

13. Indigenous and Non-Indigenous Heritage

13.1 Introduction

The assessment of impacts on indigenous and non-indigenous heritage was documented in a separate Working Paper to the original EIS and presented in Section 11 of the EIS. This included identification of a range of management measures to avoid or minimise impacts on heritage items.

This section assesses whether the works associated with the modified alternative design would have any additional impacts on identified heritage items beyond those associated with the approved project. It also considers whether any additional mitigation measures beyond those associated with the original approval (including relevant NPWS concurrence conditions) are required.

13.2 Impacts Associated With Approved Project

13.2.1 Indigenous Heritage

Survey effort for the assessment of impacts on indigenous heritage comprised:

- a search of the NPWS Aboriginal Heritage Sites Register which identified 28 recorded sites within a 4 km radius of the (then) proposed route;
- a search of the Register of the National Estate which identified four items of Aboriginal heritage significance within the Byron LGA, none of which were located in the (then) proposed road corridor; and
- two field surveys involving representatives of the Tweed-Byron Local Aboriginal Land Council (LALC) and the Bundgelung Council of Elders.

The first survey involved an 'on-foot' inspection of the route of the proposed duplication of the Brunswick Heads Bypass and a combined vehicle and on foot survey of a broad corridor based on the preferred route north of the Brunswick River. The purpose of the survey was to confirm the status of areas which had been identified as being of potential archaeological significance from a desktop assessment. Eight Potential Archaeological Deposit (PAD) areas were identified in the section of the route north of the river.

After the preferred route was identified, a second on-foot inspection of the route was undertaken in conjunction with representatives of the Tweed-Byron LALC. This survey identified two isolated artefacts (B-IS-1, B-IF-2) and seven PAD areas. Both isolated finds were located to the south of Billinudgel on an elevated spur which had been heavily disturbed by quarrying and the removal of topsoil. PAD areas 1, 2 and 3 were located outside Sections 2, 4 and 5 of the route and are consequently not relevant to this assessment. PADs 4, 5, 6 and 7 were located in Section 5 of the route.

The scientific and Aboriginal heritage significance of both isolated artefacts was assessed as low and this was confirmed by representatives of the Tweed-Byron LALC. The original EIS indicated that the significance of the PAD areas would be the subject of further sub-surface testing prior to the commencement of construction. The probability of these PAD sites containing high artefact densities was considered low as no artefacts were located in the vicinity of the PAD areas and other sub-surface investigations of sites in similar topography recorded sites with low artefact densities.

The original EIS noted that the section of the proposal north of the Brunswick River would have been disturbed by extensive clearing of mature forest, intensive farming practices, road construction and both industrial and residential development. It was also noted that the approved design had the potential to impact on any sites that were located within the road corridor, and on any areas outside the corridor where heavy machinery, gravel pads, car parks or administration areas might be located.

13.2.2 Non-Indigenous Heritage

Survey effort for the assessment of impacts on non-indigenous heritage comprised:

- a search of heritage databases to identify known heritage items and places in the Brunswick—Yelgun area;
- consultation with the Brunswick Historical Society and a Billinudgel resident; and
- a field survey.

The Australian Heritage Commission Register of the National Estate database listed 34 items for the Byron Bay area, however, none were located within the (then) proposed road corridor. Similarly, there were no items listed on the NSW Heritage Council database nor on the National Trust Register affected by the proposal. At the time of the original assessment, the Byron Shire Council Heritage Schedules had 21 items and places listed, none of which were within the study area.

Consultation with the Brunswick Historical Society indicated that the only items of heritage significance known to the Society within the study area were the Billinudgel School buildings and the Billinudgel Church, both of which are over 100 years old. It was also suggested by a local resident that areas of importance to the local community included cyprus trees over 100 years old in the Billinudgel School grounds and 2–3 ha of original rainforest, located west of the railway line near the Salad Bowl. It was recalled that this was the only piece of original rainforest that had not been cleared by settlers. This resident also noted three to four fig trees planted over 100 years ago, located west of Billinudgel School. No other relics or places of heritage significance were identified.

The most historically interesting location in the Brunswick Heads / Yelgun area was considered to be associated with the middle arm ferry crossing and the original bridge crossing. Information obtained from the RTA archives, the Mitchell Library and discussions with local residents indicated that the only remaining evidence of the ferry crossing and the puntman's house was a section of landing ramp on the northern side of the river, upstream from the existing bridge. The EIS indicated that this area would not be affected by the proposal. Due to the lack of physical evidence and previous impacts on the area, the heritage significance of the ferry landing site was assessed as low. It was noted that the current bridge had undergone many changes since its construction in 1934 and the only original sections of the structure appeared to be the pylons and support bearers.

One heritage item and one area of historical interest were identified in the original EIS (SKM, 1998) in Sections 2 and 5 (none were found in Section 4). These were an old growth cedar stump with logging cut-outs, in which boards would have been placed to give the loggers access to the tree trunk so that it could be more easily felled (BH-HS-2, located in Section 5), and the Ferry Reserve area (in Section 2), which contains the site of the ferry slipways and the first bridge crossing of the Brunswick River.

The original EIS identified that both the heritage item (BH-HS-2) and the existing bridge across the Brunswick River would be directly affected by the proposal. These items were assessed as having low heritage significance. The original EIS also indicated that there would be no direct impact on the Ferry Reserve area.

13.3 Impacts Associated With Proposed Modifications

As has been noted, the proposed modifications associated with the modified alternative design would generally, with a few exceptions, be restricted to the approved road corridor. The areas where the modified road reserve boundaries would extend slightly outside the approved road reserve (in SEPP 14 wetland No 65, at the STP access road and at the Yelgun interchange) have not been identified as being of indigenous or non-indigenous heritage significance. As such, there would not be any change in impact between the approved design and the modified alternative design.

Subsequent to the project approval, two further investigations by both the RTA and the local community were undertaken to assess potential heritage-related impacts of the proposal. These are described briefly below.

