Somersby Fields
PARTNERSHIP
ABN 41 781 514 513

Somersby Fields Project

Response to Government Agency Submissions and Non-Confidential Public Submissions Regarding Ecological Issues and Biodiversity Offsets

Compiled in conjunction with:

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- Robert Payne – Ecological Surveys and Management
- Kendall and Kendall Ecological Services Pty Ltd
- University of Newcastle
- RCA Australia

April 2008

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Ref No. 521/14

April 2008

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FOREWORD

This document presents responses addressing a range of ecological issues incorporated within submissions provided by Government Agencies and non-confidential public submissions relating to the Somersby Fields Project.

The responses have been assembled into five sections.

Section 1: Information compiled relating to flora issues.

Section 2: Information compiled relating to fauna issues. Reference is made to a supplementary fauna assessment conducted by Kendall & Kendall (see **Annexure 1**).

Section 3: Information compiled relating to groundwater-dependent ecosystems.

Section 4: A set of responses are provided in response to comments relating to biodiversity offsets, conservation agreements and suggested conditions.

Section 5: An updated copy of the Proponent's Statement of Commitments that incorporate a range of amended or new commitments relating to ecological issues compiled in response to the issues raised in submissions and at the recent Independent Hearing and Assessment Panel.

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1 FLORA RESPONSE

1.1 *PROSTANTHERA JUNONIS* (SOMERSBY MINTBUSH)

1.1.1 Removal of *P.junonis*

Comments

Prostanthera junonis is listed as Endangered under the Threatened Species Conservation Act 1995 and the Environment Protection and Biodiversity Conservation Act 1999. The proposed project would result in the removal of approximately thirty (30) to forty (40) P. junonis individuals, which is said to resemble 11 – 16% of the total number of individuals occurring onsite. The report has not identified or assessed the likely impact of the proposal upon potential habitat of the species.

Gosford City Council

The entire site was searched over a period of several years for the Somersby Mintbush. This involved areas of natural vegetation but in particular access tracks and areas previously disturbed for road gravel extraction. It is noted that much of the previously disturbed area is now grassed (as a sediment and erosion control). The entire potential habitat for *P. junonis* on the Project Site was searched over the several years. These searches established that *P. junonis* is only regenerating near or beside existing natural vegetation either along tracks or in isolated previously extracted areas where it is regenerating under higher light conditions. The Mintbush population on the Somersby Fields Project Site represents a very small proportion of the total estimated population of this species throughout the Somersby Plateau.

We point out that Prostanthera junonis (Somersby Mintbush) is a known rare and threatened species. The mintbush that exists on this site is noted as the largest existing population and is Number 6 on the State Register. It is not acceptable that this mine will destroy almost 20% of the largest population on private land on the State Register. It is also unlikely that the voluntary conservation area is large enough to adequately protect the remaining plants of population 6.

The Somersby mintbush is an endangered species, and features predominantly in the proposed mine site. The Environmental Assessment report concedes that around 60% of the species here will be wiped out. This does not include the 20% of population 6 that was conveniently omitted from the report.

Somersby Public School
P&C Association

Response

With the Project in mind, the Proponent is committed to a Voluntary Conservation Agreement to protect most of the Somersby Mintbush plants that are agglomerated in a substantial clump forming the main sustainable population on the Project Site and within the adjoining Peats Ridge Road Reserve. The retained vegetation along the northern boundary of the Project Site will co-function as a wildlife corridor. It is acknowledged that some plants that are isolated and well separated from the main population will be removed (and translocated) but that proposal has been discussed with the authorities for many years and would appear to be the most successful outcome to sustain Population 6.

Comments

The Somersby mintbush is an endangered species, and features predominantly in the proposed mine site. The Environmental Assessment report concedes that around 60% of the species here will be wiped out. This does not include the 20% of population 6 that was conveniently omitted from the report.

Nicole, Bonney and Luke Dwyer

Response

Sixty percent of the population will be "wiped out" is incorrect. Furthermore the claim that 20% of the population that was omitted from the report is also not correct.

Comments

Prostanthera junonis is recorded on site as a significant population by Payne (2006). This species is highly restricted and a number of populations (ie. Raverson Close Somersby) appear to have undergone significant decline over the last decade and no overall assessment is provided on the current status of the species (that includes all known populations).

Wyong Shire Council

Response

The DECC is well aware of the various *P. junonis* populations including two additional substantial populations found east of the Pacific Highway in Brisbane Water National Park. None of the other sites have been investigated by Mr Payne.

1.1.2 Fragmentation and Isolation of *P. junonis*

Comments

The remaining vegetation to be retained may prove to be isolated and fragmented. The previous report (July 2004) stated that 'if isolation does occur impacts may be too great and the population may not survive'. However the current Section 5a assessment states that the project, with its fragmentation, is unlikely to affect the long-term survival of the species. This assumption is based on research that shows that the population can survive the fragmentation. As this research was carried out in 2000 to 2001, it is surprising that the former report dated July 2004 contradicts this information. Section 5a assessment is inconsistent with previous assessments in respect to fragmentation and isolation.

Gosford City Council

Key threats to Prostanthera identified in the Recovery Plan that are relevant to the project include habitat loss and fragmentation, habitat isolation, stormwater run-off, soil erosion and saltation, weed invasion, Phytophthora cinnamomi, and inappropriate fire regimes.

The project would result in the isolation of sub-population 6A for a substantial period of time (at least 18 years, until the completion of operations and the revegetation of the site).

Environmental Defenders Office

Response

At the outset, clarification is provided to explain that the July 2004 report referred to, related to a document accompanying an application by the Proponent to adjust the internal subdivision boundaries for a rural / residential land use, i.e. not to be confused with the proposed extractive industry.

The proposed corridor along the northern side of the Project Site and VCA area were identified previously after early discussions with NSW DECC commencing in the Year 2000. The DECC recognised there would be benefits if Gosford City Council participated with the Proponent given Council's ownership of the Peats Ridge Road reserve in which the plant is also present. The combined corridor, buffer and road reserve vegetation will be substantial to protect the main plants within the population.

It should be noted at this point that this population survived the previous extraction operation when the NSW RTA recovered material from the site for the F3 roadworks. This population still survives and in the view of Robert Payne, this plant prefers a habitat which has been disturbed or has access to light, eg near open rock shelves. Throughout the Project Site *P. junonis* always grows either along access tracks, besides cleared areas or throughout previously extracted areas. On the Project Site, Robert Payne never found it amongst natural vegetation but only on the edges. So over time and as the survey proceeded over several years, he changed his viewpoint as he found it in new areas.

On the telecommunications site near the Project Site, *P. junonis* was found in disturbed habitats against the vegetation edge but at the corner of Wisemans Ferry Road and the Pacific Highway Somersby it was found amongst natural vegetation – growing on rocky platforms amongst *Darwinia glaucophylla*. These rocky platforms are subject to desiccation but also allow noticeable light penetration. In the Brisbane Water National Park, east of the Pacific Highway the recently discovered populations were both found on rocky benches but with surrounding sparse native vegetation.

Comments

Key threats to Prostanthera identified in the Recovery Plan that are relevant to the project include habitat loss and fragmentation, habitat isolation, stormwater run-off, soil erosion and saltation, weed invasion, Phytophthora cinnamomi, and inappropriate fire regimes.

The project would result in the isolation of sub-population 6A for a substantial period of time (at least 18 years, until the completion of operations and the revegetation of the site).

Environmental Defenders Office

Response

As outlined in the *Environmental Assessment* the retained main population of *P. junonis* will be protected and managed such that it will not be subject to stormwater runoff and soil erosion. Weed invasion and inappropriate fire regime will be constantly monitored by the on-site environmental coordinator.

1.1.3 Objectives of the Recovery Plan for *P. junonis*

Comments

The Flora Assessment (Robert Payne Ecological Surveys and Management, December 2006) suggests that the objectives of this Recovery Plan have been addressed. The direct loss of thirty (30) to forty (40) plants and the loss of potential habitat is inconsistent with the aims. The Flora Assessment (Robert Payne Ecological Surveys and Management, December 2006) highlights the fact that the site is important at a local scale because it accommodates a population as identified in the Recovery Plan, of a comparatively large number of plants.

Gosford City Council

Inconsistency with the Somersby Mintbush Prostanthera junonis Recovery Plan - The objectives of the Recovery Plan include ensuring that populations of Prostanthera are not destroyed due to habitat loss and minimising the risk of populations declining in the long term. There is a significant risk that the project may result in the decline of population 6A in the long term, in particular due to the removal of individuals, habitat isolation, stormwater run-off, soil erosion and saltation, and Phytophthora. The Minister for Planning must take the recovery plan into account in making a decision under Part 3A of the Environmental Planning and Assessment Act 1979.

Environmental Defenders Office

Response

The 30 to 40 plants that would be removed (and translocated) have all grown since the area was disturbed for extraction of the laterite for the construction of the F3. The core of Population 6 is essentially along the access track near the northern boundary of the Project Site. The use of a management plan will assist to ensure potential threats to the core population are correctly managed – the absence of such plans at other sites eg at the nearby Trig Station can result in the destruction of any remaining plants – see Commitment 15.1 in Section 4 regarding the proposed Vegetation and Threatened Species Management Plan.

1.1.4 Adequacy of Conservation Area

Comments

The large bush-covered block to the south of the mine was <u>not</u> searched for Somersby Mintbush.

Mintbush conservation area too small – The proponents have set aside a narrow strip of land along Peats Ridge Road for a 'voluntary' conservation area for Somersby Mintbush (a threatened species). This are will not be large enough to sustain the mintbush population.

Although the conservation zone has been set aside for threatened species, the effect of dust from the operations of the mine on the conservation zone and on habitat on neighbouring properties will damage the species that are identified to be protected. Change of surface water flows and lowering of groundwater tables will have an impact on the future of this habitat. Especially as some species have died due to drought. This compounds the issue.

Installation of shallow bores across the voluntary conservation area will have destroyed some of the very plants that the conservation area is intended to protect.

Somersby Action Group

Response

The large bush-covered block to the south of the site ("Woodlands") was searched for the Somersby Mintbush with no plants being found. This area largely supports different vegetation and no Somersby Mintbush plants could be found on that property.

The proposed buffer, corridor and Voluntary Conservation Area adjacent to the northern boundary of the Project Site were identified previously after earlier discussions with NSW DECC commencing in the Year 2000. It should be noted that the area northwest of the *P. junonis* population is also to be retained as a corridor with a buffer, which with the road reserve vegetation will be a substantial 50m wide section of native vegetation to protect the population and maintain potential habitat between the main population and the Trig Station.

The groundwater investigation established that the *P. junonis* plants were not groundwater dependent. Hence, predicted groundwater level reductions within the Voluntary Conservation Area and the buffer zone will have no impacts on the heath or occurrence of *P. junonis* plants. It is further noted that the shallow groundwater bores used for this program were positioned in close consultation with Mr Payne to ensure the creation of drill pads etc did not contribute to any adverse impacts upon the plant.

Comment

The project proposes to compensate habitat and vegetation loss with the establishment of a Voluntary Conservation Area. It should be noted that the area identified for the conservation of P. junonis as depicted in Figure 2.4 of the Environmental Assessment (R.W. Corkery & Co. Pty Limited, May 2007) is considerably smaller and exposed to greater edge effects than originally proposed in the Eight-Part Test of Significance. The Eight-Part Test of Significance (Ecological Surveys and Management, July 2004), estimated that the removal of 31 P. junonis plants would result in a loss in the soil seed bank of 2800 fruits, this information was omitted and seed bank assessment has not been undertaken in the current (December 2006) report.

Gosford City Council

Response

Since 2004, Robert Payne found more *P. junonis* plants both within and surrounding the extraction area. This in turn changed the numbers of plants for the assessment. The conservation area has not changed since 2004 although the Proponent has now proposed to add a further area of the Project Site for retention in perpetuity through a Section 88B covenant. Irrespective of the method or instrument used, it is the Proponent's intention for the vegetation on the excess of 24ha of the Project Site will be protected in perpetuity.

Comment

Potential habitat of Prostanthera junonis is present over the entire site and half its habitat is proposed to be cleared. It has not been demonstrated that the proponents have the capacity to restore this habitat. There is some risk that half the habitat on site will be reduced in quality (d part iii of the Seven Part Test is inadequate). There is thus a likelihood that the proposal will have a significant impact on this species.

Wyong Shire Council

Response

The Proponent is committed to rehabilitate the defined areas of the Project Site in a manner that will over time generally recreate the two main vegetation communities. It is noteworthy that *P. junonis* plants colonised parts of the previous extraction area following the cessation of extraction activities in the early 1980s – without any assistance!

Comment

Prostanthera is not adequately protected in conservation reserves (only two known populations occur in conservation reserves, both being within Brisbane Water National Park). We note that the Somersby Mintbush Prostanthera junonis Recovery Plan ('Recovery Plan') (NPWS, 2000) identifies that many existing populations are threatened by impacts associated with urban development. We also note that the EA identified that sub-population 6B (20 individuals in 2000 / 2001) at Mangrove Tower was damaged during conservation works and no individuals could be relocated in October 2006).

Environmental Defenders Office

Response

The above statement is correct. Hence, the intent to establish a Voluntary Conservation Area on site (and hopefully over the relevant section of the Peats Ridge Road Reserve) will benefit the longevity of *P. junonis*. The development and implementation of a management plan for those plants within the main population will also be beneficial.

1.1.5 Translocation

Comments

The Flora Assessment (Robert Payne Ecological Surveys and Management, December 2006) concludes that the project is unlikely to have any significant impact on P. junonis. This assumption is made under the pretence that the mitigation method of translocating species of Prostanthera junonis and Hibbertia procumbens to the conservation area can be undertaken successfully. It should be noted that the Department of Environment and Climate Change does not support the translocation of Threatened Species as an ameliorative measure. The translocation program is the primary mitigative method, and if translocation is not supported and cannot be undertaken successfully, the reports conclusions regarding the minimal impact on this Threatened Species, will be unfounded.

The EA proposes to translocate individuals of Prostanthera within the disturbance area to the Voluntary Conservation Agreement area and the habitat corridors at the east and west of the site. We argue that the success of translocation is highly uncertain. The Recovery Plan identifies that the translocation of threatened flora is often unsuccessful and does not recommend translocating this species.

Gosford City Council

Response

Translocation will only apply to those plants that will need to be removed from areas approved for sand removal. Translocation is not essential but the Proponent considers it would be environmentally responsible to attempt translocation rather than allowing the plants be destroyed. It is noted that the plants will not be removed at one time. Hence, the opportunity exists for research to be conducted to improve the opportunities to develop methods to translocate rare plants.

1.1.6 Dust

Comments

The dust created during the mining process will inhibit the plants ability to function. The mining down to a depth of 20 metres will result in the soil moisture content being altered and the reduced numbers will be more vulnerable to replenish after fire events.

B. De'Hon

Every effort should be made presently to ensure that further species of plants such as the Somersby Mintbush are not lost. Existence of a mine with its emission of dust and extraction of water will no doubt have an adverse effect on the survival of the plant.

Giles Finney

The site is particularly sensitive due to its location at the headwaters of the four creeks. There are endangered species (eg. Somersby mintbush, Heart-shaped Eucalyptus) and the potential for dust to clog local streams destroying the creek flora and fauna is extreme. The loss of hanging swamps and surface moisture in the local area will impact on important habitats that are under increasing pressure.

Nicole Robson from Robson Consulting Group Pty Limited

Response

The dust generated during sand removal and the transportation of excavated sand to the processing plant will be managed principally by water applied to on-site roads. Studies undertaken on pasture growth suggest that substantially higher levels of deposited dust than will occur on the Project Site will be necessary to affect plant growth. Further, the 5m high northeastern acoustic barrier will also substantially protect the core population of *P. junonis* from dust generated on the Project Site.

The groundwater studies undertaken during the preparation of the *Environmental Assessment* established that *P. junonis* is not a groundwater dependent species. Hence, reductions in the water table will not affect the species.

1.1.7 *P. junonis* Subpopulations

Comments

Given the relatively large number of plants of Somersby Mintbush now identified from within the central area of the Project Site, it would be appropriate for them to be recognised (and consequently treated) as a distinct sub-population (6D) of Population 6.

Department of Environment and Climate Change

P. junonis (Somersby Mintbush): The 30:40 plants identified for removal or relocation are not isolated and should be considered as part of sub-population 6D. This combined with the 15 – 20 individuals which have been omitted from the mapping within the central area of the project site represent approximately 20% of population 6. Serious disturbance to sub-population 6A combined with changes to the hydrology of surrounding areas may have a negative impact on sub-populations 6B and 6D. These factors are likely to significantly affect the viability of P. junonis sub-populations within the area. The EA ignores this issue.

Somersby Action Group

Response

The isolated *P. junonis* plants that have grown in areas disturbed since the 1980's are somewhat isolated from the main population and from each other. It would be somewhat academic to create a distinct sub-population.

1.1.8 Adequacy of Assessment

Comment

Section 5a assessment undertaken for Prostanthera junonis, in the Flora Assessment (Robert Payne Ecological Surveys and Management, December 2006) is inadequate. Based upon and environmental assessment on the information submitted to date, Council opposes the view that the project is unlikely to have any significant impact on P. junonis.

The Voluntary Conservation Agreement may protect sub-population 6A from key threats such as habitat loss and fragmentation, but there is a significant potential for the project to impact on sub-population 6A due to stormwater run-off, soil erosion and saltation, and Phytophthora. The EA does not appear to specifically address these potential impacts.

Gosford City Council

Response

The *Environmental Assessment* describes how stormwater runoff and soils will be managed in such a manner that there will be no impact upon the sub-population 6A. The sand removal operation, if approved, would provide a greater level of protection (in perpetuity) for the main population (sub-population 6A) – an important factor overlooked in this comment on the Section 5a assessment – protection and management of the main population has always been supported by DECC. It is to be hoped that Council's concern regarding *P. junonis* is reflected in future in the event the project is approved to work collaboratively with the Proponent to better manage the entire sub-population 6A.

1.2 *HIBBERTIA PROCUMBENS*

1.2.1 Removal of H. procumbens

Comments

Hibbertia procumbens is listed as Endangered under the Threatened Species Conservation Act 1995. The proposal will result in the removal of approximately ten (10) H. procumbens plants, which is said to resemble 25% of the total number of H. procumbens plants onsite. Similar to P. junonis the report has not identified or assessed the likely impact of the proposal upon potential habitat of the species. Considering the project requires the removal of approximately 14.42ha of mature native vegetation, Council's Environmental Assessment Officer is of the opinion that Section 5a of the Threatened Species Conservation Act 1995 has not been adequately addressed. Furthermore, the current report suggests that this species expansion into rehabilitation areas will depend upon the creation of localized moist substrates for this species. Further details in this regard is required.

Gosford City Council

Hibbertia is listed as endangered under the TSC Act. We note that Hibbertia has a very restricted distribution in NSW and is only known from a small number of sites in the Gosford and Wyong local government areas.

The project would result in the removal of about 10 individuals of Hibbertia, which represents a significant proportion (about 25%) of the known population at the site and surrounds.

The project would result in the removal of a significant area of potential habitat of Hibbertia. The EA identifies that most of the site comprises potential habitat for this species.

Environmental Defenders Office

Response

Based on known location sites that Robert Payne has seen on the Somersby Plateau, *Hibbertia procumbens* is a prostrate species that has a preference for moist habitats.. It is widely spread throughout the plateau with plants distributed between Kariong, Mount White and Calga. Its occurrence throughout the Somersby Plateau increased substantially in 2004 when numerous new populations were identified following seasonally favourable conditions.. It is adequately represented in Brisbane Water National Park.

The potential habitat on the Project Site is the "Banksia Tall Shrubland with Fern Understorey" totaling 8.6 hectares. Section 2.12.5.3 clearly described the Proponent's plan to create the required substrate for the re-instatement of the community.

1.2.2 Adequacy of Assessment

Comments

Section 5a assessment undertaken in the Flora Assessment (Robert Payne Ecological Surveys and management, December 2006) is inadequate. Council does not support the conclusion that the project is unlikely to have any significant impact on Hibbertia procumbens.

Gosford City Council

The importance of the Hibbertia procumbens (Spreading Guinea Flower, see photo) has been under-rated. The species is listed as ENDANGERED under the Threatened Species Conservation Act 1995 and is restricted to the Central Coast bioregion. Thirteen populations of H. procumbens are known to occur within the Somersby – Mangrove Mountain area (Bell 2004). Insufficient information on the status of the species has been provided in the EA.

H. procumbens limited information is provided on the status of the species over the Somersby Plateau / Central Coast bioregion to make an informed decision regarding this population. The EA is unsatisfactory on this point.

Somersby Action Group

Response

Hibbertia procumbens is found over a wide area on the Somersby Plateau. It is well distributed on adjoining local properties that have been investigated. As a result of further work on this species, under instruction by NSW DECC for Kariong High School, it was found to be well represented in Brisbane Water National Park and thus the local population is in no threat of becoming extinct.

1.2.3 Adequacy of Conservation Area

Comment

The area identified for the conservation of Threatened Species, as depicted in Figure 2.4 of the Environmental Assessment is considerably smaller and exposed to greater edge effects than originally proposed in the Eight-Part Test of Significance (Ecological Surveys and Management, July 2004) submitted with a previous application.

Gosford City Council

Response

The area of conservation for threatened plants on the Project Site was intended to be the area defined by the Voluntary Conservation Area on Figure 2.4 of the *Environmental Assessment* and the substantial 21ha Section 88B covenant area. It is now intended to rely upon the most appropriate mechanism nominated by the Minister for Planning for the protection of the nominated vegetation in perpetuity. The bulk (approximately 75%) of the *H. procumbens* plants identified on site will be protected within vegetation retained in perpetuity. The loss of 10 plants would be an insignificant impact on the local population which is well represented on the Somersby Plateau and in nearby national parks and state forests.

1.2.4 Translocation

Comment

A translocation program is proposed. The Department of Environment and Climate Change does not support the translocation of Threatened Species as an ameliorative measure, which this report relies its findings on.

Gosford City Council

Response

The buffer, corridor and Voluntary Conservation Area were identified previously after earlier discussions with NSW DECC commencing in the Year 2000. It should be noted that the area northwest of the *P. junonis* and part of the *H. procumbens* population is to be retained as a corridor with a buffer, which with the road reserve vegetation, will be a substantial 50m wide section of native vegetation to protect the population.

Contrary to the assertion in the comment, translocation is not relied upon as an ameliorative measure, rather translocation will only apply to those *H. procumben* plants that will need to be removed because of sand extraction. Translocation is not essential but it would be environmental responsible to attempt translocation rather than allowing the plants to be destroyed.

1.3 *TETRATHECA GLANDULOSA*

Comment

Tetratheca glandulosa is listed as a vulnerable species under both the Threatened Species Conservation Act 1995 and the Environment Protection and Biodiversity Conservation Act 1999. The project proposes to retain the two (2) T. glandulosa plants onsite within the proposed Conservation Area. As there are only two (2) plants of this species onsite, the reduction in vegetation throughout the site is likely to cause isolation, which may impact upon the viability of this species. Council's Environmental Assessment Officer is of the opinion that the Flora Assessment's (Robert Payne Ecological Surveys and Management, December 2006) fails to adequately address Section 5a of the Threatened Species Conservation Act 1995. Council adequately address Section 5a of the Threatened Species Conservation Act 1995. Council considers that the proposed development will have significant impact upon T. glandulosa.

Gosford City Council

Response

The buffer, corridor and Voluntary Conservation Area for *P. junonis* will also protect the population of *Tetratheca glanulosa. T. glandulosa* is well distributed locally and well protected in conservation reserves.

1.4 *EUCALYPTUS CAMFIELDII*

Comments

The threatened plant Camfield's Stringybark Eucalyptus camfieldii has been recorded by Bell (1997) on the Project Site. Although the flora assessment did not identify this species on the Project Site, a number of specimens of Brown Stringybark E. capitellata and Narrow-leaved Stringybark E. oblonga (which are taxonomically similar to E. camfieldii) were recorded. Given that both species are commonly associated with and any be confused with Camfield's Stringybark, voucher specimens of what were considered to have been the two former species should have been taken and their identification checked by an expert (eg. from the Herbarium of NSW) to ensure that they were not Camfield's Stringybark.

Department of Environment and Climate Change

Eucalyptus camfieldii (Heart-leaved stringybark) has been recorded by Bell (1997) within the project site. The species is difficult to identify and is often confused with E. oblonga and / or E. capitellata.

The species list prepared by Payne (2006) identifies five E. oblonga and one individual E. capitellata within the project site. Given the importance of this species, confirmation of specimens is required with the Herbarium of NSW. The EA is not clear as to whether this has been done.

It is indeed possible that Eucalyptus camfieldii still exists on the mine site. As it was identified in Bell's report in 1997, the consultants should re-examine the site to find the specimens, or suggest reasons as to why they have disappeared in the last 6 years. These trees were seen by Robert Payne in 2001 as 'tagged' on the site (EA, Section 3.2). It is indefensible for the EA to ignore this species.

There is no mention of what action is to be taken for the protection of Eucalyptus camfieldii.

Somersby Action Group

Loss of native habitat on site – development of the site will remove a large portion of native bush that covers a number of properties. This bush has been undisturbed for a number of decades and acts as an important wildlife corridor for the movement of species. There is a rare eucalypt (E. camfieldii) that is known to be on the site.

Somersby Action Group

Response

Camfield's Stringybark has larger and more distinct buds and fruits than the other two species. It also has heart-shaped juvenile leaves on the Somersby Plateau (eg see population in Brieses Road). The writer knows this species very well, having recently set up a reserve for the conservation of this particular species through negotiations with Environment Australia.

The subject specimen identified as *E. camfieldii* was still tagged at the time of inspection although a more thorough search was made of all the stringybarks. The subject tagged stringybark was compared to a *Eucalyptus oblonga* specimen on the Woodlands property, which had been sent to the National Herbarium of NSW for checking just prior to this survey. The identification supplied was *E. oblonga possibly E. camfieldii* and was a juvenile sapling and not a semi-mature tree. The subject tree on the Somersby Fields property is still present. The NSW National Parks and Wildlife Service had previously accepted this explanation. If it does occur, the tree will be protected in the VCA-corridor area proposed along the northern boundary of the Project Site.

2 FAUNA RESPONSE

2.1 FAUNA SURVEY TECHNIQUES

Comments

The surveys undertaken for mammals are considered to be inadequate. Cage trapping (a major or primary survey technique for the threatened Spotted-tailed Quoll Dasyurus maculatus, Long-nosed Potoroo Potorous tridactylus and Southern Brown Bandicoot Isoodon obesulus) does not appear to have been undertaken, despite Section 4.7.4 of the EA stating that the Long-nosed Potoroo was "identified as being likely to occur on or within the environs of the Projects (sic) Site". The size of Elliott traps used is not the optimum size to trap bandicoots. Arboreal Elliott traps – the major survey method for the Squirrel Glider Petaurus norfolcensis – was not employed. Although the Eastern Pygmy Possum Cercatetus nanus has been found on the Project Site and nearby (see below), no targeted surveys were undertaken. The Eastern Pygmy Possum is best detected by using appropriate-sized Elliott traps mounted on platforms amongst flowering Banksias and alike, and such a survey does not appear to have been undertaken. Dusk surveys i.e. listening and watching in suitable habitat (including live or dead hollow-bearing trees) – a useful technique for detecting roost and nest sites for hollow-dependent fauna such as arboreal mammals, owls and bats – do not appear to have been undertaken.

DECC's Director-General's Requirements (DGRs) for Species Impact Statements state that surveys must have been carried out within five years of the date of request of DGRs to be eligible to be taken into consideration in identifying and assessing the fauna and flora species present in an area. However, the bulk of the fauna surveys were carried out in December 2000, almost seven years ago, with only subsequent surveys comprising a one day survey of a subsequent 8ha addition to the Project Site, and a brief one day survey for threatened winter bird migrants and several nights for threatened owl species.

DECC strongly recommends to DoP that the fauna survey be amended (where required) so that it is in accordance with "Threatened Biodiversity Survey and Assessment' so that it is in accordance with 'Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities' (DEC – November 2004).

The bulk of the surveys were undertaken during severe drought conditions not conducive to obtaining a representative sample of the fauna that would be present in more normal conditions.

No surveys appear to have been undertaken to determine the location, numbers and sizes of hollows in trees. These tree hollows comprise critical nesting and/or roosting habitat for a range of species including owls, gliders and the Brush-tailed Phascogale. Although the flora survey has identified the presence of Corymbia gummifera, Banksia ericifolia and B. serrata – all recognised "Nectar Feed Trees" or the threatened Squirrel Glider Petaurus norfolcensis – in the absence of any information on the availability of den hollows, it is impossible to determine the likelihood of the presence of this species on the Project Site.

Species identification – The expert report has a number of inadequacies (see General Environmental Comments, Appendix F) including:

Habitats not identified as having significant species, eg. Eastern Pygmy-possum, Red-crowned Toadlet, Giant Burrowing Frog, various micro-bat species.
No principles prescribed for protection of these species.

The failure to adequately survey for some fauna groups and species, (particularly threatened species) that have a reasonable likelihood of occurring on the Project Site and utilising habitats means that the proposed amelioratory conditions do not adequately identify measures to address the impacts of the proposed development on these species.

Department of Environment and Climate Change

The Fauna Assessment report relies on fauna surveys, of which the bulk was carried out in December 2000. It has been seven (7) years since the bulk of surveys were carried out, during this time, council has adopted minimum survey requirements (LHCCREMS Flora and Fauna Survey Guidelines 2002) and other species have been added to the schedule of the Threatened Species Conservation Act 1995.

Furthermore, the main surveys were conducted during an extremely dry period that preceded a number of years of very low rainfall. Fauna densities were said to be unusually low due to poor breeding conditions that year as well as several preceding years. Due to the prevailing drought during the main fauna surveys, frog species would be especially affected. Further surveys are required to adequately assess the current Threatened Species value of the site.

Gosford City Council

Response

The supplementary fauna survey conducted by Kendall and Kendall between 20 February and 1 March 2008 re-dressed the short-comings identified in the above comments. A copy of the Supplementary Fauna Assessment is provided as **Annexure 1**.

2.2 EASTERN PYGMY-POSSUM

Comments

Mammals
The Eastern Pygmy-possum has been recorded on the Somersby Fields Mine Site by the Australian Museum. Populations within Brisbane Water NP appear to prefer Banksia Scrub-Woodland Communities on Hawkesbury Sandstone. This community will be significantly cleared by the operation and the flowering of Banksia ericifolia (on which the Possum depends) may be affected around the area by changes in hydrology.

A number of threatened micro-bat species (Little Bent-wing Bat, Common Bent-wing Bat, Large-eared Pied Bat, Yellow-bellied Sheathtail-bat and Eastern Freetail-bat) are likely to utilise riparian zones within the project site for foraging.

Part 6, Section 6 – Survey Results
No results were shown for the nocturnal call playback. The EA should include this information.

Part 6, Section 7 – Discussion

The discussion dismisses (based on a brief subjective assessment with little scientific evidence) the occurrence of the following species which have been recorded on and / or within close proximity to the project site.

- *Red-crowned Toadlet.*
- *Giant Burrowing Frog.*
- *Giant Barred Frog.*
- *Stuttering Frog.*
- *Eastern Pygmy Possum.*
- *Powerful Owl.*

Somersby Action Group

The Eastern Pygmy Possum lives in the Banksia habitat that is to be destroyed on the site. Similar habitats exist outside the mine site but will be seriously impacted upon and destroyed by the loss of ground moisture. This process will further threaten this species.

Jeremy Smith

It is noted under Section 4: Assessment and Management of Key Environmental Issues that the majority of the proposed stages 1/3 and 1/4 have not been disturbed since 1954 and look like they have never been disturbed according to the photographic evidence of the pages on page 4-11 (Appendix D). This particular section seems to be the habitat of the Eastern Pygmy Possum although there is no mention of this in the EA despite a study undertaken by the Australian Musuem.

Somersby Public School P&C Association

A population of the threatened Eastern Pygmy Possum would necessitate the retention of an adequate area of Hawkesbury Banksia Scrub-Woodland to support a viable population, and a re-assessment of the entire proposal to determine the extent and intensity of the likely impacts of groundwater drawdown on the flowering and continued viability of the banksias – a critical foraging resource for the species.

Department of Environment and Climate Change

Response

The supplementary fauna survey recorded the Eastern Pygmy-possum at two locations on the Project Site (see Section 3.3). A seven-part test was conducted for the Eastern Pygmy-possum (see Section 4.9.2 in **Annexure 1**). The test presents the recommended "avoid / mitigation / offset" strategy and concludes "It is considered likely that the proposal will impact on the Eastern Pygmy-possum local population, however, this impact is probably not sufficient to place the local population at risk of extinction".

2.3 AMPHIBIANS

Comments

The report indicates that the amphibian survey was of limited value due to prevailing dry conditions at the time. On balance, the site may support significant habitat for species such as the Red-crown Toadlet and Giant Burrowing Frog. The report should be referred to relevant experts for these species for review (State Forests and Department of Environment and Climate Change to report on the validity for these assessments).

Wyong Shire Council

Table 4.49 fails to identify two species of amphibians, listed under the TSC Act 1995: the Red-crowned Toadlet and Giant Burrowing Frog which were both recorded by Robert Payne in the Expert Report (see Part 6, Section 6.1 Countrywide Ecological Service 2006).

