PROPOSED PACIFIC HIGHWAY UPGRADE – BALLINA BYPASS

Director-General's Report
Section 115C of the
Environmental Planning and Assessment Act 1979

February 2003

Published February 2003
NSW Department of Planning
www.planning.nsw.gov.au
03/101
ISBN 0 7347 0432 1

FOREWORD

The Roads and Traffic Authority of NSW (RTA) is proposing to upgrade the Pacific Highway by constructing a dual carriageway bypass of Ballina on the NSW north coast. The proposal, which is approximately 12.5km in length, has been developed to address road safety and travel time concerns. The proposal is part of the Pacific Highway Upgrade Program which is being jointly funded by the State and Federal governments.

The proposal is subject to assessment under Division 4, Part 5 of *the Environmental Planning and Assessment Act 1979* (EP&A Act). As such, the approval of the Minister for Planning is required. The RTA has sought the approval of the Minister for Planning for the proposal under Section 115B of the EP&A Act. This Report has been prepared in accordance with Section 115C of the EP&A Act, which requires that the Minister obtain a Report from the Director-General of the Department of Planning prior to making a decision.

The purpose of this Report is to review the Environmental Impact Statement (EIS) prepared for the proposal, issues raised in representations in response to the public exhibition of the EIS, further information provided by the Proponent and other relevant matters pertaining to the potential environmental impacts of the proposed works. This Report documents the outcome of an independent assessment of the proposal and concludes that the potential environmental impacts associated with the proposal can be mitigated to an acceptable level by adopting management measures referred to in this Report and reflected in the Recommended Conditions of Approval. On that basis, it is recommended that the proposal be approved subject to the recommended conditions.

Sue Holliday
Director-General

EXECUTIVE SUMMARY

The Proposal

The Roads and Traffic Authority (RTA) proposes to upgrade the Pacific Highway at Ballina on the north coast. The proposal involves the construction of a four-lane dual carriageway bypass of Ballina and is 12.5 kilometres in length. The proposed route extends from 600m south-west of the Bruxner Highway intersection to 400m north of Ross Lane. A locality plan is shown in Figure 1. Plans of the modified proposal are given in Figures 2 a – i.

The proposal traverses a variety of terrain from low lying floodplain near Emigrants Creek requiring the construction of embankments, through to undulating terrain in the north requiring cut and fill. It includes the construction of bridges over Duck Creek, Sandy Flat Creek, Emigrants Creek (at three separate locations) and the Cumbalum Floodway. Grade separations are proposed for the Bruxner Highway and Teven Road junctions, at Cumbalum Lane and Ross Lane, and minor intersections at Pimlico Road and Sandy Flat Road. Initially, the Bruxner Highway and Teven Road junctions are proposed to be constructed as at-grade intersections.

The capital cost of the modified proposal is approximately $196 million for stage 1 and $230 million including the ultimate proposal components. It is being funded jointly by the NSW and Federal Governments. The proposal is expected to generate approximately 120 jobs during construction.

The proposal is located entirely within Ballina Shire Local Government Area.

EIS Exhibition and Approval Process

The RTA as Proponent determined that the proposal has the potential to result in significant environmental impacts and accordingly prepared an Environmental Impact Statement (EIS). As the RTA is both the Proponent and a determining authority for the proposal, and an EIS was prepared, the proposal is subject to assessment under Division 4, Part 5 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) and the approval of the Minister for Planning is required before it can be determined by the Minister for Roads.

An Environmental Impact Statement (EIS) for the proposal was publicly exhibited between 5 March 1998 and 16 April 1998. The Proponent received 19 representations to the EIS. Property, traffic and access, flooding and hydrology, noise and vibration and flora and fauna impacts were primary issues of concern.

The proposal traverses State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14 wetlands) No. 108 and 95. Ballina Shire Council granted development consent on 31 March 1999, with the concurrence of the Director-General of the Department of Planning for the construction and operation of the proposal in these SEPP 14 wetlands.

This Report has been prepared in accordance with Section 115C of the EP&A Act which requires the Director-General to assess and report to the Minister on the proposal.

Proposal Justification

The proposal is recognised as a component of the Pacific Highway Upgrade Program. The existing section of the Highway is in poor condition and has a high accident fatality rate. The proposal is 6.5 kilometres shorter than the existing Highway alignment and is predicted to result in travel time savings of up to 10 minutes over the length of this section. It is also the major north-south link between NSW and Queensland, a route that is of major state importance, and has experienced significant growth in the volume of freight and tourist traffic. The Department recognises that the proposal would result in substantial benefits to the local community and the wider population.

Environmental Impact Assessment

Geotechnical Constraints

A key and problematic issue for this proposal are the geotechnical constraints posed by constructing a road in soft soils in the southern end of the proposal and the hills in the northern section. While the Department notes that settlement and instability issues pose significant management challenges, the Proponent has committed to ongoing investigation and, if required, modifications to the proposed construction methods and concept design. The Proponent would need to carefully document the findings of the required investigations and use this information in designing and constructing the proposal. The Department concludes that the likely geotechnical constraints of the proposal could be managed to acceptable levels, subject to the Recommended Conditions of Approval.

Staging Implications

The Proponent proposes to construct the proposal in distinct stages: an initial upgrade stage and an "Ultimate Stage" which includes the construction of grade-separated interchanges at the intersection with the Bruxner Highway and Teven Road and new southbound bridges over Duck Creek and Emigrant Creek (south). While the RTA has indicated that the Ultimate Stage elements would be required in the period between 2022 and 2032, it was proposed to complete the earthworks required for the Ultimate Stage as part of the initial upgrade stage. To ensure that the environmental impacts associated with proposal staging are appropriately assessed and managed, the Department has recommended that the Proponent update the environmental impact assessment for proposal elements not constructed by 2016. Additionally, preliminary works (i.e. earthworks) for the components of the Ultimate Stage would not be undertaken as part of the initial stage unless those components were to be fully constructed or unless geotechnical and hydrological studies conclude that it is necessary to complete the earthworks at that time.

Another key issue is the extent of exposed surfaces during an extended construction period. The Department considers that the implementation of a progressive revegetation strategy would minimise the likely erosion and sediment control, dust and visual impacts associated with construction of the proposal. To ensure that this revegetation strategy is prepared to progressively mitigate erosion and sediment control, dust and visual impacts the RTA would be required to fully integrate the management Sub Plans for the various issues and particularly for any components of the Ultimate Stage.

Property and Land Use Impacts

The proposal would bypass the town of Ballina and traverse cane farms, tea-tree plantations and cattle grazing areas as well as creeks, wetland corridors and pockets of rainforest and woodland. A number of properties would be affected by the proposal, the most affected of which are to be acquired. It is

noted that the RTA has already acquired approximately 30% of the properties directly affected by the proposal. A number of measures are also proposed to ensure that property and land use impacts are minimised and the continuation of agricultural activities.

Traffic and Access

A number of representations noted concern over the construction and operational traffic impacts of the proposal. The Proponent would be required to repair sections of the existing highway to be transferred to Ballina Shire Council and negotiate with Council regarding contributions for maintenance. The Proponent would also be required to prepare a comprehensive Construction Traffic Management Sub Plan to cover all construction stage traffic management requirements, including an analysis of the need to construct the grade-separated interchange at Cumbalum at the earliest opportunity possible and strategies to minimise construction heavy vehicles travelling through Ballina.

Flooding and Hydrology

A number of landowners noted concern over the potential for the proposal to exacerbate existing drainage problems and the lack of flooding assessment undertaken. The Department recommends that the proposal be designed to not increase inundation by more than 50 mm in a 1 in 100 year ARI and limit increases in inundation time to a maximum of one hour for any rainfall event. To assist property owners in understanding hydrologic and flooding issues, it is recommended that the Proponent provide funding for the DLWC to engage a hydrologist to act as a technical advisor. The Department also recommends that the Proponent endeavour to resolve amicably any dispute between itself and any landowner about alterations to flooding characteristics caused by the proposal. If the parties cannot reach a mutually satisfactory resolution, the matter shall be referred firstly to the hydrologist referred to above for resolution.

Noise and Vibration

The RTA has indicated that the proposal is likely to result in significant construction noise impacts and exceedances of road noise criteria on opening if no mitigation measures were applied. The RTA has outlined a number of possible construction and operational noise measures and has undertaken to further investigate measures during detailed design. The RTA would also be required to adhere to EPA noise criteria, monitor construction and operational noise and, in the event of exceedances, implement additional noise mitigation measures.

The EIS and Representations Report note that blasting would be required in some sections and that maximum instantaneous charges are predicted to exceed the relevant criteria. The Department considers that, at this stage, the use of such large charge sizes has not been proven to be acceptable. The Department recommends that the RTA undertake trial blasting to determine site specific blast response characteristics and define maximum allowable blast sizes to meet the relevant criteria.

Flora and Fauna

The Department's flora and fauna assessment has recommended that the RTA undertake additional regeneration works on pockets of Closed Forest/Rainforest communities to improve their condition and connectivity and fence off and protect the vulnerable species *Macadamia tetraphylla* and *Tinospora tinosporoides.* To offset the loss of 1.3 hectares of mangroves (some of which would lost from SEPP 14 wetlands), the RTA would also be required to provide compensatory habitat at a ratio of 2:1 to the satisfaction of NSW Fisheries. To ensure the mitigation measures detailed in the EIS and

Representations Report and outlined above are implemented in a timely and effective manner, the RTA would be required to prepare a Flora and Fauna Management Sub Plan.

Other Issues

The Department has also undertaken an assessment of other likely environmental issues associated with the proposal including impacts associated with: utilities; visual, design and landscaping; spoil management; water quality and erosion and sedimentation control; acid sulphate soils; air quality; indigenous and non-indigenous heritage; hazards and risk; economic and social issues; the location of construction facilities; and cumulative impacts. The Department's review has indicated that, provided all comprehensive mitigation measures are implemented, the impacts of the proposal would be reduced to an acceptable level.

Conclusions and Recommendations

The proposal has been developed to address poor road safety and traffic congestion and improve local access and amenity. At the local level, the proposal would result in reduced local/regional traffic conflicts, reduced local air pollution, reduced noise and improved safety. The proposal would also result in benefits to travelling motorists through increased safety and significantly reduced travel times.

While the Department's assessment has identified many benefits associated with the proposal, it has concluded that constructing a Highway across soft soils in the flood prone southern section and the hills in the northern section would require diligent monitoring and management. In particular, construction is expected to occur over an extended duration, with the ultimate timeframe highly dependent on embankment settlement. Spoil and fill management and long term erosion and sedimentation controls would need to be fully integrated with noise and traffic management and landscaping strategies.

The proposed staging of the proposal poses particular management challenges. The Department's assessment has concluded that earth works associated with the Ultimate Stage components should not occur until it is proposed to fully construct these components, unless geological and hydrogeological investigations indicate that it is necessary to construct these earthworks as part of Stage 1. The Proponent would be required to prepare a staging program and assess any impacts associated with the final staging schedule to ensure that the conclusions of the assessment undertaken to date remain valid.

A number of measures are also proposed to ensure that property and land use impacts are minimised and the continuation of agricultural activities. In particular, the Proponent would be required to design the proposal so as to minimise flooding impacts and work with landowners to resolve any flooding and drainage issues. Impacts associated with the affected natural areas have been address through extensive mitigation measures including compensation packages and those developed through the SEPP 14 wetland impact assessment process.

To further strengthen the requirements outlined, the Department recommends that the Proponent prepare comprehensive Environmental Management Plans for the construction and operation of the proposal which embody the mitigation measures contained in the EIS, Representations Report and the Recommended Conditions of Approval for the proposal. The key elements of the Recommended Conditions of Approval include:

- comprehensive geotechnical and hydrogeological investigations and management;
- comprehensive flooding and hydrology design and management;

- a requirement to update assessment on proposal elements not completed by 2016;
- preparation of a construction program and staging scenario;
- preparation of a progressive revegetation strategy to be implemented during construction in order to minimise erosion and sediment control, visual and dust impacts;
- establishment of a Community Liaison Group to discuss measures to minimise impacts arising from the construction of the works;
- monitoring of noise levels and provision for further mitigation or acquisition of properties if criteria are exceeded;
- preparation and implementation of comprehensive Construction and Operational EMPs;
- the preparation of detailed Sub Plans as part of the EMPs for:
    - construction traffic management;
    - integrated wetland management;
    - flora and fauna;
    - water and soil;
    - noise and vibration;
    - acid sulfate soils;
    - indigenous archaeology;
    - landscaping and rehabilitation;
    - air quality;
    - hazards and risk; and,
    - waste management and reuse.

The Department's assessment has concluded that, provided the Recommended Conditions of Approval contained in Section 9 of this Report are adopted, the proposal could be approved by the Minister for Planning.

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GLOSSARY AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
Acid Sulfate Soils (ASS)	Naturally acid clays, mud and other sediments usually found in swamps and estuaries. These may become extremely acidic when drained and exposed to oxygen, and may produce acidic leachate and runoff which can pollute receiving waters and liberate toxins
Ambient Noise	The background noise at a point being a composite of sounds from near and far
ANZECC	Australian and New Zealand Environment and Conservation Council
Department, the	Department of Planning
Director-General	Director-General of the Department of Planning
DLWC	Department of Land and Water Conservation
DUAP	Department of Planning
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environment Protection Authority (NSW)
EP&A Act	Environmental Planning and Assessment Act 1979
Floodplain	Flat large area of alluvium adjacent to a watercourse, characterised by frequent active erosion and aggregation by channelled and overbank stream flow
Grade separation	The separation of a road, rail or other traffic so that crossing of movements, which would otherwise conflict, are at different elevations
Interchange	A grade separation of two or more roads with one or more interconnecting carriageways
Level of Services (LOS)	An indicator of performance of the road network
Median	A strip of road not normally intended for use by traffic, which separates carriageways for traffic in opposite directions
NPWS	National Parks and Wildlife Service
RTA	Roads and Traffic Authority
SEPP 14	State Environmental Planning Policy No. 14 - Coastal Wetlands
TSC Act	Threatened Species Conservation Act 1995
Wetland	Land either permanently or temporarily covered by water, usually characterised by vegetation of moist-soil or aquatic type

1. INTRODUCTION

1.1 Nature of the Proposal

The Roads and Traffic Authority (RTA) propose to upgrade the Pacific Highway at Ballina on the north coast. The proposal involves the construction of a four-lane dual carriageway bypass of Ballina and is 12.5 kilometres in length. The proposed route extends from 600m south-west of the Bruxner Highway intersection to 400m north of Ross Lane. A locality plan is shown in Figure 1. Plans of the modified proposal are given in Figures 2 a – i.

The proposal traverses a variety of terrain from low lying floodplain near Emigrants Creek requiring the construction of embankments, through to undulating terrain in the north requiring cut and fill. The proposal includes the construction of bridges over Duck Creek, Sandy Flat Creek, Emigrants Creek (at three separate locations) and the Cumbalum Floodway. It includes grade separations for the Bruxner Highway and Teven Road junctions, at Cumbalum Lane and Ross Lane, and minor intersections at Pimlico Road and Sandy Flat Road. Initially, the Bruxner Highway and Teven Road junctions are proposed to be constructed as at-grade intersections.

The capital cost of the modified proposal is approximately $196 million for stage 1 and $230 million including the ultimate proposal components. It is being funded jointly by the NSW and Federal Governments. The proposal is expected to generate approximately 120 jobs during construction.

The proposal is located entirely within Ballina Shire Local Government Area.

1.2 Development of Proposed Corridor

A number of studies completed by the RTA into the performance of the existing Highway conclude that upgrading to dual carriageway and bypassing a number of towns would improve road safety and reduce amenity impacts and travel times. The construction of Ballina Bypass is considered a high priority for these reasons. In response to the joint commitment by the State and Federal governments to upgrade the Pacific Highway from Hexham to Tweed Heads and the studies discussed above, the RTA concluded that a significant environmental impact was likely and determined that an Environmental Impact Statement (EIS) should be prepared.

1.3 Statutory Provisions and Assessment Process

The proposal is subject to Parts 4 and 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Part 4 requirements relate to the crossing of State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14) No. 108 and 95. Under SEPP 14, the sections of the proposal crossing Duck Creek and the southern crossing of Emigrant Creek that affect these significant wetlands are considered designated development. Accordingly, these sections of the proposal require Development Consent from Ballina Shire Council and the concurrence of the Director-General of the Department. Concurrence was given by the Director-General, subject to a number of conditions on 5 March 1999. Development Consent was granted by Ballina Shire Council, subject to a number of conditions, on 31 March 1999. A copy of the Director-General's Concurrence Conditions and the Ballina Shire Council's Consent Conditions are contained in Appendix A and B respectively.

The remainder of the proposal is subject to Part 5 requirements. As the RTA is both the Proponent and a determining authority for the proposal, and an EIS was prepared, Division 4, Part 5 of the EP&A Act applies. As such, the approval of the Minister for Planning (the Minister) is required for the proposal.

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) came into force on 16 July 2000 and repealed a number of Commonwealth Acts including the *Environment Protection (Impact of Proposals) Act 1974* (EPIP Act). This legislation requires the approval of the Commonwealth Minister for the Environment for any action which is likely to have a significant impact on matters of national significance. Since the EIS was prepared and exhibited prior to the implementation of the EPBC Act, the Proponent is required to assess any likely impacts on matters of national significance. The Proponent has found that no significant impacts on matters of national environmental significance or Commonwealth land and therefore concluded that Commonwealth approval is not required for the proposal to proceed.

1.4 Preparation and Exhibition of the Environmental Impact Statement

The RTA sought the requirements of the Director-General for the EIS on 26 September 1997. The requirements were issued on 27 October 1997. An EIS for the proposal was subsequently prepared by the RTA (Connell Wagner, 1998) and publicly exhibited between 5 March 1998 and 16 April 1998. Nineteen representations were received in response to the EIS. Copies of all representations were forwarded to the Department as required by the EP&A Act.

1.5 Request for the Approval of the Minister for Planning

In accordance with Section 115B of the EP&A Act, the RTA sought the approval of the Minister for Planning by way of letter dated 14 March 2002. The request for approval was accompanied by a Representations Report which presented the RTA's response to the issues raised in public representations to the public exhibition.

1.6 Purpose of This Report

The purpose of this Report is to review the EIS for the proposal, the issues raised in representations to the public exhibition, submissions made by the Proponent and other matters pertinent to the potential environmental impact of the proposal.

This Report has been prepared in accordance with Section 115C of the EP&A Act, which requires the Director-General of the Department of Planning to assess and report to the Minister on the proposal. The Report documents the outcome of an independent environmental impact assessment by the Department accounting for all issues raised in representations to the EIS.

2. THE PROPOSAL DESCRIBED IN THE EIS

This Section of the Report provides a description of the proposal described in the EIS. The purpose is to provide an overview of the information presented in the EIS and does not necessarily represent the views of the Department. Section 5 provides a discussion of the proposed modifications to the proposal following exhibition of the EIS. The Department's consideration of the modified proposal is provided in Sections 3 and 3.

2.1 Introduction

The proposal involves the construction of a 12.5 km Pacific Highway bypass of Ballina, extending from 600m south-west of the Bruxner Highway intersection to 400m north of Ross Lane. The road would be constructed as a dual carriageway with two lanes in each direction and would be divided by a depressed median or by a raised barrier. The provision of six lanes between the Bruxner Highway and Tevern Road is also proposed. The RTA also propose to construct grade separated interchanges at the intersections with the Bruxner Highway and Teven Road and new southbound bridges over Duck Creek and Emigrant Creek (south) and/or widening of the Emigrant Creek (south) bridge at later stages as needed. These works are referred to as the "Ultimate Stage." The following sections provide details of the key elements of the proposal.

2.2 Proposal Objectives

The objectives of the proposal as detailed in the EIS are:

- to significantly reduce road accidents and injuries;
- to reduce travel times;
- to reduce freight transport costs;
- a community satisfied with physical development of the route;
- a route that supports economic development;
- reconstruction of the route managed in accordance with ecologically sustainable principles;
- maximum effectiveness of expenditure; and,
- to improve the town amenity of Ballina.

2.3 Carriageway Design

The proposal has been designed to comply with all relevant RTA design criteria. The design concept is based on minimisation of geotechnical constraints, property and utility impacts and achieving cut and fill balance to the greatest extent possible. Table 1 below outlines the key design features of the proposal.

Table 1 Key Design Features of the Proposal

Design Speed	110km/hr
Minimum radius of horizontal curves	600m (generally 800 to 1000 metres)
Maximum gradient	6% (northern part of Cumbalum cutting)
Traffic Lane	3.5 metres
Shoulder Width	3 - 4 metres near side, 1 metre offside
Median Width	3 to 9 metres
Flood Immunity	1 in 20 year flood (at least one lane open in each

	direction)
Deepest Cut	26 metres (Cumbalum area)
Highest fill embankment	15 metres
Batter slopes – floodplain embankment	4 to 1
Batter slopes – deep cut and fill	2 to 1

2.4 Cut and Fill Requirements

The proposal would involve cuttings up to 26 metres deep and over 7 kilometres of embankments across the Emigrant Creek floodplain. Approximately 1.5 million cubic metres of material would be excavated and approximately 2 million m^3 would be required for filling and embankment works. About 0.5 million m^3 of material would need to be imported, assuming that the excavated material would be suitable for use as fill. The EIS indicates that imported fill would be sourced from local quarries and sand pits.

2.5 Waterway Crossings

The proposal would involve the construction of four bridges:

- Duck Creek – new north bound bridge approximately 165 metres long and 12.5 metres wide between kerbs. South bound traffic would use the existing bridge. Construction of a new south bound bridge is proposed at a later stage;
- Emigrant Creek (south) – new north bound bridge approximately 185 metres long and 12.5 metres wide between kerbs. South bound traffic would use the existing bridge. Construction of a new south bound bridge and/or widening of the existing bridge is proposed at a later stage;
- Emigrant Creek (central) – two new bridges approximately 70 metres long and 10.5 metres wide for each carriageway; and,
- Emigrant Creek (north) – two new bridges approximately 60 metres long and 10.5 metres wide for each carriageway.

Major culverts would be constructed at the crossing of Sandy Flat Creek, the Sandy Flat Floodway, between Teven Road and Emigrant Creek, south of the Cumbalum interchange and in embankments from the existing Highway to high ground north of Cumbalum.

2.6 Drainage

On embankment sections it is proposed to disperse stormwater into the existing drainage system. In more sensitive environments surrounding creek crossings it is proposed to construct spillage ponds with the capacity to capture up to 20 000 litres within the road reserve and direct all road runoff away from waterways. The construction of a number of culverts is also proposed in flood plain areas to allow for cross drainage.

2.7 Access Arrangements

Intersections

The proposal would involve the construction of the following intersections:

- Pimlico Road - at grade T-intersection catering for all movements;

- Bruxner Highway Intersection - initially a T-intersection catering for all movements and at a later stage (in response to traffic needs and funding) construction of partial or full grade separated interchange;
- Teven Road junction- initially an at grade large radius roundabout and at a later stage to include a bridge spanning Teven Road. Embankments for the overbridge would be formed as part of the initial scheme;
- Cumbalum interchange – a bridge for the existing Highway with access ramps to provide for south bound turns into Ballina and north bound access onto the bypass;
- Sandy Flat Road – minor at grade T-intersection; and,
- Ross Lane Interchange – a bridge over the proposed Highway with roundabout and ramp arrangements to provide for all movements.

The Intersection of the Highway with Teven Road to the south and the Cumbalum Road Interchange to the north of Ballina would function as gateways to Ballina.