13.3.1 Indigenous Heritage

The occurrence of shell deposits on the northern shore of the Brunswick River was first reported to the NPWS in November 2001. The middens were reported as being located to the west of the existing highway opposite Rajah Road, Ocean Shores. An initial site inspection was conducted by the NPWS in the same month. Subsequently, the RTA decided to commission a formal archaeological assessment. Mary Dallas Consulting Archaeologists (MDCA) was commissioned by Connell Wagner on behalf of the RTA to undertake this assessment. The Ocean Shores Community Association also commissioned a report (produced by Mr Ron Heron) which was made available to the RTA in October 2002. The findings of these reports are detailed below.

The Mary Dallas Consulting Archaeologists (MDCA) Report

The full report of this investigation is provided in Appendix F. The shell deposits located to the west of the existing road alignment were determined to be Aboriginal in origin. The site contained:

- shellfish remains within edible sizes for edible species;
- shellfish selected within the species immediately procurable from an estuarine context;
- imported shellfish from ocean sandy beach and rocky shore contexts;
- stone artefacts; and
- possible stone hearths.

Evidence of other activities was not observed. None of the trees in the vicinity of the site were considered old enough to bear scars to which an Aboriginal origin could be ascribed. The oldest trees present were considered to be approximately 40–50 years in age. The area was considered by MDCA to be an unlikely location for Aboriginal burials, being low-lying and likely to retain standing water after storm, flood or wetter periods. Mounded deposits in the area of the site were found to be turkey nests.

On the basis of a surface inspection and limited sub-surface exposure, the middens were

considered to consist of a low density scatter of shellfish remains with little or no accumulation of deposit. There was no indication of the relative or absolute age of the deposits. The shellfish remains and isolated artefacts indicated that the site was likely to represent a series of small individual meal events for a small group of people. There was no evidence of accumulated remains or repeated use of the area.

The area between the existing highway and the proposed new road boundary was found to be heavily disturbed by the existing road, batter and drain construction and transmission line installation (refer to Figure 13.1 which is based on an aerial photograph dated to 1959). This area was 9–10 m wide in the vicinity of the midden site. Surfaces were found to be irregular and deeply gouged. It was considered by MDCA that it would be highly unlikely that substantial cultural material would have survived these impacts if it had existed in the area.

The closest midden scatter was located 15 m to the west of the approved road boundary. It continued west intermittently for a distance of about 80 m in a strip approximately 20 m in width. The area between the first of the midden scatters and the new road boundary contained disturbed portions of the road verge and relatively undisturbed portions of the floodplain. No shell midden material was observed in this area. Surface visibility throughout the middens area was limited by leaf litter, however, careful inspection of surface scrapes provided reasonable certainty that the site did not extend further east than the easternmost midden exposure.

In the vicinity of the shell middens the alignment of the modified alternative design has been relocated very slightly (approximately 0.5 m) to the east and would consist of a vertical retaining wall. Construction of the wall would be undertaken from within the new road footprint plus a one metre construction buffer. No work would be undertaken outside the proposed new road boundary at this location. Consequently, the middens would not be impacted by the proposal.

The Ocean Shores Community Association/Heron Report

The Ocean Shores Community Association recently provided the RTA with a copy of an archaeological report prepared by Mr Ron Heron (August 2002). This report was commissioned by the Ocean Shores Community Association to investigate sites of Aboriginal Heritage to the east and west of the existing Pacific Highway within the Brunswick Heads Nature Reserve on the northern bank of the Brunswick River.

The areas surveyed included sections of the Brunswick Heads Nature Reserve and adjacent properties located in the vicinity of the A2 and VA2 routes. The report specifically assessed three areas: Area 1—Brunswick Heads Nature Reserve West; Area 2—Brunswick Heads Nature Reserve East; and Area 3—The VA2 area. Areas 1 and 2 are of relevance to this environmental study and the findings are outlined below.

The report provided additional details on the indigenous heritage in the area, including the presence of a midden site located approximately 40-50 m to the east of the alignment and a possible additional scarred tree approximately 45-50 m to the west of the alignment.

The report confirmed that the closest midden is located between 14–15 m to the west of the proposed western boundary of the upgrade. As such all Aboriginal sites within this area would be protected within the Brunswick Heads Nature Reserve.

Given that those areas within the footprint of the road upgrade have already been subject to past disturbance, as can be seen in the aerial photography of 1959 (refer Figure 13.1), the continued conservation/preservation of cultural heritage sites within the adjacent areas is

important.

Given the importance of the Aboriginal sites within the area, the RTA would continue to liaise with both the Tweed-Byron LALC and NPWS to ensure that appropriate mitigation measures are developed and implemented to protect all sites.

Summary

There have not been any other additional listings of indigenous items or sites that could be affected by the modified alternative design since project approval.

There would not be any impacts on indigenous heritage items (i.e. the isolated artefacts, PADs 4-7 or the shell middens) from works associated with the modified alternative design. Although the management measures identified in the original EIS are considered to be adequate to address the potential impacts to the isolated artefacts and PADs 4-7, it is considered appropriate to implement the specific protective measures identified by the MDCA report in order to avoid indirect impacts on the shell deposits identified by both the RTA and the community studies. These are discussed further in Section 13.4.1.

13.3.2 Non-Indigenous Heritage

In November 2000, an inspection was made of the landform and vegetation associated with the open space ('car park') and surrounds on the northern bank of the Brunswick River to the east of the existing highway. The particular area of interest was a small triangle of land which formed the western 'tip' of an old cemetery reservation. The purpose of this assessment was to determine whether any undisturbed area within the triangular area (i.e. within the highway boundary) or in close proximity to this area could contain grave sites. In addition to the site inspection, reference was made to an aerial photograph taken in 1959 (refer Figure 13.1).

The site inspection and examination of the 1959 aerial photograph indicated that, apart from a small narrow strip approximately 5 m in width, the entire triangular area of interest had been heavily disturbed by quarrying. Although surveyed and dedicated as a cemetery in 1892, it was considered unlikely that the area was ever used for this purpose as it was dedicated for the preservation of native flora in 1926 and incorporated into the Brunswick Heads Nature Reserve in 1979.