Somersby Action Group

The development will lead to ecological impacts that will be very significant and damaging in particular to the change in groundwater. Such a change in hydrology will affect the nearby hanging swamps which are already under threat. The loss of such an ecosystem will mean a loss in habitat for the Red-crowned Toadlet already threatened by urban development.

Jeremy Smith

The surveys undertaken for amphibians are considered to be inadequate. Amphibian-targeted surveys only utilised pit fall trapping and were only undertaken during a single four day period in drought conditions in summer. This is considered inappropriate climatic conditions for detecting any frog species. Call playback and listening for consequent calls is the standard technique for general amphibian surveys, however, it appears that this was only undertaken for short periods during general survey activities. In addition to the standard survey technique, species-specific survey methodologies should have been employed for the four threatened frog species – Green and Golden Bell Frog Litoria aurea, Green-thighed Frog Litoria brevipalmata, Red-crowned Toadlet Pseudophryne Australia and Giant Burrowing Frog Helioporus australiacus that are likely or have the potential to occur on the Project Site.

The Red-crowned Toadlet and/or the Giant Burrowing Frog would require consideration to be given to the conservation of areas of potential or known habitat (eg. feeder creek lines, soaks and gutters).

Department of Environment and Climate Change

Amphibians
The Red-crowned Toadlet is likely to occur across the project site, particularly in areas of dense vegetation and debris beside ephemeral creeks, soaks and gutters. The Giant Burrowing Frog is likely to occur in several areas within the project site, particularly areas of health, woodland and open forest with sandy soils. The species may travel several hundred metres to creeks to breed (eg. Robinson Creek or Platypus Creek). Both species are sensitive to changes in hydrology and may be affected by surface water harvesting and predicted declines in groundwater level and spring flows.

The Giant Barred Frog (Mixophyes iterates) and Stuttering Frog (M. balbus) have been recorded within Stony Creek catchment (Strickland State Forest) and their survival is dependant upon maintaining existing quality and quantity of environmental flows from Dam A.

Somersby Action Group

Response

The supplementary fauna survey recorded the Red-crowned Toadlet within Stage 1/3 on the Project Site. A follow-up survey by Newcastle University identified approximately 19.3ha of suitable habitat on the Project Site, 10.7ha within the proposed extraction area and 8.6ha within the area of vegetation planned to be protected in perpetuity. The conclusion of the follow-up survey and assessment was that the impact from the proposed activities will not place immediate pressure on the species to the extent that a local viable population is likely to be placed at risk of extinction.

2.4 AVIFAUNA

Comments

The survey undertaken for threatened winter migrant bird species such as the Swift Parrot Lathamus discolor and the Regent Honeyeater Xanthomyza phrygia is considered inadequate as it was carried out on only one day. Furthermore, the survey report makes no mention of whether relevant nectar feed trees were in flower, and as such the significance of even the one day's survey is unknown.

Department of Environment and Climate Change

Under Section 8.1 of the Fauna Assessment Report it is suggested that the Glossy Black Cockatoo nests in large tree hollows. The report goes on to say that no tree with a large hollow will be affected by the proposal. It is unlikely that the proposed activity will have any significant impact on this species. On the contrary to this, Section 8.4 states that one large hollow bearing tree will be removed. Therefore the assessment regarding the Glossy Black Cockatoo is inconsistent.

Gosford City Council

Avifauna
Both the Gang Gang Cockatoo and Glossy Black-cockatoo have been recorded within and surrounding the project site. Both species inhabit eucalypt forest woodland where Allocasuarina and Casuarina species provide abundant foraging resources and old tree hollows provide nesting site (Tanton 1994). A. littoralis is relatively common within Somersby Plateau Forest (the most widespread community within the study area).

The Powerful Owl occurs in a wide range of vegetation types and is likely to use the upper catchment area of the project site for foraging.

Somersby Action Group

Response

The supplementary fauna survey recorded a Gang Gang Cockatoo on the Project Site. No Glossy Black Cockatoos were recorded.

2.5 MICROCHIROPTERA (MICROBATS)

Comment

Micro bats – a number of local residents have observed microbats in the area. These bats appear at dusk hunting insects. They hide during the day in crevices and small spaces in rocks, trees and even fence posts. Some are as small with a wing span of 150mm. The report in Appendix F notes there are a number of endangered species that would forage on the mine site and surrounding properties. It is certain that these animals would be under threat.

Somersby Action Group

Response

The supplementary fauna survey recorded both the Little Bent-wing Bat and Common Bent-wing Bat, both listed threatened species. It is noted that the Eastern Freetail-bat had previously been recorded on site by Dr Lim in 2000.

2.6 WILDLIFE CORRIDORS

Comment

It is imperative that the proposal does not sterilise opportunities to establish local wildlife corridors in the locality (see Appendix 2). In 2002, Council engaged Robert Payne to evaluate wildlife corridors for the Wyong Conservation Strategy. As part of this strategy a potential wildlife corridor route was identified which affects the subject site (see wildlife corridor no. 4) in the report by Payne (2002) for further information. There might be some other alternative locations to achieve the same wildlife corridor planning outcome. However, it is recommended that corridor options are not sterilised without fully examining this issue.

Wyong Shire Council

Response

The proposal by the Proponent provides for the long term retention of vegetation on the eastern side of the Project Site and retention / enhancement of vegetation on the western side of the Project Site – both of which will function as wildlife corridors in perpetuity – if the Project is approved.

2.7 ASSESSMENT

Comments

The Eastern pygmy possum, a threatened species, as well as the red-crowned toadlet an endangered species will have their habitats destroyed, along with countless other birds and animals. The EA report fails to state how, or even if, these species will be protected, or what will be the lasting costs to their habitats. The EA report conservatively estimates that hanging swampland in the area will completely dry up, springs and soaks will disappear, and admits that the loss of groundwater will impact on all other flora and fauna in the general area.

Nicole, Bonny and Luke Dwyer

The test of significance fails to adequately satisfy Section 94(3) of the Threatened Species Conservation Act 1995.

- *Eastern Pygmy Possum – this little possum lives in the Banksia habitat that is to be destroyed on the site.*
- *Similar habitats exist outside the mine site that will be destroyed by the loss of ground moisture. This will further threaten this species.*
- *There are many other sources of sand that could be mined. This mine is in the wrong place at the top of a hill with 4 creeks rising from it and a village community and Public School next door.*

The EA does not detail how the red crown toadlet, Giant burrowing frog, Giant barred frog, Stuttering frog, eastern pygmy possum and the powerful owl are to be protected or how the ecosystem on which they all depend.

Threatened micro-bat species have also been recorded on and around the surrounding riparian zones within the project site for foraging.

Australian Conservation Foundation

The Fauna Assessment (Countrywide Ecological Service, December 2006) is inconsistent with the information presented within the Environmental Assessment (R.W. Corkery & Co. Pty Limited, May 2007). The Environmental Assessment states that sixty-eight (68) species were identified onsite, including two (2) Threatened Species, the Eastern Freetail-bat (Mormopterus norfolkensis) and Little Bentwing-bat (Miniopterus australis). However, the Fauna Assessment suggests that while the Eastern Freetail-bat was identified onsite, the Little Bentwing-bat was not. In addition, the Fauna Assessment suggests that the Threatened Species, the Red-crowned Toadlet was also reported onsite.

Impact assessment of noise upon Threatened Fauna Species onsite, has been overlooked. Given that the report confirms that the project will exceed the criteria for noise pollution, this may have an unknown affect on Threatened Fauna Species within the project site and surrounding area, and as such scientific uncertainty exists. In light of this, the precautionary principal should be invoked given regard to Environmentally Sustainable Development and the applicant be requested to address the impact associated with noise upon Threatened Species. It is considered that the Fauna Assessment does not accurately undertake a seven (7) part assessment, pursuant to Section 5a of the EP&A Act 1979.

Gosford City Council

Part 6, Section 7.1 – Test of Significance
The test of significance fails to adequately satisfy Section 94 (3) of the Threatened Species Conservation Act 1995.

This point applies to any species known or expected to occur within the area. Several species have not been addressed (see above) and very limited information is provided on the lifecycle of each threatened species (eg. aspects such as reproduction, foraging, predation, migration and dispersal).

The extent of habitat to be removed is not given (approximately 12.8ha of mature vegetation). No consideration is given to the specific habitat requirements of each species. No consideration has been given to existing corridors with private property to the south of the project site and their fragmentation by the development. The site is located at the headwaters of 4 sub-catchments and is likely to be highly important in the movement of fauna. The site is considered to be important habitat for a number of species.

Somersby Action Group

Response

The Supplementary Fauna Assessment incorporates further seven-part assessments for the species of interest reflecting the results of the most recent survey.

3 GROUNDWATER DEPENDENT ECOSYSTEMS RESPONSE

3.1 GROUNDWATER DEPENDENT ECOSYSTEMS

Comments

The distribution in the Project Site of two areas of a community referred to as "Sandstone Hanging Swamp – Variant A" (as per Bell 2004[2]) is depicted in Figure 4.27 of the EA. However, no description of the community is provided and it is aggregated with the Hawkesbury Banksia Scrub-Woodland community in determining its size within the Project Site. Confusingly, the Flora Assessment report component of the EA states that the Hawkesbury Banksia Scrub-Woodland on the Project Site does not qualify as "Hanging Swamp vegetation". However, it would appear that by depicting the latter separate to the former on Figure 4.27, some at least of the Hawkesbury Banksia Scrub-Woodland on the Project Site is considered to belong to the Sandstone Hanging Swamp vegetation community.

As the Sandstone Hanging Swamp vegetation community has not been considered separately from the Hawkesbury Banksia Scrub-Woodland community, the impacts of the proposed drawdown of groundwater on the former community have not been assessed. Although there is only a small amount of the Sandstone Hanging Swamp community on the Project Site, larger areas adjoin the latter immediately to the south. DECC considers that the drawdown of groundwater as a result of the proposed development will have significant adverse impacts on such communities that are located within one kilometre of the sand removal operations ie. impacts both within and beyond the Project Site. This is implicitly acknowledged by the EA - "only in localised areas, eg. on the southern side of the Project Site where there is significant seepage in this area" (p. 4-130 of the EA). However, the implications of this seepage removal on the Sandstone Hanging Swamp community in this area are not addressed.

Sandstone Hanging Swamp communities are restricted in distribution within the Gosford Local Government Area (Bell 2004) and are regarded as being of high priority under the Water Sharing Plan for the Kulnura Mangrove Mountain Groundwater Sources 2003 Order (under the Water Management Act 2000). The Sandstone Hanging Swamp community is likely to be the prime habitat for the threatened Red-crowned Toadlet, Giant Burrowing Frog and Hibbertia procumbens, and both species are likely to be substantially adversely affected by the proposed drawdown.

Clause 39 (Protection of Groundwater Dependent Ecosystems) of the Water Sharing Plan for the Kulnura Mangrove Mountain Groundwater Sources 2003 states that the extraction of groundwater from a bore for any purpose is excluded within 100m of specified vegetation communities identified as high priority groundwater dependent ecosystems – these include the Hawkesbury Banksia Scrub-Woodland and Sandstone Hanging Swamps and Heaths communities, both of which occur in the Project Site.

Table 4.47 (in Section 4.6.6.1 of the EA) only identifies the direct physical impacts (ie. sand removal) of the proposal on the vegetation communities of the Project Site but not the indirect impacts of surface water harvesting and groundwater extraction on these communities. These latter impacts are likely to extend beyond the confines of the Project Site but these wider geographical impacts are not addressed. In fact, this section of the EA – addressing the impacts of the proposed development on vegetation communities – makes virtually no mention of the impacts of surface water harvesting and groundwater extraction on these communities.

Whilst the nature of these impacts are outlined in Section 4.2.9.2 (Surface Water) and 4.2.9.3 (Groundwater) of the EA these sections do not indicate what biodiversity values might be impacted or detail the nature of these impacts. Section 4.2.9.2 states that the greatest impact of surface water harvesting will be the reduction of spring runoff, which has been observed to flow in a north-south direction into the adjoining Lot 211 DP 708275 (as depicted in Figure 4.10 of the EA). This Lot contains hanging swamp communities and groundwater dependent ecosystems. Section 4.2.9.3 states that the proposal is likely to result in:

- *A reduction in the extent and quality of high priority groundwater dependent ecosystems both on and adjacent to the Project Site.*
- *Changes in environmental flows to the four identified sub-catchments, potentially affecting riparian vegetation and habitat values in these areas. The threatened Giant Barred Frog Mixophyes iterates and Stuttering Frog Mixophyes balbus have been recorded from within the affected catchment of Stony Creek and their long term viability is likely to be adversely impacted by reduction in the quality and quantity of environmental flows from the Project Site.*

Department of Environment and Climate Change

Loss of Hanging Swamps
The Environmental Assessment states that the surrounding hanging swamps will dry up. The springs and soaks will also dry up and the creatures that depend on this water source will disappear.

Hanging swamps are scattered throughout the Somersby Plateau and are dependent on groundwater to maintain their floristic diversity.

These hanging swamps are unique ecological communities, providing potential habitat for threatened species such as the Regent Honeyeater, the Red-crowned Toadlet, the Adams Emerald Dragonfly, and a number of threatened and rare plant species.

Fiona Ralph
B.Hort.Sc

The EA report conservatively estimates that hanging swampland in the area WILL completely dry up, springs and soaks WILL disappear, and admits that the loss of groundwater will impact on all other flora and fauna in the general area.

Dwyer Family

The site is particularly sensitive due to its location at the headwaters of the four creeks. There are endangered species (eg. Somersby mintbush, Heart-shaped Eucalyptus) and the potential for dust to clog local streams destroying the creek flora and fauna is extreme. The loss of hanging swamps and surface moisture in the local area will impact on important habitats that are under increasing pressure.

NB Bran

Hanging Swamps to be lost – Directly to the south of the mine site is a recognised hanging swamp zone (see Appendix F). This is one of the largest in the Plateau area. It is recorded on the map attached to the SREP8 (also by the NSW State Wetland Advisory Committee). Other hanging swamps in the area include the portion of the mine site to the east of the proposed mine workings. Local information indicates that hanging swamps on the Somersby Plateau have been drying out recently, to the extent that many have entirely disappeared.

The EA expert report erroneously states that the surface seepage is towards the east and would not contribute to the hanging swamp vegetation found on the woodlands property to the south. This is misleading as the infiltration area on top of the hill must be the source of any water seeping out of the ground just a few metres downhill of the site. There is no other source. It is clear that these important recorded habitats to the south and east would dry up due to the mine operations and the wetland species would die (see General Environmental Comments, Appendix F). Similar smaller habitats to the north and west would also be affected.
EA 4.6.6.1 Assessment of Impacts – Vegetation Communities
Table 4.47 fails to recognise the impact of surface water harvesting and groundwater losses (due to the mine pit and any water extraction that may occur) on vegetation communities.

As stated in Section 4.2.9.2 (Assessment of Residual Impacts – Surface Water) the greatest impact of surface water harvesting will be on spring runoff which has been observed to seep in a north-south direction into Lot 211 DP 708275 (see Figure 4.10) containing hanging swamp communities and groundwater dependent ecosystems. These ecosystems rely upon both the perched water tables and groundwater seepage.

Somersby Action Group

The operation will destroy and damage the National Parks bordering the mine. The very existence of such natural heritage is dependent on the swamps and spring fed creeks created by the groundwater.

Maria and Allan Brooks

Response

Considerable confusion has been introduced in the discussion of groundwater dependent ecosystems within and surrounding the Project Site. The groundwater assessment for the project has clearly identified that there are two main forms of groundwater.

1. The true groundwater consistent with the regional groundwater table present across the entire Somersby Plateau. This water table is recharged through long term infiltration of rainfall of the plateau.
2. Rainfall-dependent springs that typically display regular outflows around the 272m AHD level throughout the Somersby area. The rate of flow from the bulk of these springs is directly related to the level of rainfall and is therefore variable. During periods of dry weather, flows from this type of spring are negligible or they dry up.

Apart from the above groundwater occurrences, moisture is also observed on site principally throughout the eastern side of the Project Site within the sandy clayey subsoil. This material holds the moisture and limits the downward percolation of water into the true groundwater. The occurrence of this water is recognised to be the main reason for the presence of coral fern in the eastern side of the Project Site. The coral fern is not a groundwater dependent species on the Project Site. It is also re-iterated that *Prostanthera junonis* is also not groundwater dependent.

Each of the above water sources has vegetation associated with their occurrence with the only groundwater dependent vegetation within the proposed sand removal area being a very small area (860m^2) of Sandstone Hanging Swamp – Variant A (see EA Figure 4.27). This occurrence near the southern boundary of the Project Site is fed by spring water from a longitudinal seep that traverses the southern boundary of the Project Site. The availability of water to this small area fluctuates with rainfall availability. A larger area of Sandstone Hanging Swamp (3 300m^2) is present on the Project Site, but outside the area of sand removal and a considerably larger area (41 400m^2) is present on the "Woodlands" property southwest of the Project Site. Both of these areas of vegetation are rainfall-dependent features whose area of coverage presumably fluctuates with rainfall availability.

The groundwater assessment has established that there will be minor reductions in spring flows to each of the above groundwater dependent ecosystems, principally because of the loss of surface water catchments currently feeding water to those areas. Hence, it is likely that the areal extent of the Sandstone Hanging Swamp would reduce to a level commensurate with the long term flow at those locations. It is highly unlikely the Sandstone Hanging Swamps beyond the proposed area of sand removal would disappear. The most recent groundwater modelling conducted by RCA Australia has established that the Sandstone Hanging Swamp identified on the "Woodlands" property is predicted to experience a loss in spring flow of less than 10% which is unlikely to have any observable impact on the vegetation present.

4 BIODIVERSITY OFFSETS, CONSERVATION AGREEMENTS AND SUGGESTED CONDITIONS

4.1 VOLUNTARY CONSERVATION AGREEMENT AND SECTION 88B PROTECTION

Comments

A Voluntary Conservation Agreement (VCA) under the Threatened Species Conservation Act 1995 (TSC Act) has been proposed as an instrument to provide security of tenure and provision for appropriate management for the largest population of Somersby Mintbush Prostanthera junonis on the Project Site. DECC acknowledges that the proponent is proposing to set aside an area of 3.2ha under a VCA, but considers this inadequate to compensate against the loss of 22ha of known threatened species and their habitat.

DECC also notes that under Section 2.12.2 of the Biodiversity Offset Strategy the proponent has stated that a further 21ha will be protected under a Section 88B covenant under the Conveyancing Act 1919. DECC is unsure of the specifics of this covenant, notably whether or not this will ensure that the land will be protected in perpetuity, and what management measures will be implemented to achieve long-term conservation of this area, including adequate buffers against the development.

It appears that the discussions between the proponent and DECC regarding a VCA took place in about 2000, but the EA does not provide specifics (eg. with who). The proponent needs to determine whether the Parks and Wildlife Group of DECC – the relevant DECC body – is currently predisposed to agree to a VCA, either in principle or in detail.

Department of Environment and Climate Change

Voluntary Reserve – This "Voluntary Conservation Reserve" does not provide sufficient protection to the remaining species of Somersby Mintbush on the site. It is likely that changes in the soil moisture alone (due to the mine pit existing a few metres away) will be sufficient to wipe out this remaining remnant.

Australian Conservation Foundation

It is not clear if the 3.2ha Voluntary Conservation Area proposed is a Voluntary Conservation Agreement under Section 69 of the National Parks and Wildlife Act (1974).

The CMA is concerned that the proposed 'Section 88B protected area' does not provide adequate long term security for vegetation on the site. Further, the proposed final land use I promoted as rural / residential and grazing (page 2-54) but does not refer to conservation.

The Offset Strategy proposed by the proponent does not meet the definition of 'offset' as provided in the EA Glossary page 7-5 because the negative impacts are not compensated. The Native Vegetation Regulation 2005 also provides a definition for 'offset' which is not met by the proponent's Offset Strategy.

The CMA is of the view that the proposed Biodiversity Offset Strategy is clearly inadequate and that it does not meet the 'improve or maintain' principle. The CMA supports the use of a Voluntary Conservation Agreement but is of the view that the area protected should be increased significantly to include all vegetation outside the extraction area of the project.

The VCA should be linked to the title of the land in perpetuity and contain management conditions to improve the condition of all of the native vegetation including the threatened species. If the proponent's 'Voluntary Conservation Area' does not meet these criteria then the CMA would suggest the proponent considers a Property Vegetation Plan under the Native Vegetation Act 2003. The proponent should further consider:

- *reducing the footprint of the extraction area to increase the offset area; and*
- *an offsite offset to compensate for the native vegetation lost by the development. It should be noted that assessments under the Native Vegetation Act in similar situations have established offset ratios of between 10:1 and 50:1.*

Hunter-Central Rivers Catchment Management Authority

Response

At the outset, it is highlighted that the regular reference in the DECC submission to 22ha of cleared native vegetation is incorrect. The *Environmental Assessment* refers to the clearing of 12.8ha of native vegetation and 9.2ha of existing cleared / non-native vegetation – totalling 22ha. Therefore, it remains important that consideration be focussed on the 12.8ha of native vegetation, or 10.8ha as is now proposed to be cleared and **not** 22ha.

The concern expressed by each of the above stakeholders regarding the adequacy of the Voluntary Conservation Agreement or Section 88B covenant is unfounded. The Proponent is committed to the retention of the nominated remnant vegetation, enhanced plantings and revegetation areas in perpetuity. As a consequence of this commitment, the Proponent is prepared to accept whatever mechanism the Minister for Planing considers is most appropriate to protect the subject areas in perpetuity (see Commitment 15.1 in Section 5).

4.2 SITE REHABILITATION

Comment

It is very uncertain whether the reconstruction of ecological communities at the site will adequately replace the ecological communities and habitats that currently exist at the site, including habitat for Prostanthera.

Generally restoration is extremely slow (several decades to possibly centuries) and may never result in ecological communities or habitats that resemble the original situation.

Environmental Defenders Office Limited

Response

It is acknowledged that the intended ecological communities would take many decades to develop. The Proponent is committed to progressive rehabilitation of the site – consequently, there will be an opportunity for a clear understanding of progress towards the various ecological communities throughout the life of the project. The Proponent has further

committed that it would not progress with Stage 2 of the project unless all required rehabilitation in Stage 1 has been commenced and the required level of performance achieved. With respect to *P. junonis*, it is noted that the disturbed areas of the former extraction area were colonised from the main population without any encouragement. The retention and management of the main population as proposed would equally enable the natural recolonisation of nearby areas on the rehabilitated landform.

4.3 VEGETATION AND THREATENED SPECIES MANAGEMENT PLAN

Comments

DECC suggests that an appropriate Management Plan (such as vegetation, threatened species or habitat) be developed as a key mitigation measure for any offset areas proposed. This management plan should clearly document how any proposed offset areas or measures will be managed with respect to long-term conservation and viability, including aspects of (but not limited to) weed management, feral animal control, fire management (including Asset Protection Zones), public access, minimisation of edge effects, stormwater control and changes to hydrology (eg. minimise impact to Sandstone Hanging Swamps), and management of specific habitat enhancement measures (eg. hollow / habitat trees). Furthermore this plan should indicate long-term financial commitment to any proposed conservation measures, including any mechanisms to be implemented to achieve this. DECC believes such a proposal should contain firm, enforceable and effective commitments to protect threatened species values. Although DECC acknowledges that the proponent is suggesting that a 'Vegetation and Threatened Species Management Plan' will be developed, this document has not been provided. DECC would require that such a plan be developed and reviewed by the relevant agencies prior to any support or consideration of the proposal.

Department of Environment and Climate Change

Response

The DECC refers to the Proponent's "suggestion" that a "Vegetation and Species Management Plan" be developed and its request for the plan to "be developed and reviewed by the relevant agencies prior to any support or consideration of the proposal". The intention to prepare a "Vegetation and Species Management Plan" was proposed by the Proponent not as a "suggestion" but reflecting its commitment to ensure that all ecological issues are appropriately managed during the life of the project. In order to reflect its commitment to the plan, the Proponent has incorporated a new commitment in **Table 5.2** (Commitment 15.1) relating to the plan (see Section 5).

4.4 BIODIVERSITY OFFSET STRATEGY

Comments

DECC notes that the proposal will involve the clearing of approximately 22 hectares of native vegetation. DECC considers that this removal of native vegetation will result in the loss of known threatened species and their habitat (including local endemics), and hence DECC suggests that adequate offset measures should be placed on the development to compensate for the loss of 22 hectares of native vegetation.

Section 2.12 of the EA is titled "Site Rehabilitation and Biodiversity Offset Strategy". It outlines a Biodiversity Offset Strategy and states that "the rehabilitation plan has been prepared…". However, the SC contains no reference to a Biodiversity Offset Strategy or a Rehabilitation Plan as such. Similarly, Section 4.6.5 of the EA identifies the preparation of a "Vegetation and Threatened Species Management Plan" but no such plan is referred to in the SC.

DECC is of the opinion that the EA does not adequately provide details of the proposed offset provisions, such as preserving similar habitat in perpetuity. Although DECC acknowledges that some land will be afforded protection under an 88B covenant, it considers the proponent has not provided specific details on this matter, including appropriate buffers to minimise indirect and edge impacts associated with the development. Given DECC would consider any proposed conservation area to be 'sensitive areas', it would require a minimum of 50m buffer to be afforded to such areas to reduce the potential for edge effects and alike. If such buffers are applied than the total land afforded protection would likely be less than that being developed, which does not meet the DECC's 'offsetting principles'.

The EA does not provide adequate details on the long-term management, financial commitment to both the proposed VCA or 88B covenant areas, or mitigation measures to preserve habitat values on site or minimise impacts to potential threatened species. DECC suggests that DoP request that the proponent to identify and provide appropriate details about the proposed mitigation measures, including the provision of compensatory habitat.

In considering any development proposals, DECC may take any proposed measures to offset or remediate impacts on threatened species (or their habitat) into account. Offsets may include, among other things, voluntary conservation actions proposed by the proponent under section 126N of the Threatened Species Conservation Act 1995. Action might include securing the protection of land for conservation (for example, a voluntary conservation agreement or reservation of land under Part 4 of the National Parks and Wildlife Act 1974), restoring threatened species habitat, or the contribution of money for appropriate conservation purposes. DECC would typically consider offsets based on:

- *size, condition and type of habitat preserved, that is, as a minimum starting point an area equal or greater in size and quality to that being lost;*
- *suitable habitat for the threatened species, populations and / or ecological communities being considered; and*
- *longevity of any covenant placed on the land in that conservation and appropriate management is ensured in perpetuity, such as Section 88B of the Conveyancing Act 1919, Voluntary Conservation Agreement under the National Parks and Wildlife (NP&W) Act 1974, a bio-banking agreement under the Threatened Species Conservation Act 1995, and / or reservation of land under Part 4 of the NP&W Act 1974.*

Compensatory measures should be provided in accordance with DECC's 'offsetting principles', a copy of which can be obtained in the "Draft Lower Hunter Regional Conservation Plan" or the "Draft Guidelines for Biodiversity Certification of Environmental Planning Instruments" (Appendix 2).

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DECC (undated) has recently outlined principles for offsetting, which include a requirement to quantitatively assess the loss in biodiversity due to the development compared to the gain in biodiversity due to the offset. The EA has not undertaken this level of assessment.

Environmental Defenders Office Limited

Response

The Proponent has reviewed its Biodiversity Offset Strategy presented in Section 2.12.2 of the *Environmental Assessment* and proposes the following in light of the submissions and outcomes from the supplementary fauna assessment. It is noted at the outset of this response that during the formulation / design stage for the Project, the Proponent purchased an additional 8ha of land to incorporate within the Project Site. An important factor in the purchase of this land was that the subject land included approximately 6.5ha of native vegetation adjacent to the then Project Site which could increase the area of the on-site offset required given the planned removal of some native vegetation on the subject site.

The Proponent commits to the following components in its Biodiversity Offset Strategy.

1. The 12.7ha of native vegetation beyond the original proposed area of disturbance (as defined in the May 2007 *Environmental Assessment*) will be protected in perpetuity in the manner directed by the Minister for Planning. (The nominated area is also depicted on Figure 2.16 (Amended)). The area of retained vegetation incorporates the main population of *P. junonis* on the Project Site (and a 20m minimum buffer).
2. The extraction stage nominated as Stage 1/3 on Figure 2.6 of the May 2007 *Environmental Assessment* is now proposed to be retained in its natural form, albeit with a minor realignment with the adjoining Stage 1/4. This realignment was undertaken to achieve a distance of 100m from the western side of Stage 1/1 and 1/2 and the eastern side of Stage 1/4. The realigned boundary between Stage 1/3 and Stage 1/4 is shown on Figure 2.6 (Amended). The distance of 100m was determined based upon two factors.
    (i) The typical distance moved by Red-crowned Toadlets is understood to be in the order of 50m. Hence sufficient area would be available for movement through this area.
    (ii) The home range for an Eastern Pygmy-possum is in the order of 0.8ha which would equate to a circle of approximately 100m diameter. Hence, the area would provide sufficient area for habitat for the animal.

    It is further noted that retention of Stage 1/3 vegetation would also provide a vegetated corridor between the Voluntary Conservation Area encompassing the main *P. junonis* population and the native vegetation approaching and beyond the southern boundary of the Project Site.

    As a result of the retention of this area (covering approximately 2ha), the area of existing native vegetation retained in perpetuity will increase from 12.7ha (as discussed in 1. above) to 14.7ha.
3. The vegetation within the western fauna corridor depicted on Figure 2.16 (Amended) will be enhanced by removing all non-native vegetation and progressively planting native vegetation throughout the corridor over a period of 5 years.

4. The area within the proposed area of disturbance nominated on Figure 2.16 (Amended) will be progressively rehabilitated to incorporate both existing and surrounding vegetation communities. A total of 9.3ha of the area to be disturbed will be rehabilitated back to native vegetation.
5. The 17.5ha of enhanced vegetation and revegetation depicted on Figure 2.16 (Amended) will also be protected in perpetuity in the manner directed by the Minister for Planning.
6. The Proponent will secure in perpetuity an area of land with comparable ecological attributes to the land to be cleared of native vegetation on the Project Site.
7. The Proponent will support the preparation of a recovery plan for the Red-crowned Toadlet up to a value of $25 000.

The relevant guidelines for the assessment of biodiversity offset proposals in NSW are the *Principles for the use of Biodiversity Offsets in NSW* presented as Appendix II of the *Guidelines for Biodiversity Certification of Environmental Planning Instruments – Working Draft* published by the Department of Environment and Climate Change in April 2007.

The Proponent's Biodiversity Offset Strategy has been assessed against each of the 13 principles as follows.

Principle 1 - Impacts must be *avoided first* by using prevention and mitigation measures.

> *Offsets are then used to address remaining impacts. This may include modifying the proposal to avoid an area of biodiversity value or putting in place measures to prevent offsite impacts.*

The Proponent proposes to satisfy this principle by reducing the total area of extraction by removing Stage 1/3 from the extraction program and in doing so would avoid the impacts on the flora and fauna habitat in that 2ha area. This area was selected for retention given it is the area in which both the Eastern Pygmy-possum and Red-crowned Toadlets were recorded by Kendall and Kendall and it provides a useful corridor between the vegetation retained on the southern and northern sides of the Project Site.

Principle 2 - All regulatory requirements must be met.

> *Offsets cannot be used to satisfy approvals or assessments under other legislation, e.g. assessment requirements for Aboriginal heritage sites, pollution or other environmental impacts (unless specifically provided for by legislation or additional approvals).*

The Proponent's biodiversity offset strategy satisfies this principle as its main focus is to offset the direct ecologically-related impacts that will arise throughout the life of the project.

Principle 3 - Offsets must never reward ongoing poor performance.

> *Offset schemes should not encourage landholders to deliberately degrade or mismanage offset areas in order to increase the value from the offset.*

It remains the Proponent's objective to maximise the recovery of sand from the proposed areas of disturbance. The preparation and implementation of a Vegetation and Threatened Species Management Plan for the entire Project Site will ensure that all efforts are made to protect the vegetation and habitats in perpetuity.

