

Appendix C
Supplementary ecology report



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Delta Electricity

Report for Bamarang Gas-fired
Power Facility

Ecological Assessment
Addendum

August 2006



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1. Introduction

1.1 Purpose

GHD Pty Ltd (GHD) was commissioned by Delta Electricity to undertake additional ecological surveys for the proposed Gas-fired Power Facility at Bamarang on the NSW South Coast. Flora and fauna surveys were undertaken by GHD along the proposed powerline route and Gas-fired Power Facility site during August 2005. An Ecological Assessment Report detailing the findings and including an impact assessment under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP& A Act) was prepared and placed on public exhibition in June 2006 for comment. Based on the submissions received from a number of government authorities including Department of Environment and Conservation (DEC) and Department of Planning and Infrastructure (DPI) (Fisheries), the need for additional ecological surveys was identified. Subsequent consultation with DEC and the Department of Planning (DOP) was undertaken to determine the level of additional assessment required.

This report forms an addendum to the original Ecological Assessment Report and outlines the additional surveys undertaken, the findings of these surveys and includes updated impact assessments where necessary.



2. Methodology

2.1 Field Surveys

Consultation with DEC was undertaken prior to the surveys and the methodology designed to meet the requirements of the DEC *Draft Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (2004). Two ecologists undertook surveys for threatened species over a four-day period from 24 July 2006 to 28 July 2006.

2.1.1 *Prasophyllum* sp.

One previously unknown individual of the orchid genus *Prasophyllum* was found during the August 2005 surveys and is thought to be a new species. The site where this species was originally found was revisited during the survey period but the species had not flowered. The orchid was originally found flowering in mid-August and therefore the site was revisited again at this time this year by Alan Stephenson (orchid expert) but no flowering was evident.

2.1.2 *Triplarina nowraensis*

Additional individuals of Nowra Heath Myrtle (*Triplarina nowraensis*) were recorded by DEC south of Yalwal Road adjacent to Flat Rock Dam just prior to this survey and included approximately 30 individuals. It is anticipated that these plants had been slashed at the time of the previous GHD surveys due to their location within the road reserve and therefore had been missed. Therefore GHD revisited this area to map the new individuals and search for any additional individuals in the vicinity.

2.1.3 Fauna Habitat Mapping

Detailed mapping of potential habitat for threatened ground-dwelling mammal species considered to have the potential to occur at the site was undertaken across the proposed Gas-fired Power Facility site. Areas providing potential foraging, sheltering or breeding habitat were identified.

2.1.4 Mammal Trapping

Ground-dwelling Mammals

Sampling for the presence of large and small ground-dwelling mammals and potentially small arboreal mammals, was conducted across the proposed Gas-fired Power Facility site using a combination of techniques in order to increase the likelihood of detection. Hair tubes, A-size Elliot traps and cage traps were used for these species.

In accordance with the DEC *Draft Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (2004), each trap line was spaced approximately 10 - 20 m apart and hair tubes were located adjacent to the trap line of A-size Elliots at intervals of approximately 10 - 20 m. A line of five cage traps at



slightly larger intervals was also placed at each of the trap sites. Hair tubes and Elliot A traps were baited with a peanut butter, oats and honey mix and sardines were added to the mixture for use in the cage traps. To meet the guidelines, trapping was undertaken for three consecutive nights. The location of each of the trap lines is shown in Figure 1.

Arboreal Mammals

B-size Elliot traps were placed in trees at two sites across the proposed Gas-fired Power Facility site. Traps were placed at intervals of approximately 20 m but this distance varied slightly depending on the presence of suitable large trees on which to mount the traps. Traps were baited with a peanut butter, oats and honey mix and a honey and water mixture was sprayed on the trunk of the trees above and below the traps. The location of each of the Elliot B trap lines is shown in Figure 1.

Stagwatching

Arboreal mammals are known to commonly emerge from hollows at dusk. Therefore, stagwatching was conducted on two nights at dusk prior to spotlighting to increase the likelihood of detecting arboreal mammals such as Yellow-bellied Gliders, at the site. Hollow-bearing trees were watched for approximately 30 minutes from dusk until dark for the emergence of arboreal mammals and potentially bat species. Stagwatching locations are shown on Figure 1.

Spotlighting

Spotlighting was conducted for at least one person hour across the proposed Gas-fired Power Facility site. Figure 1 shows the spotlighting locations across the site.

2.1.5 Microchiropteran Bats

Roost Habitat Identification

The disused abattoir building was searched for bat colonies and evidence of roost sites. Any scats found were collected and sent to Barbara Triggs of Dead Finish for identification.

2.1.6 Hollow-bearing Tree Counts

Hollow-bearing trees across the proposed Gas-fired Power Facility site were mapped and key characteristics noted. An estimate of the number of hollow-bearing trees to be conserved and removed as a consequence of the proposal was then made.

Details recorded for each hollow-bearing tree included:

- ▶ Tree Species;
- ▶ Height;
- ▶ Number of hollows;
- ▶ Average hollow diameter; and
- ▶ Dead / Alive.



2.1.7 Giant Burrowing Frog Targeted Survey

Given the rain experienced prior to and during the survey period, targeted surveys for the Giant Burrowing Frog (*Heleioporus australiacus*). This involved spotlighting for individuals along paths and tracks. Areas searched are shown on Figure 1.

2.1.8 Aquatic Habitat Assessment

An aquatic habitat assessment of riparian zones throughout the study area was undertaken. The assessment was in accordance with the Australian River Assessment System (AusRivAS) habitat assessment standards.

2.2 Survey Effort

Table 1 lists the survey effort for each of the surveys conducted across the proposed Gas-fired Power Facility site.

Table 1 Survey Effort

Target Species / Guild	Method / Technique	Person Hours / Trap Nights
Ground-dwelling Mammals	Trapping: Elliot A Traps Hair Tubes	60 trap nights
Ground-dwelling Mammals	Cage Traps	30 trap nights
Arboreal Mammals	Trapping: Elliot B Traps	60 trap nights
Arboreal Mammals	Spotlighting	4.5 person hours
Arboreal Mammals	Stagwatching	2 person hours
Bat Roost Site Search	Guano and Scat search	1.5 person hours
Giant Burrowing Frog	Spotlighting	3 person hours

2.3 Weather Conditions

Over the weekend preceding the survey heavy rain had been experienced. At the time of surveys the rain had eased but intermittent rainfall events were experienced during the days of 25, 26 and 27 July 2006 and heavy rainfall throughout the evening of 25 July 2006. Temperatures during the survey period were mild with daytime average temperatures of approximately 16 – 18 °C. Night-time temperatures were variable with warmer temperatures experienced on those nights with high levels of cloud cover. Temperatures during the early part of the evenings when spotlighting was conducted averaged approximately 12 - 14 ° C.

