FLORA AND FAUNA ASSESSMENT
EXTENSION OF
CLEARY BROS (BOMBO) SAND QUARRY
GERROA, MUNICIPALITY OF KIAMA

A report prepared by
KEVIN MILLS & ASSOCIATES PTY LIMITED

OCTOBER 2006

05/042/2

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SUMMARY

This report provides a detailed description of the flora and fauna of a Project Area surrounding a proposed extension of quarrying operations at the sand quarry operated by Cleary Bros (Bombo) Pty Limited near Gerroa in the Municipality of Kiama. The report has particularly identified the conservation values on the Project Area and the adjacent land, and assessed the potential of the proposed quarry extension to impact on these values.

The report describes seven vegetation communities on the Project Area, five of which are native. These are Littoral Rainforest, Blackbutt-Banksia Forest, Bangalay Sand Forest, Swamp Sclerophyll Forest and *Phragmites* Reedland; the artificial communities are described as Miscellaneous Forest and Introduced Grassland. A vegetation map is provided showing the distribution of these vegetation communities within the extension area. Although most of the forest in the quarry extension area is not threatened, two endangered ecological communities occur within the extension area; small areas of Littoral Rainforest and Bangalay Sand Forest will be removed. Swamp Sclerophyll Forest on Coastal Floodplains occurs immediately adjacent to the proposed quarry extension.

The report provides a list of the plant species occurring within the Project Area; this list contains the names of 101 native species and 25 exotic species. A list of fauna species recorded in the Project Area over a period of several years is provided along with a larger list of species recorded nearby.

There is a very low probability of threatened plant species occurring in the Project Area. The presence or likely presence of several threatened fauna species in the Project Area is identified. These species are Australasian Bittern, Black Bittern, Powerful Owl, Swift Parrot, Green and Golden Bell Frog, Large Bentwing-bat and Grey-headed Flying-fox. An assessment, as provided for under the *Threatened Species Conservation Act 1995*, is carried out to determine if the proposed quarry extension is likely to have a significant effect upon these species or the above endangered ecological communities and thus whether a Species Impact Statement (SIS) is warranted.

The proposal will remove about 1.7 hectares of natural forest, 1.6 hectares of modified forest and 0.3 hectares of planted forest, as well as 3.9 hectares of exotic grassland. In compensation for this loss of forest, it is proposed to replant similar types of forest nearby on the same property over an area of at least four times the area removed. It is concluded that an SIS is not required for this proposal. This is contingent upon adequate protection being provided for the relatively large area of Swamp Sclerophyll Forest on the adjoining land.

The potential for species and communities listed under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* to occur on the site was also assessed. It was concluded that several internationally protected migratory species could occur there. After applying the criteria in the *Administrative Guidelines* (Environment Australia 2000), it is concluded that the proposed development is not likely to have a significant impact on any species and communities listed under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*, and referral to the Commonwealth Minister for the Environment for assessment and approval is not warranted.

Most of the forest to be cleared is identified in *Kiama LEP 1996* as Area of High Conservation Value, although few HCV boundaries match the native vegetation on the ground. Fragmentation of the forest in the area is considered as part of the assessment. The forest in the locality is already somewhat fragmented by past clearing, but connections exist between most extant stands of forest. The proposed quarry extension will cause a link between two forest areas to be severed, but the proposed creation and strengthening of other links nearby will mitigate this impact.

Recommendations are made to minimise and avoid impacting on the identified conservation values. Where there is likely to be some impact upon these values, including endangered communities and identified land under the LEP as being of high conservation value, proposals are outlined for compensatory measures.

Because the proposal involves the removal of about three hectares of forest, a major forest regeneration program is proposed in the vicinity of the Project Area. This will include the planting of an area of Littoral Rainforest and Bangalay Sand Forest in compensation for the clearing of a small area of these endangered ecological communities. A guide to the key matters dealt with in this document is provided in the following pages.

Guide to Matters dealt with in this Document

1 INTRODUCTION

This report was prepared by Kevin Mills & Associates, Ecological and Environmental Consultants, on behalf of Cleary Bros (Bombo) Pty Limited, of Port Kembla, operators of the Gerroa Sand Quarry. The purpose of the report is to investigate an area of land proposed for the extension of the existing sand quarry, and to (i) provide a description of the flora and fauna, (ii) identify any features of particular conservation importance, and (iii) assess the impact of the proposed quarry extension on these important features, as well as the flora and fauna in general.

The study area is referred to in this report as the "Project Area". It covers about 16 hectares and adjoins the existing sand quarry, extending northwards between Seven Mile Beach Road and a formed drainage channel that becomes Blue Angle Creek. The quarry extension covers about 7.5 hectares. The extent of the Project Area is shown on Figure 1.

A study by Kevin Mills & Associates (2005b) described in detail the flora, fauna, vegetation communities and habitats across the whole of the Cleary Bros (Bombo) land at Gerroa. That report forms a companion document to this current report; relevant information from the earlier reports is included here where relevant. Two other documents, namely a Draft Vegetation Management Plan and a Proposed Screen Planting report, both prepared for this project, accompany this report. All three reports should be read in conjunction with this Flora and Fauna Assessment.

This report has been prepared with due regard being given to the contents of the following:

- the Director General's Requirements from the Department of Planning, 20 January 2006;
- a letter from Department of Environment and Conservation (DEC), 30 September 2005;
- a further letter from DEC, 28 April 2006;
- a submission to Cleary Bros (Bombo) from Gerroa Environmental Protection Society, 15 May 2006;
- a letter from Department of Primary Industries, 18 May 2006.

All of the matters raised in the above documents have been covered in this report.

2 THE PROJECT AREA

The existing sand quarry has operated for many years and is located directly north and west of Berry Beach Road and Seven Mile Beach Road, respectively. The Project Area incorporates the proposed quarry extension as well as the immediately surrounding land; i.e. within 100 metres of the edge of the proposed quarry.

The Project Area is located about three kilometres to the southwest of Gerroa. The area extends to the north of the existing sand quarry for about 800 metres, with an average width of about 200 metres; see Figure 1. The area is on coastal sand dunes and flats and is mostly cleared of its original forest and now supports exotic grassland. Immediately to the north of the existing quarry there is a stand of forest.

The Project Area is about 700 metres inland from Seven Mile Beach, with drainage being directly into the sand, towards the existing dredge pond and to a drainage channel that becomes Blue Angle Creek on the western boundary of the area. This creek is a tributary of the Crooked River, located about 2.5 kilometres to the north.

3 SURVEY METHODS

Flora

Vegetation surveys were undertaken in the Project Area at various times between January 2005 and May 2006, although the consultant had studied this area on several occasions over the past 15 years. The purpose of the survey was to describe the vegetation on the site, prepare a vegetation map and a plant species list.

The character and distribution of the vegetation were investigated on the Project Area, with the assistance of a colour aerial photograph and a site plan provided by Perram & Partners, project managers. The boundaries were marked directly onto a base map, and a vegetation map was prepared later with the assistance of the colour aerial photograph. Vegetation survey plots, 20m by 20 m, were temporarily established within the three forest types on the extension area. Within these plots, information on the plants present in each stratum was recorded, as were the numbers of each tree species. A tree survey was undertaken in the two eucalypt forests, this survey consisted of measuring the diameter at chest height (dch) and the number of obvious tree hollows in 14 randomly selected trees within each forest community.

The vegetation communities were generally classified on the basis of their structure and the name(s) of the dominant species in the tallest stratum. Each community was also given an identification code, selected from a list of codes devised by the consultant (Mills 1998; Kevin Mills & Associates 2006a) to standardise the classification of the vegetation in the region. The names of the endangered ecological communities are the same as those used in the Final Determinations made by the NSW Scientific Committee.

As many as possible of the native plant species on the site were identified. The resulting list is reasonably comprehensive, but not definitive. Introduced plant species were also recorded during the species audit.

A vegetation map of the whole of the property was prepared by Kevin Mills & Associates (2005b), using a colour aerial photograph at a scale of about 1:3,570. This map was further refined for the purposes of this investigation.

Nomenclature

The plant species names in this report are the current names published by the National Herbarium of New South Wales in the *Flora of New South Wales* (Harden 1992-2002). Most of the common names are from the *Flora of New South Wales* (op. cit.) and *Australian Plant Genera* by Baines (1981).

Fauna

Fauna surveys were undertaken in the Project Area at various times between January 2005 and May 2006, although the consultant had studied this area on several occasions over the past 15 years. The study by Kevin Mills & Associates (2006b) documented the fauna of the Municipality of Kiama; that document provides a useful context and background information for the current investigation. The fauna of the locality was documented in the study prepared by Kevin Mills & Associates (2005b).

Diurnal fauna surveys were conducted on various occasions over many years; the current surveys were undertaken at the same time as the vegetation surveys. A nocturnal survey was undertaken in 2002 as part of a previous study (Kevin Mills & Associates 2002) and additional nocturnal surveys were undertaken in

mid-July 2005. Aquatic organisms within the drainage channel and Blue Angle Creek were not surveyed because the proposal does not involve any change to this watercourse nor its riparian vegetation.

The survey concentrated on mammals, birds, reptiles and amphibians, with the aim of detecting as many as possible of the species present. The survey results indicate which fauna species were observed during the survey. The survey results should not be regarded as a full inventory of the species that would occur in the Project Area; this could be obtained only during a long and intensive study spanning all seasons.

Mammals

Mammals were identified by sight, as well as by interpreting any distinctive calls and other conclusive evidence of their presence. The survey techniques included incidental sightings and a ground search for scats, tracks, diggings and other signs of mammal presence (Triggs 1996). A spotlight was used to detect nocturnal fauna, particularly arboreal mammals. A bat survey was undertaken in 2002 with ANABAT II echo-location instruments, that record the ultrasonic "calls" if insectivorous bats. The recordings were later analysed to identify the species that emitted them.

Birds

The birds on the site were identified by sight and by interpreting their calls. Observations were made throughout the whole study period, and all habitat types were investigated.

Pre-recorded calls of several threatened owl species (the Powerful Owl, Masked Owl and Barking Owl) were broadcast at various locations at night, in an attempt to elicit a response. The calls were played for several minutes, followed by several minutes of listening; this was repeated several times at each location. Each site was searched with a spotlight after the last set of calls.

Reptiles

The reptile survey was conducted during the hottest parts of the day, when sun and heat encourage maximum activity. A search for sheltering and cryptic reptiles was made in suitable locations, for example in habitat niches under rocks, logs and debris; these items were moved in the search for fauna, and then replaced. Potential basking sites were investigated, especially near water and on bare surfaces.

Amphibians

Amphibians were usually identified by interpreting characteristic calls. Moist areas and habitat niches were also searched, especially under rocks, wood and debris. A nocturnal frog survey was conducted with a spotlight, but the survey was mainly auditory.

Nomenclature

The fauna species nomenclature in this report is based on the Australian Museum's *The Mammals of Australia* (Strahan 1995), *Australian Bats* (Churchill 1998), *The Taxonomy and Species of Birds of Australia and its Territories* (Christidis & Boles 1994) and *Reptiles and Amphibians of Australia* (Cogger 1992).

4 VEGETATION

4.1 PLANT SPECIES

A plant list was prepared for the Project Area during the course of the current investigation. This plant list is provided in Appendix 1, where the name of the species, both botanical and common name, and the family to which each belongs, is stated. The list contains the names of 101 native species and 25 exotic (introduced) species, a total of 126 plant species.

Table 1
Ecological Communities in the Project Area

Community Name[1]/Map Unit	Status	Within Extension Area
Littoral Rainforest SIM-LRF	Endangered Ecological Community[1] Rare and restricted to small stands scattered along coast.	Small area of about 0.9 ha within Blackbutt-Banksia Forest on sand dunes.
Blackbutt - Banksia Forest PIL-BAN	Common and widespread in the Shoalhaven, less common in Kiama Municipality.	A stand exists on sand dunes immediately to the north of the existing quarry; this is about 1.7 ha in area.
Bangalay Sand Forest BOT-BAN (Bangalay - Banksia Forest)	Common and widespread in the Shoalhaven, less common in Kiama Municipality. EEC[1]	There is a partially cleared remnant of this forest in the central part of the area; this covers about 1.6 ha.
Swamp Sclerophyll Forest on Coastal Floodplains ROB-MEL	Endangered Ecological Community[1] Mostly cleared; rare on swampy sites along coast.	Occurs adjacent to the western edge of the proposed quarry extension.
Phragmites Reedland PHR-RDL	Part of the above endangered ecological community.	Adjacent to the Swamp Sclerophyll Forest on a water-logged area.
Miscellaneous Forest (Planted Native Trees) MIS-FOR	Planted areas using local native species; planted for screening and rehabilitation around dredge pond.	A stand of planted trees originally from about 1992 occurs at the southern end of the grazing land; this covers about 0.3 ha.
Introduced Grassland INT-GRL	Mainly grazing paddock supporting exotic grassland, mostly pasture improved.	Covers the grazing land in the northern part of the area.

1. Endangered Ecological Community under the NSW *Threatened Species Conservation Act, 1995*.

4.2 VEGETATION COMMUNITIES

The vegetation communities identified within the Project Area are summarised in Table 1; where a total of seven communities are listed, two of which are artificial. A description of each community is provided below the table. A map showing the distribution of the vegetation communities in the Project Area is provided in Figure 2.

LITTORAL RAINFOREST

Alternative Name: Simple Littoral Rainforest (Kevin Mills & Associates 2006a)
Code: SIM-LRF
Key Species: *Glochidion ferdinandi, Guioa semiglauca, Eucalyptus botryoides*
Description: This is a simple rainforest community, being dominated by only a handful of species. The dominant tree is Cheese Tree *Glochidion ferdinandi*, with occasional Guioa *Guioa semiglauca*. A few shrub specimens of Hairy Clerodendrum *Clerodendrrum tomentosum*, Native Olive *Notelaea longifolia* and Breynia *Breynia oblongifolia* occur. There is an overstorey of Bangalay *Eucalyptus botryoides* and Blackbutt *Eucalyptus pilularis* above the dense canopy of Cheese Tree. The ground cover is mainly composed of "non-rainforest" species, such as Spiny-headed Mat-rush *Lomandra longifolia*, Wandering Sailor *Commelina cyanea* and Flax-lily *Dianella caerulea*. Creepers are relatively common, with 10 species being recorded. These include Snake Vine *Stephania japonica*, Slender Grape *Cayratia clematidea* and Wombat Berry *Eustrephus latifolius*. A list of the plant species recorded in the stand in the Project Area is provided at Appendix 2. The information gained from a 20m by 20m survey plot in the northern part of the stand is provided in Appendix 3.
Occurrence: This community occurs at the base of the dunes in the southern part of the Project Area, between the Blackbutt Forest on higher ground and the Swamp Sclerophyll Forest and Bangalay Sand Forest on the lower land. It covers a small area, about 0.9 hectares. The eastern arm of the stand (see Figure 2) contains the most dense rainforest plants, particularly trees. The western section is far sparser, with almost no continuous rainforest tree canopy. This area does, however, meet the definition of Littoral Rainforest.
Regional Status: Littoral rainforest is an endangered ecological community under the NSW *Threatened Species Conservation Act 1995;* see Appendix 4. This type of littoral rainforest is quite common nearby, on the eastern side of Seven Mile Beach Road, where it occurs in Seven Mile Beach National Park and on Crown land to the north.

BLACKBUTT - BANKSIA FOREST

Alternative Name: Blackbutt-Banksia Tall Forest (Kevin Mills & Associates 2006a)
Code: PIL-BAN
Key Species: *Eucalyptus pilularis, Banksia integrifolia, Eucalyptus botryoides*
Description: This tall forest is dominated by Blackbutt *Eucalyptus pilularis.* The associated trees are Rough-barked Apple *Angophora floribunda* and Bangalay *Eucalyptus botryoides*, although these species are uncommon in the forest in the Project Area. The understorey is composed of small trees and shrubs, including Coast Banksia *Banksia integrifolia*, Cheese Tree *Glochidion ferdinandi*, Tree Broom-heath *Monotoca elliptica* and Maiden's Wattle *Acacia maidenii*. The common smaller shrubs and other plants in the forest include Spiny-headed Mat-rush *Lomandra longifolia*, Bracken *Pteridium esculentum*, Blady Grass *Imperata cylindrica* and Kangaroo Grass *Themeda australis*. Creepers such as Climbing Guinea Flower *Hibbertia scandens* and Native Rasberry *Rubus parvifolius.* Dense stands of the introduced rambling shrub Lantana *Lantana camara* occur in many places.
Occurrence: This community occurs on the higher dunes immediately to the north of the existing sand quarry; the area of this forest type is about 1.7 hectares. The data gained from a 20m by 20m survey plot is provided in Appendix 3.

Regional Status: A common and widespread forest type of coastal dunes, along the whole of the Shoalhaven coast, but much more restricted in the Kiama area. Blackbutt Forest is quite extensive on the sand sheet behind Seven Mile Beach. Much of the forest is in a much better condition than the forest in the Project Area, where there are no very large trees and Lantana is abundant. Most of this forest in the locality is within Seven Mile Beach National Park.

BANGALAY SAND FOREST

Alternative Name: Bangalay - Banksia Forest (Kevin Mills & Associates 2006a)
Code: BOT-BAN
Key Species: *Eucalyptus botryoides, Banksia integrifolia, Angophora floribunda, Acacia maidenii*
Description: This community has been heavily disturbed in the past; the scattered trees indicating the forest was largely cleared many years ago. The trees present in this forest are mainly Bangalay *Eucalyptus botryoides* and Rough-barked Apple *Angophora floribunda*, with occasional Maiden's Wattle *Acacia maidenii.* The open understorey is a grassland of native and some introduced species, mainly the result of grazing and "underscrubbing". The common native species include Kangaroo Grass *Themeda australis*, Common Bracken *Pteridium esculentum*, Spiny-headed Mat-rush *Lomandra longifolia*, Couch Grass *Cynodon dactylon*, Small-leaved Bramble *Rubus parvifolius* and Blady Grass *Imperata cylindrica.* Scatttered shrubs include Breynia *Breynia oblongifolia* and Corkwood *Duboisia myoporoides*.
Occurrence: Bangalay Sand Forest occurs on the central part of the Project Area; it has been partially cleared. The area of this forest is about 1.6 hectares. The data gained from a 20m by 20m survey plot is provided in Appendix 3.
Regional Status: Bangalay Sand Forest has all but gone from the Kiama area through extensive clearing for agricultural pursuits. In the Shoalhaven, it is common and widespread along the coast, including the nearby Seven Mile Beach National Park. Bangalay Sand Forest is listed as an endangered ecological community under the NSW *Threatened Species Conservation Act 1995*; see Appendix 5.

SWAMP SCLEROPHYLL FOREST ON COASTAL FLOODPLAINS

Alternative Name: Swamp Mahogany - Paperbark Forest (Kevin Mills & Associates 2006a)
Code: ROB-MEL
Key Species: *Eucalyptus robusta, Melaleuca linariifolia, Livistona australis, Casuarina glauca, Eucalypus botryoides*
Description: This forest contains the wetland trees Swamp Mahogany *Eucalyptus robusta*, Swamp Oak *Casuarina glauca* and Narrow-leaved Paperbark *Melaleuca linariifolia*. Other characteristic species, most associated with wet sites, include Cabbage Palm *Livistona australis*, Harsh Ground Fern *Hypolepis muelleri*, Tall Sedge *Carex appressa*, Tall Saw-sedge *Gahnia* clarkei, Common Reed *Phragmites australis* and, climbing the trees, Monkey-rope Vine *Parsonsia straminea*. In drier sites, Bangalay *Eucalyptus botryoides* is common and the following species are prominent, Coast Banksia *Banksia integrifolia*, Golden Wattle *Acacia longifolia* and Corkwood *Duboisia myoporoidoes*. The mapped community includes some stands of treeless reedland, dominated by Common Reed *Phragmites australis*.
Occurrence: This forest mostly occurs on very wet, swampy soils; in the Gerroa area it occurs below about the two metre AHD contour. In the Project Area, the community occurs along the drainage channel, Blue Angle Creek and its floodplain, all along the western edge of the proposed quarry extension.
Regional Status: This community is of high conservation value because it is relatively rare in New South Wales and has been heavily cleared from the floodplains along the coast. It has been listed as part of the Swamp Sclerophyll Forest Complex, an endangered ecological community under the NSW *Threatened Species Conservation Act 1995*; see Appendix 6. The forest is also of very high fauna habitat value, because *Eucalyptus robusta* flowers during winter, when many other sources of nectar are unavailable. Note that the stands of *Phragmites australis* are included in the endangered community, as described in the Final Determination to list this community.

PHRAGMITES REEDLAND

Alternative Name: Freshwater Wetlands on Coastal Floodplains.
Code: PHR-RDL
Key Species: *Phragmites australis*
Description: This community covers small areas within the Swamp Sclerophyll Forest. The main species is Common Reed *Phragmites australis* that generally grows quite densely.

MISCELLANEOUS FOREST (PLANTED NATIVE TREES)

Alternative Name: None.
Code: MIS-FOR
Key Species: *Casuarina glauca, Eucalyptus botryoides, Eucalyptus robusta, Melaleuca linariifolia, Acacia maidenii, Acacia longifolia*
Description: These areas support planted trees, most of which are local native species, particularly Swamp Oak *Casuarina glauca,* Bangalay *Eucalyptus botryoides,* Swamp Mahogany *Eucalyptus robusta,* Narrow-leaved Paperbark *Melaleuca linariifolia,* Maiden's Wattle *Acacia maidenii* and Golden Wattle *Acacia longifolia.* Many native plants are colonising these areas, although introduced plants are common and often dominate the ground cover, particularly Rhodes Grass *Chloris gayana*.
Occurrence: A copse of planted local native trees, covering about 0.3 ha, grows on previously cleared land in the central part of the Project Area; this planting was in about 1992.
Regional Status: Useful as habitat for native fauna and flora as well as providing habitat linkages between native stands of forest.