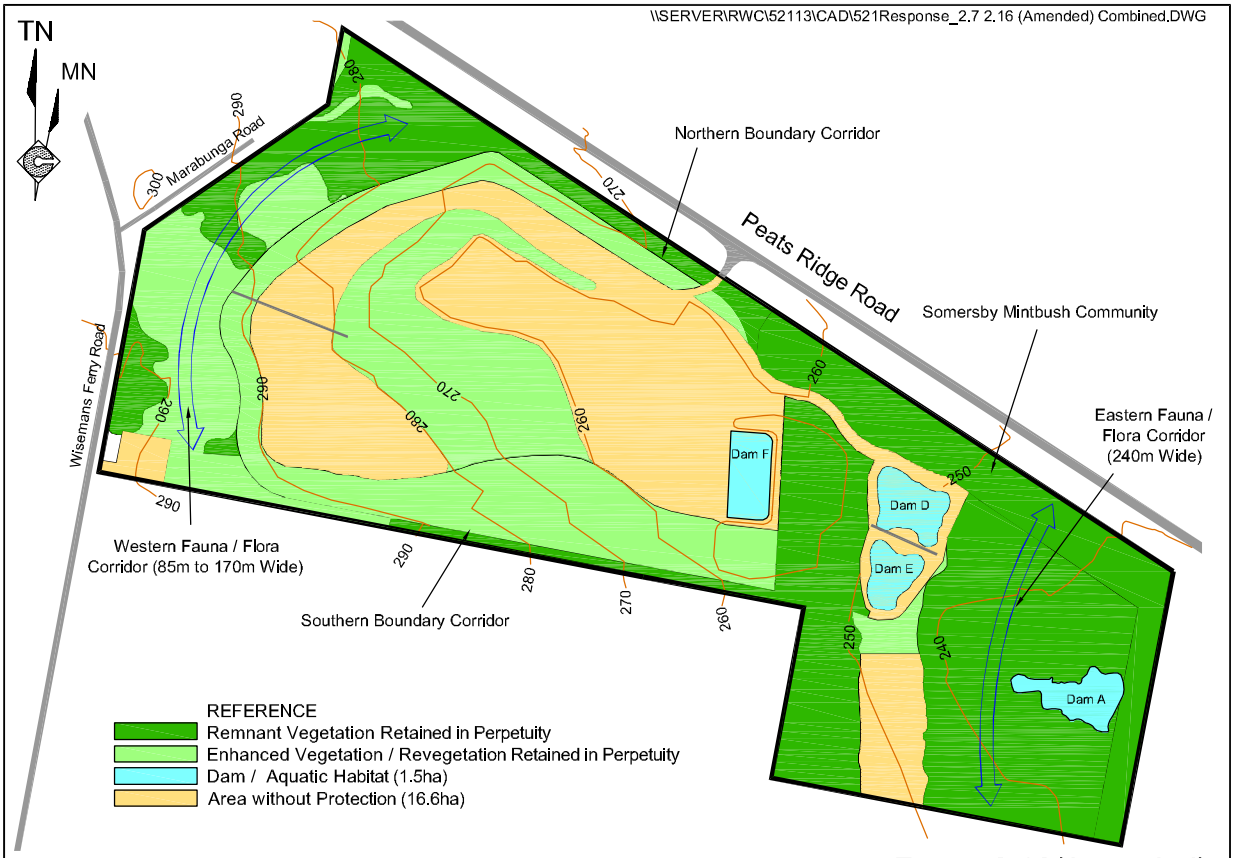

Figure 2.16(Amended)
AMENDED BIODIVERSITY
OFFSET STRATEGY

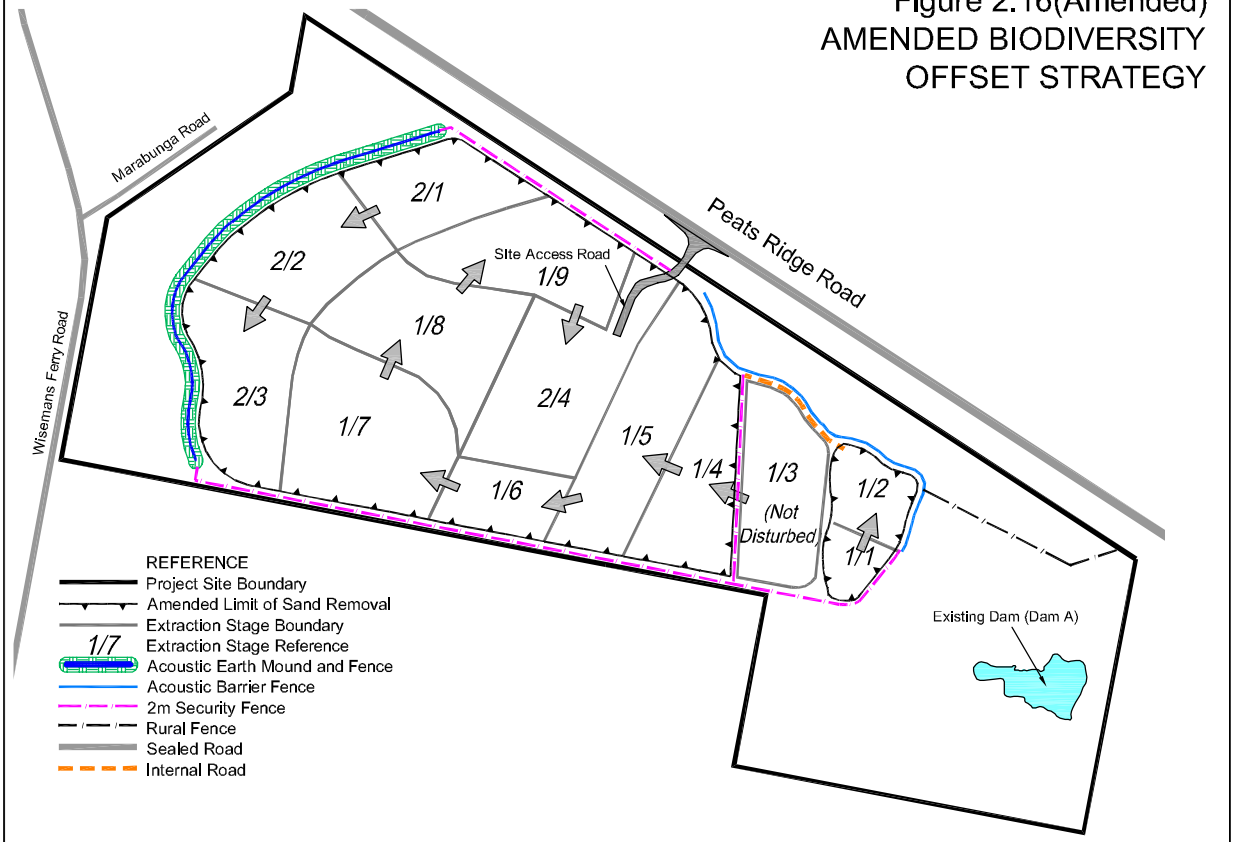

Figure 2.7(Amended)
SAND REMOVAL SEQUENCE
- STAGES 1 AND 2

Principle 4 - Offsets will complement other government programs.

A range of tools is required to achieve the NSW Government's conservation objectives, including the establishment and management of new national parks, nature reserves, state conservation areas and regional parks and incentives for private landholders.

This principle will be satisfied by the Proponent securing land beyond the Project Site which has comparable ecological attributes to the land cleared of vegetation on the Project Site.

Principle 5 - Offsets must be underpinned by sound ecological principles.

They must:

include the consideration of structure, function and compositional elements of biodiversity, including threatened species;

enhance biodiversity at a range of scales;

consider the conservation status of ecological communities; and

ensure the long-term viability and functionality of biodiversity.

Biodiversity management actions, such as enhancement of existing habitat and securing and managing land of conservation value for biodiversity, can be suitable offsets. Reconstruction of ecological communities involves high risks and uncertainties for biodiversity outcomes and is generally less preferable than other management strategies, such as enhancing existing habitat.

The proposed offsets have been identified based upon sound ecological advice from Kendall and Kendall Ecological Services and the University of Newcastle. This particularly relates to the component of the biodiversity offset strategy involving the removal of Stage 1/3 from the proposed extraction program. It is also noted that the area of suitable habitat for Red-crowned Toadlets remaining on the Project Site will be approximately 8.6ha or approximately 40% of the overall potential suitable habitat on the Project Site and a comparatively small proportion of the potential habitat on the Somersby Plateau. It is also noted that approximately 60% of the western fauna and flora corridor is to be enhanced through the progressive removal of remnant pine trees and other weeds and replacement with native species consistent with those present on the Somersby Plateau Forest.

Principle 6 - Offsets should aim to result in a net improvement in biodiversity over time.

Enhancement of biodiversity in offset areas should be equal to or greater than the loss in biodiversity from the impact site.

Setting aside areas for biodiversity conservation without additional management or increased security is generally not sufficient to offset against the loss of biodiversity. Factors to consider include protection of existing biodiversity (removal of threats), time-lag effects, and the uncertainties and risks associated with actions such as revegetation.

Offsets may include enhancing habitat, reconstructing habitat in strategic areas to link areas of conservation value, or increasing buffer zones around areas of conservation value and removal of threats by conservation agreements or reservation.

The proposed offsets will achieve the required net improvement in biodiversity over time as:

(i) 14.7ha of land with native vegetation (and incorporating 8.6ha of suitable habitat for the Red-crowned Toadlet) will be retained in perpetuity on the Project Site);

(ii) addtional land will be secured off site with comparable ecological attributes to the land cleared of native vegetation on the Project Site; and

(iii) a greater understanding would be achieved of the methods to re-create suitable habitat for the Red-crowned Toadlet. This would be incorporated in a Recovery Plan for the species.

It is noted that the various improvements referred to above equally apply to other species eg. Eastern Pygmy-possum.

Principle 7 - Offsets must be enduring – they must offset the impact of the development for the period that the impact occurs.

As impacts on biodiversity are likely to be permanent, the offset should also be permanent and secured by a conservation agreement or reservation and management for biodiversity. Where land is donated to a public authority or a private conservation organisation and managed as a biodiversity offset, it should be accompanied by resources for its management. Offsetting should only proceed if an appropriate legal mechanism or instrument is used to secure the required actions.

The offsets proposed are designed to achieve long term positive results well beyond the operational life of the Somersby Fields Project, ie. in perpetuity.

Principle 8 - Offsets should be agreed prior to the impact occurring.

Offsets should minimise ecological risks from time-lags. The feasibility and in-principle agreements to the necessary offset actions should be demonstrated prior to the approval of the impact. Legal commitments to the offset actions should be entered into prior to the commencement of works under approval.

The offsets proposed would be embodied in the Project Approval for the Somersby Fields Project, should the Project be approved.

Principle 9 - Offsets must be quantifiable – the impacts and benefits must be reliably estimated.

Offsets should be based on quantitative assessment of the loss in biodiversity from the clearing or other development and the gain in biodiversity from the offset. The methodology must be based on the best available science, be reliable and used for calculating both the loss from the development and the gain from the offset. The methodology should include:

- *the area of impact;*
- *the types of ecological communities and habitat/species affected;*
- *connectivity with other areas of habitat/corridors;*
- *the condition of habitat;*
- *the conservation status and/or scarcity/rarity of ecological communities;*

- *management actions; and*
- *level of security afforded to the offset site.*

The best available information/data should be used when assessing impacts of biodiversity loss and gains from offsets. Offsets will be of greater value where:

- *they protect land with high conservation significance;*
- *management actions have greater benefits for biodiversity;*
- *the offset areas are not isolated or fragmented; and*
- *the management for biodiversity is in perpetuity (e.g. secured through a conservation agreement).*

Management actions must be deliverable and enforceable.

Each of the components of the biodiversity offset package have been quantified.

Principle 10 - Offsets must be targeted.

They must offset impacts on the basis of like-for-like or better conservation outcome. Offsets should be targeted according to biodiversity priorities in the area, based on the conservation status of the ecological community, the presence of threatened species or their habitat, connectivity and the potential to enhance condition by management actions and the removal of threats. Only ecological communities that are equal or greater in conservation status to the type of ecological community lost can be used for offsets. One type of environmental benefit cannot be traded for another: for example, biodiversity offsets may also result in improvements in water quality or salinity but these benefits do not reduce the biodiversity offset requirements.

The 14.7ha on-site vegetation exceeds the area of vegetation to be removed by approximately 4ha. It is further noted that the Proponent has committed to secure land off site with comparable ecological attributes to the land cleared of native vegetation on the Project Site.

Principle 11 - Offsets must be located appropriately.

Wherever possible, offsets should be located in areas that have the same or similar ecological characteristics as the area affected by the development.

The offsets proposed are all located on the Somersby Plateau recognised to have comparable ecological values to those on the Project Site.

Principle 12 - Offsets must be supplementary.

They must be beyond existing requirements and not already funded under another scheme. Areas that have received incentive funds cannot be used for offsets. Existing protected areas on private land cannot be used for offsets unless additional security or management actions are implemented. Areas already managed by the government, such as national parks, flora reserves and public open space cannot be used as offsets.

Each of the components of the biodiversity offset package are not supplementary to any other scheme.

Principle 13 - Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.

> *Offsets must be audited to ensure that the actions have been carried out, and monitored to determine that the actions are leading to positive biodiversity outcomes.*

The offsets proposed would be embodied both in the Project Approval, should the Project be approved.

4.5 RESPONSE TO SUGGESTED CONDITIONS AND MODIFICATIONS TO COMMITMENTS

Comments

The following comments were provided commenting on specific commitments in Section 5 of the *Environmental Assessment* (Statement of Commitments). A brief response is provided to each, and where appropriate, the commitment has been adjusted – see Section 5 of this response.

Action 6.7 *states "All fallen and lopped native trees will be left on the ground within the fauna flora conservation areas". Why should native trees be lopped within the fauna and flora conservation areas?* – **Response:** Action 6.7 (renumbered to Action 6.8) has been amended to clarify that all fallen and lopped native trees will be **placed** on the ground….

Action 14.6 *states "Finalise a Voluntary Conservation Area along the Peats Ridge Road reserve as shown in Figure A. The action should be reworded to make it clear that the proposed VCA adjoins and does not form part of the Peats Ridge Road reserve. Figure A does not identify a VCA, nor its proposed size.* – **Response:** This action has been reworded to clarify the intent that the VCA (at the request of the DECC) is confined to the Project Site. It is indeed unfortunate that the cooperation sought between the Gosford City Council and the Proponent is not encouraged by the DECC.

Action 14.7 *states "Translocate as many as possible of the Prostanthera junonis plants…" the criteria for determining "as many as possible" must be determined. Section 4.6.6.2 of the EA states that "The Proponent intends to conduct a … translocation program for these plants…" (Hibbertia procumbens, in the areas of sand removal). However, this proposed action is not identified in the draft SC. DECC would require further details regarding the proposed translocation process, numbers to be transplanted and potential impact to the VCA and any mitigation measures implemented to minimise such an impact.* – **Response:** Action 14.7 has been reworded to reflect that translocation is intended for "all identified" *Prostanthera junonis* plants …. It is intended that the details of the translocation program would be incorporated in the Vegetation and Threatened Species Management Plan.

Action 14.8 *states "Support appropriate monitoring research projects…". "Support" needs to be defined in the context of the type of support (ie. funds, administrative, general) and the quantum of support. "Appropriate" needs to be defined and / or an organisation identified as responsible for determining what is covered by "appropriate". Additionally, DECC would require an indication of financial commitment to this process.* – **Response:** This action has not been modified at this stage. It is however the intention of the Proponent to identify meaningful research projects relating to the *P. junonis* throughout the life of the Project which will be reflected in the relevant revisions of the Vegetation and Threatened Species Management Plan.

Action 14.13 *states "Place a Section 88B covenant over the areas nominated on Figure 2.16". No reference is made to what management actions would be implemented over the s88B area, the longevity of such a covenant, who would be responsible for these actions and what funding would be provided by the proponent to implement these actions.* – **Response:** This action has been modified to reflect the Proponent's commitment to protect vegetation in perpetuity as shown on Figure 2.16 (Amended).

Action 15.1 *states "Retain and augment the buffer strip between the Project Site and Peats Ridge Road". No definitions of "retain" and "augment" are provided. It is not clear what area is being referred to, given that the land between the Project Site and Peats Ridge road is a reserve unde the control of the Council. No indication of the proposed future land tenure and management of the "buffer strip" has been provided. In general terms, Departmental practice recommends that buffers be a minimum of 50 metres when adjacent to 'environmentally sensitive areas' (eg. road reserves).* – **Response:** Action 15.1 (Renumbered as Action 15.2) has been modified to "retain and enhance" where appropriate the buffer strip….. Details of this Action will be incorporated in the Vegetation and Threatened Species Management Plan.

Action 15.2 *states "Retain the natural habitat on the eastern boundary of the Project Site". The exact location and dimensions of the area referred to are not provided. No indication of the proposed future land tenure and management of the "buffer strip" has been provided.* – **Response:** Action 15.2 (Renumbered as Action 15.3) has been modified to better specify the area involved namely "the "natural habitat on the eastern side of the Project Site" identified as the eastern fauna / flora corridor (as shown on Figure 2.16 (Amended)).

Action 15.4 *states "Rehabilitate the site sensitively". DECC notes that under Section 2.12 Site Rehabilitation and Biodiversity Offset Strategy that "the rehabilitation plan has been prepared…" However, the SC contains no reference to a Rehabilitation Plan as such.* – **Response:** Action 15.4 (Renumbered as Action 15.5) has been expanded to confirm that the rehabilitation will be undertaken in accordance with an approved Rehabilitation Procedures Manual.

Department of Environment and Climate Change

5 STATEMENT OF COMMITMENTS

The Proponent has compiled this section as an update of the Statement of Commitments that was included in the February 2008 Response to Submissions. The updated statement incorporates both new and modified commitments relating to ecological and related issues. Some additional minor modifications are provided in response to some matters raised and clarified at the recent Independent Hearing and Assessment Panel.

Table 5.1
Statement of Commitments for Site Operations and Management

Page 1 of 4

Desired Outcome	Action		Timing
1. Area of Activities			
All approved activities are undertaken in the area(s) nominated on the approved plans and figures.	1.1	The boundaries of the areas of sand removal will be surveyed and permanent markers placed at 50m intervals. Each marker will be numbered and its location recorded on the site layout plan.	Prior to any vegetation clearing within the sand removal areas.
	1.2	The locations of all security fencing and the far-western earth mound will be surveyed.	Prior to fence and earth mound construction.
	1.3	The centre line of the site access road will be surveyed and pegged.	Prior to construction of the site access road.
	1.4	The boundary of the processing area will be surveyed and pegged at 50m intervals.	Prior to the clearing of the processing area.
	1.5	The boundary of the Voluntary Conservation Area will be surveyed and pegged at 25m intervals to enable protective fencing to be erected.	Prior to any clearing activities on site.
	1.6	Stage 1/3 is to be removed from the approved sand removal area as part of the Proponent's Biodiversity Offset Strategy.	Entire project life (reflected in all project documentation).
2. Operating Hours – Site Establishment and Construction			
Construction activities managed in accordance with the approved operating hours.	2.1	Earthmoving Activities: 7:00am to 6:00pm Monday to Saturday.	Continuous.
	2.2	Non-audible maintenance and equipment installation: 6:00am to 10:00pm Monday to Saturday.	Continuous.
	2.3	Construct the far-western earth mound and acoustic barrier during proclaimed school holidays only (see also Item 10.6).	Establishment of operations.
3. Operating Hours – Operations			
Operating hours of work managed in accordance with the approved consent conditions.	3.1	Sand removal and processing: 7:00am to 6:00pm Monday to Saturday.	Continuous
	3.2	Product transportation: 5:00am to 10:00pm Monday to Friday; 5:00am to 4:00pm Saturday.	Continuous
	3.3	Non-audible maintenance: 5:00am to 10:00pm Monday to Saturday.	Continuous

Table 5.1 (Cont'd)
Statement of Commitments for Site Operations and Management

Desired Outcome	Action		Timing
4. Workforce Competencies and Training			
All employees and contractors are trained and assessed as competent to undertake those activities influencing the environment.	4.1	All employees and contractors will be required to demonstrate competency for any task undertaken on site.	Prior to commencement of activity.
	4.2	In the event that the required level of competency has not been achieved, training would be provided or sought.	Following an assessment of competency.
5. Waste Management			
Manage fuel and oils on site to prevent leakage and soil contamination.	5.1	Install and maintain appropriately sized and designed bunds around all oil / fuel storages on site unless double-lined tanks are used.	During construction phase.
	5.2	Install concrete floors on all maintenance areas.	During construction phase.
	5.3	Collect all used oils in one location and employ a specialist collection / recycling contractor for such products.	Continuous.
Minimise general waste and recycle wherever possible.	5.4	Install separate containers for the collection of recyclable items and employ a recognised licenced recycling contractor for collection.	Continuous.
	5.5	Employ a licensed waste collection contractor for all general waste / garbage at least on a weekly basis.	Continuous.
6. Bushfire Management			
Manage the Project Site in a manner that minimises the risk of creating a bushfire or allowing a bushfire to travel through the site.	6.1	Install on site pumping facilities and appropriate hoses from Dam A for use in bushfire fighting.	During construction phase.
	6.2	Ensure that the Somersby Bushfire Brigade visits the site each year to be fully aware of water storage on site and access, if required for fire-fighting purposes.	Annually.
	6.3	Allow water in all dams to be used for bush fire fighting efforts.	Continuous.
	6.4	Ensure there is a permanent cleared zone around the processing plant and that all on-site mobile equipment are fitted with fire extinguishers maintained to the manufacturer's specifications.	During construction phase and ongoing.
	6.5	Ensure the entire site is a "No Smoking" area.	Continuous.
	6.6	Require, as a condition of employment, that there be "No Smoking" by employees, during employment hours and while on or in Company property.	As each person is employed.
	6.7	Construct and maintain a service vehicle accessway generally around the perimeter of the site.	As required.
	6.8	All fallen and lopped native trees will be placed on the ground within the fauna and flora conservation areas.	As required.
7. Documentation			
All operational procedures are documented to ensure consistency in implementation throughout the project life.	7.1	Operational procedures will be prepared for each site activity that could potentially impact upon the local environment.	All procedures would be compiled prior to the commencement of the nominated activity.

Table 5.1 (Cont'd)
Statement of Commitments for Site Operations and Management

Desired Outcome	Action		Timing
7. Documentation (Cont'd)			
A systematic set of documents is in place to guide the planning and implementation of all necessary environmental strategies.	7.2	An environmental management strategy will be prepared to record the set of documents required throughout the life of the project and the trigger points for their preparation.	Prior to the commencement of site activities.
All operational procedures relevant to site establishment and construction activities are prepared.	7.3	Procedures manuals will be prepared relating to: – Protection of Threatened Species; – Vegetation Clearing; – Soil Stripping and Stockpiling; – Operation of Earthmoving Equipment; – Installation of Sediment Controls; – Revegetation Activities; – Translocation of Threatened Species; – Hydrocarbon Management; and – Environmental Monitoring.	Prior to commencement of nominated activity.
All operational procedures relevant to site operations and product transportation are in place.	7.4	Procedures manuals will be prepared relating to: – Site Security; – Operation of the Wash Plant; – Operation of the Mortar Sand Plant; – Operation of the Filter Press; – Placement of dewatered clay fines; – Rehabilitation; – Operation and Maintenance of the Wheel Wash Facility; – Fire fighting; – First aid; – Environmental Monitoring; and – Driver's Code of Conduct. – Maintenance, monitoring and data collection in relation to all environmental monitoring equipment.	Prior to commencement of nominated activity. Each manual would be reviewed and updated biennially.
An annual report is prepared for government agencies and the community.	7.5	The annual environmental management report will report on the activities and environmental monitoring conducted during the reporting period and the planned activities and environmental monitoring for the ensuing 12 months.	Submitted within 2 months of the completion of the reporting period.
Annual production data is provided to the Mineral Resources Division of the Department of Primary Industries.	7.6	Data recording the quantity and value of construction materials produced on site will be compiled on the form supplied.	Annually
A biannual newsletter regarding the project's progress and performance.	7.7	Compile a summary of each annual environmental management report for circulation as a newsletter to the local community.	Prepare and circulate at the time when the annual report is prepared and 6 months thereafter.
	7.8	A similar summary document will be prepared for the intermediate 6 month period.	

Table 5.1 (Cont'd)
Statement of Commitments for Site Operations and Management

Desired Outcome	Action		Timing
7. Documentation (Cont'd)			
A biannual newsletter regarding the project's progress and performance.	7.9	Each newsletter will be circulated to interested surrounding residents and posted on the Proponent's web site.	
All insurance aspects.	7.10	Ensure all necessary insurance cover is in place.	Commencement and continuous.

Table 5.2
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action		Timing
8. Groundwater			
Ongoing monitoring of groundwater throughout the life of the project and effective communication of results to land owners within 1km of the Project Site.	8.1	Install, maintain and monitor four permanent groundwater monitoring wells generally at the locations shown on **Figure B**.	As part of the construction phase.
	8.2	Establish baseline data for 15 representative bores on properties surrounding the project site.	Prior to the commencement of sand removal.
	8.3	Provide all monitoring results to interested land owners within 1km of the Project Site together with a comparison of groundwater levels and those predicted on the groundwater computer model developed by RCA Australia (see Commitment 18.2).	Annually
	8.4	Communicate with any land owner who could be affected by the monitored groundwater saturation thickness if it is more than 10% below the level forecast in the groundwater computer model.	As required.
Existing registered bores demonstrated to be affected by the project (see 8.6) are either deepened or re-drilled to provide a water supply comparable or better than from the existing bore.	8.5	Maintain a water supply to Somersby Public School by providing an improved / deeper bore for the Department of Education and Training (or other agreed arrangements) to address the reduction of the saturated groundwater thickness at the bore on the Somersby School property. Other arrangements could include the supply of water from the Somersby Fields Site.	Before construction phase commences.
	8.6	Land owners whose registered bores are shown by monitoring to experience a reduction in saturated thickness of more than 10%, as a result of the project, will have their groundwater bore deepened and /or re-drilled.	Progressively.
Alternative sources of water are provided to those land owners with spring water flows that are adversely affected by the project.	8.7	Provide alternative water supply arrangements with all such land owners or other nominated compensation.	Written undertakings have already been provided to six land owners. The alternative water supply would be provided when monitoring results indicate that project activities have commenced influencing the integrity of the nominated spring.

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action		Timing
8. Groundwater (Cont'd)			
Manage the impact of the project on groundwater and in a manner that minimises the effect on other land owners.	8.8	Participate actively in the Somersby Plateau Cumulative Impacts Consultative Committee.	Continuous
	8.9	Ensure final landform and revegetation is planned so that the long term predicted groundwater levels are achieved as soon as possible.	Continuous
9. Surface Water			
Maintain low flows beyond Dam A into the DPI Dam.	9.1	Construct a weir and install an overflow pipe to direct small surface flows around Dam A.	During the site establishment period.
Record baseline water quality.	9.2	Monitoring will include: Measurement of pH, EC, TSS, major cations/anions at representative surface water occurrences.	Prior to commencement of site establishment and construction.
Record water quality during site establishment and construction.	9.3	Monitoring will include: Measurement of pH, EC, TSS, Oil and Grease at overflow from Dam A.	Monthly / events.
Record water quality during life of operations.	9.4	Monitoring will include: Surface Water Quality: Measure pH, EC, TSS, Oil and Grease from overflow from Dam A.	Quarterly / events.
10. Noise			
Project is designed to minimise noise impact on all adjoining land owners.	10.1	On-site acoustic barriers and earth mounds will be constructed as per Appendix E of Part 7 of the *Specialist Consultant Studies Compendium*.	Far-western and Northeastern barriers - during the early stages of the construction phase. Mid-western barrier – prior to Stage 1/7.
	10.2	Enclose and operate the wash plant within a building.	In the early stages of construction phase.
	10.3	Use alternative warning systems to reversing alarms on all on-site mobile plant.	Continuous
	10.4	Ensure that the best available technology and best management practices are used to minimise adverse acoustical impacts.	Continuous
Construction phase will be planned and timed to minimise noise impacts on neighbours.	10.5	Acoustic barriers and earth mounds will be among the first items to be constructed.	During construction phase.
	10.6	Construction of the far-western earth mound nearest to Somersby Public School will be conducted during proclaimed school holidays.	During construction phase.
Noise monitoring will be undertaken and the results reported to neighbours.	10.7	Noise monitoring will be undertaken at those locations recommended in Part 7 of the *Specialist Consultant* Studies *Compendium* or as adjusted by the Environment Protection Licence or project approval.	At intervals agreed with DEC.
Note: Full details of all groundwater monitoring to be undertaken will be included in the Groundwater Management Plan for the project.			

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action		Timing
10. Noise (Cont'd)			
Noise monitoring will be undertaken and the results reported to neighbours.	10.8	Provide results of noise monitoring to neighbours.	Quarterly (if no exceedance) Within 1 week (if exceedance)
	10.9	Noise monitoring results will be included in the reports to the School Principal and the Parents and Citizens Association as per 10.7.	Monthly.
A 24-hour telephone number will be available to receive any noise complaints. These complaints will be answered quickly with the results of relevant noise monitoring made available to the complainant.	10.10	Complaints on noise will be logged and managed in the manner recommended in Sections9.5.2 and 9.5.3 of Part 7 of the *Specialist Consultant* Studies *Compendium*.	Continuous
Negotiated agreements will be in place with the neighbours who may be impacted by noise in excess of the noise criteria assessment levels.	10.11	Seek to finalise undertakings with B&L Daniel (Location N)	Before the commencement of Stage 2.
Record parameters of the local environment being affected during site establishment and construction.	10.12	Monitoring will include: Record $L_{Aeq\ (15\ minute)}$ noise levels from operations at Sites SN-1 to SN-4 or at any other site nominated in the project approval or Environment Protection Licence.	Related to activity.
Employees and contractors will be sensitive to the noise impacts on neighbours.	10.13	All hours of work will be strictly within approved limits (i.e. mobile plant / truck engines will not be started before these nominated hours).	Continuous
	10.14	Reversing alarms will not be fitted to any equipment used on site.	Continuous
	10.15	Induction of staff will highlight noise management responsibilities of every employee / contractor.	As required.
Record parameters of the local environment being affected by the operation.	10.16	Monitoring will include: Record $L_{Aeq\ (15\ minute)}$ noise levels from operations and $L_{Aeq\ (1\ hour)}$ from transport operations.	Quarterly for first 2 years (subject to review after 2 years) / related to activity.
11. Air Quality			
Operate in a manner that ensures all air quality standards in the Environment Protection Licence are fully met.	11.1	Seal those roads on site that are to be used by delivery trucks and light vehicles (see **Figure A**).	During the construction phase.
	11.2	Keep sealed roads clean and water all other on-site access ways up to five times per day, as required.	Operational Days (subject to weather).
	11.3	Water stockpiles and exposed sandy areas to minimise dust.	As required.
	11.4	Minimise area of exposed ground.	Continuous.
	11.5	Progressively rehabilitate / stabilise available areas of disturbance.	Continuous
	11.6	Enclose processing plant for washing and screening within a building.	During construction phase.

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action		Timing
11. Air Quality (Cont'd)			
Ensure the impact on air quality at the Somersby Public School is minimised and remains better than any threshold level established by the DECC.	11.7	Report the air quality monitoring results to the School Principal and the Parents and Citizens Association.	Monthly.
	11.8	Provide access for the School Principal and the Parents and Citizens Association to the Proponent's air quality consultants.	6 monthly (if requested).
	11.9	Develop an early warning alert reporting system with the School Principal and the Parents and Citizens Association for the air quality monitored at or near the School which identifies periods when the 24 hour PM_{10} dust levels attributable to "natural" and potentially the project-related contribution is >40µg/m^3.	As needed.
	11.10	Based on the most up-to-date experience and reported scientific results, re-run the air quality model (adjusted if necessary) reporting the results to the School Principal and the Parents and Citizens Association as shown.	Once during construction phase. Annually in Stage 1. Every 6 months in Stage 2.
	11.11	Report the re-runs of the model to the NSW Department of Planning.	As above.
Undertake continuous monitoring to confirm that the nominated air quality goals are being met by the project.	11.12	Monitoring will include: – Maintaining existing deposited dust gauges at Sites SD-1 to SD-5 (see **Figure B**) or at other approved locations and PM_{10} monitor at an agreed site (subject to periodic review for relevance). – Establish a continuous PM_{10} dust monitor (such as a TEOM monitor) at the Somersby Public School or an alternative agreed location. – On-site meteorological monitoring will be undertaken to record relevant parameters.	Deposited dust – monthly. PM_{10} – continuous. Continuous.
	11.13	Maintain a register of air quality concerns and record action taken.	As required
Ensure immediate land owners are aware of results of dust monitors.	11.14	Provide the results of dust and meteorological monitoring to the owners of properties where dust monitors are installed.	Quarterly.
12. Health Issues			
Ensure the pupils and staff at Somersby Public School experience only negligible changes in silica exposure.	12.1	Monitor dust (PM_{10}) prior to the commencement of sand extraction to establish continuous background levels for PM_{10} and silica.	For a period of one month at least one month prior to the commencement of sand removal activities.
	12.2	Monitor dust (PM_{10}) and if PM_{10} concentrations measured at the PM_{10} continuous monitor exceeds 40µg/m^3 throughout the agreed period, the major dust generating activities on site will be curtailed until the PM_{10} dust level has reduced to a level less than 40µg/m^3 for a period of > 30 minutes.	PM_{10} –continuously.