Local Access

The bypassed sections of the existing Highway and a series of new access roads would provide property access. The existing Highway would be crossed at two locations between the proposed Cumbalum interchange and Sandy Flat Road necessitating the construction of underpasses to allow continued local access. Underpasses are also proposed at three locations between Sandy Flat Road and Ross Lane to provide for property access.

Pedestrians and Cyclists

While the proposal does not specifically provide for pedestrians or cyclists, the EIS indicates that the bypassing of Ballina would create a safer environment for pedestrians and cyclists in and around Ballina.

2.8 Other Design Features

Other design features of the proposal include:

- landscaping of the roadside and creation of gateways into Ballina utilising native plants and palms in particular; and,
- signposting in accordance with RTA policy and in consultation with Ballina Shire Council.

2.9 Property Acquisition

The EIS indicates that 34 properties would be directly affected by the proposal. Part acquisition of some properties is proposed and replacement or otherwise of affected improvements such as private accesses, fencing, stockyards, drainage and services would be negotiated with landowners.

2.10 Construction Issues

The EIS notes that site compounds and concrete and asphalt batching plants would be required. It states that the locations of these facilities would be determined by the successful contractor and depend on access arrangements, flooding, environmental sensitivity and negotiation with property owners.

The EIS identifies the main construction tasks as follows:

- establishment of site compounds and access tracks;
- clearing of vegetation;
- establishment of temporary erosion and sediment controls;
- topsoil stripping and management;
- installation of drainage lines and wick drainage systems;
- bulk earthworks;
- compaction and settlement of fill material;
- bridge construction;
- pavement construction;
- vegetation of batters and berms;
- landscaping; and,
- line marking, lighting and signpost installation.

The EIS indicates that the proposal would take 3.5 years to construct and concludes that construction staging would be determined by the successful contractor and would depend on:

- weather patterns;
- stability of embankments;
- ongoing settlement of embankments; and,
- traffic management during importation of fill.

The cost of the proposal is approximately $131.3 million.

3. JUSTIFICATION, ALTERNATIVES CONSIDERED AND IMPACTS IDENTIFIED IN THE EIS

This Section discusses the proposal need and justification as described in the EIS and outlines the alternatives considered and the potential adverse and beneficial impacts of the proposal as identified in the EIS. This Section does not necessarily reflect the views of the Department. The Department's assessment of the issues associated with the proposal is provided in Sections 3 and 3.

3.1 Need and Justification

The proposal is part of the Pacific Highway upgrading program. The Pacific Highway is the major north-south transport link between Sydney and Brisbane and serves a number of important regional and local centres. The EIS states that upgrading of the Pacific Highway at Ballina is required because of traffic delays, road safety concerns and unacceptable amenity impacts on the Ballina township.

Traffic delays on this section are due to the poor level of service provided through the township during peak periods resulting from: congestion; the required speed controls; and poor road geometry north of Ballina. The EIS indicates that the crash rate between 1990 and 1993 was 0.66 crashes per million vehicle kilometres and concludes that this is well above the goal of 0.4 crashes/MVkm. Accidents were attributable to cross traffic movements and loss of control around bends.

The EIS states that the proposal is required to:

- support economic development of regional centres on the North Coast;
- facilitate the efficient movement of freight;
- link major tourist centres (i.e. Ballina, Byron Bay, south-east Queensland);
- support development of interstate and inter-capital road links;
- minimise environmental impacts of the Highway on urban areas of Ballina (i.e. community severance, traffic noise); and,
- separate through and local traffic movements.

The EIS concludes that the proposal would:

- significantly reduce the number and severity of accidents along this Highway section;
- reduce travel times by reducing route length and improved alignment;
- facilitate economic development by improving inter-regional transport and optimising access to the business and tourism markets of Ballina; and,
- improve the amenity of the township of Ballina.

3.2 Consequences of Not Proceeding

The EIS identifies the following consequences of the 'do nothing' option:

- deterioration in the level of service provided by roads through Ballina;
- acceleration of the need for upgrading of roads within Ballina; and,
- loss of road safety and environmental benefits of the proposal.

3.3 Alternatives Considered

Using constraints mapping four bypass options which provided four traffic lanes were initially outlined. At a Value Management Workshop these initial options were discussed and other possible options were outlined. Seven bypass options were identified during the Value Management Workshop as worthy of evaluation. Two of these options, not considered feasible by the Proponent, were discarded and, following geotechnical investigation a further option was added. The options considered were located west of Ballina and ranged from skirting the western edge of the Ballina to an option about 10 km west of Ballina that lies west of Cumbalum township and on the fringes of Tintenbar.

Using feedback from consultation activities including the initial Value Management Workshop, the Planning Focus Meeting and a newly established community reference group, criteria for option evaluation were developed and weighted. Factors such as 'traffic performance', 'social impact', 'natural environment' and 'flooding/hydrology' ranked highly. Option B5 was selected as the preferred option on cost and road user economic performance grounds. It is noted that this option also performed well in terms of constructability, impacts on properties and business, impacts on the natural environment and road traffic noise impacts.

3.4 Major Benefits and Adverse Impacts Identified in the EIS

The EIS states that the proposal would result in the following major benefits:

- reduced travel times;
- reduced accident rates; and,
- improved amenity for Ballina town centre including decreased road traffic noise, safer roads and improved air quality.

The EIS recognises that the construction and operation of the proposal would create a range of adverse impacts including:

- traffic disruption during construction;
- additional holiday traffic;
- demands for urban development;
- impacts on wetlands;
- impacts on flora and fauna;
- flooding and water quality impacts; and,
- loss of agricultural land.

4. SUMMARY OF REPRESENTATIONS

The EIS was exhibited between 5 March 1999 and 16 April 1999 and nineteen representations were received from the following groups:

State government	4
Local government	1
Businesses	3
Individuals	11

The Representations Report contains a summary of the issues raised in the representations. The Department has undertaken its own examination of the representations and is satisfied that the RTA has identified all key issues for consideration. The frequency of issues raised is given in Table 2.

The key issues raised in the representations were:

- Property and Land Use Impacts: Twelve representations raised concern over property impacts. Key issues of concern included the size, location and drainage issues associated with the proposed underpasses, the potential for agricultural water supplies to be directly impacted and/or isolated, the severance of agricultural land, the extent of acquisition required, loss of residential development potential, need for compensation, alternate alignments which placed the Highway further away from residences and construction stage property access.

- Traffic and Access: Ten representations noted concern over traffic and access impacts. Key concerns included proposed operational access arrangements and maintenance of new access roads and the section of the Highway to be bypassed. A representation noted that the smoke from cane burning could pose road safety concerns. Another representation also recommended that a diamond interchange is constructed at Cumbalum.

- Flooding and Hydrology: Eight representations raised concerns over potential flooding and drainage impacts. Key issues of concern included the lack of detailed assessment included in the EIS, exacerbation of existing flooding issues, the use of underpasses for drainage as well as access purposes and the need to relocate or protect existing drainage.

- Noise and Vibration: Six representations expressed concern over the road traffic noise associated with the proposal. Key issues of concern included the close proximity of the proposal to residences and the need for appropriate operational noise mitigation. Three representations noted concern over construction noise and vibration impacts including the potential for blasting and the likely extended duration of impact.

- Flora and Fauna: Six representations expressed concern over the impacts of the proposal on flora and fauna. Key issues of concern included:

  - recent listings to the TSC Act not being considered;
  - lack of assessment in relation to threatened species;
  - impacts on rainforest remnants and mangroves;
  - need for fauna movement to be incorporated into bridge and culvert designs;
  - the likely presence of the three threatened fish species in the study area; and,
  - impacts on SEPP 14 wetlands.

- Impacts on Utilities: Four representations raised concern over impacts on utilities. Key issues of concern were the need to maintain and/or relocate existing electricity and town water supply connections.

- Visual Impacts: Three representations noted concern over the visual impacts of the proposal. Issues of concern included the proximity of the proposal to residences and the need for screen planting.

- Water Quality, Erosion and Sediment Control: Two representations raised concern over water quality, erosion and sediment controls associated with the proposal. Key issues of concern included the slope of batters and their ability to sustain vegetation, and the need for appropriate mitigation measures. The EPA and DLWC noted that Acid Sulphate Soils required careful management and requested further consultation in relation to the preparation of management plans.

- Air Quality: Two representations noted concern over construction stage dust impacts, noting the proximity of residences. The EPA noted that cumulative air quality impacts associated with the Pacific Highway Upgrade Program needed to be managed.

- Geotechnical constraints: Two representations raised concern over the geotechnical constraints associated with the proposal. Key issues of concern included the stability of batters and the geotechnical issues identified in the EIS.

Table 2 - Issues Raised in Representations to the EIS

Issue/Representation	EPA	Ballina Shire Council	DLWC	NPWS	NSW Fisheries	Individual	Individual	Individual	Business	Individual	Individual	Business	Individual	Individual	Individual	Business	Individual	Individual	Individual	Total
Property Impacts																				
Underpass size/location/drainage concerns							T			T	T	T							T	5
agricultural water supply			T				T			T	T								T	5
Severance of agricultural land							T			T					T				T	4
Extent of property acquisition									T						T	T				3
Loss of development potential								T			T									2
Need for compensation for property impacts												T	T							2
Alignment alternatives								T						T						2
Construction stage access							T													1
Traffic and Access																				
Operational property access							T	T		T		T		T			T		T	7
Road Maintenance		T													T					2
Road Safety												T								1
Road Design																		T		1
Flooding and Hydrology																				
Flooding impacts			T		T	T		T		T	T	T								7
Need for additional flooding assessment						T				T	T								T	4

Issue/Representation	EPA	Ballina Shire Council	DLWC	NPWS	NSW Fisheries	Individual	Individual	Individual	Business	Individual	Individual	Business	Individual	Individual	Individual	Business	Individual	Individual	Individual	Total
Noise and Vibration																				
Operational noise	T						T	T						T			T		T	6
Construction noise and vibration	T														T				T	3
Flora and fauna																				
General			T	T	T									T			T			5
Impacts on SEPP 14 Wetlands	T																			1
Utilities Impacts										T					T	T	T			4
Visual Impacts														T	T		T			3
Water and Soil																				
Water quality and erosion control	T		T																	2
Acid Sulfate Soils	T		-T																	2
Air Quality																				
Construction dust impacts	T														T					2
Operational Air Quality	T																			1
Geotechnical Constraints								T											T	2

5. MODIFICATIONS TO THE PROPOSAL FOLLOWING EIS EXHIBITION

This Section describes the current proposal described in the Representations Report for which the RTA has sought approval from the Minister for Planning. The modifications to the proposal described in this Section have been made by the RTA following exhibition of the Environmental Impact Statement in response to the issues raised in representations and further investigations.

5.1 Introduction

The Representations Report proposes a number of modifications to the proposal in response to issues raised in representations to the EIS and further geotechnical and detailed design work undertaken since exhibition of the EIS. These modifications are:

- changes to the vertical alignment;
- changes to the horizontal alignment;
- alterations to access to some properties;
- design of the Emigrant Creek bridge structure;
- design of Cumbalum flood relief bridge structure;
- design of Sandy Flat Creek bridge structure;
- potential realignment of Sandy Flat Road;
- design of Ross Lane overbridge; and,
- changes of fill embankment berms.

The Representations Report indicates that the proposed modifications would:

- reduce geotechnical risk;
- protect against cost escalations during construction;
- not result in a substantial transformation of the proposal;
- eliminate or reduce the detrimental effects of the activity; and,
- result in additional net benefits in relation to the objectives of the proposal, as identified in the EIS.

Plans of the modified proposal and a typical cross-section are given in figures 2 a - i. The modifications are discussed in detail below.

5.2 Independently Graded Carriageways

The Representations Report proposes staggering the height of the two carriageways by up to 4 metres at two locations. This means that one of the two carriageways would be higher than the other. The two locations are between points just north of Sandy Flat Creek floodway (132.9 km) and the Sandy Flat Floodway crossing (133.8 km) where the northbound carriageway would be elevated and between 130 km and the intersection of Sandy Flat Road (132.6 km) where the southbound carriageway would be elevated. Batter slopes and bench widths would remain unchanged at 2:1 and 4 metres respectively, but the vertical height of benches would increase to a maximum of 10 metres. The horizontal alignment would shift 18 metres and the formation width would reduce by 80 metres near the southern crossing of Emigrant Creek.

The Representations Report states that this modification would reduce the area of land requiring acquisition, reduce the visual impact of the proposal by stepping carriageways into the 'general lay of the land', reduce the depth of required cuts and reduce the amount of rock anchoring required. The

Representations Report also indicates that this modification would result in minor noise increases at two residences and reduce the amount of fill available.

5.3 Horizontal Alignment Shift

The Representations Report proposes modifying the horizontal alignment between chainages 133.85 km and 134.85 km by moving the Highway up to 45 metres to the west. This would significantly reduce the road footprint (and the area of land requiring acquisition), reduce disturbance to adjacent forest remnants, allow for a 4 metre clearance on a proposed stock underpass at 133.95 km, reduce visual impacts on surrounding residences and eliminate the need for a retaining wall on the south-eastern side of Ross Lane.

5.4 Alterations to Property Access

The Representations Report proposes raising the eastern roundabout at the Ross Lane intersection and realigning the Highway 14 metres to the west at the south-east of the Ross Lane intersection. This modification provides improved property access and improved access to severed properties.

5.5 Design of Emigrant Creek Bridge Structures

The Representations Report proposes increasing the length of the central Emigrant Creek Bridge structure by 55 metres to a total of 125 metres. Retaining walls, which would have presented stabilisation challenges, would no longer be required for the bridge approach embankments. This would reduce destruction of fauna habitat, allow for a wider fauna corridor and reduce the geotechnical risk posed by poor soil conditions.

The Representations Report also proposes modifying the northern Emigrant Creek Bridge structure from a bridge and culvert structure to an extended bridge structure. This increases the bridge length from 75 metres to 135 metres. A longer bridge structure would reduce destruction of fauna habitat, allow for a wider fauna corridor, reduce geotechnical constraints by bridging over very soft soils and reduce construction costs.

5.6 Design of Cumbalum Flood Relief Bridge Structure

The Representations Report proposes to replace a proposed 50 metre box culvert on the Emigrant Creek floodway at chainage 130.050 km with a 90 metre bridge structure. This change was required because a need to raise the road across the floodplain by 0.5 metres made a culvert structure uneconomic. The change in bridge structure improves flood immunity and reduces construction risks associated with poor soil conditions.

5.7 Design of Sandy Flat Creek Bridge Structure

The Representations Report proposes deletion of a 10 metre box culvert structure and underpass openings in favour of a bridge structure 51 metres in length which would allow for a 4 metre wide and 3.5 metre high wet weather access beneath the northern end of the bridge to the severed portion of the adjacent property. This would reduce geotechnical constraints, improve hydraulic efficiency and improve all weather access to the Bartlett property.

5.8 Potential Realignment of Sandy Flat Road

The EIS proposal provided an at-grade connection to Sandy Flat Road and construction of a 10 metre wide bank of box culverts to cross Sandy Flat Creek. The Representations Report proposes modifications to this intersection to allow Sandy Flat Road to pass under the upgraded Highway and connect to the existing Highway including:

- narrowing the median in this area;
- redesigning the existing twin bridges to include four (15 metre) spans which would provide a 4.6 metre clearance and allow the realignment of the road along the stability berm below the southern span; and,
- provision for emergency flood access to the Highway from an adjacent access road.

These changes would have significant road safety benefits by eliminating construction stage conflicts between construction and local traffic, conflicts between local and Highway traffic once operational and reducing the footprint of the proposal as turning lanes would no longer be required. However, direct access to the upgraded Highway from Sandy Flat Road would no longer be provided, forcing traffic to travel 3 km along the old Highway to connect to the upgraded Highway at either the Cumbalum interchange (to/from the north) or the Ross Lane interchange (to/from the north or south). The Representations Report notes that the realigned road would be impacted by settlement damage from the Highway unless foundation treatments such as timber piles are used.

The Representations Report states that the adoption of these changes would be subject to further geotechnical investigations and feasibility analysis to be completed during detailed design.

5.9 Design of Ross Lane Overbridge Structure

The Representations Report proposes increasing the length of the Ross Lane overbridge structure by 30 metres to a total of 65 metres requiring three spans and eliminating the need for retaining walls at the abutments of this structure. The reason for this was is to improve the aesthetics of the original design which involved a narrow and cramped road cutting. The change involves cutting the proposed batters back further, increasing the volume of fill available from this area and reducing visual impacts by providing enhanced landscaping opportunities over flatter batter slopes. The Representations Report indicates that this modification would also reduce construction costs.

5.10 Changes to Fill Embankment Berms

The Representations Report indicates that additional fill embankment berms are required at a number of locations to provide stability to embankments on bridge approaches. This would require widening of the typical embankment design formation by an additional 10 metres including a terrace of up to 1.5 metres and batter slope of 4 to 1. This would reduce the visual impact of the proposal by providing enhanced landscaping opportunities over flatter batter slopes and also facilitate the implementation of soil erosion controls. More imported fill would be required.

6. ASSESSMENT OF KEY ISSUES RELATING TO THE MODIFIED PROPOSAL

This Section of the Report provides an assessment of the key environmental impacts of the modified proposal based on an examination of the EIS, issues raised in representations made during the exhibition period and the RTA's response to these issues presented in its Representations Report and during further consultation with the Department.

The RTA also provided the Department with an assessment of all issues raised in the representations in Section 5 of the RTA's Representations Report. The assessment has been reviewed by the Department and where required further assessment has been undertaken and discussed. It is therefore important that this Section be read in conjunction with the RTA's Representations Report to understand how all issues raised in representations have been addressed.

6.1 Geotechnical Constraints

6.1.1 Background

The proposal traverses the Richmond River catchment and crosses low lying alluvial floodplain in the south and moderate to steeply graded hills in the north (up to 142 metres AHD), interfacing sharply at Cumbalum, approximately halfway along the route. Geotechnical investigations indicate that the soils in the southern half of the study area and at Sandy Flat Creek are characterised by a deep (greater than 20 metres) layer of highly compressible soft estuarine sediments including prairie soils and dense clays with high plasticity, permanently high water tables and localised salinity. The northern section is characterised by a deep kraznozem soil and an extremely weathered basaltic profile with high strength core stones and halloystatic clay overlaying weathered argillite. The EIS states that the basalt/argillite interface is a moisture zone and indicates that kraznozem soils in low-lying areas are prone to localised flooding.

The EIS states that geotechnical constraints were a key issue in determining the route of the preferred option and concludes that the proposal has been designed to minimise geotechnical risk.

6.1.2 Key Issues Raised

Two representations raised concern over the geotechnical constraints associated with the proposal. Key issues of concern included the stability of batters and geotechnical issues identified in the EIS. The DLWC also noted that the steep batters in kraznozem soils could be unstable and recommended that that flatter batters be constructed to aid revegetation and reduce erosion.

6.1.3 Additional Investigations

The Representations Report indicates that the deep soft alluvial deposits found in the southern section of the proposal and at Sandy Flat Creek would have implications for the settlement of embankments and the timing of the construction of the proposal. In relation to the northern section, the Representations Report indicates that uncertainty surrounding the location and condition of the basalt/argillite interface poses an increased risk of slips.

The Representations Report concludes that further geotechnical investigations are required to manage the following geotechnical risks:

- the potentially very weather sensitive nature of large quantities of excavated material from cuts;
- the presence of hallyosite in some excavated material making the degree of compaction hard to detect;
- the presence of potential and actual Acid Sulfate Soils;
- the presence of a significant quantity of oversize core stones in basalt material which would be difficult to process for re-use;
- stability issues in cut areas arising from a basalt/argillite interface and associated bedding and groundwater problems;
- the erosivity of exposed site materials and the sedimentation risk to adjacent waterways and properties;
- the weather sensitive nature of construction access;
- stability issues posed by embankments greater than four metres high which would require monitoring during construction;
- the potential for settlement of lowland embankments over very long periods of time necessitating the surcharging of embankments and/or the use of more specialised techniques if post construction and differential settlement is to be substantially reduced;
- specialised techniques, such as wick drains, would be required for embankments containing structures or where substantial completion of settlement is required before pavement construction;
- allowance for post construction settlement is required where minimum long-term embankment levels are to be maintained; and,
- allowance would be required in the design of bridges, drainage structures and pavements for both ongoing settlement and differential settlement effects.

Sedimentation and Acid Sulfate Soils issues are discussed in Sections 7.1 and 7.2 of this Report respectively.

Given the risks outlined above, the Representations Report includes the results of ongoing geotechnical investigations and concludes that analysis of the geological conditions along the length of the proposal is expected to continue into the construction stage and possibly beyond. Geotechnical investigations completed to date include the construction of two full scale trial embankments over soft soils on floodplains at Teven Road and Emigrant Creek, Cumbalum and extensive geotechnical testing to better determine the extent and constraints of the basalt/argillite interface.

The two trial embankments were constructed using different techniques selected on the basis of soil conditions and monitored. The embankment at Cumbalum was also fitted with an extensive grid of wick drains to allow the effectiveness of this mitigation treatment in accelerating settlement to be assessed. The Representations Report states that the results to date indicate that:

- embankments are likely to take longer to settle and settle more than originally estimated;
- additional fill would be required to allow for increased settlement, resulting in initially higher embankments;
- as embankments would be initially higher, additional opening space at bridges would be required to ensure that flooding characteristics are not altered; and,
- the variable depth and thickness of soft soils along the route leads to a risk of embankment and foundation instability.

The Representations Report concludes that stage 1 of the proposal is likely to take 9 years to build to allow settlement to take place. This program compares to the 3.5 – 5 years reported in the EIS.

Investigations of the basalt/argillite interface indicate a varying dip angle associated with a layer of very weak, weathered tuffaceous material which is generally wet. The Representations Report concludes that the reduction in pressure on the underlying basalt during excavation of cuttings could lead to groundwater seepage and the risk of batter instability. It also indicates that a majority of material excavated from cuttings would only be suitable for use as general fill.

The Representations Report proposes additional drainage, foundation treatments and stabilisation measures along the length of the route to address stability issues for embankments, roads, bridges and other structures. These modifications are outlined in Section 5 of this Report but specific locations are not specified. The Representations Report notes that some of the changes required to address geotechnical risks have been incorporated into the concept design and concludes that, if required, further changes would be made during detailed design and/or project documentation. Overall, the Representations Report concludes that geotechnical issues, particularly settlement would have major implications for design, construction, cost and proposal staging.

During its assessment of the Representations Report, the Department requested additional information on the methodology used to undertake the settlement analysis and the adopted parameters, assumptions and known limitations. The RTA provided a supplementary report reviewing geotechnical monitoring and settlement issues. This report concluded that trial embankments provided a sound basis for the prediction of construction timeframes and staging requirements.

