



Part

C

Assessment of
key environmental
issues

9 Environmental risk assessment

Environmental risk assessment has been an integral activity throughout the development of the Sapphire to Woolgoolga project. This chapter identifies the environmental risk assessment undertaken during the route options development, preferred route selection and environmental assessment phases of the Proposal. These project phases have each incorporated findings from supporting technical investigations and stakeholder consultations that have enabled the NSW Roads and Traffic Authority's (RTA) project team to progressively make informed decisions based on a clear understanding of the environmental and social risks associated with the study area and the Proposal.

9.1 Route options development phase

The methodology adopted for the development of route options incorporated a combination of three main activity streams including:

- Constraints analysis to examine social, environmental and engineering influences on option development.
- Route options identification and comparative environmental assessment of the impacts.
- Engineering concept development of feasible route options.

The constraints analysis occurred in two stages: firstly to facilitate broad corridor identification and secondly, to support route options development. In both stages, the constraints mapping was an important input to the corridor and route option planning and was based on preliminary investigation of current and proposed urban development, topographical and geotechnical aspects, land use and key environmental planning issues (e.g. heritage, archaeology and flora and fauna).

This approach meant that key environmental and social constraints played a fundamental part in generating route options at the earliest opportunity, so as to avoid or minimise potential adverse impacts. As such, the engineering concepts for the corridors and subsequent route options were prepared in parallel with a screening of key environmental risks. As a result, many potential route options that had engineering design merit (including some options generated from the *Quantm* planning tool) were discarded because of environmental conflicts that became evident through the constraints analysis work.

The route options identification stage involved refinement of the initial corridor boundaries through the following specialist technical studies and design activities that were carried out:

- Aboriginal and non-Aboriginal heritage.
- Planning and land use impacts.
- Traffic noise.
- Topography, hydrology and geology.
- Air quality.
- Biological (flora and fauna).
- Geotechnical.
- Agricultural land.
- Socio-economic issues.
- Traffic and transport.
- Cost estimates and road user cost benefit analysis.
- Urban design and visual assessment.
- Concept engineering design.

The results of these specialist studies as well as community consultation undertaken with the community, council and government departments contributed to identification of feasible route options within each corridor and ways of avoiding, minimising or mitigating impacts on areas identified as environmentally or socially sensitive.

As noted in Chapter 6, the supplementary Options C1 and E were developed in response to the request of Coffs Harbour City Council due to concerns over the alignment of Option C and its impact on future urban development potential, especially in the south Woolgoolga area. These routes were developed and assessed in a manner consistent with the approach for the previously assessed route options.

9.2 Option evaluation

Environmental risk assessment was also an inherent part of the options evaluation process. The value management workshops held in April 2003 and August 2004 were important inputs in the route selection process (refer Chapter 6). The workshops adopted an approach that was based on comparative assessment of the relative impacts and benefits of the new and revised route options. Both workshops used a "triple bottom line" method for the comparative assessment of short-listed highway options. Within each of the three assessment or 'performance' categories considered, specific criteria were developed that reflected the main project risks as perceived by the workshop participants.

The criteria, which are shown in Table 9.1, were also numerically weighted to reflect their relative importance and, in this way, the workshop participants were able to assign a collective value judgement on the likelihood of impacts and the associated consequences of the options.

"Bio-physical" and "socio-economic" environmental aspects were therefore extensively considered as part of the risk assessment process undertaken as part of the development, and subsequent assessment of various route options.

9.3 The preferred route

The risk assessment that was integrated in the option evaluation phase culminated in the adoption of the preferred route which was announced in December 2004. In the following period of design development through much of 2005 and 2006, a range of specialist investigations were initiated and progressed.

TABLE 9.1 VALUE MANAGEMENT WORKSHOP TRIPLE BOTTOM LINE

TRIPLE BOTTOM LINE CATEGORY	ASSESSMENT CRITERIA
Functional performance	<ul style="list-style-type: none"> ■ Long term function, safety, flexibility, capacity. ■ Safety. ■ Travel time and efficiency.
Environmental performance	<ul style="list-style-type: none"> ■ Impact on water courses /aquatic environment. ■ Impact on fauna habitat /vegetation. ■ Impact on wildlife corridors. ■ Impact on threatened species.
Socio-economic performance	<ul style="list-style-type: none"> ■ Impact on local air quality. ■ Impact of traffic noise. ■ Extent of community severance. ■ Impact on Aboriginal heritage. ■ Impact on European heritage. ■ Impact on existing land use and business. ■ Impact on future land use planning. ■ Effects on landscape and visual amenity. ■ Impact on agricultural business/ viability.

