

ATTACHMENT 5

KOALA VEGETATION SURVEY PLOT DATA

PLOT 3

SPECIES		OVERSTOREY		UNDERSTOREY	
Botanical Name	Common Name	No	%	No	%
<i>*E. microcorys</i>	Tallowwood	1	6	4	23
<i>*E. propinqua</i>	Small-fruited Grey Gum	4	22	3	19
<i>E. umbra/acmenoides</i>	White Mahogany	2	11	4	23
<i>Corymbia maculata</i>	Spotted Gum	3	17	4	23
<i>Corymbia intermedia</i>	Pink Bloodwood	4	22	1	6
<i>E. siderophloia</i>	Northern Grey Ironbark	4	22	1	6
<i>Lophostemon confertus</i>	Brushbox	-	-	-	-
<i>Syncarpia glomulifera</i>	Turpentine	-	-	-	-
<i>E. saligna</i>	Blue Gum	-	-	-	-
TOTAL		18	100	17	100
* Schedule 2 species		5	28	7	42
Potential koala habitat			Yes		Yes

PLOT 4

SPECIES		OVERSTOREY		UNDERSTOREY	
Botanical Name	Common Name	No	%	No	%
<i>*E. microcorys</i>	Tallowwood	7	35	1	8
<i>*E. propinqua</i>	Small-fruited Grey Gum	2	10	-	-
<i>E. umbra/acmenoides</i>	White Mahogany	-	-	3	25
<i>Corymbia maculata</i>	Spotted Gum	4	20	5	42
<i>Corymbia intermedia</i>	Pink Bloodwood	3	15	3	25
<i>E. siderophloia</i>	Northern Grey Ironbark	4	20	-	-
<i>Lophostemon confertus</i>	Brushbox	-	-	-	-
<i>Syncarpia glomulifera</i>	Turpentine	-	-	-	-
<i>E. saligna</i>	Blue Gum	-	-	-	-
TOTAL		20	100	12	100
* Schedule 2 species		9	45	1	8
Potential koala habitat			Yes		No



PLOT 5

SPECIES		OVERSTOREY		UNDERSTOREY	
Botanical Name	Common Name	No	%	No	%
<i>*E. microcorys</i>	Tallowwood	6	44	1	6
<i>*E. propinqua</i>	Small-fruited Grey Gum	4	28	6	31
<i>E. umbra/acmenoides</i>	White Mahogany	-	-	1	6
<i>Corymbia maculata</i>	Spotted Gum	2	14	8	41
<i>Corymbia intermedia</i>	Pink Bloodwood	2	14	1	6
<i>E. siderophloia</i>	Northern Grey Ironbark	-	-	2	10
<i>Lophostemon confertus</i>	Brushbox	-	-	-	-
<i>Syncarpia glomulifera</i>	Turpentine	-	-	-	-
<i>E. saligna</i>	Blue Gum	-	-	-	-
TOTAL		14	100	19	100
* Schedule 2 species		10	72	7	37
Potential koala habitat			Yes		Yes

PLOT 6

SPECIES		OVERSTOREY		UNDERSTOREY	
Botanical Name	Common Name	No	%	No	%
<i>*E. microcorys</i>	Tallowwood	1	10	1	3
<i>*E. propinqua</i>	Small-fruited Grey Gum	4	40	6	20
<i>E. umbra/acmenoides</i>	White Mahogany	-	-	4	13
<i>Corymbia maculata</i>	Spotted Gum	1	10	9	31
<i>Corymbia intermedia</i>	Pink Bloodwood	2	20	-	-
<i>E. siderophloia</i>	Northern Grey Ironbark	1	10	2	7
<i>Lophostemon confertus</i>	Brushbox	-	-	1	3
<i>Syncarpia glomulifera</i>	Turpentine	-	-	3	10
<i>E. saligna</i>	Blue Gum	1	10	4	13
TOTAL		10	100	30	100
* Schedule 2 species		5	50	7	23
Potential koala habitat			Yes		Yes



PLOT 7

SPECIES		OVERSTOREY		UNDERSTOREY	
Botanical Name	Common Name	No	%	No	%
* <i>E. microcorys</i>	Tallowwood	3	19	2	8
* <i>E. propinqua</i>	Small-fruited Grey Gum	2	12	1	5
<i>E. umbra/acmenoides</i>	White Mahogany	3	19	10	43
<i>Corymbia maculata</i>	Spotted Gum	-	-	6	26
<i>Corymbia intermedia</i>	Pink Bloodwood	5	31	3	13
<i>E. siderophloia</i>	Northern Grey Ironbark	1	7	-	-
<i>Lophostemon confertus</i>	Brushbox	-	-	-	-
<i>Syncarpia glomulifera</i>	Turpentine	-	-	1	5
<i>E. saligna</i>	Blue Gum	2	12	-	-
TOTAL		16	100	23	100
* Schedule 2 species		5	31	3	13
Potential koala habitat			Yes		No

PLOT 8

SPECIES		OVERSTOREY		UNDERSTOREY	
Botanical Name	Common Name	No	%	No	%
* <i>E. microcorys</i>	Tallowwood	2	16	2	12
* <i>E. propinqua</i>	Small-fruited Grey Gum	4	33	2	12
<i>E. umbra/acmenoides</i>	White Mahogany	4	33	10	58
<i>Corymbia maculata</i>	Spotted Gum	-	-	-	-
<i>Corymbia intermedia</i>	Pink Bloodwood	1	9	1	6
<i>E. siderophloia</i>	Northern Grey Ironbark	-	-	-	-
<i>Lophostemon confertus</i>	Brushbox	-	-	1	6
<i>Syncarpia glomulifera</i>	Turpentine	1	9	1	6
<i>E. saligna</i>	Blue Gum	-	-	-	-
TOTAL		12	100	17	100
* Schedule 2 species		6	49	4	24
Potential koala habitat			Yes		Yes



PLOT 9

SPECIES		OVERSTOREY		UNDERSTOREY	
Botanical Name	Common Name	No	%	No	%
<i>*E. microcorys</i>	Tallowwood	3	19	4	18
<i>*E. propinqua</i>	Small-fruited Grey Gum	1	7	4	18
<i>E. umbra/acmenoides</i>	White Mahogany	5	31	8	36
<i>Corymbia maculata</i>	Spotted Gum	-	-	-	-
<i>Corymbia intermedia</i>	Pink Bloodwood	2	12	4	18
<i>E. siderophloia</i>	Northern Grey Ironbark	5	31	2	10
<i>Lophostemon confertus</i>	Brushbox	-	-	-	-
<i>Syncarpia glomulifera</i>	Turpentine	-	-	-	-
<i>E. saligna</i>	Blue Gum	-	-	-	-
TOTAL		16	100	22	100
* Schedule 2 species		4	26	8	36
Potential koala habitat			Yes		Yes



ATTACHMENT 6

SECTION 5A (EIGHT POINT TEST) ASSESSMENTS

SECTION 5A (EP&A ACT) THREATENED SPECIES ASSESSMENT

EIGHT POINT TESTS

Requirements of this test are to assess potential impact utilising the following considerations:

- a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction, Note: NPWS (1996) defines local viable population as "the population that occurs within the study area, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary of the study area can be demonstrated."*
- b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised, Note: NP&WS (1996) define significant as "important, weighty or more than ordinary".*
- c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed, Note: NP&WS (1996) define habitat as "an area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community and includes any biotic or abiotic component".*
- d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community,*
- e) *whether critical habitat will be affected,*
- f) *whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region,*
- g) *whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,*
- h) *whether any threatened species, population or ecological community is at the limit of its known distribution."*



In addition, as a means of assisting in determining whether impacts are likely to be significant, the items (where relevant) in a NP&WS recommended Checklist (1996) were considered for each species assessed as a component of the Eight Point Test format listed above. This checklist poses the following questions:

Q1 How is the proposal likely to affect the lifecycle of a threatened species and/or population which could occur on the subject land?