6.1.4 Consideration of Key Issues

Peer Review of Geotechnical Assessment

The Department commissioned Pells Sullivan Meynink (PSM) to review the geotechnical assessment included in the EIS and Representations Report. A copy of PSM's Report is given in Appendix C. The Report:

- recommended that further investigation be carried out to more accurately define the location of the basalt/argillite interface;
- noted that the tie back structures, identified in the Representations Report as a key stabilisation method, are normally used as a method of last resort because of expense, the forces involved and corrosion issues;
- identified that the following measures that could be used to minimise excavation induced movement and maximise cut stability. These are listed in order of decreasing practicality:
  - avoiding low-strength materials;
  - adoption of flatter overall slope angles;
  - reducing groundwater pressure by the installation of drainage;
  - providing buttresses of high strength materials at the base of slopes;
  - reinforcing soils by the installation of soil nails; and,
  - the installation of structural support (i.e. anchors and piles).
- concluded that the degree of instability acceptable for cut batters depended upon the consequence of slope failure;
- noted that embankment failure is most likely to occur during or very soon after construction;
- concluded that the embankment settlement analysis undertaken was simplistic. This is appropriate for a preliminary design but more detailed methods are necessary to more accurately predict embankment settlement behaviour;
- concluded that the basis for an extended construction duration of nine years was uncertain;

- concluded that fill embankments could cause damage to adjoining properties from either ground movement and/or slope failure;
- noted that no information was provided on the potential for groundwater drawdown induced settlement and concluded that cuts through hillside could result in settlement extending to surrounding areas;
- noted that drawdown settlement impacts could be managed by preventing drawdown, supporting structures or monitoring and compensating according to resulting damage; and,
- concluded that compensation based on proper monitoring would be reasonable in some areas and for some structures. Its appropriateness depends on the expected magnitude of settlement and the sensitivity of structures.

The findings of the PSM Report concur with the Department's assessment, which is given below.

Department's Assessment

The Department is concerned by the magnitude of risk and uncertainty posed by geotechnical constraints outlined in the Representations Report. While the Department notes that geotechnical investigations are ongoing and that some modifications to reduce settlement risk have been made to the proposal, the magnitude of geotechnical constraints identified and the potential need for further changes to the proposal during detailed design to manage geotechnical risks is of particular concern. While the proposed modifications reduce the scale of the proposed cuttings, major cuts are still proposed and it is unclear how the proposed modifications would reduce the instability of batters, given the limited information presented in the Representations Report.

The Department also notes that when excavation occurs through hillsides groundwater levels maybe lowered at and adjacent to the Highway. While the Representations Report concludes that drainage and extensive batter cut stabilisation measures have been incorporated into the concept design, it is unclear what magnitude of groundwater drawdown or dewatering is likely or what modifications have been made to specifically address dewatering and associated impacts.

To ensure that the risks and constraints posed by the soil characteristics in the study area and the potential for settlement impacts on surrounding properties are effectively managed, the Department recommends further investigation into the potential for, and appropriate mitigation of:

- embankment settlement and stability;
- excavation induced ground settlement;
- groundwater drawdown induced settlement; and,
- any likely damage to properties.

The Department notes the lack of information and the need for further investigation identified in PSM's Report and recommends that detailed investigations into the magnitude of potential settlement and instability be completed. The monitoring data collected during the detailed design phase should be used to determine the magnitude of primary and secondary settlement likely and assess the effectiveness of the proposed construction techniques. To this end, the Department's Recommended Condition of Approval No. 26 requires that a report on the constructability of the proposal be prepared by the Proponent following completion of these studies. If this report identifies the likelihood of significant long term ground or embankment settlement and/or embankment or batter instability the Proponent would be required to identify appropriate stabilisation measures to be incorporated into the proposal. This Report would be submitted to the Director-General and would be certified by qualified geotechnical and construction engineering experts prior to submission.

The Department also recommends that the Proponent prepare detailed Groundwater and Settlement Management Sub Plans for both construction and operation of the proposal in consultation with the EPA and DLWC to manage groundwater and settlement including treatment and disposal of inflows, monitoring and mitigation. This requirement is reflected in Recommended Conditions of Approval Nos. 27 and 28.

The Proponent would be required to carry out building condition surveys on all structures:

- within 150 metres of excavation works or six times the maximum depth of the excavation (whichever is greatest); or
- within 20 metres of filling works or three times the height of a fill embankment (whichever is greatest); or
- 200 metres of blasting activities and/or other construction activities resulting in vibration impacts; or
- identified as potentially affected in the Report required under Recommended Condition of Approval No. 26.

Settlement criteria for buildings and structures are set out under Recommended Condition of Approval No. 29. Should the geotechnical and hydrogeological model discussed above indicate exceedance of the settlement criteria, mitigation measures such as appropriate support and stabilisation structures would be implemented in consultation with the landowner. If monitoring during construction indicates exceedance of the criteria then all work affecting ground settlement shall cease immediately and not resume until the reasons for excessive settlement are determined and mitigation measures are identified, evaluated and implemented.

The Proponent would be required to rectify any damage to buildings, structures, lawns, sheds, fencing etc resulting from any construction or operation activity at no cost to the owner(s). This requirement is specified in Recommended Condition of Approval No. 24.

6.1.5 Conclusion

While the Department notes that settlement and instability issues pose significant management challenges, it is noted that the Proponent has committed to ongoing investigation, and if required, modifications to the proposed construction methods and concept design. Any modifications to the proposal would require further assessment in accordance with the EP&A Act.

Given the requirement for further investigations identified in the EIS and reflected in the Recommended Conditions of Approval, the Department considers that a precautionary approach in relation to geotechnical constraints is warranted. The Proponent would need to carefully document the findings of the required investigations and use this information in designing, constructing and operating the proposal. The Department concludes that the likely geotechnical constraints of the proposal could be managed to acceptable levels, subject to the Recommended Conditions of Approval discussed above.

6.2 Staging

6.2.1 Background

The EIS indicates that the proposal would be constructed in two distinct stages: an initial upgrade stage referred to as "Stage 1" and, at a later date, an "Ultimate Scheme" which incorporates construction of:

- new bridges to replace the existing south bound bridges over Duck Creek and Emigrant Creek (south) or widening of the existing Emigrant Creek bridge;
- a grade separated interchange at the intersection with the Bruxner Highway; and,
- a grade separated interchange at the intersection with Teven Road.

The Representations Report clarified that the section of the Highway between the intersections with the Bruxner Highway and Teven Road would be constructed with six lanes as part of Stage 1.

The EIS indicates that embankments required for grade separated interchanges would be constructed as part of the initial proposal. While no actual timeframe for construction of the Ultimate Stage is provided, the EIS indicates that construction of the grade separated interchange at the Bruxner Highway would be in response to traffic need and funding availability. The traffic assessment included in the EIS notes that the grade separation of the Bruxner intersection would not be required within the next twenty years. The EIS also indicates that construction timeframes are highly dependent on primary settlement.

6.2.2 Key Issues Raised

The Department raised concern in relation to the duration and certainty of construction timeframes and the need to consider the impacts of staging, particularly in terms of noise impacts and interim traffic arrangements. The Department is also concerned that no specific timeframes for the construction of the ultimate proposal are given.

6.2.3 Additional Investigations

Additional information provided by the RTA indicates that further details of construction staging would be determined during the detailed investigation and design phase of the proposal and would be progressively reviewed and refined. Geotechnical constraints and, in particular embankment monitoring results, would be a fundamental consideration in determining the final staging scenario. The RTA also noted that the availability and timing of funding would also be a key determinant. Given these issues, the RTA has indicated that a multi-staged delivery strategy, with staged opening of the proposal to traffic, would be adopted and provided the following indicative milestones:

- end of year 6 – divert Pacific Highway over the completed Cumbalum overpass;
- end of year 7 – open the section of the bypass north of the Cumbalum interchange;
- end of year 9 – open Stage 1 using the Teven Road ramps and roundabout;
- end of year 11 – open the grade separated Teven Road interchange; and,
- end of year 13 – complete the Ultimate Stage of the proposal.

With regard to the timing of construction of the Ultimate Stage, the RTA noted that there was no current funding commitment for completion of this stage.

The RTA also noted that the following options may reduce proposal delivery timeframes and would be investigated during detailed design:

- construction of an additional span on the eastern end of the Cumbalum overpass bridge;
- completion of all earthworks as part of Stage 1;
- completion of the Teven Road interchange as part of Stage 1;
- redesign of the Sandy Flat Road to pass under the Bypass via extended twin bridges over Sandy Flat Creek and to connect to the existing Pacific Highway.

The RTA also noted that the staging of construction over 13 years, would have no impact on fill management requirements as it has always been proposed that the Cumbalum interchange and northern section of the proposal would be completed first to allow material excavated from cuttings to be used as fill for the embankments in the southern section. The RTA also notes that the extension of time required to construct the Cumbalum interchange would have implications for the required service life of the temporary deviation of the existing Highway.

With regard to noise impacts, the RTA have indicated that acoustic requirements would be reviewed during detailed design and note that the extended construction period would not impact on the construction noise levels predicted in the EIS. Operational road noise levels would increase by up to 2 – 3 dB(A) over those levels predicted for the EIS opening date and would be unlikely to result in significant changes in the locations or lengths of the noise barrier options discussed in the EIS. Notwithstanding, barrier heights may need to be increased if this mitigation option is utilised.

6.2.4 Consideration of Key Issues

Timing of construction of the Ultimate Proposal

The Department notes that there are no timeframes specified for the construction of the Ultimate Stage and that there is currently no funding commitments for these elements. The updated traffic assessment completed for the Representations Report indicates that the performance of Stage 1 intersections would be acceptable at 2022 and that grade separated interchanges at Teven Road and the Bruxner Highway would be required in the period between 2022 and 2032. Notwithstanding, the EIS, Representations Report and the additional information provided indicate that the embankments for Ultimate Stage components may be constructed as part of Stage 1.

Given the uncertain construction timeframes for the proposal, the Department requires that the Proponent submit a construction program and staging report before commencing construction. This requirement is specified in Recommended Condition of Approval No. 18. The Department also notes that early construction of the embankments required for the Ultimate Stage may result in these embankments lying idle for up to 30 years, if required at all. Given the potential visual and erosion and sedimentation impact associated this proposal, it is recommended that Ultimate Stage components are constructed shortly after the construction of Stage 1 as assumed in the staging scenario provided, or if and when required. To this end, Recommended Condition of Approval No. 18 prohibits the Proponent from commencing earthworks for the ultimate stage components as part of Stage 1, unless the earthworks related to components to be constructed as part of Stage 1. If the construction of any works has not commenced by 2016, the Proponent would be required to update the environmental impact assessment for these elements to the satisfaction of the Director-General prior to construction commencement.

Opening the Proposal to Traffic in Stages

Given that the RTA now propose to open the proposal to traffic in stages, it would be necessary to comply with the requirements of the Recommended Conditions of Approval as they relate to the selected stages. To facilitate this, Recommended Condition of Approval No. 3 allows the Proponent to meet the requirements of Conditions in stages. For example, in order to commence construction of the section of the proposal north of the Cumbalum interchange, the Proponent would be required to prepare a Construction Environmental Management Plan and the required Sub Plans to cover the relevant works and would need to ensure that the other Conditions are addressed where relevant to this road

section. Similarly, to open this section to traffic, the Proponent would need to ensure that all operational requirements relating to this section are met.

Spoil Management

While the RTA has indicated that the extended construction duration would have no impact in terms of spoil management, it is noted that spoil haulage from the north to the southern section of the proposal would now occur for an extended duration and therefore require comprehensive long-term erosion and sedimentation controls and careful management of both construction traffic and Highway and local traffic and noise during construction. To this end, it is recommended that the Spoil and Fill Management Sub Plan is fully integrated with the Construction Stage Traffic Management Sub Plan, the Construction Soil and Water Management Sub Plan, the Construction Noise and Vibration Management Sub Plan and the Waste Management and Reuse Sub Plan. Spoil Management is discussed further in Section 6.11 of this Report.

6.3 Property and Land Use Impacts

6.3.1 Background

The proposal predominantly passes through agricultural land used for cane farming in the south and cattle grazing in the north. The EIS indicates that a total of 34 freehold properties, ranging from residential lots to rural properties in excess of 40 hectares would be directly affected by the proposal. Impacts range from altered access arrangements, strip acquisition, major severance to total acquisition. While the likelihood of complete acquisition is discussed, the number of properties which would require total acquisition is not detailed. The EIS concludes that the negative land use impacts of the proposal could be reduced by:

- compensating land owners in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the RTA's *Land Acquisition Policy*;
- provision of alternate property access and adjustments in consultation with the land owners;
- reinstatement of local drainage and avoidance of exacerbating flood conditions; and,
- installation of comprehensive landscape treatments.

6.3.2 Key Issues Raised

Property impacts were the most frequently raised issue in representations. Key issues of concern included the size, location and drainage issues associated with the proposed underpasses, the potential for agricultural water supplies to be directly impacted and/or isolated, the severance of agricultural land, the extent of acquisition required, loss of residential development potential, need for compensation, alternate alignments which placed the Highway further away from residences and construction stage property access.

Flooding and drainage impacts are discussed in Section 6.5 of this Report. The potential for settlement impacts is discussed in Section 6.1.

6.3.3 Consideration of Key Issues

The Representations Report indicates that the modified proposal would directly impact on 36 freehold properties and several unformed Crown roads. In relation to agricultural impacts, the Representations Report states that the proposal would impact on the viability of two cane farms (one of which has

already been acquired by the RTA). The Representations Report concludes that the mitigation measures outlined in the EIS would ensure that the property impacts of the proposal are effectively managed.

The Department considers that property impacts during construction and operation of the proposal require careful consideration and management, particularly given the uncertainty about construction timing and duration. Recommended Condition of Approval No. 23 requires that the Proponent ensures that property access is maintained throughout the construction period. The Proponent would also be required to consult with affected landowners on a regular basis regarding practical and cost-effective measures to minimise impacts prior to the commencement of construction. This requirement is reflected in Recommended Condition of Approval No. 22.

The Department notes that a number of affected land owners noted concern over impacts to existing water supplies. The Proponent would be required to reinstate water supplies of equivalent quality and quantity to affected properties in consultation with the landowners. This requirement is reflected in Recommended Condition of Approval No. 25.

The proposal has some impacts on the development potential of growth areas identified in the *Ballina Urban Release Strategy* and zoned 1(b) Rural (Urban Investigation) Zone under the *Ballina Local Environmental Plan 1987*. Since the exhibition of the EIS, a portion of this land has been rezoned for residential development and Ballina Shire Council approved the Ballina Heights subdivision after consulting with the RTA and ensuring that appropriate setbacks from the proposal were provided.

The Department notes that the 1(b) Rural (Urban Investigation) Zone is a 'holding' zone pending detailed investigation into the suitability of the land for urban uses and environmental consequences. Any further releases would also need to consider the alignment of the proposal. The Department concludes that acquisition in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the mitigation measures discussed above would ensure that property impacts are appropriately managed.

6.4 Traffic and Access

6.4.1 Background

The EIS notes that the subject section of the Highway has a poor accident history, particularly at the Cumbalum bends and Tintenbar Hills which are characterised by steep gradients and tight curves. Between the Highway's intersections with the Bruxner Highway and Ross Lane 260 accidents were recorded in the period between 1991 and 1997. These included three fatalities and 119 injuries.

The EIS contains a traffic assessment based on 1994 trip tables which have been factored up to a base year of 1997 and assumes 2002 as a likely opening time of the entire proposal. Staging of the proposal is discussed in Section 6.2 of this Report. The operation of the Bruxner and Teven intersections for the initial (at–grade intersections) proposal is modelled. The EIS notes that traffic volumes along this section have increased steadily and concludes that the bypass would remove large volumes of traffic that presently pass through the Ballina Town Centre (predicted to be over 30 000 vehicles per day on the western approach to the town by 2022). The EIS indicates that the downgrading of Tintenbar Road would increase traffic volumes on the bypass and decrease traffic on the existing Highway, however it is noted that this is not proposed as part of the proposal.

The Teven Road and Bruxner Highway intersection is predicted to operate at a Level of Service (LOS) A in 2022, with the exception of:

- south bound right turns into Teven Road which would operate at a LOS B;
- southbound right turns into the Bruxner Highway which would operate at LOS B in 2018 and D in 2022; and,
- eastbound right turns from the Bruxner Highway which would operate at LOS D in 2012, E in 2018 and F in 2022.

The EIS concludes that the Bruxner Highway interchange would not require grade separation within a 20 year horizon.

While there are no specific provisions for pedestrians or cyclists, it is noted that the reduced traffic volumes within Ballina would create a safer traffic environment.

Overall, the EIS concludes that the proposal is 6.5 km shorter than the existing Highway and would provide a far superior level of service.

In relation to construction traffic impacts, the EIS states that fill would be imported from quarries in the Cumbalum and Tintenbar hills. While likely construction traffic volumes or the duration of transportation is not given, it is concluded that the early grade separation of the Cumbalum Interchange would be desirable to avoid significant delays and inefficiencies for Highway traffic and construction activities over a lengthy period. The EIS concludes that notification of changed access arrangements and consultation with affected property owners in relation to property access would ensure that construction stage impacts are effectively managed.

6.4.2 Key Issues Raised

Ten representations noted concern over traffic and access impacts. Key concerns included proposed operational access arrangements and maintenance of new access roads and the sections of the existing Highway to be bypassed. A representation recommended that a diamond interchange be constructed at Cumbalum.

The Department also noted concern over the age of the traffic assessment and required clarification on whether it was proposed to open the proposal in stages given the extended construction period.

Staging issues are discussed in Section 6.2 of this Report. Property access issues are discussed in Section 6.3 of this Report.

6.4.3 Consideration of Key Issues

Operational Traffic Assessment

The relevance of the operation traffic assessment in the EIS was queried by the Department given the delay in proposal implementation and the extended construction period. A response to this question was contained in supplementary information provided by the RTA to the Department. The RTA extended the traffic assessment to the year 2032, or 30 years after opening the Bypass.

The supplementary information concludes that:

- actual traffic volumes increases over the past few years have been lower that those used in the traffic modelling contained in the EIS. On that basis the model used in the EIS provides a conservative assessment;
- the mid-block capacity of the Bypass is adequate for the 30 year assessment period;
- the stage 1 at-grade intersections provided for the Bruxner Highway and the Bypass and Teven Road and the Bypass would be adequate until at least 2022. By the year 2032 the LOS provided by these intersections would deteriorate to a LOS F which represents an unacceptable level. Upgrades of these intersections would be required sometime between 2022 and 2032.

The Department accepts the additional analysis undertaken but notes that the conclusions are sensitive to the traffic increase forecasts.

Realignment of Sandy Flat Road

The realignment of Sandy Flat Road is discussed in the Representations Report as a potential modification to the proposal. The Representations Report concludes that a final decision on the alignment of this road would not be made until further geotechnical investigations and detailed design work is complete. While having benefit in terms of access during construction, flooding, erosion and sedimentation and geotechnical constraints, this realignment would significantly alter local traffic arrangements. Currently an at-grade intersection provides access to the existing Highway from Sandy Flat Road. Under the EIS proposal a minor at-grade T intersection with the Bypass was proposed. However, if Sandy Flat Road were to be realigned direct access to the Bypass would no longer be provided, forcing traffic to travel 3 km along the old Highway to connect to the Bypass at either the Cumbalum interchange (to/from the north) or the Ross Lane interchange (to from the north or south). Access to and from the south would also be available via Ballina and the Teven Road interchange. The Department notes that the prosed realignment would affect only traffic accessing properties off Sandy Flat Road (it is noted that Sandy Flat Road does not connect to any roads other than the existing Highway). The Department concludes that as assess to the existing Highway is provided, this change would not significantly alter existing arrangements.

Cumbalum Interchange

One representation requested that the RTA consider providing a full diamond interchange at Cumbalum. At this intersection, which would act as the northern gateway to Ballina, a bridge for the existing Highway with access ramps to provide for south bound turns into Ballina and north bound access onto the bypass would be constructed. The Representations Report notes that traffic demand would not warrant the construction of a full diamond interchange at this stage.

Construction Stage Traffic Management

The Department notes that 0.4 Million m^3 of fill would need to be imported during the construction of the proposal and a further 1 Million m^3 would be excavated and used a fill elsewhere along the alignment (these figures are preliminary earthworks quantities only. The Representations Report makes no reference to construction stage traffic impacts and no additional commitments in relation to construction traffic management. The Department considers that given the significant volume of fill transportation required and the likely nine year, or more, construction period, construction traffic requires careful management. Recommended Condition of Approval No. 31 therefore requires the Proponent to prepare a detailed Construction Traffic Management Sub Plan, in consultation with Ballina Shire Council, to cover all construction stage traffic management requirements. This Sub Plan would include:

- identification of all public roads to be used by construction traffic, in particular for the transport of earthworks and pavement materials;
- the timing and duration of the use of these roads;
- impacts on existing traffic (including pedestrians, vehicles, cyclists and disabled persons) including the staging of construction works to minimise lane closures during peak periods and delay to traffic;
- access to construction sites;
- truck ingress and egress routes, entry and exit locations and the nature of loads;
- an analysis of the need to construct the grade separated Cumbalum interchange at the earliest opportunity possible;
- temporary and interim traffic arrangements including intersection and property access;
- strategies to minimise construction heavy vehicles travelling through Ballina;
- a response plan which sets out the proposed response to any traffic, construction or other incident; and,
- appropriate review and amendment mechanisms.

A large portion of construction traffic will result from spoil and fill transport and this Sub Plan would need to be fully integrated with the Spoil and Fill Management Sub Plan Required by Recommended Condition of Approval No. 69 and discussed in Section 6.11 of this Report.

Road Maintenance

Ballina Shire Council raised concern over the maintenance costs associated with the sections of the existing Highway which would become local roads under the proposal. Under Recommended Condition of Approval No. 30 the Proponent would be required to prepare a road dilapidation report for all non-arterial roads likely to be used by construction traffic prior to the commencement of construction and once construction is complete. Any damage resulting from construction of the proposal would be repaired at the cost of the Proponent. Under this Condition, the Proponent would also be required to repair the sections of the existing Highway to be transferred to Ballina Shire Council to agreed standards and negotiate with Council regarding contributions to costs for maintenance.

6.5 Hydrology and Flooding

6.5.1 Background

The proposal crosses the flood plains of Emigrant, Duck, Maguires and Sandy Flat Creeks which form a small portion of the Richmond River Catchment. The EIS notes that creeks are influenced by tidal flows and concludes that the maximum increase in inundation levels is 5 cm in 1 in 100 year Average Recurrence Interval (ARI) flood event upstream of the northern Emigrant Creek Bridge. All other increases are less than this. The EIS also estimated flow velocities and notes that the modelling is based on averages across the entire catchment and not representative of the highest velocities that would occur. The EIS therefore notes that additional modelling is required to accurately determine the variation in velocities and changes in scour and erosion potential.

While existing inundation times are not detailed, the EIS predicts that there would be little measurable change in the duration of inundation of the flood plain resulting from construction of the proposal.

The EIS indicates that the proposal would be designed to provide two traffic lanes in a 20 year ARI flood event and to have no significant adverse impacts on existing drainage and flooding patterns. Notwithstanding, it is noted that sections of the existing Highway, including some bridges are above 1 in

100 ARI flood levels. The EIS bridge design assumed that the undersides of the new bridges were elevated to above this level.

6.5.2 Key Issues Raised

Eight representations raised concerns over potential flooding and drainage impacts. Key issues of concern included the lack of detailed assessment included in the EIS, exacerbation of existing flooding issues, the use of underpasses for drainage as well as access purposes and the need to relocate or protect existing drainage.

The Department noted that the extent of impacts required clarification, particularly in relation to any increases in inundation times. The Department was also concerned that the assessment focused on major flood events at the expense of local drainage issues.

6.5.3 Consideration of Key Issues

The primary land use in the southern section of the proposal is sugar cane farming, which requires an extensive network of drainage to minimise inundation times during flood events. The Representations Report includes an assessment of the flooding impacts associated with the modified proposal. It states that inundation increases of less than 50 mm and less than one day over existing impacts would not cause significant impact. This interpretation was confirmed by the RTA in additional information provided to the Department. In order to meet these requirements, the height of the embankments in the southern section of the proposal have been raised by 0.5 metres and a ninety metre bridge structure would be constructed over the Cumbalum floodway in place of the culverts proposed in the EIS.