The site inspection identified mounds of dumped rock and gravel along the base of the low quarry scarp. These were discounted as representing graves as the quarry was operational at least up until approximately 40 years ago. In view of its age, the quarry was noted as being of possible historical interest given that it was a likely source of gravel and rock for surfacing of the original coast road ('the Old Tweed Road'). It was noted that most of the old quarry and the Old Tweed Road lay outside of the highway footprint.

The modified alternative design would not change any potential impacts to non-indigenous heritage when compared with the impacts associated with the approved design. Consequently this issue is not considered further.

13.4 Management of Impacts

The original EIS identified various measures to mitigate and manage the impacts of the proposal on heritage items (excluding the recently identified middens). As the modified alternative design would not cause any change in impact to the items assessed in the original

EIS (SKM, 1998) these control measures are considered to be adequate to manage and mitigate the potential impacts.

However, details of additional mitigation of the potential impacts on the Aboriginal shell middens located on the north-west shore of the Brunswick River are provided in Section 13.4.1. In contrast, it is considered that as the middens located to the east of the modified alternative design are at least 40-50 m away from the road reserve boundary no specific additional mitigation measures are required to protect these middens.

Specific project approval conditions are identified in Section 13.4.2 and consideration given to their likely adequacy with respect to the proposed modified alternative design.

13.4.1 Additional Impact Mitigation Measures

The MDCA report identified the following management measures as being required to avoid direct and indirect impacts on the Aboriginal shell middens to the west of the alignment:

- installation of a temporary protective fence at least 10 m from the most easterly midden exposure and extending north-south for at least 30 m from the river bank. The aim of the fence would be to quarantine the area of the site from any construction impacts. The fence would be of a nature sufficient to prevent vehicular traffic and contain construction materials. The fence would be augmented by silt traps or barriers to divert or contain any soil or runoff from the construction zone;
- construction contractors would be made aware of the protected status of Aboriginal relics in NSW under the provisions of the *National Parks and Wildlife Act 1974* (as amended), and the penalties for unlawfully disturbing them. The observance of the quarantine area would be reinforced by formal contractual conditions; and
- the installation of the fence and its efficacy during the construction phase would be monitored to ensure ongoing protection of the site. Monitoring would be arranged through the Tweed-Byron LALC.

The mitigation measures identified in the original assessment and subsequent investigations undertaken prior to the project approval would generally be adequate for the avoidance of impacts on the Aboriginal shell middens. There are specific conditions relating to awareness training (through the Construction EMP) which would include reference to statutory obligations relating to heritage items. Similarly, monitoring of the effectiveness of impact mitigation and management measures is already addressed through various approval conditions.

The approval conditions do not make specific reference to these Aboriginal shell middens (as they was identified post-original EIS (SKM, 1998)), although Approval Condition 49 requires the establishment of temporary protective fences around all sites considered to be archaeologically sensitive. The Construction EMP would, however, make specific reference to these sites and the management measures would explicitly reflect the MDCA report recommendations. It is considered that the relevant Conditions of Approval are appropriate for the modified alternative design.

13.4.2 Relevant Approval Conditions

Section 8 of the Representations Report listed a range of recommended conditions of approval with Section 8.2.24 listing six conditions specifically targeted at mitigating impacts on heritage. Compliance with these conditions was formalised through Approval Condition 1.

In addition to this general condition, the approval contained six specific conditions (Nos 46 to 51 inclusive) relating to indigenous and non-indigenous heritage. Management of impacts on heritage items is also broadly addressed through Approval Conditions 14 and 15, which require the preparation of environmental management plans for construction and operation of the project. Approval Condition 16 imposes the requirement to undertake a compliance audit to assess the accuracy of impact predictions and the effectiveness of mitigation measures.

Approval Condition 46 requires the development of an Indigenous Heritage Management Sub-plan as a component of the Construction EMP. This plan would identify archaeological items and develop management options, and would be produced in consultation with Byron Shire Council, NPWS and the Tweed-Byron LALC. This plan would incorporate all relevant mitigation measures detailed in this EIS/REF and the original EIS (SKM, 1998), and would provide for a representative of the Tweed-Byron LALC and /or NPWS to be on site during initial site clearance activities in these areas to monitor the works and provide assurance that the middens would be adequately protected.

Approval Condition 47 requires that, prior to disturbance of any Aboriginal sites, the requirements of NPWS must be complied with, and where appropriate, the requirements of the relevant Local Aboriginal Land Council.

Approval Condition 48 requires that the scarred tree (identified in the original EIS (SKM, 1998) and located in Section 1) be protected, while Approval Condition 49 requires the use of protective fences around all sites to be considered to be archaeologically sensitive to protect them from construction impacts.

13.5 Summary

The original EIS determined that the approved route would not exert any substantial adverse impact on indigenous or non-indigenous heritage items or places. Notwithstanding this, the original EIS (SKM, 1998) identified a number of impact mitigation and management measures to minimise heritage-related impacts. Although it is considered that the proposed modifications associated with the modified alternative design would not necessitate any changes to original mitigation or management measures, the middens discovered since project approval would be protected by the additional mitigation measures identified above. The applicable approval conditions are considered to be adequate with respect to the management of impacts on heritage items.

In November 2001 a previously undetected Aboriginal shell midden site located on the northern shore of the Brunswick River, west of the Pacific Highway and opposite Rajah Road, Ocean Shores was reported to the NPWS. The archaeological significance of this site was subsequently investigated by both the RTA and the local community. The presence of additional middens to the east of the alignment was also confirmed by the community investigation. These middens are at least 40-50 m outside of the road reserve boundary and would consequently not be affected by the modified alternative design.

The middens to the west of the alignment are located approximately 14-15 m from the western boundary of the road corridor and extend westwards for approximately 80 m. As such all Aboriginal sites within this area would be protected within the Brunswick Heads Nature Reserve.

Given that those areas within the footprint of the road upgrade have already been subject to

past disturbance, as can be seen in the aerial photography of 1959 (refer Figure 13.1), the continued conservation / preservation of cultural heritage sites within the adjacent areas is important.

Given the importance of the Aboriginal sites within the area, the RTA would continue to liaise with both the Tweed-Byron LALC and NPWS to ensure that appropriate mitigation measures are developed and implemented to protect all sites.