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action		Timing
12. Health Issues (Cont'd)			
Ensure the pupils and staff at Somersby Public School experience only negligible changes in silica exposure.	12.3	Analyse PM_{10} samples from a high-volume sampler to establish the concentration of silica in the dust collected at the PM_{10} monitoring location.	Initially monthly for 12 months – subject to review and consultation with NSW Health.
	12.4	Provide a silicosis and health impact report each year to the School Principal and the Parents and Citizens Association.	Annually.
Surrounding land owners are kept informed annually regarding monitored dust levels.	12.5	Undertake an annual review of 24 hour average PM_{10} levels and deposited dust levels and relate to deposited dust levels at other sites.	Annually.
Ensure all site employees and contractors are fully protected against the risk of respirable silica.	12.6	Monitor occupational respirable silica regularly on site with the frequency to be determined by the results obtained and discussions with WorkCover.	Continuous
	12.7	If the results exceed the NOHSC standard of $0.1mg/m^3$ TWA, immediately cease operations until the exposure can be managed and reduced via isolation of the employee from the source, engineering controls, administrative controls and personal protective equipment or a combination of all of these actions.	As required.
13. Traffic and Transport			
Somersby Public School staff and pupils are not affected by traffic from the project and in a way that endangers their safety.	13.1	Construct the entrance to the Project Site in accordance with the RTA-approved design that will prevent trucks from turning left when exiting the Project Site.	From the start of construction (with temporary arrangements until permanent arrangements constructed).
	13.2	Require all trucks without exception to travel to and from the site entrance to the F3 directly on Peats Ridge Road.	From start of construction and throughout the entire project.
	13.3	Require all truck drivers to sign contracts that they will be dismissed if they break any road rule while driving on Peats Ridge Road or any Somersby local road – particularly in the event they disobey Action 13.2.	On engagement of each driver.
Trucks enter and exit site (on Peats Ridge Road) without incidents and have the minimum effect on traffic flow.	13.4	Construct the site entrance intersection in Peats Ridge Road as per Figure 12 in report (Cardno (NSW) Pty Ltd – Part 8 of the Specialist Consultant Studies Compendium).	At the start of the construction phase.
	13.5	Instruct drivers on need to enter Peats Ridge Road traffic flow safely when a gap in traffic exists.	On engagement of each driver.

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action		Timing
13. Traffic and Transport (Cont'd)			
Truck noise is confirmed to be approved hours of operation and is measured and does not breach noise consent standard. (See also Actions 10.13 to 10.15).	13.6	Ensure all truck drivers do not exit the F3 onto Peats Ridge Road prior to 5:00am (re-inforced in the Code of Conduct).	On engagement of each driver.
	13.7	Ensure all drivers are aware of all relevant approval conditions for the project and enforce those conditions.	On engagement of each driver.
	13.8	Provide a 24-hour telephone number for complaints re: trucks and truck noise.	Continuous.
	13.9	Require drivers to avoid the use of compression braking on Peats Ridge Road.	Continuous.
	13.10	Limit truck movements during early morning and late evenings to maximum levels specified in Section 2.7.4 of the *Environmental Assessment* or to levels required to meet noise criteria at affected residences.	Continuous.
	13.11	Establish a register to record complaints and note remedial action taken.	Continuous.
Environmental impact of trucks is minimal and does not breach approval standards.	13.12	Ensure wheel wash is always clean, effective and used by all trucks.	Continuous.
	13.13	Ensure trucks are well maintained to minimise exhaust emissions.	Continuous.
Best practice traffic and transport management is used both on-site and off-site.	13.14	Implement all recommendations by Traffic Specialist Consultant (Cardno (NSW) Pty Ltd) on Tables 14 and 15 of their report (Part 8 of the Specialist Consultant Studies Compendium).	Continuous.
14. Flora Management			
The Proponent will ensure that its operations are carried out in a manner that provides the best safeguards for flora.	14.1	Only disturb/clear vegetation in the area of sand removal for the next 12 months.	Each clearing campaign.
	14.2	Transfer topsoil, wherever possible, directly onto final rehabilitation areas in order to maximise seed stock retention.	Soil removal campaigns.
	14.3	Collect seeds from felled vegetation for future revegetation programs.	Each clearing program (subject to appropriate season).
	14.4	Undertake a program of weed control.	Continuous
	14.5	Remove all pine trees and exotic grasses on the Project Site and progressively replace with mixed Eucalypt woodland species.	During Stages 1 and 2.
Long-term retention and protection for the majority of the population of *Prostanthera junonis* on the Project Site.	14.6	Finalise and establish a Voluntary Conservation Area on the Project Site adjacent to the Peats Ridge Road boundary as shown in *Environmental Assessment* **Figure 2.4**.	At the start of construction period.
	14.7	Translocate as many as possible of all identified *Prostanthera junonis* plants from the sand removal area to the Voluntary Conservation Area or eastern and western fauna / flora corridors. The translocation program will be the subject of a separate procedures manual prepared in consultation with the DECC.	As clearing extends into area of isolated *Prostanthera junonis.*

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action		Timing
14. Flora Management (Cont'd)			
Long-term retention and protection for the majority of the population of *Prostanthera junonis* on the Project Site.	14.8	Support appropriate monitoring research projects consistent with the Recovery Plan for *Prostanthera junonis.*	Continuous
	14.9	Improve the habitat on site by removing pine trees, exotic grasses and weeds from the buffer areas surrounding the area of sand removal.	During Stage 1 and Stage 2.
Long-term retention and protection of Black Eyed Susan *(Tetratheca glandulosa)* on the Project Site	14.10	Extend the Voluntary Conservation Area to cover the area in which the Black Eyed Susan is located.	At the start of the construction phase.
Long-term retention and protection of valuable native trees and bushland along the eastern boundary of the Project Site.	14.11	Provide a 30m wide buffer zone along the eastern boundary of the Project Site (see **Figure A**). This buffer zone coincides with the area with some archaeological sensitivity and would be preserved within Voluntary Conservation Area.	At the start of the construction phase.
	14.12	Inform all contractors and employees about the various buffer zones and that they are not to be entered except for specific operational purposes.	Continuous
Long term protection of areas of enhanced native vegetation and native revegetation.	14.13	Place a Section 88B covenant over the areas nominated on **Figure 2.16**.	At the completion of all rehabilitation activities.
15. Fauna Management			
Protect natural habitat and threatened species on the site and retain maximum natural vegetation.	15.1	Retain and augment the buffer strip between the Project Site and Peats Ridge Road.	Continuous
	15.2	Retain the natural habitat on the eastern boundary of the Project Site.	Continuous
	15.3	Preserve the main area of *Prostanthera junonis* via a Voluntary Conservation Agreement.	Continuous
	15.4	Rehabilitate the site sensitively.	Progressively throughout project life
	15.5	Minimise all sediment to the headwaters of four creeks on the site.	Continuous
	15.6	Remove the exotic pines beyond the sand removal area in the southwestern corner of the Project Site.	Progressively throughout Project Life.
Retain the natural habitat on the eastern side of the Project Site.	15.7	Protect and enhance existing vegetation to create the eastern fauna / flora corridor.	Progressive / continuous.
	15.8	Exclude employees and contractors from entering this area except for specific operational purposes.	Continuous
	15.9	Retain all native trees and the diverse fauna in the area east of Dam A.	Continuous
Retain remnant vegetation on the western side of the Project Site and replace exotic vegetation with native vegetation.	15.10	Progressively remove all Radiata Pine and weeds from western side of Project Site to create the western fauna corridor.	Progressive / continuous.
	15.11	Transfer biomass and topsoil from sand removal areas to corridor.	Progressive / continuous.

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action		Timing
15. Fauna Management (Cont'd)			
Adopt preventative management procedures to avoid injuries / harm to individual fauna.	15.12	Inspect hollow-bearing trees prior to their removal for the presence of hollow dependent fauna.	As required.
	15.13	Engage a wildlife carer during the felling of any hollow-bearing trees.	As required.
Protection of habitat for native animals is well managed.	15.14	Ensure honey bee hives are prohibited and removed from the site.	Continuous
	15.15	Avoid using *Gambusia holbrooki* in all dams / water storage for the control of mosquito breeding.	Continuous
	15.16	Wherever possible, place felled and fallen native timbers on rehabilitated areas as logs and ground cover habitats and refuges for native fauna.	Continuous
	15.17	Only remove vegetation in the areas of sand removal / operations / stockpiling / transport and do so in a timely manner to expose the least possible area at any point of time.	Continuous
	15.18	Relocate hollow logs from the areas of sand removal to undisturbed areas.	Continuous
	15.19	Ensure the two fauna corridors (eastern and western end) are always fenced.	Continuous
Install effective mitigation measures for threatened species	15.20	Install nesting boxes suitable for use by Eastern Pygmy-possums.	Prior to removal of any hollow-bearing trees.
Completion of rehabilitation areas in a manner able to provide habitat for native animals.	15.21	Achieve a standard of rehabilitation that will encourage native animals to recolonise in the revegetated landform.	Throughout rehabilitation program.
	15.22	Identify opportunities to recreate suitable habitat for Red-crowned Toadlets adjoining known suitable habitat areas on and adjacent the Project Site.	During rehabilitation of Stage 1.
Site is rehabilitated in a manner consistent with the habitat protection for native animals	15.23	Rehabilitate the site on a progressive basis throughout the life of the project.	Continuous
	15.24	Use seed stock from local trees that are consistent with the composition of the original local vegetation community in site rehabilitation.	Continuous
16. Biodiversity Offset Strategy			
The provision of a suite of measures to adequately offset the removal of 10.7ha of native vegetation and fauna habitat from the Project Site.	16.1	Retain 14.7ha of native vegetation including 2.0ha of land formally identified at Stage 1/3 in the sand removal program – to be protected in perpetuity by an instrument nominated by the Minister for Planning.	Entire project life.
	16.2	Enhance the western fauna / flora corridor by removing all non-native vegetation and progressively planting native vegetation throughout the corridor.	During the first five years of the project.
	16.3	Progressively rehabilitate 9.3ha of the area disturbed by sand removal to re-establish native vegetation communities similar to those existing on site.	Continuous.

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action		Timing
16. Biodiversity Offset Strategy (Cont'd)			
The provision of a suite of measures to adequately offset the removal of 10.7ha of native vegetation and fauna habitat from the Project Site.	16.4	17.5ha of enhanced vegetation (see 16.2 above) and revegetation in disturbed areas (see 16.3 above) will be protected in perpetuity using an instrument nominated by the Minister for Planning.	As nominated by the Minister.
	16.5	Secure in perpetuity an area of land with comparable ecological attributes to the land to be cleared of native vegetation on the Project Site.	Prior to the commencement of clearing.
	16.6	Support the preparation of the recovery plan for the Red-crowned Toadlet up to a value of $25 000.	Within the first five years of operation.
17. Visual			
It is not impossible for people to see sand removal / processing activities from the west (Somersby Public School); north (Peats Ridge Road) or east (Somersby Field Station).	17.1	Maintain the buffer zone on all these boundaries.	Continuous
	17.2	Design the entrance road with a curve so it is not possible to see the operation from the site entrance.	During construction phase.
	17.3	Work with Gosford City Council on the road reserve of Peats Ridge Road to maintain its health and density.	Continuous.
Apart from the exposure caused by the airstrip, maintain an adequate buffer zone to the south to prevent visual sighting of the operations.	17.4	Maintain the buffer zones as required on the southern boundary.	Continuous.
	17.5	Replant a 15m wide screen of native vegetation on the Ross property immediately south of the Project Site.	During Year 1 of operations.
	17.6	Replant promptly the area of pine trees near Wisemans Ferry Road on this boundary when they are removed, for replanting with natives.	As required.
18. Soils and Land Capability			
Soil material on site is used effectively in rehabilitation.	18.1	Strip areas required in the manner recommended in Part 11 of the Specialist Consultant Studies Compendium and store / re-use soils as per this report.	During each campaign.
19. Environmental Monitoring			
Record parameters of the local environment during site establishment and construction.	19.1	Monitoring will include:	
		• Surface Water Quality:- Measure pH, EC, TSS, Oil and Grease at overflow from Dam A.	Prior to activity / monthly / events.
		• Groundwater Levels	Automatic Water Level Recorder on four site piezometers. Quarterly in bores measured manually on adjoining properties.

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

Desired Outcome	Action	Timing
	19. Environmental Monitoring (Cont'd)	

Record parameters of the local environment during site establishment and construction.	• Groundwater Quality
	  ○ Field pH and EC in the four on-site piezometers.
	  ○ Full set of analytes in the four on-site piezometers.
	• Noise: Record $L_{Aeq\ (15\ minute)}$ from operations at Sites SN-1 to SN-4 260m from Somersby Public School (Stage 1) or at other sites nominated in the project approval or Environment Protection Licence.
	• Deposited Dust – Re-establish deposited dust gauges at Sites SD-1 to SD-5 260m from Somersby Public School (Stage 1) or at other sites nominated in the project approval or Environment Protection Licence (see **Figure B**).
	• PM_{10} – Establish a continuous PM_{10} monitor in an agreed location at or near the Somersby Public School.
		
		Monthly
		Annually
		Related to activity (in consultation with Somersby Public School.
		Monthly.
		Continuous measurements.

Record parameters of the local environment being affected during operations.	19.2 Monitoring will include:
	• Surface Water Quality: Measure pH, EC, TSS, Oil and Grease from overflow from Dam A.
	• Water Storage Volumes
	• Groundwater Levels
	• Groundwater Quality
	  ○ Field pH and EC in the four on-site piezometers.
	  ○ Full set of analytes in the four on-site piezometers.
	• Noise: Record LAeq (15 minute) from operations at sites SN-1 to SN-4 and LAeq (1 hour) from transport operations.
		
		Quarterly / events.
		Monthly.
		Automatic Water Level Recorder on four site piezometers.
		Quarterly in bores measured manually on adjoining properties.
		
		Monthly
		Annually
		Quarterly for first 2 years (subject to review after 2 years) / related to activity (in conjunction with Somersby Public School).

Table 5.2 (Cont'd)
Statement of Commitments for Management of Environmental Issues

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Desired Outcome	Action	Timing
19. Environmental Monitoring (Cont'd)		
Record parameters of the local environment being affected during operations.	• Deposited Dust: Maintain deposited dust gauges at Sites SD-1 to SD-5 260m from Somersby Public School (Stage 1) or at other sites nominated in the project approval or Environment Protection Licence. • PM10 – maintain the continuous PM10 monitor at nominated locations.	Continuous measurements.
Demonstrate dust and noise levels can satisfy DEC criteria during Stage 1 – at a comparable distance to that between Stage 2 and Somersby Public School.	19.3 Establish dust and noise monitoring approximately 260m from Stage 1 operations.	Following the date of commencement of operations – at the completion of site establishment.
Note: Full details of all monitoring to be undertaken will be included in the Environmental Monitoring Plan for the project.		

Table 5.3
Statement of Commitments for Community-Related Issues and Consultation

Page 1 of 2

Desired Outcome	Action	Timing
20. Indigenous Heritage		
Effective protection provided for archaeologically sensitive areas.	20.1 Provide buffer zone 30m wide along the eastern boundary of the Project Site (to be covered by a Section 88b commitment (see EA Figure 2.16).	At start of construction period.
Employees who are sensitive to and respectful of possible Aboriginal heritage on the site.	20.2 Inform all contractors and employees of the 30m buffer zone. 20.3 Inform all contractors and employees of their responsibility under the *National Parks and Wildlife Act 1974* if any bone, stone artefacts etc. are found.	From the start of their employment. From the start of their employment.
Pupils at Somersby Public School better understand local Aboriginal heritage.	20.4 Offer Somersby Public School the opportunity for pupils, under appropriate guidance, to visit the site and learn of Aboriginal heritage of Somersby areas.	From the 2nd year of operations.
21. Somersby Community Relationships		
Local Somersby community has confidence Somersby Fields is meeting the required environmental standards.	21.1 Establish a Community Consultative Committee (CCC). 21.2 Report to the CCC and in the community newspaper on environmental results. 21.3 Provide the CCC with access to specialist consultants to build credibility about the monitoring program.	Prior to construction commencing. Quarterly. Every 6 months (if requested).
To be a good contributory member of the local Somersby community.	21.4 Undertake annually a community and a school survey and report findings to the CCC and in the community newspaper. 21.5 Develop and publicise a Community plan and update it annually. 21.6 Provide easy access for residents to query / complain / respond on any aspect of the project.	Annually. Prior to construction commencing and then annually. Prior to construction commencing.

Table 5.3 (Cont'd)
Statement of Commitments for Community-Related Issues and Consultation

21. Somersby Community Relationships (Cont'd)			
To be a good contributory member of the local Somersby community.	21.7	Support local community events.	As appropriate.
	21.8	Commit that the site's end use will not be for hard rock quarrying or as a waste facility.	As part of approval process.
To achieve a good understanding and acceptance of the activities on the Project Site within the Somersby Public School community to avoid the need for counselling etc.	21.9	Develop a program with the school Principal and P & C Association to identify the most effective manner in which information about the project can be conveyed to the parents and students.	Prior to construction commencing and as often as required.
Support educational program at Somersby Public School and elsewhere.	21.10	Offer access for pupils to Voluntary Conservation Area as well as to other areas of educational interest re: geology, water chemistry etc.	As appropriate.
	21.11	Work with TAFE and other training organisations to encourage local take up of employment and support local employees to green light trade skills.	As appropriate.
Develop ways of operating which best meet the requests of the Somersby community.	21.12	Use the CCC Forum to develop ways to improve relationship with Somersby community.	Quarterly.
	21.13	Work with Gosford City Council's Cumulative Impact Consultative Committee for extractive industries on the Somersby Plateau.	As per committee meeting schedule.

Annexure 1

Supplementary Fauna Assessment for the Somersby Fields Project

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March / April 2008

FOREWORD

This fauna assessment report has been prepared for R.W. Corkery & Co. on behalf of the Somersby Fields Partnership and provides supplementary information required for the ecological fauna assessment for the Somersby Fields Project.

An original ecological fauna assessment was prepared by Countrywide Ecological Services (CES 2006), titled "Somersby Fields Project - Fauna Assessment (2006) the bulk of the field survey conducted for this assessment occurred in the year 2000. This supplementary report read should be read in conjunction with the original Countrywide Ecological Services report.

This report provides considerations of the requirements of Section 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act), in regards to threatened species recorded during the field survey conducted by the author in March 2008 and not recorded by Lim. This report also provides a detailed description of the survey methodology implemented and subsequent results, updated relevant searches of available data and TSC Act schedules eg Key Threatening Processes etc.

The author of this report is:

K. R. Kendall,
Principal Zoologist and Fauna Ecologist,
Kendall and Kendall Ecological Services Pty Ltd,

whose qualification is B.A (Biological Sciences) Macquarie University.

The information presented in this report is based on an objective study undertaken in response to a brief provided by the client. While every attempt has been made to ensure the accuracy and objectivity of the report, the variability of the natural environment and the paucity of comparative research data may require that professional judgment be applied in reaching conclusions.

The author recognizes that time constraints to prepare this report to meet reporting deadlines resulted in the assessment component of this report being of a preliminary nature. Additional time would have enabled the preparation of a more comprehensive assessment.

Nevertheless the substantive conclusions drawn in this report including the *Environment Planning and Assessment Act 1979* assessment of significance, completion of comprehensive survey and recommended ameliorative measures are detailed.

The author, accompanied by Mr. Russell Jago, conducted a field survey over the period of 20th February to 28th February 2008. On the 1st March 2008, the author accompanied by Ms. Penny Kendall conducted further fieldwork.

Any opinions expressed in the report are the professional opinions of the author. They are not intended to advocate any specific proposal or position.

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EXECUTIVE SUMMARY

1. This supplementary fauna assessment report is based on information gained from an additional fauna survey conducted for the Somersby Field Project.
2. This report provides considerations of the requirements of Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act), based on the findings of the supplementary survey.
3. An original ecological fauna assessment was prepared by Countrywide Ecological Services titled "Somersby Fields Project - Fauna Assessment 2006) (CES, 2006) although the bulk of the field survey was conducted in the year 2000.
4. The original survey work conducted by Countrywide Ecological Services predated the NSW Department of Environment and Climate Change (DECC) draft survey guidelines (DEC, 2004). Consequently in some regards, they do not meet the requirements of those guidelines.
5. Vegetation community descriptions identified by Robert Payne – Ecological Surveys and Management in 2006 were used as a basis to identify the broad fauna habitats of the Study Area.
6. Searches of the DECC threatened species website and liaison between a DECC officer, R.W. Corkery and the author identified target species for the supplementary survey.
7. No endangered fauna populations or critical habitat are listed for the Study Area under the TSC Act. A total of 25 threatened species are recorded on the DECC Wildlife Atlas.to have been identified within approximately 5km of the Study Area
8. A fauna survey was conducted by Kendall & Kendall Ecological Services over the period of 20th February to 1st March 2008.
9. The Kendall & Kendall Ecological Services survey provided records of 107 terrestrial vertebrate species including:
   - 2 common protected species reported by a neighbour but not detected during survey methodologies;
   - 2 "probable" but not confirmed microbat species identifications by Anabat microbat call analysis;
   - 1 observation of an unidentified snake species;
   - 4 introduced vertebrate species; and
   - 7 species listed as vulnerable under schedule 2 of the TSC Act, one of which was recorded outside of the Study Area.

   In addition, there were a number of visual observations of unidentified microbats during the survey.
10. The four introduced vertebrate species recorded by Kendall & Kendall Ecological Services were the House Mouse, Rabbit, Dog and Fox.

11. The seven species recorded by Kendall & Kendall Ecological Services listed as vulnerable under schedule 2 of the TSC Act recorded during the field survey were the:
    - Red-crowned Toadlet;
    - Gang-gang Cockatoo;
    - Grey-crowned Babbler (eastern subsp.);
    - Eastern Pygmy-possum;
    - Grey-headed Flying Fox;
    - Little Bent-wing Bat; and
    - Common Bent-wing Bat.

The Grey-crowned Babbler was recorded off site to the north of Peats Ridge Road - the observation is based on an identification of a single call. No sign of the species was observed on the Study Area.

12. The fauna survey conducted by CES (2006) provided records of seventy-one fauna species of which 23 were not recorded during the Kendall & Kendall Ecological Services survey, including one threatened species listed as vulnerable under schedule 2 of the TSC Act being the Eastern Freetail-bat and four introduced species being the Spotted Turtle-Dove, Cat, Donkey and Horse.
13. No species listed under the threatened species provisions of the *Environment* Protection *and Biodiversity Conservation Act 1999* was recorded during the field survey.
14. A search of the DECC wildlife atlas provided information on fauna species recorded within 5km of the Study Area.
15. Ameliorative measures are recommended to avoid, mitigate and offset the potential impacts of the proposed development.

1 INTRODUCTION

This report is a supplementary fauna assessment of a proposal to remove sand from land described as Lot 41 DP 1046841and Lot 1 DP 302768 at Somersby New South Wales. The project is known as the Somersby Fields Project.

An original ecological fauna assessment was prepared by Dr Lim of Countrywide Ecological Service (CES) titled "Somersby Fields Project - Fauna Assessment CES, 2006) although the bulk of the field survey was conducted in the year 2000.

The original survey work conducted by Countrywide Ecological Service pre-dated the NSW Department of Environment and Climate Change (DECC) draft survey guidelines (DEC, 2004). Consequently, in some regards, they do not meet the requirements of those guidelines.

Vegetation community descriptions identified by Payne (2006) were used as a basis to identify the broad fauna habitats of the Study Area.

Target species for the supplementary survey were determined on:

- the broad fauna habitats identified from the Somersby Fields Field Project (2006);
- a search of the DECC threatened species website; and
- input from a DECC officer.

This fauna assessment provides consideration of the requirements of Part 3A of the EP&A Act.

1.1 Objectives

The objectives of this terrestrial fauna ecology assessment are to:

- conduct a field fauna survey to survey for the species identified as target species, the fauna survey being conducted where practicable to be in accordance with the 'Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities' (DEC – November 2004); and
- to prepare an EP&A Act Section 3A assessment in regard to threatened fauna.

1.2 Locality

The Study Area is located east of Wisemans Ferry Road, south of Peats Ridge Road and west of the Somersby interchange on the F3 Freeway, being approximately 9km northwest of Gosford and its location is indicated on **Figure 1**.

1.3 Study Area

The boundary of the Study Area is indicated on **Figure 2**.

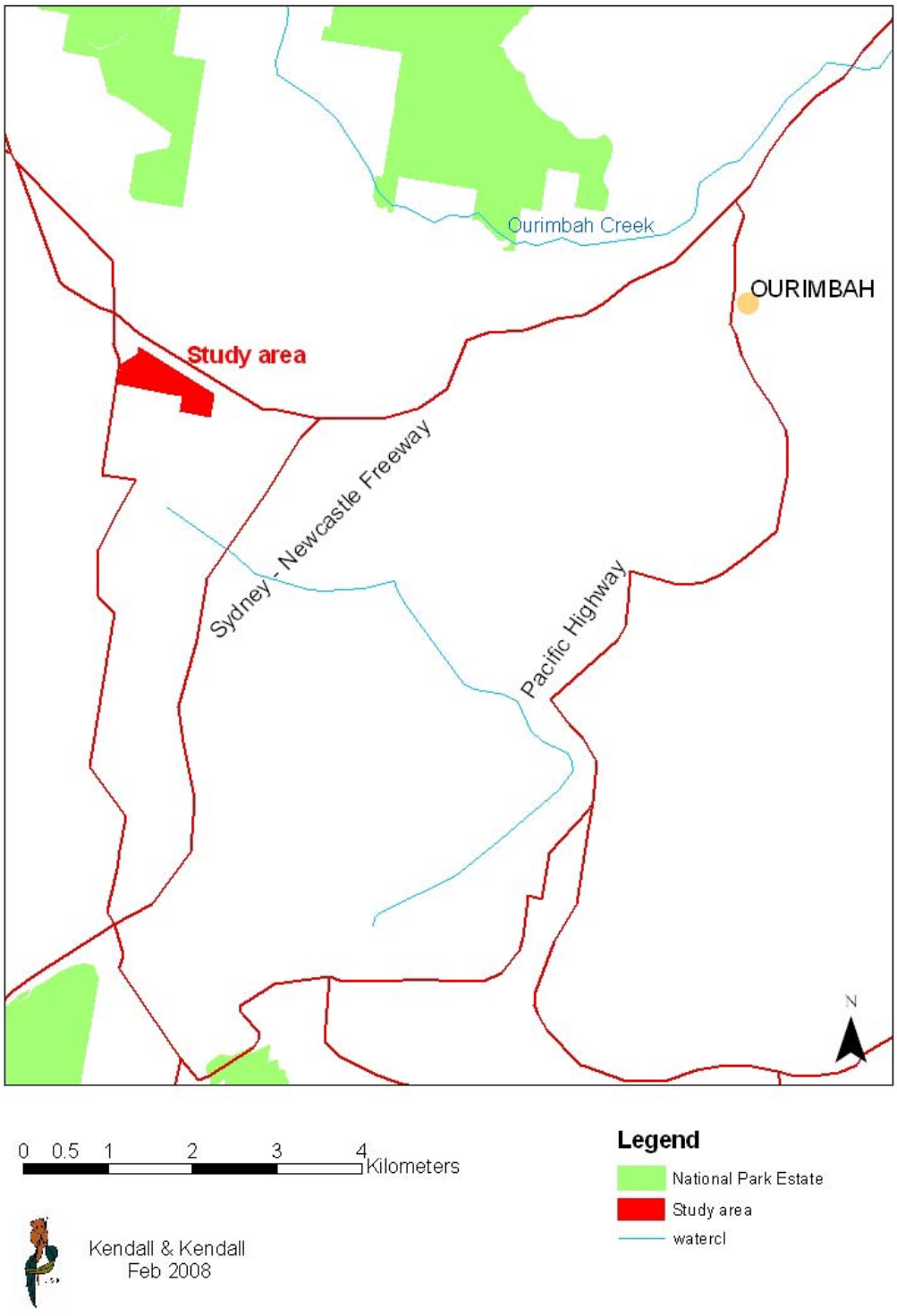

Figure 1
Study Area Location

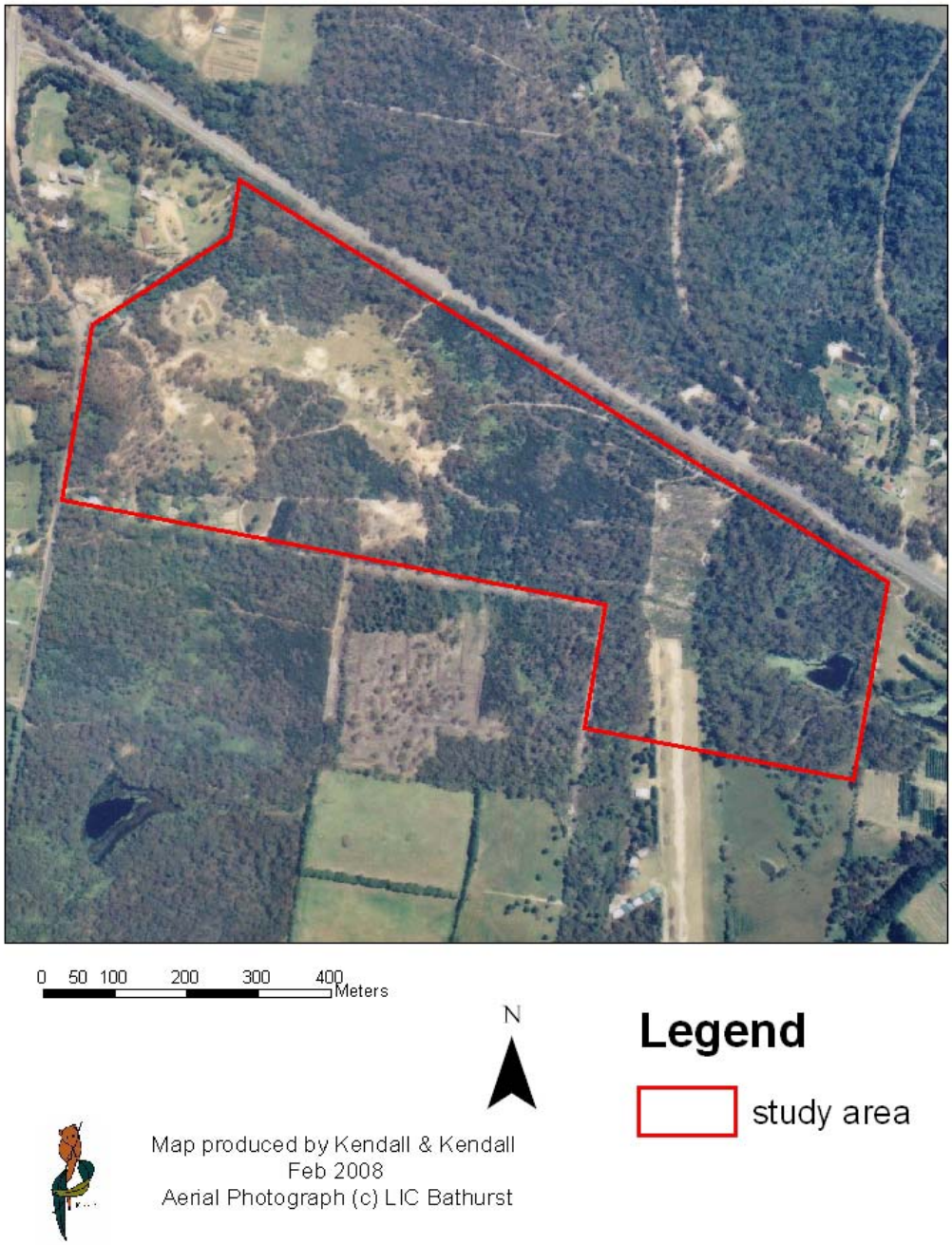

Figure 2
Study Area

2 METHODOLOGY

2.1 Identification of Target Species List

A search was conducted on the DECC's threatened species website (http://www.threatenedspecies.environment.nsw.gov.au/index.aspx) as a basis to determine TSC Act threatened species that may occur in the locality or on the Study Area. The search was conducted along the pathway:

- Home page➔ combined habitat and geographic search➔ find by geographic region ➔Hunter/Central Rivers CMA region➔Wyong ➔Threatened animals.

This list was edited to delete species whose habitat was obviously not on the Study Area eg marine animals. The list was further edited to delete species considered as unlikely to occur on the Study Area due to lack of habitat resources or disturbance to habitat. Habitat attributes described by CES (2006) and Payne (2006) were used to determine the habitat on the site and these were compared to the habitat descriptions for each species from the DECC threatened species website search link to "individual species profiles" to determine the possibility of the occurrence of a species on the Study Area. This list was reviewed by the DECC, who recommended adding some species to the list. This list is attached as Appendix 1.

2.2 Habitats Present on the Study Area

The major vegetation communities described by Payne (2006) are used to determine the major habitat types on the Study Area. These being:

- Somersby Plateau Forest – a dry sclerophyll forest;
- Hawkesbury Banksia Scrub Woodland; and
- cleared and disturbed areas.

Payne (2006) also recognised small areas of wet heath and sedgeland.

The Study Area also contains a range of specific habitat resources including:

- tree hollows - a number of areas in the Study Area contain trees with hollows of varying sizes; occurrence of tree hollows are discussed below;
- water - the Study Area contains a number of permanent dams, creeklines and seepage/ swampy areas; and
- nectar – the Hawkesbury Banksia Scrub Woodland is dominated by *Banksia ericifolia*, a plant that produces abundant nectar flows.

No rocky areas or areas that could contain caves were observed on the Study Area.

Further discussion on habitat present on the Study Area is provided in the following discussion of threatened species.

2.2.1 Hollow Bearing Trees

Tree hollows are common in trees throughout much of the Study Area and are considered far too common to count and map without spending more time on the Study Area than is available. However some comments of abundance of tree hollows can be described according to the proportion of trees that typically contain hollows in relation to trees that do not typically contain hollows. Eucalypt trees that typical contain hollows include those that are:

- Senescent i.e. old trees that have lost large branches, these trees may contain a range of sizes of hollows i.e. small to large;
- Older mature trees that have lost branches due to injury etc, these trees typical contain small to medium sized hollows but occasionally large hollows;
- Suppressed trees that may be quite old that have grown large branches but that may contain small to medium sized hollows.