INTRODUCED GRASSLAND

Alternative Names: Exotic Grassland, Improved Pasture, Non-Native Grassland
Code: INT-GRA
Key Species: *Pennisetum clandestinum, Axonopus affinis, Paspalum dilatatum*
Description: This unnatural community is composed of exotic (introduced) herbaceous plant species. The main species present are exotic grasses, such as Kikuyu Grass *Pennisetum clandestinum,* Whiskey Grass *Andropogon virginicus*, Rhodes Grass *Chloris gayna*, Parramatta Grass *Sporobolus indicus,* Carpet Grass *Axonopus affinis,* White Clover *Trifolium repens* and Paspalum *Paspalum dilatatum.* Near the forest and in the unslashed area in the south, a few characteristic native species occur, including Common Bracken *Pteridium esculentum*, Blady Grass *Imperata cylindrica* and Spiny-headed Mat-rush *Lomandra longifolia*. Other introduced species include pasture weeds such Fireweed *Senecio madagascariensis*, Ribbed Plantain *Plantago lanceolata* and Spear Thistle *Cirsium vulgare*.
Occurrence: This grassland covers most of the proposed quarry extension area.
Regional Status: This unnatural community has no special conservation value.

4.3 SIGNIFICANT PLANT SPECIES

Despite many surveys over the years, no threatened or other rare plant species have been found on the Gerroa property. Various species occur in the district, and these have been assessed in previous reports, but none have been found on this site. All occur in habitats not found in the Project Area.

The threatened species *Zieria granulata* (Rutaceae) has been planted on the bund wall to the northeast of the main dredge pond, as part of the early rehabilitation works; some of these plants are still alive. The sand dune soils on the property are not the habitat of this plant and it has not been found on such soils anywhere in the region where it naturally occurs. Further planting is not recommended.

4.4 SIGNIFICANT VEGETATION COMMUNITIES

As noted in Table 1, three endangered ecological communities occur in the Project Area; these are:

- Littoral Rainforest, mapped as SIM-LRF in this study;
- Swamp Sclerophyll Forest on Coastal Floodplains, mapped as ROB-MEL in this study; and
- Bangalay Sand Forest, mapped as BOT-BAN in this study.

The distribution of the above communities in the Project Area is shown on Figure 2. The Final Determinations made by the NSW Scientific Committee for each of these endangered ecological communities are provided in Appendices 4 and 5.

5 FAUNA

5.1 ANIMAL SPECIES

A fauna species list for the Cleary Bros (Bombo) property and the surrounding land was compiled from all previous studies and from additional information gained from recent field studies (Kevin Mills & Associates 2005b); see Appendix 7. The list contains 204 species names, including 33 mammals, 147 birds, 15 reptiles and nine frogs; this includes eight introduced mammal species, and six introduced bird species.

The fauna can readily be divided into three main animal groups, viz. native forest species, native wetland species and species of farmland, including native and introduced species. The information on the nearby records has come from various papers and reports; principle among these was the work of Murphy (1998), Kevin Mills & Associates (1991) and other work by the consultants in the area over the last 20 years. This material is summarised in the report by Kevin Mills & Associates (2005b).

Those species recorded in the Project Area by the consultant over a period of several years are indicated in the appendix. In all, 10 mammals, 68 birds, two reptiles and three frogs have been recorded in the Project Area. Those species of particular conservation importance are discussed in Section 5.3.

5.2 HABITATS

The habitats in the Project Area correspond closely to the vegetation communities described in Section 2.2. These habitats are primarily tall forest, swamp forest, woodland (planted trees), wetlands (including ponds, drains and the large dredge pond) and cleared land supporting introduced grassland.

The most important fauna habitats in the Project Area are:

- swamp forest (swamp sclerophyll forest containing *Eucalyptus robusta*);
- treeless wetlands, particularly in the southern part of the dredge pond.

To determine the potential value of the forests in the quarry extension area, a survey of the trees was undertaken. The results obtained from 14 randomly selected trees in each forest type are set out in Table 2.

The hollows are mostly small, formed in the ends of broken, dead branches; these are suitable only for bats. A few large hollows in *Eucalyptus botryoides* would be suitable for use by arboreal mammals. No very large Blackbutt trees occur on the site; these have been logged out long ago. Such large trees, as seen on the opposite side of Seven Mile Beach Road within the national park, are of high habitat value. Hollows are more readily formed in Bangalay trees; usually, Blackbutt trees must be very old to form hollows. Hollows in the

Blackbutt Forest in the Project Area are rare, while in the disturbed Bangalay Forest there is an average of about one hollow per tree. This is a very low hollow density. The individual trees are quite old but are not unique locally, as most of the Bangalay Sand Forest in the nearby national park contains similarly aged treed.

Table 2
Results of Tree Surveys

Tree Species	dch[1]	No. Hollows
Area: disturbed Bangalay Sand Forest		
Eucalyptus botryoides (7)	126, 86, 69, 64, 61, 47, 46	8
Angophora floribunda (6)	90, 66, 63, 63, 60, 60	6
Eucalyptus pilularis (1)	40	0
Area: Blackbutt - Banksia Forest		
Eucalyptus pilularis (13)	112, 67, 53, 50, 49, 45, 44, 43, 42, 40, 40, 34, 33	1
Eucalyptus botryoides (1)	37	1

1. dch – diameter at chest height of tree trunk.

5.3 SIGNIFICANT ANIMAL SPECIES

The most important animal species in terms of conservation are listed in the schedules to the *NSW Threatened Species Conservation Act 1995*; these species are listed as threatened in New South Wales, and are either endangered or vulnerable. Previous studies have identified several threatened species that are known to occur or that could occur in the Project Area and nearby (Kevin Mills & Associates 2005a). These species are listed in Table 3. Below the table, comment is provided on each species, and their known or likely occurrence in the Project Area.

Table 3
Threatened Fauna Species recorded in the Seven Mile Beach Area

Common Name	Habitat and Occurrence
Schedule 1 - Endangered species	
Amphibians	
Green and Golden Bell Frog *Litoria aurea*	Fresh wetlands; occurs at Coomonderry Swamp and adjacent ponds and dams. Also reported in the southern end of the existing dredge pond within the Project Area.
Birds	
Regent Honeyeater *Xanthomyza phrygia*	Recorded from Seven Mile Beach in 1993 and 1995.
Schedule 2 - Vulnerable species	
Birds	
Glossy Black-Cockatoo *Calyptorhynchus lathami*	Reported from Shoalhaven Heads in 1994. No habitat in the Project Area.
Australian Bittern *Botaurus poiciloptilus*	Known to be resident at Coomonderry Swamp; one record from the small dredge pond in the Project Area, in January 2003.
Black Bittern *Ixobrychus flavicollis*	Recorded on Blue Angle Creek, just outside the Project Area, in 1990.

Swift Parrot *Lathamus discolor*	Reported from Shoalhaven Heads in 1984.
Powerful Owl *Ninox strenua*	Recorded in forest at Seven Mile Beach; two birds were killed by motor vehicles on Seven Mile Beach Road in 2004.
Masked Owl *Tyto novaehollandiae*	A road-killed bird was found near Gerroa in 1980.
Mammals	
Spotted-tailed Quoll *Dasyurus maculatus*	There is one record of a road-killed animal on Seven Mile Beach Road in 1987.
Large Bentwing-bat *Miniopterus schreibersii*	Possible record in the Project Area in 2002.
Grey-headed Flying-fox *Pteropus poliocephalus*	A regular summer visitor to the district; would no doubt forage in the Project Area at that time.
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	Recorded in Seven Mile Beach National Park by Murphy (1998).
Greater Broad-nosed Bat *Scoteanax rueppellii*	Recorded in Seven Mile Beach National Park by Murphy (1998).

Green and Golden Bell Frog

The Green and Golden Bell Frog has been reported in the southern end of the dredge pond (G. Leonard pers. comm.); this is the oldest part of the pond and supports stands of reeds. There is a known population nearby to the south, in the Coomonderry Swamp area (Daly 1996). This frog is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Regent Honeyeater

This species is occasionally recorded in the Illawarra region, where it is mainly a summer visitor. It has been seen at Seven Mile Beach in 1993 and 1995. The winter flowering Swamp Mahogany *Eucalyptus robusta* may be an important food source if the species visits at that time of the year. The Regent Honeyeater is listed as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Glossy Black-Cockatoo

The Glossy Black-Cockatoo was recorded at Shoalhaven Heads in 1994. Its primary food tree is Black She-oak *Allocasuarina littoralis*, a species that does not occur in the Project Area. The chances of this species occurring there are slight; it does not feed on Swamp Oak *Casuarina glauca*. This species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Australasian Bittern

A resident population of the Australasian Bittern occurs at Coomonderry Swamp, just to the south of the Project Area. The only observation within the Project Area is of a bird flushed from reeds in the far southern end of the small dredge pond in January 2003. This species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Black Bittern

This rare species mainly inhabits the lower estuarine reaches of coastal rivers and coastal lagoons and lakes. There is one record from along Blue Angle Creek, in July 1990, just to the north of the Project Area. This species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Swift Parrot

This is a non-breeding winter visitor to the forests along the coast; birds are not seen every year (Mills 2004a). A small flock was observed at Shoalhaven Heads in 1984; it is probably an irregular visitor to the forests at Seven Mile Beach. Its favoured food plants are Swamp Mahogany *Eucalyptus robusta* and Coast Banksia *Banksia integrifolia*, both of which flower in winter when the birds visit the region. The area of Swamp Mahogany Forest in the Project Area is prime habitat for the Swift Parrot. The Swift Parrot is listed as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Powerful Owl

The Powerful Owl is present at Seven Mile Beach (Murphy 1998), where there is an abundance of arboreal mammals, the owl's main prey species. Two birds were found killed by motor vehicles on Seven Mile Beach Road in 2004 (Mills 2004b). The forest in the study area is probably within the home range of the owls living in the forests behind Seven Mile Beach. There are, however, unlikely to be any nest trees in the Project Area; these trees are too small and do not have the large hollows required by the owls for nesting. This species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Masked Owl

There is a record of road-killed Masked Owl near Gerroa in 1980. The absence of other records from the Seven Mile Beach area suggests that the species may not be resident in the forests there. This species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Spotted-tailed Quoll

There is one report of a road-killed quoll on the Seven Mile Beach Road in 1987. Murphy (1998) suggests that this species "may still occur as vagrant individuals" at Seven Mile Beach. It seems unlikely that the quoll is resident in the Project Area. This species is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Grey-headed Flying-fox

This bat is a common migrant to the Illawarra during summer; it can be seen in forest and gardens, as well as isolated trees at that time of year. It would probably not roost in the Project Area, but is would certainly visit the eucalypt forests in the area to forage. Flowering Bangalay *Eucalyptus botryoides* trees are visited for nectar in late summer-early autumn. This species is listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Large Bentwing-bat

This bat is very widespread in New South Wales and can be expected to turn up on almost any site. It roosts in caves and the like, including unnatural structures such as buildings and drains. There is very little opportunity for the species to roost in the Project Area, although it is very likely to regularly forage over the area in summer. This species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Yellow-bellied Sheathtail-bat

This bat inhabits a very wide range of habitats and roosts in tree hollows. It is a summer migrant to southern Australia. This species was recorded in 1995 by Murphy (1998), in forest within Seven Mile Beach

National Park. The forest in the Project Area provides suitable habitat for this bat, although tree hollows are uncommon. This species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Greater Broad-nosed Bat

This bat is found in a range of forest types and roosts in tree hollows and sometimes the roofs of buildings. This species was recorded in 1995 by Murphy (1998), in forest within Seven Mile Beach National Park. The forest in the Project Area would provide suitable habitat for this species, although tree hollows are uncommon. This species is not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

Summary

In summary, the following species are known to occur in the Project Area, albeit some as very rare visitors:

- Swift Parrot
- Australasian Bittern
- Black Bittern
- Powerful Owl
- Grey-headed Flying-fox
- Large Bentwing-bat

Migratory Species

In addition to threatened species, the EPBC Act allows for the listing of internationally protected migratory species, i.e. species listed under the Japan-Australia Migratory Bird Agreement (JAMBA), the China - Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Many of the species recorded on or adjacent to the Project Area are internationally protected migratory species; these include all ducks and diurnal birds of prey. Many common Australian bird species have been listed as internationally protected migratory species under the EPBC Act, so a few other listed species would also occur on or near the area from time to time.

6 IMPACT ASSESSMENT

6.1 GENERAL IMPACT ON VEGETATION AND FAUNA HABITAT

The proposed quarry extension covers about 7.35 hectares; see Figure 3. Quarrying this area would involve the clearing of about 1.7 hectares of Blackbutt-Banksia Forest, 1.6 hectares of disturbed Bangalay Sand Forest and 0.3 hectares of planted native trees. Within the Blackbutt-Banksia Forest, there is a small stand of Littoral Rainforest covering about 0.9 hectares, however, most of this forest type is excluded from the extraction area. The majority of the quarry extension area, 3.9 hectares or 53%, is cleared land covered by exotic grassland.

The quarry is adjacent to a stand of Swamp Sclerophyll Forest, which occur immediately to the west of the existing and proposed quarry extension. The boundary of this forest was pegged on site by a botanist and a five metre set back from that line forms the edge of the proposed quarry extension. Observation over many years of the existing quarry operations indicates that the forest adjoining the quarry is not affected by quarrying close to its edge as long as the trees are not susceptible to falling into the quarry. The above five metre set back is sufficient to ensure that trees are not impacted.

The primary compensation measure for removing the above vegetation is the implementation of a major reforestation program on the adjoining Company property. The aim of the reforestation project is to offset the loss of the forest being cleared within the quarry extension area. In developing this project, due regard was taken of the draft document titled *Green Offsets for Sustainable Development. Concept Paper* (DEC 2002). In particular, the concepts of "like for like or better" principle and locating the compensation as close as possible to the impacted area were considered.

The proposed reforestation program aims to replant the communities being removed for the quarry extension; i.e. Blackbutt Forest, Bangalay Sand Forest and Littoral Rainforest. The areas proposed for the planting of these communities, and the other two local communities Swamp Sclerophyll Forest and Swamp Oak Forest, are shown on Figure 4.

Further plantings in the south of the area, in the vicinity of the existing site office, will be undertaken as the Company withdraws from the existing quarry area. This will also strengthen the forest link to the southwest of the existing dredge pond. Should the nearby golf course proposal on the adjoining farmland proceed, it is envisaged that at least an additional 10 hectares of forest would be planted. Because of the character of that site, this would primarily be Swamp Oak Forest and Swamp Sclerophyll Forest. The proposed reforestation areas identified in this report will not be affected by the golf course, should it proceed.

Fragmentation of the forest in the area has been considered as part of the assessment. The forest in the locality is already somewhat fragmented by past clearing, but connections exist, albeit tenuous in some cases, between most extant stands of forest. The proposed quarry extension will cause a link between two forest areas to be severed. To mitigate this potential impact on the forest biota, measures for creating and strengthening other links nearby are included in the reforestation program outlined below and in the Draft Vegetation Management Plan. One aim of the reforestation project is to reinstate links between the forest in the national park to the east and the forest west and north of the sand quarry. Reforestation areas have been chosen in these locations, as shown on Figure 4. Forest links will be improved through planting appropriate vegetation communities and by improvement in managing the existing forest on the company's land. For example, about 2.4 hectares of Bangalay Sand Forest/Littoral Rainforest will be planted on the cleared land immediately to the north of the proposed quarry extension. At the southern end of the old dredge pond, the existing plantings will be strengthened through additional plantings and control of Lantana and other weeds. Both of these strategies will improve the linkages between the forest in the national park and that to the west of the quarry and, to the north, the forest around Blue Angle Creek. It is proposed to plant all of the local forest communities in the compensatory reforestation scheme.

Seven Mile Beach National Park occurs on the eastern, opposite side of Seven Mile Beach Road to the proposed development. The park is heavily forested and generally in a natural condition. The existing dredge pond has had no impact on the national park. Douglas Partners has predicted that while the extended dredge pond will affect adjacent groundwater levels, the influence will decline with distance as occurs with the existing pond. Taking into account the separation distance and the affect of the sand quarry to date, the proposed extension should have no observable impact on the national park or its conservation values.

The potential for algal blooms to occur in the new dredge pond is considered slight. There are no exceptionally high sources of nutrients in the area (cattle grazing will be removed from the area) and in visiting the existing dredge pond over the past 15 years or so, we have never seen excessive algae in the pond. In fact, except for some turbidity caused at times by the dredge in the pond, the water is exceptionally clean. Analysis of the water in the existing dredge pond found that the levels of phosphorus and nitrogen were very low.

The cumulative loss of forest habitat needs to be considered in all impact assessments. Clearly much forest has been lost from the Crooked River catchment. Although only about 3.3 hectares of semi-natural and disturbed forest will be removed, in the context of the overall loss of forest locally compensation for this loss is necessary. The proposals to achieve this compensation are set out here and in the Draft Vegetation Management Plan.

6.2 THREATENED SPECIES CONSERVATION ACT

The *Threatened Species Conservation Act 1995* requires that the particular matters be taken into account when considering whether a proposal is likely to have a significant effect on threatened species, populations or ecological communities, and whether a Species Impact Statement (SIS) is required. This process has been applied below to the proposed quarry extension in terms of threatened animals and threatened ecological communities. As there are no known threatened plant species in the Project Area, the seven-part test is not undertaken for threatened plant species.

6.2.1 Recent Legislative Changes

The *Threatened Species Conservation Amendment Act 2002* was introduced following a Joint Parliamentary Committee review of the *Threatened Species Conservation Act 1995* in 1997. The provisions of the TSC Amendment Act are being proclaimed in stages. The new provisions relating to the assessment of significance were introduced on 31 October 2005. Note that the amendments also affected the relevant sections of the *Fisheries Management Act 1994.*

Under the TSC Act, as amended, the factors to be considered when determining whether an action, development or activity is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats (previously known as the Eight Part Test), have been revised. These factors are taken into account when considering whether the preparation of a Species Impact Statement (SIS) is warranted.

The revised factors are,

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

6.2.2 Assessment of Significance

The TSC Amendment Act has empowered the Minister for the Environment, with the concurrence of the Minister for Planning, to issue assessment guidelines relating to the determination of whether an action is likely to significantly affect threatened species, populations or ecological communities, or their habitats.

The Department of Environment and Conservation published the Draft guidelines in August 2005. Referred to as the Assessment of Significance Guidelines (Seven Part Test), they aim to clarify technical terms and assist in the interpretation and application of the factors.

The Guidelines state that,
"the revised factors maintain the same intent [as the Eight Part Test] but focus consideration of the likely impacts in the context of the local rather than the regional environment as the long-term loss of biodiversity at all levels arises primarily from the accumulation of losses and depletions of populations at a local level. This is the broad principle underpinning the TSC Act, State and Federal biodiversity strategies and national agreements. The consideration of impacts at a local level is designed to make it easier for local government to assess, and easier for applicants and consultants to undertake the Assessment of Significance because there is no longer a need to research regional and statewide information in considering potential impacts. Further consideration is required when a significant effect is likely and is more appropriately considered when preparing a Species Impact Statement."

"When applying each factor, consideration must be given to all of the likely direct and indirect impacts of the proposal. *Direct impacts* are those that directly affect habitat and individuals and include but are not limited to acute death through predation, trampling, poisoning of the animal/plant itself and removal of suitable habitat. *Indirect impacts* occur when project-related activities affect resources in a manner other than a direct loss of the resource. A broad range of impacts need to be considered, for example, killing of species through starvation, exposure, predation, by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious changes in the water table, increased soil salinity, promotion of erosion, inhibition of nitrogen fixation, provision of suitable seed bed for exotic weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas."

"Mitigating, ameliorative or compensatory measures proposed as part of the action, development or activity should not be considered in determining the degree of effect on threatened species, populations, or ecological communities, unless the measure has been proven successful for that species in a similar situation."

"In determining the nature and magnitude of an impact, it is important to consider matters such as:

- Pre-construction, construction and occupation/maintenance phases,
- All on-site and off-site impacts, including location, installation, operation and maintenance of auxiliary infrastructure and fire management zones,
- All direct and indirect impacts,
- The frequency and duration of each known or likely impact/action,
- The total impact which can be attributed to that action over the entire geographic area affected, and over time,
- The sensitivity of the receiving environment, and
- The degree of confidence with which the impacts of the action are known and understood."

"Application of the precautionary principle requires that a lack of scientific certainty about the potential impacts of an action does not in itself justify a decision that the action is not likely to have a significant impact. If the information is not available to conclusively determine that there will not be a significant impact on the threatened species, population or ecological community, or its habitat then it should be assumed that a significant impact is likely."

Terminology

The terms *subject site* and *study area* are defined in the Guidelines, as follows:

- *Subject site* means the area directly affected by the proposal.
- *Study area* means the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account. This corresponds to the Project Area in this investigation; i.e. the development area plus the surrounding land within 100 metres.