These investigations were undertaken to support the ongoing refinement and development of the concept design for the preferred route and also in anticipation they would serve as key inputs to the environmental assessment for the adopted Proposal. The investigations included:

- Terrain surveys.
- Significant geotechnical investigations.
- Flora and fauna studies.
- Land use and agricultural investigations.
- Environmental investigations into soil and water management, traffic noise and air quality.
- Social analysis (e.g. Sikh cultural assessment).
- Heritage studies (Aboriginal and non-Aboriginal).
- Visual impact and urban design.

The information and results from these comprehensive investigations was integral to the preliminary environmental assessment included in the *Project Application Report* (Connell Wagner 2006) provided to the Department of Planning in October 2006. That assessment was based on a typical environmental risk assessment approach that comprised the following:

- Environmental planning risk identification.
- Likelihood and consequence analysis / ratings.
- Development of risk responses – this took the form of defining environmental mitigation and management measures.

The key environmental risk categories / issues identified through this risk assessment process were included in the project application report.

9.4 Environmental assessment phase risk review

The consideration of environmental risk issues for the Proposal has been comprehensive, spanning diverse bio-physical aspects as well as community, social and economic risk matters. The risk analysis completed at various stages was also able to draw on considerable input from the community as well as key government, council and other stakeholders to ensure project impacts were identified, minimised and managed at each stage of development.

The key issues identified in the environmental assessment requirements for the Proposal were:

- Planning and land use.
- Traffic and access.
- Traffic noise and vibration.
- Biodiversity (flora and fauna).
- Heritage.
- Economic and social impacts.
- Soil and water.
- Urban design and landscaping.

After receipt of the environmental assessment requirements, another round of environmental risk analysis was undertaken. The level of environmental risk was assessed through a consideration of the potential environmental impacts of the Proposal and the ability to manage those impacts to minimise potential harm to the environment.

While the approach to the environmental risk review is qualitative, it provides an important step in the process of project planning and assessment of the potential environmental impacts. It also provides a guide to scoping the environmental investigations and assessments, the refinement of the concept design and the identification and assessment of management responses and mitigation measures for the Proposal.

The criteria used for the environmental risk analysis is below and outlines the risk categories as well as the description of each category:

A	Proposal may have a medium to high impact and investigations are / were required to describe and determine the level of potential impact and identify appropriate measures to manage the effects.
B	Proposal may have a medium impact but using standard management measures, the effects can be reduced to acceptable levels.
C	Has low impact and standard measures can be used to manage the effects.

The environmental assessment phase environmental risk analysis is summarised in Table 9.2.

TABLE 9.2 ENVIRONMENTAL RISK ANALYSIS

ISSUE	RISK	RISK REVIEW	RISK CATEGORY	REPORT REFERENCE
<p>Noise and vibration (identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> Noise impacts on sensitive receivers during construction and operation. 	<ul style="list-style-type: none"> New noise source along the bypass, with a number of sensitive noise and vibration receivers within the study area. Use of low-noise pavement along the alignment to reduce noise levels. Impacts from construction activities, heavy vehicle movement and blasting. However, impacts would be transient and short-term. Noise monitoring and modelling to assess the potential noise and vibration impacts of the Proposal (both construction and operation) on sensitive receivers. Proposed management measures to be derived from noise assessment and incorporated into the Proposal. Community consultation has consistently raised construction noise as an issue of concern. 	<p>A</p>	<p>Chapter 11</p>
<p>Air quality and greenhouse gases</p>	<ul style="list-style-type: none"> Impacts from dust and emissions of heavy construction machinery during construction. Impact on emissions during operation of Proposal. 	<ul style="list-style-type: none"> Potential for dust generation during earthworks, other construction activities and from construction vehicle movements. Impacts would be transient and short-term. Reduced vehicle emissions through Woolgoolga due to bypass and along existing highway between Sapphire and south Woolgoolga due to free traffic flow along new high standard dual carriageway highway. Additional vehicle emissions with progressive traffic growth along corridor including introduction of near-field emissions to new rural areas along bypass section. 	<p>C</p>	<p>Chapter 20</p>
<p>Biodiversity (flora and fauna) (identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> Loss of or disturbance to threatened flora and fauna species. Potential impact on endangered ecological communities. Vegetation clearance and loss of habitat. Potential for impacts on aquatic habitat 	<ul style="list-style-type: none"> The existing environment consists of woodland and cleared areas. The Proposal could potentially impact on the following endangered ecological communities: Lowland rainforest on floodplain; Subtropical coastal floodplain forest; Swamp oak floodplain forest; Swamp sclerophyll forest. Where feasible and practical, the Proposal has been refined to avoid and / or minimise potential impacts on threatened / endangered flora and fauna species and endangered ecological communities. Prior to or during construction, the RTA will develop a compensatory habitat agreement in consultation with the Department of Environment and Climate Change to offset impacts from the Proposal. The agreement may be developed in conjunction with a number of Pacific Highway upgrade projects on a regional basis. Footprint of road and vegetation clearance to be kept to a minimum to avoid and / or minimise potential impacts on vegetation clearance and loss of habitat. Major creeks are to be bridged and loss of riparian vegetation to be minimised. Design has been undertaken in accordance with Department of Primary Industries (Fisheries) Guidelines. 	<p>A</p>	<p>Chapter 17</p>