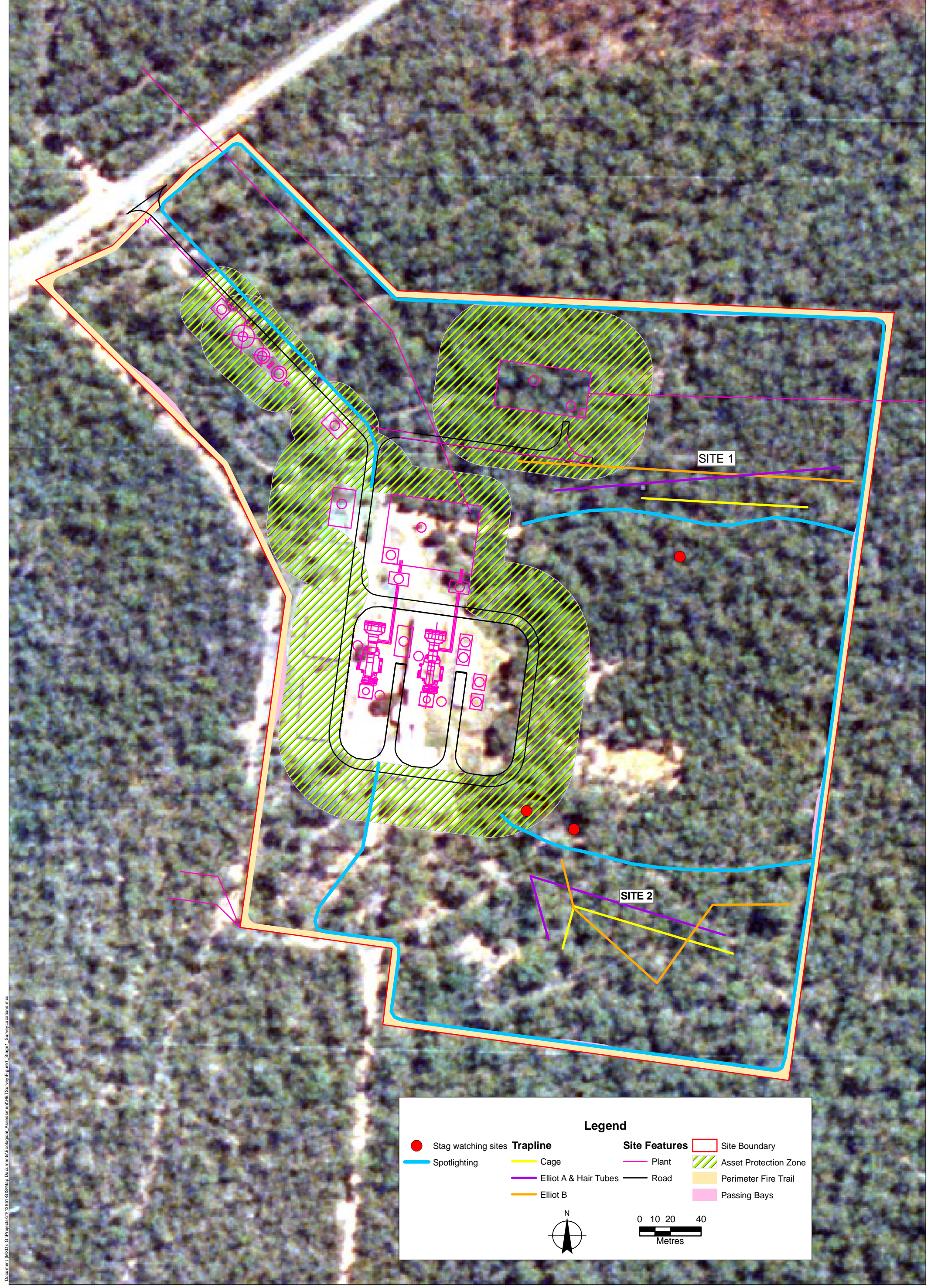


2.4 Limitations

Surveys were undertaken outside the optimal survey period for some species and therefore it is possible that some species utilise the study area but were not detected during the survey period. Some fauna species are also mobile and transient in their use of resources. Consequently, it is likely that not all species either resident or transitory to the site would have been recorded during the surveys.

Mammal activity is also known to decrease during the colder months and therefore the detection potential for these species may have been somewhat reduced. Furthermore, the rainy weather conditions experienced particularly during the initial stages of the survey, may have reduced mammal activity and hence trapping success.

Consequently, this survey was not designed to detect all species, either resident or transitory to the site. Instead it was aimed at providing an overall assessment of the ecological values of the site with particular emphasis on threatened species to allow an assessment of the impacts of the proposal.



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Figure 1 - Survey Locations



3. Results

3.1 Threatened Flora

3.1.1 *Triplarina nowraensis*

Additional individuals of Nowra Heath Myrtle were recorded by DEC east of Flat Rock Dam within the road reserve in 2006. These individuals were not recorded during the GHD August 2005 surveys and this is thought to be attributable to the plants having been slashed at the time of the GHD surveys and therefore not detected. Therefore GHD undertook another survey of the location identified by DEC and further east along Yalwal Road. A total of 60 new plants were recorded during the survey and their distribution is shown in Figure 2. Given that these individuals were located within the road reserve they would need to be removed for the proposal. Therefore the previous Part 3A assessment completed for this species has been updated to include the additional plants and the new anticipated impacts on this species.

3.1.2 *Prasophyllum* sp.

Fifteen individuals of a previously unidentified *Prasophyllum* species were recorded along the powerline easement east of Longreach Road during the GHD 2005 surveys. It was envisaged that surveys for this species would be undertaken during August 2006 to verify the species and search for any additional individuals. However, orchid expert Alan Stephenson has been taking regular visits to the location but there does not appear to be any evidence of the *Prasophyllum* in flower this season. Other *Prasophyllum* species such as *Prasophyllum affine* have been known to flower infrequently and this is thought to be in response to varying weather conditions between years. Therefore it is possible that the *Prasophyllum* at the site responds in a similar fashion and therefore may not flower this season.

An assessment of the potential impacts of the proposal has been undertaken for the known individuals. These individuals would not be directly impacted by the proposal and would be protected from any indirect impacts.