The factors under Section 5A of the EP&A Act 1979 are addressed below separately to threatened fauna and endangered ecological communities; note that no threatened plants are known or expected to occur in the Project Area. No species or communities listed under the *Fisheries Management Act 1994* are relevant to this proposal.

Threatened Fauna

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The Guidelines provide the following definitions for key terms in factors (a) and (b):

- Life cycle *is the series or stages of reproduction, growth, development, aging and death of an organism.*
- Viable *is the capacity to successfully complete each stage of the life cycle under normal conditions.*
- *The* local population *is the population that occurs in the study area. In cases where multiple populations occur in the study area, each population should be assessed separately.*
- Risk of extinction *is the likelihood that the local population will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the viability of that population.*

The Guidelines further state that:

- The key assessment is risk of extinction of the local population. The risk of extinction will increase if any factor operates to reduce the population size or reproduction success";

- Considerable effort and study would be required to demonstrate that a population is not viable, and that any known or presumed local population should therefore "be assumed to be viable unless the contrary can be conclusively demonstrated through analysis of local information, records, references and knowledge of the species' behaviour and habitat or through a comprehensive on-site ecological study".

The *Draft Guidelines* state “only those species listed on Part 1 and Part 4 of Schedule 1 and Part 1 of Schedule 1A of the TSC Act” are relevant to this factor. These parts of the Act refer to endangered species, species presumed extinct and critically endangered species. We assume this is an error and deal here also with vulnerable species, listed under Part 1 of Schedule 2; the *Guidelines* cannot change the definition of "threatened" in the Act.

As described in Section 5.3, several threatened fauna species have been recorded in and around the Project Area. The wetland species would not find suitable habitat within the proposed quarry extension area, which is totally dry. There is no roosting habitat within the extension area for the Large Bentwing-bat., a bat that roosts in caves and similar places. The two other microbats may occur in the area although there appear to be few hollows for roosting in the trees on the site and these bats were not found in the area during a bat survey carried out in 2002. The Grey-headed Flying-fox is a regular summer visitor to the district and is likely to occur in the forest on the site from time to time, although this would represent a minute part of the overall foraging area available for this bat in the region. The stand of rainforest on the site is not tall enough or large enough to support a flying-fox camp.

The Swift Parrot may visit the Swamp Mahogany forest adjacent to the proposed quarry when these trees are flowering in winter, but this forest will not be affected by the quarry extension. Powerful Owls are still likely to be resident in the Seven Mile Beach area and may well forage within the forest in the extension area from time to time. Similarly, the Masked Owl could visit the area from time to time, but local records are very scarce. There are no large eucalypts suitable for breeding within this forest that would only be a small part of the foraging territory of these owls in the locality. The Regent Honeyeater has been observed occasionally in the Seven Mile Beach area; any visit to the Project Area would be rare and fleeting. None of the above species have resident populations on the quarry site or the immediately surrounding land.

Given the status of the threatened species in the Project Area, it is not likely that the proposed action (extension of the sand quarry) would place at risk of extinction a local population of these or other threatened species.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

The proposed action is not likely to have an adverse effect on the life cycle of any endangered population. No endangered populations have been declared on, or adjacent to, the Project Area.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its occurrence is likely to be placed at risk of extinction

With regard to (c), the Assessment Guidelines state that:

- The size and age of the remnant are not determining factors as to whether a remnant constitutes a listed endangered or practically endangered ecological community.
- Ecological communities are usually defined by two components: the geographical extent, and the species and physical composition. The relative importance of each varies, so this factor provides for consideration of both components, i.e. local occurrence and changes to the composition of the community.

The Assessment Guidelines provide the following definitions for key terms in point (c):

- The *local occurrence* is the community that occurs within the study area.
- Similar to the definition provided in factor (a), *risk of extinction* is used here as the likelihood that the local occurrence of the ecological community will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the community, and includes changes to ecosystem functioning.
- *Composition* refers to both the assemblage of flora and fauna species, and the physical structure of the community. Note that, while many communities are identified primarily by their vascular plant composition, all species that occur in a community are part of that community.

The Guidelines also state that "consideration must be given to whether the life cycle of the species which make up the ecological community will be disrupted, in a similar manner to the consideration of individual species described in factor (a)".

This question is not relevant to threatened species.

(d) in relation to the habitat of a threatened species, population or ecological community:
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

With regard to (d), the Assessment Guidelines state that:

- *Habitat* is the area occupied, or periodically or occasionally occupied, by any threatened species, population of ecological community, and includes all different aspects both biotic and abiotic) used by species at different stages of their life cycles.
- *Extent* refers to the physical area removed and/or to the compositional components of the habitat and the degree to which each area is affected.
- The *importance* or the habitat will be related to the stages of the species' life cycles and how reproductive success may be affected.
- *Locality* has the same meaning prescribed to local population of a species or local occurrence of an ecological community i.e. the habitat that occurs within the study area.

The Guidelines also state that "a quantitative and qualitative approach to assessing the extent to which habitat is likely to be removed or modified/degraded should consist of the following steps:

- An assessment of the area and quality of habitat of the threatened species, population or ecological community that occurs within the locality.
- An assessment of the areas and quality of habitat of the threatened species, population or ecological community that occurs within the study area.
- An estimation of the area and quality that the habitat of the study [area] represents in relation to the local distribution of that habitat.

- An estimation of the area and quality of the habitat of the study area which is to be removed or modified by the proposed development, activity or action or indirectly by longer term impacts from the proposed development such as increased predation, weed invasion, salinity, etc.
- An estimation of the area and quality of the habitat of the region that will be removed or modified by the proposed development, activity or action.
- An assessment of the ecological integrity of the habitat to be affected and of the habitat that will remain.

Extent

About 3.3 hectares of forest and modified forest habitat will be removed. This is part of about 1,000 hectares of forest in the Seven Mile Beach area. Of the forest to be removed, about 0.4 hectares is the endangered Littoral Rainforest and about 1.6 hectares is modified Bangalay Sand Forest. Within the study area (Project Area) there are about seven hectares of Swamp Sclerophyll Forest, 0.9 hectares of Littoral Rainforest and 1.6 hectares of Bangalay Sand Forest.

The regional (Sydney Basin Bio-Region) extent of these communities is unknown but would be a large area in relation to the above areas within the study area.

Isolation

The proposed extension of the sand quarry at Gerroa is not expected to exacerbate the isolation of areas of habitat for threatened fauna species. The removal of forest and cleared land will not cause habitat potentially utilised by these species to be isolated in such a way that habitat would not be accessible to the species involved. These species will readily cross the dredge pond or go around it, as they would now across cleared land and Seven Mile Beach Road. None of the threatened forest species discussed are ground animals, except the Spotted-tailed Quoll that is very unlikely to have a viable population in the study area.

Importance

The area of potential habitat for those threatened forest species that could from time to time visit the forest to be cleared is very minor compared to their ranges and habitat requirements. This small area of forest is not likely to be a significant area of habitat for any threatened species. The potential use of the forest on the site by the threatened species known to occur in the area is discussed above.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers only to those areas of land listed in the Register of Critical Habitat. No critical habitat has been declared on or near the Project Area.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

Recovery plans have not been finalised for the threatened species discussed in this report. No relevant threat abatement plans have been prepared.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Guidelines state that this factor refers only to those key threatening processes (KTP) listed on Schedule 3 of the TSC Act and Schedule 6 of the FM Act. In addition to deciding whether the action/activity constitutes a KTP, consideration must also be given to whether the proposal is likely to

exacerbate a KTP. The species listed in the determination as being "at risk" warrant particular consideration if these species are known or likely to occur on the site of the development or activity.

The NSW Scientific Committee has listed 30 key threatening processes under the TSC Act and seven are listed under the *Fisheries Management Act*. The applicability of these processes to the proposed works has been summarised below.

Key Threatening Process	Applicable; Yes/No
TSC Act	
Alteration of habitat following subsidence due to longwall mining	no
Alteration to the natural flow regimes of rivers, etc.	no
Anthropogenic Climate Change	minor
Bushrock removal	no
Clearing of native vegetation	yes
Competition and grazing by feral European Rabbit	no
Competition and habitat degradation by Feral Goats	no
Competition from Feral Honey Bees	no
Death or injury to marine species following capture in shark control programs	no
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	no
Herbivory and environmental degradation caused by feral deer	no
High frequency fire resulting in the disruption of life cycle processes	no
Importation of Red Imported Fire Ants	no
Impact of Feral Pigs	no
Infection by Psittacine Circoviral Disease in Parrots	no
Infection of frogs by amphibian chytrid	no
Infection of native plants by *Phytophthora cinnamomi*	no
Introduction of the Large Earth Bumblebee	no
Invasion and establishment of exotic vines and scramblers	no
Invasion and establishment of the Cane Toad *Bufo marinus*	no
Invasion, establishment and spread of *Lantana camara*	yes
Invasion of native plant communities by *Chrysanthemoides monilifera*	yes
Invasion of native plant communities by exotic perennial grasses	no
Invasion of the Yellow Crazy Ant, *Anoplolepis gracilipes*	no
Loss and/or degradation of sites used for hill-topping by butterflies	no
Predation by *Gambusia holbrooki*	no
Predation by the European Red Fox	no
Predation by the Feral Cat	no
Predation from the Ship Rat on Lord Howe Island	no
Removal of dead wood and dead trees	yes
FM Act	
Current shark meshing program	No
Hook and line fishing in areas with threatened fish	No
Introduction of fish to fresh waters	No
The removal of large woody debris	No
The degradation of native riparian vegetation	No
Instream structures altering natural river flow regimes	No
Introduction of fish and vegetation to coastal waters	No

The proposed extension of the sand quarry at Gerroa involves one main key threatening process, namely, the clearing of native vegetation. Our recommendation is for an appropriate area of forest replanting to be undertaken as part of a compensation package to address the clearing of native forest vegetation. The removal of dead wood and dead trees would also occur to a relatively minor degree. Virtually all human activity contributes in some way to anthropogenic climate change; this is beyond this report to assess, although we note that the planting of forest can assist in counteracting the effects of human-induced climate change. The vegetation management proposals will reduce the spread of *Lantana camara* and *Chrysanthemoides monilifera* on the property, so will have a positive impact in terms of these key threatening processes.

Endangered Ecological Communities

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

This question is not relevant to endangered ecological communities.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

This question is not relevant to endangered ecological communities.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its occurrence is likely to be placed at risk of extinction

The proposed extension of the sand quarry would involve the removal of part of a stand of Littoral Rainforest within the Project Area (local occurrence). About 44% of the rainforest area of 0.9 hectares would be removed. The removal of this rainforest will not place the local occurrence at risk of extinction; the densest part of the rainforest will be retained and the community will be expanded by planting additional areas of similar rainforest. The proposal will not substantially and adversely modify the composition of the remaining ecological community; better management is envisaged that would improve the composition of the local occurrence by planting appropriate native species and controlling weeds, particularly Lantana. We note that this littoral rainforest community is common in the nearby Seven Mile Beach National Park (NPWS 2006).

About 1.6 hectares of highly modified Bangalay Sand Forest would be removed. The local occurrence, i.e. that area within the Project Area or study area, would be removed by the proposal; the local occurrence would therefore become extinct. We note that this is a common forest type within the adjacent Seven Mile Beach National Park (NPWS 2006).

The Swamp Sclerophyll Forest that occurs immediately adjacent to the proposed quarry will not be affected by the extension proposal; this will be avoided by the quarry footprint and measures will be taken to manage the forest edge to ensure that its composition is not adversely modified by the adjoining quarry.

(d) in relation to the habitat of a threatened species, population or ecological community:
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Extent
Within the study area (Project Area), there is approximately seven hectares of Swamp Sclerophyll Forest, 1.7 ha of Blackbutt Forest, 1.6 ha of modified Bangalay Sand Forest and about 0.9 ha of littoral rainforest. About 0.4 ha of Littoral Rainforest will be removed; this is about 44 percent of the stand on the site. Note that the densest rainforest is being retained; that to be removed contains a much lower density of rainforest trees and other species. About 1.6 hectares of modified Bangalay Sand Forest will be removed; this is all of the community within the study area. Although it is adjacent to the proposal, the Swamp Sclerophyll Forest will not be affected by the quarry.

The regional (Sydney Basin Bio-Region) extent of these communities is unknown but would be a large area in relation to the areas within the proposal extension area and the study area. In particular, Bangalay Sand Forest is very common and widespread in the Shoalhaven Region; it is common in the adjoining Seven Mile Beach National Park. Littoral rainforest also occurs across much of the northern part of the national park, mostly as an understorey to Bangalay Forest, as it does on the project area. The map at Appendix 9, obtained from the NPWS (2006) study, shows the distribution of these communities in the Seven Mile Beach area. As can be seen from the map, the Bangalay and rainforest communities are relatively extensive in the area, and are mostly reserved within the national park; the following approximate areas were calculated by us using the map at Appendix 9 and our more accurate map of the Cleary Bros (Bombo) Property.

Bangalay Sand Forest	124 ha
Littoral Rainforest (nearly all of which is an understorey to Bangalay Forest)	66 ha
Minimum area of both communities at Seven Mile Beach:	190 ha

Isolation
The rainforest stand is already isolated from other stands of rainforest by a major road and cleared land. The stand of Bangalay Sand Forest to be removed is already isolated from other stands of this forest type by cleared land.

Importance
The forest to be removed is a relatively small area, although all losses of an endangered community are of concern. The loss is not considered to be of critical importance for the long-term survival of the community in the locality. The company is committed to replanting and improving management of the existing forest areas on the Company's property at Gerroa. The cumulative impact of the proposal will be minimal because there is not going to be any further clearing of forest within the property; there will be no incremental loss of forest in the future, a concern raised by the DEC. The remaining forest will be protected through a Vegetation Management Plan and a significant area of forest will be planted. The DEC also expressed concern over the removal of old Bangalay trees, stating they may have special values. Large old Bangalay trees are abundant in the Seven Mile Beach area, occurring throughout the Bangalay Sand Forest and Blackbutt Forest communities. Those trees in the project area are not especially important as a seed source, as hollow-bearing trees or as connections to surrounding forest communities.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitat refers only to those areas of land listed in the Register of Critical Habitat. No critical habitat has been declared or near the Project Area.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plans have been prepared for the endangered ecological communities occurring in the area. No relevant threat abatement plans have been prepared.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

An assessment of the key threatening processes has been undertaken above.

Conclusion

The proposed extension of the sand quarry at Gerroa is not likely to have a significant effect on any threatened species, population or ecological community listed under the *Threatened Species Conservation Act* or *Fisheries Management Act 1994*, or their habitats, so the preparation of a Species Impact Statement is not warranted.

In forming the above view, we have considered the following additional factors:

- The part of the stand of Littoral Rainforest to be removed contains rather sparse rainforest trees and other species; the densest area is being retained.

- Bangalay Sand Forest is very common between the Crooked River and Batemans Bay; there is about 190 ha of Bangalay Sand Forest/Littoral Rainforest in the adjacent national park and nearby all of which is in a better condition than that being removed.

- The removal of Littoral Rainforest, Bangalay Sand Forest and the forest generally will be compensated for by re-planting and rehabilitating over four times the area removed with appropriate native species.

- An improved management regime will be implemented for the remaining areas of the endangered ecological communities and other forests on the Company's land.

- Measures will be taken to ensure that the quarry does not impact upon the endangered Swamp Sclerophyll Forest growing adjacent to the quarry.

6.3 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT

The Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* specifies that approval is required from the Commonwealth Minister for the Environment for actions that have, will have or are likely to have a significant impact on a matter of "national environmental significance"; these include listed threatened species, ecological communities and migratory species.

The Department of Environment and Heritage Minister has issued the Policy Statement title *EPBC Act – Principal Significant Impact Guidelines 1.1 Matters of National Environmental Significance* (Dept. Environment and Heritage 2005). The *Guidelines* assist proponents in determining whether an action is likely to be significant and, hence, whether it should be referred to the Commonwealth Minister for assessment and approval.

What is habitat critical to the survival of a species?
Habitat critical to the survival of a species refers to:
a) habitat identified in a recovery plan for the species as habitat critical for those species or communities; and/or
b) habitat listed on the Register of Critical Habitat maintained by the Minister under the Act; and/or
c) areas that are necessary:
- for activities such as foraging, breeding, roosting, or dispersal;
- for succession;
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species.

The potential for the proposed extension of the sand quarry at Gerroa to have a significant impact on threatened species has been assessed below, by applying the criteria in the Department's *Guidelines*.

Criteria for Critically Endangered and Endangered Species
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real possibility that it will:
- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of the species, or
- fragment an existing population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of a population, or
- modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- interferes with the recovery of the species.

Impact on Regent Honeyeater and Swift Parrot
Stands of the winter flowering tree Swamp Mahogany *Eucalyptus robusta* is a key species of coastal New South Wales for the endangered Swift Parrot. The endangered Regent Honeyeater is also occasionally observed in these trees during its winter wanderings, although records are very rare in the Kiama/Shoalhaven region.

Swamp Mahogany is common in the Swamp Sclerophyll Forest mapped in this study; all of this is avoided by the proposed quarry extension. The other types of forest to be cleared by the proposal are unlikely to be of particular importance for either species.

It is concluded that as long as the Swamp Sclerophyll Forest remains unaffected, then it is unlikely that the proposal would have any of the above impacts on either the Swift Parrot or Regent Honeyeater.

Criteria for Vulnerable Species
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
- lead to a long-term decrease in the size of an *important population* of a species, or
- reduce the area of occupancy of an *important population*, or
- fragment an existing *important population* into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an *important population*, or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or

- result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or
- interferes substantially with the recovery of the species.

An *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

Impact on Grey-headed Flying-fox and Spotted-tailed Quoll

The development of the proposed sand quarry is not likely to have a significant impact on Grey-headed Flying-foxes. The site is not known or expected to support an "important population" of Grey-headed Flying-foxes, as defined above, and the development involves clearing only a relatively small area of potential foraging habitat for the species, not breeding habitat. There are vast areas of similar foraging habitat in the local area and throughout the district. There is one quite old record of a Spotted-tail Quoll in the Seven Mile Beach area, in 1987. This species is very rare on the coastal plain and it seems fairly unlikely that the clearing of about 3.3 hectares of forest could have the above impacts on this species, even if it was present at Seven Mile Beach.

Criteria for Internationally Protected Migratory Species

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of *important habitat* of the migratory species, or
- result in invasive species that is harmful to the migratory species becoming established in an area of *important habitat* of the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an *ecologically significant proportion* of the population of the species.

Impact on Internationally Protected Migratory Species

The development of the proposed sand quarry is not likely to have a significant impact on any internationally protected migratory species. The Project Area does not contain "important habitat" for any listed migratory species, or an "ecologically significant proportion" of a population of these species. At most, listed migratory species would be occasional visitors to the site.

Conclusion, EPBC Act

The proposed extension of the sand quarry at Gerroa is not likely to have a significant impact on any species or communities listed under the *Environmental Protection and Biodiversity Conservation Act*, or their habitat. Referral to the Commonwealth Minister for the Environment for assessment and approval is therefore not warranted.

6.4 STATE ENVIRONMENTAL PLANNING POLICIES

SEPP NO. 14 – Coastal Wetlands

State Environmental Planning Policy No. 14 - Coastal Wetlands identifies and makes provision for the protection of coastal wetlands in New South Wales.

Five wetlands are mapped under the SEPP for the Kiama area; none of these occur on the Crooked River or its tributaries; no such wetlands occur on or near the Project Area.

SEPP NO. 26 – Littoral Rainforest

State Environmental Planning Policy No. 26 – Littoral Rainforests identifies and makes provision for the protection of littoral (coastal) rainforest in New South Wales. A copy of SEPP No. 26 is provided in Appendix 8.

Patches of littoral rainforest identified in the SEPP occur near the Crooked River. Two stands, Nos. 175J and 175K, occur between the Seven Mile Beach Road and Blue Angle Creek. These stands are about one kilometre to the north of the Project Area. Littoral rainforest behind Seven Mile Beach is much more extensive than the areas delineated in SEPP No. 26, extending southwards in the national park to the Berry Beach Road picnic area. The adjacent area within Seven Mile Beach National Park adjacent to the Project Area and the Crown land to the north is almost totally covered in littoral rainforest.

SEPP NO. 44 – Koala Habitat Protection

SEPP 44 encourages the conservation and management of natural vegetation that provides habitat for Koalas, to ensure a permanent free-living population over the species' present range and to reverse the current trend of Koala population decline. Kiama is not one of the local government areas listed on Schedule 1 of *State Environmental Planning Policy No. 44 - Koala Habitat Protection* (SEPP 44) (New South Wales 1995), so that the Policy does not apply to the area where the quarry extension is located. The Shoalhaven local government area is so listed on Schedule 1, so that the Policy applies to the most southern part of the access road, near Berry Beach Road. In terms of this project, this encompasses about 300 metres of access road plus the area around the site office and loading area.

SEPP 44 helps to identify "potential Koala habitat", namely "areas of native vegetation where the trees of the types listed in Schedule 2 [SEPP 44 – Feed Tree Species] constitute at least 15% of the total number of trees in the upper or lower strata of the tree component". If no Schedule 2 tree species are present or if they constitute less than 15% of the total number of trees present, then no further provisions of the Policy apply.

If more than 15% of the trees in the area are Schedule 2 tree species, then an assessment must be made by a qualified person to determine whether the area contains "core koala habitat", a term applied to "an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population".

