect to interaction and safety in crossing the highway, though it is recognised that the existing highway would remain a busy thoroughfare even with reduced traffic volumes. It is anticipated that the proposed bypass would provide opportunities to increase the amount of community interaction by re-establishing pedestrian and cyclist access not currently available due to safety measures in place. It would also result in much of the traffic being located further from the schools and therefore reduction in noise impacts would be expected. This is discussed further in Section 5.8.



Of significant concern to a number of local residents is the impact of the proposed upgrade location at the foot of Bulahdelah Mountain and how this would result in the community's loss of immediate connection to the Mountain, both physical and spiritual. The Department acknowledges that the proposal would result in a high degree of severance at this location, substantially changing the landscape for those using the Mountain Park area in particular. This change is likely to be experienced as a significant loss for some local residents, which cannot be fully mitigated by the proposed design and landscaping measures.

Notwithstanding, the Department notes that there is some considerable community desire to ensure that the proposed upgrade route be located as close to the town as possible to minimise economic impacts on businesses. This included a re-evaluation of the "through town" option and an assessment of relative impacts of bypass options, as discussed further in Section 5.1 of this Report. While the impact on the local Park area would be significant, there is greater benefit from the removal of high traffic volumes and heavy vehicles from the centre of the town. It is also noted that vegetation on the Mountain to the east of the Proposal would remain intact.

As a result of the upgrade, a new access to the Mountain to the east of the highway would be required. The Proponent proposes to construct a 60 metre Mountain Access Overbridge adjacent to Mountain Park where existing access to the mountain is obtained to replace the track which would be severed by the proposal, matching the original track's alignment as closely as possible. Additional access would be provided at Bombah Point Road and Stuart Street. The Department is satisfied that this would provide adequate access to the Mountain for pedestrians and recreational users of the area. Further discussions between the Proponent, the DPI, Council, the NSW Heritage Office and the local community regarding the works to take place in Mountain Park Picnic Area, including the Overbridge, are recommended.

Severance would also be experienced by the owner of property no. 5 as identified in the EIS, with the proposal bisecting agricultural land in this property. The Proponent has committed to the provision of a livestock underpass in the connecting road from the southern interchange to the existing highway. The Department recommends requiring the Proponent to consult with the owner of the property with regard to the design and location of underpasses to permit the movement of livestock and agricultural machinery between the two sides of the project. The Proponent is also required to bear the full cost of such underpasses.

### Recreational Impacts

A number of submissions raise the issue of recreational impacts of the proposal, particularly in relation to the impacts on Mountain Park. It is understood that Mountain Park is regularly used by both local residents and travellers or tourists passing through the area. The park has both recreational and heritage significance given its historical connection to mining on Bulahdelah Mountain.

The proposal would have direct impacts on Mountain Park including loss of area, potential noise impacts and modification of access to the mountain. Possible security impacts of formalising access across the highway were raised by the Department. Proposed mitigation of these impacts include the relocation of the playground and replacement of facilities away from the upgrade, installation of noise walls and provision of new access points across the highway to the mountain. Use of the area would likely be diminished during the construction phase; however, overall, the Department considers that the proposal would result in a park area that would still be attractive and useable for recreational purposes, particularly for travellers/tourists.

Formalising access points to the park, use of interpretive signage to acknowledge the heritage values and access across the highway may result in greater use and appreciation of the facilities. The measures proposed would not reverse the changes to the amenity of the area, but would rather serve to maximise the potential of the newly shaped Mountain Park. This would provide an area of reasonable size and amenity for recreation, with some access to the rest of the Mountain via specified routes across or underneath the Highway. The Department is satisfied that the Proponent's proposed measures would adequately address the issue of tourist amenity for the Mountain Park.

Notwithstanding, use of the area by the local community may be affected in the short term until the changes are embraced and the anticipated benefits realised. In order to minimise adverse impacts and encourage community ownership, it is recommended that broad consultation be undertaken during design of all facilities and

landscaping related to the Mountain Park including specific consultation with the DPI, the NSW Heritage Office, Council and the Community Liaison Group. The final design should be to the satisfaction of DPI as the owners of the impacted land. The Department therefore recommends requiring the Proponent to undertake broad consultation and be responsible for upgrade and reinstatement works.