Figure 2 - *Triplarina nowraensis* additional records



3.2 Fauna Habitat

The site provided potential habitat for a variety of fauna species including ground-dwelling and arboreal mammals and potentially some threatened mammal species. DEC requested that additional surveys for mammals were undertaken across the site including mapping of areas of potential habitat for a number of threatened ground-dwelling mammal species. Figure 3 illustrates the habitat types present across proposed Gas-fired Power Facility and Table 2 lists those threatened mammal species for which potential habitat was present and the habitat types that each may utilise.

In areas mapped as *Open woodland with a dense heath and grass layer*, patches of dense bracken were scattered throughout and would provide shelter for a number of threatened ground-dwelling mammals. However, given the small size of these areas and the scale of the mapping they have not been included in Figure 3. Furthermore the site supported a number of fallen logs that would also provide shelter for ground-dwelling mammals but could not be mapped.

3.2.1 Southern Brown Bandicoot

The site supported potential habitat for the Southern Brown Bandicoot (*Isoodon obesulus obesulus*). This species is known to inhabit areas with a dense understorey but also forage in open grassy areas and therefore the majority of the site would provide potential habitat. The majority of the areas supporting a dense heath and grass layer, providing both shelter and foraging habitat for the Southern Brown Bandicoot, would be conserved at the site with most of the more open areas proposed for clearing (Figure 3).

3.2.2 Long-nosed Potoroo

The Long-nosed Potoroo (*Potorous tridactylus*) inhabits areas where there is a mosaic of areas including dense understorey and occasional open areas. For this reason much of the site could be considered potential habitat for the Long-nosed Potoroo. Woodland areas with an open understorey occurred primarily in the north-western and western parts of the site and vegetation supporting a more dense heath and grass layer was present on the east (Figure 3). Some of the open woodland in the north-west of the site would be removed for the proposal as would some of the dense vegetation in the east. However based on the proposed footprint design, a mosaic of open and dense areas would still be present at the site following construction works. Although a large proportion of the open areas at the site would be lost, additional open areas would be created through the planned partial clearing for the Asset Protection Zones (APZs).

3.2.3 Eastern Pygmy Possum

Vegetation supporting a heath understorey and particularly *Banksia* spp. and *Callistemon* spp. is favoured by the Eastern Pygmy Possum (*Cercartetus nanus*). Not all parts of the site would provide suitable habitat for the Eastern Pygmy Possum with the eastern side likely to be more suitable. Vegetation in this area included dense



heath and grass layers and small areas of more open heath (Figure 3). *Banksia* spp. were scattered throughout this area and would therefore provide suitable foraging resources for the Eastern Pygmy Possum. Hollow-bearing trees were present across the site with the highest densities recorded in the eastern portion of the site (see Figure 4 and Figure 5). There is the potential for some of these hollow-bearing trees to provide potential sheltering habitat for the Eastern Pygmy Possum.

3.2.4 White-footed Dunnart

Habitat for the White-footed Dunnart (*Sminthopsis leucopus*) was more limited across the site, as this species prefers an open understorey. Areas mapped as *open woodland* and *open woodland with open heath* would provide potential habitat for this species (Figure 3). Potential sheltering habitat is also present for this species across much of the site and there were numerous fallen logs scattered throughout.



Table 2 Areas of Suitable Habitat for Threatened Ground-dwelling Mammals at the Site

Scientific Name	Common Name	Open woodland: dense heath & grass (8.1 ha)	Open woodland (1.6 ha)	Dense Bracken (1.0 ha)	Woodland: open heath (3.6 ha)	Grass (0.3 ha)
Southern Brown Bandicoot	<i>Isoodon obesulus obesulus</i>	F, S	F, S	S	F	F
Long-nosed Potoroo	<i>Potorous tridactylus</i>	S	F	S	F	F
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	F, S	F		F, S	
White-footed Dunnart	<i>Sminthopsis leucopus</i>	S	F, S		F, S	

Note: F = foraging habitat, S = sheltering habitat



Legend

- | | | |
|-----------------------|---------------|---|
| Asset Protection Zone | Site Boundary | Vegetation |
| Drainage Lines | Plant | Grass |
| Perimeter Fire Trail | Road | Dense Bracken Fern |
| Passing Bays | | Open Woodland |
| | | Woodland with Open Heath |
| | | Woodland with Dense Heath and Grass Layer |

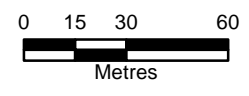
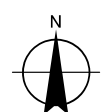


Figure 3 - Fauna Habitat Mapping



3.3 Mammals

3.3.1 Ground-dwelling and Arboreal Mammals

Although the site provides potential habitat for a number of threatened fauna species, trapping and spotlighting success was limited with only two common ground-dwelling mammals namely, Brown Antechinus (*Antechinus stuartii*) and Bush Rat (*Rattus fuscipes*) recorded during the surveys. This may partly be attributable to the rainy conditions experienced leading up to and during the initial days of the survey period. The absence of evidence of foraging activities by threatened ground-dwelling fauna such as diggings also suggests that these species may not be utilising the site for foraging and there is a high likelihood that if they were, diggings would be present. Furthermore given that large areas of native vegetation including Bamarang Nature Reserve surround the site, more suitable habitat for some species may be present in these areas.

No arboreal mammals were recorded during spotlighting. This may also partly be attributable to the rainy conditions experienced leading up to and during the initial days of the survey period. Although the Yellow-bellied Glider (*Petaurus australis*) has been recorded previously within the study area, it was not recorded during the most recent surveys. However, this does not preclude the potential presence of this species at the site, as conditions during the survey were not optimal due to the rain. Furthermore, this species is transient and can forage over large areas (20 to 85 ha). No feed scars were seen on any trees during the inspection but the numerous Red Bloodwoods (*Corymbia gummifera*) present at the site would provide potential foraging habitat.

3.3.2 Microchiropteran Bats

A number of microchiropteran bats were recorded at the site during a survey undertaken by GHD in February 2006 to target the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) as this species had been recorded within the locality and the disused abattoir building provided potential roosting habitat for this species. Although the Eastern Bentwing-bat was not recorded at the site, a number of other microbats were detected through echolocation recordings and these species included:

- ▶ Eastern Horseshoe Bat (*Rhinolophus megaphyllus*);
- ▶ East Coast Freetail bat (*Mormopterus norfolkensis*);
- ▶ Eastern Freetail Bat (*Mormopterus* sp. 2);
- ▶ Large-eared Pied Bat (*Chalinolobus dwyeri*);
- ▶ Gould's Wattled Bat (*Chalinolobus gouldii*); and
- ▶ Fishing Bat (*Myotis adversus*).

