6. Biophysical Issues

6.1 Topography and Geotechnical

6.1.1 Terrain and Land Use

The Coastal Ridgeway Option leaves the existing Pacific Highway alignment just south of Englands Road. The alignment heads almost due west between Englands Road and Newports Creek before turning north at the foot of the Coastal Range scarp face. The road would climb from this point as it passes into Boambee State forest. The alignment stays within the steep hilly terrain (slopes 8-35%) passing through Orara East State Forest. At approximately 1km south-west of Old Bucca Road the CRW either starts a descent before connecting with the Sapphire to Woolgoolga Option D (existing highway upgrade) just north of Bucca Road or continues north along the top of the escarpment before connecting with the Sapphire to Woolgoolga Option A. Due to the steep hilly terrain associated with the Coastal Range, numerous deep cuts or tunnels, high fills and viaduct structures will be required along this alignment.

6.1.2 Geology

The Department of Mineral Resources 1 : 100,000 Geological Series Sheet SH 56 – 11 of Coffs Harbour (undated), the 1992, 1 : 250,000 Metallogenic Study and the Mineral Deposit Data Sheets SH 56/-10 & SH/56 –11 of Dorrigo – Coffs Harbour indicate that the geology along the alignment is subdivided into two main units of Late Carboniferous age. Rocks of the Coramba Formation underlie the northern section down to just south of Korora. South of this, rocks of the Brooklana Formation underlie the area. The regional metamorphic grade increases from north to south. The rock types vary from lower grade feldspathic wackes in the north to higher grade argillites and black siltstones in the south. The Coramba Beds overly the Brooklana Formation and both are strongly folded and faulted.

The Brooklana Formation comprises thin-bedded siliceous argillite, slate and rare siliceous greywacke and the Coramba Formation comprises thin-bedded Greywacke, slate and siliceous argillite. The engineering properties of the two formations are expected to be similar and hence certain general characteristics ascertained from the recent investigations on Option A in the northern strategy area (on the Coramba Formation) can be assumed to apply to the section of the CRW within the Brooklana Formation.

6.1.3 Major Geotechnical Considerations

Cuttings

The steep terrain requires deep cuts in order to obtain satisfactory vertical alignment. Numerous deep cuts in excess of 30m would be necessary along the Coastal Ridgeway option.

Throughout the steep terrain the rock head is expected to be very shallow with a thin soil cover. The extremely weathered rock in the upper regions of the rock profile is expected to be fragmented and low strength rock and will need to be battered back at 1V:2H. At deeper depth the rock may become highly silicified, very high strength rock and require blasting to excavate. The silicified rock, although much harder and less weathered is typically highly fractured, it would therefore be prudent, for planning purposes, to assume that cuts may have to be battered back at 1V:1.5H in the harder rock. Terraces would be provided at 7 – 10 metre intervals to provide drainage, allow for maintenance and protect the adjacent carriageway from rock falls.

Rock excavated from cuttings would most probably be suitable as general rock fill and maybe suitable in road layerworks and concrete.

Fill Embankments

Due to the rugged terrain consisting of ridges and steep sided valleys, major fill embankments will be required along the CRW. The indicative vertical alignment indicates that many of the fill embankments would need to be between 30 to 40m high. Numerous other areas of fill less than 10m high would also be required.

Typically the embankments are expected to be founded on stiff to very stiff subgrades or benched into rock in the sides of the steep valleys

Fill embankments would have to be constructed no steeper than 1V:2H for stability purposes but may need to be flattened to 1V:3H or 1V:4H for ease of maintenance. Batter slopes would need to be broken at 7.5m vertical intervals by a 4.0m wide bench/berm. Batter slopes would then be topsoiled and grassed to reduce the possibility of erosion. Significant earthworks are expected to be required to bench in the very high embankments to ensure stability.

Deeper compressible alluvial soils may be encountered near the tie-in points with the existing Pacific Highway at the northern and southern ends of the alignment. At these points some re-working and/or stabilisation of the existing subgrade material may be required using methods such as wick drains.

Structures

As previously noted, significant engineering structures including tunnels and viaducts would be required as part of the CRW proposal. Founding of bridge and viaduct structures is not likely to be a major concern due to the expected shallow bedrock. Hard rock tunnelling methods would have to be employed, probably including both tunnel boring machines and drill and blast methods. The high quartz content and high unconfined compressive strength of the material would result in significant wear on machinery.