Two Schedule 2 Koala feed tree species occur in vicinity of the above section of road. Swamp Mahogany *Eucalyptus robusta* has been planted to the east; these plantings are about 15 years old. In the paddock to the west, there are a few small Forest Red Gum *Eucalyptus tereticornis* growing on the edge of the stand of Swamp Oaks about 50 metres from the access road and there are a few larger trees within the nearby Berry Beach Road reserve. The Forest Red Gum trees form far less than 15% of the trees in the area, while the planted Swamp Mahogany trees do form more than 15% of the planted trees near the access road.

An observation of a Koala has recently been entered into the NSW Wildlife Atlas for the Gerroa area. The details provided by DEC are as follows:

Date: 15 December 2005
Location: "In tree on western side of road between Gerroa and Gerringong, ½ km north of Beach Road intersection."
The closest known Koala colony is above Macquarie Pass, over 30 kilometers to the north west. Koalas are also known from Morton National Park to the west of Nowra. It seems extraordinary that an animal has

crossed many kilometres of farmland to get to Gerroa and this is the only report for the Seven Mile Beach area since the 1960s.

The forest in the area is not core Koala habitat because there is no resident Koala population. At most the site has been visited by a wandering individual, presumably a male.

6.5 KIAMA LEP 1996

Areas of High Conservation Value (HCV land) in the Kiama local government area have been identified on an overlay in the *Kiama Local Environmental Plan 1996*. Some forest in the Project Area is identified as an area of HCV.

The objectives of HCV land are:

(a) to conserve environmentally important land having ecological, scientific, faunal, floristic or aesthetic values;
(b) to preserve intact rainforests and promote regenerating rainforest areas which are of significance;
(c) to preserve areas of significant vegetation and to promote the regeneration of forests and eradication of vegetation which competes with native flora;
(d) to protect wildlife and associated habitats and to protect and promote wildlife corridors;
(e) to exclude activities which would prejudice the ongoing conservation or rehabilitation of land referred to in paragraph (a); and
(f) to encourage and allow activities which will meet the conservation objectives.

Although the HCV boundaries on the LEP map do not match the edges of the forest in reality, it is clear that the Council map intended to include all of the forest in the Project Area as an area of HCV. Some of this forest will be removed; we note that the planted native trees and about half of the Bangalay Sand Forest is not covered by the HCV map, allowing for a correction in the boundaries to align with the reality on the ground. As noted elsewhere, a replanting and rehabilitation program will be developed by the Company in compensation for the loss of this forest.

Kiama Municipal Council is currently reviewing the LEP. The presence of endangered ecological communities, remnant forest and native fauna habitat in the Crooked River – Seven Mile Beach areas has been described and the importance of the area generally highlighted in the reports prepared for Council by Kevin Mills & Associates (2006a, 2006b). The reports promote the protection of the important natural features of the area, recommending that "if clearing is approved, then appropriate compensatory plantings or reforestation should be required".

7 DISCUSSION AND RECOMMENDATIONS

Discussion

This report has described seven vegetation communities in the Project Area, i.e. the area on and surrounding the proposed quarry extension; five of these are native communities. These communities are identified as: Littoral Rainforest, Bangalay Sand Forest, Blackbutt-Banksia Forest, Swamp Sclerophyll Forest and *Phragmites* Reedland, and the artificial communities Miscellaneous Forest (Planted Native Trees) and Introduced Grassland. Although most of the vegetation within the quarry extension area is not threatened, two endangered ecological communities occur within the extension area; small areas of Littoral Rainforest and Bangalay Sand Forest will therefore be removed. Swamp Sclerophyll Forest on Coastal Floodplains occurs immediately adjacent to the proposed quarry extension.

There is a very low probability of threatened plant species occurring within the Project Area. The presence or likely presence of several threatened fauna species in the Project Area is identified. These species are Australasian Bittern, Black Bittern, Powerful Owl, Swift Parrot, Green and Golden Bell Frog, Large Bentwing-bat and Grey-headed Flying-fox. An assessment, as provided for under the *Threatened Species Conservation Act 1995*, was carried out to determine if the proposed quarry extension is likely to have a significant effect upon these species or the above endangered ecological communities, and thus whether a Species Impact Statement (SIS) is warranted.

It is concluded that an SIS is not required for this proposal. This is contingent upon adequate protection being provided for the relatively large area of Swamp Sclerophyll Forest on the adjoining land. The potential for species and communities listed under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* to occur on the site was also assessed. It was concluded that several internationally protected migratory species could occur there from time to time. After applying the criteria set out in the *EPBC Act - Principal Significant Impact Guidelines* (Dept. Environment and Heritage 2005), it is concluded that the proposed development is not likely to have a significant impact on any species and communities listed under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*, and referral to the Commonwealth Minister for the Environment for assessment and approval is not warranted.

The proposed extension of the sand quarry at Gerroa will have some impact on natural features. The proposal will remove about 1.7 hectares of natural forest, 1.6 hectares of modified forest, 0.3 hectares of planted native trees and 3.9 hectares of exotic grassland. In compensation for the loss of forest, it is proposed to replant similar types of forest nearby on the same property over an area of at least four times the extent of forest removed. Fragmentation of the forest in the area is considered as part of the assessment. The forest in the locality is already somewhat fragmented by past clearing, but connections exist between most extant stands of forest. The proposed quarry extension will cause a link between two forest areas to be severed, but creating and strengthening other links nearby will mitigate this impact.

Because the proposal involves the removal of about three hectares of forest, a major forest regeneration program is proposed in the vicinity of the Project Area. This will include the planting of an area of Littoral Rainforest and Bangalay Sand Forest in compensation for the clearing of small areas of both of these endangered ecological communities.

The letter from the Department of Primary Industries dated 18 May 2006 suggests that the quarry proposal involves "deviating the channel" of Blue Angle Creek. This is not the case. The quarry extension is well away from the channel of this watercourse and does not involve any disturbance to the channel nor the adjacent wetland (riparian) vegetation growing on its floodplain. There will be no "risk to downstream aquatic habitat", as the proposal will not disturb the creek or its associated riparian vegetation or habitats.

Recommendations

The following recommendations are made to avoid, minimise and compensate for the impact of the proposed quarry extension on the identified conservation values. Where there is likely to be some impact upon these values, including endangered ecological communities and forest identified under the LEP as having high conservation value, recommendations are made for compensatory measures.

(i) The edge of the endangered Swamp Sclerophyll Forest should be accurately pegged by a botanist; this must determine the limit of the proposed sand quarry. As was done with the previous extension of the quarry elsewhere on the site, enough setback should be provided to ensure that trees do not fall over into the quarry due to undermining of their roots. A minimum of five metres should be adopted from large trees. This boundary, as identified by a botanist, should be used as the quarry boundary. Inspection of the existing quarry operations indicates that a setback of five metres is quite adequate to ensure trees are not affected.

Outcome: The consultant has inspected the site with representatives of the company and their surveyors and has identified the edge of the above community; this was marked on the ground where necessary. A survey plan was subsequently prepared.

(ii) In compensation for removing forest, and in particular Littoral Rainforest and Bangalay Sand Forest, a program of reforestation should be undertaken on the company's property.

Outcome: Suitable areas for reforestation have been identified. The proposed reforestation areas cover a total area of about 20.8 hectares, or well over the four times the area of forest to be removed that was set as an objective; see Figure 4. This proposal would see the replanting of the local forest communities in appropriate locations in various places across the Company's property and enhancement of other areas to improve the quality of the forest; these plans will also improve forest habitat linkages across the property and onto adjoining forested land. The planting will not be affected should a golf course proposal for the rural property proceed at some time in the future.

(iii) A Vegetation Management Plan should be prepared to guide management of the native vegetation on the site, particularly the reforestation program. This plan should include, among other things, identification of the areas to be planted, the plant communities and their distribution in the area, the planting techniques and the on-going maintenance needs of the plantings.

Outcome: A Draft Vegetation Management Plan has been prepared as a part of the Application.

(iv) Appropriate native species should be planted and distributed on the identified reforestation areas to recreate the following natural communities:
- Littoral Rainforest
- Bangalay Sand Forest
- Swamp Sclerophyll Forest
- Blackbutt - Banksia Forest

Outcome: A full description of how this will be achieved is set out in the Draft Vegetation Management Plan.

(v) The vegetation debris removed from the site should, where practical, be used to assist in the establishment of the reforestation areas. The top 20 cm of sandy soil (containing seeds and other propagation material), logs and timber debris are all useful in re-establishing forest habitat on the presently cleared land that is dominated by exotic plants.

Outcome: These matters are dealt with in the Draft Vegetation Management Plan.

(vi) The forest around the quarry should be protected and, where needed, enhanced; this would include weed removal and planting of appropriate native species.

Outcome: These matters are discussed in the Draft Vegetation Management Plan; the Plan covers all of the forest on the Company's land.

(vii) The planting areas should be monitored for at least five years to ensure that they are progressing satisfactorily towards the planned forest communities.

Outcome: Monitoring and reporting requirements are discussed in the Draft Vegetation Management Plan.

8 REFERENCES

Baines, J. (1981). *Australian Plant Genera.* The Society for Growing Australian Plants, Surrey Beatty & Sons Pty Ltd, NSW, 406p.

Christidis, L. & Boles, W. (1994). *The Taxonomy and Species of Birds of Australia and its Territories.* Royal Australasian Ornithologists Union, Melbourne, 112p.

Churchill, S. (1998). *Australian Bats.* New Holland Publishers (Australia) Pty Ltd, Sydney, 230p.

Cogger, H. (1992). *Reptiles and Amphibians of Australia.* Reed, Sydney, revised ed., 775p.

Commonwealth of Australia (1999). *Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth Government, Canberra.

Daly, G. (1996). Some problems in the management of the Green and Golden Bell Frog *Litoria Australian Zoologist.* Vol 30(2), May, pp233-236.

Department of Environment and Conservation (DEC) (2002). *Green Offsets for Sustainable Development. Concept Paper*. The Department, Sydney, April.

Department of Environment and Heritage (2005). *EPBC Act - Principal Significant Impact Guidelines 1.1.* The Department, Canberra.

Harden, G. (ed.) (1992-2002). *Flora of New South Wales. Volumes 1 to 4.* Royal Botanic Gardens/University of NSW Press, Sydney, incl. revised edition.

Kevin Mills & Associates Pty Limited (1991). Ecological Survey and Assessment, Coomonderry Swamp Catchment, Seven Mile Beach, City of Shoalhaven. Prepared for Mitchell McCotter Associates, August.

Kevin Mills & Associates Pty Limited (2002). Supplementary Information, Flora and Fauna Study, Southern Extraction Area, Gerroa Sand Quarry, Municipality of Kiama. Prepared for Cleary Bros (Bombo) Pty Ltd, Port Kembla, June.

Kevin Mills & Associates (2005a). Waterbird Survey Report Number 9, Gerroa Sand Quarry, Cleary Bros (Bombo) Pty Limited. Prepared for Cleary Bros (Bombo) Pty Ltd, January.

Kevin Mills & Associates (2005b). Overview of the Flora and Fauna, Cleary Bros (Bombo) Property at Gerroa. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, February.

Kevin Mills & Associates (2006a). The Natural Vegetation in the Municipality of Kiama, New South Wales. Prepared for Kiama Municipal Council, June.

Kevin Mills & Associates (2006b). The Fauna of Kiama, Municipality of Kiama, South Coast, New South Wales. Prepared for Kiama Municipal Council, June.

Kiama Municipal Council (1996). Kiama LEP 1996. The Council, Kiama.

Mills, K. (1998). Vegetation Survey Methods and Natural Vegetation Types in the Coastal Parts of the City of Shoalhaven, New South Wales. *Illawarra Vegetation Studies* (7), Coachwood Publishing, Jamberoo, NSW.

Mills, K. (2004a). The Swift Parrot on the South Coast of New South Wales. *Illawarra Wildlife Studies* (5), Coachwood Publishing, Jamberoo, NSW, November.

Mills, K. (2004b). Animals Killed by Motor Vehicles adjacent to Seven Mile Beach National Park and in the Illawarra Region. *Illawarra Wildlife Studies* (3), Coachwood Publishing, Jamberoo, NSW.

Murphy, M.J. (1998). Mammal Survey of Seven Mile Beach National Park and Comerong Island Nature Reserve on the South Coast of New South Wales In Lunney, D. & Dawson, L. (eds). *Australian Zoologist* 30(4): 419-425.

National Parks and Wildlife Service (NPWS) (2006). Endangered Ecological Communities Survey And Mapping, Coastal Vegetation Communities – Littoral Rainforest And Coastal Saltmarsh. NGH Environmental, June.

New South Wales (1994). *Fisheries Management Act 1994*. NSW Government, Sydney.

New South Wales (1995). *Threatened Species Conservation Act 1995*. NSW Government, Sydney.

New South Wales Scientific Committee (2005). Preliminary Determination to List Bangalay Sand Forest as an Endangered Ecological Community. The Committee, Hurstville, April.

Strahan, R. (1995). *The Mammals of Australia*. Australian Museum/Reed Books, Sydney, 756p.

Triggs, B. (1996). *Tracks, Scats and Other Traces. A Field Guide to Australian Mammals.* Oxford University Press Australia, Melbourne, 340p.

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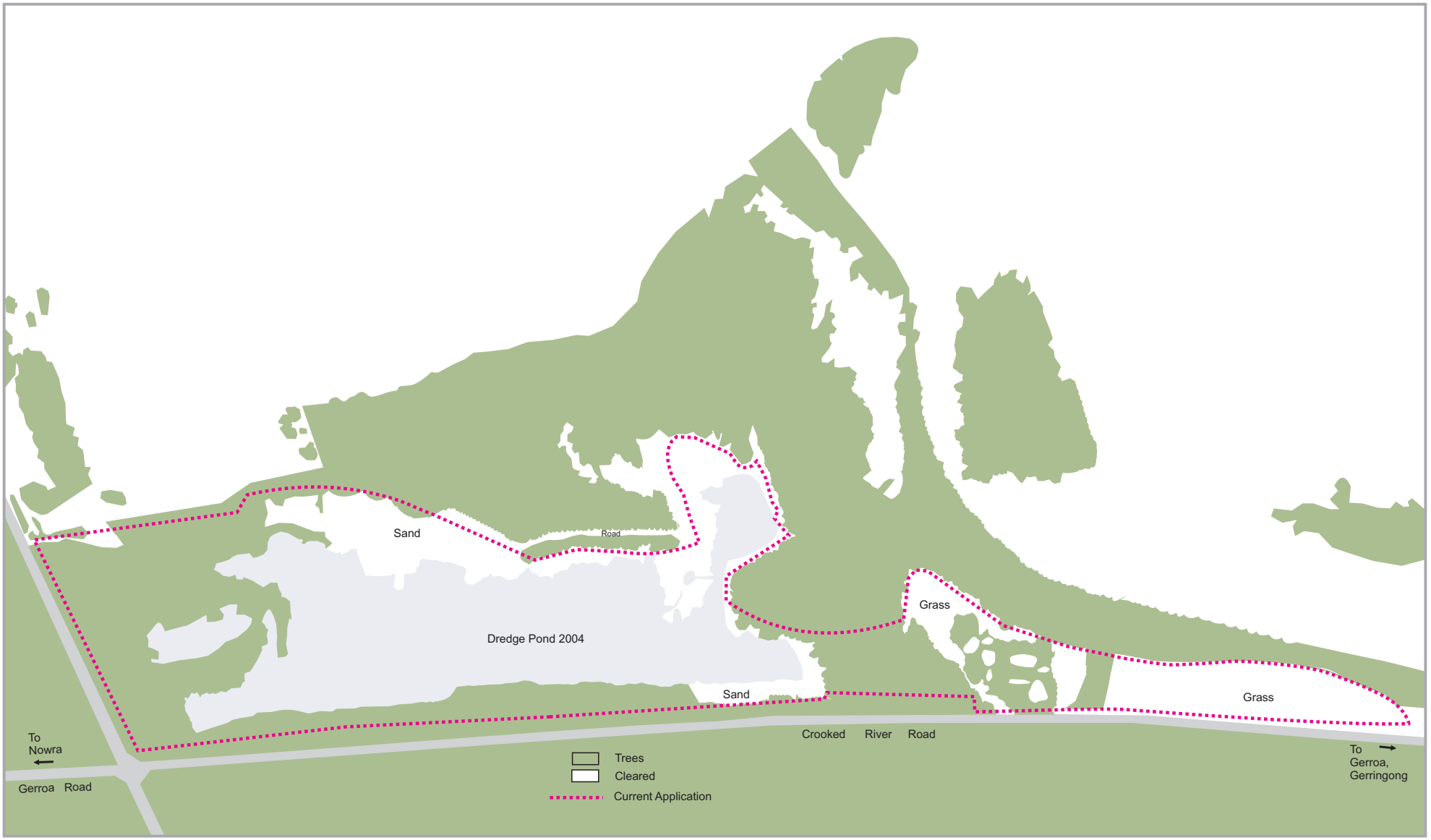

Figure 1 Project Area

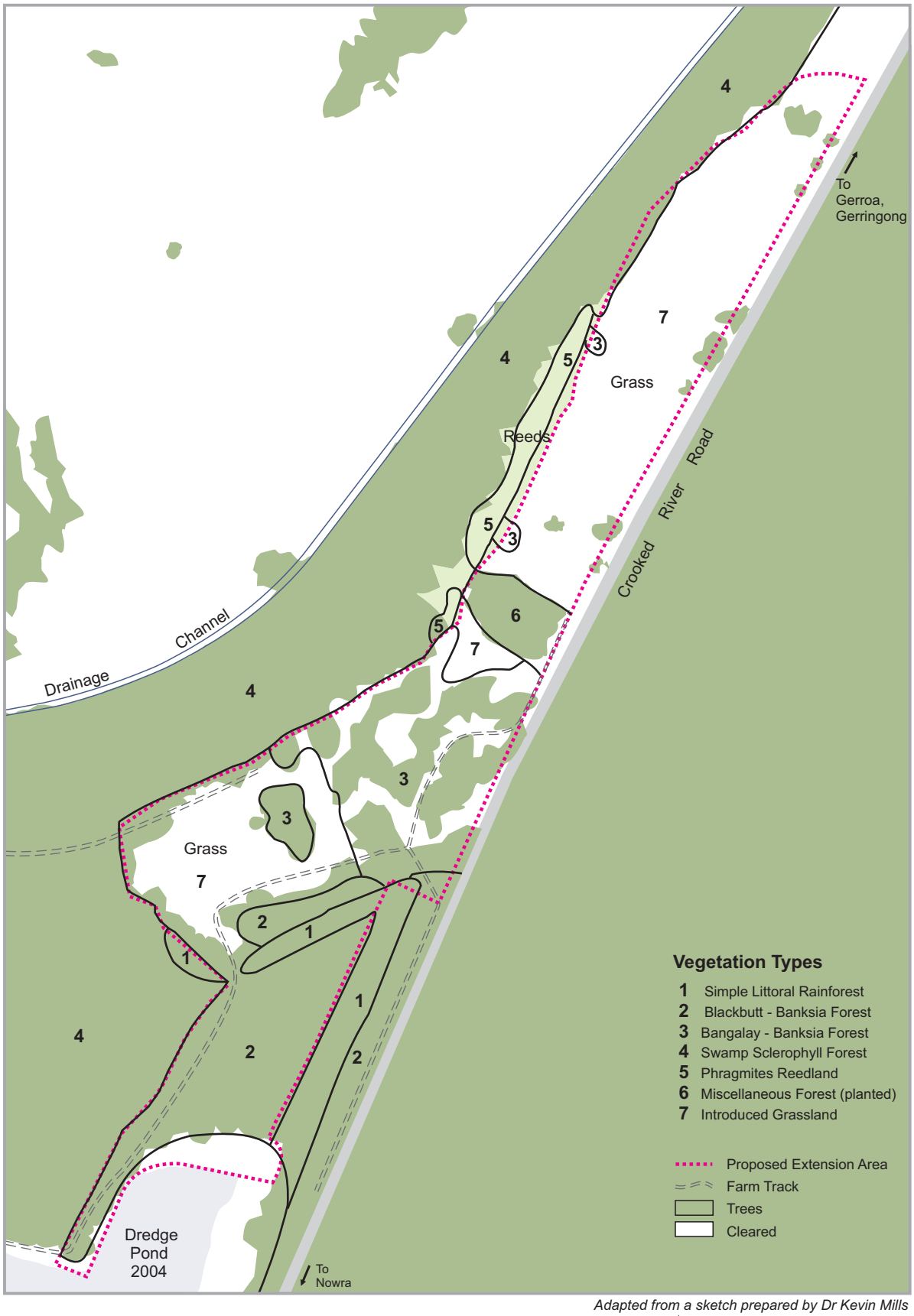

Figure 2 Vegetation Map

I.S.G.