## Conclusion

The Department has proposed the following conditions of approval in order to address access and amenity issues:

- Condition 2.30: Proponent to upgrade and reinstate Mountain Park in consultation with relevant stakeholders with respect to new playground equipment, extended carparking, signage, location and design of the Mountain Access Overbridge, landscaping and cycling/pedestrian paths;
- Condition 2.31: Proponent to offer reasonable and feasible landscaping to provide visual screening to residences particularly impacted by southern part of proposal; and
- Condition 2.32: Proponent to provide underpasses in consultation the owner property no. 5 to permit movement of livestock and agricultural machinery.

The Department concludes that the proposal would result in some visual impacts, particularly for residents on the floodplain, but that the majority of the township would not be impacted visually by the proposal. The proposal would enhance connectivity within the township of Bulahdelah by removing large amounts of traffic and heavy vehicles from the current Highway, but would result in significant physical and visual severance of the Mountain Park area from Bulahdelah Mountain. The Department acknowledges that this severance would impact upon a number of residents who habitually use the area and would constitute a major change to the Mountain Park. However, the Department is of the opinion that in the longer term the Mountain Park area would receive enhanced visitor facilities as a result of the proposal, and that adequate pedestrian access to the Mountain itself would be provided. The majority of the Mountain would remain unaffected by the Proposal.

With the implementation of the recommended conditions and the Proponent's commitments, the Department is satisfied that the impacts of the proposal on access and amenity would be managed to an acceptable level.

## 5.8 Noise and Vibration

### Issue

General construction of the upgrade would involve excavation, blasting and bridge construction which could generate significant noise emissions for periods of time. Noise generating ancillary facilities may include concrete batching plants. Background noise levels during construction are expected to be exceeded at up to 22 sensitive receivers including Bulahdelah Primary School and St Joseph's Primary School.

In addition to general noise from construction works involving excavation and bridge construction, blasting will be required to remove material from the large cutting at the base of Bulahdelah Mountain and near the northern interchange. Vibration overpressure is expected to be met on 95 per cent of occasions.

Mitigation measures would be required to meet the daytime and night-time goals for both construction and operation phases. There are a number of noise sensitive receivers which would experience an improved operational noise environment as a result of the proposal.

In order to mitigate and manage impacts relating to noise generation during construction and operation of the proposal, the Proponent has committed to the following (Commitments 5 and 6):

- preparing and implementing a Construction Noise and Vibration and Management Plan including measures for general construction activities, public address system use, rock breaking/hammering, piling, vibration and blasting and monitoring;
- undertaking pre-construction noise monitoring;
- undertaking blasting trials if blasting will be required;

- advising the community within 500m of blast sites in advance of blast events;
- preparing and implementing an Operational Noise Management Plan which includes identification of applicable noise levels at all sensitive receivers, noise management measures including "reasonable and feasible" physical mitigation requirements, noise monitoring and reporting and complaint procedures; and
- assessing the adequacy of implemented noise mitigation measures 12 months after opening in accordance with the RTA's Environmental Noise Management Manual.

## Submissions

Issues raised in submissions to the EIS include:

- schools should not be exposed to noise where there are alternatives;
- a noise, vibration and blast management plan should be prepared prior to construction commencement;
- Bulahdelah Water Treatment Plant, Bulahdelah Reservoirs and associated infrastructure should be considered in vibration monitoring and risk assessment;
- will noise levels at sensitive receivers be acceptable 10 years after opening;
- noise reflection from Bulahdelah (Alum) Mountain; and
- further detail on noise attenuation measures is required.

## Department's Consideration

### Construction

#### *Blasting*

Blasting would be used to remove material in the large cutting at the foot of Bulahdelah Mountain, and in the construction of the northern interchange. Criteria for maximum levels of blast overpressure and ground vibration are given by the DECC. The Proponent has committed to ensuring that vibration levels meet the requirements of any relevant licence, applying appropriate guidelines and restricting blasting activities to certain hours. The Department therefore recommends requiring limiting blasting activities to the committed hours, and limiting airblast overpressure and ground vibration from blasting to within the criteria specified by the DECC.