Slope Stability

Clearing of the vegetation on the steep slopes may cause localised slope instability especially on steep colluvial slopes associated with the Suicide soil landscape formation which covers much of the CRW alignment. Cutting benches for fill construction may cause instability of the colluvium and excavation of benches would have to be carefully monitored. The stability of cut and fill batters is expected to be satisfactory if constructed to the suggested batters. However, numerous high angled slickensided joints were evident in the rock investigated for the more northern Option A. Some inferred faults are shown on the geological map of the area and if encountered along the CRW, they could be a potential failure plane and may cause larger rockslides where the fault intersects proposed cuttings.

Erosion

Typically the soils tested throughout the northern section of the strategy area were of very low dispersion potential with Emerson Class Numbers of 5 to 6. However, the fine grained nature of all the soils means they are particularly susceptible to sheet and gully erosion. The Megan soil landscape is indicated to be highly to very highly susceptible to this type of erosion. Adequate protection of both cut and fill embankments would be required. Measures would include benching, grassing and the provision of cut-off drains and landscaping to direct water away from the cut and fill batters.

6.2 Biodiversity

A desk study was undertaken to identify the broad impacts of the CRW proposal on ecological communities, threatened terrestrial species, wildlife linkages, Koala habitat and threatened aquatic species. Further details are contained within Appendix I.

From existing information it was possible to determine that the CRW passes through twelve vegetation types, including a number of rainforest, wet and dry sclerophyll eucalypt forests and a swamp forest (refer Figure 5.5). This variety of communities reflects the traverse of the CRW from the environments associated with coastal lowlands at the southern and northern ends, to those of the more elevated and rugged land to the west. The indicated native vegetation removal required as a direct result of CRW would be as follows:

- 64.4ha of High Conservation Status and 20ha of Low Conservation Status ecological communities
- 4.1ha of Forest Management Zones 2 and 3, noted to constitute an informal reserve system within State Forests.

These Forest Management Zones have recently been declared special management zones under the *National Park Estate (Reservations) Act 2002*. Special management zones are recognised in the *Forestry Act 1916* as areas of State forest that have special conservation value and certain forestry operations, such as general purpose logging, are prohibited in these zones. With certain exceptions, Section 21A of the *Forestry Act* prohibits such a declaration to be revoked (either wholly or in part) except by an Act of Parliament or by notice of the Governor of NSW. The exceptions enabling revocation of special management zones only apply in certain circumstances and in accordance with the provisions of the *Forestry Act*. The exceptions are:

- exchange of land
- land up to 20ha being made available for a public work or public purpose