- a) displaces or disturbs threatened species and/or populations
- b) disrupts the breeding cycle
- c) disturbs the dormancy period
- d) disrupts roosting behaviour
- e) changes foraging behaviour
- f) affects migration and dispersal ability
- g) disrupts pollination cycle
- h) disturbs seedbanks
- i) disrupts recruitment of plants
- j) affects the interaction between threatened species and other species in the community
- k) other matters

Q2 How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

- a) disturbs any permanent, semi-permanent or ephemeral water bodies
- b) degrades soil quality
- c) clears or modifies native vegetation
- d) introduces weeds, vermin or feral species
- e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat
- f) affects natural revegetation and recolonisation of existing species following disturbance
- g) other matters

Q3 How is the proposal likely to affect current disturbance regimes?

- a) modifies the intensity and frequency of fires
- b) modifies flooding flows
- c) other matters

Q4 How is the proposal likely to affect habitat connectivity?

- a) creates a barrier to fauna movement
- b) removes remnant vegetation or wildlife corridors
- c) modifies remnant vegetation or wildlife corridors
- d) other matters



Q5 How is the proposal likely to affect critical habitat?

- a) removes or modifies key habitat features
- b) affects natural revegetation or recolonisation of existing species following disturbance
- c) introduces weeds, vermin or feral species
- d) generates or disposes of solid, liquid or gaseous waste
- e) uses pesticides, herbicides, other chemicals
- f) other matters

Assessments were undertaken for the following groups of flora and fauna:

4.1 FAUNA

- 4.1.1 Threatened Species Detected
- 4.1.2 Threatened Species Recorded within 10 km
- 4.1.3 Threatened Species not Recorded within 10 km - but which may occur
- 4.1.4 General Eight Point Test
- 4.1.5 Fish and Marine Vegetation

4.2 FLORA

- 4.2.1 Threatened Species Detected
- 4.2.2 Threatened Species Recorded within 25 km
- 4.2.3 Threatened Species not Recorded within 25 km - but which may occur

These Assessments are as follows:

4.1 FAUNA

4.1.1. Threatened Species Detected

Eastern Freetail-bat (*Mormopterus* sp. probably *norfolkensis*) – Schedule 2 Vulnerable

Habitat requirements: Occurs mainly in dry sclerophyll forest although a number of individuals have been caught flying low over a rocky river through rainforest and wet sclerophyll forest. Seldom has more than one individual been recorded from the 15 or so known locations (Strahan, 1994).

Roosts in tree hollows and under loose bark as well as houses and outbuildings (Allison, F R and Hoye, G A 1995).

Unreferenced: Feeds on insects above the forest canopy and in clearings at forest edges. Often found close to dams and waterholes. Localised, occurs all north coast, few captured.



Habitat occurrence: The dry sclerophyll forest is general habitat for this species. The one habitat tree with hollows on the *Site* could be used for roosting. No decorticating bark trees occur. Similar habitat occurs adjacent and extensive areas of similar forest occur in the general locality.

Likelihood of species occurrence: Probably occurs. Identification not certain. *Mormopterus* sp. detected in ten separate passes – not necessarily on the site but moreso on adjacent cleared areas, eg tracks and spoil deposition areas.

Eight Point Test:

- a) Area of vegetation (potential habitat) to be removed would only be a minute proportion of foraging area (2.2 ha) with most of the habitat on the Lots (allowing for programmed quarry expansion) being retained indefinitely. Connections to other habitat will remain (this is not so relevant to fauna capable of flight). However, as these highly mobile species have a large home range (and similar – though better, habitat occurs adjacent and nearby), it is unlikely to be impacted upon by the proposal that will remove 2.2 ha of potential habitat. Whilst a potential roost tree will be removed, such trees occur elsewhere on the Lots and particularly adjacent the *Site*. No camp area occurs on or adjacent the site.

Hence it can reasonably be concluded there will be no significant impact on life cycle, ie movement, breeding, food supply – these should not be affected to a degree that creates a significant effect on the species survival.

- b) None of the threatened populations gazetted as at 26 October 2001 occur on the site. No known “local” population occurs. As detailed in (a) above, the impact will not be to a degree that it is likely to disrupt the viability of a population.
- c) Small area of potential habitat will be removed. Creation of openings often favours these species (detected often in openings). Regional distribution of similar habitat for these species is extensive. The site is not the location for any endangered populations as gazetted 26 October 2000.
- d) Separation of habitat is not so critical for fauna capable of flight. The area of potential habitat to be removed is a pocket adjacent the present quarry and will be an expansion of the area already developed. Clearing of minor areas should not affect the movement pattern of individuals nor populations.
- e) Critical habitats (as per TSC Act) are yet to be defined. A small area of potential habitat will be removed – but does not contain any critical features eg caves. Hollow trees could be regarded as critical - only one will be removed and adjacent areas have better trees which will remain. Extensive, similar habitat occurs in the adjacent and nearby freehold lands and National Park.



- f) More relevant to flora. As species requires large areas, all habitat is likely and necessarily utilised – not just reserves. To maintain biodiversity all populations should be protected to the extent possible. Extensive, similar habitat occurs in the adjacent and nearby freehold lands and National Park. Species are variously known (not extensively) from conservation reserves in the NSW Biogeographical Region (perhaps more so due to lack of surveys). Hence it is difficult to state that these species are inadequately represented in Conservation Reserves. Being species capable of flight this criterion is of lesser importance.
- g) Of the gazetted threatening processes, “clearing” is a listed key threatening process. As yet a Threat Abatement Plan has not been prepared by the NP&WS. Given that this proposal for the removal of a further 2.2 ha of vegetation is likely to be the last (apart from previously approved and programmed quarry expansion), the remainder of the vegetation on the Lots is likely to remain. Therefore the removal of a small area of potential habitat by the proposal is unlikely to be in conflict with any subsequently prepared Threat Abatement Plan to manage clearing on a “landscape” basis. This conclusion presumes that incremental loss of habitat in this vicinity will be minimal following this development. Likely threatening process would be general habitat loss in association with loss of tree hollows. In this case (see above) this impact will be minimal.
- h) Within distribution range.

Conclusion: There will be no significant impact on this species from the proposal. This conclusion is subject to adherence to the Recommendations (see PART E) provided.

4.1.2 Threatened Species Recorded within 10 km

Amphibians

Nil

Reptiles

Nil



Birds

Black Bittern (*Ixobrychus flavicollis*) – Schedule 2 Vulnerable

Habitat requirements: Found in forested fresh rivers and estuarine inlets, <200 m elevation. Often nests in trees above water. Confined to margins of quiet watercourses flowing through coastal forests and woodlands. Freshwater sites seem preferred, especially when densely vegetated margins are present with species such as *Melaleuca* sp. and *Casuarina* sp. Main food source is fish, amphibians, molluscs and insects foraging along the shallow margins of woodland watercourses. Occurs all of north coast.

Habitat occurrence: Does not occur.

Likelihood of species occurrence: Nil. Not detected in surveys.

Eight Point Test: Not required.

Black-necked Stork (*Ephippiorhynchus asiaticus*) - Sch 1 Endangered

Habitat requirements: At south-eastern end of its range in north-eastern NSW, but found as far south as Sydney. Occurs in tropical and warm temperate fresh or saline swamps up to 0.5 m deep. Includes wetland areas such as lagoons, permanent billabongs, swamps, creeks, wet heathland, flooded fields and dams, sewage ponds etc. Main food is fish but also eat reptiles, frogs, crabs, rodents and carrion. Nests in a large bulky stick nest platform up to 1.8m wide at the top of a high tree, usually in a swamp. The same nest maybe used year after year (*Complete Book of Australian Birds* 1994). Species moves in pairs and occasionally in groups up to 18 individuals. Roosts in live or dead trees in or overhanging water. Although it may establish long term residence in a particular area it is capable of making long journeys to access suitable wetland habitat. Breeds March to June in the northern part of its distribution. (Pizzey, P & Knight, F. 1997. *Field Guide to the Birds of Australia*).