ISSUE	RISK	RISK REVIEW	RISK CATEGORY	REPORT REFERENCE
<p>Hydrology, water quality and soil management (identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> ■ Disturbance of soils and potential for soils to become susceptible to erosion. ■ Water quality impacts during construction and operation. 	<ul style="list-style-type: none"> ■ Adequate protection of both cut batters and fill embankments to be provided including grassing, the provision of cut-off drains and landscaping to divert water away from cut and fill batters. Sediment traps to be implemented. Removal of vegetation during construction only where absolutely necessary. ■ While deep cuts could locally lower the water table and may have adverse effects on water levels and yields in existing water bores, continual monitoring of bores would be undertaken during and post-construction phase. ■ Potential issue of accidental spills during operation – measures in the form of detention structures or contingency plans or a combination of both would be effective in minimising harm from spills. ■ The Proposal has been developed so as to avoid the project causing any significant adverse flooding impacts, including afflux, flood levels, velocities, duration and inundation times. All water-way crossings would be located and sized so as to not cause any significant adverse flooding impacts. 	A	Chapter 18
<p>Contaminated land</p>		<ul style="list-style-type: none"> ■ Disturbance of, and inappropriate classification and handling of, contaminated land. ■ Adequate identification of areas of contaminated land, including "hot spots" (especially associated with lands previously and currently used for banana plantations) to ensure that all identified contaminated land is correctly classified and handled and disposed of according to classification. Additional sampling and assessment would be undertaken prior to and during construction. ■ Materials handling procedures would be designed in order to protect human health and not pose an unacceptable risk to the environment. 	B	Chapter 20
<p>Traffic and transport (identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> ■ Potential traffic disruptions on highway and local roads during construction. ■ Changes to local traffic movement. 	<ul style="list-style-type: none"> ■ Local traffic movement would be safer as a result of the introduction of the local access road network and rationalisation of access points onto the highway to two at grade and five grade-separated interchanges. ■ Public transport and pedestrians would travel along the local access road network. ■ Reduction of traffic volumes through Woolgoolga with local traffic and accessibility benefits in the area. 	A	Chapter 10
<p>Agriculture (identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> ■ Property impacts. 	<ul style="list-style-type: none"> ■ 40 agricultural properties would be affected by the bypass alignment. Preliminary agricultural assessment identified that 19 properties would be severely to critically affected. Access has been provided to some severed parcels of land and land consolidation of some severed parcels to be assessed pre-construction. ■ Potential implications for aerial spraying of bananas. 	A	Chapter 15