The East Coast Freetail Bat, Large-eared Pied Bat and Fishing Bat are all listed as threatened under the *Threatened Species Conservation Act 1995* (TSC Act) and the Large-eared Pied Bat is also listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Of these microbats all are known to utilise man-



made structures for maternal roost sites and these species were recorded flying around the disused abattoir. A visual inspection of the interior of the abattoir failed to detect any bat colonies or bat guano, which would indicate present and / or past usage by bats of the building for roosting. An additional survey was undertaken again during the recent survey and any scat samples found within the abattoir were collected to verify if any bat species were utilising the building. Scat collected included those from *Antechinus* sp., *Rattus* sp. and Sheep (*Ovis aries*) but not bat scats were collected. It is believed that the identification of one of the scats as belonging to a sheep may have been a mistake as no sheep were seen at the site. However, a goat (*Capra hircus*) was seen at the site during all site visits and therefore it is considered more likely that the scat was that of the goat.

Given that no bat scats were collected and no microchiropteran bats were found roosting in the disused abattoir during inspections, it is considered unlikely that any of the threatened bat species recorded at the site are currently roosting in the disused abattoir building.

A number of hollow-bearing trees were present across the site and some would provide suitable roosting habitat for microchiropteran bats. Figure 4 and Figure 5 show the location of hollow-bearing trees across the site in relation to the proposed development footprints for Stages 1 and 2 and Table 3 lists the characteristic features of each of the hollow-bearing trees across the site. Although some potential roosting habitat in the form of hollow-bearing trees would be removed for the proposal, a number of suitable hollow-bearing trees are to be retained and therefore reduce the likelihood of the proposal having detrimental impacts on any bats species.

3.4 Hollow-bearing Trees

The site supported a large number and diversity of hollow-bearing trees. Table 3 lists the hollow-bearing trees present across the site, their key features and whether they would need to be removed for the project. Figure 4 and Figure 5 show the location of each in relation to the Stage 1 and Stage 2 proposed footprints.

Forty-six hollow-bearing trees were recorded across the site. Based on the current footprint for Stage 1 of the proposal, it is anticipated that all hollow-bearing trees could be conserved even though 11 are located within the APZs. Given that only partial clearing to create a discontinuous canopy layer is required in the APZs it is likely that any hollow-bearing trees could be avoided through selective removal of other trees if necessary to create the discontinuous canopy.

Stage 2 works would require the removal of approximately seven hollow-bearing trees and there is the potential for another nine to need to be removed within the APZ. However, as stated for Stage 1, it is likely that all hollow-bearing trees within the APZ could be conserved provided a discontinuous canopy could still be achieved.

Of the trees to be removed, the majority are spouts of approximately 15 –20 cm diameter. However one tree (tree no. 128) that is proposed for removal supported a large hollow in the trunk of approximately 50 cm diameter. Given the scarcity of trees with hollows in the trunk and of this size at the site and that the tree is located on the



fringe of the proposed footprint for Stage 2 (Figure 5), it is recommended that clearance of this tree be avoided if possible.

Based on the proposed footprints, a worse case scenario would require the removal of approximately 15 hollow-bearing trees from the site (33% of all hollow-bearing trees at the site). However given that the majority of these hollow-bearing trees are within the APZs and therefore could be avoided, removal of approximately seven hollow-bearing trees (15% of all hollow-bearing trees at the site) is considered the most likely scenario. Furthermore, the hollow-bearing trees to be conserved include a variety of species with a diversity of key features and would therefore ensure that potential habitat for a variety of hollow-dependant species would remain at the site.



Table 3 Hollow-bearing Trees Present Across the Site

Tree Number	Species	Height (m)	Number of hollows	Location of hollow	Average diameter of hollows (cm)	Scratch mark	Comments (flowering, dead tree)	Cleared		
								Stage 1	Stage 2	Conserved
14	<i>Corymbia gummifera</i>	18	1	spout	15	No	alive	X*	X	
22	<i>Corymbia gummifera</i>	15	3	spout	20	No	alive	X*	X	
134	<i>Eucalyptus pilularis</i>	18	2	spout	15	N/A	alive	X*	X	
135	<i>Corymbia gummifera</i>	15	2	spout	20	N/A	alive	X*	X	
136	<i>Corymbia gummifera</i>	18	1	spout	25	N/A	alive	X*	X	
17	<i>Eucalyptus haemastoma</i>	16	2	spout	10	Yes - very few	alive	X*	X*	
25	<i>Eucalyptus punctata</i>	20	2	spout	15	No	alive	X*	X*	
31	<i>Corymbia gummifera</i>	16	15	spout	15	No	alive	X*	X*	
36	<i>Eucalyptus haemastoma</i>	12	1	spout	10	No	alive	X*	X*	



Tree Number	Species	Height (m)	Number of hollows	Location of hollow	Average diameter of hollows (cm)	Scratch mark	Comments (flowering, dead tree)	Cleared		
								Stage 1	Stage 2	Conserved
40	<i>Corymbia gummifera</i>	18	1	trunk	50	No	alive	X*	X*	
133	<i>Eucalyptus globoidea</i>	12	1	spout	25	N/A	alive	X*	X*	
128	<i>Corymbia gummifera</i>	12	1	trunk	50	N/A	alive		X	
129	<i>Corymbia gummifera</i>	15	1	spout	20	N/A	alive		X	
42	<i>Corymbia gummifera</i>	22	2	spout	20	No	alive		X*	
43	<i>Eucalyptus globoidea</i>	12	1	spout	10	No	alive		X*	
130	<i>Corymbia gummifera</i>	20	1	spout	20	N/A	alive		X*	
18	<i>Eucalyptus punctata</i>	24	1	spout	20	No	alive			X
24	<i>Eucalyptus globoidea</i>	15	1	spout	25	No	alive			X
30	<i>Eucalyptus haemastoma</i>	18	4	spout	15	Yes	alive			X



Tree Number	Species	Height (m)	Number of hollows	Location of hollow	Average diameter of hollows (cm)	Scratch mark	Comments (flowering, dead tree)	Cleared		
								Stage 1	Stage 2	Conserved
30	<i>Eucalyptus haemastoma</i>	18	2	spout	10	No	alive			X
37	<i>Corymbia gummifera</i>	8					stag			X
39	<i>Eucalyptus haemastoma</i>	15	1	trunk	15	No	alive			X
39	<i>Eucalyptus haemastoma</i>	20	3	trunk	15	No	alive			X
118	<i>Corymbia gummifera</i>	12	1	spout	10	N/A	alive			X
119	<i>Eucalyptus haemastoma</i>	18	3	spout & branch	20	N/A	alive			X
120	<i>Eucalyptus haemastoma</i>	20	1	spout	12	N/A	alive			X
121	<i>Corymbia gummifera</i>	15	3	branch	12	N/A	alive			X
122	Stag	10	1	top	40	N/A	dead/stag			X
123	<i>Eucalyptus globoidea</i>	18	1	spout	20	N/A	alive			X
124	<i>Corymbia gummifera</i>	25	1	spout	15	N/A	alive			X