While the Department notes that increases of 50 mm are not likely to cause significant adverse impacts, it is the changes in duration which are critical in assessing the impacts of the proposal on surrounding catchments. Therefore, a key design consideration in the development of flood mitigation strategies for the proposal should be to ensure minimal increases in the duration of inundation. It has not been demonstrated that increases in inundation times of up to one day would not have a significant impact and details of likely increases have not been provided, other than that increases in duration would not extend beyond one day. It is noted that other Pacific Highway projects, including the Yelgun to Chinderah section (which is now open) have been designed with the goal of no increases in inundation times.

The Department recommends that the proposal be designed so as not to increase inundation by more than 50 mm in a 1 in 100 year ARI. It is also recommended that increases in inundation time be limited to a maximum of one hour for any rainfall event. These requirements are specified in Recommended Condition of Approval No. 64.

A number of representations from farmers directly impacted by the proposal raised concerns about specific impacts on local drainage and inundation, particularly in relation to the need to specify pipe sizes and drainage alterations/linkages for individual properties. Property owners noted that machinery underpasses should not double as drainage structures. While the Department accepts that at this stage, it is impractical for the Proponent to identify specific flood control measures for each and every property affected, this would need to be completed during detailed design in close consultation with affected landowners.

To assist property owners in understanding hydrologic and flooding issues, it is recommended that the Proponent provide funding for the DLWC to engage a hydrologist to act as a technical advisor. This

requirement is specified in Recommended Condition of Approval No. 66. The Department recommends that the Proponent endeavour to resolve amicably any dispute between itself and any landowner about alterations to flooding characteristics caused by the proposal. This requirement is specified in Recommended Condition of Approval No. 65. If the parties cannot reach a mutually satisfactory resolution, the matter shall be referred firstly to the hydrologist referred to above for resolution.

6.6 Noise and Vibration

6.6.1 Background

The EIS indicates that construction works in close proximity to residences exceed EPA criteria. The EIS notes that while there would be little opportunity to reduce construction noise emissions, the selection of plant and equipment with appropriate mufflers and noise controls is recommended and, where practicable, work practices and plant selection are to be managed to minimise noise impacts.

Blasting is proposed between Cumbalum and Ross Lane and the EIS recommends that blasts be monitored for vibration and airblast impacts at residential properties within 200 metres of works and, where required, blast patterns be modified and charges reduced to minimise impacts and ensure compliance with the relevant criteria. The EIS also notes that pile driving and compacting operations are likely to result in ground vibrations in the order of 4mm/s at a distance of 20 metres and less than 2 mm/s at distances greater than forty metres from works. The EIS indicates that vibration levels of this magnitude would not result in structural damage and concludes that compaction activities within 20 metres of sensitive structures should be monitored.

In relation to operational noise, the EIS indicates that EPA road noise criteria would be exceeded if no mitigation were applied at opening of the Bypass (assumed to be 2002) at two residences during normal traffic conditions and up to eight residences during worst case traffic conditions. Impacts worsen at ten years after opening. The EIS recommends that noise affectation is considered in future land zonings and residential development adjacent to the Bypass. The EIS also considers a range of mitigation measures including acoustic barriers of 2 – 3 metres and individual treatments to affected dwellings. It is however unclear whether any mitigation measures are proposed. The EIS concludes that road noise within the Ballina Town Centre would reduce significantly.

6.6.2 Key Issues Raised

Six representations expressed concern over the road traffic noise associated with the proposal. Key issues of concern included the close proximity of the proposal to residences and the need for appropriate operational noise mitigation. Three representations noted concern over construction noise and vibration impacts including the potential for blasting and the likely extended duration of impact.

The EPA and the Department noted concern over the need for mitigation measures to be clarified at this stage. The EPA requested further information in relation to background noise monitoring and emphasised the need for vibration monitoring during construction and a Construction Noise and Vibration Management Sub Plan to detail management measures including a community information program.

6.6.3 Additional Investigations

The Representations Report includes a review of the noise impacts associated with the modified proposal including the extended construction period. In relation to construction impacts, the

Representations Report confirmed that the assessment undertaken in the EIS was still relevant and concluded that localised adverse impacts could be minimised utilising the methods outlined in the EIS. The Representations Report indicates that blast charge sizes of 10 kg would expose residences within 100 metres to vibration levels which exceed the EPA criterion of 5mm/sec. The Representations Report concludes that dilapidation surveys and monitoring would be undertaken at all residences within 200 metres of blasting activities and that residents within 500 metres would be notified.

The operational noise review indicates that road noise goals would be exceeded at 11 residences and concludes that eight properties are to be considered for mitigation. A preference for individual architectural treatment was noted. At the remaining three residences, noise emissions were found to only marginally exceed goals and the Representations Report states that mitigation would not be feasible for these properties. The Representations Report concludes that noise monitoring would be undertaken after opening to confirm impacts and, if necessary, controls would be implemented at the three properties.

In response to concerns the Department raised with regard to the noise implications of the extended construction period, additional information provided by the RTA indicates that acoustic requirements would be reviewed during detailed design and notes that the extended construction period would not impact on the construction noise levels predicted in the EIS. Operational road noise levels would increase by up to 2 – 3 dB(A) over those levels predicted for the EIS opening date and would be unlikely to result in significant changes in the locations or lengths of the noise barrier options discussed in the EIS. Notwithstanding, barrier heights may need to be increased if this mitigation option is utilised.

6.6.4 Consideration of Key Issues

Background Noise Monitoring

The EPA requested additional information in relation to conditions during noise monitoring to ascertain whether the noise levels were sufficiently representative of existing conditions. While the Representations Report indicates that this information has been provided to the EPA and that they are now satisfied that the assessment undertaken is suitably representative, it is noted that this monitoring was completed in May and June 1997, some five years ago. The Department therefore requires that additional background noise monitoring be undertaken in consultation with the EPA and be used in the development of the Construction Noise and Vibration and Operational Noise Management Sub Plans discussed below. This requirement is reflected in Recommended Condition of Approval No. 41.

Construction Noise

The Department notes that while the proposal traverses mainly agricultural land, it is in close proximity to a number of residences which would experience noise levels above the EPA's construction noise goals. This, together with the extended construction period, means that construction noise impacts would require careful consideration and management. The Department recommends that construction activities are restricted to the hours between 7:00 am to 6:00 pm, Monday to Friday, 8:00 am to 1:00 pm on Saturday and at no time on Sundays and public holidays. This requirement is specified in Recommended Condition of Approval No. 43.

Given the magnitude of impacts likely, the Department also recommends that that the Proponent investigate a range of structural and non-structural mitigation including individual treatment of houses, the use of temporary barriers and equipment shielding and /or temporary relocation. The results of these investigations should be included in the Construction Noise and Vibration Management Sub Plan

required under Recommended Condition of Approval No. 42. The Department's Recommended Conditions of Approval Nos. 44 and 46 also require the Proponent to, where practicable, adhere to the EPA's construction noise goals and ensure that:

- the offset distance between noisy plant items and sensitive receivers is maximised;
- the co-incidence of noisy plant working simultaneously, close together and adjacent to sensitive receivers is minimised;
- bored piles are used in place of driven piles in close proximity to residences; and,
- loading and unloading is carried out away from noise sensitive areas.

Neither the EIS nor the Representations Report detail the specific impacts of the piling operations required for bridge construction or propose any mitigation. The Department notes that piling in close proximity to residences has the potential to result in unacceptable impacts, given the impulsive and tonal nature of the noise generated. In addition to the general management measures discussed above, the Department recommends that sheet piling and other activities which generate these types of noise should be limited to between 9:00 am to 3 pm, Monday to Friday and 9:00 am to 12:00 pm on Saturday, with respite periods after continuous three hour periods. This requirement is specified in Recommended Condition of Approval No. 47.

In order to ensure that construction noise is effectively managed, the Department requires that construction noise levels be monitored to verify compliance with the Construction Noise and Vibration Management Sub Plan and EPA Construction Noise Goals. If monitoring indicates exceedances the Proponent would be required to implement best available mitigation measures to the satisfaction of the EPA. This requirement is specified in Recommended Condition of Approval No. 45. The erection of operational noise mitigation measures prior to the commencement of construction where reasonable and feasible is also recommended. This requirement is specified in Recommended Condition of Approval No. 42.

Blasting and Vibration

The Department is concerned that both the EIS and Representations Report propose the use of maximum instantaneous charges (MICs) which are predicted to exceed EPA and ANZECC blasting guidelines. The Department considers that vibration impacts on residences within close proximity to works have the potential to result in unacceptable impacts and, therefore, recommends that trial blasts be undertaken at each section where blasting is proposed to determine the site-specific blast response characteristics and to define allowable blast sizes that meet the relevant criteria. This requirement is specified in Recommended Condition of Approval No. 50. The Department also recommends that blasting is only undertaken between 9:00 am and 3:00 pm, Monday to Friday and 9:00 am and 12:00 pm on Saturday and that vibration levels due to blasting are limited to meet EPA requirements. These requirements are specified in Recommended Conditions of Approval Nos. 48 and 49. Recommended Condition of Approval No. 51 requires that the Proponent make all reasonable attempts to notify the occupants of residences within 500 m of blasting at least 48 hours in advance.

Proposed construction activities including piling and compaction works also have the potential to result in unacceptable vibration impacts. The Department's Recommended Condition of Approval No. 52 sets limits for vibration. It is recommended that vibratory compactors are not used within 50 metres of residences and that vibration levels are monitored to ensure compliance with the limits. These requirements are specified in Recommended Condition of Approval Nos. 53 and 54.

To ensure that any damage to structures can be identified, the Proponent would be required to conduct dilapidation surveys on all properties within 200 metres of blasting or construction activities resulting in vibration impacts. This requirement is specified in Recommended Condition of Approval No. 20.

Operational Noise

The Department notes that while the noise assessment has been reviewed in light of the alignment changes and likely extended construction duration and is based on worst case traffic volumes, (calculated by multiplying annual average daily vehicles in 2022 by a factor of 1.765) it has not been updated to reflect changes in traffic volumes since the publication of the EIS in 1998. Accordingly, the Department recommends that the Proponent monitor road noise on opening the proposal and assess the adequacy of mitigation measures. If exceedances of the EPA Road Noise Criteria are noted, the Proponent would be required to implement mitigation measures to ensure compliance with the criteria. This requirement is specified in Recommended Condition of Approval No. 56.

With respect to proposed mitigation measures, the Department notes that while the Representations Report states a preference for individual architectural treatments the assessments included in the EIS and the Representations Report do not eliminate the option of erecting noise barriers. The Department notes that individual treatments only reduce noise impacts within the residence and the need to keep windows shut in the Ballina climate is likely to necessitate the need for installation of air conditioning. The Department therefore requires that a range of structural and non-structural measures be considered in finalising appropriate noise mitigation strategies under the Operational Noise Management Sub Plan required by Recommended Condition of Approval No. 55.

6.7 Impacts on Flora and Fauna

6.7.1 Background

The study area is predominantly cleared and utilised for rural purposes, including the growing of sugar cane and pasture grasses. Small stands of native vegetation mainly occur in the northern sections of the study area, around Tintenbar, and along watercourses. These stands consist of four broad vegetation types; Casuarina Woodland, Mangrove Low Closed Forest, Eucalypt Open Forest, and Rainforest.

The study area also supports aquatic habitat, in the form of wetlands and small watercourses. The proposed alignment crosses Duck Creek, Sandy Flat Creek and Emigrant Creek in the southern and central sections of the study area. Two SEPP 14 Wetlands (No.108 & No.95) in the vicinity of Emigrant and Ducks Creeks would also be traversed by the proposed alignment in the southern section of the study area. Impacts on SEPP 14 Wetlands are discussed in Section 6.8 of this Report.

Terrestrial flora and fauna surveys undertaken for the EIS revealed that two threatened flora species (Arrow-head Vine *Tinospora tinosporoides* and *Macadamia tetraphylla*) and one threatened fauna species (Rose-crowned Fruit Dove *Ptilnopus regina)* occur within the study area. In addition, a further seven threatened fauna species are considered potential inhabitants given the presence of suitable habitat in the study area.

No threatened aquatic species were identified in the EIS, although no aquatic surveys or assessment were provided in the EIS.

In accordance with the EP&A Act, the RTA determined that a Species Impact Statement (SIS) was not required for the proposal, as no threatened species, populations, ecological communities, or their habitats are likely to be significantly affected by the proposal.

6.7.2 Key Issues Raised

Six representations expressed concern over the impacts of the proposal on flora and fauna. Key issues of concern included:

- recent listings to the TSC Act not being considered;
- lack of assessment in relation to threatened species;
- impacts on rainforest remnants and mangroves;
- need for fauna movement to be incorporated into bridge and culvert designs; and,
- the likely presence of three threatened fish species in the study area.

6.7.3 Additional Investigations

To address many of the concerns raised further flora and fauna surveys and assessments were conducted to target terrestrial and aquatic threatened species.

Supplementary terrestrial fauna surveys were conducted in the study area for seven threatened fauna species considered potential inhabitants based on the presence of suitable habitat and previous records in the locality. These were Mitchell's Rainforest Snail *Thersites mitchellae*, Bush Hen *Gallinula olivacea*, and Black Bittern *Ixyobricus flavicollis*, and four threatened microchiropteran bats species. Of these species, only the Little Bent-wing Bat *Miniopterus australis* was recorded in the study area.

Two aquatic studies were also done (in 1998 and 2000) to investigate the presence of three threatened fish species within the waterways of the study area, the Eastern Freshwater Cod, Oxleyan Pygmy Perch and Honey Blue-eye. From these studies, it was determined that the Eastern Freshwater Cod and the Oxleyan Pygmy Perch could potentially occur in the study area and be impacted by the proposal. Although the 1998 Study determined that the proposal is likely to have a significant effect on these species and their habitats, the subsequent 2000 study found this was not the case and concluded that an SIS was not required for the proposal. This conclusion is supported by NSW Fisheries.

Since the preparation of the EIS, Lowland Rainforest on Floodplain in the NSW North Coast Bioregion as been listed under the TSC Act as an endangered ecological community.

6.7.4 Consideration of Key Issues

<u>Recent listing to TSC Act</u>

The Department raised concerns in regard to additional listings under the TSC Act since the completion of the EIS. These included the threatened species, Mitchell's Rainforest Snail and the endangered ecological community Lowland Rainforest on Floodplain in the NSW North Coast Bioregion.

The Representations Report details the investigations carried out for the Mitchell's Rainforest Snail. No evidence of this species was recorded in the bushland stands of the study area and the habitat present was considered to be inconsistent with habitat known to support this species in the locality. The Department is satisfied with the level of surveys undertaken and the conclusion that this species is unlikely to occur in the study area or be affected by the proposal.

Additional information provided by the RTA indicates that the Lowland Rainforest on Floodplain in the NSW North Coast Bioregion does not occur in the study area. The Department's own desktop review of the vegetation communities that would be affected by the proposal, including a review of the species lists generated from field surveys, concurs with the conclusion that the rainforest community in the study area is not commensurate with the endangered Lowland Rainforest community. This conclusion does not reduce the value of the remnant rainforest and other communities in the study area that comprise components of what was the largest area of lowland subtropical rainforest in Australia (the "Big Scrub") or the benefits of protection and restoration of such communities. To this end, the Department recommends that the Closed Forest/Rainforest community identified in the Representations Report adjacent to the proposal should undergo regeneration works as described in Recommended Condition of Approval No. 36.

Lack of Assessment for Threatened Fauna

NPWS and the Department raised a number of issues regarding the survey methods and assessment for threatened fauna in the EIS. These issues included the lack of detail provided for the fauna surveys, the use of inappropriate methods for detecting threatened microchiropteran bat species and the poor assessment given to a number of threatened fauna species.

Further information on the methods used to target threatened fauna in EIS was provided to the Department in a letter from the RTA dated 1st March 1999. To substantiate the conclusion in the EIS that the proposal is unlikely to have a significant effect on threatened fauna species, further surveys were conducted and the methods detailed in the Representations Report. These surveys involved targeted searches for threatened microchiropteran bat species using ultrasonic bat detection methods, and searches for Mitchell's Rainforest Snail, Bush Hen and Black Bittern amongst suitable habitat. Of these species, only one threatened species was recorded in the study area, the Little Bent-wing Bat.

A Section 5A Assessment of Significance was conducted for the Little Bent-wing Bat, which concluded that the proposal is unlikely to have a significant effect on this species or its habitat. Given that no roost sites were recorded and the relatively small amount of habitat to be removed, the Department concurs with this conclusion. However, to compensate for the loss of habitat in the study area, Recommended Condition of Approval No. 36 requires that the Proponent regenerate disjunct parcels of land to improve their condition and connectivity and enable wildlife corridors to be created as part of the proposal.

Impacts on Rainforest Remnants and Mangroves

NPWS and NSW Fisheries raised concerns regarding the impacts of the proposal on rainforest remnants and mangroves in the study area. Of particular concern was that the EIS underestimated the conservation significance of these vegetation communities, stating that they are adequately conserved in the region. However, NPWS advised that previous flora studies conducted in the region conflict with these conclusions, stating that these vegetation communities are poorly conserved.

To minimise impacts to Closed Forest/Rainforest communities, Recommended Condition of Approval No. 36 requires that the RTA regenerate rainforest remnants adjacent to the study area to improve their condition and connectivity with other remnants. These regeneration works shall involve the use of locally endemic species and the use of weed-free topsoil (Recommended Conditions of Approval Nos. 37 and 39).

The proposal would remove approximately 1.3 ha of mangroves from the study area. To meet NSW Fisheries' policy of "no net habitat loss." the Representations Report indicates that mangrove habitat compensation would be provided at a ratio of 2:1. Recommended Condition of Approval No. 38 requires that the RTA rehabilitate the mangrove communities adjacent to the study area or negotiate suitable compensation with NSW Fisheries. It is noted that the Proponent is also required to investigate the potential of transplanting juvenile mangroves from affected areas of Emigrants and Ducks Creeks under Recommended Condition of Approval No. 40. This requirement is discussed further in Section 6.8 of this Report.

Bridge and Culvert Design

NPWS raised a concern over the lack of consideration into bridge and culvert design to facilitate fauna movement, and in particular, the need to provide sufficient access underneath structures to allow dry weather movement. Recommended Condition of Approval No. 67 requires that the RTA consult with NPWS regarding bridge design to encourage fauna use underneath these structures.

Impacts on Threatened Biota During Construction

The Department has concerns that threatened biota occurring adjacent to the proposal footprint may be severely impacted during construction works, particularly from sedimentation impacts and insensitive placement of machinery. Of particular concern are the vulnerable species *Macadamia tetraphylla* and *Tinospora tinosporoides* which have been recorded in the study area.

Recommended Condition of Approval No. 34 requires that sites containing any of the two vulnerable species adjacent to the proposal footprint are fenced and protected from direct and indirect impacts.

Likely Presence of Three Threatened Fish Species

In response to concerns raised by NSW Fisheries, two supplementary studies were undertaken in 1998 and 2000 to determine whether the threatened Eastern Freshwater Cod, Oxleyan Pygmy Perch, and Honey Blue-eye occur within the study area and are likely to be significantly impacted by the proposal.

From a desktop analysis, the 1998 study found that the Eastern Freshwater Cod and Oxleyan Pygmy Perch are likely to occur in the study area and may be significantly impacted by the proposal, particularly from sediment input into the watercourses after heavy rainfall. Preparation of an SIS was therefore recommended. However, as this study adopted a precautionary approach, mainly because of the absence of definitive information about the likelihood of impacts, the RTA decided to undertake a supplementary aquatic study in 2000.

The 2000 study detailed the findings of a fish survey of the study area and negotiations with NSW Fisheries on the appropriate mitigation measures to avoid having a significant impact on threatened fish species. The fish survey, which was endorsed by NSW Fisheries, involved extensive sampling for the three threatened fish species.

Of the three threatened species, only the Eastern Freshwater Cod was considered likely to occur in the study area, despite this species not being detected. Appropriate mitigation measures were developed to reduce the impacts of the proposal on this species and its habitat, particularly from sediment inputs into the watercourse during high rainfall. These measures include the capture and treatment of run-off and the preparation of environmental management plans on stormwater, erosion and sedimentation.

A Section 5A Assessment of Significance was prepared for this species, assuming the implementation of a range of mitigation measures. The assessment concluded that the proposal is unlikely to have a significant effect on this species or its habitat, and therefore a SIS is not required. The Department concurs with this finding.

Notwithstanding, to ensure that sedimentation is adequately managed during high rainfall, Recommended Condition of Approval No. 57 requires that the Applicant consult with NSW Fisheries in the preparing a Soil and Water Management Plan. Recommended Condition of Approval No. 67 also requires the RTA to design bridge structures appropriately to ensure fish passage is maintained and minimise impacts to fish habitat.

6.7.5 Conclusion

The Department considers that the impacts of the proposal on flora and fauna can be managed to acceptable levels provided the commitments detailed in the EIS and Representations Report and embodied in the Recommended Conditions of Approval are met. To ensure that these measures are effectively implemented Recommended Condition of Approval No 33 requires the Proponent to Prepare a Flora and Fauna Management Sub Plan.

6.8 Impacts on SEPP 14 Wetlands

6.8.1 Background

The sections of the proposal crossing Duck Creek and the southern crossing of Emigrant Creek affect State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14 wetlands) No. 108 and 95. The location of these wetlands is shown in Figure 3. That policy makes development within these wetlands designated development. These sections of the proposal require development consent from Ballina Shire Council and the concurrence of the Director-General of the Department.

The EIS indicates that the proposal would directly impact approximately 0.3 hectares of SEPP 14 wetlands. The EIS notes that the affected area is significantly degraded due to the presence of introduced species and exposure to surrounding disturbance. The EIS concludes that impacts would not be significant, provided the following range of safeguards are implemented:

- management plans for rehabilitation;
- adoption of low impact bridge construction techniques to minimise ground disturbance;
- implementation of erosion and sedimentation controls;
- construction of pollution control ponds to contain spills; and,
- regeneration of wetland areas.

6.8.2 Key Issues Raised

The Department raised a number of issues in relation to impacts on SEPP 14 wetlands which were addressed prior to the issue of concurrence. Issues included:

- an analysis of alternatives to impacts on these wetlands;
- details of environmental protection measures; and,
- details of measures to off-set the loss in wetland values.

The EPA highlighted the need to ensure that effective erosion and sedimentation controls are implemented to minimise impacts on SEPP 14 Wetlands and concluded that regular water quality monitoring during construction could provide feedback on the adequacy of water pollution controls in this area.

NSW Fisheries noted the loss of mangroves in Duck and Emigrant Creeks and requested that a rehabilitation management plan be prepared to ensure that there is no net habitat loss.

6.8.3 Consideration of Key Issues

The Representations Report noted that the proposed route was selected partly because it minimised impacts on SEPP 14 wetlands compared to other options. The Representations Report concludes that the proposal would not significantly affect SEPP 14 wetlands, provided recommended mitigation measures are implemented. The Department's assessment concurred with this finding. Concurrence was given by the Director-General, subject to a number of conditions, on 5 March 1999. Development Consent was granted by Ballina Shire Council, subject to a number of conditions, on 31 March 1999. A copy of the Director-General's Concurrence Conditions and the Ballina Shire Council's Consent Conditions are contained in Appendix A and B respectively. The conditions require the RTA to:

- restore four areas of coastal wetlands with a total area of 3.61 hectares; and,
- prepare a suitable Compensatory Wetlands Agreement aiming to ensure that compensatory wetland areas are managed for their wetland values in perpetuity, in consultation with DLWC and NPWS.