APPROX. TRUE NORTH

To Gerroa and Gerringong

7.54ha

3.11ha

WIRO 15/4 UAG-S
Nr. 134.6 153.50

AREA A

1.6ha

SPARSE TREE
COVERED AREA

1.74ha

AREA B

LEGEND

LIMIT OF WETLAND
As identified by K. Mills &
surveyed by K.F.Williams
19-11-01 & 1-3-06

LIMIT OF LITTORAL FOREST
As identified by K. Mills
1-3-06

APPENDICES

APPENDIX 1
LIST OF PLANT SPECIES FOR THE PROJECT AREA

PTERIDOPHYTA (Ferns)
DENNSTAEDTIACEAE

Hypolepis muelleri Wakef.	Harsh Ground Fern
Pteridium esculentum (Forster f.) Cockayne	Common Bracken

ANGIOSPERMAE (Flowering Plants)

AMARYLLIDACEAE

Crinum pedunculatum R. Br.	Swamp Lily

APIACEAE

Hydrocotyle laxiflora DC.	Stinking Pennywort

APOCYNACEAE

Parsonsia straminea (R. Br.) F. Muell.	Monkey-rope Vine

ARECACEAE

Livistona australis (R. Br.) Mart.	Cabbage Palm

ASPLENIACEAE

Asplenium australasicum (Smith) Hook.	Bird's Nest Fern

ASCLEPIADACEAE

**Araujia hortorum* Fourn.	Moth Vine
Marsdenia rostrata R. Br.	Common Milk Vine
Tylophora barbata R. Br.	Bearded Tylophora

ASPARAGACEAE

**Protasparagus aethiopicus* (L.) Oberm.	Asparagus Fern

ASTERACEAE

Cassinia aculeata (Labill.) R. Br.	Common Cassinia
Ozothamnus diosmifolius (Vent.) DC.	Everlasting
Senecio bipinnatisectus Belcher	Groundsel
Senecio hispidulus A. Rich.	Rough Fireweed
Senecio linearifolius A. Rich.	Fireweed Groundsel
Sigesbeckia orientalis L.	Indian Weed
**Bidens pilosa* L.	Cobbler's Pegs
**Chrysanthemoides monilifera* (L.) Norlindh	Bitou Bush
**Cirsium vulgare* (Savi) Ten.	Spear Thistle
**Conyza albida* Willd. ex Sprengel	Tall Fleabane
**Gnaphalium americanum* Miller	American Cudweed
**Hypochaeris radicata* L.	Flatweed
**Senecio madagascariensis* Poiret	Fireweed
**Tagetes minuta* L.	Stinking Roger

BIGNONIACEAE

Pandorea pandorana (Andrews) Steenis	Wonga Vine

CASUARINACEAE	
Casuarina glauca Sieber ex Sprengel	Swamp Oak
CLUSIACEAE	
Hypericum gramineum Forster f.	Small St John's Wort
COMMELINACEAE	
Commelina cyanea R. Br.	Wandering Sailor
CONVOLVULACEAE	
Dichondra repens Forster & Forster f.	Kidney Weed
CYPERACEAE	
Baumea articulata (R. Br.) S. T. Blake	Jointed Twig-rush
Carex appressa R. Br.	Tall Sedge
Carex longebrachiata Boeck.	Bergalia Tussock
Gahnia clarkei Benl	Tall saw-sedge
Isolepis nodosa (Rottb.) R. Br.	Knobby Club-rush
Schoenoplectus validus (Vahl) A. & D. Love	River Club-rush
DILLENIACEAE	
Hibbertia obtusifolia DC.	Grey Guinea Flower
Hibbertia scandens (Willd.) Gilg	Climbing Guinea Flower
EPACRIDACEAE	
Monotoca elliptica (Smith) R. Br.	Tree Broom-heath
EUPHORBIACEAE	
Breynia oblongifolia Muell. Arg.	Breynia
Glochidion ferdinandi (Muell. Arg.) Bailey var. *ferdinandi*	Cheesetree
Omalanthus populifolius Graham	Bleeding Heart
FABACEAE	
FABOIDEAE (subfamily)	
Desmodium varians (Labill.) G. Don.	Slender Tick-trefoil
Glycine clandestina J.C. Wendl.	Twining Glycine
Kennedia rubicunda (Schneev.) Vent.	Dusky Coral-pea
**Erythrina x sykesii* Barneby & Krukoff	Coral Tree
**Trifolium repens* L.	White Clover
MIMOSOIDEAE (subfamily)	
Acacia binervata DC.	Two-veined Hickory
Acacia implexa Benth.	Hickory Wattle
Acacia longifolia (Andrews) Willd.	Golden Wattle
Acacia maidenii F. Muell.	Maiden's Wattle
Acacia mearnsii De Wild.	Black Wattle
Acacia suaveolens (Smith) Willd.	Sweet Wattle
Acacia ulicifolia (Salisb.) Court	Prickly Moses
GERANIACEAE	
Geranium solanderi Carolin	Native Geranium

JUNCACEAE	
Juncus usitatus L.A.S. Johnson	Common Rush
JUNCAGINACEAE	
Triglochin procerum R. Br.	Water Ribbons
LAURACEAE	
Cassytha pubescens R. Br.	Downy Dodder-laurel
**Cinnamomum camphora* (L.) Nees	Camphor Laurel
LOBELIACEAE	
Pratia purpurascens (R. Br.) E. Wimmer	Lobelia Pratia
LOMANDRACEAE	
Lomandra longifolia Labill.	Spiny-headed Mat-rush
LORANTHACEAE	
Amyema pendulum (Sieber ex Sprengel) Tieghem	Drooping Mistletoe
MELIACEAE	
Synoum glandulosum (Smith) A. Juss.	Rosewood
MENISPERMACEAE	
Stephania japonica (Thunb.) Miers	Snake Vine
MORACEAE	
Ficus coronata Spin	Sandpaper Fig
Ficus macrophylla Desf. ex Pers.	Moreton bay Fig
Ficus obliqua Forster f.	Small-leaved Fig
MYRSINACEAE	
Rapanea howittiana Mez	Muttonwood
MYRTACEAE	
Angophora floribunda (Smith) Sweet	Rough-barked Apple
Eucalyptus botryoides Smith	Bangalay
Eucalyptus pilularis Smith	Blackbutt
Eucalyptus robusta Smith	Swamp Mahogany
Leptospermum juniperinum Smith	Prickly Teatree
Melaleuca ericifolia Smith	Swamp Paperbark
Melaleuca linariifolia Smith	Narrow-leaved Paperbark
OLEACEAE	
Notelaea longifolia Vent.	Native Olive
ORCHIDACEAE	
Acianthus fornicatus R. Br.	Pixie Caps
Dendrobium teretifolium R. Br.	Rat's-tail Orchid
Pterostylis nutans R. Br.	Nodding Greenhood
OXALIDACEAE	
Oxalis exilis Cunn.	Wood Sorrel

PASSIFLORACEAE	
**Passiflora edulis* Sims	Edible Passionfruit
PHILESIACEAE	
Eustrephus latifolius R. Br.	Wombat Berry
Geitonoplesium cymosum (R. Br.) A. Cunn. ex Hook.	Scrambling Lily
PHORMIACEAE	
Dianella caerulea Sims	Flax-lily
PITTOSPORACEAE	
Billardiera scandens Smith	Common Apple-berry
Citriobatus pauciflorus Cunn. ex Ettingsh.	Orange Thorn
Pittosporum revolutum Aiton	Yellow Pittosporum
Pittosporum undulatum Vent.	Sweet Pittosporum
PLANTAGINACEAE	
**Plantago lanceolata* L.	Ribbed Plantain
POACEAE	
Cymbopogon refractus (R. Br.) A. Camus	Barbed Wire Grass
Cynodon dactylon (L.) Pers.	Couch Grass
Echinopogon caespitosa C. E. Hubb.	Tufted Hedgehog Grass
Entolasia stricta (R. Br.) Hughes	Wiry Panic
Eragrostis leptostachya Steud.	Paddock Lovegrass
Hemarthria uncinata R. Br.	Mat Grass
Imperata cylindrica P. Beauv. var. *major* (Nees) C. E. Hubb.	Blady Grass
Microlaena stipoides (Labill.) R. Br.	Weeping Grass
Oplismenus aemulus (R. Br.) Roem. & Schult.	Australian Basket-grass
Oplismenus imbecillus (R. Br.) Roem. & Schult.	Pademelon Grass
Phragmites australis (Cav.) Trin. ex Steud.	Common Reed
Themeda australis (R. Br.) Stapf	Kangaroo Grass
**Andropogon virginicus* L.	Whisky Grass
**Axonopus affinis* Chase	Carpet grass
**Chloris gayna* Kunth	Rhodes Grass
**Paspalum dilatatum* Poir.	Paspalum
**Pennisetum clandestinum* Hochst. ex Chiov.	Kikuyu Grass
** Setaria ? sphacelata* (K. Schum.) Stapf & C. E. Hubb.	South African Pigeon Grass
**Sporobolus indicus* (L.) R. Br.	Parramatta Grass
**Stenotraphrum secundatum* (Walter) Kuntze	Buffalo Grass
POLYGONACEAE	
** Acetosella vulgaris* Fourr.	Sheep Sorrel
PROTEACEAE	
Banksia integrifolia L. f.	Coast Banksia
RANUNCULACEAE	
Clematis aristata R. Br. ex DC.	Australian Clematis
RESTIONACEAE	
Restio tetraphyllus Labill. subsp. *meiostachyus* L. A. S. Johnson & O. D. Evans	Tassel Cord-rush

RHAMNACEAE	
Alphitonia excelsa (Fenzl) Reisseck ex Benth.	Red Ash
ROSACEAE	
Rubus parvifolius L.	Native Raspberry
RUTACEAE	
Melicope micrococca (F. Muell.) T. Hartley	White Euodia
Zieria smithii Jackson	Sandfly Zieria
SAPINDACEAE	
Guioa semiglauca (F. Muell.) Radlk.	Guioa
SMILACACEAE	
Smilax glyciphylla Sm.	Thornless Sarsaparilla
SOLANACEAE	
Duboisia myoporoides R. Br.	Corkwood
**Physalis peruviana* L.	Cape Gooseberry
TYPHACEAE	
Typha orientalis C. Presl	Broad-leaved Cumbungi
VERBENACEAE	
Clerodendrum tomentosum R. Br.	Hairy Clerodendrum
**Lantana camara* L.	Lantana
VIOLACEAE	
Viola hederacea Labill.	Native Violet
VITACEAE	
Cayratia clematidea (F. Muell.) Domin	Slender Grape

* Introduced Species.

APPENDIX 2
LIST OF PLANT SPECIES IN LITTORAL RAINFOREST STAND

Trees	
Acacia maidenii	
Angophora floribunda	
Banksia integrifolia	EEC[1]
Duboisia myoporoides	EEC
Eucalyptus botryoides	EEC
Eucalypus pilularis	
Glochidion ferdinandi	EEC
Guioa semiglauca	EEC
Pittosporum undulatum	EEC
Shrubs/Small Trees	
Alphitonia excelsa	
Breynia oblongifolia	EEC
Citriobatus pauciflorus	
Clerodendrum tomentosum	
Livistona australis	EEC
Melicope micrococca	EEC
Monotoca elliptica	
Notelaea longifolia	EEC
Pittosporum revolutum	
Synoum glandulosum	EEC
**Lantana camara*	
Understorey	
Acianthus fornicatus	
Asplenium australasicum	
Breynia oblongifolia	
Dianella caerulea	
Dichondra repens	
Entolasia stricta	
Geranium solanderi	
Imperata cylindrica	
Lomandra longifolia	EEC
Macrozamia communis	
Microlaena stipoides	
Oplismenus imbecillis	EEC
Pteridium esculentum	
Themeda australis	
Vines and Creepers	
Billardiera scandens	
Cayratia clematidea	EEC
Cissus hypoglauca	EEC
Clematis aristata	
Commelina cyanea	
Desmodium varians	
Eustrephus latifolius	EEC
Geitonoplesium cymosum	
Glycine clandestina	EEC
Hibbertia scandens	
Kennedia rubicunda	
Marsdenia rostrata	
Pandorea pandorana	EEC
Parsonsia straminea	
Rubus parviflorus	
Smilax glyciphylla	EEC
Stephania japonica	EEC
**Passiflora edulis*	

1. EEC - Species listed as charactersitic species of the Littoral Rainforest endangered ecological community.

APPENDIX 3
VEGETATION SURVEY PLOT DATA

Location: Seven Mile Beach, north-east of sand quarry.

Land Ownership: Private. Community: Simple Littoral Rainforest.
Date: January 2005 Grid Ref.: 02970 61487
Map Sheet: Gerroa Plot Size: 20m by 20m
Abundance on plot: 5-dominant; 4-common; 3-mod. common; 2-uncommon;1-rare.

Trees	Abundance	No. stems (>4m tall)
Glochidion ferdinandi	5	68
Guioa semiglauca	3	7
Eucalyptus botryoides	3	7
Angophora floribunda	3	4
Monotoca elliptica	2	3
Acacia maidenii	1	1
Banksia integrifolia	1	1
Duboisia myoporoides	1	1
Eucalypus pilularis	1	1
Shrubs/Small Trees		
Breynia oblongifolia	2	
Clerodendrum tomentosum	1	
Livistona australis	1	
Pittosporum revolutum	1	
**Lantana camara*	4	
Ground Cover		
Lomandra longifolia	4	
Oplismenus imbecillis	4	
Guioa semiglauca	2	
Breynia oblongifolia	2	
Acacia maidenii	1	
Dianella carulea	1	
Dichondra repens	1	
Geranium solanderi	1	
Imperata cylindrica	1	
Notelaea longifolia	1	
Pittosporum revolutum	1	
Pteridium esculentum	1	
Synoum glandulosum	1	
Vines and Creepers		
Commelina cyanea	4	
Cayratia clematidea	3	
Desmodium varians	2	
Eustrephus latifolius	1	
Glycine clandestina	1	
Hibbertia scandens	1	
Kennedia rubicunda	1	
Rubus parviflorus	1	
Smilax glyciphylla	1	
Stephania japonica	1	
**Passiflora edulis*	1	

Location: Seven Mile Beach, north of sand quarry.

Land Ownership: Private. Community: Bangalay Sand Forest (modified)

Date: May 2005 Grid Ref.: 02970 61488

Map Sheet: Gerroa Plot Size: 20m by 20m

Abundance on plot: 5-dominant; 4-common; 3-mod. common; 2-uncommon;1-rare.

Trees	Abundance	No. stems (>4m tall)
Eucalyptus botryoides		1
Banksia integrifolia		2
Shrubs/Small Trees		
Banksia integrifolia	1	1
Acacia maidenii	3	9
**Lantana camara*	2	
Ground Cover		
Imperata cylindrica	5	
Lomandra longifolia	5	
Pteridium esculentumi	5	
Themeda australis	5	
Cynodon dactylon	3	
Banksia integrifolia	1	
Dichondra repens	1	
Echinopogon caespitosa	1	
Eragrostis leptostachya	1	
Geranium solanderi	1	
Glochiion ferdinandi	1	
Microlaena stipoides	1	
Oplismenus aemulus	1	
Oxalis exilis	1	
**Acetosella vulgaris*	1	
**Axonopus affinis*	1	
**Bidens pilosa*	1	
**Hypochaeros radicata*	1	
**Lantana camara*	1	
**Setaria ? sphacolata*	1	
Vines and Creepers		
Hibbertia scandens	3	
Commelina cyanea	2	
Cayratia clematidea	1	
Desmodium varians	1	
Glycine clandestina	1	
Rubus parviflorus	1	
Stephania japonica	1	

Location: Seven Mile Beach, north of sand quarry.

Land Ownership: Private. Community: Blackbutt – Banksia Forest

Date: May 2005 Grid Ref.: 02968 61486

Map Sheet: Gerroa Plot Size: 20m by 20m

Abundance on plot: 5-dominant; 4-common; 3-mod. common; 2-uncommon;1-rare.

Trees	Abundance	No. stems (>4m tall)
Eucalypus pilularis	5	8
Shrubs/Small Trees		
Acacia maidenii	1	1
Eucalypus pilularis	1	1
**Lantana camara*	2	
Ground Cover		
Imperata cylindrica	5	
Lomandra longifolia	5	
Pteridium esculentum	4	
Themeda australis	4	
Glochiion ferdinandi	2	
Geitonoplesium cymosum	1	
Acacia maidenii	1	
Acacia ulicifolia	1	
Acianthus fornicatus	1	
Banksia integrifolia	1	
Breynia oblongifolia	1	
Dianella caerulea	1	
Dichondra repens	1	
Duboisia myoporoides	1	
Echinopogon caespitosa	1	
Entolasia stricta	1	
Hemarthria uncinata	1	
Isolepis nodosa	1	
Microlaena stipoides	1	
Monotoca eliptica	1	
Oplismenus aemulus	1	
Oxalis exilis	1	
Parsonsia straminea	1	
**Axonopus affinis*	1	
**Chrysanthemoies monilifera*	1	
**Conyza albida*	1	
**Hypochaeros radicata*	1	
**Lantana camara*	2	
Vines and Creepers		
Billardiera scandens	1	
Commelina cyanea	1	
Desmodium varians	1	
Eustrephus latifolius	1	
Glycine clandestina	1	
Hibbertia scandens	2	
Rubus parviflorus	1	
Stephania japonica	1	

NSW Scientific Committee
Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act, and as a consequence, to omit reference to the Sutherland Shire Littoral Rainforest from Part 3 of Schedule 1 (Endangered Ecological Community) of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is generally a closed forest, the structure and composition of which is strongly influenced by proximity to the ocean. The plant species in this ecological community are predominantly rainforest species with evergreen mesic or coriaceous leaves. Several species have compound leaves, and vines may be a major component of the canopy. These features differentiate littoral rainforest from sclerophyll forest or scrub, but while the canopy is dominated by rainforest species, scattered emergent individuals of sclerophyll species, such as *Angophora costata*, *Banksia integrifolia, Eucalyptus botryoides* and *E. tereticornis* occur in many stands. Littoral Rainforest in NSW is found at locations along the entire NSW Coast in the NSW North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion. The areas mapped for inclusion in State Environmental Planning Policy 26 Littoral Rainforest are examples of the Littoral Rainforest ecological communities, but the mapping for SEPP 26 is not exhaustive and stands of the Littoral Rainforest ecological community occur at locations not mapped under SEPP 26. Some stands may be regrowth or in the process of regenerating. The Sutherland Shire Littoral Rainforest Endangered Ecological Community which was previously listed as an endangered ecological community is included within this Community.

2. Littoral rainforest occurs on both sand dunes and on soils derived from underlying rocks (McKinley *et al*. 1999). Stands on headlands exposed to strong wind action may take the form of dense windpruned thickets (for example the Bunga Head Rainforest illustrated by Keith & Bedward 1999, or MU5 Littoral Windshear Thicket in NPWS 2002). In more sheltered sites, and in hind dunes, the community is generally taller, although still with wind pruning on the windward side of stands. Floristically there is a high degree of similarity between stands on different substrates. Most stands of Littoral Rainforest occur within 2 km of the sea, but may occasionally be found further inland, but within reach of maritime influence.

3. Littoral Rainforest comprises the *Cupaniopsis anacardioides – Acmena* spp. alliance of Floyd (1990). This alliance as described by Floyd includes five sub-alliances – *Syzygium leuhmannii – Acmena hemilampra, Cupaniopsis anacardioides, Lophostemon confertus, Drypetes – Sarcomelicope – Cassine – Podocarpus* and *Acmena smithii – Ficus - Livistona – Podocarpus.* The distribution of some of these sub-alliances is geographically restricted – the *Syzygium luehmannii – Acmena hemilampra* sub-alliance is restricted to the north coast, while the most widespread sub-alliance *Acmena smithii – Ficus – Livistona – Podocarpus* is the only one present on the coast south of Sydney. The *Lophostemon confertus* suballiance, synonymous with Forest Type 25 Headland Brush Box (Forestry Commission of NSW 1989) is restricted to exposed headlands in the North Coast Bioregion. There is considerable floristic variation between stands and in particular areas localised variants may be recognised (for example on the south coast a number of variants within the *Acmena smithii – Ficus – Livistona – Podocarpus* sub-alliance have been described, see Mills 1996, Mills & Jakeman 1995; Keith & Bedward 1999, NCC 1999, NPWS 2002). Small, depauperate stands may be difficult to assign to sub alliances. A number of species characteristic of Littoral Rainforest in NSW reach their southern limits at various places along the coast (for example *Cupaniopsis anacardioides* reaches its southern limit between Sydney and the Illawarra) but a number of temperate species are

restricted to the south coast, and the total Littoral Rainforest flora declines from north to south. Characteristic species of littoral rainforest include:

Acacia binervata
Acmena hemilampra
Acmena smithii
+ *Acronychia imperforata*
Acronychia oblongifolia
+ *Alpinia caerulea*
Alectryon coriaceus
Alyxia ruscifolia
+ *Aphananthe philippinensis*
+ *Archontophoenix cunninghamiana*
Arthropteris tenella
+ *Arytera divaricata*
Asplenium australasicum
+ *Baloghia marmorata*
Banksia integrifolia subsp*. integrifolia*
+ *Beilschmiedia obtusifolia*
Breynia oblongifolia
+ *Bridelia exaltata*
+ *Calamus muelleri*
Canthium coprosmoides
+ *Capparis arborea*
Cayratia clematidea
Celtis paniculata
Cissus antarctica
Cissus hypoglauca
Cissus sterculiifolia
Claoxylon australe
+ *Cordyline congesta*
+ *Cordyline stricta*
Cryptocarya glaucescens
Cryptocarya microneura
+ *Cryptocarya triplinervis*
Cupaniopsis anacardioides
Cynanchum elegans
Dendrocnide excelsa
+ *Dendrocnide photinophylla*
Dioscorea transversa
Diospyros australis
Diospyros pentamera
Doodia aspera
Duboisia myoporoides
+ *Dysoxylum fraserianum*
Ehretia acuminata
+ *Elaeocarpus obovatus*
+ *Elattostachys nervosa*
Endiandra discolor
Endiandra sieberi
Eucalyptus botryoides
Eucalyptus tereticornis
Eupomatia laurina
Eustrephus latifolius
Ficus coronata
Ficus obliqua
Ficus rubiginosa
+ *Ficus watkinsiana*
Flagellaria indica
Geitonoplesium cymosum
Glochidion ferdinandi
Glycine clandestina
+ *Gossia bidwillii*
Guioa semiglauca
+ *Ixora beckleri*
+ *Jagera pseudorhus*
+ *Lepidozamia peroffskyana*
Litsea reticulata
Livistona australis
Lomandra longifolia
+ *Lophostemon confertus*
Maclura cochinchinensis
+ *Mallotus philippensis*
Melaleuca quinquenervia
Melicope micrococca
+ *Melicope vitiflora*
+ *Mischocarpus pyriformis*
+ *Monococcus echinophorus*
+ *Morinda jasminoides*
+ *Mucuna gigantea*
Myoporum acuminatum
Notelaea longifolia
+ *Olea paniculata*
Oplismenus imbecillis
+ *Pandanus pedunculatus*
Pandorea pandorana
Pararchidendron pruinosum var*. pruinosum*
Parsonsia straminea
+ *Pentaceras australis*
Piper novae-hollandiae
+ *Pisonia umbellifera*
Pittosporum multiflorum
Pittosporum undulatum
Platycerium bifurcatum
Podocarpus elatus
Pollia crispata
Polyscias elegans
Pouteria australis
Pouteria cotinifolia var*. cotinifolia*
+ *Pouteria myrsinoides*
Rapanea variabilis

	Rhodamnia rubescens	+	*Rhodomyrtus psidioides*
	Ripogonum album		*Ripogonum discolor*
	Sarcomelicope simplicifolia		*Scolopia braunii*
	Smilax australis		*Smilax glyciphylla*
+	*Sophora tomentosa* subsp*. australis*		*Stephania japonica* var*. discolor*
	Synoum glandulosum		*Syzygium australe*
+	*Syzygium luehmannii*		*Syzygium oleosum*
	Syzygium paniculatum	+	*Tetrastigma nitens*
	Trophis scandens subsp*. scandens*		*Viola banksii*
	Wilkiea huegeliana		

Those species marked '+' are found in littoral rainforest north of Sydney, with some restricted to the north coast or in only a few sites south of the North Coast Bioregion. The other species are geographically more widespread.