Habitat occurrence: Does not occur

Likelihood of species occurrence: Nil. Not detected in surveys.

Eight Point Test: Not required.



Glossy Black-Cockatoo (*Calyptorhynchus lathami*) - Sch 2 Vulnerable

Habitat requirements: : Characteristically inhabits open forests on sites with low soil-nutrient status, reflecting the distribution of key *Allocasuarina* spp. (Tanton 1994). The drier forest types with intact and less rugged landscapes (flat to undulating land) are preferred by the species (NPWS 1994).

Requires roomy cavities (0.3 m to 3.1 m deep) in large hollow trees (often dead) for nesting purposes (Saunders *et al* 1993). These trees are often in a forest clearing (Forshaw and Cooper 1978).

Known as an obligate feeder on the seeds of Sheoaks - *Allocasuarina* sp especially *torulosa*, *littoralis* and to a lesser degree, *stricta*. These trees are dioecious - hence only half bear cones – need to be mature. However has been seen feeding on fruit of Angophora, grubs in casuarinas and possibly acacias. Hence occur on forests of low nutrient levels (Blakers *et al* 1994). Not all trees are used, with a study showing that only 24% of cone bearing trees showed signs of feeding. Trees selected by the birds had greater crops of cones (Clout M.N. 1989). Forest Oak presence often far in excess of requirements of populations and individuals - evidenced by absence of crushed cones beneath most trees (pers obs).

Widely distributed with large numbers of recordings - especially on State Forest (pers obs).

Habitat occurrence: No possibility for nesting (no trees with hollows large enough for this species to nest) occur. Potential *Allocasuarina torulosa* feed trees do occur variously throughout the forested area of the Site, however most are suppressed, scattered understorey and not the typical mature, heavily fruiting grove favoured by this species (pers obs).

Likelihood of species occurrence: Low. Not detected on site during previous nor current surveys, nor were crushed cones (indicator of presence) detected, nor would nest on site. Closest record 7 km distant in NPWS database.

Eight Point Test: See 4.1.4 General Eight Point Test.

Osprey (*Pandion haliaetus*) – Sch 2 Vulnerable

Habitat requirements: Associated with coastal and estuarine habitats and lake shores. Require expanses of water with tall trees for feeding bases. Prefers open and swamp forest. Nests high in dead trees in open forests next to waterways, or on cliff faces between April and November. Confined to isolated occurrences along coastline, eg Stewarts River.

Likelihood of species occurrence: Low. Not detected on site during previous nor current surveys, nor would nest on site. Closest record 8 km distant in NPWS database.

Eight Point Test: See 4.1.4 General Eight Point Test.



THE OWLS

Masked Owl (*Tyto novaehollandiae*) - Sch 2 Vulnerable

Habitat requirements: Known to be the most sparsely distributed owl (Debus 1994). Usually keep to heavily forested country (Readers Digest 1993). Inhabitant of forest, woodland and partly cleared areas (Debus 1993). Birds are often seen in disturbed areas. Species is significantly associated with sites having high densities of old hollow trees and a sparse/grassy understorey (Kavanagh and Bamkin 1995). Considered a species of forest margins (Debus and Rose 1994). It also lives in isolated stands of trees in agricultural land (Hollands 1991). Owls not recorded in forest at a successional stage of less than 60 years (Davey 1993). Distances of 1, 5 and 10 km between breeding pairs have been observed (Garnett 1992). Have home range of 500-1000 hectares per pair, covering forested and partly open country (NPWS 2000). As exploits disturbed environments, may be less vulnerable in coastal forests (Debus and Rose 1994).

Often hunt along forest edges including roadsides (NPWS 2000). Hunts prey close to the ground over open country (Debus 1993). Takes larger prey: mainly small terrestrial mammals up to the size of a rabbit, and to a lesser degree arboreal prey such as possums and medium sized birds (Readers Digest 1993). Rats feature prominently in their diet - indicator species (Hyem, 1979).

Roost and breed primarily in moist open forest particularly in the gullies. Favour large roomy vertical hollows for nesting, with depth varying from 0.4 m to 5 m (Hyem, 1979). Roosts in the same places: big hollows in trees, crevices in cliffs and even caves, but rarely heavy foliage like the *Ninox* Owls (Readers Digest 1993). Nest sites used in successive years and therefore remain in the same territory (Readers Digest 1993). Birds maintain separate roost sites (Debus 1993).

Unreferenced. Occupy a range of environments from tall wet eucalypt forests to dry woodland, often - but not always, at the ecotone with cleared land, in fragmented forest - pastoral country usually near creeklines, and in open grassy woodlands. Has been known to occur in rainforest. Prefers open, flatter forests with an understorey and shrub component. Nests and roosts by day in large vertical hollows (35-50 cm dia and 1-5+ m deep) in large old trees usually in or near gullies. They also roost by day in the dense foliage of Lilly Pilly and other rainforest species. Does not appear to have the strong relationship with drainage lines as do Sooty and Powerful Owls.



Powerful Owl (*Ninox strenua*) - Sch 2 – Vulnerable

Habitat requirements: : This species occurs in rainforest (Schodde & Mason 1980) and in wet and dry eucalypt forest utilising unlogged or lightly logged forest as well as undisturbed forest (Davey, S M 1993). This owl is considered a habitat generalist, occupying a wide range of tree species communities (Kavanagh 1991). They are characteristically found in densely forested gullies on coastal slopes (Lindsey 1992).

Large trees with large hollows at least 0.5 m deep are required for nesting (Schodde & Mason 1980). These trees tend to be live eucalypts which are typically the largest and oldest in the vicinity and usually in tall, open forest (Debus & Chafer 1994). These trees are often at the head of a gully or on the face of a hill (Fleay 1968). They roost during the day in tall trees that give them a commanding view of their surroundings. Each pair has a number of roosting trees and the birds roost on different trees on different days, not always together but always within calling distance (Readers Digest 1993).

Diet consists mainly of small to medium sized arboreal mammals especially the Greater Glider and Common Ringtail Possum (80-90% of prey). Also eats Sugar Gliders and young Brushtail Possums. Other prey includes rats, birds and young rabbits (Readers Digest 1993) and flying foxes (Schodde and Mason 1980). Kavanagh (1988) believes that the owls concentrate on patches of forest where higher population densities of the prey occur.

Unreferenced: This species nests in large hollows (35-50 cm internal dia and 1-3 m deep) inside large, old eucalypt trees usually in or near gullies. Hollow mouth usually has a pronounced lower lip. They roost by day among the foliage of stands of Sheoaks, Lilly Pilly, Coachwood, Blackwood, or in tall eucalypts and turpentines. The species prefers unlogged forests for daytime roosting sites. Preferred habitat is densely forested gullies or slopes – on the flatter coastal plains (but not restricted to this habitat). Home range of a pair may be 1000-3000 hectares, governed by population density of prey.

Habitat occurrence (refers to both Owl Species): Forest on the *Site* could be a very minor part of large home range. Prey (mainly rats) as determined by previous surveys are relatively scarce. Species tend to occur where prey concentrates. As have large home ranges it is possible that the forested area could be a minute component of these species large home range.

No possible nest trees occur. Possible roost sites occur within the adjacent riparian vegetation (will not be disturbed).

Likelihood of species occurrence (refers to both Owl Species): Low. Not detected during intensive surveys (three over past 3 years).

In relation to the Masked Owl, nearest record 5 km south west. In relation to the Powerful Owl, the nearest record is 3 km south east.

Eight Point Test : See 4.1.4 General Eight Point Test.