In order to ensure that impacts on wetlands are effectively managed, the Department recommends that the Proponent prepare an integrated Wetland Management Sub Plan in consultation with NSW Fisheries, DLWC and NPWS to address:

- the SEPP 14 Conditions of Consent;
- details of the wetland restoration and Compensatory Wetland Agreement required by these conditions;
- control of non-endemic plants from wetlands adjacent to the proposal;
- removal of rubbish in wetlands adjacent to the proposal; and,
- the potential for transplanting juvenile mangroves up to one metre in height from affected areas of Duck and Emigrant Creek.

These requirements are specified in Recommended Condition of Approval No. 40.

6.9 Utilities

6.9.1 Background

The EIS indicates that the following utilities may be impacted or disrupted by the proposal:

- North Power 66kV power lines between the Bruxner Highway and Teven Road (which would require relocation);
- North Power 11kV power lines at Teven Road, Tintenbar Hill and near Ross Lane (which would require relocation);
- Telstra optic fibre cable at Cumbalum (to be either protected under the embankment or relocated within the road reserve;

- Telstra local telephone lines at the Ross Lane interchange and near Sandy Flat Road (which would be relocated within the road reserve); and,
- Rous County Council 150 mm water main in the Ross Lane area (which would be relocated within the road reserve).

6.9.2 Key Issues Raised

Seven representations raised concern over impacts on utilities. Key issues of concern were the need to relocate or protect existing electricity and town water supply connections.

6.9.3 Consideration of Key Issues

The Representations Report does not indicate whether the proposed modifications would alter the impacts to utilities or services outlined in the EIS. Accordingly, the Department's Recommended Condition of Approval No. 82 requires that the Proponent identify potentially affected services and determine requirements for diversion, protection and/or support in consultation with and to the satisfaction of relevant service providers.

The Department notes concern raised by property owners in relation to service disruption. The Department's Recommended Condition of Approval No. 83 requires that the Proponent in consultation with utility providers ensure that disruptions to services are minimised and that affected residents and businesses be notified prior to any disruption of service.

6.10 Visual Impacts, Design and Landscaping

6.10.1 Background

The proposal is characterised by two distinct environments: floodplain in the southern section dominated by sugar cane, grassland and tea tree plantations with escarpment views in the background to the west; and rolling hills used for cattle grazing, dotted with pockets of woodland and residences in the northern section. Pockets of wetlands line the three creeks which meander along the flood plain.

The EIS indicates the visual sensitivity is generally low in the southern section, however, the northern section is identified as being of moderate to high visual sensitivity, particularly at high elevations where prominent views of the proposal are likely to be obtained. The visual catchment of the proposal is outlined in Figure 4. Artist impressions of the ultimate proposal as described in the EIS are given in Figures 5 a –g.

The EIS concludes that the visual impacts associated with the proposal would be ameliorated through landscape treatments developed in accordance with the following principles:

- retention of as many trees and possible;
- landscaping to enhance visual experience of road users and to reinstate/enhance existing visual quality;
- screen residences from the proposal;
- exchange the 'gateway' entry to Ballina;
- planting of endemic or representative species of the area;
- minimise weed infestation and promote wildlife corridors; and,
- interchanges and gateways would be planted with bangalow and cabbage tree palms and mature figs.

6.10.2 Issues Raised

Visual impacts were raised in two representations. There concerns were the need to conserve established trees which have historical and aesthetic value and reduce impacts in the northern section by constructing deeper cuttings and steeper batters.

The DLWC requested that methods other than hydromulching be investigated for use in batter stabilisation.

6.10.3 Consideration of Issues

The Department notes that the proposed modifications to the proposal outlined in Section 5 of this Report reduce the depth of cuts, independently grade the carriageways and step back batters. The Representations Report concludes that these modifications would soften the visual impacts of the proposal by allowing the road to more closely follow the general lay of the land and allow enhanced landscaping opportunities over flatter batter slopes. While the Department notes that these modifications are opposite to those recommended in individual representations, they are in keeping with the recommendations of DLWC.

The Department recommends that detailed Landscaping and Rehabilitation Sub Plans be prepared for both construction and operational phases of the proposal. These Sub Plans, required by Recommended Condition of Approval No. 71, would be prepared in consultation with affected landowners, the Community Liaison Group and Ballina Shire Council and include details of:

- sections and perspective sketches;
- methodology of landscaping works;
- location and identification of existing and proposed vegetation including use of indigenous species;
- location of mounds, bunds, structures or other proposed treatments, finishes of exposed surfaces (including paved areas), measures to preserve bio-diversity, colours and specifications, staging of works, methodology of landscaping;
- design of bridges;
- progressive landscape strategies incorporating other environmental controls such as erosion and sedimentation controls, dust mitigation, drainage, noise mitigation;
- decommissioning of all construction structure not that are not part of the operational proposal;
- lighting; and,
- monitoring and maintenance procedures.

The Sub Plans would also need to incorporate other environmental controls such as erosion and sedimentation controls, noise mitigation measures, drainage structures and lighting.

The Department recommends that landscaping works are monitored and maintained by a suitability qualified landscape specialist for at least three years. This requirement is reflected in Recommended Condition of Approval No. 72.

6.11 Spoil Management

6.11.1 Background

The EIS indicates that approximately 2 million m^3 of fill and construction material would be required to construct the ultimate proposal and concludes that 1.5 million m^3 would be sourced from cuts in the northern section of the proposal and treated for use and 0.5 million m^3 of sand and quarry materials would be imported from local quarries, particularly those in the Cumbalum and Tintenbar Hills.

6.11.2 Key Issues Raised

The Department requested clarification of the required fill volumes for the initial and ultimate proposals and the suitability of using spoil from cuts as fill.

6.11.3 Consideration of Key Issues

The Representations Report indicates that that majority of material excavated from cuts would only be suitable for use as general fill. Given the increases in settlement discussed in Section 6.1 and the resultant need for surcharging of embankments the Representations Report concludes that more material would need to be imported for construction of the modified proposal than identified in the EIS. The earthworks volumes were further refined in supplementary information provided by the RTA in response to the Department's questions. These earthworks are given in Table 3.

Table 3 Required Fill Volumes

	EIS Proposal Million M^3	EIS Ultimate Million M^3	Modified Proposal Million M^3	Modified Ultimate Million M^3
Cut Volume (bank)	1.47	1.47	1.09	1.09
Topsoil (bank)	0.06	0.06	0.06	0.06
Cut to Fill Volume (bank)	1.38	1.38	1.05	1.05
Imported Fill Required (compacted)	0.52	0.53	0.41	0.46
Total Fill (compacted)	1.90	1.91	1.41	1.46
Unsuitable Material – Spoil (bank)	0.09	0.09	0.07	0.07

While the EIS assumed that all excavated material would be suitable for use as fill after preparation and treatment, the RTA have indicated that up to 0.07 Million m^3 of spoil would need to be disposed of during construction.

At this stage details on the importation, transfer, stockpiling and disposal of fill have not been provided. Similarly, no information has been provided on the timing of earthworks and the need for multiple periods of earthworks in the construction of embankments over the flood plain. Spoil handling and disposal strategies require careful consideration and assessment prior to the commencement of construction and would exert significant influence over construction noise and vibration, waste management strategies and construction traffic impacts. To this end, the Department's Recommended Condition of Approval No. 69 requires the Proponent to prepare a Spoil and Fill Management Sub Plan which is fully integrated with construction stage noise and vibration, traffic management and waste

management measures. This Sub Plan would specifically address staging implications and detail how spoil and fill would be sought, handled, stockpiled and reused.

Apart from the potential for Acid Sulphate Soils (ASS) to be disturbed during construction, the EIS and Representations Report do not assess whether contaminated soil would be encountered during construction. Management of ASS is discussed in Section 7.2 of this Report. Given the predominantly rural uses of the surrounding land there is a potential for contamination from cattle tips and pesticides etc. to be present. As part of the Spoil and Fill Management Sub Plan discussed above, the Proponent would be required to investigate soil contamination, required management, monitoring of potential contaminants and a contingency plan to be implemented in the case of discovery of unanticipated contaminants.

7. CONSIDERATION OF OTHER ISSUES

This Section of the Report provides an assessment of the environmental impacts of the modified proposal based on an examination of the EIS, issues raised in representations made during the exhibition period and the RTA's response to these issues presented in its Representations Report and during further consultation with the Department.

The RTA has also provided the Department with an assessment of all issues raised in the representations in Section 5 of the RTA's Representations Report. The assessment has been reviewed by the Department and where required further assessment has been undertaken and discussed. It is therefore important that this Section be read in conjunction with the RTA's Representations Report to understand how all issues raised in representations have been addressed.

7.1 Water Quality, Erosion and Sediment Control

7.1.1 Background

The EIS notes that water quality in the study area is currently influenced by tidal flows, road runoff and agricultural runoff. Based on analysis of existing water quality, the EIS concludes that the water quality of the study area is characterised by salinity and traces of agricultural runoff, but supports a range of aquatic flora and fauna. The EIS indicates that construction of the road, particularly ground disturbance in close proximity to waterways, and accidental spills have the potential to result in water quality impacts. The disturbance of Acid Sulfate Soils is discussed in Section 7.2 of this Report. The EIS proposes a number of mitigation measures including:

- minimising disturbed areas particularly surrounding waterways;
- diverting clean runoff around disturbed areas;
- capturing and treating runoff from disturbed areas;
- where practicable maintaining vegetation buffer strips on both sides of creeks;
- constructing temporary access tracks using clean aggregate, site specific water quality controls and rehabilitating the area following construction;
- exposing the smallest area for the shortest possible time;
- bunding fuel and oil storage areas; and,
- construction of sedimentation basins to capture design storm events.

The EIS concludes that a detailed erosion and sedimentation control plan would be developed to manage mitigation implementation and maintenance and surface water and groundwater quality would be monitored during construction to test the effectiveness of measures.

In relation to operational water quality impacts, the EIS states that the installation of a network of permanent catch drains in the Cumbalum and Tintenbar Hills, construction of water quality control ponds in the vicinity of creek crossings and vegetating batters and exposed areas would ensure that impacts were minimised.

7.1.2 Key Issues Raised

Six representations raised concern over water quality, erosion and sediment controls associated with the proposal. Key issues of concern included the impacts of modifying drainage arrangements, the slope of batters and their ability to sustain vegetation, and the need for appropriate mitigation measures.

The EPA and DLWC noted that the water quality control measures needed to be further developed as part of the Construction Environmental Management Plan.

7.1.3 Additional Investigations

The Representations Report notes that the volume of proposed earthworks and the construction of the required creek crossings have the potential to affect water quality through erosion, sedimentation and the introduction of contaminants. The Representations Report includes a supplementary Water Quality Management Report which was completed in response to the water quality testing undertaken on the two trial embankments discussed in Section 6.1 of this Report. The Representations Report, like the EIS, indicates that the water quality within the study area is primarily influenced by agricultural runoff. While the Representations Report concludes that the creeks within the study area would be cleansed by rainfall and in the lower reaches by tidal flows a number of mitigation measure are proposed. The mitigation measures detailed below are proposed to replace some of the measures set out in the EIS:

- permanent pollution basins (rather than all basins) would be fitted with outflow baffles to prevent discharge of oil and grease;
- some drains (rather than all) would be planted with vegetation immediately following construction, with others lined with concrete or other materials;
- temporary access tracks would be constructed with appropriate materials (however it is not indicated what water quality controls would be implemented or whether the rehabilitation would occur following construction);
- where there is potential risk to groundwater quality, basins would be lined with an impervious material to avoid contamination (rather than all basins); and,
- a Soil and Water Management Plan including an Erosion and Sedimentation Plan would be prepared in accordance with the Department of Housing's publication *Managing Urban Stormwater: Soils and Construction*.

7.1.4 Consideration of Key Issues

Construction Stage Erosion and Sedimentation Control

The Department notes that the changes to mitigation measures proposed in the EIS remove some of the controls proposed during the construction phase and is concerned that this, together with the extended construction duration, could result in a greater potential for water quality impacts. In particular, the Department notes that ground surfaces could be exposed for extended periods and concludes that a strategy to manage the extent of exposed surfaces during construction and progressive site rehabilitation requirements is required. This strategy, required by Recommended Condition of Approval No. 58, would be fully integrated with landscaping and air quality management strategies.

The Department recommends that all runoff from disturbed areas be contained within sedimentation basins designed in accordance with Department of Housing's guideline *Managing Urban Stormwater - Soils and Construction.* This requirement is specified in Recommended Condition of Approval No. 61. The Soil and Water Management Sub Plan would also need to be updated at regular intervals in response to changing circumstances encountered during construction. Accordingly, a program for reporting on the effectiveness of these controls would be required as part of the Sub Plan. It is also recommended that the DLWC or other appropriately qualified soil conservationist be consulted on a regular basis to inspect temporary and permanent erosion and sedimentation controls and ensure that

appropriate controls are in place and that they are effectively maintained. These requirements are specified in Recommended Condition of Approval Nos. 57 and 59.

Bridge Scouring

The EIS indicates that scour protection would be required in culverts in the vicinity of Cumbalum and Teven Road. The Representations Report indicates that bridges and culverts would be designed such that scouring would be avoided. The Department notes that details of scour protection would be provided in the Soil and Water Management Sub Plan and concludes that the inspections required by Recommended Condition of Approval No. 59 and discussed above would ensure that appropriate protection measures are put in place. The Department also notes that the use of less invasive bridge construction techniques such as barge piling rather than the construction of earthen platforms proposed in the Representations Report would also reduce impacts. This commitment is reflected in Recommended Condition of Approval No. 67.

Contaminated Water

The Representations Report indicates that contaminated water would be treated on-site to an acceptable water quality standard for release in accordance with EPA standards. The Department notes that groundwater inflows are likely to be generated when cuttings are constructed in the northern section of the proposal and concludes that inflows and runoff from within construction sites would require careful management. The Department recommends that all water collected during construction which is likely to be contaminated be tested, treated handled and disposed of in accordance with EPA requirements. This requirement is specified in Recommended Condition of Approval No. 60.

Operational Water Quality

To ensure that operational stormwater runoff is effectively managed, the Department recommends that all operational stormwater drainage, erosion, sedimentation and water pollution controls be located, designed, constructed, operated and maintained to meet the requirements of relevant authorities. It is also recommended that construction stage water quality structures are maintained for a minimum of six months or until revegetation has provided groundcover to at least 70% of the exposed ground surface in order to minimise water quality impacts. These requirements are specified in Recommended Condition of Approval No. 62.

The Representations Report states that accidental spills from vehicles along the road alignment would be contained. The Department recommends that these be consistent with the RTA's *Code of Practice for Water Management – Road Development and Management* and be developed in consultation with the EPA. This requirement is specified in Recommended Condition of Approval No. 63.

7.1.5 Conclusion

The Department recognises the proximity of the proposal to sensitive waterbodies results in a potential for adverse water quality impacts with potential associated impacts on aquatic flora and fauna. The Department concurs with the RTA's recommendation that a Soil and Water Management Plan be prepared. Accordingly, the Department's Recommended Condition of Approval No. 57 requires that Soil and Water Management Sub Plans be prepared as part of the Construction and Operational EMPs. These Sub Plans would provide details of the exact locations and size of water quality control structures and, where relevant, the decommissioning of structures. To ensure that the impacts of the proposal are effectively managed these Sub Plans would also require pre-construction, construction and operational

monitoring of water quality and the preparation of contingency plans for fuel spills and turbid water discharge to be implemented should exceedances of performance criteria be recorded. The Department notes that the effectiveness of water quality, erosion and sediment control measures is dependent on diligent monitoring and maintenance of infrastructure and concludes that the recommended Sub Plans, if effectively implemented, would minimise the likely water quality impacts of the proposal.

7.2 Acid Sulfate Soils

7.2.1 Background

Exposure of Acid Sulphate Soils (ASS) to the atmosphere during earthworks results in the oxidation of sulphides, forming sulfates and the generation of sulfuric acid. Acidification of soils restricts plant growth and acid drainage both pollutes waters directly and indirectly by dissolving naturally occurring metal compounds which may generate toxins harmful to aquatic flora and fauna.

The EIS indicates that potential ASS has been identified in the study area and concludes that the following management principles would be followed:

- avoid land management activities that disturb potential ASS;
- prevent oxidation of potential ASS;
- neutralise ASS or acid produced in potential ASS;
- prevent ASS leachate; and,
- remove pyritic material.

The EIS concludes that an Acid Sulfate Soil Management Sub Plan would be prepared in accordance with the management strategy detailed in the EIS and indicates that management measures would include groundwater monitoring and lime dosing.

7.2.2 Key Issues Raised

The EPA and DLWC noted that this issue required careful management and requested further consultation in relation to the preparation of management plans.

7.2.3 Consideration of Key Issues

The Department recommends that the Proponent prepare an Acid Sulfate Soil Management Sub Plan for this proposal in accordance with the *Acid Sulfate Soils Manual* (ASSMC, 1998). This plan would include pre-construction and construction monitoring programs and a contingency plan to deal with the presence of actual or potential ASS. These requirements are reflected in Recommended Condition of Approval No. 68.

7.3 Air Quality

7.3.1 Background

The EIS indicates that dust generation during construction has the potential to impact on surrounding air quality and would be controlled by a number of standard measures including:

- watering of disturbed areas;

- minimising the area of exposed ground surface at any one time;
- progressive revegetation; and
- where practicable confining vehicle movements to designated areas.

In relation to operational air quality impacts, the EIS indicates that predicted concentrations of carbon monoxide and benzene would be within relevant limits and levels of nitrogen oxide would meet EPA goals 50 metres from the roadway. The EIS concludes that air quality is likely to improve as a result of the proposal due to the shorter route and more economic vehicle speeds.

7.3.2 Issues Raised

The EPA recommended the preparation of a Construction Stage Dust Management Plan to ensure the management measures outlined in the EIS were effectively implemented and monitoring of dust impacts at a minimum of three locations. In relation to operational air quality impacts the EPA noted that the cumulative impacts of the entire Pacific Highway route required careful consideration.

7.3.3 Consideration of Issues

Dust Impacts

While the Department concurs with the dust control measures identified in the EIS, it is noted that the effectiveness of these measures would be dependent on diligent monitoring and maintenance. Accordingly, Recommended Condition of Approval No. 77 requires the preparation of a detailed Construction Air Quality Management Sub Plan in consultation with the EPA. The Department notes the volumes of spoil and fill associated with the proposal and recommends that this plan include also include pro-active measures to reduce dust from stockpiles as well as cleared areas and other surfaces and monitoring and maintenance requirements. Where there is a risk of losing material, construction vehicles travelling on public roads should be covered and all construction vehicles should be maintained so as not to track mud or other material on public roads. These requirements are specified in Recommended Condition of Approval No. 78.

Operational Air Quality Impacts

The Department notes that predicted levels of pollutants would meet the relevant criteria 50 metres from the roadway and the emissions of carbon monoxide and benzene would be within acceptable limits. According, no significant adverse impacts would be expected to occur.

7.4 Heritage

7.4.1 Background

A search of NPWS Registers and a field survey for Aboriginal archaeology was completed in consultation with the Jali Local Aboriginal Land Council (LALC) as part of the EIS. The EIS indicates that a number of open campsites and shell middens are found within the study area including oyster middens on the western bank of Emigrant Creek 650 metres to the south-east of the proposal. During the field survey one isolated stone artefact was located near the northern crossing of Emigrants Creek at Cumbalum and three potential archaeological deposit (PAD) sites which would be impacted by the proposal were located. The locations of these PADs and the stone artefact (B5b1) are given in Figure 6. The EIS concludes that the isolated stone artefact is of low significance and would require removal. In relation to the three PADs, the EIS concludes that controlled sub-surface investigations would be

carried out in consultation with NPWS and Jali LALC. The EIS also indicates that if any relics of Aboriginal origin are uncovered during construction, work within 150 metres of the find would cease and not recommence until NPWS and Jali LALC have been consulted and any required approval obtained.

The proposal would also directly affect an historic house located on the eastern side of the Highway at Cumbalum, a remnant embankment of the old Ballina to Booyong Rail Line and the ruins of the Mitchell Homestead at Cumbalum. None of theses items are listed on any local or state heritage registers. The EIS notes that the historic house has been significantly altered and that only a block on concrete stairs (which are not thought to belong the original cottage) remain on the Mitchell Property. The EIS concludes that these items are of minor significance only and recommends that the historic property at Cumbalum and the rail embankment be further investigated as they are over 50 years old.

The Representations Report indicates that there are no additional impacts on indigenous or non-indigenous heritage items.

7.4.2 Issues Raised

In its representation, NPWS indicated that they concurred with the indigenous heritage assessment included in the EIS and support the conclusions made with respect to the need for sub-surface testing and removal of the isolated stone artefact.

7.4.3 Consideration of Issues

Indigenous Heritage

The Department concurs with the findings of the EIS. Recommended Condition of Approval No. 73 requires that the proposed sub-surface testings of PADs 1, 2 and 3 are completed in consultation with Jali LALC and NPWS and in accordance with a valid permit obtained from NPWS. To ensure that construction worker education requirements, the investigations and any required salvage operations are effectively managed, Recommended Condition of Approval No. 74 requires the preparation and implementation of an Indigenous Heritage Management Sub Plan.

Non-indigenous Heritage

While the Department notes that the identified items are of local significance, it is unclear what the outcome of the further investigations of the historic house at Cumbalum and the railway embankment would be. Accordingly, the Department recommends that a Report on the surveys be prepared, including preparation of photographic records in consultation with Ballina Shire Council. Copies of this Report would be forwarded to Council and local libraries. This requirement is specified in Recommended Condition of Approval No. 75.

Unexpected Items

While the Department notes that the EIS commits to immediately ceasing work if any previously unidentified materials of Aboriginal origin are identified during construction, this commitment should extend to all previously undiscovered relics of both Aboriginal or European origin. This requirement is specified in Recommended Condition of Approval No. 76.

7.5 Hazards and Safety

7.5.1 Background

The EIS indicates that accidental spills during construction and those resulting from traffic accidents could potentially pose risks to the biophysical environment and human health. The EIS concludes that the risks posed would be effectively managed by using the proposed sedimentation basins to contain spills in close proximity to waterways.

7.5.2 Consideration of Issues

No representations raised issues in relation to hazards and safety. The Department notes that, while accidental spillage would be a key hazard of the operation of the Bypass, other potential hazards such as fuel and explosives storage could also pose potential hazards if not effectively managed. Accordingly, the Department requires that Hazards and Risk Management Sub Plans are prepared for both the construction and operational phases of the proposal. The requirement is specified in Recommended Condition of Approval No. 79.

7.6 Economic and Social Impacts

7.6.1 Background

The EIS estimated that the cost of the proposal would total $131.3 million. A road user cost benefit analysis (RUCBA) was conducted as part of the EIS, comparing travel time savings, accident cost savings and vehicle operating cost savings as a result of the proposal with the capital costs. A benefit cost ratio of approximately 2:1 (i.e. benefits outweigh costs by a factor of 2) was estimated based on a 7% discount rate and a modelling horizon of 30 years.

The EIS did not specifically identify social impacts as a result of the proposal, however, the EIS discussed potential impacts as a result of property acquisition and the impacts of increased noise on those properties close to the proposal.