Given the small size of many stands and the history of fragmentation, the number of characteristic species in any stand is likely to be smaller than this list. In addition, the total richness of stands declines with increasing latitude and a number of the species listed above are absent or rare in the south.

4. The total species list of the community is considerably larger than that given above, with many species present in only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought condition and by its disturbance (including fire) history. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented but the assemblage in individual stands will depend on geographic location, size of stand, degree of exposure, history of disturbance and, if previously disturbed, stage of regeneration.

5. Threatened species and populations for which Littoral Rainforest is known or likely habitat include:

Acronychia littoralis	*Cryptocarya foetida*
Archidendron hendersonii	*Macadamia tetraphylla*
Cynanchum elegans	*Hicksbeachia pinnatifolia*
Fontainea oraria	*Syzygium moorei*
Senna acclinis	*Xylosma terrae-reginae*

Syzygium paniculatum

Amaurornis olivaceus	Bush-hen
Coracina lineata	Barred Cuckoo-shrike
Lichenostomus faciogularis	Mangrove Honeyeater
Monarchia leucotis	White-eared Monarch
Ninox strenua	Powerful Owl
Pandion haliaetus	Osprey
Ptilinopus magnificus	Wompoo Fruit-dove
Ptilinopus regina	Rose-crowned Fruit-dove
Ptilinopus superbus	Superb Fruit-dove
Tyto tenebricosa	Sooty Owl
Dasyurus maculatus	Spotted-tailed Quoll
Kerivoula papuensis	Golden-tipped Bat
Mormopterus beccarii	Beccari's Freetail-bat
Mormopterus norfolkensis	Eastern Freetail-bat
Myotis adversus	Large-footed Myotis
Nyctimene robinsoni	Eastern Tube-nosed Bat

Potorous tridactylus	Long-nosed Potoroo
Pteropus alecto	Black Flying Fox
Pteropus poliocephalus	Grey-headed Flying Fox
Syconycteris australis	Eastern Blossom Bat
Thylogale stigmarica	Red-legged Pademelon
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink
Hoplocephalus bitorquatus	Pale-headed Snake
Thersites mitchellae	Mitchell's Rainforest Snail

Emu, *Dromaius novaehollandiae*, population in the NSW North Coast Bioregion and Port Stephens Local Government Area
Menippus fugitivus (Lea), a beetle population in the Sutherland Shire

Most of the species included in this list are found at only some sites, or vary in occurrence and abundance. As such they are not regarded as part of the characterisation of the community. Nevertheless, they are of conservation significance and need to be considered in recovery planning.

6. Littoral Rainforest occurs in numerous, small stands and in total comprises less than 1% of the total area of rainforest in NSW. The largest known stand occurs in Iluka Nature Reserve, which is approximately 136 ha. Many, but not all, stands of Littoral Rainforest have been included in mapping for State Environmental Planning Policy 26 Littoral Rainforest, but degradation of the ecological community is still occurring.

7. Weed species that threaten the integrity of particular stands include *Ambrosia artemisifolia*, *Anredera cordifolia, Arecastrum romanzoffianum, Asparagus* spp*., Cardiospermum grandiflorum, Chrysanthemoides monilifera, Coprosma repens, Ehrharta* spp., *Gloriosa superba, Ipomoea* spp; *Impatiens walleriana, Lantana camara, Macfadyena unguis-cati, Rivina humilis, Pennisetum clandestinim, Schefflera actinophylla, Senna septemtrionalis, Solanum mauritianum Thunbergia alata* and *Tradescantia fluminensis.*

8. Other threats include loss of canopy integrity arising from salt and wind damage as a result of clearing or damage to stand margins; clearing of understorey (including for firewood collection); grazing and physical disturbance of understorey including by feral deer; inappropriate collection of a range of plant species (including, but not restricted to, epiphytes); fire, particularly fire incursion along boundaries: visitor disturbance including soil compaction, soil disturbance, erosion from foot, cycle, trail bike and 4 wheel drive tracks, introduction of pathogens, and disturbance from creation of new planned and unplanned tracks; increased visitation and resulting increased demand for and use of, visitor facilities such as walking tracks, viewing platforms, toilet blocks, picnic areas etc; dumping of garden waste causing weed infestation; car and other rubbish dumping. Loss of fauna due to predation by feral animals, road kill, loss of habitat and feeding resources, disturbance from human visitation (faunal elements are essential to the ecological functioning of littoral rainforest and loss, or reduction, in pollinators and seed dispersal agents will adversely affect long term vegetation health); fragmentation resulting in loss of connectivity and possibly reduced genetic exchange between populations. For stands not protected by State Environmental Planning Policy 26, clearing and development remains a possibility. (Adam 1987, 1992; Floyd 1990; Mills 1996).

9. In view of the above the Scientific Committee is of the opinion that Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Associate Professor Paul Adam, Chairperson, Scientific Committee
Proposed Gazettal date: 04/06/04
Exhibition period: 04/06/04 – 16/07/04

References:

Adam P (1987) *New South Wales rainforests. The nomination for the World Heritage List*. NPWS, Sydney.

Adam P (1992) *Australian rainforests* Oxford University Press, Oxford.

Floyd AG (1990) Australian rainforests in New South Wales. Surrey Beatty and Sons, Sydney.

Forestry Commission of New South Wales (1989) Research Note No 17. Forest types in New South Wales FCNSW, Sydney.

Keith DA and Bedward M (1999) Native vegetation of the South East Forests region, Eden, New South Wales. *Cunninghamia* 6 (1), 1-218.

McKinley A, Milledge D, Nicholson H, Nicholson N and Stewart B (1999) Identification of littoral rainforest on krasnozem soils between the Queensland – New South Wales border and the Richmond River. Report for the National Parks and Wildlife Service.

Mills K (1996) Littoral Rainforests in Southern NSW: inventory, characteristics and management. Revised version of 1988 Illawarra Vegetation Studies, Paper 1.

Mills K and Jakeman J (1995) Rainforests of the Illawarra District. Coachwood Publishing, Jamberoo.

NCC (1999) Towards an Illawarra Regional Vegetation Management Plan. Vols. 1 & 2. Nature Conservation Council, Sydney.

NPWS (2002) Native Vegetation of the Wollongong Escarpment and Coastal Plain. Draft unpublished report for the Bioregional Assessment Study of the Wollongong LGA. NSW National Parks and Wildlife Service, Hurstville.

NSW Scientific Committee
Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:
1. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with coastal sand plains of marine or aeolian origin. It occurs on deep, freely draining to damp sandy soils on flat to moderate slopes within a few km of the sea and at altitudes below 100 m. Bangalay Sand Forest is characterised by the assemblage of species listed in paragraph 2 and typically comprises a relatively dense or open tree canopy, an understorey of mesophyllous or sclerophyllous small trees and shrubs, and a variable groundcover dominated by sedges, grasses or ferns.

2. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is characterised by the following assemblage of species:

Acacia longifolia	*Acacia sophorae*
Acmena smithii	*Allocasuarina littoralis*
Astroloma pinifolium	*Banksia integrifolia* subsp*. integrifolia*
Banksia serrata	*Billardiera scandens*
Breynia oblongifolia	*Cassytha pubescens*
Carex longebrachiata	*Casuarina glauca*
Commelina cyanea	*Desmodium gunnii*
Dianella caerulea var*. caerulea*	*Dianella crinoides*
Dichondra repens	*Echinopogon ovatus*
Entolasia marginata	*Eucalyptus botryoides*
Eucalyptus pilularis	*Geranium potentilloides*
Glycine clandestina	*Gonocarpus teucrioides*
Hardenberia violacea	*Hibbertia scandens*
Imperata cylindrica var*. major*	*Isolepis nodosa*
Kennedia rubicunda	*Lagenifera stipitata*
Lepidosperma concavum	*Leptospermum laevigatum*
Lomandra longifolia	*Marsdenia rostrata*
Microlaena stipoides var*. stipoides*	*Monotoca elliptica*
Notelaea longifolia	*Oplismenus imbecillus*
Parsonsia straminea	*Pittosporum revolutum*
Pittosporum undulatum	*Pratia purpurascens*
Pteridium esculentum	*Ricinocarpus pinifolius*
Rubus parvifolius	*Solanum pungentium*
Stephania japonica var*. discolor*	*Stellaria flaccida*
Themeda australis	*Viola hederacea*

3. The total species list of the community is larger than that given above, with many species present only in one or two sites, or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including grazing, land clearing and fire) history. The number and relative abundance of species will change with time since fire, and may also change in response to changes in fire frequency or grazing regime. At any one time, above-ground individuals of some species may be absent, but the species may be represented below ground in the soil

seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is mainly of vascular plant species, however the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented.

4. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions typically has a dense to open tree canopy, approximately 5 – 20 m tall, depending on exposure and disturbance history. The most common tree species include *Eucalyptus botryoides* (Bangalay) and *Banksia integrifolia* subsp. *integrifolia* (Coast Banksia), while *Eucalyptus pilularis* (Blackbutt) and *Acmena smithii* (Lilly Pilly) may occur in more sheltered situations, and *Casuarina glauca* (Swamp Oak) may occur on dunes exposed to salt-bearing sea breezes or where Bangalay Sand Forest adjoins Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions, as listed under the *Threatened Species Conservation Act 1995*. The open shrub stratum may be dominated by sclerophyllous species, such as *Banksia serrata* (Old Man Banksia), *Leptospermum laevigatum* (Coast Teatree) and *Monotoca elliptica*, or mesophyllous, species, such as *Breynia oblongifolia* (Coffee Bush) and *Pittosporum undulatum* (Sweet Pittosporum), or a combination of both. Shrubs may vary in height from one to ten m tall. The groundcover varies from open to dense, and may be sparse where the tree canopy is dense or where there is a thick litter of leaves and branches. Dominant species include *Dianella* spp. (Blue Flax Lilies), *Lepidosperma concavum, Lomandra longifolia* (Spiny-headed Matrush), *Pteridium esculentum* (Bracken), and the grasses *Imperata cylindrica* var. *major* (Blady Grass), *Microlaena stipoides* var. *stipoides* (Weeping Grass) and *Themeda australis* (Kangaroo Grass), while herbs, such as *Desmodium gunnii*, *Dichondra repens* (Kidney Weed), *Pratia purpurascens* (Whiteroot) and *Viola hederacea* (Ivy-leaved Violet), are scattered amongst the larger plants. Vines of *Glycine clandestina, Hardenbergia violacea* (False Sarsparilla), *Kennedia rubicunda* (Running Postman)*, Marsdenia rostrata* (Common Milk Vine) and *Stephania japonica* var. *discolor* (Snake Vine) scramble through the groundcover and occasionally over shrubs or tree trunks.

5. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is currently known from parts of the Local Government Areas of Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions. Bioregions are defined in Thackway and Creswell (1995).

6. A number of vegetation surveys and mapping studies have been carried out across the range of Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions. In the Sydney-South Coast region, this community includes 'Ecotonal Coastal Hind Dune Swamp Oak-Bangalay Shrub Forest' (ecosystem 27) excluding those stands that are dominated by *Casuarina glauca* and 'Coastal Sands Shrub/Fern Forest' (ecosystem 28) of Thomas *et al*. (2000); 'Littoral Thicket' (map unit 63) and part of 'Coastal Sand Forest' (map unit 64) of Tindall *et al*. (2004); 'Coastal Sand Bangalay-Blackbutt Forest' (map unit 25) of NPWS (2002); and 'Dry Dune Shrub Forest' of Keith and Bedward (1999). Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is included within the 'South Coast Sands Dry Sclerophyll Forests' vegetation class of Keith (2002, 2004). There may be additional or unmapped occurrences of Bangalay Sand Forest within and beyond these surveyed areas.

7. Near its northern limit in the Bundeena area, Bangalay Sand Forest co-occurs with Kurnell Dune Forest in the Sutherland Shire and City of Rockdale, which is listed as an Endangered Ecological Community in Part 3 of Schedule 1 of the Act. In this area, Bangalay Sand Forest is generally restricted to foredunes and hind dunes of beaches, while Kurnell Dune Forest generally occurs on sheltered sand flats further from the immediate influence of the sea. Characteristic species of Kurnell Dune Forest, such as *Angophora costata, Banksia ericifolia, Cupaniopsis anacardioides, Endiandra sieberi, Eucalyptus robusta* and *Maclura cochinchinensis*, are not common components of Bangalay Sand Forest. However, the two communities may intergrade where they co-occur. This Determination and the Determination of Kurnell Dune Forest collectively encompass all intermediate stands of vegetation between the two communities.

8. Another Endangered Ecological Community, Umina Coastal Sandplain Woodland in the Sydney Basin bioregion, occupies a similar sandplain habitat to the north of Sydney. However, this community occupies podsolised sands that are rich in iron (Burges & Drover 1952), as distinct from the humic podsols that characterise Bangalay Sand Forest, and is dominated by *Angophora floribunda* with *E. paniculata*, while *E. botryoides* predominates only in the vicinity of the beach. In addition, Umina Coastal Sandplain Woodland includes a greater diversity of mesic understorey species and *Acacia* species than Bangalay Sand Forest.

9. Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions is threatened by land clearing; degradation and disturbance associated with heavy recreational use; frequent burning; rubbish dumping; and weed invasion. These threats are generally associated with existing and proposed urban development along the coast. However, areas of Bangalay Sand Forest within conservation reserves, including Royal, Seven Mile Beach, Conjola, Meroo, Murramarang, Eurobodalla and Biamanga National Parks, are exposed to degradation by visitor overuse due to their proximity to popular beaches and camping areas.

10. Available vegetation mapping indicates that Bangalay Sand Forest has suffered substantial levels of clearing. The coastline between Gerroa and Bermagui includes an estimated area of about 3450 hectares, representing one-quarter of the estimated pre-1750 distribution of the community (ecosystems 27 and 28 of Thomas *et al*. 2000). Similarly, Tindall *et al*. (2004) map about 2200 hectares of Littoral Thicket, representing about one-third of the its estimated pre-European distribution between Sydney and Moruya. South of Bermagui, Keith & Bedward (1999) mapped a further 650 hectares, representing less than two-fifths of the estimated pre-1750 distribution. However, recent reconnaissance suggests that these studies may have over-estimated the remaining area of Bangalay Sand Forest (J. Miles, pers. comm.). North of Gerroa, only small fragments of the community persist, for example, on Minnamurra Spit (Mills 2000), around Primbee and Windang (NPWS 2002), Bundeena and Taren Point. Overall, these estimates indicate large reductions in the geographic distribution of the community. Clearing of native vegetation is listed as a Key Threatening Process under the *Threatened Species Conservation Act (1995)*.

11. Some areas of Bangalay Sand Forest are exposed to frequent burning, particularly around camping areas, towns and other sources of ignition. High frequency fire alters species composition by favouring fire-tolerant rhizomatous grasses, sedges and ferns at the expense of woody plants that are slow to regenerate after fire (Keith 1996). Elimination of woody species by frequent burning is likely to be accelerated by grazing. These processes of degradation represent large reductions in the ecological function of the community. High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition is listed as a Key Threatening Process under the *Threatened Species Conservation Act (1995)*.

12. Weed invasion occurs where Bangalay Sand Forest is exposed to disturbance and degradation. Common weed species include *Asparagus* spp., *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), introduced forms of *Cynodon dactylon* (Couch), *Cirsium vulgare* (Spear Thistle)*, Conyza bonariensis* (Fleabane)*, Hypochaeris radicata* (Cats Ear)*, Ipomea* spp. (Morning Glory spp.), *Lantana camara, Pennisetum clandestinum* (Kikuyu). These and other weed species may achieve considerable abundance within stands of Bangalay Sand Forest, indicating a large reduction in ecological function of the community. Invasion of native plant communities by exotic perennial grasses is listed as a Key Threatening Process under the *Threatened Species Conservation Act (1995)*.

13. Additions to the coastal reserve system and land use zoning have protected some stands of Bangalay Sand Forest from clearing. However, pressures associated with increasing human populations and recreational activity on the coast continue to intensify, especially where stands of the community occur in the vicinity of coastal villages and urban centres, and where new reserves involve the establishment of camping areas and other visitor infrastructure. Disturbance associated with increased human access contributes particularly to habitat degradation, increased frequencies of bushfire ignitions, and weed invasion, posing major threats even on land managed for conservation. In addition to the processes

outlined above, activities such as illegal fire wood collection by campers and coastal residents may threaten habitat for vertebrate and invertebrate fauna and disrupt nutrient and carbon cycling. Removal of dead wood and dead trees is listed as a Key Threatening Process under the *Threatened Species Conservation Act (1995)*. These processes may result in a large reduction in ecological function of the community.

14. In view of the above, the Scientific Committee is of the opinion that Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions it is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival cease to operate.

Dr Lesley Hughes
Chairperson
Scientific Committee
Proposed Gazettal date: 21/10/05
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References

Burges A, Drover, DP (1952) The rate of podzol development in sands of the Woy Woy district, N. S. W. *Australian Journal of Botany* 1, 83-95.

Keith DA (1996) Fire-driven mechanisms of extinction in vascular plants: a review of empirical and theoretical evidence in Australian vegetation. *Proceedings of the Linnean Society of New South Wales* 116, 37-78.

Keith DA, Bedward M (1999). Vegetation of the South East Forest region, Eden, New South Wales. *Cunninghamia* 6, 1-218.

Mills K (2000) Rural lands study City of Shellharbour. Nature conservation study. Shellharbour City Council.

Tindall D, Pennay C, Tozer MG, Turner K, Keith DA (2004) 'Native vegetation map report series. No. 4. Araluen, Batemans Bay, Braidwood, Burragorang, Goulburn, Jervis Bay, Katoomba, Kiama, Moss Vale, Penrith, Port Hacking, Sydney, Taralga, Ulladulla, Wollongong.' NSW Department of Environment and Conservation and NSW Department of Infrastructure, Planning and Natural Resources, Sydney.

Thackway R, Creswell ID (1995) (eds) 'An interim biogeographic regionalisation of Australia: a framework for establishing the national system of reserves.' (Australian Nature Conservation Agency: Canberra).

Thomas V, Gellie N, Harrison T (2000) 'Forest ecosystem classification and mapping for the southern Comprehensive Regional Assessment.' NSW National Parks and Wildlife Service, Queanbeyan.

NSW Scientific Committee
Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act, and as a consequence to omit reference to Sydney Coastal Estuary Swamp Forest in the Sydney Basin bioregion from Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act.
The Scientific Committee has found that:

1. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (adapted from Speight 1990). Swamp Sclerophyll Forest on Coastal Floodplains generally occurs below 20 m (though sometimes up to 50 m) elevation, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains in the NSW North Coast, Sydney Basin and South East Corner bioregions. The structure of the community is typically open forest, although partial clearing may have reduced the canopy to scattered trees. In some areas the tree stratum is low and dense, so that the community takes on the structure of scrub. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent. Typically these forests, scrubs, fernlands, reedlands and sedgelands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water (e.g. Pressey 1989a).