Eucalypt trees that generally do not contain hollows include regrowth i.e. young trees and generally mature trees that have not yet been subject to the processes of hollow formation.

The following estimates of the proportion of hollows present were made at various locations throughout the Study Area.

- The open forest dominated by Scribbly Gum had a high proportion (greater than 30%) of tree containing hollows with few regrowth trees present;
- The open forest near Dam A at the eastern end of the Study Area had a high proportion (greater than 30%) of tree containing hollows with few regrowth trees present;
- The open forest dominated by red bloodwood in the southern/central part of the Study Area had a medium proportion of trees (15-30%) of tree containing hollows with few regrowth trees present;
- The open forest around the creek line that drains east towards the airstrip had a medium proportion of trees (15-30%) of tree containing hollows many of these were suppressed trees meaning large tree hollows were uncommon there were few regrowth trees present;
- The open forest in the north west section of the Study Area had a medium proportion of trees (15-30%) of tree containing hollows with few regrowth trees present; and

The open forest in the southwest section of the Study Area at few hollows as there was a high proportion of regrowth trees present.

2.3 Fauna Survey

A field fauna survey was conducted to survey for the species identified as target species, the fauna survey was where practicable in accordance with the 'Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities' (DEC – November 2004).

2.3.1 Survey Period

The survey was conducted throughout the period of 20th February to 1st March 2008.

Dates for specific survey techniques implemented are provided below.

2.3.2 Survey Techniques

Table 1
Survey Methodologies implemented during the Field Survey

METHOD	Date (Set)	Date Collected	Time	No. of Traps
Anabat 1	22 & 23/2/08	na	na	1
Anabat 1	24 & 25/2/08	na	na	1
Anabat 2	22 & 23/2/08	na	na	1
Anabat 2	24 & 25/2/08	na	na	1
Cage Traps	22/02/2008	26/02/2008	na	8
Diurnal Habitat Search	25/02/2008	na	0900 - 0930	na
Diurnal Habitat Search	26/02/2008	na	0930 - 1000	na
Diurnal Habitat Search	27/02/2008	na	1500 - 1530	na
Diurnal Habitat Search (Dam B)	26/02/2008	na	1100 - 1130	na
Elliot Trap (A) ground	22/02/2008	26/02/2008	na	25
Elliot Trap (A) ground	24/02/2008	28/02/2008	na	25
Elliot Trap (A) ground/arboreal	24/02/2008	28/02/2008	na	25
Elliot Trap (B) arboreal	22/02/2008	26/02/2008	na	10
Elliot Trap (B) arboreal	24/02/2008	28/02/2008	na	10
Elliot Trap (B) ground	22/02/2008	26/02/2008	na	10
Hair Tube (Airstrip Creekline)	26/02/2008	01/03/2008	na	10
Hair Tube (Eastern most Line)	26/02/2008	01/03/2008	na	10
Hair Tube (heath)	26/02/2008	01/03/2008	na	15
Hair Tube (west)	26/02/2008	01/03/2008	na	10
Harp Trap 1	21/02/2008	23/02/2008	na	1
Harp Trap 2	21/02/2008	23/02/2008	na	1
Harp Trap 3	25/02/2008	27/02/2008	na	1
Harp Trap 4	23/02/2008	25/02/2008	na	1
Harp Trap 5	24/02/2008	26/02/2008	na	1
HBT watch	22/02/2008	na	1900 -2015	na
HBT watch	22/02/2008	na	1900 -2015	na
HBT watch	23/02/2008	na	1900 -2015	na
HBT watch	24/02/2008	na	1900 -2015	na
HBT watch	25/02/2008	na	1930-2015	na
HBT watch	26/02/2008	na	1900 - 2015	na
HBT watch spot	25/02/2008	na	1930-2015	na

Table 1 (Cont'd)
Survey Methodologies implemented during the Field Survey

METHOD	Date (Set)	Date Collected	Time	No. of Traps
NCPB	22/02/2008	na	2015 - 2130	na
NCPB	23/02/2008	na	2115 - 2230	na
NCPB	24/02/2008	na	2100 - 2210	na
NCPB	25/02/2008	na	2110 - 2220	na
NCPB	26/02/2008	na	2035 - 2145	na
NCPB	01/03/2008	na	2000 - 2110	na
Pit Fall Trapline 1	21/02/2008	25/02/2008	na	6
Pit Fall Trapline 2	21/02/2008	25/02/2008	na	6
Pit Fall Trapline 3	23/02/2008	27/02/2008	na	6
Pit Fall Trapline 4	23/02/2008	27/02/2008	na	6
Spotlight Vehicle 1	23/02/2008	na	2300 - 2310	na
Spotlight Vehicle 2	25/02/2008	na	2310 - 2320	na
Spotlight Walk	22/02/2008	na	2130 - 2200	na
Spotlight Walk	23/02/2008	na	2020 - 2105	na
Spotlight Walk	23/02/2008	na	2130 - 2150	na
Spotlight Walk	24/02/2008	na	2020 - 2055	na
Spotlight Walk	25/02/2008	na	2220 - 2255	na
Spotlight Walk	26/02/2008	na	2020 - 2030 & 2145 - 2215	na

Appendix 2 provides a list of the methodologies implemented to survey for each target species.

The following figures indicate the locations that various methodologies were implemented on the Study Area. Traps were set in locations in habitat selected to optimise the opportunity to trap target species. Further discussion of selection of traps is discussed below.

Species calls played during Nocturnal Call Playback (NCPB) included:

- Giant Burrowing Frog;
- Red-crowned Toadlet;
- Bush Stone-curlew;
- Yellow-bellied Glider; and
- Squirrel Glider.

2.3.3 Weather Conditions Prior to and during the field survey.

Prior to the survey and during the months leading to the survey period, northeastern NSW experienced drought-breaking rain falling over an extended period of time associated with regular monsoonal troughs over northern Australia. During February 2008, Gosford received a total of 401mm and Mangrove Mountain received 236mm (see **Appendix 3**).

Weather conditions on the Study Area were noted during various survey techniques and this information is provided in **Appendix 4**. **Appendix 4** also contains the daily maximum and minimum temperatures recorded on the Study Area during the survey.

3 RESULTS

3.1 Fauna Species Recorded by CES (2006) on the Study Area

The fauna survey conducted by CES (2006) provided records of seventy-one fauna species of which 23 were not recorded during the Kendall & Kendall Ecological Services survey, including one threatened species listed as vulnerable under schedule 2 of the TSC Act being the Eastern Freetail-bat and four introduced species being the Spotted Turtle-Dove, Cat, Donkey and Horse. The list of species recorded by CES (2006) is attached as **Appendix 5**.

3.2 Fauna Species Recorded by Kendall (2008) on the Study Area

The Kendall & Kendall Ecological Services survey provided records of 107 terrestrial vertebrate species including:

- 2 common protected species reported by a neighbour but not detected during survey methodologies;
- 2 "probable" microbat species identifications by Anabat microbat call analysis;
- 1 observation of an unidentified snake species;
- 4 introduced vertebrate species; and
- 7 species listed as vulnerable under schedule 2 of the TSC Act, one of which was recorded outside of the Study Area.

In addition, there were a number of visual observations of unidentified microbats during the survey. The list of species recorded during the recent survey is attached as **Appendix 6**.

The four introduced vertebrate species recorded by Kendall & Kendall Ecological Services were the House Mouse, Rabbit, Dog and Fox.

3.3 Threatened Fauna Species Recorded by Kendall and Lim on the Study Area

The six species recorded by Kendall & Kendall Ecological Services listed as vulnerable under schedule 2 of the TSC Act recorded on the Study Area during the field survey were the:

- Red-crowned Toadlet;
- Gang-gang Cockatoo;
- Eastern Pygmy-possum;
- Grey-headed Flying Fox;
- Little Bent-wing Bat; and
- Common Bent-wing Bat.

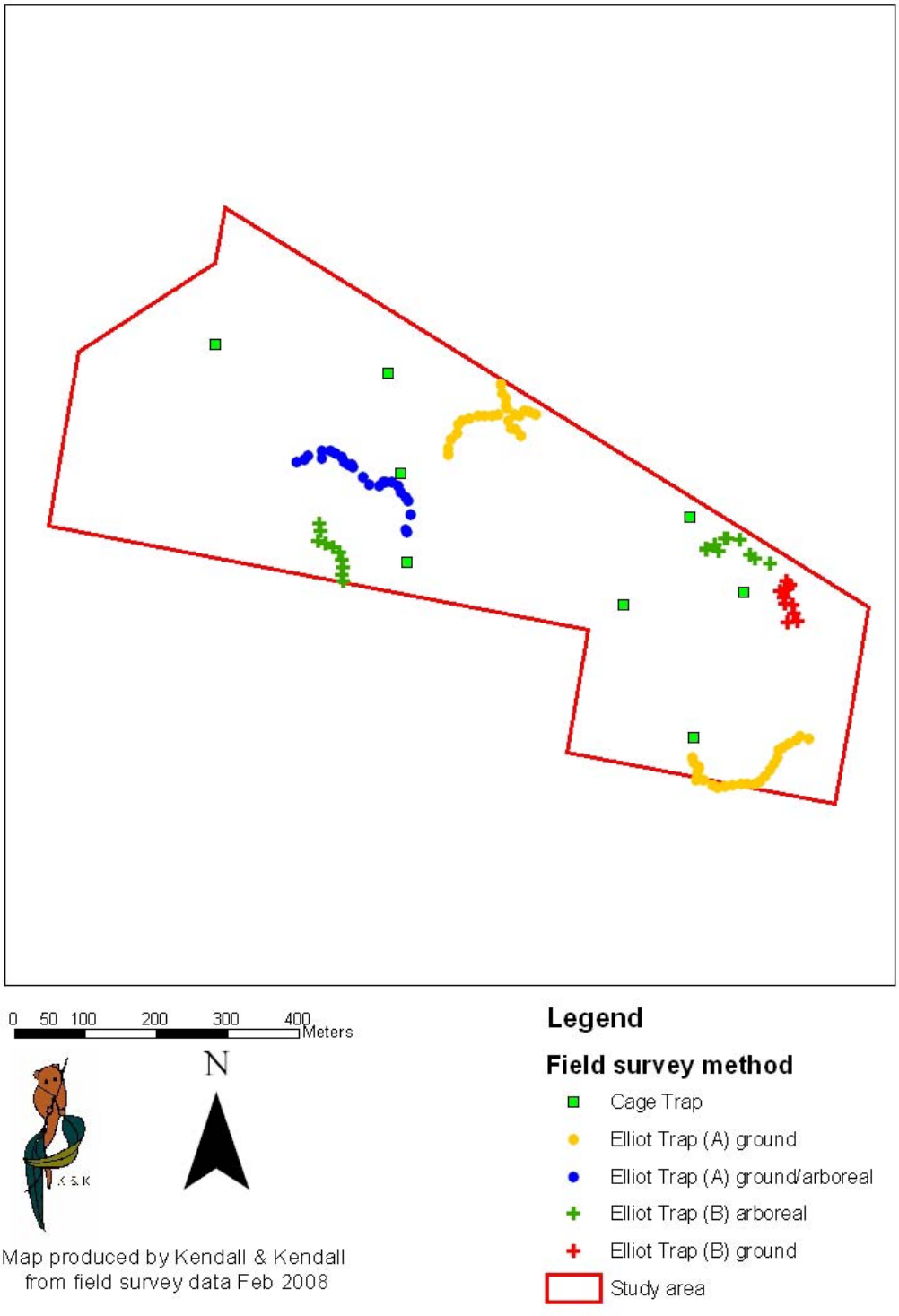

Figure 3
Locations of Specific Survey Techniques Elliot traps (various) and Cage Traps

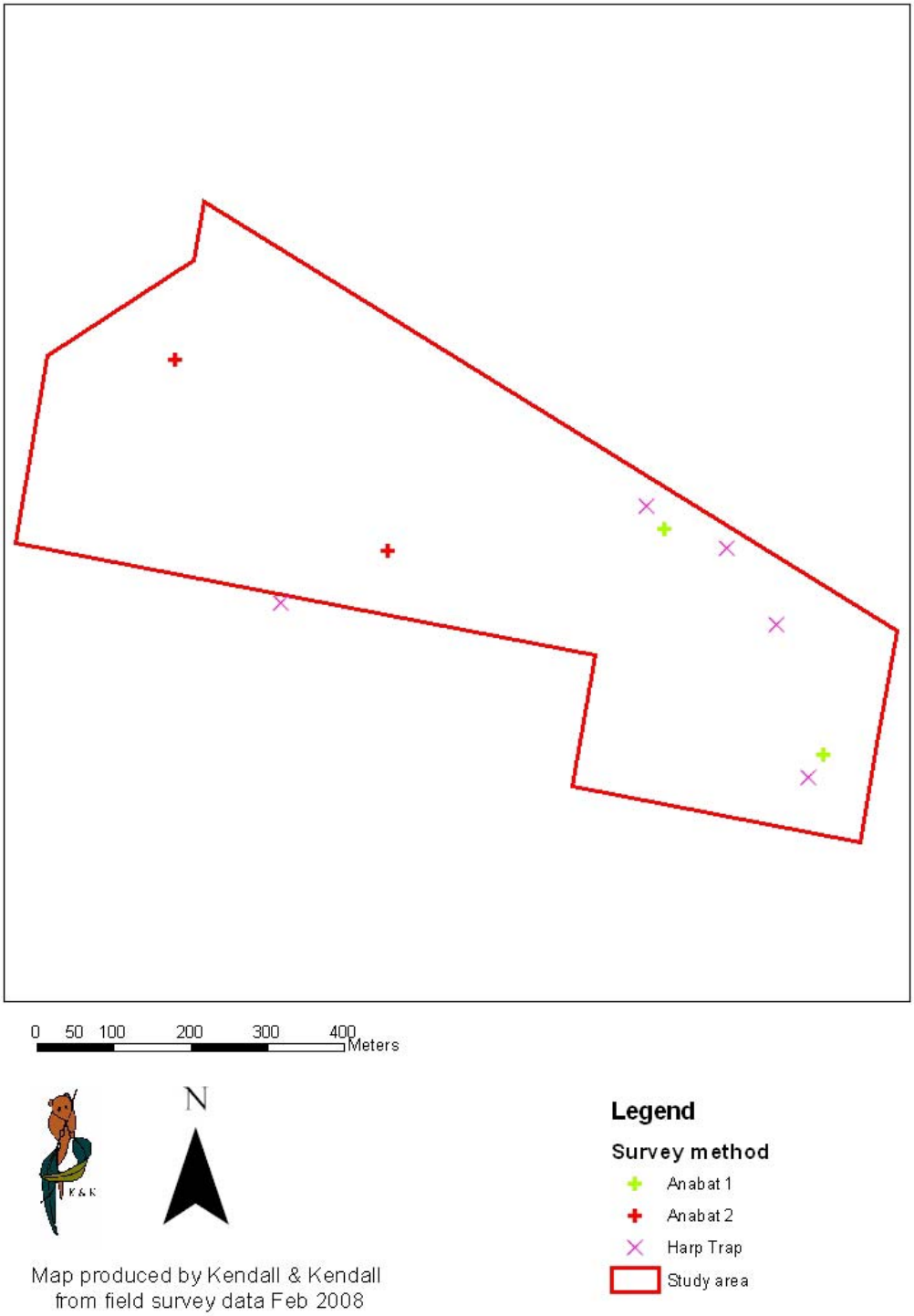

Figure 4
Locations of Specific Survey Techniques - Harp Traps and Anabats

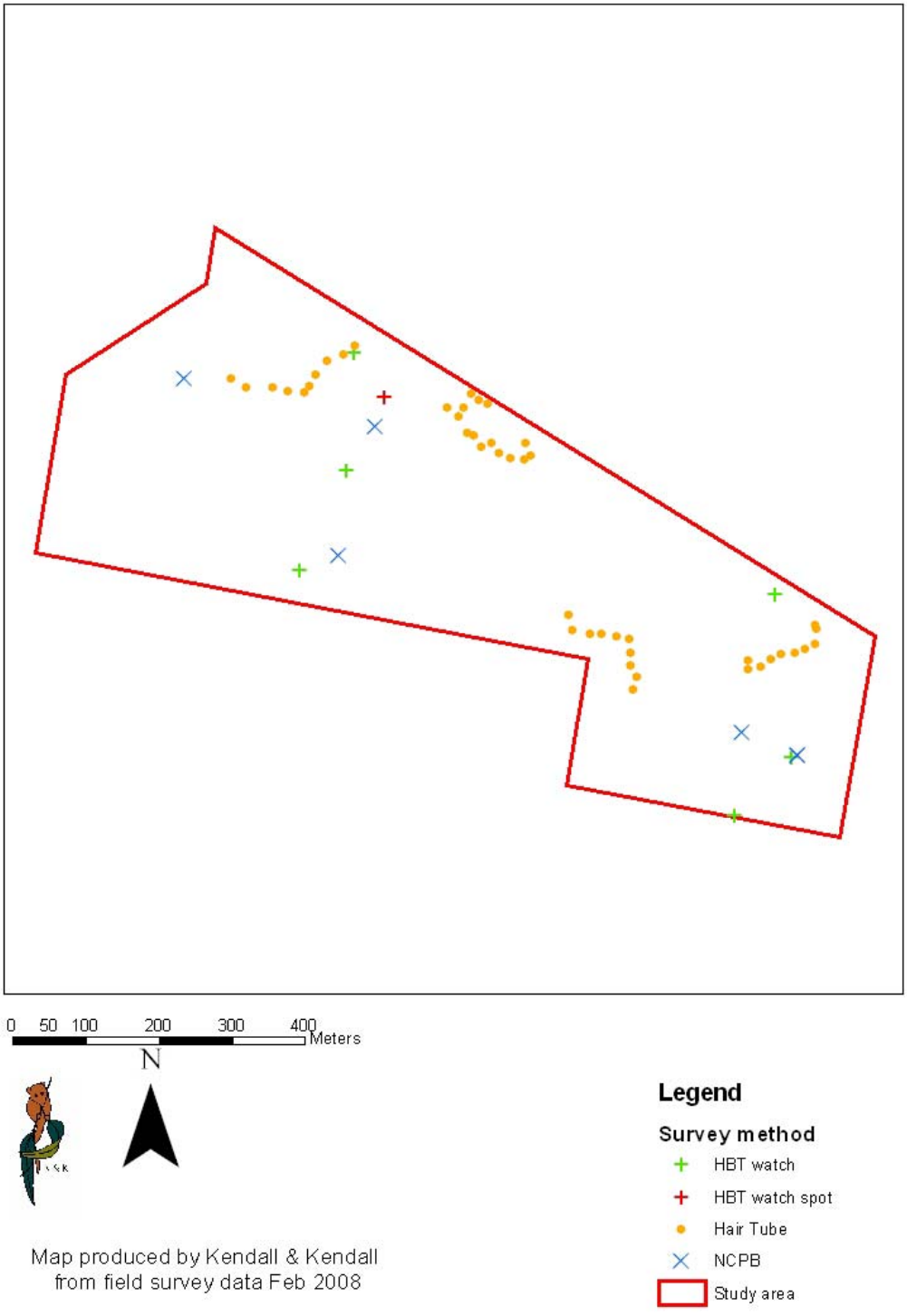

Figure 5
Locations of Specific Survey Techniques Hollow Bearing Tree Watch, Nocturnal Call Playbacks, Hair Tubes

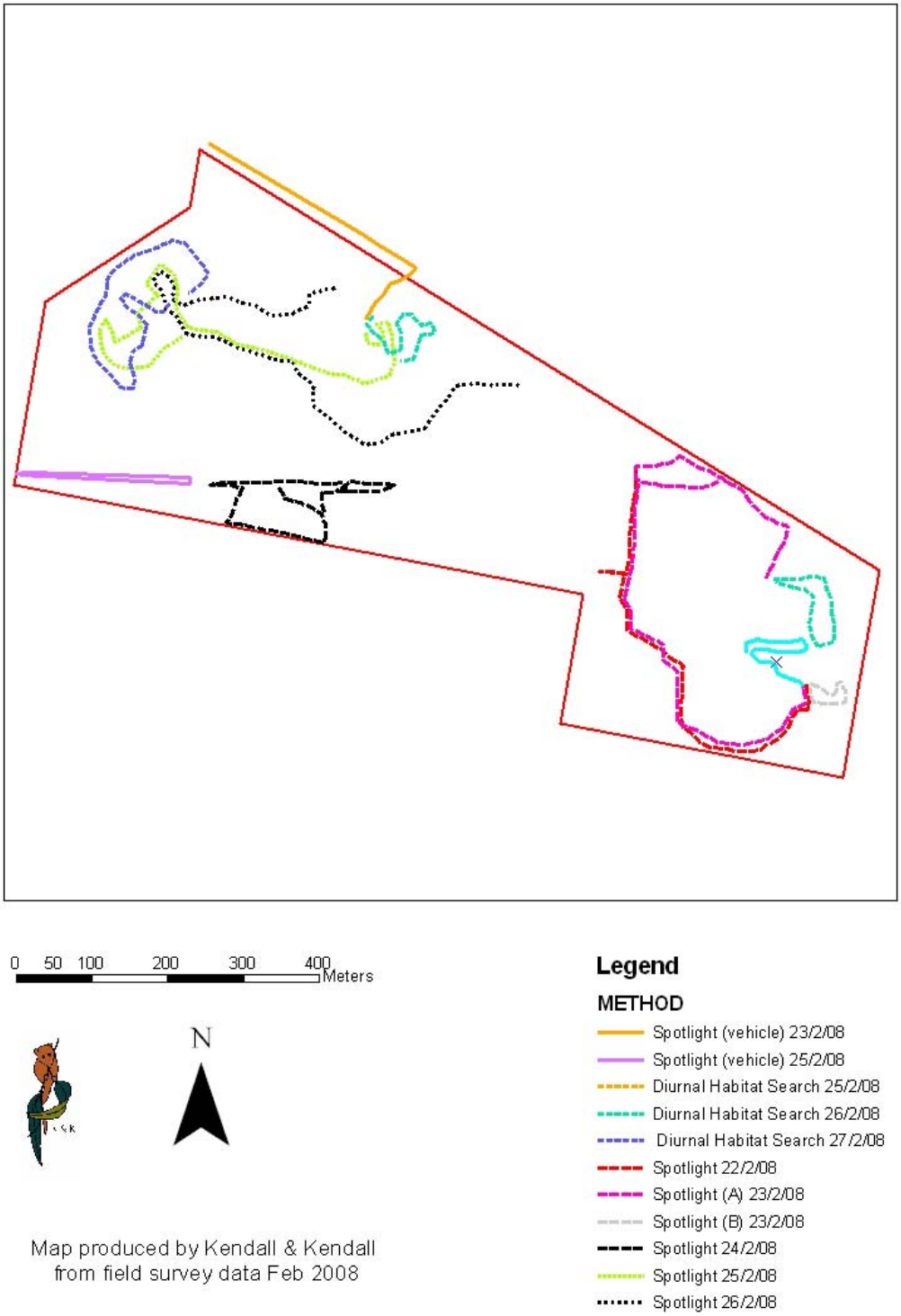

Figure 6
Locations of Specific Survey Techniques Spotlight Transects and Diurnal Habitat Searches

The Grey-crowned Babbler was recorded off site to the north of Peats Ridge Road. The observation is based on an identification of a single call. No sign of the species was observed on the Study Area. The Grey-headed Flying Fox was a record of one Grey-headed Flying Fox flying high over the Study Area.

CES (2006) recorded two TSC Act threatened species on the Study Area these being the Eastern Freetail-bat and Little Bent-wing Bat, Lim also recorded the Gang Gang Cockatoo off site.

3.4 DECC Wildlife Atlas Threatened Fauna Species Records within Approximately 5km of the Study Area

A search of the DECC Wildlife Atlas was conducted under licence for the Gosford 1:100 00 map sheet on March 11 2008. A review, a GIS mapping program, was used to determine the locations of threatened species records within 5km of the boundary of the Study Area. Due to licence conditions, the locations of these records cannot be provided in this report. However, the numbers of records of each threatened species occurring within approximately 5km of the Study Area and the distance calculated to the nearest record from the approximate centre of the Study Area for each species is provided in **Table 2**.

Table 2
TSC Act Threatened Species recorded within Approximately 5km of the study Area on the DECC Wildlife Atlas

Common Name	Scientific Name	No. of Records within Approximately 5km of the Study Area
Giant Burrowing Frog	*Heleioporus australiacus*	29
Stuttering Frog	*Mixophyes balbus*	1
Giant Barred Frog	*Mixophyes iteratus*	1
Red-crowned Toadlet	*Pseudophryne australis*	17
Green and Golden Bell Frog	*Litoria aurea*	1
Green-thighed Frog	*Litoria brevipalmata*	5
Pale-headed Snake	*Hoplocephalus bitorquatus*	1
Black-winged Petrel	*Pterodroma nigripennis*	1
Gang-gang Cockatoo	*Callocephalon fimbriatum*	4
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	8
Barking Owl	*Ninox connivens*	2
Powerful Owl	*Ninox strenua*	10
Masked Owl	*Tyto novaehollandiae*	2
Sooty Owl	*Tyto tenebricosa*	26
Painted Honeyeater	*Grantiella picta*	21
Spotted-tailed Quoll	*Dasyurus maculatus*	5
Koala	*Phascolarctos cinereus*	3
Eastern Pygmy-possum	*Cercartetus nanus*	4
Yellow-bellied Glider	*Petaurus australis*	3
Long-nosed Potoroo	*Potorous tridactylus*	1
Grey-headed Flying-fox	*Pteropus poliocephalus*	4
Eastern Freetail-bat	*Mormopterus norfolkensis*	1
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	2
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	4
Large-footed Myotis	*Myotis adversus*	1

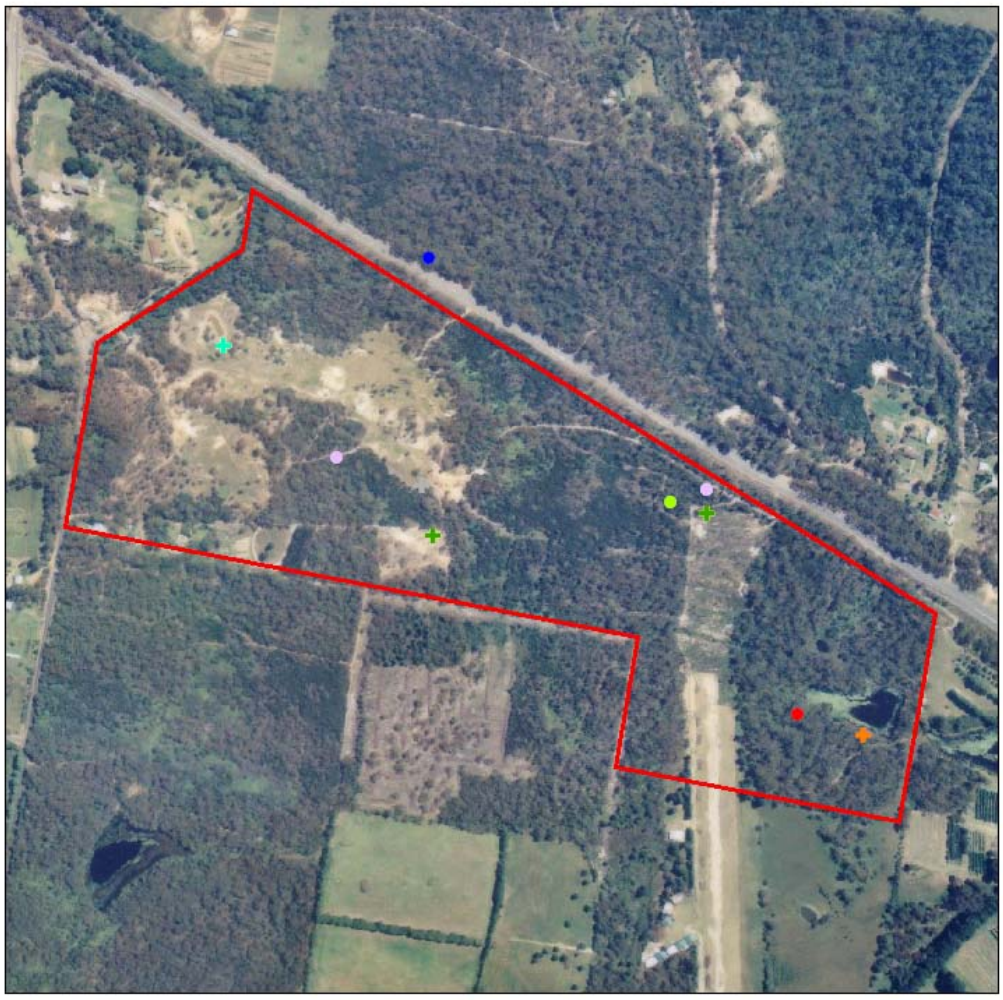

Figure 7
Field Survey Threatened Species Locations

3.5 Endangered Populations, or their Habitats, or Critical Habitat

No Endangered Fauna Populations or Critical Habitat are listed for the Study Area under the TSC Act.

4 DISCUSSION

4.1 Threatened Species Known to Occur on the Study Area

The six species recorded by Kendall & Kendall Ecological Services listed as vulnerable under schedule 2 of the TSC Act recorded on the Study Area during the field survey were the:

- Red-crowned Toadlet;
- Gang-gang Cockatoo;
- Eastern Pygmy-possum;
- Grey-headed Flying Fox;
- Little Bent-wing Bat; and
- Common Bent-wing Bat.

CES (2006) also recorded the Eastern Freetail-bat on the Study Area.

4.1.1 Red-crowned Toadlet

Following the recording of the Red-crowned Toadlet on the Study Area during the Kendall (2008) field survey, it was considered necessary to engage a suitably qualified biologist to assess the impact of the proposal on the Red-crowned Toadlet and provided recommended ameliorative measures. Dr. Michael Mahony and Mr Simon Clulow provided the assessment and recommended ameliorative measures based on addition field survey conducted by Mr Simon Clulow, their report is attached as **Appendix 8**.

4.1.2 Gang-gang Cockatoo

The individual species profile for the Gang-gang Cockatoo available on the DECC threatened species website describes the habitat of the Gang-gang Cockatoo as:

- In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas.
- May also occur in sub-alpine Snow Gum *Eucalyptus pauciflora* woodland and occasionally in temperate rainforests.
- Move to lower altitudes in winter, preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas.
- Favours old growth attributes for nesting and roosting.

The Kendall (2008) field survey recorded the species on the Study Area in the month of March, this bird species is generally found at higher altitudes in summer though in winter they can often range beyond mountains, however it is known that some birds remain in lowlands in the summer (Higgins 1999), indicating that there may be a year round presence of the species occurring in the locality of the Study Area. The Kendall (2008) survey located the species in the open forest to the east of the study area (**Figure 7**). CES (2006) also recorded the species to the east of the Study Area.

4.1.3 Eastern Pygmy-possum

The individual species profile for the Eastern Pygmy-possum available on the DECC threatened species website describes the habitat of the Eastern Pygmy-possum as:

- Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest.
- Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable.
- Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests.
- Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (Pseudocheirus peregrinus) dreys or thickets of vegetation, (eg. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.
- Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares.
- Young can be born whenever food sources are available, however most births occur between late spring and early autumn.
- Agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal.
- Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.

Dr Brad Law (NSW Department of Primary Industries - Forestry) is currently conducting studies on the Eastern Pygmy-possum in McPherson State Forest although no report is yet available. Dr Law is using a number of survey techniques including radio-tracking and spool and line thread trails in mainly open-forest. Dr Law provided the following information (pers comm.).

- Eastern Pygmy-possum have been observed feeding on nectar in *Banksia serrata*, Banksia *spinulosa*, *Gymea lolly*, Lomandras, Red Bloodwood (honey dew), and Woody Pear.
- They have been observed crossing dirt tracks.

- Eastern Pygmy-possums appear to at high risk of predation from both introduced species eg foxes and native predators.
- Eastern Pygmy-possum often shelter at ground level under logs etc.

4.1.4 Little Bentwing-bat

The individual species profile for the Little Bentwing-bat available on the DECC threatened species website describes the habitat of the Little Bentwing-bat as:

- Moist eucalypt forest, rainforest or dense coastal banksia scrub.
- Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.
- They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.
- In NSW, the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bats (M. schreibersii) and appears to depend on the large colony to provide the high temperatures needed to rear its young.

The Study Area contains suitable foraging habitat and tree hollows that may provide sheltering habitat for the species.

4.1.5 Eastern Bentwing-bat

The individual species profile for the Eastern Bentwing-bat available on the DECC threatened species website describes the habitat of the Eastern Bentwing-bat as:

- Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.
- Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.
- Maternity caves have very specific temperature and humidity regimes.
- At other times of the year, populations disperse within about 300 km range of maternity caves.
- Cold caves are used for hibernation in southern Australia.
- Breeding or roosting colonies can number from 100 to 150,000 individuals.
- Hunt in forested areas, catching moths and other flying insects above the tree tops.

The Study Area contains suitable foraging habitat, however, does not contain suitable sheltering habitat for the species.

4.2 Threatened Species Likely to Occur on the Study Area

Although the Study Area has had fauna surveys conducted that generally met DECC survey guidelines and that the Lim and Kendall surveys have sampled the Study Area over different periods under varying seasonal and climatic conditions it is considered that a number of species that have not been detected during the field survey are still considered possible to occur on the Study Area. Some of these species are considered unlikely to occur whilst others are considered likely to occur on the Study Area.