The EIS included details of an extensive business survey conducted in 1997 to identify the potential impacts of the proposed Ballina bypass. The survey, based on the methodology recommended in Parolin and Garner 1996[1], included direct surveys of businesses that could be expected to have some passing trade business (such as service stations, fast food outlets, cafes and restaurants, accommodation and gift shops etc), surveys of 'stoppers' at service stations and food outlets and 'stayers' surveys at motels and hotels.

Fifty-four businesses with some 'passing trade' responded to the survey and estimated on average that their annual turnover would decrease by 19.1% or $11.7 million as a result of the bypass. This decline in turnover is estimated at 4.3% of the total estimated turnover of all retail and accommodation business in Ballina in 1997. The businesses surveyed estimated that up to 118 current employment positions would be lost due to the bypass, 76 of which were classified as part time/casual. This reduction in employment represented about 18% of employment within the businesses surveyed or approximately 6% of all employment in retail and accommodation businesses in Ballina.

[1] Parolin, B and Garner, B 1996. *Evaluation of the Economic Impacts of Bypass Roads on Country Towns.* Report prepared for the Roads and Traffic Authority, R&D Project TEP/93/6.

The EIS estimated that the businesses that would be most affected would be those on the outskirts of town (such as the Big Prawn complex and service stations) with a heavy reliance on passing trade. This is consistent with findings from Goulburn.

The mitigation measures for Ballina discussed as part of the EIS include:

- appropriate signage and 'gateway' treatments promoting the range of facilities within Ballina;
- active promotion of Ballina as a destination for visitors by the local business community in cooperation with Council and tourism authorities (not part of this proposal); and,
- the potential private development (not part of this proposal) for a new Highway service centre on the proposed bypass such as near Teven Road to offset some of the employment and income impacts of the bypass.

The EIS also notes that two nurseries in the path of the preferred alignment would be acquired and that the site water management facilities of a landscape supplies business would require alteration. Impacts on these businesses and agricultural uses are discussed further in Section 6.3 of this Report.

7.6.2 Key Issues Raised

The Department requested that maintenance costs for upgrading and maintaining the existing Highway be including in the economic assessment. Given the proposed construction times increase from 3.5 to up to nine years, the Department also requested that the Proponent revise the economic analysis to take into account the delay in opening and therefore the delay in road user benefits.

Despite the potential significance of the impacts on businesses, it was surprising that no submissions were received from existing businesses or residents in Ballina. This may be as a result of a feeling of inevitability of the bypass by businesses or alternatively a level of acceptance.

7.6.3 Additional Investigations

In response to the questions raised by the Department an updated RUCBA was prepared. The RUCBA was based on revised construction cost estimates and revised road user benefits based on an evaluation period of 30 years commencing from the year 2012 (the assumed opening). Based on construction costs of $194 million for Stage 1 of the proposal with a construction duration of 9 years, the benefit to cost ratio for a 30 year horizon was estimated at 1.6. The 'ultimate' proposal (including grade separated interchanges) was not modelled in the revised analysis. There has been a substantial reduction in the benefit-cost ratio since the EIS. The RTA attribute this reduction to increased costs and a longer construction period.

7.6.4 Consideration of Key Issues

The Department recognises that the bypass would result in substantial overall benefits in the amenity and safety within Ballina by removing the through traffic from local traffic movements. The RUCBA effectively shows that road users would also benefit in terms of travel time savings and increased safety as a result of the proposal.

The proposal is estimated to potentially result in the loss of 118 jobs and $11.7 million of turnover in businesses that have some reliance on passing trade. The impact, whilst considerable, is a relatively small proportion of the total economic base of Ballina, particularly when compared to small towns bypasses such as Karuah. The Department is aware that the Parolin and Garner study indicates that

towns with a larger economic base generally have the ability to reduce the impacts through improved opportunities in other sectors. For example in the case of Goulburn it was found after the town was bypassed some retail sectors expanded as people from the hinterland increasingly used the town as an attractive place to shop now that the through trucks and traffic had been removed.

The length of time between the approval/start of construction and actual opening of the proposal (conceivably 10-15 years) would also reduce any short to medium term business impacts of the bypass. Such a length of time would allow business groups and the local community to adjust to the changes as a result of the reduced passing trade such as greater promotion of tourism and main street improvement works to attract shoppers from the Ballina hinterland.

The Department recognises that appropriate signage and 'gateway' treatments have the potential to reduce the impacts of the loss of passing trade. Recommended Condition of Approval No. 19 requires that this signage shall be designed in consultation with Council and the Community Liaison Group. To reduce potential social impacts the Department has recommended a number of conditions in relation to property acquisition, noise and air quality. Additionally, the establishment of a Community Liaison Group prior to construction would facilitate the dissemination of regular proposal updates during construction, reducing uncertainty.

7.7 Location of Construction and Ancillary Facilities

7.7.1 Background

The EIS indicates that temporary concrete and asphalt batching plants and construction compounds would be established on-site to provide construction materials for the proposal. The number of plants required and the location(s) would be determined by the successful contractor, but the EIS notes that it is likely that one would be located at the southern end of the Cumbalum Hills to serve construction of the bypass over the floodplain and another in the northern section. The EIS concludes that the precise location of the required plants would be dependent on:

- access;
- flooding;
- environmental sensitivity;
- negotiations with property owners; and,
- the availability of suitable sites within the road reserve.

7.7.2 Issues Raised

The Department requested further information in relation to the locations and impacts of these facilities.

7.7.3 Additional Investigations

The Representations Report includes an assessment of potential batching plant sites using the following criteria:

- sites to be located within the road reserve or on land near the road reserve where the land use is permitted;
- sites to be located central to the proposal to facilitate effective transport of concrete and asphalt;
- sites to be located with access to the existing road network;
- be at least 1 hectare in size;

- be more than 200 metres from residences unless shielded by topography;
- be more than 50 metres from creeks with adequate erosion and sedimentation controls or over 100 metres from creeks;
- not require substantial clearing of native vegetation ;
- be more than 200 metres from, and not drain directly to SEPP 14 wetlands; and,
- be located so that the operation of plant does not impact on surrounding land uses.

The Representations Report identifies the following sites as fitting the criteria outlined above and also allowing for the delivery of aggregates from local sources by routes with do not necessitate vehicles passing through Ballina:

- Site 1: to the north of the Cumbalum interchange;
- Site 2: adjacent to the northern boundary of Site 1 for site offices and sheds only;
- Site 3: adjacent to the northern boundary of Site 3 for site offices and sheds;
- Site 4: adjacent to the Teven Road interchange;
- Site 5: the nursery site to the west of Ballina proposed for total acquisition; and,
- Site 6: to the south-east of the intersection with Ross Lane (it is noted that this site would be 100 metres from the nearest residence.

The Representations Report concludes that the locations of the required construction compounds and batching plants would be determined prior to the commencement of construction and in accordance with the criteria outlined above.

7.7.4 Consideration of Issues

The Department recognises the need for the RTA to maintain flexibility at this time in determining the exact locations of construction facilities including concrete batching plants, as the final locations would be dependent on the requirements of the contractor selected to undertake the work. As such, the Department accepts that the approach taken by the RTA aims to retain flexibility, while ensuring the impact of construction facilities is acceptable. Notwithstanding, the Department notes that these sites should not:

- require the clearing of any native vegetation beyond that which must be cleared for the proposal in any case;
- be located below the 20 year ARI flood level unless contingency plans are prepared;
- be located within 100 metres of waterways unless adequate erosion and sediment controls are implemented to protect water quality; or,
- generally require heavy vehicles to travel through Ballina.

The Department considers that if the criteria outlined within the Representations Report and above are met the selected sites would have an acceptable level of impact and can be included as part of the proposal. As part of the Construction Environmental Management Plan, the Proponent would be required to identify the precise locations it has selected for construction compounds and batching plants and demonstrate, to the satisfaction of the Director-General, that the required criteria have been effectively implemented. This requirement is specified in Recommended Condition of Approval No. 85.

7.8 Cumulative Impacts

The proposal forms an integral part of the Pacific Highway Upgrade Program. The RTA has completed a cumulative impact assessment for the Pacific Highway (entitled *Pacific Highway Upgrade Program – Strategic Assessment Study*, 1999) which aims to assess the cumulative effects of the upgrade program. The Department understands that these cumulative impact findings are to be updated as new proposals are assessed.

The Department considers that it would be essential for data obtained from monitoring undertaken during the construction and operation of this proposal to be used in the continued assessment of cumulative impacts. As such, it is recommended that the RTA retain records of certain information with the view of utilising it in the assessment of future Highway proposals. Examples of such information include:

- effectiveness of embankment and batter stability measures;
- effectiveness of flora and fauna mitigation measures;
- effectiveness of water quality and erosion and sediment control measures;
- adequacy of hazards and risk management measures and procedures; and,
- adequacy of landscaping.

The results of such monitoring should be made available to appropriate bodies including Councils, NPWS, DLWC, EPA and the Community Liaison Group. This requirement is reflected in Recommended Condition of Approval No. 84.

8. CONCLUSIONS AND RECOMMENDATIONS

The proposal has been developed to address poor road safety and traffic congestion and improve local access and amenity. At the local level, the proposal would result in reduced local/regional traffic conflicts, reduced local air pollution, reduced noise and improved safety. The proposal would also result in benefits to travelling motorists through increased safety and significantly reduced travel times.

While the Department's assessment has identified many benefits associated with the proposal, it has concluded that constructing a Highway across soft soils in the flood prone southern section and the hills in the northern section would require diligent monitoring and management. In particular, construction is expected to occur over an extended duration, with the ultimate timeframe highly dependent on embankment settlement. Spoil and fill management and long term erosion and sedimentation controls would need to be fully integrated with noise and traffic management and landscaping strategies.

The proposed staging of the proposal poses particular management challenges. The Department's assessment has concluded that earth works associated with the Ultimate Stage components should not occur until it is proposed to fully construct these components, unless geological and hydrogeological investigations indicate that it is necessary to construct these earthworks as part of Stage 1. The Proponent would be required to prepare a staging program and assess any impacts associated with the final staging schedule to ensure that the conclusions of the assessment undertaken to date remain valid.

A number of measures are also proposed to ensure that property and land use impacts are minimised and the continuation of agricultural activities. In particular, the Proponent would be required to design the proposal so as to minimise flooding impacts and work with landowners to resolve any flooding and drainage issues. Impacts associated with the affected natural areas have been address through extensive mitigation measures including compensation packages and those developed through the SEPP 14 wetland impact assessment process.

To further strengthen the requirements outlined, the Department recommends that the Proponent prepare comprehensive Environmental Management Plans for the construction and operation of the proposal which embody the mitigation measures contained in the EIS, Representations Report and the Recommended Conditions of Approval for the proposal. The key elements of the Recommended Conditions of Approval include:

- comprehensive geotechnical and hydrogeological investigations and management;
- comprehensive flooding and hydrology design and management;
- a requirement to update assessment on proposal elements not completed by 2016;
- preparation of a construction program and staging scenario;
- preparation of a progressive revegetation strategy to be implemented during construction in order to minimise erosion and sediment control, visual and dust impacts;
- establishment of a Community Liaison Group to discuss measures to minimise impacts arising from the construction of the works;
- monitoring of noise levels and provision for further mitigation or acquisition of properties if criteria are exceeded;
- preparation and implementation of comprehensive Construction and Operational EMPs;
- the preparation of detailed Sub Plans as part of the EMPs for:
    - construction traffic management;
    - integrated wetland management;

- flora and fauna;
- water and soil;
- noise and vibration;
- acid sulfate soils;
- indigenous archaeology;
- landscaping and rehabilitation;
- air quality;
- hazards and risk; and,
- waste management and reuse.

The Department's assessment has concluded that, provided the Recommended Conditions of Approval contained in Section 9 of this Report are adopted, the proposal could be approved by the Minister for Planning.

9. RECOMMENDED CONDITIONS OF APPROVAL

This Section provides the Department's Recommended Conditions of Approval for the proposal under Section 115B(2) of the EP&A Act. These are based on the Department's assessment of the EIS, the representations made to the Department and supplementary information and advice provided.

It is noted that the EIS and Representations Report contain extensive information on procedures and mitigation strategies to be implemented to ameliorate impacts of the proposal. The recommended conditions of approval should therefore be implemented in conjunction with those procedures and mitigation measures specified in the EIS and the Representations Report. Where there is an inconsistency with the recommendations in the EIS or Representations Report, the Recommended Conditions will prevail.

Contents

The following acronyms and abbreviations are used in this Section:

ARI	Average Recurrence Interval – refers to the average or expected period between exceedances of a flood of a given size
ASS	Acid Sulfate Soils
CLG	Community Liaison Group
Construction	Commencement of any physical works under this Approval
Director-General, the	Director-General of the Department of Planning or delegate
Director-General's Report	Proposed Ballina Bypass Director-General's Report, dated February 2003
DLWC	Department of Land and Water Conservation
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environmental Management Representative
EPA	Environment Protection Authority
L_{Aeq} 9hour	Equivalent continuous (constant) sound level over a 9 hour period from 10pm to 7am
L_{Aeq} 15 hour	Equivalent continuous (constant) sound level over a 15 hour period from 7am to 10pm
LAeq (15 mins)	Equivalent sound pressure level over a 15 minute interval
LA1(1 minute)	Sound pressure level exceeded for 1 per cent of the time measured over a 1 minute interval
LA10 (15 mins)	Sound pressure level exceeded for 10 per cent of the time over a 15 minute period
Minister, the	Minister for Planning
NPWS	National Parks and Wildlife Service, NSW
OEMP	Operational Environmental Management Plan
PAD	Potential Archaeological Deposit
Proponent	Roads and Traffic Authority
Reasonable and feasible	Consideration of best practice taking into account (as applicable): Benefit of proposed measures, technological and associated operational application in the NSW/Australian context. 'Feasible' relates to engineering considerations and what is practical to build. 'Reasonable' relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
REA	Relevant Environmental Assessment documents. These include the EIS, Representations Report and the Director-General's Report as described in Condition 1
Representations Report	*The Ballina Bypass Representations Report* prepared by RTA Operations for the RTA, dated 12 December 2001
RTA	Roads and Traffic Authority
Substantial Construction	Does not include survey, acquisitions, fencing, test drilling/test excavations, building/road dilapidation surveys, minor surveys, minor clearing except where endangered ecological communities or threatened flora or fauna species would be impacted, establishment of site compounds in generally cleared, highly disturbed or non environmentally sensitive areas, minor access roads, minor adjustments to services/utilities and other minimal environmental/community impact activities.
SEPP 14	State Environmental Planning Policy No. 14

General

1. The project shall be carried out consistent with:

    (i) the proposal contained in the Environmental Impact Statement (EIS 'Pacific Highway Ballina Bypass' prepared for the Roads and Traffic Authority (RTA) by Connell Wagner and dated February 1998 and the Representations Report 'Pacific Highway Ballina Bypass' prepared by RTA Environmental Technology for the RTA and dated December 2001;
    (ii) all identified procedures, safeguards and mitigation measures identified in the EIS and Representations Report;
    (iii) the Director-General's Report; and,
    (iv) the Conditions of Approval granted by the Minister.

    Despite the above, in the event of any inconsistency with the proposal as described in items (i) to (iii), the Conditions of Approval granted by the Minister shall prevail.

    These conditions do not relieve the Proponent of the obligation to obtain all other approvals and licences from all relevant authorities required under any other Act. Without affecting the generality of the foregoing, the Proponent shall comply with the terms and conditions of such approvals and licences.

    It shall be the ultimate responsibility of the RTA to ensure compliance with all conditions of approval granted by the Minister.

Compliance

General

2. The Proponent shall comply with, or ensure compliance with all requirements of the Director-General in respect of the implementation of any measures arising from the Conditions of this Approval. The Proponent shall bring to the attention of the Director-General any matter that may require further investigation and the issuing of instructions from the Director-General. The Proponent shall ensure that these instructions are implemented to the satisfaction of the Director-General within such time that the Director-General may specify.

3. The Proponent may elect to construct the project in discrete work packages or defined stages. In that situation the Conditions of Approval may be complied with separately for each discrete work package or defined stage.

Pre-Construction Compliance Report

4. At least one month prior to commencement of substantial construction (or within such period as otherwise agreed by the Director-General), the Proponent shall submit a report detailing how all conditions to be addressed prior to substantial construction have been complied with. The project must not commence until the proponent has been advised in writing that the Director-General has approved the Pre-Construction Compliance Report.

    The Director-General shall provide a response within 1 month of receiving the Pre-Construction Compliance Report. The Director-General may request additional information if the Pre-

Construction Compliance Report is considered incomplete. In such cases, the time between the date on which the Proponent receives the request, and the date on which the additional information is provided to the Director-General, shall not be taken into account in the 1 month period. The Director-General shall make any requests for additional information within 2 weeks of receipt of the Pre-Construction Compliance Report from the Proponent.

This report shall provide the following information as a minimum:

(a) Details demonstrating how the activities leading up to *substantial construction* have been addressed. Amongst other matters, these activities shall include:
  (i) nomination and approval of *Environmental Management Representative*;
  (ii) site surveying (assuming no clearance or site works are required);
  (iii) community consultation including copies of publications and media releases;
  (iv) the geological and hydrogeological report required under Condition 26;
  (v) noise monitoring;
  (vi) EMP preparation;
  (vii) communications with Department of Planning and other relevant agencies; and,
  (viii) compliance with all relevant Conditions of Approval.
(b) a timeframe indicating when each of the conditions were complied with. This may include dates of submissions of the various studies and/or approval dates;
(c) conditions placed on any approvals or licences issued by other agencies and action taken (or proposed) to satisfy the requirements of approvals and/or studies; and,
(d) a plan indicating how the conditions which apply to the construction work package or defined stage will be satisfied.

Note:
If construction is undertaken in discrete stages then a Pre-Construction Compliance Report will need to be prepared in accordance with Condition 4 for each discrete work package or defined stage.

Pre-Operation Compliance Report

5. At least one month (or within such period as otherwise agreed by the Director-General) prior to commencement of operation of any part of the project (or defined stages of the project), the Proponent shall submit a *Compliance Report* for approval of the Director-General. This report shall detail how all conditions that apply prior to commencement of operation have been complied with. The report shall provide the following information as a minimum:

(a) details demonstrating how each condition was satisfied during construction;
(b) a timeframe indicating when each condition was complied with. This may include dates of submissions of the various studies and/or requirements of various relevant conditions, approval dates, completion of any necessary works etc;
(c) summaries of major issues raised through the ongoing Community Consultation process and how these issues were addressed;
(d) summaries of major environmental issues, how they were managed, and lessons learned;
(e) conditions placed on any operational approvals or licences issued by other agencies; and action taken (or proposed) to satisfy the requirements of approvals and/or studies; and,
(f) a plan indicating how the conditions which apply during the operation stage will be satisfied.

Note:
The Director-General shall provide a response within 1 month of receiving the Pre-Construction Compliance Report required by Condition 4 or the Pre-Operation Compliance Report required by Condition 5. The Director-General may request additional information if the report is considered incomplete. In such cases, the time between the date on which the Proponent receives the request, and the date on which the additional information is provided to the Director-General, shall not be taken into account in the 1 month period. The Director-General shall make any requests for additional information within 2 weeks of receipt of the Pre-Construction Compliance Report or the Pre-Operation Compliance Report from the Proponent.

Project Commencement

6. The Proponent shall notify the Director-General and all relevant authorities in writing at least 1 week prior to commencement of construction and operation. For the purposes of assessing compliance with these Conditions, the Proponent shall explicitly identify a date for construction and a date for substantial construction.

Dispute Resolution

7. The Proponent shall endeavour, as far as possible, to resolve any dispute with relevant public authorities arising out of the implementation of the Conditions of this Approval. Should this not be possible, the matter shall be referred firstly to the chief executives and directors of the agencies involved and if the matter cannot be resolved then to the Minister for resolution. The Minister's determination of the disagreement shall be final and binding on all parties.

Complaints Management System

8. The Proponent shall implement a system (supported by adequate resources) prior to the commencement of construction which ensures all complaints received during construction are recorded and managed as expeditiously as possible. Minimum requirements of the Complaints Management System include:

   (a) a 24 hour, toll free telephone number listed with a telephone company and advertised. This telephone number shall enable any member of the public to reach a person who can arrange appropriate responses to the complaint(s) being made;
   (b) adequate resourcing including human resources, communication and transport etc.;
   (c) an appropriate person(s) to receive, log, track and respond to complaints within the specified timeframe. The name and contact details of the nominated person(s) shall be provided to Ballina Shire Council, relevant authorities and the Director-General upon appointment or upon any changes to that appointment;
   (d) details of all complaints received during construction are to be recorded and at least a verbal response on what action is proposed to be undertaken is required within two hours during any night-time works and 24 hours during standard hours or non-construction times;
   (e) a process for the provision of a more detailed response to the complainant within 10 days, if additional information exists (over and above that provided in the initial response);
   (f) appropriate management structures to allow effective resolution of complaints; and,
   (g) a mediation system to ensure that all complaints are satisfactorily addressed to the greatest extent practicable. Where external or independent mediation is required, the mediator is to be approved by the Director-General.

Information on all complaints received, including the means by which they were addressed and whether resolution was reached with or without mediation, shall be included in the six-monthly Construction Compliance Report required by Condition 15 and shall be made available upon request.

Advertisement of Activities

9. Prior to the commencement of construction, and then at three (3)-monthly intervals, the Proponent shall advertise in relevant local newspapers, the nature of the works proposed for the forthcoming three months, the areas in which these works are proposed to occur, the hours of operation and a contact telephone number.

   The Proponent shall ensure that the local community and businesses are kept informed (by appropriate means such as: newsletters, leaflets, newspaper advertisements, community noticeboards, etc.) of the progress of the project, including any traffic disruptions and controls, construction of temporary detours and work required outside the nominated working hours, in particular noisy works, prior to such works being undertaken.

10. The Proponent shall establish a project internet site prior to the commencement of construction and maintain the internet site until 12 months after opening the project to traffic. This internet site shall contain monthly updates of work progress, consultation activities and a planned work schedule, including but not limited to:

    (a) a description of relevant approval authorities and their areas of responsibility;
    (b) a list of reports and plans that are publicly available under this Approval and the executive summaries of those reports;
    (c) minutes of community liaison group meetings;
    (d) contact names and phone numbers of the project communications staff; and,
    (e) the 24 hour toll-free complaints contact telephone number.

    Updates of work progress, construction activities and planned work schedules shall be provided more frequently where significant changes in noise impacts are expected.

Community Liaison Group

11. A Community Liaison Group shall be formed prior to the commencement of substantial construction to discuss detailed design issues and methods for minimising the impact on the local community and businesses during the construction stage. The Group shall include the Environmental Management Representative, representatives from the RTA, the contractor, relevant local community and business groups and Ballina Shire Council unless otherwise agreed by the Director-General.

    Issues for discussion shall include, but not be limited to: flora and fauna controls; noise control measures; property access arrangements, air and water quality; landscaping requirements and any other issues considered relevant by the Group.

    Appropriate facilities and information shall be provided by the Proponent to assist the Group in carrying out its functions.

The Group may make comments and recommendations about the design and implementation of the project, which shall be considered by the Proponent. In the event of any dispute between the Group and the Proponent, the Proponent's decision shall be considered as final so long as it is consistent with these Conditions of Approval.

Environmental Management Representative

12. Prior to the commencement of construction, the Director-General shall approve the appointment of the person nominated by the Proponent to serve as the Environmental Management Representative (EMR). In considering the appointment, the Director- General shall take into account:

(a) the qualifications and experience of the EMR including demonstration of general compliance with AS/NZS ISO 14012:1996 *Guidelines for Environmental Auditing : Qualification Criteria for Environmental Auditors*;
(b) the role and responsibility of the EMR; and,
(c) the authority and independence of the EMR including details of the Proponent's internal reporting structure.