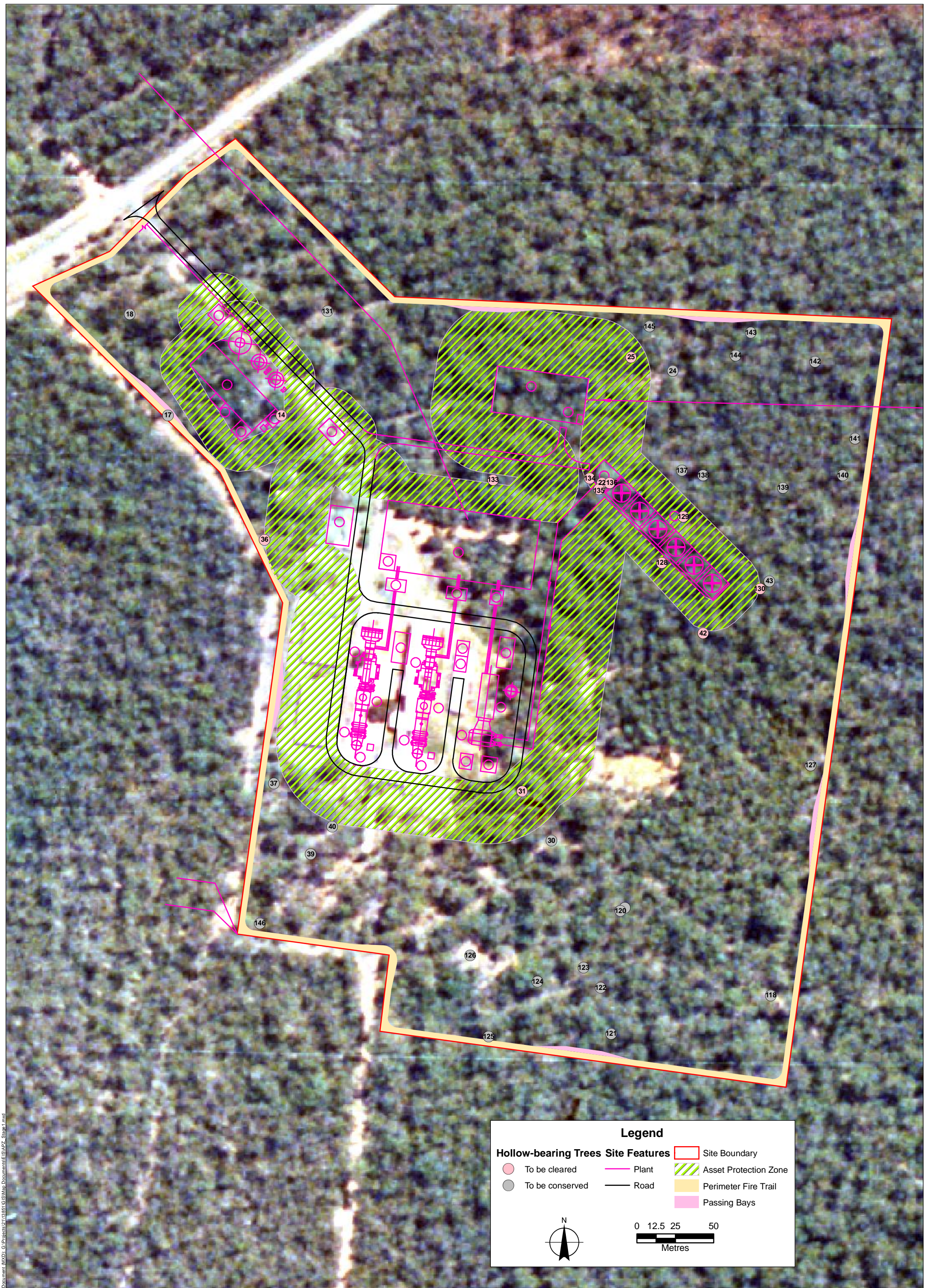
Tree Number	Species	Height (m)	Number of hollows	Location of hollow	Average diameter of hollows (cm)	Scratch mark	Comments (flowering, dead tree)	Cleared		
								Stage 1	Stage 2	Conserved
124	<i>Corymbia gummifera</i>	25	1	spout	30	N/A	alive			X
124	<i>Corymbia gummifera</i>	25	1	spout	15	N/A	alive			X
125	<i>Stag</i>	15	4	spout	25	N/A	dead/stag			X
126	<i>Eucalyptus globoidea</i>	8	1	top	60	N/A	dead trunk			X
127	<i>Eucalyptus pilularis</i>	15	1	spout	15	N/A	alive			X
131	<i>Corymbia gummifera</i>	24	1	spout	15	N/A	alive			X
137	<i>Eucalyptus punctata</i>	20	1	spout	15	N/A	alive			X
138	<i>Eucalyptus haemastoma</i>	12	1	spout	15	N/A	alive			X
139	<i>Corymbia gummifera</i>	12	1	spout	25	N/A	alive			X
140	<i>Corymbia gummifera</i>	18	3	spout	20	N/A	alive			X
141	<i>Corymbia gummifera</i>	15	2	spout	15	N/A	alive			X



Tree Number	Species	Height (m)	Number of hollows	Location of hollow	Average diameter of hollows (cm)	Scratch mark	Comments (flowering, dead tree)	Cleared		
								Stage 1	Stage 2	Conserved
142	<i>Corymbia gummifera</i>	20	1	spout	30	N/A	alive			X
143	Stag	15	1	spout	20	N/A	dead/stag			X
144	<i>Eucalyptus globoidea</i>	15	1	spout	25	N/A	alive			X
145	Stag	10	2	spout & top	15 & 60	N/A	dead/stag			X
146	<i>Corymbia gummifera</i>	15	3	spout & trunk	25	N/A	alive			X



Figure 4 - Hollow-bearing Trees (Stage 1)



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Figure 5 - Hollow-bearing Trees (Stage 2)



3.5 Giant Burrowing Frog

Conditions for undertaking surveys for the Giant Burrowing Frog were considered suitable due to the rain experienced before the survey period. The site provided potential habitat for this species (approximately 13.3 ha) as it is known to burrow in sandy soils in areas supporting heath, woodland and open forest during periods without rain and will come to the surface during rain. Spotlighting was undertaken along the tracks at the site but no individuals were sighted. Some areas of potential habitat for this species would be conserved at the site (Stage 1: approximately 10.0 ha and Stage 2: approximately 9.1 ha).