#### *Construction Hours and Noise Levels*

The Proponent has committed to construction hours as defined in the EIS, unless otherwise approved. In order to clarify this commitment, the Department recommends requiring the Proponent to restrict construction activities that would generate an audible noise at any residential premises to specified hours. To ensure that the needs of Bulahdelah Primary School and St Josephs Primary School are considered, the Department also recommends that the Proponent schedule audible construction works so as not to coincide with exam periods or major sporting events of those schools. Any exemptions to the specified construction hours for audible activities require approval from the Director-General and agreement from the DECC.

It is recognised by the Department and the DECC that it is difficult for a Proponent to meet the construction noise goals as specified in the DECC's Environmental Noise Control Manual for many construction activities. Standard practice has been that the goals should be used by a Proponent as a noise objective or target to ensure that all reasonable and feasible measures have been applied. As the proposal would take more than 26 weeks to construct, the standard applicable criteria is that the  $L_{A10}$  noise level measured over a period of not less than 15 minutes should not exceed the background  $L_{A90}$  noise level by more than 5 dB(A) at any noise sensitive receiver. The Department therefore recommends specifying that the standard construction noise objectives be applied to construction activities and requiring the Proponent to identify and manage activities that are likely to exceed the objectives in accordance with the Construction Noise and Vibration Management Plan.

### Operation

The Department is of the opinion that the majority of concerns regarding operational (traffic) noise modelling have been appropriately addressed by the Proponent in the Submissions Report.

All noise modelling assesses the predicted impacts of noise 10 years from opening of the proposal. Generally predicted noise levels are acceptable and within the goals although there would be some residences where noise objectives may not be met with standard treatments such as use of open graded asphaltic concrete or noise barriers. The onus is on the Proponent to address these on a case by case basis with the property owners to develop the optimum noise management measures to ensure compliance. There are also some residences that would experience a minor increase in noise levels in 10 years as a result of the proposal than would otherwise have been experienced; the Proponent will be required to address these through reasonable and feasible mitigation measures where goals have been exceeded.

The proposal will relocate the Highway further from the existing schools and thereby traffic noise will be reduced from that which is currently experienced. With optimal noise barriers in place, the predicted daytime noise levels at St Josephs Primary School in 2018 are 53.9 dB(A) in the playground and 44.9 dB(A) in the classroom. Levels are likely to be lower than these at Bulahdelah Central School. These figures are within the relevant criteria and therefore acceptable.

With regard to noise reflection from Bulahdelah Mountain, the Proponent has confirmed that noise modelling and proposed mitigation for the proposal has considered local topography and the effects of noise reflection. The Department accepts that this is standard practice in noise modelling and that no further modelling is required at this time.

In order to provide further project specific detail of how traffic noise will be managed based on the detailed design of the project, the Department recommends that the Proponent submit for the approval of the Director-General, prior to the commencement of construction of the project and in consultation with the DECC, a Review of proposed operational noise mitigation measures. This Review would detail the investigations of reasonable and feasible operation noise mitigation methods based on the assessment to date but refined in the process of detailed design, in accordance with the RTA's 'Environmental Noise Management Manual' (ENMM), and recommend specific measures for each location.

Notwithstanding the above, the Department is aware of the limitations of modelling, including that the inputs are based on assumptions and are necessarily predictive at the environment assessment phase. In order to ensure that the predicted outcomes have been achieved, the Proponent has committed to assessing the adequacy of the implemented traffic noise mitigation measures 12 months after opening and implementing measures to correct discrepancies with noise goals where possible. In order to confirm this commitment, the Department recommends requiring the Proponent to undertake a program of monitoring to confirm the noise performance of the project within one year of commencement of operation, in accordance with particular criteria. It is recommended that the Proponent report on this monitoring to the Department and the DECC within 60 days of completion, detailing any additional measures that may be required to ensure compliance.