The EMR shall have responsibility for:

(i) considering and advising the Proponent on matters specified in the Conditions of Approval and compliance with such;
(ii) certifying the environmental/community impacts as minor for all activities defined by the Proponent as not constituting substantial construction;
(iii) endorsing the Construction EMP in accordance with Condition 14;
(iv) reviewing the Proponent's induction and training program for all persons involved in the construction activities and monitor implementation;
(v) periodically monitoring the Proponent's environmental activities to evaluate the implementation, effectiveness and level of compliance of on-site construction activities with the Construction EMP and associated plans and procedures, including carrying out site inspections at least fortnightly;
(vi) recording and providing a written report to the Proponent of non-conformances with the Construction EMP and require the Proponent to undertake mitigation measures to avoid or minimise any adverse impacts on the environment or report required changes to the Construction EMP;
(vii) directing the Proponent to stop work immediately, if in the view of the EMR an unacceptable impact on the environment is likely to occur, or require other reasonable steps such as the authorisation of hold points to be taken to avoid or minimise any adverse impacts;
(viii) reviewing corrective and preventative actions to ensure the implementation of recommendations made from the audits and site inspections;
(ix) reviewing minor revisions to the Construction EMP;
(x) providing regular (as agreed with the Department) reports to the Department on matters relevant to the carrying out of the EMR role, including notifying the Director-General of any stop work notices; and,
(xi) endorsing the Operational EMP in accordance with Condition 16.

The EMR shall immediately, and at the same time, advise the Proponent and the Director-General of any major issues resulting from the construction of the project that have not been dealt with expediently or adequately by the Proponent.

The EMR shall be available during construction activities at the site and be present on-site during any critical construction activities as identified in the Construction EMP.

Environmental Management System

13. The Proponent shall ensure the appointment of contractors that have a demonstrated capability and experience in the implementation of an Environmental Management System prepared in accordance with the AS/NZS ISO 14000 series or BS7750-1994 certified by an accredited certifier and/or have a proven environmental management performance record.

Construction Environmental Management Plan

14. Prior to the commencement of substantial construction, a Construction Environmental Management Plan (EMP) shall be prepared, following consultation with the EPA, DLWC, NPWS, NSW Agriculture, NSW Fisheries and Ballina Shire Council. Where construction activities may be undertaken in discrete work packages or defined stages, the Proponent may prepare individual EMPs relating to specific work packages or stages of construction.

    The Construction EMP shall be prepared in accordance with the Conditions of this Approval, all relevant Acts and Regulations and accepted best practice management procedures. The Construction EMP requires approval by the Director-General prior to substantial construction works or within such time as otherwise agreed to by the Director-General. The EMP shall be certified as being in accordance with the Conditions of Approval by the EMR prior to seeking approval of the Director-General.

    The Director-General shall provide a response to the Construction EMP within one (1) month of receipt of all relevant information from the Proponent assuming receipt of adequate and sufficient information. If a request is made by the Director-General for additional information the period of time that elapses between the date on which the Proponent receives the request and the date on which the additional information is provided to the Director-General shall not be taken into account in the one (1) month period referred to above.

    The Construction EMP shall:

    a) address construction activities associated with all key construction sites, including staging and timing of the proposed works;
    b) cover specific environmental management objectives and strategies for the main environmental system elements and include, but not be limited to: noise and vibration; geotechnical issues; air quality; water; erosion and sedimentation; access and traffic; heritage and archaeology; groundwater; contaminated spoil and acid sulfate soils, spoil stockpiling and disposal; waste/resource management; flora and fauna; flooding and stormwater control; impacts on SEPP 14 Wetlands; visual screening; landscaping and rehabilitation; hazards and risks; energy use, resource use and recycling; and utilities; and,
    c) address, but not be limited to:
        i) identification of the statutory and other obligations which the Proponent 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 Proponent's construction of the project;
        ii) definition of the role, responsibility, authority, accountability and reporting of personnel relevant to compliance with the Construction EMP;

iii) measures to avoid and/or control the occurrence of environmental impacts;
iv) measures (where possible and cost-effective) to provide positive environmental offsets to unavoidable environmental impacts;
v) the role of the EMR;
vi) environmental management procedures for all construction processes which are important for the quality of the environment in respect of permanent and/or temporary works;
vii) 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;
viii) 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;
ix) the sub plans required under this Approval including: the Groundwater and Settlement Management Sub Plan (Conditions 27), the Construction Traffic Management Sub Plan (Condition 31), the Flora and Fauna Management Sub Plan (Condition 33), the Integrated Wetland Management Sub Plan (Condition 40), the Construction Noise and Vibration Management Sub Plan (Condition 42), the Soil and Water Management Sub Plan (Condition 57), the Acid Sulfate Soils Management Sub Plan (Condition 68), the Spoil and Fill Management Sub Plan (Condition 69), the Landscaping and Rehabilitation Sub Plan (Condition 71), the Indigenous Heritage Management Sub Plan (Condition 74), the Construction Air Quality Sub Plan (Condition 77), Hazards and Risk Management Sub Plan (Condition 80), and the Waste Management and Reuse Sub Plan (Condition 80);
x) steps the Proponent intends to take to ensure that all plans and procedures are being complied with;
xi) consultation requirements with relevant government agencies; and,
xii) community consultation and notification strategy (including local community, relevant government agencies, and Ballina Shire Council), and complaint handling procedures.

Specific requirements for some of the main environmental system elements referred to in (b) shall be as required under the conditions of this Approval and/or as required under any licence or approval.

The Construction EMP(s) shall be made publicly available.

Construction Environmental Monitoring

15. The Proponent shall submit to the Director-General reports in respect of the environmental performance of the construction works and compliance with the Construction EMP and any other relevant Conditions of this Approval. The reports shall be prepared six months after the start of substantial construction and thereafter at six monthly intervals or at other such periods as requested by the Director-General to ensure adequate environmental performance over the duration of the construction works.

The reports shall be submitted no later than one month after the six month period to which they apply, and are to be certified by the EMR to confirm that all EMP requirements and Conditions of Approval have been complied with.

The report(s) shall include, but not be limited to, information on:

(a) applications for consents, licences and approvals, and responses from relevant authorities;

(b) implementation and effectiveness of environmental controls and conditions relating to the work undertaken;
(c) identification of construction impact predictions made in the EIS and any supplementary studies and details of the extent to which actual impacts reflected the predictions;
(d) details and analysis of results of environmental monitoring;
(e) number and details of any complaints, including summary of main areas of complaint, action taken, response given and intended strategies to reduce complaints of a similar nature;
(f) the plan to be adopted for the project to ensure continued compliance over the coming six month period; and,
(g) any other matter relating to the compliance by the Proponent with the Conditions of this Approval or as requested by the Director-General.

The report(s) shall be provided to the EPA, DLWC and Ballina Shire Council, and any other relevant government agency nominated by the Director-General. The report(s) shall also be made publicly available.

Operational Environmental Management Plan

16. An Operational Environmental Management Plan (EMP) shall be prepared prior to the commencement of operation. The Plan shall be prepared in consultation with the EPA, DLWC, NPWS, NSW Fisheries, Ballina Shire Council and any other relevant government agency nominated by the Director-General. The Plan shall be prepared in accordance with the Conditions of this Approval, all relevant Acts and Regulations and accepted best practice management procedures. The Operational EMP requires approval by the Director-General prior to commissioning or within such time as otherwise agreed to by the Director-General. The EMP shall be certified as being in accordance with the Conditions of Approval by the EMR prior to seeking approval of the Director-General.

The Director-General shall provide a response to the Operational EMP within one (1) month of receipt of all relevant information from the Proponent assuming receipt of adequate and sufficient information. If a request is made by the Director-General for additional information, the period of time that elapses between the date on which the Proponent receives the request and the date on which the additional information is provided to the Director-General shall not be taken into account in the one (1) month period referred to above.

The Operational EMP shall address at least the following issues:

i. identification of the statutory and other obligations which the Proponent 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 Proponent's operation of the project;
ii. sampling strategies and protocols to ensure the quality of the monitoring programme, including specific requirements of the EPA and DLWC;
iii. 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 (eg. frequency and location) and procedures to follow;
iv. the sub plans required under this Approval including: the Operational Noise Management Sub Plan (Condition 55), the Soil and Water Management Sub Plan (Condition 57), the Landscaping

and Rehabilitation Sub Plan (Condition 71), the Hazards and Risk Management Sub Plan (Condition 79), and the Waste Management and Recycling Sub Plan (Condition 80);

v. steps the Proponent intends to take to ensure compliance with all plans and procedures;
vi. consultation requirements, including relevant government agencies, the local community and Council, and complaints handling procedures; and
vii. strategies for the main environmental system elements and including but not limited to: noise; water; SEPP 14 Wetlands; groundwater; flora and fauna; hydrology and flooding; visual screening, landscaping and rehabilitation; and hazards and risks.

Specific requirements for some of the main environmental system elements referred to in (g) shall be as detailed under the conditions of this Approval and/or as required under any licence or approval.

The Operational EMP shall be made publicly available.

All sampling strategies and protocols undertaken as part of the Operational EMP shall include a quality assurance/quality control plan and shall be approved by the relevant regulatory agencies to ensure the effectiveness and quality of the monitoring program. Only accredited laboratories can be used for laboratory analysis.

Compliance with this condition may be waived with the approval of the Director-General on the proviso that the RTA has an operational maintenance and monitoring program for the whole of the Pacific Highway which addresses the key issues relating to this activity and provided that the results of this program are made publicly available.

Environmental Impact Audit Report

17. An Environmental Impact Audit Report shall be submitted to the Director-General and the EPA and, upon request by the Director-General, to any other relevant government authority 12 months after commissioning of the project and at any additional periods thereafter as the Director-General may require. An independent person at the Proponent's expense shall prepare the Report. The Report shall assess the key impact predictions made in the EIS and any supplementary studies and detail the extent to which actual impacts reflect the predictions. In particular, the Report shall provide details on actual versus predicted impact for all key impact issues identified in the EIS. The suitability of implemented mitigation measures and safeguards shall also be assessed. The Report shall also assess compliance with the Operational EMP.

    The Report shall discuss results of consultation with the local community in terms of feedback/complaints on the operational phases of the project and any issues of concern raised. The Proponent shall comply with all reasonable requirements of the Director-General, EPA and other relevant authorities with respect to any reasonable measure arising from, or recommendations in, the report.

    The Report shall be made publicly available.

Staging

18. The Proponent shall prepare a construction program and staging report at least one month prior to the commencement of construction. The report shall be provided to the Director-General for information. The report shall:

(a) include the output from the geotechnical and hydrogeological investigations (Condition 26);
(b) identify the rationale for the staging and construction program; and,
(c) assess the program and staging against the REA to determine if the REA conclusions remain valid.

If construction of any part of the project has not commenced by 2016, environmental impact assessment for those project elements shall be updated to the satisfaction of the Director-General prior to construction commencement. This assessment shall address all relevant issues identified in the REA and shall take into account any changes to land uses and surrounding environments as applicable at the time. The updated assessment shall be based on relevant environmental standards and criteria applicable at that time.

The Proponent shall not commence earthworks for the works identified in the "Ultimate" Stage as part of the Stage 1 works identified in the EIS and Representations Report, unless these works are:

i. for structures to be completed as part of Stage 1; and/or,-
ii. the geological and hydrogeological investigations (Condition 26) conclude that it is necessary to construct these earthworks as part of Stage 1.

Note:
The "Ultimate" Stage works include the new southbound bridges over Duck Creek and Emigrant Creek (south) and/or widening of the Emigrant Creek (south) bridge and the grade separated interchanges at the intersection with the Bruxner Highway and Teven Road

Economic Impacts

19. At least six months prior to opening the section of the project between the Cumbalum Interchange and the Teven Road intersection to traffic, the Proponent shall develop appropriate signage and 'gateway' treatments in consultation with Ballina Shire Council and the Community Liaison Group. The signage policy shall be developed in accordance with the RTA's standard signposting policy, indicating the range of services in town and that the route through town may be taken as an alternative route to the bypass.

Property and Land Use

Pre-Construction

20. Subject to landowner agreement, building condition surveys shall be conducted on all buildings and structures:

(a) within 150 metres of excavation works or six times the maximum depth of the excavation (whichever is greatest); or
(b) within 20 metres of filling works or three times the height of a fill embankment (whichever is greatest); or
(c) 200 metres of blasting activities and/or other construction activities resulting in vibration impacts; or
(d) identified as potentially affected in the report required under Condition 26.

Building condition surveys shall be undertaken at least 30 days before construction occurs within the distance limits described in this condition.

The building condition surveys need not be conducted if the report required under Condition 26 concludes that a building or structure is very unlikely to be affected.

Note:
Structure is defined as any fixed artificial object that might reasonably be expected to be able to be damaged by the works (e.g. dams, cable support structures, farm buildings, residences, etc.)

21. The owners of all properties to be surveyed, as identified in Condition 20 are to be advised at least 14 days prior to the commencement of surveys of the scope and methodology of the survey and the process for making a property damage claim. A copy of the survey shall be given to each affected owner at least three weeks prior to the commencement of construction in the section of road affecting the property. A register of all properties surveyed and considered for survey shall be maintained by the Proponent and provided to the Director-General upon request.

22. The Proponent shall consult on a regular basis with all directly affected landowners regarding any practical and cost-effective measures to minimise impacts. Agreed measures shall be implemented according to a program agreed between the relevant landowner and the Proponent.

Management

23. The Proponent shall ensure that access to properties fronting the project and the service road are maintained throughout the construction period. The Proponent shall ensure that any access-way affected by the project is reinstated to an equivalent standard or that adequate compensation is negotiated with the relevant landowner(s).

24. Any damage to buildings, structures, lawns, sheds, gardens, fencing, etc. as a result of any project construction or operation activities direct or indirect (i.e. including vibration and groundwater changes) shall be rectified at no cost to the owner(s).

25. Where a licensed bore, dam or other property water supply is affected by the project the Proponent shall reinstate water supplies of equivalent quality and quantity to affected landowners. Alternatively the Proponent may negotiate appropriate compensation for the loss of a water supply with the landowner.

Geology, Groundwater and Settlement

Pre-Construction

26. A detailed model of geological and hydrogeological conditions along the route shall be prepared prior to the commencement of construction, including locating and mapping the basalt/argillite interface. The model shall be used to predict ground movement (horizontal and vertical) caused by construction of the road including movement caused by excavation, the construction of embankments and groundwater changes. The model and analysis shall be prepared in consultation with the DLWC.

    Following completion of these studies the Proponent shall prepare a report for the information of the Director-General that:

(a) provides the methodology and results of the geological and hydrogeological investigations;
(b) analyses the staging of the project based on the geological and hydrogeological conditions;
(c) identifies all buildings and structures that may be affected by the project, including those within the limits contained in Condition 20; and,
(d) identifies monitoring requirements for the design, construction and operation of the project.

This report shall be certified by geotechnical and construction engineering experts with appropriate registration on the National Professional Engineers Register prior to submission.

Construction

27. A detailed Groundwater and Settlement Management Sub Plan shall be prepared as part of the Construction EMP in consultation with the EPA and DLWC. The Sub Plan shall include:

(a) identification of impacts on buildings and structures from potential settlement in accordance with Condition 26;
(b) identification of licensed bores, dams or other property water supplies affected by the project;
(c) groundwater inflow control, handling, treatment, and disposal methods;
(d) a detailed monitoring plan for groundwaters, settlement and instability. The plan shall identify monitoring methods, instrument types and locations, monitoring frequency, monitoring duration and analysis requirements.

Note:
References to settlement and instability relate only to off-site effects.

Operation

28. A detailed Groundwater and Settlement Management Sub Plan shall be prepared as part of the Operation EMP in consultation with the EPA and DLWC and to the satisfaction of the Director-General. The Sub Plan shall include:

(a) identification of impacts on buildings and structures from potential settlement in accordance with Condition 26;
(b) identification of licensed bores, dams or other property water supplies affected by the project;
(c) groundwater inflow control, handling, treatment, and disposal methods;
(d) a detailed monitoring plan for groundwaters, settlement and instability. The plan shall identify monitoring methods, instrument types and locations, monitoring frequency, monitoring duration and analysis requirements.

Note:
References to settlement and instability relate only to off-site effects.

Settlement Criteria

29. Should the Report required by Condition 26 indicate that exceedances of the criteria in Table 1 are likely at buildings, structures or other facilities mitigation measures shall be implemented in consultation with the relevant land and/or infrastructure owners. The mitigation measures shall be agreed, and where necessary implemented, prior to the commencement of construction.

Table 1- Settlement Criteria for Specific Structures

Beneath Structure/Facility	Total Maximum Settlement	Total Maximum Angular Distortion
Existing Buildings and Structures	As described in AS 2870 - 1996	
Existing Roads	40 mm	1 in 250
Existing Parks	50 mm	1 in 250
Existing Utilities including sewerage, gas, electricity and telecommunication services	To be determined by the relevant utility provider.	To be determined by the relevant utility provider.

If monitoring during construction indicates off-site movement in excess of that predicted then all work affecting ground settlement shall cease immediately. Work shall not resume until the reasons for the excessive settlement are determined and mitigation measures identified, evaluated and implemented.

The above criteria shall not remove any responsibility of the Proponent for the protection of existing structures or for rectifying any damages even if settlement is contained within the above criteria.

Note:
Existing is defined as existing at the date of this Approval.
Total maximum settlement and angular distortion is the total cumulative settlement and angular distortion from all influences.

Traffic and Access

30. A road dilapidation report shall be prepared for all non-arterial roads likely to be used by construction traffic prior to commencement of construction and after construction is complete. A copy of the report shall be provided to Ballina Shire Council. Any damage resulting from the construction of the project, aside from that resulting from normal wear and tear, shall be repaired at the cost of the Proponent.

All sections of State Highway that are transferred to Ballina Shire Council as service roads shall be brought to standards as negotiated with Ballina Shire Council. The Proponent shall negotiate with Ballina Shire Council regarding contributions to costs for maintenance.

Note:
Nothing in this Condition shall be taken as restricting the Proponent from negotiating an alternative payment for damage to local roads with Ballina Shire Council, subject to the agreement of Ballina Shire Council.

31. A detailed Construction Traffic Management Sub Plan shall be prepared as part of the Construction EMP in consultation with Ballina Shire Council. The Sub Plan shall include, but not be limited to:

    (a) identification of all public roads to be used by construction traffic, in particular for the transport of earthworks and pavement materials;
    (b) the timing and duration of the use of these roads;
    (c) impacts on existing traffic (including pedestrians, vehicles, cyclists and disabled persons) including the staging of construction works to minimise lane closures during peak periods and delay to traffic;
    (d) access to construction sites;
    (e) truck ingress and egress routes, entry and exit locations and the nature of loads;
    (f) an analysis of the need to construct the grade separated Cumbalum interchange at the earliest opportunity possible;
    (g) temporary and interim traffic arrangements including intersection and property access;
    (h) strategies to minimise construction heavy vehicles travelling through Ballina;
    (i) a response plan which sets out the proposed response to any traffic, construction or other incident; and,
    (j) appropriate review and amendment mechanisms.

    This Sub Plan shall be fully integrated with the Spoil and Fill Management Sub Plan required under Condition 69.

32. The Proponent shall monitor the use of local roads by construction heavy vehicle traffic in consultation with Ballina Shire Council to develop measures to minimise and/or restrict use of local roads by heavy vehicle traffic as far as reasonable and practicable.

Flora and Fauna

Construction

33. As part of the Construction EMP, the Proponent shall prepare a detailed Flora and Fauna Management Sub Plan in consultation with the NPWS, Ballina Shire Council, DLWC and NSW Fisheries. The Sub Plan shall manage all the impacts on flora and fauna in the vicinity of the project and shall Include:

    (a) the characteristics and location of the terrestrial and aquatic flora and fauna communities in the vicinity of the project;
    (b) procedures for the clearance of vegetation and soil for construction including identification of requirements for seed collection;
    (c) detailed plans and maps of the construction footprint, areas to be cleared, timing of clearing, important habitat areas, threatened species locations, and vegetation type and location;
    (d) strategies for minimising vegetation clearance within the worksite where possible and complete protection of vegetated areas outside the worksite area;
    (e) strategies for transplanting individuals or populations of any threatened plant species affected by the road alignment where possible;
    (f) Noxious Weed Management Action Plan including but not limited to: scope of works, minimising physical disturbance, revegetating cleared areas with local native plant species and regular removal of weeds and application of herbicide to newly establishing weed species. This plan shall address weed management for both terrestrial and aquatic flora;
    (g) reuse of topsoil and cleared vegetation including weed eradication;

(h) replanting and rehabilitation of indigenous species, including trees suitable as a food resource for threatened species, preferably using materials that have been obtained from the site;
(i) measures to use any surplus vegetation shall be identified including donation to community groups and distribution to the local community;
(j) derivation of rehabilitation materials;
(k) a program for the active management and maintenance of all preserved, planted and rehabilitated vegetation (including aquatic vegetation) including watering regimes, fencing, replacement of vegetation that may have died and weed management; and,
(l) a program for reporting on the effectiveness of terrestrial and aquatic flora and fauna management measures against performance goals.

The Flora and Fauna Management Sub Plan shall clearly show how the mitigation measures identified in Section 6.6.5 of EIS and the Representations Report will be implemented during construction and operation.

34. All locations of the threatened species *Macadamia tetraphylla* and *Tinospora tinosporoides* that occur adjacent to the project footprint shall be fenced and protected from the direct and, as far as practicable, indirect impacts of the project. Protection from indirect impacts shall include as a minimum the erection of appropriate sedimentation and erosion controls prior to construction and educating construction contractors of the environmental significance of these areas.

35. If, during the course of construction, the Proponent becomes aware of the presence of any threatened species not identified and assessed in the REA and which are likely to be significantly affected, the Proponent shall immediately advise the Director-General of the NPWS and/or NSW Fisheries. No activity which places any of these species at risk shall be undertaken until advice has been received from the NPWS and/or NSW Fisheries. All recommendations by the NPWS and NSW Fisheries shall be complied with prior to any works likely to affect any threatened species.

36. The Proponent shall prepare a Bush Regeneration Plan in consultation with NPWS and DLWC. This plan shall identify disjunct parcels of land, consistent with the EIS and Representations Report, suitable for regeneration and potential connection with existing remnants with the objective of reducing exposure to edge effects, increasing connectivity between remnants and creating wildlife corridors. The Plan shall also include the areas of Closed Forest/Rainforest Communities. Ongoing management of these remnants shall also be addressed.

37. Where possible, seed of locally endemic species shall be collected prior to the commencement of construction to provide seed stock for revegetation purposes to the satisfaction of a qualified bushland regeneration officer acceptable to the NPWS. Topsoil and mulch shall be stripped and stored for placement back in the vegetation zone from where it was removed.

38. The Proponent shall provide compensatory habitat (or funding for such) to offset the loss of 1.3 hectares of mangroves at a ratio of 2:1 and to the satisfaction of NSW Fisheries.

39. Weed infested topsoil as identified by a qualified bush regeneration officer acceptable to NPWS shall not be used in the rehabilitation works unless it is to be sterilised or treated as specified by the bushland regeneration officer.