Appendix 9 contains the list of species initially derived from the DECC threatened species website search for the Wyong subregion of the Hunter and Central Rivers CMA. A subjective opinion based on the suitability of habitat for each species, known records in the locality and detectability of the species by survey methodologies is provided as a nil, unlikely, possible or likely chance of occurrence.

It is considered the Giant Burrowing Frog, Littlejohn's Tree Frog and Grey-headed Flying-fox are likely to occur on the Study Area.

In **Appendix 9**, a number of species considered possible to occur on the Study Area are far-ranging nomadic or migratory species, these species include the Swift Parrot, Turquoise Parrot, Painted Honeyeater, Regent Honeyeater, Comb-crested Jacana, Blue-billed Duck and Painted Snipe. Their movement may depend on the seasonal availability of foraging resources or the need to seek drought refuge.

4.3 Threats to Threatened Species Occurring on the Study Area

Review of the "Individual Species Profiles", available on the DECC threatened species website, for each of the threatened species known to occur on the Study Area was conducted to identify recognised threat to each species. **Table 3** lists these threats for each threatened species known to occur o the Study Area. **Table 3** identifies whether the impact of the project on these threatened species will or will not contribute to the recognised threats. Furthermore **Table 3** also identifies whether (in the author's opinion) it is possible to develop ameliorative measures based for the principles of avoid, mitigate or offset for each of the threats. Recommended ameliorative measures are detailed later in this report.

4.4 Key Threatening Processes

To date, thirty-two "Key Threatening Processes" (KTPs) are listed on Schedule 3 of the TSC Act 1995. It is considered that the Somersby Fields Project will contribute to two of these being the KTPs.

- Clearing of native vegetation.
- Loss of Hollow-bearing Trees.

It is also considered that a further 3 KTPs are currently operating on the Study Area these being:

- competition and grazing by the feral European rabbit;
- competition from feral honeybees; and
- predation by feral cats.

4.5 Threat Abatement Plans

It is the DECC's responsibility to prepare Threat Abatement Plans (TAPs) for each KTP, of the KTPs listed above, one TAP as been prepared to date this being:

- Predation by the Red Fox.

In regards to the other KTPs listed above, TAPs are yet to be prepared and it as been advised that these KTPs should be considered in a generic sense in relation to each threatened species that may be affected by a project using existing the EP&A Act assessment i.e. the 7-part test. Seven-part tests have been prepared for each threatened species known to occur on the Study Area as part of this report.

4.6 Priority Actions

The DECC has identified a range of "Priority Actions" for TSC Act threatened species (DECC Threatened Species Website Individual Species Profiles). These are available in the "individual species profiles" accessible via the DECC threatened species website. **Appendix 10** contains the list of priority actions identified for each of the threatened fauna species known to occur on the Study Area. Many of these are not relevant to the Project, **Table 4** contains those priority actions relevant to the Project. Furthermore, **Table 4** identifies whether (in the authors opinion) it is possible to develop ameliorative measures based for the principles of avoid, mitigate or offset for each of the threats. Recommended ameliorative measures are detailed later in this report.

4.7 Recovery Plans

It is the DECC's responsibility to prepare a Recovery Plan for each TSC Act threatened species, a search of the DECC website indicated as yet no recovery plan has been prepared for any of the threatened fauna known to occur on the Study Area.

Table 3
Recognised Threats to Threatened Species known to occur on the Study Area
(DECC Threatened Species Website)

Page 1 of 2

Threat	Species	Impact by Project	Control Measures Applicable
Damage to or disturbance of roosting caves, particularly during winter or breeding.	Eastern Bentwing-bat	Nil	NA
Loss of foraging habitat.	Eastern Bentwing-bat	Direct (minimal compared to home range of species)	Yes - mitigate
Application of pesticides in or adjacent to foraging areas.	Eastern Bentwing-bat	Nil	NA
Predation by feral cats and foxes.	Eastern Bentwing-bat	Indirect	Yes - mitigate
Loss of hollow-bearing trees.	Eastern Freetail-bat	Direct	Yes - mitigate
Loss of foraging habitat.	Eastern Freetail-bat	Direct (minimal compared to home range of species)	

Table 3 (Cont'd)
Recognised Threats to Threatened Species known to occur on the Study Area
(DECC Threatened Species Website)

Threat	Species	Impact by Project	Control Measures Applicable
Application of pesticides in or adjacent to foraging areas.	Eastern Freetail-bat	Nil	NA
Loss and fragmentation habitat through land-clearing for agriculture, forestry and urban development.	Eastern Pygmy-possum	Direct	Yes - avoid and mitigate
Changed fire regimes that affect the abundance of flowering myrtaceous shrubs, particularly banksias.	Eastern Pygmy-possum	Nil	Yes - Offset
Declining shrub diversity in forests and woodlands due to overgrazing by stock and rabbits.	Eastern Pygmy-possum	Nil	Yes - mitigate
Predation from cats, dogs and foxes.	Eastern Pygmy-possum	Indirect	Yes - mitigate
Loss of nest sites due to removal of firewood.	Eastern Pygmy-possum	Nil	Yes - mitigate
Clearing of vegetation and degradation of habitat may reduce the abundance of optimal foraging and roosting habitat.	Gang-gang Cockatoo	Direct	Yes - avoid
Individual pairs show high fidelity to selected nesting trees (choosing nesting hollows of particular shape, position and structure), with clearing and frequent fire posing a threat to continued successful breeding.	Gang-gang Cockatoo	Nil	Yes - mitigate
Climate change may alter the extent and nature of its preferred habitat (cool termperate vegetation).	Gang-gang Cockatoo	Nil	NA
Susceptible to Psittacine cirovirus disease (PCD) which is spread through contaminated nest chambers. PCD is known to have increased near Bowral in the southern highlands of New South Wales over the past decade and constitutes a further threat to the species.	Gang-gang Cockatoo	Nil	NA
Disturbance of colonies, especially in nursery or hibernating caves may be catastrophic.	Little Bentwing-bat	Nil	NA
Destruction of caves that provide seasonal or potential roosting sites.	Little Bentwing-bat	Nil	NA
Changes to habitat, especially surrounding maternity caves.	Little Bentwing-bat	Nil	NA
Use of pesticides.	Little Bentwing-bat	Nil	NA
Clearing of habitat, particularly along ridges.	Red-crowned Toadlet	Direct	Yes - offset
Reduction in water quality flowing from ridges, particularly in urban areas.	Red-crowned Toadlet	Direct	Yes - mitigate
High frequency fire, resulting in changing vegetation structure and composition.	Red-crowned Toadlet	Nil	Yes - mitigate and off set
Collection of bush rock.	Red-crowned Toadlet	Nil	NA
Disease (chytrid fungus).	Red-crowned Toadlet	Nil	NA

Table 4
Relevant DECC Priority Actions for Threatened Species Known to occur on the Study Area

Species	Description of Priority Action	Priority	Ameliorative Measures Applicable
Red-crowned Toadlet	**Recovery strategy: Develop and implement protocols and guidelines**		
	Develop best practice management strategies that buffer and protect important headwater/ridge top breeding sites from changes to water flow, flow regimes and water quality changes.	H	Avoid and Offset
	Recovery strategy: Habitat management: Fire		
	Develop a preferred habitat fire regime and mosaic burn, heap burn and other burn strategies that reduce impacts on the species.	M	Offset
Gang-gang Cockatoo	**Recovery strategy: Habitat management: Fire**		
	Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).	M	Mitigate
	Recovery strategy: Habitat Rehabilitation/Restoration and/or Regeneration		
	Provide supplementary hollows/nest boxes within the primary habitat areas.	M	Mitigate
Eastern Pygmy-possum	**Recovery strategy: Community and land-holder liaison/ awareness and/or education**		
	Encourage and support land managers to undertake management actions that benefit the species (see recovery information for land managers in our detailed species profile).	M	Avoid Mitigate Offset
	Recovery strategy: Habitat management: Feral Control		
	Control and monitor abundance of feral predators, especially cats, where there are known populations of EPP in areas of high quality habitat and encourage night-time curfews for cats on urban fringes adjacent to these habitats.	M	Mitigate
Eastern Pygmy-possum	**Recovery strategy: Habitat management: Fire**		
	Provide map of known occurrences to Rural Fire Service and seek fire frequency of >10 years on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).	H	Mitigate
	Reserve fire management strategies to include operational guidelines to protect this species from fire, with fire frequency of >10 years .	M	Mitigate
	Recovery strategy: Research		
	Encourage research on appropriate fire and land management regimes for retention and recruitment of EPP habitat.	M	Mitigate
Little Bent-wing Bat	**Recovery strategy: Habitat management: Feral Control**		
	Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites.	M	Mitigate
	Recovery strategy: Habitat management: Weed Control		
	Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.	L	Mitigate
Eastern Bent-wing Bat	**Recovery strategy: Habitat management: Feral Control**		
	Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites.	M	Mitigate
	Recovery strategy: Habitat management: Weed Control		
	Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.	L	Mitigate
	Recovery strategy: Monitoring		
	Identify the susceptibility of the species to pesticides.	M	Mitigate
Eastern Freetail-bat	**Recovery strategy: Habitat Protection (inc vca/ jma/ critical habitat nomination etc)**		
	Promote the conservation of these private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means.	H	Offset & Acquisition

4.8 Recommended Ameliorative Measures

The following ameliorative measures have been developed using the principle of avoid, mitigate and offset.

Avoid

Figure 8 indicates the staging of sand removal, which will include removal of existing vegetation. Areas not indicated for sand extraction currently are covered by native vegetation and will be retained as habitat. As a result of the identification of the Eastern Pygmy-possum on the Study Area identified during the Kendall and Kendall field survey, Stage 1/3 will now be retained as habitat for this species. The retention of Stage 1/3 would also be a suitable ameliorative measure to reduce the area of direct impact on the Red-crowned Toadlet as discussed in **Appendix 8**.

Mitigate

The following ameliorative measures are recommended.

- Revegetate disturbed areas with native endemic vegetation following completion of the final landform for each stage.
- Implement programs to control vertebrate pest species including cats, dogs and foxes on the Study Area.
- Inspect hollow-bearing trees prior to their removal for presence of hollow dependent fauna. When hollow-bearing trees are removed, a wildlife carer should be present to care for any fauna located in the tree after it is felled.
- Install nesting boxes for the variety of hollow-dependent threatened fauna known to occur on the Study Area. Nesting boxes installed for use by Eastern Pygmy-possums should be monitored to determine the status of the population throughout Stage 1 of the Project.
- Provide assistance with research into the ecology of the Red-crowned Toadlet in locality of the Study Area.

- Dollar for Dollar support funding to the value of $25 000 to prepare a recovery plan for this species.

Offset

In **Appendix 8**, Dr Mahony suggests three forms of offsets which collectively would assist to offset the removal of suitable habitat for the Red-crowned Toadlet. These offsets are equally applicable for other fauna.

1. The Proponent proposes to retain an amended Stage 1/3 area that will provide an area of 200m x 100m (covering 2ha). Apart from retaining the habitat of the species recorded during the Kendall (2008) survey, the retained vegetation would provide a corridor between the proposed Voluntary Conservation Area and the vegetation and other habitat towards and beyond the southern boundary of the Project Site.

2. The Proponent could consider contributing to a research project that assists to better understand how to re-create the habitat for the Red-crowned Toadlet. The progressive rehabilitation of the Project Site following sand removal and landform reconstruction will provide an opportunity to research the effectiveness of various rehabilitation techniques in re-creating the preferred habitat of the Red-crowned Toadlet.

3. Dr Mahony also suggests land acquisition as a potential offset with the acquired land being confirmed Red-crowned Toadlet habitat. Similar Red-crowned Toadlet habitat to that which occurs on the Study Area is understood to occur on freehold land adjoining nearby national parks, including in the upper catchment of Mooney Mooney Creek. It is recommended that the proponent consider contributing to the purchase of such land for it to be added to the national park estate, thus securing similar habitat in the locality.

   Furthermore, assistance could be provided for fire management planning and vertebrate pest control in the upper reaches of Mooney Mooney Creek in order to manage similar habitat in the national park estate with the objective of protecting and enhancing threatened species habitat.

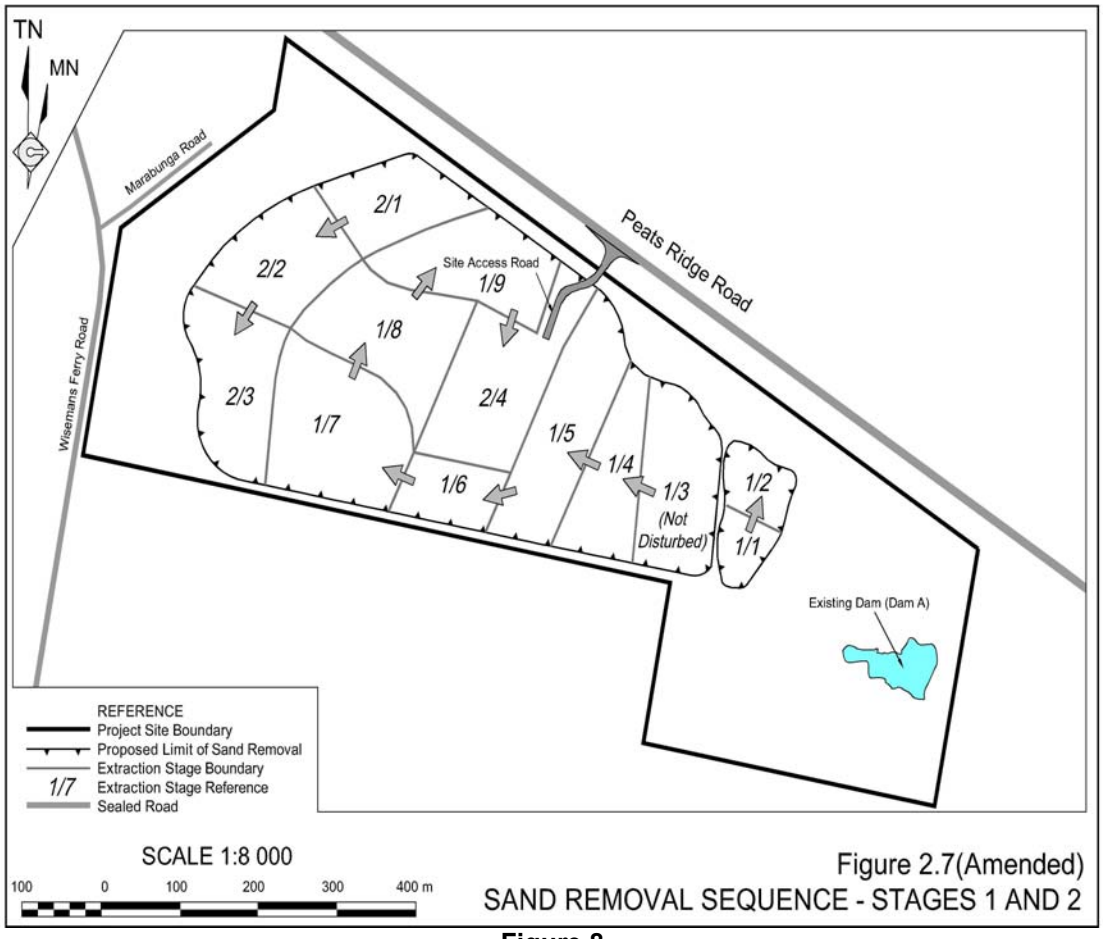

Figure 8
Sand Removal Sequence

4.9 Environmental Planning and Assessment Act 1979 - Part 3A Assessment

4.9.1 Part 3A EP&A Act Draft Assessment Guidelines

The draft *Guidelines for Threatened Species Assessment* (DECC 2005a) prepared under Part 3A of the *Environmental Planning and Assessment* (EP&A) *Act 1979* state that:

> "The objective of the assessment process is to provide information to enable decision makers to ensure that developments deliver the following environmental outcomes.
>
> - Maintain or improve biodiversity values (ie. there is no net impact on threatened species or native vegetation).
> - Conserve biological diversity and promote ecologically sustainable development.
> - Protect areas of high conservation value (including areas of critical habitat).
> - Prevent the extinction of Threatened species.
> - Protect the long-term viability of local populations of a species, population or ecological community.
> - Protect aspects of the environment that are matters of national environmental significance."

The guideline provides a five step assessment process which includes:

- preliminary assessment – to determine the likelihood of the Study Area containing threatened species; (see Section 2.1 and **Appendix 1**);
- field survey and assessment - to ensure that a reliable assessment of the presence or absence of Threatened species can be made; (see Section 2.3 and **Appendix 2**);
- evaluation of impacts – to identify the magnitude and extent of impacts, and the significance of the impacts as related to the conservation importance of the habitat, individuals and populations likely to be affected; (see this section below and **Appendix 8**);
- avoid, mitigate and then offset – including the description and justification of measures to mitigate any adverse effects and consideration of offset strategies if necessary; and (see Section 4.8 and **Appendix 8**); and
- key thresholds – justification of the Project based on whether the Project would maintain biodiversity, the long-term viability or accelerate extinction of a species, population or community and any adverse effects on critical habitat. (see this section below and **Appendix 8**).

In the absence of specific assessment methodologies, matters of consideration including the '7-part test' as described within the *Threatened Species Assessment Guidelines* (DECC 2005b) for assessment under Section 5A of the EP&A Act have been used to evaluate the potential impacts of the Project.

This assessment includes the following considerations.

Pre-construction, construction and occupation/maintenance phases.

Vegetation will be removed in a staged manner over an eighteen-year period.

On-site and off-site impacts, including location, installation, operation and maintenance of auxiliary infrastructure and fire management zones.

It is expected that the impacts of the Project would be confined largely to the area of the Project Site, because:

- the extraction sites and processing area would be fenced, bunded, and access would be controlled;
- the extraction sites and processing area would be surrounded by areas of native vegetation currently present on the Study Area; and
- the extraction sites would be progressively rehabilitated with non-invasive species throughout the life of the Project.

A range of measures will be implemented to maintain surface water and groundwater flowing from the Study Area, however, changes in both the surface water and groundwater regimes will occur on and immediately surrounding the site such that minor impacts are predicted that will be unavoidable. With respect to the retention of Stage 1/3, it is understood that the surface water regime will need to be adjusted to ensure that the level of near surface seepage continues to occur in Stage 1/3.

All direct and indirect impacts.

Direct impacts are expected to be the loss of native vegetation as a staged process on the Study Area. It is now intended to remove approximately 10.8ha of native vegetation prior to extracting sand from the defined sand extraction stages. Approximately 14.7ha of native vegetation would remain undisturbed on the Project Site.

It is noted that the proposed surface water management regime developed on site will assist to improve the quality of water flowing off site and benefit off-site environmental flows.

The frequency and duration of each known or likely impact/action.

Direct impacts arising from loss of 10.8ha of native vegetation cover and removal of sand within the proposed extraction stages would be ongoing for the life of the Project, estimated as 18 years.

Importantly, the Proponent intends to progressively rehabilitate the disturbed areas such that at the end of the project life, approximately 32.2ha of native vegetation would be present, ie 14.7ha of remnant vegetation and 17.5ha of regrowth and enhanced plantings varying in age from 2 to 16 years (because of the progressive nature of the revegetation).

The total impact which can be attributed to that action over the entire geographic area affected, and over time.

The total impact is expected to be the direct impact described above. This impact is acknowledged in the context that approximately 14.7ha of native vegetation on the Project Site would be retained and a further 17.5ha of native vegetation would be planted for retention in perpetuity.

The sensitivity of the receiving environment.

The receiving environment lies within the Study Area, the impact of removal of 10.8ha of vegetation for most threatened species known to occur on the Study Area has been offset by retaining 14.7ha areas of native vegetation on site.

The remaining 8.6ha of suitable habitat of the Red-crowned Toadlet on the Study Area will require the maintenance of similar hydrology to the existing regime.

The degree of confidence with which the impacts of the action are known and understood

In regard to vegetation removal, it is considered the impact on fauna habitat is well known and in some cases habitat rehabilitation can be achieved eg the provision of nesting boxes to replace tree hollows.

However, the potential for habitat re-creation for threatened fauna species such as the Red-crowned Toadlet is not well known.

4.9.2 The Seven Part Test (Red-crowned Toadlet, Eastern Pygmy-possum and Little Bentwing-bat and Eastern Bentwing-bat)

The 7-part test has been applied to the following threatened fauna species recorded on the Study Area by Kendall (2008) but not by CES (2006)

- Red-crowned Toadlet;
- Eastern Pygmy-possum; and
- Little Bentwing-bat and Eastern Bentwing-bat.

<u>Red-crowned Toadlet</u>

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

Dr Mahony and Mr Clulow in **Appendix 8** state:

> *"Of the 19.3ha of potential Red-crowned Toadlet habitat mapped on the Project Site 10.7ha occurs within the proposed extraction area and 8.6ha occurs outside of the proposed extraction area (Figure 1). It is considered likely that all habitat occurring in the proposed extraction area will be lost. A possibility exists whereby the areas of habitat mapped outside of the proposed extraction area to the east may be indirectly impacted through alterations in hydrology resulting from sand extraction activities in the higher grounds to the west. If these alterations were substantial, this could have a significant impact on the breeding habitat and breeding behaviour by the toadlet in these areas.*
>
> *The suitable habitat for P. australis on the Project Site is comparable to numerous other areas on the Somersby Plateau both on private land and with the various national parks and state forests. While it is considered likely that the impacts on habitat and individuals of the Red-crowned Toadlet will contribute to the long-term decline of the species across the Somersby Plateau through incremental habitat loss, it is the opinion of the authors of this report that the impact from the proposed activities will not place immediate pressure on the species to the extent that a local viable population is likely to be placed at risk of extinction."*

Ameliorative measures are recommended in **Appendix 8** that combine the principles of avoiding, mitigating and offsetting impacts.

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

No endangered fauna population occurs on the Study Area.

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

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

All endangered ecological communities are based on vegetative and abiotic descriptions.

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

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

It is intended to remove 10.8ha of native vegetation on the Study Area and remove sand from this area. Approximately 8.7ha of the native vegetation to be removed is mapped by Dr Mahony and McClulow as potential / suitable habitat for *P. australis*. Approximately 14.7ha of native vegetation will be retained on the Study Area, 8.6 ha of which is also suitable habitat for P. australis. There remains substantial areas of potential habitat for Red-crowned Toadlets off site elsewhere on the Somersby Plateau and beyond.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the Project,

Figure 8 indicates that within the Study Area the following areas will be retained as natural vegetation:

- narrow areas along the northern and southern boundaries
- a broader area along the western boundary (where it is intended to implement revegetation and weed control to enhance habitat values);
- Stage 3/1 running north-south through the approximate middle of the Study Area providing a corridor between the proposed Voluntary Conservation Area and habitat towards and beyond the southern boundary of the Study Area.
- Designated offset areas in the east of the Study Area.

It is considered that in general for most fauna, threatened species known to occur on the Study Area or considered likely to occur on the Study Area the retention of these areas should avoid fragmentation of habitat. In the case of the Red-crowned Toadlet, Dr Mahony concludes "the impact from the proposed activities will not place immediate pressure on the species to the extent that a local viable population is likely to be placed at risk of extinction."

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

It is considered that the sand to be extracted provides the surface hydrological environment upon which the Red-crowned Toadlet is dependent.

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

Critical habitat as listed in the Register of Critical Habitat kept by the Director-General of Department of Environment and Climate Change does not occur in the Study Area.

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

No recovery plans or threat abatement plans currently apply to any of the Threatened species or communities known or considered likely to occur in the Study Area (http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Recovery+planning, http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Threat+abatement+planning.

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

The Project would involve removal of 10.8ha of native vegetation.

As no threat abatement plan for native vegetation clearance has yet been prepared by DECC, it is not possible to review the proposed activity in light of that plan. Meanwhile, clearing of native vegetation should be considered as a threatening process in a generic sense *ie:* is the Project likely to have a significant effect on Threatened species, populations or ecological communities, or their habitats, and in particular, would it:

- cause fragmentation of ecological communities;
- reduce the viability of ecological communities by disrupting ecological functions;
- result in the destruction of habitat and loss of biological diversity; and
- lead to soil and bank erosion, increased salinity and loss of productive land.

Based on this assessment, it is considered that, with respect to fauna, the removal of vegetation would not be likely to further fragment the communities, result in the loss of biological diversity, disrupt ecological functions or lead to erosion, salinity or loss of productive land.

Eastern Pygmy-possum

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

Important habitat and life cycle features of the Eastern Pygmy-possum are described above. In summary Eastern Pygmy-possums:

- are found in a variety of vegetation types;
- feed largely on nectar and pollen, and also soft fruits and insects;
- Shelter in tree hollows, rotten stumps, holes in the ground and under logs;
- Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares.
- Young can be born whenever food sources are available, however most births occur between late spring and early autumn.

It is considered that all of the native vegetation is potential habitat, which would vary in quality from marginal to optimum habitat. The capture of Eastern Pygmy-possums on the Study Area indicate that the habitat on the Study Area is "known" habitat and that a local population of the

species occurs on the Study Area. There are four records of the Eastern Pygmy-possum on the DECC wildlife within 5km of the Study Area and it is considered that the local population would occur beyond the in suitable habitat beyond the Study Area. However fragmentation of this habitat would have occurred due to vegetation clearing, development and the effects of fire. It is also considered that Wiseman's Ferry Road and Peat's Ridge Road probably form barriers to the movement of the species for access between habitat containing foraging and shelter resources but that these roads may not necessarily impede genetic flow.

It is considered likely that the proposal will impact on the Eastern Pygmy-possum local population however this impact is probably not sufficient to place the local population at risk of extinction.

However measures to ameliorate against this incremental loss of habitat should be implemented following the principles of avoid, mitigate and offset.

Avoid

The Project as described in the original brief to the author did include retaining native vegetation some of which would be suitable Eastern Pygmy-possum habitat. As a consequence of locating the Eastern Pygmy-possum on the Study Area during the field survey for this report, the proponent as agreed to avoid removing habitat to Stage 1-3 of the Project (see Figure 8), thus adding to the amount of habitat to be retained.

Mitigate

- Rehabilitate disturbed areas with native endemic vegetation following sand extraction for each stage;
- Implement programs to control vertebrate pest species including cats, dogs and foxes on the Study Area;
- Inspect hollow bearing trees prior to their removal for presence of hollow dependant fauna. When hollow bearing trees are removed a wildlife carer should be present to care for any fauna located in the tree after it is felled; and
- Install nesting boxes suitable for use by Eastern Pygmy-possums.

Offset

Offset measures are described above for the Red-crowned Toadlet, it is likely that Red-crowned Toadlet habitat available in the local area would also be suitable Eastern Pygmy-possum habitat.

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

No endangered fauna population occurs on the Study Area.

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

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

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

All endangered ecological communities are based on vegetative and abiotic descriptions.

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

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

It is intended to remove 10.8ha of native vegetation on the Study Area and remove sand from this area. 14.7ha of native vegetation will be retained on the Study Area and a further 17.5ha of the Study Area will be revegetated with native endemic species.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the Project,

Figure 8 indicates that within the Study Area the following areas will be retained as natural vegetation:

- narrow areas along the northern and southern boundaries
- a broader area along the western boundary (where it is intended to implement revegetation and weed control to enhance habitat values);
- Stage 3.1 running north south through the approximate middle of the Study Area; and
- Designated offset areas in the east of the Study Area.

It is considered that in general for most fauna threatened species known to occur on the Study Area or considered likely to occur on the Study Area the retention of these areas should avoid fragmentation of habitat.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project will remove Banksia shrubland a vegetation type that would be providing important foraging habitat to the Eastern Pygmy-possum on the Study Area. The Project will also remove tree hollows and other sheltering resources that Eastern Pygmy-possums may be using on the Study Area. However it is considered that native vegetation of the Study Area also includes these resources and that these resources are also too be found outside the Study Area and in nearby national parks. The design of the project facilitates movement through the Study Area for the Eastern Pygmy-possum.

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

Critical habitat as listed in the Register of Critical Habitat kept by the Director General of Department of Environment and Climate Change does not occur in the Study Area.

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

No recovery plans or threat abatement plans currently apply to any of the Threatened species or communities known or considered likely to occur in the Study Area (http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Recovery+planning, http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Threat+abatement+planning.

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

The Project would involve removal of 10.8ha of native vegetation.

As no threat abatement plan for native vegetation clearance has yet been prepared by DECC, it is not possible to review the proposed activity in light of that plan. Meanwhile, clearing of native vegetation should be considered as a threatening process in a generic sense *ie:* is the Project likely to have a significant effect on Threatened species, populations or ecological communities, or their habitats, and in particular, would it:

- cause fragmentation of ecological communities;
- reduce the viability of ecological communities by disrupting ecological functions;
- result in the destruction of habitat and loss of biological diversity; and
- lead to soil and bank erosion, increased salinity and loss of productive land.

Based on this assessment, it is considered that, with respect to fauna, the removal of vegetation would not be likely to further fragment the communities, result in the loss of biological diversity, disrupt ecological functions or lead to erosion, salinity or loss of productive land.

Little Bentwing-bat and Eastern Bentwing-bat

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

Local Occurrence

Both the Little Bentwing-bat Bat and Eastern Bentwing-Bat were recorded on the Study Area during the recent field survey. There are no records of the Little Bentwing-Bat within 5km of the Study Area and there are 4 records of the Eastern Bentwing-Bat within 5km of the Study Area on the DECC wildlife atlas.

These bats are far ranging and the local populations are expected to extend well beyond the Study Area.

The Little Bent-wing Bat inhabits moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (M. schreibersii) and appears to depend on the large colony to provide the high temperatures needed to rear its young.

Caves are the primary roosting habitat for the Eastern Bentwing-Bat, but they also use derelict mines, storm-water tunnels, buildings and other man-made structures. They form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops.

The DECC Threatened species website identifies the following threats on the Little Bent-wing Bat:

- Disturbance of colonies, especially in nursery or hibernating caves may be catastrophic;
- Destruction of caves that provide seasonal or potential roosting sites;
- Changes to habitat, especially surrounding maternity caves; &
- Use of pesticides.

The DECC Threatened species website identifies the following threats on the Eastern Bentwing-bat Bat:

- Damage to or disturbance of roosting caves, particularly during winter or breeding;
- Loss of foraging habitat;
- Application of pesticides in or adjacent to foraging areas;
- Predation by feral cats and foxes.

Considering the far ranging nature of these highly mobile species and that a minor area of foraging habitat will be affected by the proposal and that in the case of the Little Bentwing-Bat nesting boxes suitable for use by microbats will be installed it is considered that the Project it is very unlikely to have an adverse effect on the life cycle of either the Little Bent-wing Bat or Eastern Bentwing-Bat such that a viable local population of either species would be likely to be placed at risk of extinction.

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

No endangered fauna population occurs on the Study Area.

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

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

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

All endangered ecological communities are based on vegetative and abiotic descriptions.

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

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

It is intended to remove 10.8ha of native vegetation on the Study Area and remove sand from this area. 14.7ha of vegetation will be retained on the Study Area.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the Project,

The Project will not fragment or isolate areas of habitat for these mobile species which are capable of flight.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

Due to its relative small area compared to the home range of the species and the lack of preferred shelter and breeding resources it is considered that the habitat to be removed is not considered important to either species.

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

Critical habitat as listed in the Register of Critical Habitat kept by the Director General of Department of Environment and Climate Change does not occur in the Study Area.

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

No recovery plans or threat abatement plans currently apply to any of the Threatened species or communities known or considered likely to occur in the Study Area (http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Recovery+planning, http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Threat+abatement+planning.

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

The Project would involve removal of 10.8ha of native vegetation.

As no threat abatement plan for native vegetation clearance has yet been prepared by DECC, it is not possible to review the proposed activity in light of that plan. Meanwhile, clearing of native vegetation should be considered as a threatening process in a generic sense *ie:* is the Project likely to have a significant effect on Threatened species, populations or ecological communities, or their habitats, and in particular, would it:

- cause fragmentation of ecological communities;
- reduce the viability of ecological communities by disrupting ecological functions;
- result in the destruction of habitat and loss of biological diversity; and
- lead to soil and bank erosion, increased salinity and loss of productive land.

Based on this assessment, it is considered that, with respect to fauna, the removal of vegetation would not be likely to further fragment the communities, result in the loss of biological diversity, disrupt ecological functions or lead to erosion, salinity or loss of productive land.

5 CONCLUSION

It is considered that substantive measures will need to be implemented to ameliorate against the impact of the Project on threatened fauna known to occur on the Study Area, and that as indicated above these measures should combine the principles of avoid, mitigate and offset.