## Conclusion

In order to address the issues raised in submissions regarding noise and vibration, the Department has recommended the following conditions:

- Condition 2.17: Proponent to restrict audible construction activities to certain hours;
- Condition 2.18: Exemptions to specified construction hours require approval from the Director-General and agreement from DECC;
- Condition 2.19: Blasting activities to be restricted to certain hours;
- Condition 2.20: Proponent to schedule audible construction works so as not to coincide with exam periods or major sporting events of local schools;
- Condition 2.21: Standard construction noise objectives to be applied, exemptions to be identified in Construction Noise and Vibration Management Plan;
- Condition 2.22: Airblast overpressure to be limited to within DECC criteria;
- Condition 2.23: Ground vibration from blasting to be limited to within DECC criteria;
- Condition 2.24: Review of operational noise mitigation measures to be submitted prior to commencement of construction;

- Condition 3.3: Proponent to undertake a program of operational noise monitoring within one year of commencement of operation;
- Condition 3.4: Proponent to report on operational noise monitoring to Department and DECC within 60 days of completion;
- Condition 6.5: Construction Noise and Vibration Management Plan to be prepared as part of CEMP; and
- Condition 6.6: Measures to monitor and manage noise impacts to be included in OEMP.

The Department is of the opinion that, with the implementation of these conditions and the Proponent's commitments, the potential noise and vibration impacts of the proposal would be mitigated to an acceptable level, such that the benefits of the proposal would outweigh any impacts.

## 6 CONCLUSIONS AND RECOMMENDATIONS

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The Bulahdelah Pacific Highway Upgrade would provide a vital link in the Pacific Highway Upgrading Program, a Program committed to by the NSW and Federal governments.

The Upgrade would result in improved safety for both motorists using the Highway and motorists and pedestrians travelling through the township of Bulahdelah by removing traffic and heavy vehicles from passing through the township. It would also reduce traffic noise and vehicle emission levels in the centre of the township, and improve connectivity for residents on either side of the existing Highway.

Environmental impacts that would result from the proposed Upgrade include significant impacts on threatened flora and fauna species, including three rare or threatened orchid species, one of which is listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and the Squirrel Glider. The Department has sought and received expert advice regarding the threatened orchids (Appendix F). The Proponent has committed to minimising impact through design, clearing methodology, replacement of lost habitat where feasible, the provision of aerial crossings for the purpose of Squirrel Glider populations and the preparation and implementation of an Orchid Management and Translocation Plan that would include trial cryostorage and translocation of orchids. The Department has recommended a number of conditions of approval including certification by the Proponent that the final design in the vicinity of Bulahdelah Mountain has been undertaken to minimise ecological impact, monitoring programs for both the Squirrel Glider and affected orchid species to determine the longer-term viability of these populations during and after project construction and negotiation of an offset package by the Proponent with the DECC and the Commonwealth Department of Environment and Water Resources (DEW).

The proposal would also result in the bisection or removal of sites and objects of indigenous and non-indigenous heritage. The majority of these occur within the proposed corridor through the foot of Bulahdelah Mountain. In addition to the Proponent's commitments to minimise and mitigate such impacts, the Department has recommended a number of conditions of approval including avoidance of impact to scarred trees and Alunite Mine Site where feasible, a Plan of Management for the Alunite Mine Site, specialist guidance to be used for salvage of Guardian Tree and design of the healing stream crossing and installation of signage highlighting cultural heritage to be undertaken in consultation with the Karuah Local Aboriginal Land Council and NSW Heritage Office.