Wetlands

Wetland Management Sub Plan

40. The Proponent shall prepare an integrated Wetland Management Sub Plan in consultation with Ballina Shire Council, NSW Fisheries, NPWS and DLWC and incorporate this Sub Plan into the Construction EMP. The Plan shall incorporate the SEPP 14 Conditions of Consent and include:

    (a) details of coastal wetland restoration and Compensatory Wetland Agreement;
    (b) control of non-endemic plants in wetlands adjacent to the roadway;
    (c) removal of rubbish from wetlands adjacent to the roadway;
    (d) potential for transplanting juvenile mangroves up to one metre in height from affected areas of Duck Creek and Emigrant Creek; and
    (e) measures for the rehabilitation of wetland areas disturbed during construction of the project that are not required for the operational project.

Noise and Vibration

Background Noise Monitoring

41. The Proponent shall complete additional background noise monitoring in consultation with the EPA to be used in the development of the Construction Noise and Vibration Monitoring Sub Plan required by Condition 42 and the Operational Noise Management Sub Plan required by Condition 56.

Construction Noise and Vibration Management Sub Plan

42. A detailed Construction Noise and Vibration Management Sub Plan shall be prepared as part of the Construction EMP and in consultation with the EPA and where relevant, sufficient to address the technical requirements for obtaining EPA licences. The Sub Plan shall include, but not be limited to:

    a) identification of each work area, site compound and construction depot and the specific activities which will be carried out that these locations;
    b) construction timetabling;
    c) identification of all potentially affected noise sensitive receivers;
    d) identification of appropriate construction noise objectives with regard to the requirements of Condition 44;
    e) identification of appropriate vibration objectives with regard to the requirements of Conditions 49 and 52;
    f) assessment of potential noise and vibration from the proposed construction methods including noise from construction vehicles and noise impacts from required traffic diversions;
    g) detailed examination of all reasonable and feasible noise mitigation measures;
    h) consideration of erecting operational stage noise mitigation measures prior to construction commencement;
    i) details of all mitigation and management strategies to be implemented;
    j) noise and vibration monitoring, reporting and response procedures;
    k) community consultation and complaints handling procedures;
    l) contingency plans to be implemented in the event of non-compliances and/or noise complaints; and,

m) education of construction personnel about noise minimisation.

With respect to (g) above, the Proponent shall consider the use of a range of structural and non-structural measures during construction including barriers, acoustic treatment of residences, scheduling of construction activities to minimise impacts and temporary relocation of affected residents. The Proponent shall ensure that the mitigation measures referred to in Working Paper 3 of the EIS and in these Conditions are incorporated into the Sub Plan.

Construction Hours

43. All construction activities, including entry and departure of heavy vehicles are restricted to the hours of 7:00 am to 6:00 pm (Monday to Friday); 8:00 am to 1:00 pm (Saturday) and at no time on Sundays and public holidays.

Works outside these hours that may be permitted include:

(a) any works which do not cause noise emissions to be audible at any nearby residential property;
(b) the delivery of materials which is required outside these hours as requested by Police or other authorities for safety reasons;
(c) emergency work to avoid the loss of lives, property and/or to prevent environmental harm; and,
(d) any other work as agreed through the Construction Noise and Vibration Management Sub Plan Process.

Local residents should be informed of the timing and duration of works covered under clause (d) at least 48 hours prior to commencement.

Construction Noise Criteria

44. The Proponent shall manage noise from construction activities so as to not exceed the following objectives, unless otherwise specified in the Construction Noise and Vibration Management Sub Plan:

(a) For a construction period of four weeks or less, the L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation shall not exceed the background level by more than 20dB(A).
(b) For a construction period of greater than four weeks but less than 26 weeks, the L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation shall not exceed the background level by more than 10dB(A).
(c) For a construction period greater than 26 weeks, the L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation shall not exceed the background level by more than 5dB(A).

The Proponent shall ensure that all feasible and reasonable noise mitigation and management measures are implemented with the aim to achieve the applicable construction noise objective. Any activities that may cause noise emissions that exceed the objective shall be identified and managed in accordance with the Construction Noise and Vibration Management Sub Plan required by Condition 42.

Construction Noise Management

45. Construction noise levels shall be monitored to verify compliance with the Construction Noise and Vibration Management Sub Plan. Should monitoring indicate exceedances of construction noise goals, the Proponent shall consult with the EPA and implement all reasonable and feasible mitigation measures to the satisfaction of the EPA.

46. The Proponent shall ensure that wherever practicable:

    (a) the offset distance between noisy plant items and sensitive receivers is maximised;
    (b) the co-incidence of noisy plant working simultaneously, close together and close to sensitive receivers is minimised;
    (c) bored piles are used in place of driven piles in close proximity to residences; and,
    (d) loading and unloading is carried out away from noise sensitive areas.

47. The Proponent shall ensure that sheet piling and any other activities which result in impulsive or tonal noise generation close to residences and other sensitive receptors are only scheduled between the following hours unless otherwise specified in the Construction Noise and Vibration Management Sub Plan:

    (a) 9 am to 3 pm, Monday to Friday; and,
    (b) 9 am to 12 pm, Saturday

    Where activities are undertaken for a continuous three hour period and are audible to noise sensitive receptors, a minimum respite period of at least one hour shall be scheduled before activities recommence.

Blasting

48. Blasting shall only be undertaken between the hours of 9:00 am and 3:00 pm, Monday to Friday, and 9:00 am to 12:00 pm on Saturday.

49. The vibration level due to blasting activities shall meet the requirements of the EPA as specified in its Licence.

    In general the Guideline entitled "*Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*" prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC) shall be applicable.

50. For any section of the project where blasting is proposed, the Proponent shall undertake a series of initial trials at reduced scale prior to commencement of the proposed blasting to determine site-specific blast response characteristics and to define allowable blast sizes to meet the criteria specified in the Construction Noise and Vibration Sub Plan.

51. The Proponent shall make all reasonable attempts to advise occupants of residences within 500 metres of a blast of the blasting. The advice shall be provided at least 48 hours in advance and include a schedule of blast time(s) and a telephone contact name and number should the resident have concerns.

Construction Vibration

52. Vibration resulting from construction of the project shall be limited to:

    (a) For structural damage vibration - German Standard DIN 4150 and BS 7385: Part 2 – 1993; and,
    (b) For human exposure to vibration - the evaluation criteria presented in British Standard BS6472 for low probability of adverse comment,

    unless otherwise agreed by the EPA through the Construction Noise and Vibration Management Sub Plan.

53. Vibration levels shall be monitored to verify compliance with the limits specified in Conditions 52 and 49. Monitoring shall occur at representative properties within a minimum of 500 metres of blasting works. Should monitoring indicate exceedances, the Proponent shall consult with the EPA and implement best available mitigation measures to the satisfaction of the EPA.

54. Vibratory compacters and rock breakers shall not be used within 50m of residential buildings, unless the requirements of Condition 52 are satisfied.

Operational Noise Management Sub Plan

55. A detailed Operational Noise Management Sub Plan shall be prepared as part of the Operational EMP, to the satisfaction of the Director-General. The Sub Plan shall provide details of noise control measures to be undertaken during the operation stage and in accordance with the NSW Government's *Environmental Criteria for Road Traffic Noise* and the RTA's *Environmental Noise Management Manual*. The Sub Plan shall include, but not be limited to:

    (a) clearly identify appropriate operational noise criteria;
    (b) predictions of noise levels at all affected residential, recreational, commercial and industrial land uses;
    (c) specific reasonable and feasible physical and managerial measures for controlling noise;
    (d) the location, type and timing of erection of permanent noise barriers and/or other noise mitigation measures demonstrating best practice;
    (e) the urban design issues relating to noise control measures; and,
    (f) noise monitoring, reporting and response procedures including monitoring on surrounding roads which experience significantly increased traffic volumes as a result of the project.

Operational Noise Management

56. Monitoring of road traffic noise shall be undertaken as stated in the Operational Noise Management Sub Plan and in accordance with the NSW Government Guideline Environmental Criteria for Road Traffic Noise. The Proponent shall review the monitoring results and assess the adequacy of the traffic noise mitigation measures in accordance with the 'Post Construction Noise Monitoring Practice Note viii" contained in the RTA's Noise Management Manual.

Soil and Water Management

Soil and Water Management Sub Plan(s)

57. As part of the Construction and Operational EMPs, a detailed Soil and Water Management Sub Plan(s) shall be prepared in consultation with the EPA, DLWC, NSW Fisheries, NPWS and Ballina Shire Council. The Sub Plan(s) shall be prepared in accordance with the Department of Housing's guideline *Managing Urban Stormwater - Soils and Construction* and where appropriate, DLWC's *Constructed Wetlands Manual*. The Sub Plan(s) shall be prepared prior to construction or operation as appropriate.

    The Soil and Water Management Sub Plan(s) shall contain, but not be limited to:

    (a) management of the cumulative impacts of the development on the quality and quantity of surface and groundwaters, including stormwater in storage, sedimentation dams and flooding impacts;
    (b) preparation of a catchment analysis to determine the capacity of existing drainage systems and changes resulting from the construction of the project including detention requirements;
    (c) details of short and long-term measures to be employed to minimise soil erosion and the discharge of sediment to land and/or waters including the exact locations and capacities of sedimentation basins;
    (d) details of strategies to manage the stage construction of embankments including mitigation measures to be implemented, maintenance and responsibility;
    (e) management of the impacts of the development on creeks and water bodies, in particular Duck Creek, Emigrant Creek, Maguires Creek, Richmond River and SEPP 14 Wetlands No. 108 and 95;
    (f) identification of all potential sources of water pollution and a detailed description of the remedial action to be taken or management systems to be implemented to minimise emissions of these pollutants from all sources within the project;
    (g) detailed description of water quality monitoring to be undertaken during the pre-construction, construction and operation stages of the project including identification of monitoring locations;
    (h) contingency plans to be implemented in the event of fuel spills or turbid water discharge from the site; and,
    (i) a program for reporting on the effectiveness of the sediment and erosion control system against performance goals.

    The Soil and Water Management Sub Plan(s) shall clearly show how the mitigation measures identified in Section 6.4 of EIS and the Representations Report will be implemented during construction and operation.

Erosion and Sediment Control Works

58. The Soil and Water Management Sub Plan shall incorporate detailed erosion and sedimentation controls including a strategy to manage the extent of exposed ground surface during construction and progressive site rehabilitation requirements (in accordance with Conditions 71 and 77). The Sub Plan shall be prepared in consultation with DLWC, EPA and NSW Fisheries.

Construction

59. The DLWC, or other appropriately qualified soil conservationist, shall be consulted on a regular basis to undertake inspections of temporary and permanent erosion and sedimentation control devices to ensure that the most appropriate controls are being implemented and that they are being maintained in an efficient condition at all times and meet the requirements of any relevant approval/licence condition(s).

    The results of these inspections and any follow-up actions shall be reported in the six monthly Environmental Performance and Compliance Report required by Condition 15.

60. All runoff collected during construction which is likely to be contaminated, shall be tested, treated, handled and disposed of in accordance with the provision of the Protection of the Environment Operations Act 1997 and the conditions of any Licence issued by the EPA.

61. All runoff from disturbed areas shall be contained by appropriate erosion and sedimentation controls designed in accordance with the Department of Housing's guideline *Managing Urban Stormwater - Soils and Construction*.

Operation Stage Control Measures

62. All stormwater drainage, erosion, sedimentation and water pollution control systems and facilities of the project shall be located, designed, constructed, operated and maintained to meet the requirements of the relevant authorities including the EPA, NSW Fisheries, Ballina Shire Council and the DLWC. All facilities including wetland filters, grass filter strips, gross pollutant traps and sedimentation basins shall be inspected regularly and maintained in a functional condition for the life of the project. Construction stage water quality structures shall be maintained for a minimum of six months after commissioning of the project or until revegetation has provided groundcover to at least 70% of the exposed ground surface.

63. The Proponent shall provide appropriate detention systems for containment of spills and materials arising from accidents that are consistent with the RTA's "*Code of Practice for Water Management – Road Development and Management*" in consultation with the EPA.

Hydrology and Flooding

Inundation levels

64. The project shall be designed to "not worsen" the existing flooding characteristics in any waterway upstream or downstream of the project elements. "Not worsen" shall be defined as:

    (a) a maximum increase in inundation levels upstream of the project of 50 mm in a 1 in 100 year ARI rainfall event; and,
    (b) a maximum increase in inundation time of one hour for any rainfall event.

65. The Proponent shall endeavour to resolve amicably any dispute between itself and any landowner about alterations to flooding characteristics caused by the project. If the parties cannot reach a mutually satisfactory resolution, the matter shall be referred firstly to the hydrologist referred to in Condition 66 for resolution. If the hydrologist cannot resolve the issue then the dispute resolution requirements of Condition 7 shall apply.

Hydrological Specialist

66. The Proponent shall provide appropriate funding for the DLWC to engage a qualified hydrologist(s) to ensure that each landowner affected by the project has appropriate technical resources to understand hydrologic issues and to receive advice concerning the provision of appropriate flood/drainage facilities consistent if not better than would exist without the project. The RTA shall notify all affected landowners of the availability of the hydrologist(s) as soon as practicable and prior to commencement of substantial construction activities likely to affect flood/drainage patterns.

Bridge and Culvert Design

67. The Proponent shall consult the EPA and NSW Fisheries in relation to the design and timing of bridge and culvert construction. In undertaking bridge design and construction, the Proponent shall ensure that: no culverts are used to cross creeks and rivers; no earthen platforms for driving piles are constructed; and all embankments are located away from the edge of waterways unless otherwise agreed by NSW Fisheries. The Proponent shall also investigate in consultation with NPWS designing bridge structures that are suitable for fauna use. This may require incorporating features such as locating bridge abutments a sufficient distance from the edge of creek or river bank to allow for fauna movement and measures to ensure that adequate light and moisture is maintained underneath bridges to facilitate native vegetation growth.

    In undertaking culvert design and construction, the Proponent shall ensure that there is no drop or 'waterfall' effect at the end of the structure, water levels above and below the crossing are the same and the base of the culvert is set into (rather than on) the floodplain so that natural sediments cover the bottom, providing a less alien habitat for fish passage.

Acid Sulfate Soils Management

68. A detailed Acid Sulfate Soil Management Sub Plan shall be prepared in consultation with NPWS, NSW Fisheries, EPA and DLWC prior to any construction activity in potentially affected areas. The Sub Plan shall include reference to the water quality monitoring program contained in the Soil and Water Quality Management Sub Plan. The Sub Plan shall be prepared in accordance with the *Acid Sulfate Soils Manual* (ASSMC, 1998). As part of the Sub Plan, a Contingency Plan to deal with the unexpected discovery of actual or potential acid sulphate soils shall be prepared to the satisfaction of the DLWC and in consultation with the EPA.

Spoil and Fill Management

69. The Proponent shall prepare a Spoil and Fill Management Sub Plan and incorporate this Sub Plan into the Construction EMP. This Sub Plan shall include:

    (a) details of the volumes of fill required in relation to staging of the project;
    (b) how spoil and fill material will be sought, handled, stockpiled, reused and disposed;
    (c) details of disposal sites and the volumes of spoil to be transported to each site;
    (d) details of the any contaminated soil and appropriate management and monitoring measures for potential contaminants; and,
    (e) a contingency plan to be implemented in the case of unanticipated discovery of contaminated material during construction.

The Spoil and Fill Management Sub Plan shall be fully integrated with the Construction Stage Traffic Management Sub Plan required by Condition 31, the Construction Soil and Water Management Sub Plan required by Condition 57, the Construction Air Quality Sub Plan required by Condition 77, the Construction Noise and Vibration Management Sub Plan required by Condition 42 and the Waste Management and Reuse Sub Plan required by Condition 80.

70. All material excavated from the works shall be reused or recycled where suitable and cost effective to do so. The Proponent shall ensure that of the reuse of suitable material generated from construction activities is maximised in preference to importing fill.

Landscaping and Rehabilitation

71. As part of the Construction and Operational EMPs, the Proponent shall prepare a detailed Landscaping and Rehabilitation Sub Plan in consultation with Ballina Shire Council, all affected landowners and the Community Liaison Group. The Sub Plan shall include, but not be limited to the following:

    (a) sections and perspective sketches;
    (b) methodology of landscaping works;
    (c) location and identification of existing and proposed vegetation including use of indigenous species;
    (d) location of mounds, bunds, structures or other proposed treatments, finishes of exposed surfaces (including paved areas), measures to preserve bio-diversity, colours and specifications, staging of works, methodology of landscaping;
    (e) design of bridges;
    (f) progressive landscape strategies incorporating other environmental controls such as erosion and sedimentation controls, dust mitigation, drainage, noise mitigation;
    (g) decommissioning of all construction structure not that are not part of the operational project;
    (h) lighting; and,
    (i) monitoring and maintenance procedures.

    The Proponent shall also include landscape strategies incorporating other environmental controls such as erosion and sedimentation controls, noise mitigation measures, drainage structures and lighting.

72. All landscaping works shall be monitored and maintained by a suitably qualified landscape specialist at the Proponent's expense for a period of not less than three years following completion of the relevant road stage when landscaping is undertaken. The Proponent shall implement any required remediative measures to maintain landscaping works to a high standard. Any landscaping within the road reserve shall be maintained by the Proponent for the life of the project.

Heritage

Test Excavation Works

73. The Proponent shall undertake a subsurface testing program on PADs 1, 2 and 3 in consultation with the Jali Local Aboriginal Land Council, and NPWS, prior to the commencement of construction. The Proponent shall ensure that these works are carried out in accordance with a valid permit obtained under Section 87 of the *National Parks and Wildlife Act 1974*.

Indigenous Heritage Management Sub Plan

74. The Proponent shall prepare an Indigenous Heritage Management Sub Plan, in consultation with the Jali Local Aboriginal Land Council and NPWS as part of the Construction EMP. This Sub Plan shall include:

    (a) details of the archaeological investigations to be undertaken;
    (b) details of any licences and approvals required,
    (c) detailed plans to be implemented if previously unidentified items/areas are located during construction;
    (d) an education program for all personal on obligations with regard to Aboriginal cultural materials; and,
    (e) management/salvage measures for all identified features.

Non-Indigenous Heritage Survey

75. The Proponent shall prepare a Report on the European Heritage Survey of the Historic House at Cumbalum (the Campbell Property) and the remains of the Ballina to Booyong Rail Line in consultation with Ballina Shire Council prior to the commencement of construction. The Report shall include a photographic record in colour, monochrome print and colour transparency prepared in accordance with the guidelines by the Department and the Heritage Office entitled *How to Prepare Archival Records of Heritage Items* and *Photographic Records of Heritage Sites, Buildings and Structures*. Copies of the Report shall be forwarded to Ballina Shire Council and local libraries.

Unexpected Items

76. If during the course of construction the Proponent becomes aware of any heritage items or archaeological material, all work likely to affect the site(s) shall cease immediately and the relevant authorities, including NPWS, NSW Heritage Council and the relevant Local Aboriginal Land Council shall be consulted to determine an appropriate course of action prior to the recommencement of work at that site. Appropriate supporting documentation would need to accompany any application for required permit/consent(s).

Air Quality

Construction Air Quality Sub Plan

77. As part of the Construction EMP, a detailed Construction Air Quality Sub Plan shall be prepared in consultation with the EPA. The Sub Plan shall provide details of all dust control measures to be implemented during the construction stage, including, but not limited to:

    (a) pro-active measures to reduce dust from stockpiles and cleared areas and other exposed surfaces;
    (b) progressive revegetation strategy for exposed surfaces in accordance with Conditions 58 and 71; and,
    (c) monitoring and maintenance requirements.

78. Where there is a risk of losing material, construction vehicles using public roads shall be maintained and covered to prevent any loss of load, whether in the form of dust, liquid or soils. Construction vehicles and construction roads shall be maintained in such a manner to minimise tracking of any

track mud, dirt or other material onto any street which is opened and accessible to the public. In the event of any spillage, the Proponent is required to remove the spilt material within 24 hours.

Hazards and Risk Management

79. As part of the Construction and Operational EMPs, the Proponent shall prepare and implement a Hazards and Risk Management Sub Plan. This Sub Plan shall include, but not be limited to the following:

    (a) details of the hazards and risks associated with the project; and,
    (b) pro-active and reactive mitigation measures including contingency plans to be implemented in the event of a pollution incident.

Waste Management and Recycling

Waste Management and Recycling Sub Plan

80. As part of the Construction and Operational EMPs as relevant, a detailed Waste Management and Reuse Sub Plan shall be prepared in consultation with the EPA. The Sub Plan shall address the management of wastes during the construction and operation stages respectively in accordance with Government's *Waste Reduction and Purchasing Policy*. It shall be prepared prior to construction, and shall identify requirements for:

    (a) waste avoidance;
    (b) reduction;
    (c) reuse; and,
    (d) recycling,

    and details of requirements for:

    (e) handling;
    (f) stockpiling;
    (g) disposal of wastes: specifically contaminated soil or water, concrete, demolition material, cleared vegetation, oils, grease, lubricants, sanitary wastes, timber, glass, metal, etc.;
    (h) implementation of energy conservation best practice; and,
    (i) identifying any site for final disposal of any material and any remedial works required at the disposal site before accepting the material.

81. Any waste material that is unable to be reused, reprocessed or recycled shall be disposed at a landfill licensed by the EPA to receive that type of waste. The Waste Management and Reuse Sub Plan shall be framed using the waste minimisation hierarchy principles of avoid-reduce-reuse-recycle-dispose. This shall also include the demand for water.

Utilities and Services

82. The Proponent shall identify the services potentially affected by construction activities to determine requirements for diversion, protection and/or support. This shall be undertaken in consultation with the relevant service provider(s). Any alterations to utilities and services shall be carried out to the satisfaction of the relevant service provider(s), and unless otherwise agreed to, at no cost to the service/utility provider(s).

83. The Proponent in consultation with utility authorities shall ensure that disruption to services resulting from the project are minimised and advised to customers.

Cumulative Impact Assessment

84. As part of the Construction and Operation EMPs the Proponent shall identify parameters to be monitored during construction and operation of the project which have the potential for cumulative effects to occur. The Proponent shall also define the time period for which the identified parameters will be monitored. The results of such monitoring shall then be used as an input to the RTA's Cumulative Impact Assessment Study and made available to relevant government agencies and the Community Liaison Group.

Location of Construction Facilities

85. The Proponent shall only construct concrete batching plants and construction compounds under these Conditions of Approval in those locations that satisfy the following criteria:

    (a) sites to be located within the road corridor assessed in the EIS and Representations Report to the greatest extent possible;
    (b) sites to be located with ready access to the local road network;
    (c) sites to be located to minimise the need for heavy vehicles to travel through Ballina;
    (d) sites on relatively level land;
    (e) sites to be separated from nearest residences by at least 200 m unless It can be demonstrated to the satisfaction of the Director-General that there will be no adverse noise, visual and air quality impacts;
    (f) sites are not to be permitted within 100 m of, or drain directly to, SEPP 14 wetlands;
    (g) sites are not to be located within 100 m of waterways unless adequate erosion and sediment controls are implemented to protect water quality;
    (h) sites must be above the 20 ARI flood level unless a contingency plan to manage flooding issues is prepared and implemented;
    (i) sites are to have low conservation significance for flora, fauna or heritage and they are not to require any clearing of native vegetation beyond that which must be cleared for the project in any case; and,
    (j) sites are to be selected so that the operation of the plant does not impact on the land use of adjacent properties.

The location of any concrete batching plants/construction compounds considered under these Conditions of Approval shall be detailed in the Construction EMP and shall include demonstration that the above criteria have been met.

APPENDIX A

Director-General's Concurrence

APPENDIX B

Ballina Shire Council's Development Consent

APPENDIX C

Pells Sullivan Meynink – Peer Review of Geotechnical Assessment