FIGURE 13.1
BRUNSWICK RIVER AREA SHOWING THE MODIFIED ALTERNATIVE DESIGN
QUARRY AND DEGAZETTED UNUSED CEMETERY (PHOTO DATED 1959)

14. Other Issues

14.1 Air Quality

14.1.1 Impacts Associated with Approved Project

The original EIS (SKM, 1998) concluded that with respect to operational air quality:

- the EPA's carbon monoxide 1-hour goals would not be expected to be exceeded during the operation of the proposal due to the present emission controls on motor vehicles and the projected traffic conditions for 2002 and 2012;
- the PM₁₀ annual and 24-hour maximum air quality goals would not be likely to be exceeded at any nearby residences. This was also considered to be the case for the 90-day lead goal which would not even be exceeded in the short-term;
- the predicted increases in concentration of nitrogen dioxide indicated that the EPA's interim goal would not be exceeded at any distance from the proposal; and
- predicted concentrations of benzene (and other pollutants) were not at levels likely to pose health effects (although it was recognised that there may be no safe level for exposure to benzene).

It further noted that the introduction of catalytic converters had resulted in a substantial reduction in CO, NO_x (oxides of nitrogen) and hydrocarbon emissions from motor vehicles. It was also noted that the EPA had targeted heavy duty diesel vehicles for emission control in its Air Quality Management Plan, outlined in *Action for Air* as these were identified as major emitters of NO_x and fine particulate matter. The increased speed on upgraded roads resulted in increased nitrogen oxide emissions which had offset to some extent gains from the improved technology. Nevertheless, the proposal was predicted to result in nitrogen dioxide levels which were substantially below the air quality goal.

With respect to air quality impacts from construction activities, the original EIS (SKM, 1998) noted that the principal impact would be due to dust emissions associated with earthworks. Emissions from construction machinery were not considered likely to have substantial impacts. A range of measures was identified to minimise impacts associated with dust generation.

14.1.2 Impacts Associated with Proposed Modifications

In some localities, such as Billinudgel, the alignment has been moved slightly away from some receivers, and slightly closer to others. In practice, this is unlikely to result in any substantial change in impact, either adverse or beneficial. There would not be any substantial increase in construction or operational impacts beyond those associated with the approved project.

Management of air quality impacts is addressed through mitigation measures identified in the original EIS and Representations Report. Implementation of these is required through the approval conditions. As has been noted elsewhere, the RTA is required to prepare separate environmental management plans for the construction and operational phases, which would address, in part, relevant air quality issues. The approval conditions also include four specific conditions (Nos 52–55) relating to air quality management during construction.

Modification of the approval conditions to address the management of air quality with respect to the modified alternative design is not considered necessary.

14.2 Geology and Soils

14.2.1 Impacts Associated with Approved Project

The original EIS considered impacts on geology and soils with respect to:

- road cuttings;
- embankment construction; and
- geotechnical considerations for bridges.

A number of specific environmental management issues were also addressed, these being:

- erodibility of soils;
- acid sulphate soils;
- potential contamination (such as from residual pesticides);
- construction stage; and
- sterilisation and depletion of resources.

For the most part, impact mitigation measures identified for the management of other issues (such as water quality for example) would also address the management of issues related to geology and soils. The approval conditions make specific reference to acid sulphate soils and contaminated soils.

14.2.2 Impacts Associated with Proposed Modifications

As the overall route alignment for the approved route and the proposed modified route is essentially unchanged, the construction of the proposed modifications would not result in any additional impacts related to geology and soils beyond those already assessed and determined for the approved route.

However, the change in the construction process associated with the proposed balanced cantilever bridge over the Brunswick River and the alteration to the bridges at Marshalls Creek may slightly increase the extent of potential disturbance to ASS or PASS. This would not be a substantial impact and would be effectively managed through the CEMP and the associated acid sulphate soils management plan. The general locations of ASS/PASS are known from the original EIS mapping. The original EIS indicated that management of ASS/PASS would be undertaken in accordance with the RTA's 1996 *Acid Sulphate Soil Guidelines* and with reference to the 1995 EPA guideline *Assessing and Managing Acid Sulphate Soils*. These have since been superseded by the *Acid Sulfate Soils Manual* (ASSMAC, 1998). It is noted that Approval Condition 24 makes specific reference to this manual.

Approval Conditions 24 and 25 address the management of ASS and contaminated soils respectively. The proposed modifications associated with the modified alternative design are not considered to warrant a change in the scope of these conditions.

14.3 Present and Future Land Use

14.3.1 Impacts Associated with Approved Project

The original EIS (SKM, 1998) considered the impacts of the highway upgrade in relation to a range of issues including:

- local, regional and State planning matters;

- commercial oyster growing activities in the Brunswick River;
- future urban development at Billinudgel;
- properties directly affected by the upgrade; and
- land acquisition.

The original EIS indicated the project was consistent with planning controls as they applied in the area. The effect of the project on commercial oyster growing activities was not entirely resolved in the original EIS and was subsequently addressed further in the Director-General's assessment report. The original EIS (AKM, 1998) noted that the project would not substantially affect future urban development at Billinudgel.

The principal impact on present and future land use relates to those properties affected by the acquisition of land for the project. The original EIS (SKM, 1998) indicated that mitigation of impacts in relation to this issue had been addressed partially through locating the alignment as close as practicable to the existing highway to reduce fragmentation of land parcels.

Impacts on present and future land use were further considered in the Director-General's assessment report. This formed the basis of a number of approval conditions relating to both property and land use, and to oyster moorings and leases.

14.3.2 Impacts Associated with Proposed Modifications

The proposed modifications would not exert any additional impacts on present and future land use beyond those already assessed and determined for the approved route. The proposed changes associated with the modified alternative design are generally restricted to the approved road corridor and additional direct impacts on land use are therefore considered to be minor. Although in a number of locations (SEPP 14 wetland No 65, in the vicinity of the STP access road and at the Yelgun interchange) the road reserve boundary would be extended slightly these would not exert substantial impacts on land use in the area. The likelihood of additional indirect impacts is also considered low.