Socio-economic impacts include potential loss of trade resulting from the bypassing of Bulahdelah township by the Highway and both positive and negative impacts on access and amenity. In particular, the visual amenity and connectivity with Bulahdelah Mountain for users of the Mountain Park area would change, with the Highway passing within metres of the Park and access becoming restricted to designated points. To mitigate direct economic impacts, the Proponent has undertaken to install advance signage to encourage motorists to visit Bulahdelah, implement a landscape design to give a gateway effect for motorists nearing Bulahdelah and develop a package of in-town improvements in consultation with Great Lakes Council. Council has indicated that it supports the role of Bulahdelah as a designated Highway Service Town and would limit the potential for competing development on the Highway. The Department is satisfied that the proposal has been designed with the intention of providing maximum possible incentive to Pacific Highway motorists to continue to stop at Bulahdelah and purchase services there. While there is likely to be some short-term loss of trade resulting from the bypass, the Department concludes that this impact would be mitigated to an acceptable level and is offset by safety and wider regional benefits. The Department also considers the impacts to access and amenity to be acceptable as amenity would improve for the majority of the township, the Mountain Park area would be reinstated by the Proponent with improved facilities, pedestrian and vehicle access to the Mountain would be retained and these areas are unlikely to be visible from residences.

Construction noise is likely to be audible at a number of sensitive receivers, although operational noise levels would generally be improved and are likely to be reduced to within acceptable noise goals. General construction of the upgrade would involve excavation, blasting and bridge construction which could generate significant noise emissions for periods of time. The Department has recommended a number of conditions of approval

in order to minimise and mitigate the impact of noise and vibration, including restriction of construction hours, application of noise and vibration criteria and processes for monitoring and reporting of operational noise levels. The Department considers that with the implementation of these conditions and the Proponent's commitments, the potential noise and vibration impacts of the proposal would be mitigated to an acceptable level, such that the benefits of the proposal would outweigh any negative impacts.

Finally, the Department has recommended conditions requiring the Proponent to undertake ongoing monitoring of environmental factors both during construction and for a number of years of operation, and to track and report on compliance with the Minister's approval. The Proponent must also implement a system to ensure ongoing consultation with stakeholders, including the local community.

The Department is satisfied that, with the implementation of the Proponents commitments and the recommended conditions of approval, the benefits of the proposal to the local and regional community would outweigh known and potential negative environmental impacts. Therefore it is recommended that the proposal be approved.

## 7 REFERENCES

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Arup 2004 *Great Lakes Council – Great Lakes Highway Service Centre Study and Strategy Report*  
[http://www.greatlakes.nsw.gov.au/planbld/PBDdownloads/HSC\\_final.pdf](http://www.greatlakes.nsw.gov.au/planbld/PBDdownloads/HSC_final.pdf).

Roads and Traffic Authority (RTA) 2001 *Pacific Highway, Bulahdelah Upgrade – Project Development and Preferred Route Option Report* PPK Environment and Infrastructure Pty Ltd, Newcastle.

Roads and Traffic Authority (RTA) 2004 *Bulahdelah – Upgrading the Pacific Highway Environmental Impact Statement* Parsons Brinckerhoff, Rhodes.

Roads and Traffic Authority (RTA) 2006 *Bulahdelah – Upgrading the Pacific Highway Submissions Report* RTA Environmental Technology, Parramatta.

Roads and Traffic Authority (RTA) 2007 *Pacific Highway Upgrade map – April 2007*  
<http://www.rta.nsw.gov.au/constructionmaintenance/majorconstructionprojectsregional/pacifichighwayupgrade/index.html?hlid=pachwy>.



## **APPENDIX A. RECOMMENDED CONDITIONS OF APPROVAL**

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See Project Approval on Department of Planning website (9 July 2007) – conditions approved as recommended.

## **APPENDIX B. STATEMENT OF COMMITMENTS**

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See *Bulahdelah Upgrading the Pacific Highway Submissions Report* – RTA 2006

See RTA website: <http://www.pb.com.au/bulahdelah/html/submissions.html>

## **APPENDIX C. RESPONSE TO SUBMISSIONS**

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Bulahdelah Upgrading the Pacific Highway Submissions Report – RTA 2006

See RTA website: <http://www.pb.com.au/bulahdelah/html/submissions.html>

## **APPENDIX D. ENVIRONMENTAL ASSESSMENT**

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Bulahdelah Upgrading the Pacific Highway Environmental Impact Statement – RTA 2004

See RTA website: <http://www.pb.com.au/bulahdelah/html/structure.html>

## **APPENDIX E. EXPERT ADVICE TO DEPARTMENT - ORCHIDS**

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