Square-tailed Kite (*Lophoictinia isura*) – Sch 2 Vulnerable

Habitat requirements: Inhabits open and swamp forest and heathland adjacent to the coastline or estuaries. Prefers open forests and woodlands particularly large wooded watercourses. Common features of habitat is profuse eucalypt/angophora blossom and attendant insectivorous birds. Commonly nests in Angophora woodland/forests with associated box/ironbarks flats along moist valleys. Has a home range up to fifty square kilometres. Widespread from coast to tablelands.

Habitat occurrence: Probably excessive distance from coastline or estuary to occur (nest). Also no nest of this species detected on site. Forest, although open to a degree is probably too dense for occurrence of this species. No *Angophora* occurs.

Likelihood of species occurrence: Low. Not detected in surveys.

Eight Point Test: See 4.1.4 General Eight Point Test.

Mammals

Brush-tailed Phascogale (*Phascogale tapoatafa*) - Sch 2 Vulnerable

Habitat requirements: Prefers dry, open forest with sparse crown cover (Strahan, R 1995). Known to occupy a variety of forest types, but is most frequently recorded in the drier open sclerophyll forests, with a sparse sclerophyllous or xeric understorey of herbs, grasses, shrubs and leaf litter (Soderquist 1995). However, individuals may also inhabit heathlands, swamps, rainforest and wet sclerophyll forest (Dickman, C R and McKechnie, C A 1985). Some studies have shown that this species prefers Ironbarks on ridges (no evidence that inhabits moister gullies (Traill & Coates 1993). Utilises logged and unlogged forest. Home range of the species is 4-5 hectares (Cronin, L 1991). Others (Soderquist, T 1993) state territories of 20-60 ha (females) 100 ha (males) are maintained.

An individual may use more than twenty nests in a single year, including hollow tree limbs, rotted stumps and even globular bird nests. Large tree cavities with small, secure entrances are preferred by lactating females (Strahan, R 1995). Suitable hollows are 25-40 mm wide (Ayers, D, Nash S and Baggett K 1996).

Feeds mainly on cockroaches, beetles, centipedes, spiders and even Bull Ants, but is an occasional predator of small vertebrates. Nectar forms part of the diet and this animal may spend much of the night foraging in a single heavily flowering eucalypt. Largely arboreal and seldom feeds on the ground, preferring to forage in large trees, especially in dead branches (Strahan, R. 1995). Individuals forage preferentially in rough-barked trees of 25 cm dbh or greater, where available (Soderquist T, 1993).



Unreferenced: Excessive site disturbance and feral carnivores would reduce likely occurrence in some areas. Occurrence patchy, but widely distributed at low numbers.

Habitat occurrence: Occurs but not ideal nor typical habitat. Lack of hollow trees (particularly on the *Site*) is considered to be a main factor for non occurrence. Quarry activity may also reduce potential to occur.

Likelihood of species occurrence: Low. Not detected during intensive surveys. Nearest NPWS data base record is 3 km.

Eight point test: See 4.1.4 General Eight Point Test.

BATS; including:

Grey-headed Flying-Fox (*Pteropus poliocephalus*) – Sch 2 Vulnerable

Habitat Requirements: Occurs on the coastal belt from Rockhampton to Melbourne (Strahan, 1995). Known as a Flying Fox this fruit bat belongs to a group of nectar and fruit feeding bats. They are migratory to various degrees depending on seasonal and permanent camps. The same camp sites are used year after year. (Strahan 1995 states that camps are commonly formed in gullies, typically not far from water and usually in vegetation with a dense canopy). Leave their daytime camps about 20 mins after sunset and fly up to about 30 km to feed (whilst others claim up to 50 km – Strahan 1995). The population is most nomadic in winter, leaving their camps and following the sequential flowering of eucalypts. In Spring they return to the camps on the coastal lowlands.

The species follow the flowering and fruiting of preferred tree species. The species are important pollinators of forest trees and make a significant dietary contribution to Powerful Owls. During the night an individual may travel almost 100 km, feeding in many different patches of trees, whilst others spend the entire night in the same Fig Tree. Their diet is from two sources in the forest: nectar and pollen from flowers and the flesh of rainforest fruits such as native figs and palms. They feed from the flowers of 30 species of eucalypts as well as Turpentine, Callistemon, Melaleuca, Angophora, Firewheel Tree, Coast Banksia and Silky Oak. In a study in northern NSW this species was found to feed on the fruit of 32 species of 19 plant families. Also eat introduced fruits such as mangoes, peaches, plums and mulberries (NP&WS - Biology and Management of *Pteropus* in NSW).



Little Bent-wing Bat (*Miniopterus australis*) - Sch 2 Vulnerable

Habitat requirements: Widely distributed in the north east of the State (Dwyer, P 1968). Generally found foraging in forested areas, particularly in well timbered habitats, where it forages below and above the tree canopy (Dwyer, P 1995). Can also forage in rainforest and melaleuca swamps (Strahan, R 1995).

Requires roosts in caves or mines, drains, disused tunnels or houses - several thousand bats can occur. Also roosts in tree hollows (Strahan, R 1995). Large distances are often travelled between different roosts. In spring, adult females move from widely scattered roosts to specific nursery caves (Australian Museum Business Services 1995).

Unreferenced: Preference for tall open forest and rainforest close to roosting sites. Only 12 known roosts - one NSW at Willi Willi. Common in spring and late summer becoming torpid in winter.

Eastern False Pipistrelle (*Falsistrellus tasmaniesis*) – Sch 2 Vulnerable

Habitat requirements: Requires tree hollows or caves as roost sites. Forages above canopy in tall wet and dry temperate sclerophyll forests - preferred habitat being old growth forest. Also uses rainforest. Occurs in low numbers in its range although is more common at cool elevations, found 700 -1300m. Rarely captured, from Woko to border, with most north.

Habitat occurrence (for all bat species listed above): The dry sclerophyll forest is general habitat for this species. The one habitat tree with hollows on the *Site* could be used for roosting. No decorticated bark trees occur. Few feed tree species occur for the mega bats. Similar habitat occurs adjacent and extensive areas of similar forest occur in the general locality.

Likelihood of species occurrence (for all bat species listed above): Moderate to high. Both the Grey headed Flying Fox and the Eastern Pipistrelle have been previously detected on the Lots (not on the *Site* though).

Eight Point Test (for all bat species listed above):

- a) Area of vegetation (potential habitat) to be removed would only be a minute proportion of foraging area (2.2 ha) with most of the habitat on the Lots (allowing for programmed quarry expansion) being retained indefinitely. Connections to other habitat will remain (this is not so relevant to fauna capable of flight). However, as these highly mobile species have a large home range (and similar – though better, habitat occurs adjacent and nearby), it is unlikely to be impacted upon by the proposal that will remove 2.2 ha of potential habitat. Whilst a potential roost tree will be removed, such trees occur elsewhere on the Lots and particularly adjacent the *Site*. No camp area occurs on or adjacent the site.

Hence it can reasonably be concluded there will be no significant impact on life cycle, ie movement, breeding, food supply – these should not be affected to a degree that creates a significant effect on the species survival.