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Appendix 1 - Target Species List

Common Name	Scientific Name
Giant Burrowing Frog	*Heleioporus australiacus*
Red-crowned Toadlet	*Pseudophryne australis*
Green and Golden Bell Frog	*Litoria aurea*
Green-thighed Frog	*Litoria brevipalmata*
Littlejohn's Tree Frog	*Littlejohn's Tree Frog*
Rosenberg's Goanna	*Varanus rosenbergi*
Pale-headed Snake	*Hoplocephalus bitorquatus*
Square-tailed Kite	*Lophoictinia isura*
Bush Stone-curlew	*Burhinus grallarius*
Gang-gang Cockatoo	*Callocephalon fimbriatum*
Glossy Black-cockatoo	*Calyptorhynchus lathami*
Swift Parrot	*Lathamus discolor*
Turquoise Parrot	*Neophema pulchella*
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*
Speckled Warbler	*Pyrrholaemus sagittatus*
Painted Honeyeater	*Grantiella picta*
Regent Honeyeater	*Xanthomyza phrygia*
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*
Spotted-tailed Quoll	*Dasyurus maculatus*
Common Planigale	*Planigale maculata*
Koala	*Phascolarctos cinereus*
Eastern Pygmy-possum	*Cercartetus nanus*
Yellow-bellied Glider	*Petaurus australis*
Squirrel Glider	*Petaurus norfolcensis*
Long-nosed Potoroo	*Potorous tridactylus*
Grey-headed Flying-fox	*Pteropus poliocephalus*
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*
Eastern Freetail-bat	*Mormopterus norfolkensis*
Large-eared Pied Bat	*Chalinolobus dwyeri*
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*
Golden-tipped Bat	*Kerivoula papuensis*
Little Bentwing-bat	*Miniopterus australis*
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*
Large-footed Myotis	*Myotis adversus*
Greater Broad-nosed Bat	*Scoteanax rueppellii*
Eastern Cave Bat	*Vespadelus troughtoni*
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*

Appendix 2 - Target Species Methodologies

Scientific Name	Common Name	Season	DEC Survey guidelines recommendation
Heleioporus australiacus	Giant Burrowing Frog	Adults difficult to detect at times other than when calling during warm weather, late spring summer and after rains; distinctive tadpoles are readily observable for lengthy periods.	Pitfall trapping. Nocturnal and Diurnal habitat search. NCPB.
Pseudophryne australis	Red-crowned Toadlet	After Rain	Pitfall trapping. Nocturnal and Diurnal habitat search. NCPB.
Litoria aurea	Green and Golden Bell Frog	August to March; during or immediately following substantial rain in this period;	Nocturnal and Diurnal habitat search. NCPB.
Litoria brevipalmata	Green-thighed Frog	October to March usually during a narrow window of opportunity when weather conditions are ideal (hot, sultry thunderstorms); during this time may be heard calling around breeding sites or undertaking local movements when they are more detectable;	Nocturnal and Diurnal habitat search. NCPB.
Litoria littlejohni	Littlejohn's Tree Frog		Nocturnal and Diurnal habitat search.
Varanus rosenbergi	Rosenberg's Goanna		
Hoplocephalus bitorquatus	Pale-headed Snake	mid spring to mid autumn	Nocturnal and Diurnal habitat search
Lophoictinia isura	Square-tailed Kite	Potentially all year. Sedentary or migratory. Usually approachable and confiding, but female secretive and reluctant to flush from nest when breeding	Opportunistic observation, search for nest
Burhinus grallarius	Bush Stone-curlew	All year. Largely nocturnal in its movements	NCPB
Callocephalon fimbriatum	Gang-gang Cockatoo	Move to lower altitudes in winter, preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas	Opportunistic Observation
Calyptorhynchus lathami	Glossy Black-cockatoo	All year	Opportunistic observation, search for sign
Lathamus discolor	Swift Parrot	Mid autumn to mid winter	Inappropriate Season
Neophema pulchella	Turquoise Parrot	All year	Opportunistic Observation
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	All year	Opportunistic Observation
Pyrrholaemus sagittatus	Speckled Warbler	All year	Opportunistic Observation
Grantiella picta	Painted Honeyeater	All year	Opportunistic Observation

Scientific Name	Common Name	Season	DEC Survey guidelines recommendation
Xanthomyza phrygia	Regent Honeyeater	Potentially, any time of year. Nomadic and/or possibly migratory; coastal visitor mostly March -August	Inappropriate Season
Dasyurus maculatus	Spotted-tailed Quoll	All year	Cage trapping, hair tubes
Planigale maculata	Common Planigale	All year	Pitfall Trapping. Diurnal habitat search, Elliot A Trapping (ground), Hair Tubing
Phascolarctos cinereus	Koala	All year	Spotlighting, search for sign
Cercartetus nanus	Eastern Pygmy-possum	Mid spring to mid autumn	Elliot A Trapping (ground & arboreal), Pit fall Trapping
Petaurus australis	Yellow-bellied Glider	All year	Elliot B Trapping (Arboreal)
Petaurus norfolcensis	Squirrel Glider	All year	Elliot B Trapping (Arboreal)
Potorous tridactylus	Long-nosed Potoroo	All year	Cage trapping, Ground Size B Elliot
Pteropus poliocephalus	Grey-headed Flying-fox	All year	Opportunistic observation
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	All year	Harp Trapping and Anabat recording
Mormopterus norfolkensis	Eastern Freetail-bat	All year	Harp Trapping and Anabat recording
Chalinolobus dwyeri	Large-eared Pied Bat	Mid spring-mid autumn	Harp Trapping and Anabat recording
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Mid spring-mid autumn	Harp Trapping and Anabat recording
Kerivoula papuensis	Golden-tipped Bat	Mid spring-mid autumn	Harp Trapping and Anabat recording
Miniopterus australis	Little Bentwing-bat	Mid spring-mid autumn	Harp Trapping and Anabat recording
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	hibernate from June to August	Harp Trapping and Anabat recording
Scoteanax rueppellii	Greater Broad-nosed Bat	Mid spring-mid autumn	Harp Trapping and Anabat recording
Vespadelus troughtoni	Eastern Cave Bat	All year	Harp Trapping and Anabat recording
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	All year	Elliot A & B Trapping (ground)

Appendix 3 - February BOM weather data for Mangrove Mountain and Gosford

Mangrove Mountain

Date	Day	Temps		Rain	Max wind gust			9:00 AM				3:00 PM			
		Min	Max		Dir	Spd	Time	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
		°C	°C	mm	km/h		local	°C	%	km/h		°C	%	km/h	
1	Fr	17.9	19.2	75.8	SSW	28	0:11	18	99	SSW	7	19	99	S	11
2	Sa	17.7	25.3	9.6	E	30	13:44	18.7	99	S	7	22.8	81	ENE	19
3	Su	18.6	22.9	1.4	ENE	28	12:37	21.4	94	ESE	6	22.3	93	ESE	13
4	Mo	19	21.3	30.2	E	31	16:14	19.6	99	E	13	20.2	96	E	11
5	Tu	19.4	22.7	17.6	ENE	28	23:36	20	98	NE	9	21.8	92	NW	11
6	We	16.5	28	2.2	E	33	15:35	19.4	95	NW	9	27.8	55	ENE	7
7	Th	16.4	25.6	7.4	S	48	13:25	18.5	86	NW	13	17.8	90	W	19
8	Fr	15	19.4	33.6	SE	24	14:36	15.8	94	WSW	11	17.6	81	SE	9
9	Sa	13.8	18.4	12.6	SSE	33	12:38	14.7	98	WSW	9	13.1	94	SSE	19
10	Su	12.2	21.3	5.6	S	35	12:16	15.8	86	WSW	11	20.2	69	SE	15
11	Mo	13.1	22.7	0	E	33	15:42	19.6	75	E	13	22.1	65	E	17
12	Tu	15.7	24.3	0	ENE	28	13:46	18.9	86	NNE	11	23.7	66	NE	17
13	We	14.8	19.6	0	SE	37	12:31	17.9	99	SW	11	18.6	86	SSE	15
14	Th	14	21.7	5.4	S	30	9:46	14.9	96	S	13	20.6	67	SE	15
15	Fr	14.3	22.4	1.8	S	28	13:07	15.4	97	SSW	7	20.5	68	SSE	19
16	Sa	13.1	22.7	0.2	SE	39	15:24	17.1	86	S	7	21	59	ESE	20
17	Su	14	20.6	0.2	SSE	28	10:04	18.3	78	S	11	19.7	80	SE	13
18	Mo	15.7	22.9	1.8	ENE	30	13:24	17.9	94	Calm		22.1	67	E	17
19	Tu	15.8	22.7	0.4	ENE	28	15:50	18.8	91	S	7	20.1	91	SSE	9
20	We	14.8	25.4	4.4	ENE	26	16:13	17.3	99	WNW	9	24.3	67	E	13
21	Th	16.4	25.3	0.2	S	24	14:47	18.9	99	WSW	7	24	65	S	9
22	Fr	16	30.2	0.6	ENE	26	16:03	19.9	83	WNW	9	28.9	56	NW	9
23	Sa	17.9	26.2	0	W	50	3:18	20.3	45	W	15	26.1	33	WNW	7
24	Su	12	28	0	SW	33	12:26	18.1	55	NW	13	26.6	31	W	11
25	Mo	16.5	23.2	0	E	31	16:53	19.1	75	ESE	9	22.5	64	E	15
26	Tu	15.6	28.5	0	WSW	43	17:27	19.8	85	NW	6	27.4	54	NNE	9
27	We	15.3	24.1	12.8	NW	30	11:06	18.9	87	NNW	9	21.5	69	NW	11
28	Th	15	18.5	0.2	SSW	35	20:37	17.2	99	SW	4	16.2	98	WSW	7
29	Fr	10.6	18.5	39.2	SSE	35	12:45	12.8	74	SW	13	16.4	70	S	17
				263.2											
Statistics for February 2008															
Mean		15.4	23.2					18	87		9	21.5	72		13
Lowest		10.6	18.4	0				12.8	45	Calm		13.1	31	#	7
Highest		19.4	30.2	75.8	W	50		21.4	99	W	15	28.9	99	ESE	20
Total				263.2											

Gosford

Date	Day	Temps		Rain	Max wind gust			9:00 AM				3:00 PM			
		Min	Max		Dir	Spd	Time	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
		°C	°C	mm	km/h		local	°C	%	km/h		°C	%	km/h	
1	Fr	20.1	21.8	61				20.1	99	SW	2	20.4	94	SSE	7
2	Sa	19.1	27.8	5.4	SE	22	15:13	21	95			25	73	E	9
3	Su	19.5	25.9	2.4	NNW	22	18:12	22.9	99			25.5	83	E	7
4	Mo	20.1	22.7	63	ENE	30	18:37	20.5	99	ESE	2	22.2	94	ENE	6
5	Tu	20.3	25.4	19.2	SSW	19	16:08	22.1	94	ESE	2	24.5	83		
6	We	17.2	29.3	11.6	NNW	26	16:04	22.1	81	N	4	26.8	70	ENE	9
7	Th	17.3	26.4	3.8				20.4	77	ESE	2	19.1	96	SE	6
8	Fr	16.8	21.6	27	SSE	20	10:30	18.3	86	WNW	6	20.5	70	SE	7
9	Sa	15.4	20.9	15.8	SSE	30	11:12	16.7	95	ENE	2	14.6	99	SE	7
10	Su	13.7	22.4	55.6	SE	30	12:01	17.9	78	NW	7	21.9	68	SE	13
11	Mo	13	24.2	0	NW	48	22:23	20.6	73	Calm		23.3	61	ENE	9
12	Tu	16	25.8	0	NNW	26	13:56	19.3	88	NNW	4	24.9	62	N	11
13	We	14.3	21.3	0.6	SW	44	13:37	20.5	93	W	7	20.6	73	SSE	13
14	Th	15.9	22.9	46.2	NW	46	20:04	16.7	97	W	2	22.2	57	SSE	13
15	Fr	15.3	23.5	3.6	ESE	28	15:35	17.5	95	SW	2	22.9	61	SE	13
16	Sa	13.5	23.6	0.2	S	31	14:30	18.6	90	N	6	22.7	54	SE	15
17	Su	14.3	23.1	0.2	SE	20	9:57	18.4	92	NW	2	20.5	87	Calm	
18	Mo	17.3	25.8	14	ENE	24	12:42	20.2	87	Calm		23.8	62	ENE	11
19	Tu	16.8	24.2	3.4	SE	20	13:22	18.9	99	Calm		24	70	E	6
20	We	14.4	26.6	1.8	ESE	20	14:13	19.4	99	Calm		26.1	62	E	9
21	Th	15.9	26	0	SE	22	14:03	20.9	96	Calm		23.6	76	SE	11
22	Fr	16.9	28.3	0	E	26	13:48	22.9	77	SE	2	27.5	64	ENE	7
23	Sa	17.1	25.5	0	SSE	31	8:51	22.6	36	W	6	24.9	47	ESE	11
24	Su	9.8	28.5	0	SSE	24	13:31	20.2	52	NNW	11	28.3	27	ESE	11
25	Mo	17.6	23.9	0	SE	24	14:16	19.1	86	Calm		22.7	65	ENE	9
26	Tu	16.3	28.4	0	ENE	26	15:02	21.7	82	N	7	27	63	ENE	9
27	We	17.1	26.3	17.2	NNW	17	0:25	19.8	91	NNW	6	23.5	75	Calm	
28	Th	15.7	21.3	0	SE	31	20:28	20	88	Calm		18.6	96	NNW	2
29	Fr	12.5	20.3	49.4	SSE	39	14:51	15.3	71	S	6	18.9	60	SE	19
				401.4											
Statistics for February 2008															
Mean		16.2	24.6					19.8	86		3	23	70		8
Lowest		9.8	20.3	0				15.3	36	Calm		14.6	27	Calm	
Highest		20.3	29.3	63	NW	48		22.9	99	NNW	11	28.3	99	SE	19

Appendix 4 - Weather Conditions recorded on the Study Area during the Survey Period

Date	Time	Temperature Dry	Temperature Wet	Cloud	Wind	Moon	Method
25/02/2008	0900	19	17	3/8	not recorded	not recorded	Diurnal Herp Search
27/02/2008	1500	24.5	21	7/8	Slight to Moderate breeze		Diurnal Herp Search
26/02/2008	0930	22	20	3/8	Slight breeze	not recorded	Diurnal Herp Search
24/02/2008	2100	17	not recorded	4/8	not recorded	not recorded	NCPB
25/02/2008	2130	19	18	not recorded	Slight breeze	not recorded	NCPB
23/02/2008	2030	18	16	not recorded	not recorded	8/8	Nocturnal Herp Search
25/02/2008	2220	19	not recorded	not recorded	not recorded	not recorded	Spotlight
24/02/2008	1900	24	not recorded	4/8	Slight to Moderate breeze	8/8	HBT watch
23/02/2008	1900	21	not recorded	1/8	Slight breeze	Nil (not risen)	HBT watch
26/02/2008	2030	20	19	7/8	slight breeze with some gusts & thunder		HBT watch
25/02/2008	1930	19		6/8	Slight to Moderate breeze		HBT watch
22/02/2008	1900	26.5	not recorded	4/8	Moderate breeze	Nil (not risen)	HBT watch

Appendix 5 - Species Recorded by CES (2006) on the Study Area

Class Name	Family Name	Common Name	Scientific Name	Legal Status
Amphibia	Myobatrachidae	Common Eastern Froglet	*Crinia signifera*	P
Amphibia	Myobatrachidae	Brown-striped Frog	*Limnodynastes peronii*	P
Amphibia	Myobatrachidae	Smooth Toadlet	*Uperoleia laevigata*	P
Amphibia	Hylidae	Bleating Tree Frog	*Litoria dentata*	P
Amphibia	Hylidae	Freycinet's Frog	*Litoria freycineti*	P
Amphibia	Hylidae	Tyler's Tree Frog	*Litoria tyleri*	P
Amphibia	Hylidae	Verreaux's Frog	*Litoria verreauxii*	P
Aves	Anatidae	Grey Teal	*Anas gracilis*	P
Aves	Anatidae	Australian Wood Duck	*Chenonetta jubata*	P
Aves	Podicipedidae	Hoary-headed Grebe	*Poliocephalus poliocephalus*	P
Aves	Accipitridae	Wedge-tailed Eagle	*Aquila audax*	P
Aves	Rallidae	Purple Swamphen	*Porphyrio porphyrio*	P
Aves	Charadriidae	Masked Lapwing	*Vanellus miles*	P
Aves	Columbidae	Diamond Dove	*Geopelia cuneata**	
Aves	Columbidae	Brush Bronzewing	*Phaps elegans*	P
Aves	Columbidae	Spotted Turtle-Dove	*Streptopelia chinensis*	U
Aves	Cacatuidae	Gang Gang Cockatoo	*Callocephalon fimbriatum*	E2
Aves	Cacatuidae	Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	P
Aves	Psittacidae	Eastern Rosella	*Platycercus adscitus eximius*	P

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Class Name	Family Name	Common Name	Scientific Name	Legal Status
Aves	Psittacidae	Crimson Rosella	*Platycercus elegans*	P
Aves	Cuculidae	Pacific Koel	*Eudynamys orientalis*	P
Aves	Strigidae	Southern Boobook	*Ninox boobook*	P
Aves	Alcedinidae	Laughing Kookaburra	*Dacelo novaeguineae*	P
Aves	Maluridae	Superb Fairy-wren	*Malurus cyaneus*	P
Aves	Maluridae	Variegated Fairy-wren	*Malurus lamberti*	P
Aves	Pardalotidae	Spotted Pardalote	*Pardalotus punctatus*	P
Aves	Acanthizidae	Striated Thornbill	*Acanthiza lineata*	P
Aves	Acanthizidae	Yellow Thornbill	*Acanthiza nana*	P
Aves	Meliphagidae	Eastern Spinebill	*Acanthorhynchus tenuirostris*	P
Aves	Meliphagidae	Red Wattlebird	*Anthochaera carunculata*	P
Aves	Meliphagidae	Little Wattlebird	*Anthochaera chrysoptera*	P
Aves	Meliphagidae	Yellow-faced Honeyeater	*Lichenostomus chrysops*	P
Aves	Meliphagidae	Bell Miner	*Manorina melanophrys*	P
Aves	Meliphagidae	Little Friarbird	*Philemon citreogularis*	P
Aves	Meliphagidae	Noisy Friarbird	*Philemon corniculatus*	P
Aves	Meliphagidae	White-cheeked Honeyeater	*Phylidonyris niger*	P
Aves	Meliphagidae	New Holland Honeyeater	*Phylidonyris novaehollandiae*	P
Aves	Eupetidae	Eastern Whipbird	*Psophodes olivaceus*	P
Aves	Pachycephalidae	Golden Whistler	*Pachycephala pectoralis*	P
Aves	Dicruridae	Grey Fantail	*Rhipidura albiscapa*	P

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Class Name	Family Name	Common Name	Scientific Name	Legal Status
Aves	Dicruridae	Willie Wagtail	*Rhipidura leucophrys*	P
Aves	Campephagidae	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	P
Aves	Artamidae	Australian Magpie	*Gymnorhina tibicen*	P
Aves	Corvidae	Australian Raven	*Corvus coronoides*	P
Aves	Motacillidae	Australian Pipit	*Anthus australis*	P
Aves	Estrildidae	Red-browed Finch	*Neochmia temporalis*	P
Aves	Hirundinidae	Welcome Swallow	*Hirundo neoxena*	P
Aves	Zosteropidae	Silvereye	*Zosterops lateralis*	P
Mammalia	Pseudocheiridae	Common Ringtail Possum	*Pseudocheirus peregrinus*	P
Mammalia	Phalangeridae	Common Brushtail Possum	*Trichosurus vulpecula*	P
Mammalia	Macropodidae	Swamp Wallaby	*Wallabia bicolor*	P
Mammalia	Rhinolophidae	Eastern Horseshoe-bat	*Rhinolophus megaphyllus*	P
Mammalia	Molossidae	Eastern Freetail-bat	*Mormopterus norfolkensis*	V
Mammalia	Molossidae	Little Mastiff-bat	*Mormopterus planiceps*	P
Mammalia	Molossidae	White-striped Freetail-bat	*Tadarida australis*	P
Mammalia	Vespertilionidae	Gould's Wattled Bat	*Chalinolobus gouldii*	P
Mammalia	Vespertilionidae	Chocolate Wattled Bat	*Chalinolobus morio*	P
Mammalia	Vespertilionidae	Little Bentwing-bat	*Miniopterus australis*	V
Mammalia	Vespertilionidae	Lesser Long-eared Bat	*Nyctophilus geoffroyi*	P
Mammalia	Vespertilionidae	Gould’s Long-eared Bat	*Nyctophilus gouldi*	P

Class Name	Family Name	Common Name	Scientific Name	Legal Status
Mammalia	Vespertilionidae	Eastern Forest Bat	*Vespadelus pumilus*	P
Mammalia	Vespertilionidae	Diamond Dove	*Vespedelus darlingtoni*	P
Mammalia	Muridae	House Mouse	*Mus musculus*	U
Mammalia	Muridae	Bush Rat	*Rattus fuscipes*	P
Mammalia	Muridae	Swamp Rat	*Rattus lutreolus*	P
Mammalia	Leporidae	Rabbit	*Oryctolagus cuniculus*	U
Mammalia	Canidae	Dog	*Canis lupus familiaris*	U
Mammalia	Canidae	Fox	*Vulpes vulpes*	U
Mammalia	Felidae	Cat	*Felis catus*	U
Mammalia	Equidae	Donkey	*Equus asinus*	U
Mammalia	Equidae	Horse	*Equus caballus*	U

Appendix 6 - Fauna Species Recorded by Kendall (2008)

Class Name	Family Name	Common Name	Scientific Name	Status
Mammalia	Muridae	House Mouse	*Mus musculus*	I
Mammalia	Leporidae	Rabbit	*Oryctolagus cuniculus*	I
Mammalia	Canidae	Fox	*Vulpes vulpes*	I
Mammalia	Canidae	Dog	*Canis lupus familiaris*	I
Amphibia	Myobatrachidae	Common Eastern Froglet	*Crinia signifera*	P
Amphibia	Myobatrachidae	Eastern Bango Frog	Limnodynastes dumerilii	P
Amphibia	Myobatrachidae	Brown-striped Frog	*Limnodynastes peronii*	P
Amphibia	Myobatrachidae	Dusky Toadlet	*Uperoleia fusca*	P
Amphibia	Hylidae	Eastern Dwarf Tree Frog	*Litoria fallax*	P
Amphibia	Hylidae	Broad-palmed Frog	*Litoria latopalmata*	P
Amphibia	Hylidae	Perons Tree Frog	*Litoria peronii*	P
Amphibia	Hylidae	Tylers Tree Frog	*Litoria tyleri*	P
Amphibia	Hylidae	Verreaux's Tree Frog	*Litoria verreauxii*	P
Reptilia	Agamidae	Jacky Lizard	*Amphibolurus muricatus*	P
Reptilia	Agamidae	Mountain Dragon	Rankinia diemensis	P
Reptilia	Scincidae	Tussock Rainbow Skink	Carlia vivax	P
Reptilia	Scincidae	Copper-tailed Skink	*Ctenotus taeniolatus*	P
Reptilia	Scincidae	Land Mullet	*Egernia major*	P
Reptilia	Scincidae	Eastern Water Skink	*Eulamprus quoyii*	P
Reptilia	Scincidae	Grass Skink	*Lampropholis delicata*	P
Reptilia	Scincidae	Garden Skink	*Lampropholis guichenoti*	P
Reptilia	Scincidae	Eastern Blue-tongued Lizard (Reported)	*Tiliqua scincoides*	P
Reptilia	Typhlopidae	blind snake	Ramphotyphlops nigrescens	P
Reptilia	Elapidae	Red-bellied Black Snake (Reported)	*Pseudechis porphyriacus*	P
Aves	Phasianidae	Brown Quail	Coturnix ypsilophora	P
Aves	Anatidae	Pacific Black Duck	*Anas superciliosa*	P
Aves	Anatidae	Wood Duck	*Chenonetta jubata*	P
Aves	Phalacrocoracidae	Little Pied Cormorant	*Phalacrocorax melanoleucos*	P
Aves	Phalacrocoracidae	Pied Cormorant	*Phalacrocorax varius*	P
Aves	Rallidae	Dusky Moorhen	*Gallinula tenebrosa*	P
Aves	Rallidae	Purple Swamphen	*Porphyrio porphyrio*	P
Aves	Charadriidae	Masked Lapwing	*Vanellus miles*	P

Class Name	Family Name	Common Name	Scientific Name	Status
Aves	Columbidae	Bar-shouldered Dove	*Geopelia humeralis*	P
Aves	Columbidae	Wonga Pigeon	*Leucosarcia melanoleuca*	P
Aves	Columbidae	Brush Bronzewing	*Phaps elegans*	P
Aves	Cacatuidae	Sulphur-crested Cockatoo	*Cacatua galerita*	P
Aves	Cacatuidae	Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	P
Aves	Psittacidae	Australian King-parrot	*Alisterus scapularis*	P
Aves	Psittacidae	Little Lorikeet	*Glossopsitta pusilla*	P
Aves	Psittacidae	Crimson Rossella	*Platycercus elegans*	P
Aves	Psittacidae	Eastern Rosella	*Platycercus eximius*	P
Aves	Psittacidae	Rainbow Lorikeet	*Trichoglossus haematodus*	P
Aves	Aegothelidae	Australian Owlet-Nightjar	*Aegotheles cristatus*	P
Aves	Apodidae	White-throated Needletail	*Hirundapus caudacutus*	P
Aves	Alcedinidae	Laughing Kookaburra	*Dacelo novaeguineae*	P
Aves	Alcedinidae	Sacred Kingfisher	*Todiramphus sanctus*	P
Aves	Climacteridae	White-throated Treecreeper	Cormobates leucophaea	P
Aves	Maluridae	Superb Fairy-wren	*Malurus cyaneus*	P
Aves	Maluridae	Variegated Fairy-wren	*Malurus lamberti*	P
Aves	Pardalotidae	Spotted Pardalote	*Pardalotus punctatus*	P
Aves	Pardalotidae	Striated Pardalote	*Pardalotus striatus*	P
Aves	Acanthizidae	Striated Thornbill	*Acanthiza lineata*	P
Aves	Acanthizidae	Yellow Thornbill	*Acanthiza nana*	P
Aves	Acanthizidae	Brown Thornbill	*Acanthiza pusilla*	P
Aves	Acanthizidae	White-throated Gerygone	*Gerygone olivacea*	P
Aves	Acanthizidae	White-browed Scrubwren	*Sericornis frontalis*	P
Aves	Acanthizidae	Weebill	Smicrornis brevirostris	P
Aves	Meliphagidae	Eastern Spinebill	*Acanthorhynchus tenuirostris*	P
Aves	Meliphagidae	Red Wattlebird	*Anthochaera carunculata*	P
Aves	Meliphagidae	Little Wattlebird	*Anthochaera lunulata*	P
Aves	Meliphagidae	Lewins Honeyeater	*Meliphaga lewinii*	P
Aves	Meliphagidae	Little Friarbird	*Philemon citreogularis*	P
Aves	Meliphagidae	New Holland Honeyeater	Phylidonyris novaehollandiae	P

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Class Name	Family Name	Common Name	Scientific Name	Status
Aves	Petroicidae	Eastern Yellow Robin	*Eopsaltria australis*	P
Aves	Eupetidae	Eastern Whipbird	*Psophodes olivaceus*	P
Aves	Pachycephalidae	Grey Shrike-thrush	*Colluricincla harmonica*	P
Aves	Pachycephalidae	Golden Whistler	*Pachycephala pectoralis*	P
Aves	Pachycephalidae	Rufous Whistler	*Pachycephala rufiventris*	P
Aves	Dicruridae	Magpie-lark	*Grallina cyanoleuca*	P
Aves	Dicruridae	Grey Fantail	Rhipidura albiscapa	P
Aves	Campephagidae	Black-faced Cuckoo Shrike	*Coracina novaehollandiae*	P
Aves	Oriolidae	Olive-backed Oriole	*Oriolus sagittatus*	P
Aves	Artamidae	Grey Butcher Bird	*Cracticus torquatus*	P
Aves	Artamidae	Australian Magpie	*Gymnorhina tibicen*	P
Aves	Artamidae	Pied Currawong	*Strepera graculina*	P
Aves	Corvidae	Australian Raven	*Corvus coronoides*	P
Aves	Ptilonorhynchidae	Satin Bowerbird	*Ptilonorhynchus violaceus*	P
Aves	Estrildidae	Red-browed Finch	*Neochmia temporalis*	P
Aves	Hirundinidae	Welcome Swallow	*Hirundo neoxena*	P
Aves	Zosteropidae	Silvereye	*Zosterops lateralis*	P
Aves	Muscicapidae	Bassian Thrush	*Zoothera lunulata*	P
Mammalia	Dasyuridae	Brown Antechinus	*Antechinus stuartii*	P
Mammalia	Peramelidae	Bandicoot Sp	*Bandicoot sp*	P
Mammalia	Petauridae	Sugar Glider	*Petaurus breviceps*	P
Mammalia	Pseudocheiridae	Common Ringtail Possum	*Pseudocheirus peregrinus*	P
Mammalia	Phalangeridae	Common Brushtail Possum	*Trichosurus vulpecula*	P
Mammalia	Macropodidae	Swamp Wallaby	*Wallabia bicolor*	P
Mammalia	Rhinolophidae	Eastern Horseshoe-bat	*Rhinolophus megaphyllus*	P
Mammalia	Molossidae	Little Freetail Bat	*Mormopterus sp.2*	P
Mammalia	Vespertilionidae	Gould's Wattled Bat	*Chalinolobus gouldii*	P
Mammalia	Vespertilionidae	Chocolate Wattled Bat (Probable)	*Chalinolobus morio*	P
Mammalia	Vespertilionidae	White-striped Mastiff-bat	*Nyctinomus australis*	P
Mammalia	Vespertilionidae	Gould's Long-eared Bat	*Nyctophilus gouldi*	P
Mammalia	Vespertilionidae	Eastern Broad-nosed Bat	*Scotorepens orion*	P
Mammalia	Vespertilionidae	Eastern Forest Bat	*Vespadelus pumilus*	P
Mammalia	Vespertilionidae	Little Forest Eptesicus	*Vespadelus vulturnus*	P

Class Name	Family Name	Common Name	Scientific Name	Status
Mammalia	Muridae	Bush Rat	*Rattus fuscipes*	P
Mammalia	Muridae	Swamp Rat	*Rattus lutreolus*	P
Mammalia	Vespertilionidae	Unidentified microbat	Unidentified microbat	P
Reptilia		Unidentified Snake	Unidentified Snake	P
Amphibia	Myobatrachidae	Red-crowned Toadlet	*Pseudophryne australis*	V
Aves	Cacatuidae	Gang-gang Cockatoo	*Callocephalon fimbriatum*	V
Aves	Pomatostomidae	Grey-crowned Babbler (eastern subsp.)	*Pomatostomus temporalis*	V
Mammalia	Burramyidae	Eastern Pygmy-possum	*Cercartetus nanus*	V
Mammalia	Pteropodidae	Grey-headed Flying Fox	*Pteropus poliocephalus*	V
Mammalia	Vespertilionidae	Little Bent-wing Bat	*Miniopterus australis*	V
Mammalia	Vespertilionidae	Common Bent-wing Bat	*Miniopterus schreibersii*	V
Mammalia	Vespertilionidae	Unidentified Long-eared Bat (Probable)	*Nyctophilus species*	

Appendix 7 - Species Recorded by CES (2006) on the Study Area but not by Kendall (2008)

Class Name	**Family Name**	**Common Name**	**Scientific Name**	**Legal Status**
Amphibia	Hylidae	Bleating Tree Frog	*Litoria dentata*	P
Amphibia	Hylidae	Freycinet's Frog	*Litoria freycineti*	P
Aves	Anatidae	Grey Teal	*Anas gracilis*	P
Aves	Podicipedidae	Hoary-headed Grebe	*Poliocephalus poliocephalus*	P
Aves	Accipitridae	Wedge-tailed Eagle	*Aquila audax*	P
Aves	Columbidae	Diamond Dove	*Geopelia cuneata**	
Aves	Columbidae	Spotted Turtle-Dove	*Streptopelia chinensis*	U
Aves	Cuculidae	Pacific Koel	*Eudynamys orientalis*	P
Aves	Strigidae	Southern Boobook	*Ninox boobook*	P
Aves	Meliphagidae	Yellow-faced Honeyeater	*Lichenostomus chrysops*	P
Aves	Meliphagidae	Bell Miner	*Manorina melanophrys*	P
Aves	Meliphagidae	Noisy Friarbird	*Philemon corniculatus*	P
Aves	Meliphagidae	White-cheeked Honeyeater	*Phylidonyris niger*	P
Aves	Dicruridae	Willie Wagtail	*Rhipidura leucophrys*	P
Aves	Motacillidae	Australian Pipit	*Anthus australis*	P
Mammalia	Molossidae	Eastern Freetail-bat	*Mormopterus norfolkensis*	V
Mammalia	Molossidae	Little Mastiff-bat	*Mormopterus planiceps*	P
Mammalia	Vespertilionidae	Lesser Long-eared Bat	*Nyctophilus geoffroyi*	P
Mammalia	Vespertilionidae	Diamond Dove	*Vespedelus darlingtoni*	P
Mammalia	Felidae	Cat	*Felis catus*	U
Mammalia	Equidae	Donkey	*Equus asinus*	U
Mammalia	Equidae	Horse	*Equus caballus*	U
Mammalia	Vespertilionidae	Chocolate Wattled Bat *	*Chalinolobus morio*	P

Appendix 8 - Red-crowned Toadlet Assessment

Assessment of Habitat and Suitable Mitigation Strategies for the Red-crowned Toadlet at the 'Somersby Fields Project' Site.