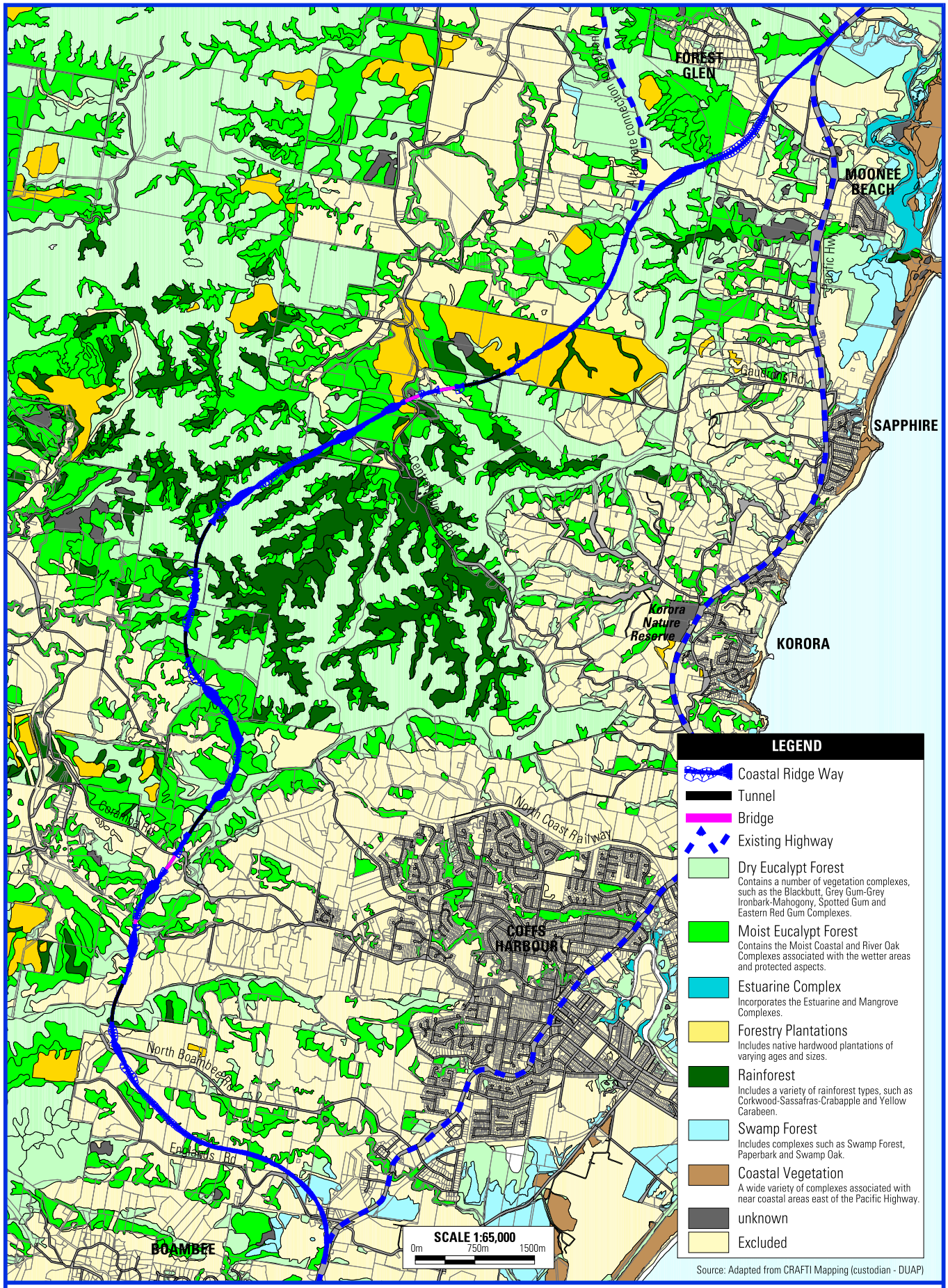
The agreement of both Houses is required to effect the revocation by an Act of Parliament.

All vegetation types in the study area have the potential to contain a number of threatened species and the location of records and the presence of suitable habitats indicate that the CRW could impact on a number of threatened species. Should a threatened species occur on the CRW, the extent of habitat removal is of a magnitude that it is likely to put at risk one or a number of local populations.

The CRW has the potential to impact on Regional and Sub-regional wildlife linkages and Koala movement corridors as shown in Figure 5.6. This is likely to have a substantial impact on the movement of fauna from large areas of vegetation in the west to coastal areas.