The impact mitigation measures identified in the original EIS (SKM, 1998) and Representations Report are therefore considered still appropriate. Further, present and future land use impacts associated with the modified alternative design are adequately addressed by the existing approval conditions. As such, modification of the approval conditions with respect to this matter is not considered necessary.

14.4 Cumulative Impacts

The original assessment identified a number of cumulative impacts associated with the proposed upgrade of this section of the Pacific Highway in conjunction with other Pacific Highway improvements and other developments in the area. These included:

- a decrease in travel times and an associated increase in travel efficiency for through traffic with a consequent reduction in vehicle operating costs;
- increased safety for road users through the provision of a route alignment with an improved cross section and access points;
- an improved level of service and safety on the existing highway and local roads through a reduction in the number of through vehicles;

- the potential for improvements to the amenity of the area through the removal of through traffic from local roads and by locating the major source of traffic noise and air emissions generally further from the existing residential areas;
- impacts on flora and fauna including threatened species and on the Brunswick Heads Nature Reserve;
- impacts on local businesses, particularly those immediately adjacent to the existing highway such as at Billinudgel, and also those with access to the existing highway; and
- contributing to the long term cumulative reduction in greenhouse gas emissions as a result of reduced traffic congestion on other roads within the study area, the reduction in travel times between destinations, and increased fuel efficiency.

The approved project included a range of measures to mitigate the potentially negative impacts (detailed in the original EIS). The Director-General's assessment report did not make any specific reference to the cumulative effects of the proposal.

It is considered that given the reasons for a number of the modifications associated with the modified alternative design, it is likely that there may be both reductions in negative cumulative impacts and an increase in positive cumulative impacts. An example of the former would be the reduction in the cumulative impacts to businesses along the route, particularly related to the improved highway access to Billinudgel. An example of the latter would be the improved efficiency of through traffic movements given that the project now represents a 'missing link' with respect to the upgraded sections of the Pacific Highway to the north and south of the Brunswick Heads to Yelgun section.

15. Environmental Management

The original EIS (SKM, 1998) identified a range of measures to ensure environmental impacts associated with the construction and operation of the upgraded section of the Pacific Highway between Brunswick Heads and Yelgun were adequately managed. These were listed in Table 17.2 of the original EIS.

Specific conditions relating to the mitigation of impacts on threatened species have also been identified in the NPWS concurrence report. These have been reinforced by the approval conditions for the project which include the specific requirement to prepare separate environmental management plans for the construction and operational phases.

Approval Condition No 13 details the matters to be addressed in the Construction EMP. These include:

- identification of construction activities associated with all key construction sites, including staging and timing of the proposed works;
- identification of specific environmental management objectives and strategies for the main environmental system elements including, but not limited to: noise and vibration; air quality; water; erosion and sedimentation; access and traffic; property adjustments; heritage and archaeology; groundwater; contaminated spoil and acid sulfate soils, spoil stockpiling and disposal; waste/resource management; flora and fauna; wetlands; flooding and stormwater control; geotechnical issues (including land slip and settlement); visual screening, landscaping and rehabilitation; hazards and risks; energy use, resource use and recycling; vermin; and utilities;
- identification of the statutory and other obligations which the RTA is required to fulfil during project construction, including all approvals and consultations/agreements required from other authorities and stakeholders, and key legislation and policies which control the RTA's construction of the project;
- definition of the role, responsibility, authority, accountability and reporting of personnel relevant to compliance with the EMP;
- measures to avoid and/or control the occurrence of environmental impacts;
- measures (where possible and cost effective) to provide positive environmental offsets to unavoidable environmental impacts;
- the role of the Environmental Management Representative;
- environmental management procedures for all construction processes which are important for the quality of the environment in respect of permanent and/or temporary works;
- monitoring, inspection and test plans for all activities and environmental qualities which are important to the environmental management of the project, including performance criteria, specific tests, protocols (eg. frequency and location) and procedures to follow;
- environmental management instructions for all complex environmental control processes which do not follow common practice or where the absence of such instructions could be potentially detrimental to the environment;
- steps the RTA intends to take to ensure that all plans and procedures are being complied with;
- identification of cumulative impacts and mitigation measures for staged EMPs;
- consultation requirements with relevant government agencies; and

- community consultation and notification strategy, and complaint handling procedures.

Approval Condition No 15 sets out similar requirements for an operational EMP. The issues required to be addressed in this EMP are listed as follows:

- identification of the statutory and other obligations which the RTA is required to fulfil, including all licences/approvals and consultations/agreements required from authorities and other stakeholders, and key legislation and policies which control the RTA's operation of the project;
- sampling strategies and protocols to ensure the quality of the monitoring program, including the specific requirements of the EPA and DLWC;
- monitoring, inspection and test plans for all activities and environmental qualities which are important to the environmental performance of the project during its operation, including description of potential site impacts, performance criteria, specific tests and monitoring requirements, protocols and procedures to follow;
- steps the RTA intends to take to ensure compliance with all plans and procedures;
- consultation requirements, including relevant government agencies, the local community and Byron Shire Council, and complaints handling procedures; and
- strategies for the main environmental system elements including noise and vibration; water; land slip/settlement; air quality; erosion and sedimentation; access and traffic; property acquisition and/or adjustments; heritage and archaeology; groundwater; contaminated spoil; waste/resource management/removal/disposal; flora and fauna; hydrology and flooding; visual screening, landscaping and rehabilitation; hazards and risks; energy use, resource use and recycling; and utilities.

As has been noted, the impacts associated with the modified alternative design are generally consistent with those associated with the approved project. As such, the existing management measures identified in the original EIS and subsequent documents would remain unchanged. Additional management measures related to the proposed modifications have been identified and are detailed in Table 15.1.