3.6 Aquatic Habitat

An aquatic habitat assessment of drainage lines and creeks throughout the study area was undertaken. The results of the assessment have been summarised in Table 4. In general, in those areas proposed for clearing for the powerlines much of the vegetation had already been removed for the road reserve and consisted of a grass layer only. However, in some parts very small areas of riparian vegetation on the fringe of the bushland would also need to be removed for the proposal and partial vegetation clearance would be required for establishment of APZs for the Gas-fired Power Facility. Some clearance is required to reduce fuel loads within this area and to create a discontinuous canopy. Such clearance would be within the 40 m riparian buffer areas specified in the Part 3A of the *Rivers and Foreshores Improvement Act 1948* (RFI Act). However, as specified under Part 3A, Division 4, section 75U of the EP&A Act, a separate approval process under the RFI Act is not required for projects that are being assessed under Part 3A of the EP&A Act (see below).

75U Approvals etc legislation that does not apply

- (1) The following authorisations are not required for an approved project (and accordingly the provisions of any Act that prohibit an activity without such an authority do not apply):
 - (a) the concurrence under Part 3 of the [Coastal Protection Act 1979](#) of the Minister administering that Part of the Act,
 - (b) a permit under section 201, 205 or 219 of the [Fisheries Management Act 1994](#),
 - (c) an approval under Part 4, or an excavation permit under section 139, of the [Heritage Act 1977](#),
 - (d) a permit under section 87 or a consent under section 90 of the [National Parks and Wildlife Act 1974](#),
 - (e) an authorisation referred to in section 12 of the [Native Vegetation Act 2003](#) (or under any Act to be repealed by that Act) to clear native vegetation,
 - (f) a permit under Part 3A of the [Rivers and Foreshores Improvement Act 1948](#),
 - (g) a bush fire safety authority under section 100B of the [Rural Fires Act 1997](#),



(h) a water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the [Water Management Act 2000](#).

Table 4 Creeks/Drainage Lines throughout the Study Area

Creek/ Drainage Line	Description of Riparian Zone	Surrounding Land Use	General Water Quality	Evidence of Disturbance
Flat Rock Creek	Dominated by native vegetation including Spotted Gum (<i>Corymbia maculata</i>) and a dense heath layer. <i>Typha</i> sp. present on fringes of creek.	Native Vegetation – Triplarina Nature Reserve	Clear, flowing	Weed invasion evident within road reserve. Bridge over top.
East of Cabbage Tree Lane	Disturbed within road reserve. Some <i>Imperata</i> sp. and <i>Lomandra</i> sp. present. Intact riparian zone outside road reserve.	Native vegetation south of Yalwal Road. Rural/Residential north of Yawal Road.	Foam, rubbish and algae present.	Culvert. Some weed invasion.
Cabbage Tree Creek	Dominated by <i>Melaleuca</i> spp. Weed invasion (<i>Lantana camara</i>) particularly adjacent to road. Some <i>Typha</i> sp. instream.	Rural/residential land north of Yalwal Road supporting River-Flat Eucalypt Forest. Dense weed invasion south of Yalwal Road.	Turbid, rubbish present.	Bridge over top. Instream disturbance evident – rock piles beneath bridge. Weed invasion.
Drainage Line 1 (north) – Proposed Gas- fired Power Facility Site	Predominantly native riparian zone including species such as Black She-oak (<i>Allocasuarina littoralis</i>), Bracken Fern	Bamarang National Park and native vegetation.	No water	Limited disturbance.



Creek/ Drainage Line	Description of Riparian Zone	Surrounding Land Use	General Water Quality	Evidence of Disturbance
	<i>(Pteridium esculentum)</i> and <i>Gahnia</i> spp.			
Drainage Line 2 (south) - Proposed Gas- fired Power Facility Site	Predominantly native riparian zone including species such as Black She- oak, Bracken Fern and <i>Gahnia</i> spp.	Bamarang National Park and native vegetation.	No water	Limited disturbance.

A number of other small drainage lines were present along the current powerline easement either side of Longreach Road. Vegetation outside the current powerline easement was primarily native with intact canopy, shrub and ground layers. It is not anticipated that these areas would be impacted by the proposal and all would be protected from potential indirect impacts.



4. Impact Assessment

4.1 Part 3A Assessment for Nowra Heath Myrtle (*Triplarina nowraensis*)

Nowra Heath Myrtle was recorded on site during this and previous surveys, including those undertaken by Parsons Brinckerhoff (2005) and GHD (2005). This species is often found on moist soils or poorly drained soils such as watercourses and bedrock surfaces with impeded drainage although two populations are known to occur in drier sites. Forest communities where the species has been recorded in the past include Grey Gum – Stringybark Forest, Scribbly Gum – Bloodwood Woodland and Scribbly Gum – Grey Gum Woodland (NPWS 2003). This species is known only from only five populations west of Nowra, all within a 20 km radius. Considering the localised records, the species is at the edge of its known distribution.

Nowra Heath Myrtle was recorded along the creeks and drainage lines adjacent to the current transmission line easement and Yalwal Road in 2005 and an additional 60 plants were recorded within the road reserve east of Flat Rock Dam during the most recent survey. The proposal will result in the removal of these 60 individuals and small areas of potential habitat for the Nowra Heath Myrtle along the creeks and drainage lines within the study area. Given that clearance of vegetation only 1 m either side of the current transmission line easement off Yalwal Road is required, no known individuals in this area would be removed.

However, removal of the 60 Nowra Heath Myrtle within the road reserve along Yalwal Road is proposed and could be considered significant if impacts are not properly mitigated and offsets not provided given the extremely restricted distribution of the species and small population numbers.

Offsets would be provided in consultation with DEC to mitigate the proposed removal of the individuals within the road reserve. This would include the protection of other areas known to support Nowra Heath Myrtle that are not currently protected and the following management measures are proposed to protect any individuals remaining in proximity to the construction area from indirect impacts:

- ▶ Measures implemented to prevent indirect impacts from runoff, sedimentation and weed invasion on adjacent bushland;
- ▶ Fencing of adjacent bushland areas to prevent construction work or workers breaching the boundaries of the proposed construction area; and
- ▶ Minimisation of clearing as much as possible.

Provided the aforementioned measures are implemented, offsets provided and given that a number of individuals of this species were recorded further south within the bushland adjacent to Yalwal Road in the same area (approximately 38 individuals), it is considered unlikely that the proposal would place the local population at risk of extinction.