The composition of Swamp Sclerophyll Forest on Coastal Floodplains is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil. Composition also varies with latitude. The community is characterised by the following assemblage of species:

Acacia irrorata	*Acacia longifolia*
Acmena smithii	*Adiantum aethiopicum*
Allocasuarina littoralis	*Banksia oblongifolia*
Banksia spinulosa	*Baumea articulata*
Baumea juncea	*Blechnum camfieldii*
Blechnum indicum	*Breynia oblongifolia*
Callistemon salignus	*Calochlaena dubia*
Carex appressa	*Casuarina glauca*
Centella asiatica	*Dianella caerulea*
Dodonaea triquetra	*Elaeocarpus reticulatus*
Entolasia marginata	*Entolasia stricta*
Eucalyptus botryoides	*Eucalyptus longifolia*
Eucalyptus resinifera subsp*. hemilampra*	*Eucalyptus robusta*
Ficus coronata	*Gahnia clarkei*
Gahnia sieberiana	*Glochidion ferdinandi*
Glycine clandestina	*Gonocarpus tetragynus*
Hydrocotyle peduncularis	*Hypolepis muelleri*
Imperata cylindrica var*. major*	*Isachne globosa*
Leptospermum polygalifolium subsp*. polygalifolium*	*Livistona australis*

Lomandra longifolia
Melaeuca ericifolia
Melaleuca quinquenervia
Melaleuca styphelioides
Omalanthus populifolius
Oplismenus imbecillis
Phragmites australis
Pratia purpurascens
Stephania japonica var. *discolor*
Villarsia exaltata
Viola hederacea
Lophostemon suaveolens
Melaleuca linariifolia
Melaleuca sieberi
Morinda jasminoides
Oplismenus aemulus
Parsonsia straminea
Polyscias sambucifolia
Pteridium esculentum
Themeda australis
Viola banksii

2. The total species list of the community is considerably larger than that given above, with many species present at only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including fire, grazing, flooding and land clearing) history. The number and relative abundance of species will change with time since fire, flooding or significant rainfall, and may also change in response to changes in grazing regimes. At any one time, above-ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented.

3. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, Lake Macquarie, Wyong, Gosford, Hornsby, Pittwater, Warringah, Manly, Liverpool, Rockdale, Botany Bay, Randwick, Sutherland, Wollongong, Shellharbour, Kiama and Shoalhaven but may occur elsewhere in these bioregions. Bioregions are defined in Thackway and Creswell (1995). Major examples once occurred on the floodplains of the Tweed, Richmond, Clarence, Macleay, Hastings and Manning Rivers, although smaller floodplains would have also supported considerable areas of this community.

4. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has an open to dense tree layer of eucalypts and paperbarks, which may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. For example, stands dominated by *Melaleuca ericifolia* typically do not exceed 8 m in height. The most widespread and abundant dominant trees include *Eucalyptus robusta* (swamp mahogany), *Melaleuca quinquenervia* (paperbark) and, south from Sydney, *Eucalyptus botryoides* (bangalay) and *Eucalyptus longifolia* (woollybut). Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* (sweet willow bottlebrush), *Casuarina glauca* (swamp oak) and *Eucalyptus resinifera* subsp. *hemilampra* (red mahogany), *Livistona australis* (cabbage palm) and *Lophostemon suaveolens* (swamp turpentine). A layer of small trees may be present, including *Acacia irrorata* (green wattle), *Acmena smithii* (lilly pilly), *Elaeocarpus reticulatus* (blueberry ash), *Glochidion ferdinandi* (Cheese Tree), *Melaleuca linariifolia* and *M. styphelioides* (paperbarks). Shrubs include *Acacia longifolia* (Sydney golden wattle), *Dodonaea triquetra* (a hopbush), *Ficus coronata* (sandpaper fig), *Leptospermum polygalifolium* subsp. *polygalifolium* (lemon-scented tea tree) and *Melaleuca* spp. (paperbarks). Occasional vines include *Parsonsia straminea* (common silkpod), *Morinda jasminoides* and *Stephania japonica* var. *discolor* (snake vine). The groundcover is composed of abundant sedges, ferns, forbs, and grasses including *Gahnia clarkei, Pteridium esculentum* (bracken), *Hypolepis muelleri* (batswing fern), *Calochlaena dubia* (false bracken), *Dianella caerulea* (blue flax lily), *Viola hederacea, Lomandra longifolia* (spiny-headed mat-rush) and *Entolasia marginata* (bordered panic) and *Imperata cylindrica* var. *major* (blady grass). The endangered swamp orchids *Phaius australis* and *P. tankervillei* are found in this

community. On sites downslope of lithic substrates or with soils of clay-loam texture, species such as *Allocasuarina littoralis* (black she-oak)*, Banksia oblongifolia, B. spinulosa* (var. *collina* or var. *spinulosa*) (hairpin banksia), *Ptilothrix deusta* and *Themeda australis* (kangaroo grass)*,* may also be present in the understorey*.* The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic grasses, vines and forbs.

5. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions provides habitat for a broad range of animals, including many that are dependent on trees for food, nesting or roosting (Law *et al*. 2000). The blossoms of *Eucalyptus robusta* and *Melaleuca quinquenervia* are also an important food source for the Grey-headed Flying Fox (*Pteropus poliocephalus*) and Common Blossom Bat (*Sycoyncteris australis*) (Law 1994), as well as the Yellow-bellied Glider (*Petaurus australis*), Sugar Glider (*Petaurus breviceps*), Regent Honeyeater (*Xanthomyza phrygia*) and Swift Parrot (*Lathamus discolor*). Other animals found in this community include the Osprey (*Pandion haliaetus*), Australasian Bittern (*Botaurus poiciloptilus*), Large-footed myotis (*Myotis adversus*), *Litoria olongburensis* and Wallum Froglet (*Crinia tinnula*).

6. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions forms part of a complex of forested and treeless wetland communities found throughout the coastal floodplains of NSW. A recent analysis of available quadrat data from these habitats identified a distinct grouping of vegetation samples attributable to this community (Keith and Scott 2005). The combination of features that distinguish Swamp Sclerophyll Forest on Coastal Floodplains from other endangered ecological communities on the coastal floodplains include: its relatively dense tree canopy dominated by *Eucalyptus robusta, Melaleuca quinquenervia* or *E. botryoides*, the relatively infrequent occurrence of other eucalypts, *Casuarina glauca* or *Lophostemon suaveolens*; the occasional presence of rainforest elements as scattered trees or understorey plants; and the prominence of large sedges and ferns in the groundcover. It generally occupies small alluvial flats and peripheral parts of floodplains where they adjoin lithic substrates or coastal sandplains. The soils are usually waterlogged, stained black or dark grey with humus, and show little influence of saline ground water.

7. Swamp Sclerophyll Forest on Coastal Floodplains includes and replaces Sydney Coastal Estuary Swamp Forest in the Sydney Basin bioregion. It may adjoin or intergrade with several other endangered ecological communities, which collectively cover all remaining native vegetation on the coastal floodplains of New South Wales. These include Lowland Rainforest on Floodplain in the NSW North Coast bioregion, River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (including the formerly listed Sydney Coastal River-Flat Forest in the Sydney Basin bioregion), Subtropical Floodplain Forest, Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions and Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. For example, as soils become less waterlogged, Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions may adjoin or intergrade with River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. As soil salinity increases Swamp Sclerophyll Forest on Coastal Floodplains may intergrade with, and be replaced by, Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions. The boundaries between these communities are dynamic and may shift in response to changes in hydrological regimes, fire regimes or land management practices (e.g. Johnston *et al.* 2003, Stevenson 2003). The Determinations for these communities collectively encompass the full range of intermediate assemblages in transitional habitats.

8. A number of vegetation surveys and mapping studies have been conducted across the range of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. This community includes the *Eucalyptus robusta* (Swamp Mahogany) community identified on coastal alluvium by Douglas and Anderson (2002) and the Coastal Alluvium Swamp Forest complex

defined by Anderson and Asquith (2002). In the Comprehensive Regional Assessment of the north-eastern NSW (NPWS 1999), those areas on floodplains mapped as 'Forest Ecosystem 112, Paperbark', and those areas on floodplains mapped as 'Forest Ecosystem 142, Swamp Mahogany' are included within this community. On the Tweed lowlands, this community includes '*Eucalyptus robusta* mid-high to very tall closed forest' (F7), '*Archontophoenix cunninghamiana-Melaleuca quinquenervia* very tall feather palm swamp forest' (F9), those parts of *Melaleuca quinquenervia* tall to very tall open to closed forest' (F8) on alluvial soils and parts of 'Floodplain Wetland Complex' (FL) dominated by *Eucalyptus robusta* or *Melaleuca quinquenervia* (Pressey and Griffith 1992). In the lower Hunter district, this community includes 'Swamp Mahogany-Paperbark Swamp Forest' (map unit 37), Riparian Melaleuca Swamp Woodland (map unit 42) and Melaleuca Scrub (map unit 42a) of NPWS (2000). In the Sydney-Gosford region, this community includes those parts of 'Freshwater Swamp complex' (map unit 27a) dominated by *Eucalyptus robusta* or *E. botryoides* (Benson 1986, Benson and Howell 1994) and parts of the 'Freshwater wetlands – on the floodplains' of Benson and Howell (1990) and Benson et al. (1996). In the Illawarra, this community includes 'Alluvial swamp mahogany forest' (map unit 35) of NPWS (2002). On the south coast, this community includes 'Northern Coastal Lowlands Swamp Forest' (forest ecosystem 175) of Thomas *et al*. (2000) and 'Coastal Sand Swamp Forest' (map unit 45) of Tindall *et al*. (2004). Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is included within the 'Coastal Floodplain Wetlands' and 'Coastal Swamp Forest' vegetation classes of Keith (2002, 2004). There may be additional or unmapped occurrences of Swamp Sclerophyll Forest on Coastal Floodplains within and beyond these surveyed areas.

9. The extent of the Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions prior to European settlement has not been mapped across its entire range. However, one estimate estimate based on a compilation of regional vegetation maps suggests that Coastal Floodplain Wetlands, which include Swamp Sclerophyll Forest on Floodplains, currently cover 800-1400 km2, representing less than 30% of the original extent of this broadly defined vegetation class (Keith 2004). Compared to this combined estimate, the remaining area of Swamp Sclerophyll Forest on Coastal Floodplains is likely to be considerably smaller and is likely to represent much less than 30% of its original range. For example, there were less than 350 ha of native vegetation attributable to this community on the Tweed lowlands in 1985 (Pressey and Griffith 1992), less than 2500 ha on the Clarence floodplain in 1982 (Pressey 1989a), less than 700 ha on the Macleay floodplain in 1983 (Pressey 1989b), up to 7000 ha in the lower Hunter – central coast district during the 1990s (NPWS 2000), and less than 1000 ha in the Sydney – South Coast region in the mid 1990s (Tindall *et al*. 2004), including less than 40 ha on the Illawarra plain in 2001 (NPWS 2002) and about 450 ha on the South Coast in the 1990s (Thomas *et al*. 2000).

10. Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has been extensively cleared and modified. Large areas that formerly supported this community are occupied by exotic pastures grazed by cattle, market gardens, other cropping enterprises (e.g. sorghum, corn, poplars, etc.) and, on the far north coast, canefields. On the Tweed lowlands, Pressey and Griffith (1992) estimated that less than 3% of the original Floodplain Wetlands and Floodplain Forest remained in 1985. Similar estimates are likely to apply to Swamp Sclerophyll Forest on Coastal Floodplains in other parts of the NSW North Coast bioregion (Goodrick 1970, Pressey 1989a, 1989b). In the lower Hunter – central coast district, about 30 % of the original area of Swamp mahogany – paperbark forest was estimated to remain in the 1990s (NPWS 2000).

11. Land clearing continues to threaten Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. A small minority of the remaining area occurs on public land (e.g. Pressey and Griffith 1992, NPWS 2000), with most occurring on productive agricultural land or in close proximity to rural centres. The remaining stands are severely fragmented by past clearing and further threatened by continuing fragmentation and degradation, flood mitigation and drainage works, landfilling and earthworks associated with urban and industrial development, pollution from urban and agricultural runoff, weed invasion, overgrazing, trampling and other soil disturbance by domestic

livestock and feral animals including pigs, activation of 'acid sulfate soils', removal of dead wood and rubbish dumping (e.g. Pressey 1989a, b; Pressey and Griffith 1992, Boulton and Brock 1999, Johnston *et al*. 2003). Anthropogenic climate change may also threaten Swamp Sclerophyll Forest on Coastal Floodplains if future flooding regimes are affected (IPCC 2001, Hughes 2003). Localised areas, particularly those within urbanised regions, may also be exposed to frequent burning which reduces the diversity of woody plant species. Clearing of native vegetation; Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands; Invasion of native plant communities by exotic perennial grasses; Predation, habitat destruction, competition and disease transmission by feral pigs; Anthropogenic climate change; High frequency fire and Removal of dead wood and dead trees are listed as Key Threatening Processes under the Threatened Species Act (1995).

12. Large areas of habitat formerly occupied by Swamp Sclerophyll Forest on Coastal Floodplains have been directly drained by construction of artificial channels (e.g. Pressey 1989a, Boulton and Brock 1999). While much of the early drainage works were associated with agricultural development, more recently they are associated with urban expansion. Additional areas that have not been directly drained may have been altered hydrologically by changed patterns of flooding and drainage following flood mitigation works, particularly the construction of drains, levees and floodgates (Pressey and Griffith 1992). On the north coast of NSW, expansion of *Melaleuca quinquenervia* into open floodplain swamps has been attributed to artificial drainage and shortening of the hydroperiod (Johnston *et al*. 2003, Stevenson 2003). These changes appear to be closely associated with enhanced acidity, altered ionic ratios, increased dissolved organic carbon and sulfide oxidation in the soil profile (Johnston *et al*. 2003).

13. Relatively few examples of Swamp Sclerophyll Forest on Coastal Floodplains remain unaffected by weeds. The causes of weed invasion include physical disturbance to the vegetation structure of the community, dumping of landfill rubbish and garden refuse, polluted runoff from urban and agricultural areas, construction of roads and other utilities, and grazing by domestic livestock. The principal weed species affecting Swamp Sclerophyll Forest on Coastal Floodplains include *Andropogon virginicus* (whiskey grass), *Anredera cordifolia* (Madeira vine)*, Ageratina adenophora* (crofton weed), *Baccharis halimifolia* (groundsel bush)*, Cinnamomum camphora* (camphor laurel), *Lantana camara* (lantana), *Ligustrum sinense* (small-leaved privet)*, Lonicera japonica* (Japanese honeysuckle) and *Ludwigia peruviana* (Keith and Scott 2005).

14. Small areas of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions are contained within existing conservation reserves, including Bungawalbin, Tuckean and Moonee Beach Nature Reserves, and Hat Head, Crowdy Bay, Wallingat, Myall Lakes and Garigal National Parks. These occurrences are unevenly distributed throughout the range and unlikely to represent the full diversity of the community. In addition, wetlands within protected areas are exposed to hydrological changes that were, and continue to be initiated outside their boundaries. Some areas of Swamp Oak Floodplain Forest are protected by State Environmental Planning Policy 14, although this has not always precluded impacts on wetlands from the development of major infrastructure.

15. Given the dynamic hydrological relationship between Swamp Sclerophyll Forest on Coastal Floodplains, Coastal Saltmarsh and other endangered ecological communities on coastal floodplains, future management of water and tidal flows may result in the expansion of some communities at the expense of others. Proposals for the restoration of natural hydrological regimes and for the rehabilitation of acid sulfate soils may also result in changes to the distribution and composition of floodplain communities. Co-ordinated planning and management approaches across whole catchments will be required to address and resolve priorities between different management objectives.

16. In view of the above the Scientific Committee is of the opinion that Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Associate Professor Paul Adam
Chairperson
Scientific Committee

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References:

Anderson J, Asquith J (2002) Findings of the coastal lowland forests/swamp mahogany project: final report. Report to the NSW State Wetlands Advisory Committee.

Benson DH (1986) The native vegetation of the Gosford – Lake Macquarie 1:100 000 map sheets. *Cunninghamia* 1, 467-490.

Benson DH, Howell, J (1990) 'Taken for granted: the bushland of Sydney and its suburbs.' (Kangaroo Press, Sydney.)

Benson DH, Howell J (1994) The native vegetation of the Sydney 1:100 000 map sheet. *Cunninghamia* 3, 679-788.

Benson DH, Howell, J, McDougall L. (1996) 'Mountain devil to mangrove.' (Royal Botanic Gardens, Sydney.)

Boulton, AJ, Brock MA (1999). 'Australian freshwater wetlands: processes and management.' (Gleneagles Publishing, Glen Osmond.)

Douglas S, Anderson, J (2002) *Eucalyptus robusta* (Swamp Mahogany) communities and their conservation status in New South Wales. Swamp mahogany project. Central coast community environment network Inc.

Goodrick GN (1970) A survey of wetlands of coastal New South Wales. Technical Memorandum No. 5. CSIRO, Canberra.

Hughes L (2003) Climate change and Australia: trends, projections and impacts. *Austral Ecology 28*, 423-443.

IPCC (2001) Climate change 2001: Impacts, adaptation and vulnerability. Report from Working Group II. Intergovernmental Panel on Climate Change, Geneva.

Johnston SG, Slavich PG, Hirst P (2003) Alteration of groundwater and sediment geochemistry in a sulfidic backswamp due to Melaleuca quinquenervia encroachment. *Australian Journal of Soil Research* 41, 1343-1367.

Keith DA (2002) 'A compilation map of native vegetation for New South Wales.' (NSW Biodiversity Strategy. NSW National Parks and Wildlife Service, Sydney.)

Keith DA (2004) 'Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT.' (NSW Department of Environment and Conservation, Sydney.)

Keith DA, Scott, J (2005) Native vegetation of coastal floodplains– a broad framework for definition of communities in NSW. *Pacific Conservation Biology* 11, in press.

Law BS (1994) Nectar and pollen: dietary items affecting the abundance of the Common blossum bat (*Syconycteris australis*) in NSW *Australian Journal of Ecology* 19, 425-434.

Law BS, Mackowski C, Schoer L, Tweedie T (2002b) The flowering phenology of myrtaceous trees and their relation to environmental and disturbance variables in Northern New South Wales. *Austral Ecology* 25, 160-178.

NPWS (1999). Forest ecosystem classification and mapping for the upper and lower north east Comprehensive Regional Assessment. NSW National Parks and Wildlife Service, Coffs Harbour.

NPWS (2000) Vegetation Survey, Classification and Mapping: Lower Hunter and Central Coast Region. Version 1.2. NSW National Parks and Wildlife Service, Sydney.

NPWS (2002) Native vegetation of the Wollongong escarpment and coastal plain. NSW National Parks and Wildlife Service, Sydney.

Pressey RL (1989a) Wetlands of the lower Clarence floodplain, northern coastal New South Wales. *Proceedings of the Linnean Society of NSW* 111, 143-155.

Pressey RL (1989a) Wetlands of the lower Macleay floodplain, northern coastal New South Wales. *Proceedings of the Linnean Society of NSW* 111, 157-168.
Pressey RL, Griffth SJ (1992) Vegetation of the coastal lowlands of Tweed shire, northern New South Wales, species and conservation. *Proceedings of the Linnean Society of NSW* 113, 203-243.
Speight JG (1990) Landform. In: 'Australian soil and land survey. Field handbook' Second edition (Eds. RC McDonald, RF Isbell, JG Speight, J, Walker, MS Hopkins), pp9-57. Inkata Press, Melbourne.
Stevenson, M (2003) Remote sensing and historical investigation of environmental change and *Melaleuca* encroachment in Tuckean Swamp, north-eastern NSW. Unpublished report. School of Environmental Science and Management, Southern Cross University, Lismore.
Thackway R, Creswell ID (1995) (eds) 'An interim biogeographic regionalisation of Australia: a framework for establishing the national system of reserves.' (Australian Nature Conservation Agency: Canberra).
Tindall D, Pennay C, Tozer MG, Turner K, Keith, DA (2004) Native vegetation map report series. No. 4. Araluen, Batemans Bay, Braidwood, Burragorang, Goulburn, Jervis Bay, Katoomba, Kiama, Moss Vale, Penrith, Port Hacking, Sydney, Taralga, Ulladulla, Wollongong. NSW Department of Environment and Conservation and NSW Department of Infrastructure, Planning and Natural Resources, Sydney.
Thomas V, Gellie N, Harrison T (2000) 'Forest ecosystem classification and mapping for the southern Comprehensive Regional Assessment.' (NSW National Parks and Wildlife Service, Queanbeyan.)