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15 April 2008

Objectives of this Report

The authors of this report were asked to make an assessment of Red-crowned Toadlet (*Pseudophryne australis*) habitat present at the Somersby Fields Project Site (hereby referred to as the Project Site) and to provide a recommendation of suitable mitigation strategies that might be incorporated into the overall development proposal. In order to achieve these objectives, three key questions must be answered:

1. What is suitable habitat on the Project Site;
2. What is the likely impact of the proposed activities on this habitat; and
3. What can be done to suitably mitigate this impact?

To answer the first question, one must take into consideration not only the location of where animals are found but also known information on the ecology, movements and habitat requirements of the species. To answer the second question, both direct impacts and indirect impact must be taken into consideration and where significant uncertainty occurs the precautionary principle should be applied. To answer the third question one must ensure that any ameliorative strategies put forth are practical, can be implemented and that there is a reasonable level of confidence in their effectiveness.

Project Site

The Project Site is situated to the south of Peats Ridge Road, to the east of Wisemans Ferry Road and is approximately 9km northwest of Gosford. The Project Site falls within a locality well known for the occurrence of the Red-crowned Toadlet and numerous records exist nearby to the Project Site and across the Somersby Plateau (NSW NPWS Wildlife Atlas accessed by Kendall & Kendall Pty Ltd).

1. What Is Suitable Habitat for the Red-crowned Toadlet on the Project Site?

The Red-crowned Toadlet was first detected on the Project Site after an individual was found in a pitfall trap during a supplementary fauna assessment in early 2008 (Kendall and Kendall, 2008). Since that time, several other Red-crowned Toadlets have been detected on the Project Site during site inspections conducted for this report.

The Project Site was inspected on two occasions in March 2008 by Mr Simon Clulow with the aim of surveying for Red-crowned Toadlet individuals and mapping suitable Red-crowned Toadlet habitat present on the Project Site. Surveys included listening for calling males, making suitable loud noises (generally by yelling 'hello frog') to encourage a response from males at places considered to be suitable breeding locations (a technique known to work for this species), and systematic searching and dip netting in appropriate water bodies to locate any tadpoles. Habitat mapping was conducted by walking the Project Site and recording drainage lines, pools, puddles, soaks and seepages that form suitable breeding habitat for the species. While Red-crowned Toadlets are known to breed in such water bodies, research by Stauber (2006) showed that individual Red-crowned Toadlets move distances of at least 50 metres from these locations and areas between these water bodies form suitable habitat for the species.

Red-crowned Toadlets were detected at several locations across the Project Site in the form of tadpoles and newly metamorphosed individuals with one record coming from an individual male heard calling briefly towards the middle of the site. The best indication to the suitability of habitat on the Project Site for the Red-crowned Toadlet is the detection of the species and to date this has occurred in numerous locations across the site. While several locations containing the species were found on the Project Site, it is considered that the surveys conducted are not exhaustive and that other locations with Red-crowned Toadlets may be found during more intensive surveys that are not constricted by relatively short time frames. Climatic conditions at the time of surveys were not considered suitable for detecting calling males on either site visit, based on the observation that no males were calling around known breeding sites determined by the presence of tadpoles in the water. Only one male was heard calling briefly on one occasion.

Numerous drainage lines, pools, puddles, soaks and seepages were found to occur across a large portion of the Project Site and it is considered that these areas form suitable habitat for the species. Figure 1 shows the location of all Red-crowned Toadlets detected on the Project Site, the location of drainage lines, pools, puddles, soaks and seepages that form suitable areas for breeding and the overall area that is considered to be suitable habitat for the species on the Project Site. Sites of detection of individuals and potential breeding habitats are mapped with GPS co-ordinates. The portion of the Project Site to the west of the area mapped as suitable habitat is drier than the eastern portion, lacking suitable breeding sites and is highly disturbed consisting mostly of cleared areas and introduced pine trees. The area to the east of the mapped suitable habitat also lacks suitable breeding locations. Several of the points taken indicating suitable breeding locations were drainage lines that run in a general west to east direction. The northern-most record of *P. australis* was the individual trapped in a pit fall during the supplementary fauna assessment by Kendall and Kendall (2008). The western-most record was the individual male heard calling briefly. All other records were tadpoles or metamorphs detected in water bodies.

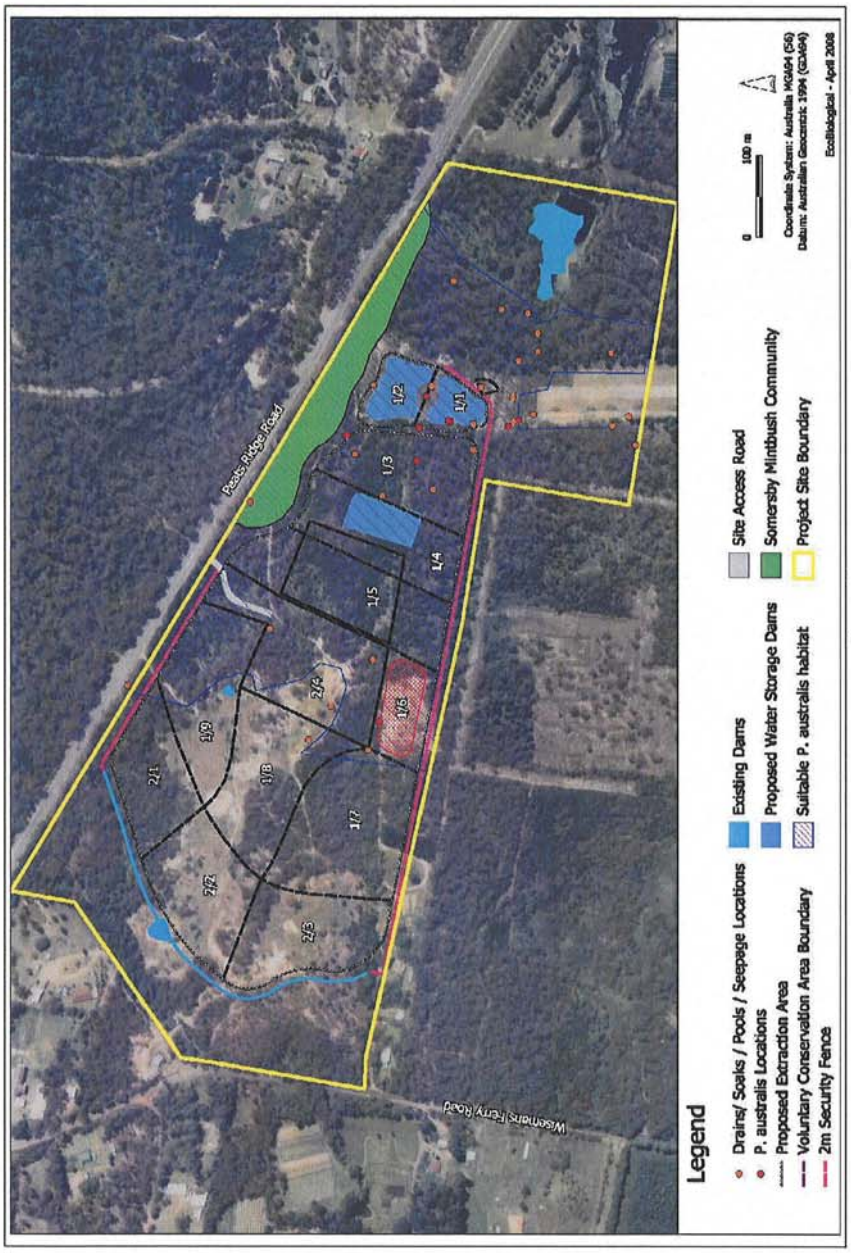

Figure 1
Aerial Photograph of the Project Site showing the location of Red-crowned Toadlets detected on site, the location of suitable drainage lines, pools, puddles, soaks and seepages, and the area considered to form suitable Red-crowned Toadlet habitat.

2. What is the Likely Impact of the Proposed Activities on the Red-crowned Toadlet Habitat?

In answering this question, two types of impacts need to be considered; direct impacts and indirect impacts. Direct impacts are defined as those that remove habitat and individuals of a species and can include death through predation, trampling, poisoning of the animal itself as well as removal of suitable habitat. Indirect impacts can be defined as activities that affect species in a manner other than direct loss and can include hydrological changes, exposure, loss of breeding opportunities, increased soil salinity, weed invasion and fertiliser drift. In identifying the likely impact on habitat and the individuals contained within that habitat, it is important to not only consider the magnitude and extent of impacts, but also the significance of the impacts as related to the conservation importance of the habitat likely to be affected. Under the threatened species assessment process, this usually translates to answering the question 'whether the action proposed will likely have an adverse effect on the life cycle of the species such that a viable population is likely to be placed at risk of extinction'.

Of the 19.3ha of suitable Red-crowned Toadlet habitat mapped on the Project Site, 10.7ha occurs within the proposed extraction area and 8.6ha occurs outside of the proposed extraction area (Figure 1). It is considered likely that all habitat occurring in the proposed extraction area will be lost. A possibility exists whereby the areas of habitat mapped outside of the proposed extraction area to the east may be indirectly impacted through alterations in hydrology resulting from sand extraction activities in the higher grounds to the west. If these alterations were substantial, this could have a significant impact on the breeding habitat and breeding behaviour by the toadlet in these areas.

The suitable habitat for *P. australis* on the Project Site is comparable to numerous other areas on the Somersby Plateau both on private land and within the various national parks and state forests. While it is considered likely that the impacts on habitat and individuals of the Red-crowned Toadlet will contribute to the long-term decline of the species across the Somersby Plateau through incremental habitat loss, it is the opinion of the authors of this report that the impact from the proposed activities will not place immediate pressure on the species to the extent that a local viable population is likely to be placed at risk of extinction.

3. What Can Be Done to Suitably Mitigate the Identified Impacts on Red-crowned Toadlet Habitat?

When developing ameliorative strategies to mitigate impact on threatened species, the Department of Environment and Climate Change (DECC) set out a three step process in priority order. These are to avoid, mitigate and then offset. Ideally, the impact identified on a threatened species should be avoided wherever possible. If it is not possible to avoid the impact, ameliorative and mitigation measures should be put in place to reduce the impact as much as possible. Finally, where measures to avoid and mitigate are not possible, then offset strategies need to be considered. Offset strategies may include offsite or local area proposals that contribute to the long-term conservation of the threatened species.

Following the three-step process outlined by DECC we recommend several possible mitigation strategies that would suitably mitigate the impact identified from the proposed development on the Red-crowned Toadlet at the Project Site. These strategies are not considered to be mutually exclusive and it is intended that a combination of strategies may need to be put in place to suitably mitigate the impact on the Red-crowned Toadlets.

Modify the plan of works – this would involve modifying the plan of works in such a way that the impact on the Red-crowned Toadlet could be avoided or reduced. A realistic strategy would be to firstly ensure measures are put in place to reduce any impacts on habitat outside of the proposed extraction area particularly caused by altered hydrology, and to secondly alter the plan of works such that some areas of identified habitat will be left aside thereby reducing the impact on the population overall. The Proponent has advised us that Stage 1/3 of the proposal could be retained in its current condition and sand not be extracted from that stage in order to set aside an area of identified Red-crowned Toadlet habitat and create a corridor linking the proposed conservation area to the north of the site with habitat to the south of the Project Site. This would equate to around 2ha of Red-crowned Toadlet habitat being set aside and reduce the amount of habitat to be removed in the proposed extraction area from 10.7ha to approximately 8.7ha. We believe this would be a suitable ameliorative strategy to reduce some of the impact on the Red-crowned Toadlet and could contribute to the overall mitigation strategy. This strategy would only be effective however if measures are put in place to ensure that the hydrology in this area of habitat is not altered significantly.

Contribute to research to inform future management of the species – this approach would aim to build on our knowledge of the status and ecology of the Red-crowned Toadlet in order to more effectively inform the management and conservation of the species into the future. While this approach would likely have little effect on reducing the immediate impact on the Project Site, it would have a large benefit for the conservation and management of the species as a whole in the locality and across its range. Several questions that could be answered through appropriate research include: what is the current status of the Red-crowned Toadlet; aspects of its ecology such as home range, dispersal and survivorship; and is habitat enhancement possible leading to increased survivorship? To answer such questions would require considerable research equal to a PhD study. Such a study would likely cost in the order of around $50k per year for 3.5 years (based on a $25k/year stipend and $25k/year research costs) and would not include any ground works associated with answering the question of habitat enhancement.

We have considered the options of firstly trying to create habitat on site and secondly to conduct a relocation program of Red-crowned Toadlets under a research framework. We consider these options as unsuitable mitigation strategies due to a high level of uncertainty of the outcomes. The Red-crowned Toadlet has very specific breeding habitat requirements and we are unaware of any evidence that such habitat could be successfully recreated for the species or that it is able to be translocated or reintroduced to such areas. An attempt at such a program may not be practical, may not be able to be implemented and there is not a reasonable level of confidence that it would be effective.

Land offsets – this strategy involves acquiring land off site that contains Red-crowned Toadlets and thus its habitat, and setting it aside into perpetuity. For this strategy to be successful, it must be shown by a suitably experienced person that the land to be offset does indeed contain Red-crowned Toadlets and suitable Red-crowned Toadlet habitat. It is preferable if this offset is located in the immediate locality of the Project Site (i.e. on the Somersby Plateau).

Conclusion

It is considered that no single ameliorative strategy suggested above may be appropriate to mitigate for all of the impact on the Red-crowned Toadlet caused by the proposed development. Instead, it is considered that a combination of strategies should be considered such as reducing the impact where possible on site and offsetting impacts that are unavoidable through contributing to research or setting aside land containing Red-crowned Toadlets into perpetuity. By adopting such an approach, the project activities will not place immediate pressure on the species to the extent that a local viable population is likely to be placed at risk of extinction.

References

Countrywide Ecological Service (2006). *Fauna Assessment of the Somersby Fields Project*, prepared on behalf of the Somersby Fields Partnership (Volume 1 – Part 6 of the *Specialist Consultant Studies Compendium*).

Kendall and Kendall Ecological Services Pty Ltd (2008). Supplementary Ecological Fauna Assessment for the Somersby Fields Project – prepared for the Somersby Fields Partnership.

Stauber, A. (2006). Habitat requirements and habitat use of the Red-crowned Toadlet *Pseudophryne australis* and Giant Burrowing Frog *Heleioporus australiacus* in the Sydney Basin. Unpublished PhD Thesis, University of Technology, Sydney.

Appendix 9 - Possibility of TSC Act Fauna Species Occurring on the Study Area

Common Name	**Scientific Name**	**Habitat**	**Possibility of Occurrence**
Adam's emerald dragonfly	*Archaeophya adamsi*	Nil	Nil
Wallum Froglet	*Crinia tinnula*	Nil	Nil
Giant Burrowing Frog	*Heleioporus australiacus*	Potential habitat occurs on the Study Area.	Likely
Stuttering Barrred Frog	*Mixophyes balbus*	Marginal potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Giant Barred Frog	*Mixophyes iteratus*	Marginal potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Red-crowned Toadlet	*Pseudophryne australis*	Recorded on Study Area during field surveys.	Known
Green and Golden Bell Frog	*Litoria aurea*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Possible
Green-thighed Frog	*Litoria brevipalmata*	Potential habitat occurs on the Study Area. Not recorded during field surveys. A cryptic species difficult to detect.	Possible
Littlejohn's Tree Frog	*Litoria littlejohni*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Likely
Rosenberg's Goanna	*Varanus rosenbergi*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Pale-headed Snake	*Hoplocephalus bitorquatus*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Possible
Broad-headed Snake	*Hoplocephalus bungaroides*	Lack of sandstone rock on the Study Area lowers the likelihood of this species occurring on the study Area.	Unlikely
Stephens' Banded Snake	*Hoplocephalus stephensii*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Possible
Australasian Bittern	*Botaurus poiciloptilus*	Marginal potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely

Common Name	**Scientific Name**	**Habitat**	**Possibility of Occurrence**
Black Bittern	*Ixobrychus flavicollis*	Marginal potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Black-necked Stork	*Ephippiorhynchus asiaticus*	Marginal potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Square-tailed Kite	*Lophoictinia isura*	Marginal potential habitat occurs on the Study Area. Not recorded during field surveys.	Possible
Osprey	*Pandion haliaetus*	Nil	Nil
Bush Stone-curlew	*Burhinus grallarius*	Marginal potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Recorded on Study Area during field surveys.	Known
Glossy Black-cockatoo	*Calyptorhynchus lathami*	No sign of the species recorded in potential foraging habitat observed during the field survey.	Unlikely
Swift Parrot	*Lathamus discolor*	Potential habitat occurs on the Study Area	Possible*
Turquoise Parrot	*Neophema pulchella*	Potential habitat occurs on the Study Area.	Possible*
Barking Owl	*Ninox connivens*	Potential habitat occurs on the Study Area. Not recorded during the Lim field surveys.	Unlikely
Powerful Owl	*Ninox strenua*	Potential habitat occurs on the Study Area. Not recorded during the Lim field surveys.	Possible
Masked Owl	*Tyto novaehollandiae*	Potential habitat occurs on the Study Area. Not recorded during the Lim field surveys.	Possible
Sooty Owl	*Tyto tenebricosa*	Nil	Nil
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	Potential habitat occurs on the Study Area. Not detected during field surveys.	Unlikely
Speckled Warbler	*Pyrrholaemus sagittatus*	Potential habitat occurs on the Study Area. Not detected during field surveys.	Unlikely
Painted Honeyeater	*Grantiella picta*	Potential habitat occurs on the Study Area. Not detected during field surveys.	Possible*

Common Name	**Scientific Name**	**Habitat**	**Possibility of Occurrence**
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	Potential habitat occurs on the Study Area. Not detected during field surveys.	Possible
Regent Honeyeater	*Xanthomyza phrygia*	Potential habitat occurs on the Study Area. Not detected during field surveys.	Possible*
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	No sign of the species recorded on the study Area although one bird was recorded north of the Study Area during the field survey.	Unlikely
Diamond Firetail	*Stagonopleura guttata*	Marginal potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Spotted-tailed Quoll	*Dasyurus maculatus*	Potential habitat occurs on the Study Area. Not recorded during the field surveys.	Unlikely
Common Planigale	*Planigale maculata*	Potential habitat occurs on the Study Area. Not recorded during the field surveys.	Possible
Koala	*Phascolarctos cinereus*	Potential habitat occurs on the Study Area. Not recorded during the field surveys.	Unlikely
Eastern Pygmy-possum	*Cercartetus nanus*	Recorded on Study Area during field surveys.	Known
Yellow-bellied Glider	*Petaurus australis*	Potential habitat occurs on the Study Area. Not recorded during the field surveys.	Unlikely
Squirrel Glider	*Petaurus norfolcensis*	Potential habitat occurs on the Study Area. Not recorded during the field surveys.	Unlikely
Long-nosed Potoroo	*Potorous tridactylus*	Potential habitat occurs on the Study Area. Not recorded during the field surveys.	Unlikely
Parma Wallaby	*Macropus parma*	Nil	Nil
Brush-tailed Rock-wallaby	*Petrogale penicillata*	Nil	Nil
Red-legged Pademelon	*Thylogale stigmatica*	Nil	Nil
Grey-headed Flying-fox	*Pteropus poliocephalus*	Recorded flying over the Study Area during field surveys, potential foraging habitat occurs on the Study Area.	Likely

Common Name	**Scientific Name**	**Habitat**	**Possibility of Occurrence**
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*		Possible
Eastern Freetail-bat	*Mormopterus norfolkensis*	Recorded on Study Area during Lim field surveys.	Known
Large-eared Pied Bat	*Chalinolobus dwyeri*	Potential sheltering habitat does not occur on the Study Area. Not recorded during field surveys.	Unlikely
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Golden-tipped Bat	*Kerivoula papuensis*	Marginal potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Little Bentwing-bat	*Miniopterus australis*	Recorded on Study Area during field surveys.	Known
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	Recorded on Study Area during field surveys.	Known
Large-footed Myotis	*Myotis adversus*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Eastern Cave Bat	*Vespadelus troughtoni*	Potential sheltering habitat does not occur on the Study Area. Not recorded during field surveys.	Unlikely
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Unlikely
Comb-crested Jacana	*Irediparra gallinacea*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Possible*
Blue-billed Duck	*Oxyura australis*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Possible*
Painted Snipe	*Rostratula benghalensis*	Potential habitat occurs on the Study Area. Not recorded during field surveys.	Possible*

Appendix 10 - List of Priority Actions Identified by DECC for each Threatened Species Known to occur on the Study Area

Species	Description of priority action	PRIORITY	RELEVANT TO PROPOSAL	*AMELIORATIVE MEASURES APPLICABLE*
Red-crowned Toadlet	**Recovery strategy: Community and land-holder liaison/ awareness and/or education**			
	Develop educational strategies and raise awareness of actions land owners can take to reduce impact on the species.	M	N	
	Develop strategies to minimise use of bushrock in landscaping i.e. alternatives, artificial rocks, awareness raising of impacts of removing natural rock from the environment.	M	N	
	Recovery strategy: Coordinate the recovery and/or threat abatement program			
	Coordinate the implementation of recovery actions.	H	N	
	Recovery strategy: Develop and implement protocols and guidelines			
	Develop best practice management strategies that buffer and protect important headwater/ridge top breeding sites from changes to water flow, flow regimes and water quality changes.	H	Y	Avoid and Offset
	Recovery strategy: Habitat management: Fire			
	Develop a preferred habitat fire regime and mosaic burn, heap burn and other burn strategies that reduce impacts on the species.	M	Y	Offset
	Develop preferred mitigation measures to minimize impact of wildlife and/or suppression operations.	M	N	
	Recovery strategy: Habitat management: Other			
	Develop best practice habitat management strategies that reduce bushrock removal from important habitat areas.	M	N	
	Prepare species prescription under the IFOA to reduce impact of forestry practices.	M	N	
	Recovery strategy: Habitat Rehabilitation/Restoration and/or Regeneration			
	Prepare guide to creating, rehabilitating or augmenting habitat for the species; this might include provision of rock/log ground cover, diversion of water, provision of breeding/nesting sites and material.	H	N	
	Recovery strategy: Monitoring			
	Monitor the various initiatives and trials of habitat manipulation for effectiveness.	M	N	
	Recovery strategy: Research			
	Develop a guide to fire trail, track and road construction and maintenance that includes details of microhabitat manipulation likely to beneficial to the species.	M	N	
	Investigate methods of ameliorating or attenuating chytrid action.	M	N	

Species	Description of priority action	PRIORITY	RELEVANT TO PROPOSAL	*AMELIORATIVE MEASURES APPLICABLE*
Red-crowned Toadlet (cont)	**Recovery strategy: Survey/Mapping and Habitat assessment**			
	Develop models of the preferred habitat of the species throughout its distribution.	M	N	
	Prepare vegetation association descriptions and map extent.	M	N	
Gang-gang Cockatoo	**Recovery strategy: Community and land-holder liaison/ awareness and/or education**			
	Produce a community awareness strategy that provides advice on how to carry out actions that will benefit the population of the species.	M	N	
	Recovery strategy: Habitat management: Fire			
	Develop fire management options within forested habitat areas that give priority to minimising loss of habitat trees.	H	Y	Mitigate
	Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).	M	Y	Mitigate
	Recovery strategy: Habitat Rehabilitation/Restoration and/or Regeneration			
	Develop a strategy that includes street tree or other planting, browse plant species within reserves and private residences.	M	N	
	Provide supplementary hollows/nest boxes within the primary habitat areas.	M	Y	Mitigate
	Recovery strategy: Monitoring			
	Monitor utilisation of the relevant forested areas as to nesting, foraging and other habitat uses.	M	N	
	Recovery strategy: Research			
	Determine from study findings whether opportunities exist to further facilitate migrations to and from the designated endangered population area.	M	N	
	Investigate movement patterns within and between areas occupied by individuals from the population.	M	N	
Eastern Pygmy-possum	**Recovery strategy: Community and land-holder liaison/ awareness and/or education**			
	Encourage and support land managers to undertake management actions that benefit the species (see recovery information for land managers in our detailed species profile).	M	Y	Avoid Mitigate Offset
	Recovery strategy: Habitat management: Feral Control			
	Control and monitor abundance of feral predators, especially cats, where there are known populations of EPP in areas of high quality habitat and encourage night-time curfews for cats on urban fringes adjacent to these habitats.	M	Y	Mitigate
	Recovery strategy: Habitat management: Fire			
	Provide map of known occurrences to Rural Fire Service and seek fire frequency of >10 years on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).	H	Y	Mitigate

Species	Description of priority action	PRIORITY	RELEVANT TO PROPOSAL	*AMELIORATIVE MEASURES APPLICABLE*
Eastern Pygmy-possum (cont)	Reserve fire management strategies to include operational guidelines to protect this species from fire, with fire frequency of >10 years .	M	Y	Mitigate
	Recovery strategy: Research			
	Encourage research on appropriate fire and land management regimes for retention and recruitment of EPP habitat.	M	Y	Mitigate
	Encourage research on the ecology, movements, habitat use and genetics of populations.	M	N	
	Recovery strategy: Survey/Mapping and Habitat assessment			
	Conduct field surveys using "Elliot" traps in trees and on the ground and pitfall traps to further delineate distribution and key populations. Avoid periods of cold weather. Areas identified for development should receive high priority.	M	N	
Little Bent-wing Bat	**Recovery strategy: Community and land-holder liaison/ awareness and/or education**			
	Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/disused mine tunnels.	M	N	
	Recovery strategy: Data recording and storage			
	Compile register of all known roost sites in natural and artificial structures including current and historical data and identify signifance of roost, e.g. maternity, hibernation, transient roost.	M	N	
	Recovery strategy: Habitat management: Feral Control			
	Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites.	M	Y	Mitigate
	Control goats around roosting sites, particularly maternity caves and hibernation sites.	M	N	
	Recovery strategy: Habitat management: Fire			
	Exclude prescription burns from 100m from cave entrance, ensure smoke/flames of fires do not enter caves/roosts in artificial structures.	L	N	
	Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts.	L	N	
	Recovery strategy: Habitat management: Other			
	Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies.	L	N	
	Recovery strategy: Habitat management: Site Protection (eg Fencing/Signage)			
	Protect significant roosts and forest habitat within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments.	M	N	

Species	Description of priority action	PRIORITY	RELEVANT TO PROPOSAL	*AMELIORATIVE MEASURES APPLICABLE*
Little Bent-wing Bat (cont)	Identify and protect significant roost habitat in artificial structures (eg culverts, old buildings and derelict mines).	L	N	
	Restrict access where possible to known maternity sites. (e.g: signs).	L	N	
	Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts.	L	N	
	Search for significant roost sites and restrict access where possible. (e.g. gating of caves). Significant includes maternity, hibernation and transient sites including in artificial structures.	L	N	
	Recovery strategy: Habitat management: Weed Control			
	Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.	L	Y	Mitigate
	Recovery strategy: Habitat Protection (inc vca/ jma/ critical habitat nomination etc)			
	Promote the conservation of these significant roost areas using measures such as incentive funding to landholders, offseting and biobanking, acquisition for reserve establishment or other means.	L	N	
	Recovery strategy: Monitoring			
	Monitor the breeding success of maternity colonies in cave roosts over a number of years to determine the viability of regional populations.	H	N	
	For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays.	L	N	
	Recovery strategy: Research			
	Identify types of winter roosts used by species. Winter roosts suspected to be banana palms and tree hollows.	H	N	
	Determine the effectiveness of PVP assessment, offsets and actions for bats.	M	N	
	Establish a gateing design for disused mines across species range that will not adversely impact species.	M	N	
	Identify important foraging range and key habitat components around significant roosts.	M	N	
	Identify the susceptibility of the species to pesticides.	M	N	
	Measure genetic population structure among cave roosts of maternity colonies to estimate dispersal and genetic isolation, and vulnerability to regional population extinction.	M	N	
	Study the ecological requirements of maternity colonies and their environs and migratory patterns.	M	N	

Species	Description of priority action	PRIORITY	RELEVANT TO PROPOSAL	*AMELIORATIVE MEASURES APPLICABLE*
Little Bent-wing Bat (cont)	Study the effect of different burning regimes on cave disturbance and surrounding foraging habitat.	M	N	
	Recovery strategy: Survey/Mapping and Habitat assessment			
	Undertake a regular census of maternity colonies (e.g. Willi Willi) and other key roosts in network, especially where there are population estimates from banding in the 1960s.	L	N	
Eastern Bent-wing Bat	**Recovery strategy: Community and land-holder liaison/ awareness and/or education**			
	Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/disused mine tunnels.	M	N	
	Recovery strategy: Data recording and storage			
	Compile register of all known roost sites in natural and artificial structures including current and historical data and identify signifance of roost, e.g. maternity, hibernation, transient roost.	M	N	
	Recovery strategy: Habitat management: Feral Control			
	Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites.	M	Y	Mitigate
	Recovery strategy: Habitat management: Fire			
	Exclude prescription burns from 100m from cave entrance, ensure smoke/flames of fires do not enter caves/roosts in artificial structures.	L	N	
	Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts.	L	N	
	Recovery strategy: Habitat management: Other			
	Ensure protection of known roosts and forest within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments.	M	N	
	Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies.	L	N	
	Recovery strategy: Habitat management: Site Protection (eg Fencing/Signage)			
	Search for significant roost sites and restrict access where possible (e.g. gating of caves). Significant includes maternity, hibernation and transient sites including in artificial structures. .	M	N	
	Identify and protect significant roost habitat in artificial structures (eg culverts, old buildings and derelict mines).	L	N	
	Restrict access where possible to known maternity sites. (e.g.: signs; bat-friendly, preferably external gates at caves).	L	N	

Species	Description of priority action	PRIORITY	RELEVANT TO PROPOSAL	*AMELIORATIVE MEASURES APPLICABLE*
Eastern Bent-wing Bat (cont)	Restrict caving activities at significant roosts during important stages of the annual bat life cycle (eg winter hibernation, summer maternity season).	L	N	
	Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts.	L	N	
	Recovery strategy: Habitat management: Weed Control			
	Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.	L	Y	Mitigate
	Recovery strategy: Habitat Protection (inc vca/ jma/ critical habitat nomination etc)			
	Promote the conservation of these key roost areas using measures such as incentive funding to landholders, offseting and biobanking, acquisition for reserve establishment or other means.	M	N	
	Recovery strategy: Monitoring			
	Monitor the breeding success of a representative sample of maternity colonies in cave roosts over a number of years to determine the viability of regional populations.	H	N	
	Regular censuses of maternity colonies (Wee Jasper, Bungonia, Willi-Willi, Riverton) and other key roosts in network, especially where there are population estimates from banding in the 1960s.	H	N	
	For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays.	L	N	
	Recovery strategy: Research			
	Confirm species taxonomy of NSW populations, relative to other Australian populations.	M	N	
	Determine the effectiveness of PVP assessment, offsets and actions for bats.	M	N	
	Establish a gating design for disused mines across species range that will not adversely impact species. Consultation with cave bat specialist prior to any gating operations.	M	N	
	Identify the susceptibility of the species to pesticides.	M	Y	Mitigate
	Research the effect of different burning regimes on cave disturbance and surrounding foraging habitat.	M	N	
	Research to identify important foraging range and key habitat components around significant roosts.	M	N	
	Study the ecological requirements of maternity colonies and their environs and migratory patterns.	M	N	
	Measure genetic population structure among cave roosts of maternity colonies to estimate dispersal and genetic isolation, and vulnerability to regional population extinction.	L	N	

Species	Description of priority action	PRIORITY	RELEVANT TO PROPOSAL	*AMELIORATIVE MEASURES APPLICABLE*
Eastern Freetail-bat	**Recovery strategy: Community and land-holder liaison/ awareness and/or education**			
	Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.	M	N	
	Recovery strategy: Habitat management: Ongoing EIA - Advice to consent and planning authorities			
	Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees.	H	N	
	Recovery strategy: Habitat management: Other			
	Ensure the largest hollow bearing trees, inc. dead trees and paddock trees, are given highest priority for retention in PVP assessments. Offsets should include remnants in high productivity.	H	N	
	Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value planning instruments and land management negotiations e.g. LEP, CAPs, PVPs.	H	N	
	Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees. .	M	N	
	Recovery strategy: Habitat Protection (inc vca/ jma/ critical habitat nomination etc)			
	Promote the conservation of these private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means.	H	Y	Offset & Acquistion
	Recovery strategy: Research			
	Identify the effects of fragmentation in a range of fragmented landscapes i.e. the farmland/forest interface and the urban/forest interface e.g. movement and persistence across a range of fragment sizes.	H	N	
	Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal.	H	N	
	Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts. .	H	N	
	Identify important foraging range and key habitat components for this species.	M	N	
	Identify the susceptibility of the species to pesticides.	M	N	
	Investigate the effectiveness of logging prescriptions.	M	N	
	Research the effect of different burning regimes.	M	N	
	Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes, such as revegetating and installing bat boxes.	M	N	
	Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species.	M	N	

Species	**Description of priority action**	**PRIORITY**	**RELEVANT TO PROPOSAL**	***AMELIORATIVE MEASURES APPLICABLE***
Eastern Freetail-bat (cont)	Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes.	M	N	
	Quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops. .	L	N	
	Recovery strategy: Survey/Mapping and Habitat assessment			
	Better define species distribution through survey in coastal lowlands on- and off-reserve.	M	N	