- b) None of the threatened populations gazetted as at 26 October 2001 occur on the site. No known "local" population occurs. As detailed in (a) above, the impact will not be to a degree that it is likely to disrupt the viability of a population.
- c) Small area of potential habitat will be removed. Creation of openings often favours these species (detected often in openings). Regional distribution of similar habitat for these species is extensive. The site is not the location for any endangered populations as gazetted 26 October 2000.
- d) Separation of habitat is not so critical for fauna capable of flight. The area of potential habitat to be removed is a pocket adjacent the present quarry and will be an expansion of the area already developed. Clearing of minor areas should not affect the movement pattern of individuals nor populations.
- e) Critical habitats (as per TSC Act) are yet to be defined. A small area of potential habitat will be removed – but does not contain any critical features eg caves. Hollow trees could be regarded as critical - only one will be removed and adjacent areas have better trees which will remain. Extensive, similar habitat occurs in the adjacent and nearby freehold lands and National Park.
- f) More relevant to flora. As species requires large areas, all habitat is likely and necessarily utilised – not just reserves. To maintain biodiversity all populations should be protected to the extent possible. Extensive, similar habitat occurs in the adjacent and nearby freehold lands and National Park. Species are variously known (not extensively) from conservation reserves in the NSW Biogeographical Region (perhaps more so due to lack of surveys). Hence it is difficult to state that these species are inadequately represented in Conservation Reserves. Being species capable of flight this criterion is of lesser importance.
- g) Of the gazetted threatening processes, "clearing" is a listed key threatening process. As yet a Threat Abatement Plan has not been prepared by the NP&WS. Given that this proposal for the removal of a further 2.2 ha of vegetation is likely to be the last (apart from previously approved and programmed quarry expansion), the remainder of the vegetation on the Lots is likely to remain. Therefore the removal of a small area of potential habitat by the proposal is unlikely to be in conflict with any subsequently prepared Threat Abatement Plan to manage clearing on a "landscape" basis. This conclusion presumes that incremental loss of habitat in this vicinity will be minimal following this development. Likely threatening process would be general habitat loss in association with loss of tree hollows. In this case (see above) this impact will be minimal.
- h) Within distribution range generally although the Eastern Pipistrelle is uncommon at lower altitudes.

Conclusion: There will be no significant impact on these species from the proposal. This conclusion is subject to adherence to the Recommendations (see PART E) provided.



Koala (*Phascolarctos cinereus*) - Sch 2 Vulnerable - Addressed under SEPP 44 Assessment

Habitat requirements: Found in eucalypt forest and woodland feeding almost entirely on the foliage of species of this genus. However there are marked local and regional preferences. Forest Red Gum, Tallowwood and Grey Gum are very important browse species. The more abundant populations tend to be linked to species growing on higher nutrient soils – such as occur in river valleys - but koalas also occur in forests on the poorer coastal soils (Strahan, R. 1995).

Throughout NSW koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non eucalypt species (Phillips, B. 1990). However, in any one area, koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis (Hindell M.A. and Lee A.K. 1990). In coastal areas Tallowwood and Swamp Mahogany are important food species (Smith, M. 1992).

The koala is solitary and individuals spend most of their time in distinct home ranges, the size of which varies according to the density of the population and the abundance of mature food trees in an area. In the denser populations, these ranges overlap but they appear to be discreet at lower densities (Strahan, R. 1995). Home range size is related to density of occurrence of large trees and possibly population density of the koala, but it can vary from several hectares to 15 ha (Mitchell, P. 1990).

Habitat conservation, particularly the preservation of large tracts of habitat and the linking of isolates with habitat corridors, is now the key issue in koala conservation (Strahan, R. 1995). Distribution in NSW is determined by those preferred trees that are growing on nutrient rich soils, and the key to koala management will be to conserve it within such locations, mainly now the largely degraded or cleared valleys (Reed *et al* 1991).

Unreferenced: Optimal habitat has been found to be forest edges between plant communities where there was seasonal diversity in the available food source. Habitat is sometimes characterised by high-use trees which serve an integral role in the social and reproductive life of the colony. Such trees are identifiable by a large number of scats and the highly scratched nature of the tree – particularly characterised by a “railway line” straight up the tree.

Utilises a suite of food trees, with site specific preferences from the suite at each locality. Often primary browse species include Grey Gum and Tallowwood. Secondary browse species include Forest Red Gum, Swamp Mahogany, Ironbark, White Mahogany, Spotted Gum, Cabbage Gum, Broad leaved Paperbark and Red Bloodwood. Requires an oasis of nutrient rich habitat in tracts of optimal and marginal forest.



Habitat occurrence: Does occur - see SEPP 44 Assessment. Whilst the forested vegetation is Potential Koala Habitat, it is not considered the site is Core Habitat (see SEPP 44 Assessment). Also the site is not nutrient rich. In the draft GTCC Koala Management Plan, the vegetation community occurring was classed as *Primary Koala Habitat*. Vegetation connects with other similar potential habitat.

Likelihood of species occurrence: High. Whilst no koalas were sighted, nor were scats found and there was little other evidence (data bases/ anecdotal/scats etc) that koalas occur either on these Lots or in the immediate vicinity – the Quarry Management advised that a koala was sighted at the entrance to the quarry in the past week. However, at most, records indicate a very sparse occurrence in the general locality. Whilst possibly a high potential for occurrence (of low numbers) on the broad area of the Lots, there is much less potential for occurrence on the 2.2 ha *Site*.

Eight Point Test:

- a) There is no evidence of the occurrence of a social breeding aggregate in the area, on the Lots nor on the *Site*. Few koalas have been seen in the general area (one recently though on the Lots) and it is therefore likely that any sighted are transient, wide ranging males. Therefore, whilst development will remove 2.2 ha of forested vegetation within which 54% of overstorey trees are favoured feed tree species, this vegetation is common in the area. Over 83% of the area of the Lots will not be disturbed as a result of this and previous quarry expansion proposals. As the site is not core habitat, it is unlikely that the vegetation contributes significantly to the food substrate for this species. Therefore this minor impact of vegetation removal would not have a significant impact on feed tree availability.

As this animal co-exists amongst development and human presence this development will not necessarily discourage utilisation of other nearby available habitat. No significant reduction in connectivity between habitat nodes is likely [see d) below] – as the *Site* is adjacent the already established quarry location.

Hence it can reasonably be concluded there will be no significant impact on life cycle, ie movement, breeding, food supply – these should not be affected to a degree that creates a significant effect on the species survival.

- b) None of the threatened populations gazetted as at 26 October 2001 occur on the site. No known “local” population occurs, although koalas are found sparsely in the wider locality. As detailed in (a) above, habitat removal is minor hence the proposal will not disrupt the viability of a population.
- c) An area of 2.2 ha of vegetation/potential habitat will be removed. Regional distribution of the habitat for this species is extensive although continued incremental habitat loss can impact on this species. The site is not the location for any endangered populations as gazetted 26 October 2001. Habitat occurring is similar to that occurring on adjacent land and National Park.



There are no known further development proposals (apart from approved quarry expansion) for the adjacent forested on these Lots, nor on adjacent Lots – hence, presumably most of this habitat should remain.

- d) Connectivity within the Lots will not be substantially altered by vegetation removal on the *Site*. The *Site* is immediately adjacent the developed quarry and hence the proposal will expand that area whilst not creating an additional barrier to movement of koalas. Revegetation of the area in the long term will progressively restore the *Site* and provide connectivity similar to that occurring now.
- e) Critical habitat is likely to be vegetation utilised by a breeding population and/or vegetation used as a connection corridor between distinctive habitat nodes. In this case these values will remain after development.
- f) More relevant to flora. As species requires large areas, all habitat is likely and necessarily utilised – not just reserves. To maintain biodiversity all populations should be protected to the extent possible. Koalas and their habitats are widespread in the region. The National Parks, Reserves, State Forests and larger undeveloped areas along the coast provide similar habitat.
- g) Of the gazetted threatening processes, “clearing” is a listed key threatening process. Clearing of vegetation/habitat is a process likely to impact on koalas – by removal of habitat/food substrate/connectivity of habitat/fragmentation of habitat. As yet a Threat Abatement Plan has not been prepared by the NP&WS. Given that this proposal for the removal of a further 2.2 ha of vegetation that is likely to be the last (apart from previously approved and programmed quarry expansion), the remainder of the vegetation on the Lots is likely to remain. Therefore the removal of a small area of potential habitat by the proposal is unlikely to be in conflict with any subsequently prepared Threat Abatement Plan to manage clearing on a “landscape” basis. This conclusion presumes that incremental loss of habitat in the general vicinity will be minimal following this development.