In addition, that the 60 individuals recorded in the recent survey were thought to have been slashed at the time of the previous surveys, suggests that this species is somewhat tolerant of disturbance and may potentially regenerate following construction. However, this potential is considered to be limited as Nowra Heath Myrtle does not appear to possess a dormancy mechanism and therefore may have a short-lived soil stored seed bank (NPWS 2003).

Potential impacts of the proposal on current disturbance regimes

The proposal is not likely to significantly alter current disturbance regimes. A *Bushfire Assessment* (GHD 2005) prepared for the site does not propose any alteration in current fire hazard reduction burning regimes. Areas cleared as part of the APZs will be periodically slashed in order to reduce fuel loads, however this is unlikely to have a significant impact on any of the threatened flora species or their habitat.

Potential impacts on habitat connectivity

Given that the proposed clearing involves the removal of strips of vegetation along already existing easements and roadsides, as well as clearing an area of vegetation for the part of the proposed gas fired power facility adjacent to a previously cleared area (where the abattoir building and stockyards are located), impacts on habitat connectivity will be minimal.

Potential impacts on critical habitat

There are no areas identified as critical habitat present at the site.

4.2 Ground-dwelling mammals

Potential habitat for threatened ground-dwelling mammals would need to be removed for the proposal. Table 5 lists the amounts of habitat to be cleared and conserved for each species under the proposal at the Gas-fired Power Facility site and their home range. The majority of the vegetation to be cleared is along the edge of the bushland. Areas of potential habitat for all species would remain at the site and more extensive areas occur adjacent to the study area and throughout the locality for all of these species. Potentially, some family groups of those species with small home ranges such as the Eastern Pygmy Possum and White-footed Dunnart may be lost as a consequence of the proposal if present within the proposed development area. However, it is considered unlikely that the proposal would put a local population of any of these species at risk of extinction as potential habitat would remain at the site and is known to occur throughout the locality for all of these species.



Table 5 Areas of potential habitat to be cleared and conserved

Scientific Name	Common Name	Home Range	Total Potential Habitat on Site	Stage 1 Removal		Stage 1 Conservation		Stage 2 Removal		Stage 2 Conservation	
				Foraging	Sheltering	Foraging	Sheltering	Foraging	Sheltering	Foraging	Sheltering
<i>Cercartetus nanus</i>	Eastern Pygmy Possum	Females	13.3 ha	Partial	Partial	10.8 ha	9.5 ha	Partial	Partial	9.2 ha	7.9 ha
		0.35 ha		2.2 ha	1.9 ha			3.0 ha	2.6 ha		
		Males		Total	Total			Total	Total		
		0.68 ha		0.3 ha	0.3 ha			1.1 ha	1.1 ha		
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	Males	14.6 ha	Partial	Partial	10.9 ha	9.7 ha	Partial	Partial	9.3 ha	8.6 ha
		5 – 20 ha		2.2 ha	1.2 ha			3.0 ha	1.7 ha		
		Females		Total	Total			Total	Total		
		2 – 3 ha		0.5 ha	0.1 ha			1.3 ha	0.5 ha		
<i>Sminthopsis leucopus</i>	White-footed Dunnart	Females	13.3 ha	Partial	Partial	3.4 ha	10.8 ha	Partial	Partial	2.9 ha	9.2 ha
		80 m in length		1.6 ha	2.2 ha			1.6 ha	3.0 ha		
		Males overlapping home ranges 100 m in length*		Total	Total			Total	Total		
				0.2 ha	0.3 ha			0.7 ha	1.1 ha		
<i>Potorous tridactylus</i>	Long-nosed Potoroo	2 – 5 ha	14.6 ha	Partial	Partial	3.5 ha	8.4 ha	Partial	Partial	3.0 ha	7.3 ha
				1.7 ha	0.6 ha			1.7 ha	1.3 ha		
				Total	Total			Total	Total		
				0.4 ha	0.1 ha			0.9 ha	0.5 ha		

Note: *Males are capable of making regular exploratory movements of up to 1 km; Partially cleared represents APZs.



4.3 Microchiropteran Bats

Although a number of microchiropteran bats were recorded at the site using Anabat Ultrasonic Bat Detection during a previous GHD survey, no evidence of bats roosting within the disused abattoir building was found. However, it is likely that some of the bat species could roost within the numerous hollow-bearing trees recorded across the site. Given that a number of hollow-bearing trees with hollows suitable for microchiropteran bats occurred across the site and that the majority of these would be conserved, it is considered unlikely that the small number to be removed would have an impact such that it would place a local population of any threatened bat species at risk of extinction. Furthermore, hollow-bearing trees with the potential to provide roosting habitat for microchiropteran bats also occur within the adjacent Bamarang Nature Reserve.

4.4 Loss of Hollow-bearing Trees

Stage 2 works would require the removal of approximately seven hollow-bearing trees and there is the potential for another nine to need to be removed within the APZ. However, as stated for Stage 1, it is likely that all hollow-bearing trees within the APZ could be conserved provided a discontinuous canopy could still be achieved.

Of the trees to be removed, the majority are spouts of approximately 15 –20 cm diameter. However one tree (tree no. 128) that is proposed for removal supports a large hollow in the trunk of approximately 50 cm diameter. Given the scarcity of trees with hollows in the trunk at the site and that the tree is located on the fringe of the proposed Stage 2 footprint (Figure 5), it is recommended that clearance of this tree be avoided if possible.

Based on the proposed footprints, a worse case scenario would require the removal of approximately 15 hollow-bearing trees from the site (33% of all hollow-bearing trees at the site). However given that the majority of these hollow-bearing trees are within the APZs and could therefore be avoided, removal of approximately seven hollow-bearing trees (15% of all hollow-bearing trees at the site) is considered the most likely scenario. Furthermore, the hollow-bearing trees to be conserved include a variety of species with a diversity of key features and would therefore ensure that potential habitat for a variety of hollow-dependant species would remain at the site.

Therefore given that a variety of hollow types and sizes would be conserved at the site and that the majority within APZs could be conserved it is considered unlikely that the proposed removal could be considered likely to significantly reduce the amount potential nestings/roosting and den sites for threatened species within the locality.



4.5 Commonwealth EPBC Act

Nowra Heath Myrtle is listed as endangered under the EPBC Act. *The Matters of National Environmental Significance – Significant Impact Guidelines* (DEH 2006) have been prepared to assist in determining whether a proposal requires preparation of a Referral under the EPBC Act and lists a number of criteria that should be used to assess the likely significance of the potential impacts of the proposal. These criteria have been listed and addressed with respect to Nowra Heath Myrtle below.