Table 15.1 Recommended additional/modified management measures for the modified alternative design

Issue	Additional/Modified Management Measure(s)
SEPP 14 wetland works	<ul style="list-style-type: none"> ▪ None required
Noise	<p>The preferred options for noise control in each area would be selected based on practicality, cost effectiveness, visual impact and community preferences. The final selection of noise control treatment would be undertaken as part of the detailed design stage. Options include:</p> <ul style="list-style-type: none"> ▪ Consideration would b given to the use of an alternative road surface (open graded asphaltic concrete (OGAC) or exposed aggregate concrete (EAC)), or a combination of pavement types;

Issue	Additional/Modified Management Measure(s)
	<ul style="list-style-type: none"> ▪ An extended height concrete barrier to the west of the highway in the vicinity of Ferry Reserve Caravan Park (Ch 44500-44800); ▪ A noise barrier between the highway and service road extending from the Brunswick River to the north of Rajah Road (Ch 45000-45400); and ▪ Noise barriers on both sides of the highway near the Christian Life Centre and the northern end of Balemo Drive (between the highway and the local service road). (Ch 48250-48550 east, Ch 48600-48750 west). ▪ Appropriate at-residence treatments would be provided as required to ensure appropriate ECRTN Allowance Criteria are achieved. This may consist of a combination of at-residence barriers, enclosing verandahs and providing secondary glazing and ventilation/air conditioning. In addition, noise mitigation treatments previously discussed between property owners and the RTA would be honoured.
Flora and fauna (outside of SEPP 14 wetlands 62 and 65)	<ul style="list-style-type: none"> ▪ Reduction of the construction buffer width to 1 m in the lowland rainforest habitat. ▪ Translocation of additional Davidson's Plum affected in Section 2 (if practicable). ▪ Rehabilitation and regeneration of swamp oak communities on surplus land around the Brunswick Heads North interchange. ▪ Replanting the two discrete swamp oak communities on the western side of the alignment to join the communities together and increase their habitat values. ▪ Retention of as much swamp oak community as possible between the on-ramp and the highway. ▪ Planting of tall-growing species on the eastern boundary of the highway on-ramp to force birds into high flight-paths when approaching the saltmarsh. ▪ Translocation or regeneration / rehabilitation of the seagrass beds directly affected by southern bridge piers. ▪ The Davidson's Plums in the vicinity of the Yelgun interchange would be protected from damage by being fenced with clearly visible fencing material. ▪ Construction personnel would be informed of the importance of avoiding damage to protected and fenced plants through the construction site environmental training and induction program.
Visual and landscape impacts	<ul style="list-style-type: none"> ▪ Additional planting of embankments to reduce the visual prominence of the increased height of the southern approach roads to the Brunswick River Bridge. ▪ Additional screen planting set back from the Brunswick River

Issue	Additional/Modified Management Measure(s)
	<p>foreshore edge plus careful design and selection of abutment materials and finishes to assist in mitigating the impacts of the higher bridge abutments. This would be controlled through independent verification of the designs prior to their implementation.</p> <ul style="list-style-type: none"> ▪ Streetscape improvements including avenue street tree planting and appropriate lighting would be provided at the Billinudgel industrial area southern approach (El Dorado) and for the Wilfred Street streetscape. ▪ Landscape screening required between the Billinudgel Industrial area property boundary and the highway would be designed to not screen views of sensitive businesses (such as the Humble Pie Company) from the highway. ▪ An effective signage regime combined with a legible landscape/streetscape framework/structure would assist route-finding for southbound traffic travelling to Billinudgel. ▪ Gateway planting at the Yelgun Interchange roundabout would assist in providing an appropriate sense of arrival to Yelgun and the Brunswick area in general and would form part of the visual sequencing of the Billinudgel approach.
Business and community impacts	<ul style="list-style-type: none"> ▪ Streetscape improvements including avenue street tree planting and pedestrian-scaled lighting would be provided at the Billinudgel industrial area southern approach (El Dorado) and for the Wilfred Street streetscape. ▪ Landscape screening provided between the Billinudgel Industrial area property boundary and the highway would be designed to not screen views of sensitive businesses (such as the Humble Pie Company) from the highway. ▪ An effective signage regime combined with a legible landscape / streetscape would assist route-finding for southbound traffic travelling to Billinudgel.
Traffic and transport	<ul style="list-style-type: none"> ▪ None required
Water quality and hydrology	<ul style="list-style-type: none"> ▪ None required
Indigenous and non-indigenous heritage	<ul style="list-style-type: none"> ▪ Inclusion of specific reference to Aboriginal shell midden site in Construction EMP. ▪ Installation of a temporary protective fence at least 10 m from the most easterly midden exposure and extending north-south for at least 30 m to quarantine the midden area. ▪ The observance of the quarantine area would be reinforced by formal contractual conditions and all personnel would be made aware of the midden and penalties for disturbing it. ▪ The installation of the temporary protective fence and monitoring of its efficacy during the construction phase to ensure ongoing protection of the site. Monitoring would be

Issue	Additional/Modified Management Measure(s)
	arranged through the Tweed-Byron LALC.
Air quality	▪ None required
Geology and soils	▪ None required
Present and future land use	▪ None required

16. Justification and Conclusion

16.1 Justification for Proposed Modifications

The approved project forms part of the Pacific Highway Upgrading Program which is a joint NSW State and Commonwealth Government initiative. The Program has been committed to meet the demands for improved capacity and safety of roads in the northern part of NSW, to respond to population increases in the area and facilitate economic growth through access to tourism and employment. The commitment to the Program is a direct response to the pressing need to address safety and efficiency problems associated with the existing alignment of the Pacific Highway.

The proposed modifications to the approved design are required in order to:

- simplify the complexity and scale of the Brunswick Heads North and Yelgun interchanges;
- provide a more suitable bridge crossing at the Brunswick River;
- provide direct northbound highway access to and from Billinudgel;
- reduce social, visual and environmental impacts; and
- provide cost efficiencies.

These have arisen through concerns expressed by the local community following approval of the project in August 1999. Development of the modified alternative design has been undertaken in tandem with an extensive community consultation program.

In addition, the need for upgrading the Brunswick Heads to Yelgun section of the Pacific Highway has become more urgent since the completion and opening to traffic of the upgraded sections of the highway immediately to the south (Tandy's Lane) and the north (Yelgun to Chinderah). Consequently, the existing Brunswick Heads to Yelgun section is a section of poorly aligned highway between two high standard routes. This represents a potential risk to highway users and may increase the accident rate along the Brunswick Heads to Yelgun section of the route.