Predation by the European Red Fox is another listed and relevant (as at 26 October 2001) threatening process which could impact on koalas. In this case a decrease in predation is a possibility following quarry development and associated human presence.

Threats by traffic should be minimal as traffic will generally be slow moving.

- h) Species is well within known area of distribution - both geographically and in habitat type. No listed population or ecological community (as at 26 October 2001) will be affected.

Conclusion: There will be no significant impact on koalas from this proposal subject to the adoption of the Recommendations (See PART E).



Tiger Quoll (Spotted-tailed) (*Dasyurus maculatus*) – Sch 2 Vulnerable

Habitat requirements: Found in a range of forested habitats including open forest and woodland. Also found in rainforest. Prefers tall, open sclerophyll forest, denser forest, rainforest and coastal woodlands with a number of understoreys. Adapted to an arboreal existence and requires hollows, hollow logs, rock crevices or caves for nesting or breeding. A solitary animal requiring possibly 500-1000 ha of home range with a preference for large unfragmented forest. Numbers and occurrence could be reduced by predators, eg dogs and foxes. Are agile climbers for hunting arboreal mammals. Needs and feeds on a wide range of medium sized arboreal and terrestrial animals. Low densities, numerous sightings in many areas. Occurs from coast to ranges.

Habitat occurrence: Occurs, although the *Site* could only be a very minor component of the species home range. Prey base in area is low which could preclude occurrence as could fragmentation of habitat in the general area.

Likelihood of species occurrence: Low. Not detected during three surveys over the past 3 years. Closest NP&WS database record is 2 km distant.

Eight Point Test: See 4.1.4 General Eight Point Test.

Squirrel Glider (*Petaurus norfolkensis*) - Sch 2 Vulnerable

Habitat requirements: Found in woodland and dry and moist open sclerophyll forest. Occurs in low densities (where occur can be up to 3 per ha), broad distribution from coast to ranges. Feeds on predominantly nectar as well as insects, acacia gum, sap of certain eucalypts, pollen, Acacia gum and the green seeds of Golden Wattle – especially in winter months when insect numbers are low (Strahan, R. 1995). Although mostly rare, the species appears locally to be common (Suckling, G.C. 1995).

In coastal NSW it lives in small groups that occupy home ranges of 2-4 ha, at population densities of 0.9 to 1.5 individuals per ha (Quin, D. G. 1993) and family groups of between 2 and 10 (Suckling, G.C. 1995). Later, Quin (1995) states home ranges can be 0.65 ha to 8.55 ha, they can glide for 50 m and night movements are estimated to be 300 m to 500 m (equivalent to a range of 30 ha). The habitat of Squirrel Gliders is stated to be restricted to specific late-successional forest or older multi-aged stands (Davey, S. M. 1984).

In addition to the availability of trees with suitable hollows for nest and den sites (smooth-barked eucalypts are preferred as these form hollows more readily than rough-barked eucalypts and support a greater diversity of invertebrates), critical habitat for this species is likely to be in areas where winter-flowering Banksias or gum producing Acacias are common. During winter when other food resources are scarce the Glider may obtain its energy from the winter flowers of coastal Banksia, Red Ironbark, River Red Gum, Grey Ironbark, Spotted Gum, Forest Red Gum and in some areas Blackbutt. Xanthorrhoea and mature Acacias may also provide a valuable food source (Quin, D. G. 1995).



The glider is an ecological specialist requiring abundant hollow-bearing trees and a mix of eucalypts, Acacias and Banksias. Within a suitable vegetation community at least one flora species should flower heavily in winter and one or more of the eucalypts should be smooth-barked (Menkhorst *et al.*, 1988; Quin, D. G. 1993). The Squirrel Glider forages at all levels in the forest strata to obtain its diet of plant exudates and arthropods (Bennett *et al.*, 1991).

The species also uses hollows in tree stumps left after timber harvesting and hollows formed at the rotting base of trees regrown from coppice stumps (Traill, B.J. and Coates, T.D. 1993). It is a species requiring old growth forest for nesting (Scotts, D. 1991).

Excessive site disturbance and feral carnivores would reduce likely occurrence in some areas (Menkhorst *et al.*, 1988)

Unreferenced: However is found in coastal habitats including swamp mahogany forests. Ranges up to 30 ha have been found.

Habitat occurrence: Habitat is partly suitable (one tree with hollows). Smooth bark trees occur as Grey Gum. Ironbark is a winter flowering tree that occurs. However, hollows trees are not abundant (one on *Site*) and frequency/distribution is very low (0.4 trees /ha). Forest is more so a mature regrowth forest. Other than eucalypts no significant foraging substrates occur (Acacias are minimal - no Banksia). An Xanthorrea occurrence (about 20 flowering) occur immediately adjacent.

Likelihood of species occurrence: Low potential to occur, low to negligible potential to depend on Lot for food substrate or nesting. Not detected on Lots nor on *Site*. Nearest NPWS database record is 4 km distant.

Eight Point Test: See 4.1.4 General Eight Point Test



Yellow-bellied Glider (*Petaurus Australis*) – Sch 2 Vulnerable

Habitat requirements: Occurs in a wide range of eucalypt forests but most frequently in dry sclerophyll forests with a xeric understorey. Tends to prefer moister gully areas but is common on the ecotone between dry and wet sclerophyll forests. More common on the coastal forests, less in the highlands. Requires hollows in trees as dens with smooth barked trees preferred. Habitat is characterised by a mosaic of tree species associations, including those which flower in winter and those with smooth-barked eucalypts that shed bark in long strips. A variety of mainly smooth-barked eucalypts such as *E. maculata*, *E. propinqua*, *E. signata*, *E. tereticornis*, *E. viminalis*, *E. saligna* and *E. grandis* and rough-barked species such as *E. fastigata*, *E. gummifera*, *E. obliqua* are incised to obtain sap. Diet also consists of invertebrates, nectar, pollen, manna and insect exudates. Gliders concentrate their foraging efforts on ephemeral food resources, particularly those obtained from under loose shedding bark and flowering eucalypts. Home range in the order of 30-65 hectares and require 10 sap site trees in this range. Very low abundance, in coastal and sub coastal areas. Up to 1000 locations known.

Critical habitat is characterised by a mosaic of tree species associations.

Known to be capable of using highly disturbed forested habitat in urban areas.

Habitat occurrence: Habitat is partly suitable (one tree with hollows) however these hollows are generally minimal in number. Additionally, over the Lots suitable hollow trees for this species are very sparse and it is unlikely that they would be adequate to support the species. Smooth bark trees occur as Grey Gum and Spotted Gum (no hollows). Ironbark occurs and is a winter flowering tree. However, hollows trees are not abundant (one on *Site*) and frequency/distribution is very low (0.4 trees /ha). Forest is more so a mature regrowth forest. Other than eucalypts no significant foraging substrates occur (Acacias are minimal - no Banksia). Species prefers a mosaic of tree species normally adjacent moister gully environments.

Likelihood of species occurrence: Low potential to occur, low to negligible potential to depend on *Site* for food substrate or nesting. Not detected on *Site* nor Lots. No evidence of feed tree use on *Site*. Nearest NPWS database record is 9 km.

Eight Point Test: See 4.1.4 General Eight Point Test.



4.1.3 Threatened Species not Recorded within 10 km - but which may occur

Amphibians

Nil

Reptiles

Stephen's Banded Snake (*Hoplocephalus stephensi*) – Sch 2 Vulnerable

Habitat requirements: Found in dry and wet sclerophyll and rainforest. Requires well developed understorey and diverse ground cover including rocks, fallen logs, loose bark on trees and tree hollows. Also found in rocky areas. Widespread but rare, found coastal and near coastal.

Habitat occurrence: Limited occurrence – particularly in relation to diverse ground cover and shrub layer. No rocky areas and very few tree hollows. No trees with loose bark.

Likelihood of species occurrence: Low. Not detected during surveys.

Eight point test: See 4.1.4 General Eight Point Test.