APPENDIX 7
LIST OF ANIMAL SPECIES FOR THE PROJECT AREA AND LOCALITY

Group Name	Common Name	Project Area[1]	Locality[2]
1. Mammals			
Black Rat*	*Rattus rattus*		N
Brown Antechinus	*Antechinus stuartii*		N
Brown Hare*	*Lepus capensis*		N
Bush Rat	*Rattus fuscipes*		N
Cat*	*Felis catus*		N
Chocolate Wattled Bat	*Chalinolobus morio*	A	N
Common Brushtail Possum	*Trichosurus vulpecula*		N
Common Ringtail Possum	*Pseudocheirus peregrinus*	A	N
Dog*	*Canis lupus*		N
Domestic Cattle*	*Bos taurus*	A	N
Eastern Forest Bat	*Vespadelus pumilus*		N
Eastern Freetail-bat	*Mormopterus* sp.		N
Eastern Pygmy-possum	*Cercartetus nanus*		N
East-coast Freetail-bat	*Mormopterus norfolkensis*		N
Feathertail Glider	*Acrobates pygmacus*		N
Fox*	*Vulpes vulpes*	A	N
Gould's Wattled Bat	*Chalinolobus gouldii*		N
Greater Broad-nosed Bat	*Scoteanax rueppellii*		N
Greater Glider	*Petauroides volans*		N
Grey-headed Flying-fox	*Pteropus poliocephalus*		N
House Mouse*	*Mus musculus*		N
Large Bentwing-bat	*Miniopterus schreibersii*	A	
Large Forest Bat	*Vespadelus darlingtoni*	A	N
Little Forest Bat	*Vespadelus vulturnus*	A	N
Long-nosed Bandicoot	*Perameles nasuta*	A	N
Rabbit*	*Oryctolagus cuniculus*	A	N
Short-beaked Echidna	*Tachyglossus aculeatus*		N
Southern Forest Bat	*Vespadelus regulus*		N
Spotted-tailed Quoll	*Dasyurus maculatus*		N
Sugar Glider	*Petaurus breviceps*		N
Swamp Wallaby	*Wallabia bicolor*	A	N
White-striped Freetail-bat	*Nyctinomus australis*		N
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*		N
2. Birds			
Australasian Bittern	*Botaurus poiciloptilus*		N
Australasian Grebe	*Tachybaptus novaehollandiae*	A	N
Australian Hobby	*Falco longipennis*		N
Australian Magpie	*Gymnorhina tibicen*	A	N
Australian Pelican	*Pelecanus conspicillatus*		N
Australian Raven	*Corvus coronoides*	A	N
Australian Shoveler	*Anas rhynchotis*		N
Australian White Ibis	*Threskiornis molucca*		N
Australian Wood Duck	*Chenonetta jubata*	A	N
Azure Kingfisher	*Alcedo azurea*		
Barn Owl	*Tyto alba*		N
Bar-tailed Godwit	*Limosa lapponica*		N

Group Name	Common Name	Project Area[1]	Locality[2]
Bassian Thursh	*Zoothera lunulata*		N
Black Bittern	*Ixobrychus flavicollis*		N
Black Swan	*Cygnus atratus*		N
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	A	N
Black-faced Monarch	*Monarcha melanopsis*		N
Black-fronted Dotterel	*Elseyornis melanops*		N
Black-shouldered Kite	*Elanus axillaris*		N
Brown Falcon	*Falco berigora*		N
Brown Gerygone	*Gerygone mouki*	A	N
Brown Goshawk	*Accipiter fasciatus*		N
Brown Songlark	*Cincloramphus cruralis*		N
Brown Thornbill	*Acanthiza pusilla*	A	N
Brown-headed Honeyeater	*Melithreptus brevirostris*		N
Brush Cuckoo	*Cacomantis variolosus*		N
Cattle Egret	*Ardea ibis*		N
Channel-billed Cuckoo	*Scythrops novaehollandiae*	A	N
Chestnut Teal	*Anas castanea*	A	N
Cicadabird	*Coracina tenuirostris*		N
Clamorous Reed-Warbler	*Acrocephalus stentoreus*		N
Collared Sparrowhawk	*Accipiter cirrhocephalus*		N
Common Koel	*Eudynamys scolopacea*	A	N
Common Myna*	*Acridotheres tristis*	A	N
Common Starling*	*Sturnus vulgaris*	A	N
Crested Pigeon	*Ocyphaps lophotes*		N
Crested Shrike-tit	*Falcunculus frontatus*		N
Crested Tern	*Sterna bergii*		N
Crimson Rosella	*Platycercus elegans*	A	N
Darter	*Anhinga melanogaster*		N
Dollarbird	*Eurystomus orientalis*	A	N
Double-barred Finch	*Taeniopygia bichenovii*		N
Dusky Moorhen	*Gallinula tenebrosa*		N
Dusky Woodswallow	*Artamus cyanopterus*		N
Eastern Curlew	*Numenius madagascariensis*		N
Eastern Rosella	*Platycercus eximius*	A	N
Eastern Spinebill	*Acanthorhynchus tenuirostris*	A	N
Eastern Whipbird	*Psophodes olivaceus*	A	N
Eastern Yellow Robin	*Eopsaltria australis*	A	N
Emerald Dove	*Chalcophaps indica*		N
Eurasian Coot	*Fulica atra*		N
European Goldfinch*	*Carduelis carduelis*		N
Fairy Martin	*Hirundo ariel*		N
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	A	N
Figbird	*Sphecotheres viridis*		N
Galah	*Cacatua roseicapilla*	A	N
Gang-gang Cockatoo	*Callocephalon fimbriatum*	A	N
Golden Whistler	*Pachycephala pectoralis*	A	N
Great Cormorant	*Phalacrocorax carbo*		N
Great Egret	*Ardea alba*		N
Grey Butcherbird	*Cracticus torquatus*	A	N
Grey Fantail	*Rhipidura fuliginosa*	A	N
Grey Goshawk	*Accipiter novaehollandiae*		N

Group Name	Common Name	Project Area[1]	Locality[2]
2. Birds cont...			
Grey Shrike-thrush	*Colluricincla harmonica*	A	N
Grey Teal	*Anas gracilis*	A	N
Hardhead	*Aythya australis*	A	N
Hoary-headed Grebe	*Poliocephalus poliocephalus*		N
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*		N
House Sparrow*	*Passer domesticus*		N
Latham's Snipe	*Gallinago hardwickii*		N
Laughing Kookaburra	*Dacelo novaeguineae*	A	N
Leaden Flycatcher	*Myiagra rubecula*	A	N
Lewin's Honeyeater	*Meliphaga lewinii*	A	N
Little Black Cormorant	*Phalacrocorax sulcirostris*	A	N
Little Eagle	*Hieraaetus morphnoides*		N
Little Egret	*Egretta garzetta*		N
Little Grassbird	*Megalurus gramineus*		N
Little Lorikeet	*Glossopsitta pusilla*		N
Little Pied Cormorant	*Phalacrocorax melanoleucos*	A	N
Little Wattlebird	*Anthochaera chrysoptera*	A	N
Magpie-lark	*Grallina cyanoleuca*	A	N
Masked Lapwing	*Vanellus miles*	A	N
Masked Owl	*Tyto novaehollandiae*		N
Mistletoebird	*Dicaeum hirundinaceum*	A	N
Musk Duck	*Biziura lobata*		N
Musk Lorikeet	*Glossopsitta concinna*		N
Nankeen Kestrel	*Falco cenchroides*	A	N
Nankeen Night Heron	*Nycticorax caledonicus*		N
New Holland Honeyeater	*Phylidonyris novaehollandiae*	A	N
Noisy Friarbird	*Philemon corniculatus*	A	N
Noisy Miner	*Manorina melanocephala*		N
Olive-backed Oriole	*Oriolus sagittatus*	A	N
Pacific Black Duck	*Anas superciliosa*	A	N
Pallid Cuckoo	*Cuculus pallidus*		N
Peregrine Falcon	*Falco peregrinus*		N
Pied Currawong	*Strepera graculina*	A	N
Powerful Owl	*Ninox strenua*		N
Purple Swamphen	*Porphyrio porphyrio*		N
Rainbow Lorikeet	*Trichoglossus haematodus*	A	N
Red Wattlebird	*Anthochaera carunculata*		N
Red-browed Finch	*Neochmia temporalis*	A	N
Red-whiskered Bulbul*	*Pycnonotus jocosus*	A	N
Regent Honeyeater	*Xanthomyza phrygia*		N
Richard's Pipit	*Anthus novaeseelandiae*	A	N
Rose Robin	*Petroica rosea*		N
Royal Spoonbill	*Platalea regia*		N
Rufous Fantail	*Rhipidura rufifrons*		N
Rufous Whistler	*Pachycephala rufiventris*	A	N
Sacred Kingfisher	*Todiramphus sanctus*	A	N
Satin Bowerbird	*Ptilonorhynchus violaceus*	A	N
Scarlet Honeyeater	*Myzomela sanguinolenta*	A	N
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	A	N
Silver Gull	*Larus novaehollandiae*		N

Group Name	Common Name	Project Area[1]	Locality[2]
2. Birds cont...			
Silvereye	*Zosterops lateralis*	A	N
Southern Boobook	*Ninox novaeseelandiae*		N
Southern Emu-wren	*Stipiturus malachurus*		N
Spangled Drongo	*Dicrurus bracteatus*		N
Spotted Pardalote	*Pardalotus punctatus*	A	N
Spotted Turtle-Dove*	*Streptopelia chinensis*	A	N
Straw-necked Ibis	*Threskiornis spinicollis*		N
Striated Pardalote	*Pardalotus striatus*	A	N
Striated Thornbill	*Acanthiza lineata*	A	N
Sulphur-crested Cockatoo	*Cacatua galerita*	A	N
Superb Fairy-wren	*Malurus cyaneus*	A	N
Swamp Harrier	*Circus approximans*		N
Tawny Frogmouth	*Podargus strigoides*		N
Tawny Grassbird	*Megalurus timoriensis*		N
Topknot Pigeon	*Lopholaimus antarcticus*		N
Tree Martin	*Hirundo nigricans*		N
Varied Sittella	*Daphoenositta chrysoptera*		N
Variegated Fairy-wren	*Malurus lamberti*	A	N
Welcome Swallow	*Hirundo neoxena*	A	N
Whistling Kite	*Haliastur sphenurus*		N
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	A	N
White-browed Scrubwren	*Sericornis frontalis*	A	N
White-faced Heron	*Egretta novaehollandiae*	A	N
White-naped Honeyeater	*Melithreptus lunatus*		N
White-necked Heron	*Ardea pacifica*		N
White-throated Needletail	*Hirundapus caudacutus*		N
White-throated Nightjar	*Eurostopodus mystacalis*		N
White-throated Treecreeper	*Cormobates leucophaeus*	A	N
Willie Wagtail	*Rhipidura leucophrys*	A	N
Yellow Thornbill	*Acanthiza nana*	A	N
Yellow-billed Spoonbill	*Platalea flavipes*		N
Yellow-faced Honeyeater	*Lichenostomus chrysops*	A	N
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		N
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	A	N
3. Reptiles			
Black-bellied Swamp Snake	*Hemiaspis signata*		N
Delicate Skink	*Lampropholis delicata*	A	N
Diamond Python	*Morelia spilota*		N
Eastern Blue-tongued Lizard	*Tiliqua scincoides*		N
Eastern Tiger Snake	*Notechis scutatus*		N
Eastern Water Dragon	*Physignathus lesueurii*		N
Eastern Water Skink	*Eulamprus quoyii*		N
Grass Skink	*Lampropholis guichenoti*	A	N
Jacky Lizard	*Amphibolurus muricatus*		N
Lace Monitor	*Varanus varius*		N
Long-necked Tortoise	*Chelodina longicollis*		N
Oak Skink	*Cyclodomorphus casuarinae*		N
Red-bellied Black Snake	*Pseudechis porphyriacus*		N
Southern Water Skink	*Eulamprus heatwolei*		N

Group Name	Common Name	Project Area[1]	Locality[2]
3. Reptiles cont...			
Three-toed Skink	*Saiphos equalis*		N
4. Frogs			
Bleating Tree Frog	*Litoria dentata*		N
Brown-striped Frog	*Limnodynastes peronii*	A	N
Common Eastern Froglet	*Crinia signifera*	A	N
Green and Golden Bell Frog	*Litoria aurea*		N
Green Tree Frog	*Litoria caerulea*		N
Jervis Bay Tree Frog	*Litoria jervisiensis*		N
Peron's Tree Frog	*Litoria peronii*		N
Tyler's Tree Frog	*Litoria tyleri*		N
Verreaux's Tree Frog	*Litoria verreauxii*		N
5. Fish			
*Gambusia holbrooki**	Plague Minnow	A	N

* Introduced species.

1. Records from the project area were obtained by the consultant over several years; the list includes those species observed on the existing dredge pond.

2. Locality means the Seven Mile Beach area; records come from various sources (see text). Many of thees species are not expected to occur within the project area, as suitable habitat is not present.

Nomenclature follows Strahan (1995), Christidis & Boles (1994) and Cogger (1992). A – Present within project area; N – recorded nearby (locality).

Citation

1. This State Environmental Planning Policy may be cited as "State Environmental Planning Policy No. 26 – Littoral Rainforests".

Aims, objectives, etc.

2. The aim of this Policy is to provide a mechanism for the consideration of applications for development that is likely to damage or destroy littoral rainforest areas with a view to the preservation of those areas in their natural state.

Interpretation

3. (1) In this Policy –
"damage", in relation to flora, includes lopping, topping and felling;
"flora" includes trees, shrubs and vegetation;
"residential land" means land which is within a zone designated "Residential", "Village" or "Township" on the day on which this Policy takes effect in any environmental planning instrument;
"the Act" means the Environmental Planning and Assessment Act 1979.

(2) Rocks, rock formations and earth are elements of the landscape for the purposes of this Policy.

Application of Policy

4. (1) This Policy applies to-
(a) land enclosed by the outer edge of the heavy black line on the series of maps held in the Department and marked "State Environmental Planning Policy No. 26 – Littoral Rainforests"; and
(b) land not so enclosed but within a distance of 100 metres from the outer edge of that heavy black line except residential land and land to which State Environmental Planning Policy No. 14 – Coastal Wetlands applies.
(2) This Policy does not apply to land dedicated or reserved under the National Parks and Wildlife Act 1974 as an Aboriginal area, historic site, national park, nature reserve, state game reserve or state recreation area or land dedicated or set apart under section 25A of the Forestry Act 1916 as a flora reserve.

Relationship between instruments

5. In the event of an inconsistency between this Policy and a regional environmental plan or a local environmental plan whether made before, on or after the day on which this Policy takes effect, this Policy shall prevail to the extent of the inconsistency.

Designated development

6. An act which requires the consent of the Council by virtue of clause 7(1) is designated development for the purposes of the Act.

Development – consent and concurrence

7.(1) A person shall not, without the consent of the Council, on land described in clause 4(1)(a), erect a building, carry out work, use land for any purpose, or subdivide it, disturb, change or alter any landform or disturb, remove, damage or destroy and native flora or other element of the landscape or dispose of or dump any liquid, gaseous or solid matter.

(2) A person shall not, without the consent of the Council, on land described in clause 4(1)(b), erect a building, disturb or change or alter any landform or disturb, remove, damage or destroy and native flora, or dispose of or dump any liquid, gaseous or solid matter.

(3) Subject to subclause (4), the Council shall not determine an application under subclause (1) or (2) by granting consent under the Act except with the concurrence of the Director.

(4) The Council shall not determine an application described in section 91A of the Act by granting consent under the Act except with the concurrence of the Minister.

(5) Nothing in subclause (1) or (2) requires the consent of the Council to be obtained for –
(a) any act which is carried out in the ordinary course of residential occupation of the land concerned;
(b) eradication of native flora declared noxious by proclamation under section 467 of the Local Government Act 1919, by means not significantly detrimental to the native ecosystem;
(c) unavoidable destruction or removal during eradication of native flora adjacent to any flora declared noxious by such a proclamation; or
(d) removal of leaf litter, shed bark or cured grasses for the purpose of reducing the risk of bushfire.

(6) The Council shall not consent to an application made under subclause (1) or (2) unless it is satisfied, if the application is to erect a building, carry out a work, use land for any purpose or dispose of or dump any liquid, gaseous or solid matter, that there is no place outside the area to which this Policy applies on which the development might suitably be located or occur.

Matters for consideration – concurrence

7. (1) The Minister and Director shall, for the purpose of deciding whether concurrence should be granted, consider-
(a) any representation made by or on behalf of the Director of National Parks and Wildlife about the likely impact of the proposal on the environment;
(b) the objectives and major goals of A National Conservation Strategy for Australia published by the Australian Government Publishing Service, Canberra. In 1984; and
(c) if the carrying out of the proposal and the use (if any) thereafter of the land concerned for the purpose for which it will be used may cause destruction or disturbance of the natural environment, the public interest (if any) in the carrying out of the proposal in relation to the public interest in the preservation of littoral rainforest in its natural state.

(2) A proposal may be in the public interest for the purposes of subclause (1) notwithstanding that it benefits persons (by means including financial or other advantage) who are not public authorities or benefits those persons exclusively.

Forwarding of copies of applications to Director of National Parks and Wildlife

8. If a Council receives an application under clause 7(1) or (2) of this Policy the Council shall within 7 days of its receipt of the application forward a copy of it to the Director of National Parks and Wildlife.

Amendment of other State Environmental Planning Policies

9. (1) State Environmental Planning Policy No. 4 – Development Without Consent, is amended by inserting in clause 4(1) after the word "State" the words "but does not apply to land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies".

(2) State Environmental Planning Policy No. 8 – Surplus Public Land is amended by inserting at the end of Schedule 1 the following words:

6. Land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies.

(3) State Environmental Planning Policy No. 9 – Group Homes is amended by inserting in clause 4 after the word "State" the words "but does not apply to land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies".

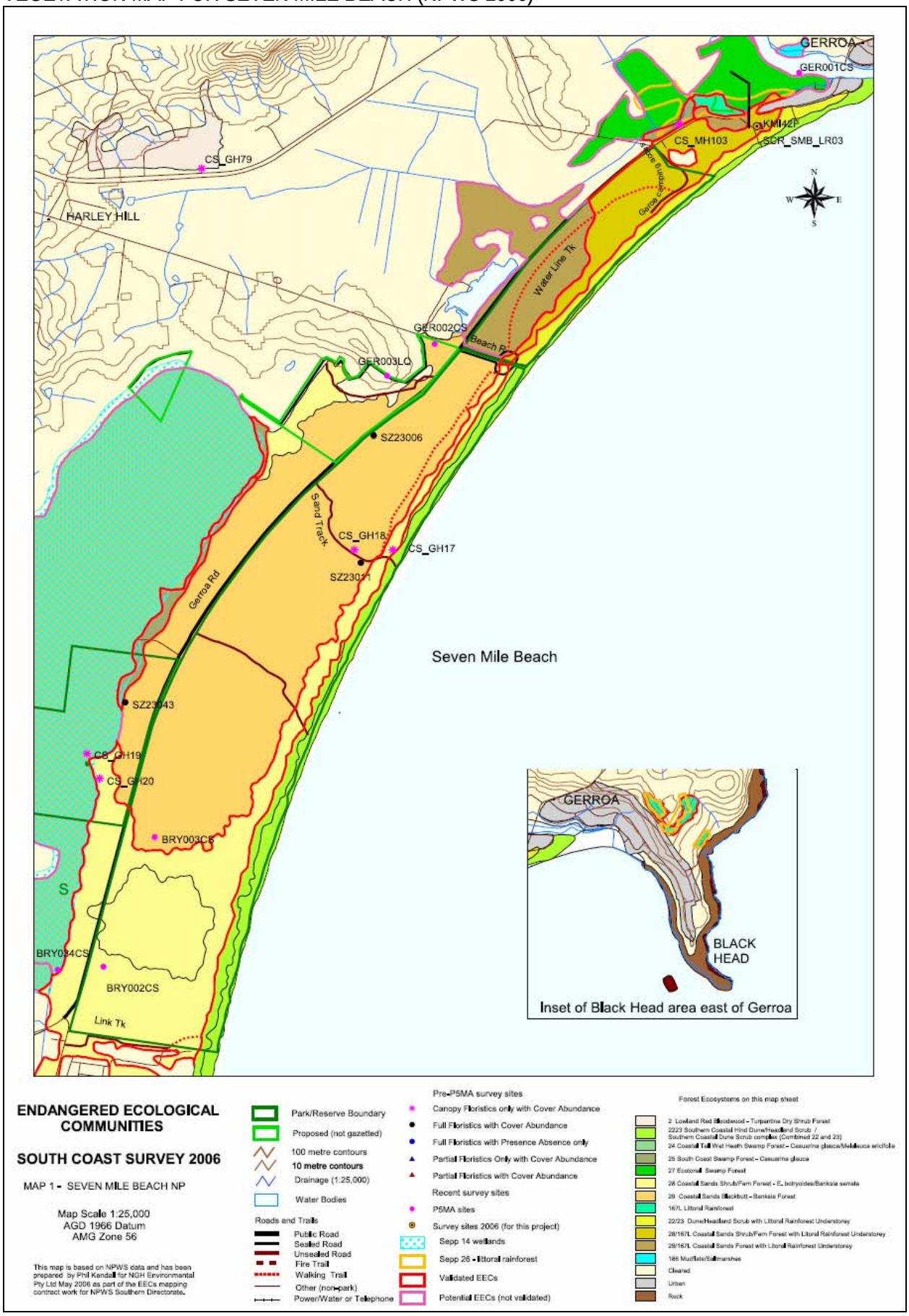
(4) State Environmental Planning Policy No. 14 – Coastal Wetlands, is amended by inserting after clause 4(3) the following subclause:

(5) This Policy does not apply to land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies.

(6) State Environmental Planning Policy No. 21 – Movable Dwellings is amended by inserting after clause 7(4) the following clause:

(7) Subclause (1) does not apply to land to which State Environmental Planning Policy No. 26 – Littoral Rainforests applies.

APPENDIX 9
VEGETATION MAP FOR SEVEN MILE BEACH (NPWS 2006)



Photograph 1. Littoral Rainforest (survey plot); this densest area of rainforest adjacent to the quarry extension will be retained.

Photograph 2. Blackbutt - Banksia Forest (survey plot); 1.7 hectaes will be removed from within the quarry extension area.

Photograph 3. Bangalay Sand Forest (survey plot); 1.6 hectares of modified forest will be removed from within the quarry extension area.

Photograph 4. Cleared land dominated by exotic plants covers 3.9 hectares (52%) of the quarry extension. The trees on the far edge of the clearing are planted and cover a further 4% of the extension area.