The original EIS (SKM, 1998) for the approved design addressed the design in relation to the principles of ESD. The modified alternative design, which has been the subject of this environmental impact assessment, results in refinements to the approved design and its relationship with ESD principles. In particular:

- stakeholder consultation has helped to modify the approved project to better address concerns related to inter-generational and intra-generational equity;
- further attention has been paid to ecological issues, and the conservation of biological diversity;
- scientific certainty has been improved in relation to some impacts; and
- the economic evaluation of the approved design has been further refined.

16.2 Summary

The RTA received planning approval from the then Minister for Urban Affairs and Planning for the Pacific Highway Upgrade from Brunswick Heads to Yelgun in August 1999. Subsequently, concern was expressed by the local community over the social and ecological impacts of the upgrade. In view of this, the RTA undertook a comprehensive review of the concept design for

the whole project. The RTA subsequently developed a number of modifications to the design to address these concerns as well as the scale and complexity of the proposal but without compromising the purpose of the upgrade.

As the proposed modifications would not be entirely consistent with the original project approval, it is necessary for the RTA to request the Minister for Planning to modify the planning approval for the project. Additionally, the RTA is required to reapply for development consent to undertake the necessary works in the affected SEPP 14 wetlands as the previous development consent has lapsed.

The proposed modifications are justified in that they enable an important public infrastructure improvement to be achieved while incorporating project refinements that result in better outcomes in terms of project design, economic performance and social and environmental impacts.

Accordingly, this document has been prepared to:

- assess the impacts associated with proposed modifications to the approved design with respect to making an application to the Minister for Planning under Section 115BA(2) of the EP&A Act with respect to seeking a modification to the original project approval for the Part 5 matters. The document is a Review of Environmental Factors (REF) with respect to this matter; and
- accompany a Development Application to be lodged with Byron Shire Council in relation to works to be undertaken in SEPP 14 Coastal Wetlands Nos 62 and 65. These works constitute designated development. Accordingly, this document (and particularly Section 6) is also an Environmental Impact Statement (EIS) with respect to this matter. The statutory matters pertaining to the Part 4 assessment have been addressed largely in Section 6.

Consideration has been given to legislative changes since project approval which have a bearing on the project. Where relevant, these have been addressed in the assessment. The principal change has been the commencement of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* in July 2000. Specific consideration of this Act has been provided in Section 8.

With the exception of the SEPP 14 wetland works, the assessment has focussed on the change in impacts associated with the modified alternative design when compared with the impacts associated with the approved project.

A range of issues has been addressed in the assessment including:

- the impact of the works to be undertaken in the SEPP 14 wetlands;
- the change in noise impacts;
- the change in impact on threatened flora and fauna, and endangered ecological communities listed under both NSW and Commonwealth legislation;
- the change in visual and landscape impacts associated with the proposed modifications, particularly in relation to the Brunswick River crossing and at Billinudgel;
- additional or reduced impacts on businesses and the local community;

- changes in traffic and transport impacts with consideration also given to other factors apart from the highway upgrade which have bearing on this issue;
- the changed impacts on water quality and hydrology;
- potential additional impacts on items of indigenous and non-indigenous heritage;
- changes to air quality;
- additional impacts on geology and soils; and
- changes in impacts on future and present land use.

Particular attention has been given to noise, flora and fauna, visual and landscape issues, and business and community issues.

Noise

The updated noise assessment undertaken for the modified alternative design has taken account of changes to the design, existing traffic noise levels, traffic levels, the proposed posted speed limit, the topographical model, the road surface correction factors and the assessment procedures since project approval.

The unattenuated noise levels from the modified alternative design would be higher than those predicted for the approved design. However, the predictions for the approved design were unlikely to have been achieved had the approved design been constructed, given the required corrections to the model assumptions since project approval. Consequently, a more valid comparison has been undertaken with the approved design corrected to 2016 to take into account the corrected model assumptions. This identified that the noise levels from the modified alternative design would be similar ($\pm 2.5\text{dB(A)}$) to those from the approved design had it been built.

Many residences and NCAs are currently noise-affected by the existing highway. Without mitigation, the unattenuated noise levels from the modified alternative design would achieve the appropriate noise criteria at the majority of residences and NCAs in Sections 2, 4 and 5. These would consequently not require noise mitigation. However, NCAs 4, 16, 17, 18 and 19 would require noise mitigation. Although NCA 16 would achieve the relevant Criteria, the night time noise levels would increase and would be above 60dB(A) and consequently mitigation would also be required at this location.

Mitigation measures would consist of a combination of roadside barriers, property barriers and property treatments (i.e. enclosing outdoor spaces, upgrading glazing, providing ventilation / air conditioning, etc). Consideration would also be given to the use of alternative road surfaces that may provide noise reductions. In combination, the mitigation measures would ensure that the appropriate noise criteria would be achieved at all residences and NCAs in Sections 2, 4 and 5.

The modified alternative design would not substantially alter the previous assessment of noise from construction activities, as presented in the original EIS (SKM, 1998) and associated Working Paper. In this regard, the most important change would be a reduction in the construction complexity and the amount of earthworks, and therefore the overall duration of construction activities in certain areas (notably the Brunswick Heads North interchange, the Brunswick River crossing, north of Rajah Road and in the vicinity of Billinudgel). These

changes would generally be beneficial, particularly at the Brunswick River where a change from driven piles to bored piles would reduce both noise and vibration.

Where noise barriers are required to control operational noise, consideration would be given to their early erection during the construction activities (where this is possible and practicable) in an effort to provide additional mitigation of construction noise.

All noise matters, including the final choice of mitigation measures, (and including noise matters in Sections 1 and 3) would continue to be addressed as part of the ongoing detailed design process, in consultation with the community and in accordance with the relevant Approval Conditions.

Flora and Fauna

The flora and fauna assessment addressed the impacts of the proposed modifications on threatened species listed at the time of project approval and subsequently under both NSW and Commonwealth legislation. The assessment has also addressed the impacts of the proposed modifications on several threatened species, including the White Yiel Yiel (*Grevillia hilliana*), which were not listed as threatened species at the time of the original EIS. Further, it has addressed the potential impacts of the modified alternative design on Mitchell's Rainforest Snail (*Thersites mitchellae*), which was not assessed in the previous investigations.