ISSUE	RISK	RISK REVIEW	RISK CATEGORY	REPORT REFERENCE
<p>Planning and land use (Identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> ■ Property acquisition. ■ Property access impacts. ■ Land use impacts. 	<ul style="list-style-type: none"> ■ Direct impact on approximately 127 properties along the entire length of the Proposal. The Proposal has been refined to minimise potential impacts on properties. ■ Bypass section passes across the south west corner of south Woolgoolga urban investigation area. No detailed development plans for area prepared to date by Coffs Harbour City Council. ■ The Proposal would provide vital transport infrastructure which would support the future increase in population along the northern beaches. ■ Bypass section passes through productive state forest lands. ■ Property accesses to be re-arranged to link with the proposed local access road network. 	<p>A</p>	<p>Chapter 14</p>
<p>Hazards and risks</p>	<ul style="list-style-type: none"> ■ Potential for hazardous material spillage. ■ Potential impacts from storage of hazardous materials during construction period. 	<ul style="list-style-type: none"> ■ Spill containment measures / facilities for incidents near sensitive environments to be incorporated into design. 	<p>C</p>	<p>Chapter 20</p>
<p>Aboriginal heritage (Identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> ■ Direct impact on 7 identified Aboriginal heritage sites. ■ 4 other identified Aboriginal heritage sites not affected but where management measures are proposed. ■ 8 potential archaeological deposits impacted by the Proposal. 	<ul style="list-style-type: none"> ■ Proposal has been refined to minimise direct impact on western flank of important Aboriginal heritage site near Coffs Harbour Gun Club and identified site S2W-13. ■ Aboriginal heritage assessment to identify measures to manage impacts to heritage sites. 	<p>A</p>	<p>Chapter 12</p>
<p>Non-Aboriginal heritage</p>	<ul style="list-style-type: none"> ■ 6 non-Aboriginal heritage items impacted by Proposal. 	<ul style="list-style-type: none"> ■ Only one heritage item is a registered heritage item. The Solitary Islands Marine Park is listed on the Register of National Estate. Appropriate water quality measures would be implemented during construction and operation phases. 	<p>A</p>	<p>Chapter 13</p>
<p>Resources</p>	<ul style="list-style-type: none"> ■ Demand on resources. 	<ul style="list-style-type: none"> ■ Proposal designed to achieve an approximate fill / cut balance, however imported material may still be required. ■ Batch plants to be located and imported material to be sourced so as to minimise any transport distance. 	<p>C</p>	<p>Chapter 8</p>

ISSUE	RISK	RISK REVIEW	RISK CATEGORY	REPORT REFERENCE
<p>Visual, urban design and landscape (identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> Visual impacts and loss of visual amenity along the existing highway upgrade and bypass sections in project area renowned for its scenic qualities. 	<ul style="list-style-type: none"> Adverse visual impacts anticipated – particularly between Sapphire and Moonee and through the southern and central sections of the Woolgoolga bypass. Suitable urban design and landscape management strategies / plans to be developed and incorporated into the Proposal. 	A	Chapter 19
<p>Socio-economic analysis (identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> Reduction in amenity along bypass alignment. Severance effects by the Proposal. Potential reduction in through traffic stoppages along the northern beaches. 	<ul style="list-style-type: none"> Community cohesion in west Woolgoolga rural area affected by new route. However, within the urban centre of Woolgoolga, would be enhanced due to diversion of substantial traffic flows. Positive overall impact on local economy (including tourism) due to enhanced road transport conditions and travel time / safety improvements through the study area. Although the local economy of Woolgoolga does not have a heavy reliance on highway related trade, there would be some loss in patronage to businesses along the existing Highway when the bypass is operational. However, improved amenity and accessibility could improve local patronage. 	A	Chapter 16
<p>Local Sikh community (identified as a key issue in the environmental assessment requirements)</p>	<ul style="list-style-type: none"> Community concern that impact on Sikh owned rural properties could result in broader cultural effect for the community. 	<ul style="list-style-type: none"> Sikh cultural assessment undertaken to assess impacts – which are related to property ownership and agricultural impacts, however there would not be widespread impacts that would result in mass migrations out of the area that would affect the integrity of the community. 	A	Chapter 16
<p>Cumulative impacts</p>		<ul style="list-style-type: none"> The overall Pacific Highway Upgrade Program is expected to generate cumulative impacts (both beneficial and adverse) with issues relating to traffic growth (especially in heavy vehicles) being of particular community concern due to potential traffic noise and road safety concerns. 	C	Chapter 21

ISSUE	RISK	RISK REVIEW	RISK CATEGORY	REPORT REFERENCE
<p>Ecologically sustainable development</p>	<ul style="list-style-type: none"> The Proposal is designed with ecologically sustainable development principles in mind. 	<ul style="list-style-type: none"> Inter-generational equity – proposal is new transport infrastructure that would benefit current and future generations by enabling safe and efficient travel through and within the area for multiple social and economic purposes. Precautionary approach – development of major new infrastructure into new rural / natural environment (especially bypass section) has the potential to introduce assorted environmental impacts, the nature and extent of which are generally well understood. Issues regarding ecology integrity and economic values are addressed in other sections above. 	<p>C</p>	<p>Chapter 21</p>