Birds

Barking Owl – (*Ninox connivens*) – Sch 2 Vulnerable

Habitat requirements: Found in well forested hills and flats, eucalypt savanna and riverine woodland. It sometimes roosts in rainforests but requires more open country for hunting and hollow eucalypts for breeding. Usually found in pairs that occupy 30-200 ha territories all year round. Have a number of sites where they roost, usually in a leafy tree in a copse, but not always well hidden. Main prey includes mammals and birds but also feeds on insects and other invertebrates (Reader's Digest Complete Book of Australian Birds).

Habitat occurrence: Possibly occurs, however apparently prefers more woodland and open country. Requires hollow eucalypts for breeding, hence could not breed on *Site* – as those hollows present would be too small. Possibly could roost in adjacent riparian vegetation – which will not be disturbed by the proposal.

Likelihood of species occurrence: Low. Not detected in surveys.

Eight point test: See 4.1.4 General Eight Point Test.



**Bush Thick-knee or Bush Stone-curlew (*Burhinus grallarius*) Schedule 1
Endangered**

Habitat requirements: Inhabits dry open forest and woodland with an open grassy understorey - short and sparse ground cover, often no shrub layer, but abundant leaf litter and fallen timber. It prefers woodland with many fallen branches near which it roosts during the day. Has been found in dune scrub and at fringes of mangroves. Rare and localised on coast.

Habitat occurrence: Does occur, but groundcover is not ideal. Proximity to development probably precludes occurrence.

Likelihood of species occurrence: Low. Not detected during surveys.

Eight point test: See 4.1.4 General Eight Point Test.

Sooty Owl (*Tyto tenebricosa*) – Sch 2 Vulnerable

Habitat requirements: Found on coastal forests where rainforest makes up a significant component of the understorey or overstorey. Is a specialist inhabitant of rainforest and tall, wet, eucalypt forests - but rainforest is not essential. Nests and roosts in large hollows inside large old trees usually in or near gullies. Require large entry hole with lower extended lip to land on. Also roosts by day amongst the darkest, densest foliage of Lilly Pilly and other rainforest species, Casuarinas, Blackwood, Turpentine, Coachwood and Callicoma. Diet comprises Ringtail Possums, Greater Glider, Antechinus, Bush Rats, Sugar Gliders and Bandicoots - hence home range can include regrowth forest.

Habitat occurrence: No nest trees with suitable hollows occur (lip). Possible roost sites occur within the adjacent riparian vegetation (will not be disturbed). No other nest sites occur. Some prey (rats) were relatively abundant, but few other (lack of understorey, shrub and groundcover layers over much of the area). As have large home ranges it is possible that the forested area could be a minute component of this species large home range. Further, location adjacent quarry could preclude occurrence.

Likelihood of species occurrence: Low. No nearby detections. Not detected during surveys.

Eight Point Test : See 4.1.4 General Eight Point Test.



Mammals

Bats including :

Common Bent-wing Bat - (*Miniopterus shreibersii*) Sch 2 Vulnerable

Habitat requirements: Occurs in a broad range of habitat types and altitudinal ranges (Dwyer, P 1968).

A common cave dwelling species (Parnaby, H 1992). Roosts in large colonies during the day in caves, old mines, stormwater channels and comparable structures and occasionally buildings (Dwyer, P 1995).

Large distances are travelled between roosts according to changing seasonal needs and age and reproductive status, and seasonal movements up to 320 km have been recorded in NE NSW. Males appear to be more sedentary and travel up to 60 km (Dwyer, P 1968).

Unreferenced: Favours valleys or uncluttered areas. Feeds above canopy in wet and dry tall open forests. Common in spring and late summer, becoming torpid in winter. Widely but sparsely distributed from coast to ranges. Major populations at Willi Willi and Carrai. Occurs south to Hunter at least.

Common (Queensland) Blossom-bat (*Syconycteris australis*) – Sch 2 Vulnerable

Habitat requirements: Roosts in rainforest and moist hardwood, but the main foraging habits are coastal forests and heaths. Coastal rainforest (or moist hardwood forest) immediately adjacent heath is therefore a very important roosting site. Feeds on flowering plants including the Banksias, Callistemons and Pink Bloodwood. Coast Banksia appears to be the most important. Roosts in sub canopy of rainforest where there is little variation in temperature and humidity. It is a strict nectarivore and rarely forages more than a few km from roost areas (Law B S 1993).

Occurs south to Booti Booti - few locations only, mainly north.

Greater Broad-nosed Bat (*Scoteanax rueppellii*) – Sch 2 Vulnerable

Habitat requirements: Considered to be a reasonably common species of coastal New South Wales (Richards, G C 1992). Occurs in cool temperate to tropical dry and wet sclerophyll forests, woodland and rainforest, but not at altitudes above 500 m. Creeks and small rivers are favourite corridors for catching prey. The open nature of eucalypt woodlands and forests appears to suit its direct flight pattern, and in the more cluttered environments of the wetter forests appear to be overcome by making use of natural and man made openings in the forest. (Hoy, G A & Richards G C 1995).



The bat is stated usually to roost in tree hollows, but it has also been found in roof spaces in old buildings (Hoy, G A & Richards G C 1995).

Unreferenced: Preference for wet gullies which have a flyway of 3-6 metres height. Forages along and over tree-lined creeks with sparse understorey, the junction of woodlands and cleared paddocks and low along rainforest creeks. Feeds on large moths and beetles and some small vertebrates, emerging just after sundown, flying slowly and directly at a height of 3-6 metres, deviating only slightly to catch larger insects. Widely distributed to south coast but sparse and localised.

Large-eared Pied Bat (*Chalinolobus dwyeri*) – Sch 2 Vulnerable

Habitat requirements: Forages above canopy mainly in open tall dry forests. Also occurs wet forests, rainforest and woodlands. Roosts mainly in caves, mines, rock overhangs. Also in tree hollows. Only isolated records - mainly ranges but some coastal.

Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*)

Habitat requirements: Wide range of habitat utilised. Critical features include roost and nest sites – tree hollows, buildings, caves and rock overhangs. Other species require expanse of water, rainforest and streams.

Habitat occurrence (for all bat species listed above): Only one tree with hollows occurs. No rainforest, fruiting trees, banksia nor streams occur. Adjacent riparian forest will not be disturbed. At most 2.2 ha of potential habitat will be removed.

Likelihood of species occurrence (for all bat species listed above): Moderate. Species not detected during surveys.

Eight Point Test (for all bat species listed above):

- a) Area of vegetation (potential habitat) to be removed would only be a minute proportion of foraging area (2.2 ha) with the majority of the habitat (allowing for programmed quarry expansion) being retained indefinitely. Connections to other habitat will remain (this is not so relevant to fauna capable of flight). However, as these highly mobile species have a large home range (and similar – though better, habitat occurs adjacent and nearby), it is unlikely to be impacted upon by the proposal that will remove 2.2 ha of potential habitat. Whilst a potential roost tree will be removed, other such trees occur elsewhere on the Lots and particularly adjacent the Site. No camp area occurs on or adjacent the site.

Hence it can reasonably be concluded there will be no significant impact on life cycle, ie movement, breeding, food supply – these should not be affected to a degree that creates a significant effect on the species survival.