Changes in ecological impacts associated with the proposed design modifications in Section 2 consist of:

- an increased impact on one additional Davidson's Plum (*Davidsonia jerseyana*), although the net impact to this species over the entire route is a reduction in impact to 11 plants resulting from the reduced impact to 12 plants in Section 5;
- an increased impact on two additional Black Walnut's (*Endiandra globosa*);
- a net reduction in impact on White Marblewood (*Acacia bakeri*) of two plants;
- a reduced impact on two Stinking Cryptocarya (*Cryptocarya foetida*);
- a reduced impact on three White Yiel Yiel (*Grevillea hilliana*);
- a reduced impact on two Spiny Gardenia (*Randia moorei*); and
- a reduced impact on one Scented Acronychia (*Acronychia littoralis*).

The small increased net impacts on two plant species have been shown to be minor and not substantial impacts when assessed in the context of the local and regional abundance of these species and their presence in conservation reserves. The net reduction in impacts to five threatened plant species (three of which are listed as endangered) is a substantial benefit of the modified alternative design.

While there would be a slight net reduction in impact on the swamp oak community, the proposed rehabilitation and regeneration of the swamp oak community and saltmarsh in the Crown and RTA-owned land surrounding the saltmarsh would be beneficial and would enhance the saltmarsh habitat for wading birds. Additional planting to the west of the highway alignment would also be beneficial for the two discrete swamp oak communities. The potential ecological impacts associated with the new access to the Brunswick Heads Nature Reserve have been largely avoided by careful design of the proposed modifications to ensure that they avoid, or minimise impacts on, threatened plants.

The modified alternative design would not affect any threatened flora or fauna in Section 4. In Section 5, the reduced impact on 12 Davidson's Plums represents a substantial reduction in the overall net impact on this species (taking into account the additional plant affected in Section 2). Further potential impacts on three Davidson's Plums have also been avoided by the careful redesign of the northbound off-ramp at the Yelgun interchange.

The overall net ecological impact caused by the footprint changes associated with the modified alternative design is positive. The minor localised increases in impacts would be effectively managed through rehabilitation and regeneration such that adverse impacts are reduced to an acceptable level.

Although the design modifications exert a slight adverse impact on a ROTAP species (the Black Walnut), this would not be significantly greater than the impact associated with the approved design. Conversely, the design modifications reduce the impact associated with the approved design on six threatened species. In the case of Davidson's Plum, which is listed as endangered under the EPBC and TSC Acts, the impact would be reduced considerably.

In summary, the modified alternative design would reduce the impacts to listed threatened flora and fauna species and the threatened ecological community associated with the approved design.

Visual and Landscape

The proposed design modifications provide a net reduction in the visual impact of the road. The reduction in the visual impact associated with the simplified Brunswick Heads North interchange and the simplified structure of the Brunswick River bridge sit in the locality far more effectively than the approved interchange and bridge. The reduction in visual impact is also substantial at both Billinudgel and Yelgun when compared with the approved design. Management and mitigation of visual impacts associated with the modified alternative design would be adequately addressed through the existing approval conditions. The additional impact mitigation measures are consistent with these approval conditions.

Business and Community Impacts

The modified alternative design would significantly reduce the adverse business and community impacts associated with the approved design. As has been noted, development of the proposed modifications has involved substantial community consultation. There are few direct references to mitigation of community and business impacts in the project approval conditions apart from Approval Conditions 63–67 inclusive. However, mitigation of these impacts is also addressed indirectly through many of the other approval conditions. The approval conditions still adequately address the management of business and community impacts.

Traffic and Transport

The modified alternative design offers a generally improved traffic and transport alternative to the approved design. Although the Brunswick Heads North interchange is reduced from a full to a half interchange, with a consequent slight reduction in transport efficiency, the remainder of the design provides a substantially improved design for traffic movements and accessibility and hence transport efficiency.

Water Quality and Hydrology

The proposed modifications associated with the modified alternative design would not exert any

additional impacts on water quality and hydrology beyond those associated with the approved route. The management of these impacts is addressed variously through mitigation measures identified in the EIS and related Working Papers. They are also addressed through the approval conditions, notably Approval Conditions 14 and 15, which require preparation of environmental management plans for construction and operation respectively. There are also specific conditions relating to soil and water management, sediment and erosion control, flooding and drainage management, and management of acid sulphate soils.

Indigenous and Non-Indigenous Heritage

The original EIS determined that the approved route would not exert any substantial adverse impact on indigenous or non-indigenous heritage items or places. Notwithstanding this, the original EIS (SKM, 1998) identified a number of impact mitigation and management measures to minimise heritage-related impacts. Although it is considered that the proposed modifications associated with the modified alternative design would not necessitate any changes to original mitigation or management measures, the middens discovered since project approval would be protected by the additional mitigation measures identified in Section 13. The applicable approval conditions are considered to be adequate with respect to the management of impacts on heritage items.

In November 2001 a previously undetected Aboriginal shell midden site located on the northern shore of the Brunswick River, west of the Pacific Highway and opposite Rajah Road, Ocean Shores was reported to the NPWS. The archaeological significance of this site was subsequently investigated by both the RTA and the local community.

The middens to the west of the alignment are located approximately 14-15 m from the western boundary of the road corridor and extend westwards for approximately 80 m. As such all Aboriginal sites within this area would be protected within the Brunswick Heads Nature Reserve.

Given that those areas within the footprint of the road upgrade have already been subject to past disturbance, as can be seen in the aerial photography of 1959 (refer Figure 13.1), the continued conservation / preservation of cultural heritage sites within the adjacent areas is important.

Given the importance of the Aboriginal sites within the area, the RTA would continue to liaise with both the Tweed-Byron LALC and NPWS to ensure that appropriate mitigation measures are developed and implemented to protect all sites.

16.3 Conclusion

The modified alternative design is justified by providing a substantial reduction in a range of impacts from those associated with the approved design.

Overall, the modified alternative design represents a positive outcome in addressing the social and environmental issues raised by the community.

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