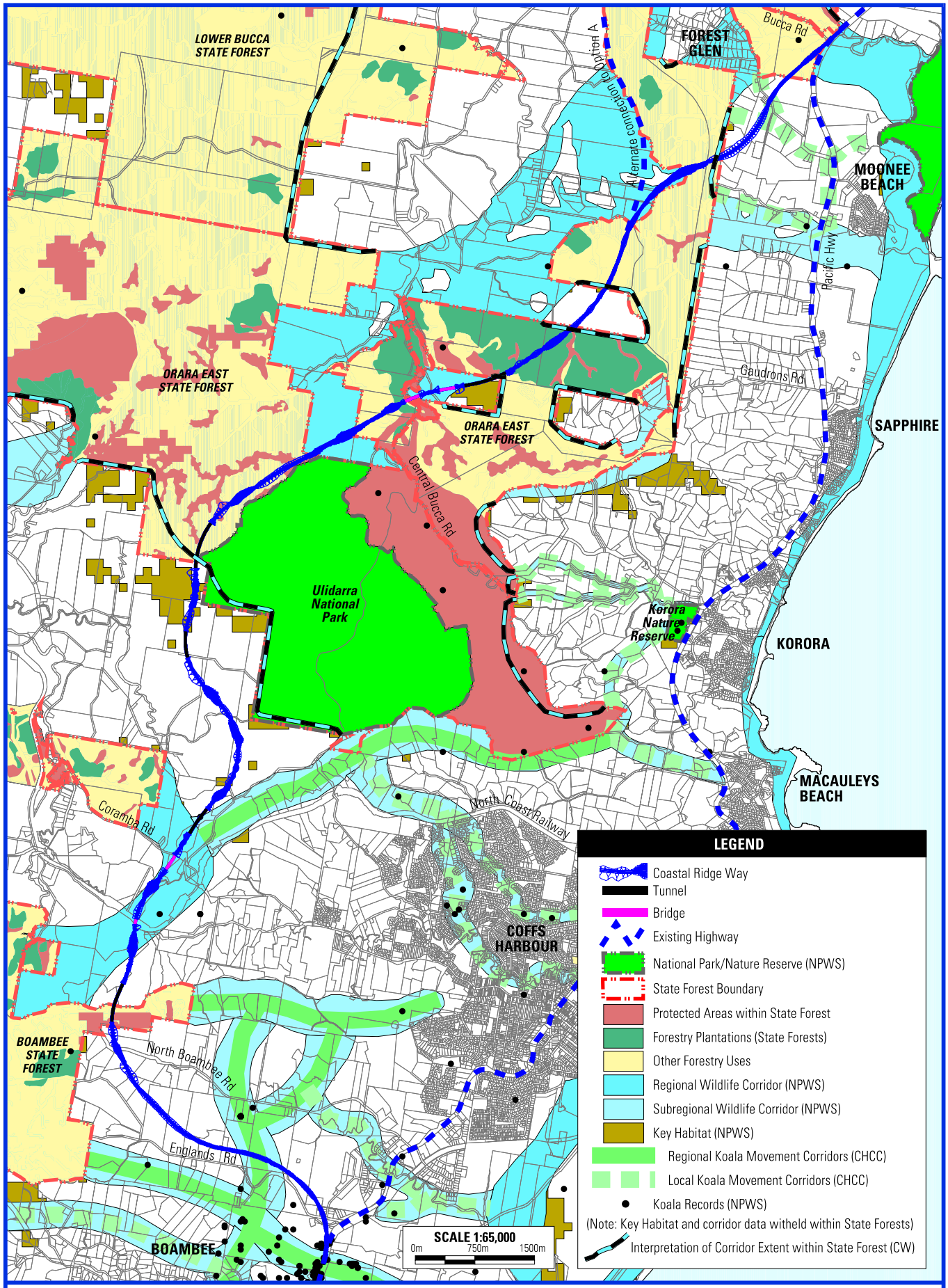
If adopted, the CRW would require extensive and expensive mitigative measures. Due to the nature of the environment traversed, it is considered unlikely that the road design or alignment could be altered such that impacts can be effectively avoided or minimised. As such, approval of the CRW would be highly dependent on mitigative measures to address impacts (e.g. fauna overpasses and underpasses, compensatory habitat etc.). However, it is considered likely that contemporary mitigation measures would only be partially effective in mitigating the impacts along much of the road.

The CRW is likely to result in a significant impact on one or a number of threatened species listed under the *Threatened Species Conservation Act* and the Commonwealth *Environment Protection & Biodiversity Conservation Act*. On this basis, it would require approvals from both the DEC and the Commonwealth Department of Environment & Heritage (formerly Environment Australia). The proposal would require very extensive and detailed ecological studies. Mindful of the probable high level of



COFFS HARBOUR HIGHWAY PLANNING
COFFS HARBOUR SECTION
REVIEW OF COASTAL RIDGE WAY

FIGURE 5.5
NATIVE VEGETATION



COFFS HARBOUR HIGHWAY PLANNING
COFFS HARBOUR SECTION
REVIEW OF COASTAL RIDGE WAY

FIGURE 5.6
KEY HABITATS AND CORRIDORS

habitat impact, the limited opportunities to avoid or minimise the impact, the high reliance on mitigation measures, the low prospect of achieving effective impact mitigation (even on the assumption that best practice measures are implemented) and the presence of viable alternative routes for the Highway, the approval process would be complicated with no certainty that approval could be achieved.

Option A for the Sapphire to Woolgoolga project forms the northern extension of the CRW proposal. This proposal passes through the recently declared addition to the Sherwood Nature Reserve. On 18 September 2003, the Hon Bob Debus MP, Minister for the Environment, wrote to the Hon Carl Scully MP, Minister for Roads, advising of the potential constraints and processes that may need to be adopted if a route through the Nature Reserve was selected as the preferred option. The letter included the advice that, should the preferred option traverse the Nature Reserve, a number of processes to enable the development of a road within a Nature Reserve would need to be followed, including the concurrence of the Minister for the Environment and the passage of an Act of Parliament to revoke the required section of the Nature Reserve. The letter also advised that, if the RTA makes an application to construct the road through the Reserve, the RTA would be required, at that time, to consider the availability of suitable alternative routes, and proposals to minimise/mitigate and/or compensate for the environmental impacts of the proposal on the DEC estate.