- b) None of the threatened populations gazetted as at 26 October 2001 occur on the site. No known "local" population occurs. As detailed in (a) above, the impact will not be to a degree that it is likely to disrupt the viability of a population.
- c) Small area of potential habitat will be removed. Creation of openings often favours these species (detected often in openings). Regional distribution of similar habitat for these species is extensive. The site is not the location for any endangered populations as gazetted 26 October 2000.
- d) Separation of habitat is not so critical for fauna capable of flight. The area of potential habitat to be removed is a pocket adjacent the present quarry and will be an expansion of the area already developed. Clearing of minor areas should not affect the movement pattern of individuals nor populations.
- e) Critical habitats (as per TSC Act) are yet to be defined. A small area of potential habitat will be removed – but does not contain any critical features eg caves. Hollow trees could be regarded as critical - only one will be removed and adjacent areas have better trees which will remain. Extensive, similar habitat occurs in the adjacent and nearby freehold lands and National Park.
- f) More relevant to flora. As species requires large areas, all habitat is likely and necessarily utilised – not just reserves. To maintain biodiversity all populations should be protected to the extent possible. Extensive, similar habitat occurs in the adjacent and nearby freehold lands and National Park. Species are variously known (not extensively) from conservation reserves in the NSW Biogeographical Region (perhaps more so due to lack of surveys). Hence it is difficult to state that these species are inadequately represented in Conservation Reserves. Being species capable of flight this criterion is of lesser importance.
- g) Of the gazetted threatening processes, "clearing" is a listed key threatening process. As yet a Threat Abatement Plan has not been prepared by the NP&WS. Given that this proposal for the removal of a further 2.2 ha of vegetation is likely to be the last (apart from previously approved and programmed quarry expansion), the remainder of the vegetation on the Lots is likely to remain. Therefore the removal of a small area of potential habitat by the proposal is unlikely to be in conflict with any subsequently prepared Threat Abatement Plan to manage clearing on a "landscape" basis. This conclusion presumes that incremental loss of habitat in this vicinity will be minimal following this development. Likely threatening process would be general habitat loss in association with loss of tree hollows. In this case (see above) this impact will be minimal.
- h) Within distribution range generally although the Eastern Pipistrelle is uncommon on lower altitudes.

Conclusion: There will be no significant impact on these species from the proposal. This conclusion is subject to adherence to the Recommendations (see PART E) provided.



Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*) – Sch 2 Vulnerable

Habitat requirements: Uses runways in thick sedges and grasses in wet heathland. However, occurs in open forest country where it uses Bladey Grass or tussocks as runways. Requires dry grassy areas for nesting. Moist habitat particularly associated with heath are optimum habitats. Optimal habitat is regenerating vegetation after fire. Occurs at very low densities, from coast to ranges.

Habitat occurrence: No heath occurs and groundcover limited within dry sclerophyll forest. Suitable habitat could occur adjacent riparian vegetation – which will not be disturbed.

Likelihood of species occurrence: Low. Not detected during surveys.

Eight point test: See 4.1.4 General Eight Point Test.

Rufous Bettong (*Aepyprymnus rufescens*) – Sch 2 Vulnerable

Habitat requirements: Requires sparse or grassy understorey, in native woodland and well-grassed open forest, often with no shrub layer. Commonly found associated with Spotted Gum forests but occurs in a variety of habitats from coastal eucalypts to tall wet sclerophyll. Home range is large (up to 110 ha). Prefers flat to undulating land - not excessively steep or rocky. Patchily distributed, main captures in ranges, but also coast.

Habitat occurrence: Does occur, but groundcover is not ideal. Proximity to development probably precludes occurrence.

Likelihood of species occurrence: Low. Not detected during surveys.

Eight point test: See 4.1.4 General Eight Point Test.

4.1.4 General Eight Point Test

A species specific Eight Point Test has been undertaken for species that **occur** (see 4.1.1) and for species with **moderate or high** likelihood of occurrence (see 4.1.2 and 4.1.3).

In addition, a general Eight Point Test has been undertaken for all other species listed in 4.1.2 and 4.1.3 above, that have a **low** likelihood of species occurrence.

These species are:

Reptiles

Stephen's Banded Snake (*Hoplocephalus stephensi*)



Birds

Barking Owl (*Ninox connivens*)
 Bush Thick-knee (*Burhinus grallarius*)
 Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
 Masked Owl (*Tyto novaehollandiae*)
 Osprey (*Pandion haliaetus*)
 Powerful Owl (*Ninox strenua*)
 Sooty Owl (*Tyto tenebricosa*)
 Square-tailed Kite (*Lophoictinia isura*)

Mammals

Brush-tailed Phascogale (*Phascogale tapoatafa*)
 Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*)
 Rufous Bettong (*Aepyprymnus rufescens*)
 Squirrel Glider (*Petaurus norfolcensis*)
 Spotted-tailed Quoll (*Dasyurus maculatus*)
 Yellow-bellied Glider (*Petaurus australis*)

Eight Point Test is as follows:

- a) Life cycle of these species can either be protected, or impact will be so minimal (if at all), so that a viable local population (none evident) is not placed at the risk of extinction.

An area of 2.2 ha of vegetation will be removed as a result of the proposal. Significantly, 83% of the vegetation on the Lots will not be disturbed – much of which serves as a habitat node and a wildlife corridor. This removal will not create a significant barrier to the movement of any fauna. Hence life cycles ie movement, breeding, food supply – should not be affected to a degree that creates a significant effect on the species survival. Many of these species are known to co-exist with human development – although quarrying activity could preclude occurrence. The proposed activity is a component of quarrying and hence impact will not significantly increase.

Only one habitat tree (trees with hollows) will be removed. As this tree is not an ideal habitat tree and frequency is low, the tree will not necessarily provide habitat for any species. Although logs and other ground cover occur, extensive survey during the EIS process did not detect any threatened species dependent on this habitat. To the extent possible a Recommendation is that these logs be removed and established in retained areas to provide habitat. Although non threatened species occur (and are prey for some threatened species) it is not considered that loss by clearing of vegetation will impact significantly on such species.



The 2.2 ha of potential habitat proposed for removal on this *Site* is only a small component of potential habitat in this area. Links with proximate habitat will be maintained by the retained wildlife corridors outside the areas proposed for quarry development. Further, lack of direct connectivity is not so significant to those species capable of flight (and to a lesser degree to gliders).

Hence it can reasonably be concluded there will be no significant impact on life cycle, ie movement, breeding, food supply – these should not be affected to a degree that creates a significant effect on the species survival.

- b) None of the endangered populations gazetted as at 26 October 2001 occur on the *Site*. No known "local" endangered population occurs. Provided the individual species life cycle is not significantly impacted upon (so determined above), then any population (none listed as endangered) should not be significantly impacted upon.
- c) An area of 2.2 ha of potential habitat will be removed by the proposal. Whilst suitable habitat for some species, this is not considered to be a significant area regionally. As most species are widely distributed (but sparse in occurrence), known habitat used by known populations should be protected (this does not mean total protection of all habitat). This *Site* is not the location for any endangered populations as gazetted 26 October 2001.
- d) Connectivity within the Lots will not be substantially altered by vegetation removal on the *Site*. The *Site* is immediately adjacent the developed quarry and hence the proposal will expand that area whilst not creating a barrier to movement of koalas. Revegetation of the area in the long term will progressively restore the *Site* and provide connectivity similar to that which occurs now. Connectivity (as affected by removal of 2.2 ha of vegetation) is not so important to those species capable of flight.
- e) Critical habitats (as per TSC Act) are yet to be defined, hence no impact can be assessed. However, critical habitat for many species would be vegetation comprising large trees with hollows and connective links. In this case only one low quality habitat tree will be removed. Connective corridors will be essentially unaltered. Whilst other critical habitat features, eg logs and ground cover will be removed, this will be only over a small area (2.2 ha). Other possible critical habitat features eg adjacent riparian vegetation, will not be disturbed.
- f) More relevant to flora. All areas of habitat are likely and necessarily utilised – not just reserves. To maintain biodiversity all populations should be protected to the extent possible. Similar habitat occurs on other freehold lands in the locality and on nearby National Park. Most species have been recorded in many National Parks in the Region. In this case there will be no impact on any listed population. Species are variously known (not extensively) from conservation reserves in the NSW Biogeographical Region (perhaps more so due to lack of surveys). Hence it is difficult to state that these species are inadequately represented in Conservation Reserves. For those species capable of flight, this criterion is of lesser importance.