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of a population;

The removal of the approximately 60 Nowra Heath Myrtle individuals is likely to lead to a long-term decrease in the size of the population as there are only five known populations, all located west of Nowra. However to mitigate the impacts of removing these plants, Delta Electricity are proposing to provide offsets and ensure stringent management measures are implemented to prevent indirect impacts on the remaining plants in proximity to the proposed construction area.

There is considered to be limited potential for the removed plants to regenerate from the seed bank as this species does not appear to possess a dormancy mechanism and therefore may have a short-lived soil stored seed bank (DEC 2003).

Reduce the area of occupancy of the species;

The plants to be removed are on the fringe of the bushland known to support Nowra Heath Myrtle, within the road reserve. Therefore it is unlikely that the removal of these individuals would be considered to significantly reduce the area of occupancy of the species.

Fragment an existing population into two or more populations;

The plants to be removed are on the fringe of the bushland known to support Nowra Heath Myrtle within the road reserve and Yalawal Road occurs to the north. Therefore it is not considered that the proposal would fragment the existing population.

Adversely affect habitat critical to the survival of a species;

Some habitat for this species would be removed but other areas supporting Nowra Heath-myrtle are known to occur adjacent to those proposed for removal and within the locality. Furthermore, the provision of offsets is proposed to mitigate the impacts.

Disrupt the breeding cycle of a population;

Given that Nowra Heath Myrtle plants occur within the adjacent bushland and would be protected from indirect impacts of the proposal, it is considered unlikely that the proposal would disrupt the breeding cycle of the population.



Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

Although a number of individuals of this species would be removed and some potential habitat impacted, it is considered unlikely that the proposal would impact in such a way that it would result in a decline in the species provided the following proposed mitigation measures are implemented:

- ▶ Provision of offsets in consultation with DEC to mitigate the proposed removal of the individuals within the road reserve and protect other areas known to support Nowra Heath Myrtle;
- ▶ Measures implemented to prevent indirect impacts from runoff, sedimentation and weed invasion on adjacent bushland;
- ▶ Fencing of adjacent bushland areas to prevent construction work or workers breaching the boundaries of the proposed construction area; and
- ▶ Minimisation of clearing as much as possible.

•Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

Provided that management measures are implemented to prevent the invasion of weeds into the bushland adjacent to construction areas and hence habitat for Nowra Heath Myrtle, it is considered unlikely that invasive species would become established such that they would threaten the survival of Nowra Heath Myrtle in the area.

Introduce disease that may cause the species to decline; or

It is considered unlikely that the proposal would introduce any diseases.

Interfere with the recovery of the species.

Provided that management measures are implemented and that offsets provided for the clearing of the 60 individuals, it is considered unlikely that the proposal could be considered likely to have an impact such that it would prevent the recovery of this species within the locality.

Based on the aforementioned assessment criteria, preparation of a Referral under the EPBC Act for Nowra Heath Myrtle would be required.



5. Avoidance and Mitigation Measures

5.1 Avoidance

In order to avoid potential impacts on flora and fauna habitat at the site the following measures have been implemented:

- ▶ To reduce the amount of vegetation clearance required, the route for the proposed transmission line easement has been located so as to follow the existing route of current easements and tracks wherever possible;
- ▶ The transmission line has been situated so as to avoid hollow-bearing trees where ever possible;
- ▶ Construction of stanchion power poles will be outside of drainage lines and riparian areas to avoid impacts of waterways; and
- ▶ The Gas-fired Power Facility has been situated within previously disturbed areas of the proposed site to reduce vegetation clearance.

5.2 Mitigation

A number of mitigation and management measures are recommended to prevent direct and indirect impacts of the proposal on flora and fauna and their habitat within the study area and locality. Recommended measures include:

- ▶ Fencing of proposed development areas to ensure construction works do not breach the boundaries and enter the adjacent vegetation and National Parks and Reserves;
- ▶ Temporary fencing of the known habitat for the *Prasophyllum* species. Note that the fencing used should not include any that would create shading of this normally unshaded area;
- ▶ Measures to prevent changes to hydrological regimes at and around the *Prasophyllum* sp. site as orchids are known to be sensitive to changes to hydrological regimes. This should include measures to trap potential runoff from the construction site;
- ▶ Installation of sediment detention basins, or similar, prior to construction to prevent untreated runoff and sediment entering drainage lines and creeks within the study area; and
- ▶ Implementation of 'best practice' stormwater treatment measures to maximise:
 - Onsite pollutant retention and removal; and
 - Infiltration and sub-surface discharge of stormwater (NPWS 1998);
- ▶ Placement of stockpiles away from vegetated areas;
- ▶ Piling of soil that may contain seed of exotic species away from adjacent vegetation or drainage lines where they could be spread during rainfall events;



- ▶ Monitoring and management of weed invasion along proposed gas pipeline route to ensure regeneration of native species takes place;
- ▶ Maintenance of a vegetated and managed buffer between any development and the adjacent Bamarang National Park;
- ▶ Appropriate fire management measures and APZs to be implemented in accordance with the provisions outlined in the *Bushfire Risk Assessment* (GHD 2005) to prevent fires spreading from the site to adjacent areas;
- ▶ Allowance for regeneration to maximum acceptable height along drainage lines supporting potential habitat for Nowra Heath Myrtle;
- ▶ Retention of mature, hollow-bearing trees within the study area (where possible) particularly within the APZs

5.3 Offsets

In order to mitigate the impacts of the proposal on Nowra Heath Myrtle, offsets should be provided in consultation with DEC and should include the preservation of areas known to support Nowra Heath Myrtle in areas where they are not currently protected. The conclusion that the proposed is considered unlikely to have a significant impact on Nowra Heath Myrtle has been based on the assumption that such offsets would be provided. Details of the proposed offset options have been outlined in an *Offset Strategy Report* (GHD 2006) and require further discussion with DEC.



6. Conclusion

The proposed Gas-fired Power Facility and associated easements have been designed to minimise the direct and indirect impacts on biodiversity of the locality, especially in relation to threatened species and endangered ecological communities. However, the removal of approximately 60 Nowra Heath Myrtle individuals would be required for the proposal. Given that Nowra Heath Myrtle has a restricted distribution consisting of only five known populations occurring within a 20 m radius west of Nowra, removal of these species is likely to be considered significant if offsets are not provided and stringent management measures are not implemented to prevent indirect impacts of the proposal on this species and its habitat. Furthermore, preparation of a Referral under the EPBC Act for this species is required to determine if the proposal is a Controlled Action.



7. References

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